The RETEC Group, Inc.
1001 W. Seneca Street, Suite 204
Ithaca, NY 14850-3342

RETEC

(607) 277-5716 Phone
(607) 277-9057 Fax
www.retec.com

August 18, 2006

Elizabeth B. Lukowski
Division of Environmental Remediation
NYSDEC
625 Broadway, 11th Floor
Albany, NY 12233-7014

RE: SRI Work Plan
Penn Yan Water Street Manufactured Gas Plant Site
Penn Yan, New York
NYSEG
NYSDEC Site No. 8-62-009
Index #: D0-0002-9309

Dear Ms. Lukowski:

In compliance with the terms of the Order on Consent Index Number D0-0002-9309, The RETEC Group, Inc. (RETEC) is submitting to you on behalf of NYSEG, three hard copies, and one electronic copy (CD ROM) of the Supplemental Remedial Investigation (SRI) Work Plan, dated August 18, 2006, for additional investigation work at the manufactured gas plant (MGP) site located on Water Street in the Village of Penn Yan, New York. Should the Department need additional copies of the Work Plan, please contact me and additional copies will be prepared.

If you have any questions regarding this submittal, please do not hesitate to contact either Bruce Coulombe or myself at (607) 277-5716. Please direct the Department's official comments or response to Mr. John Ruspantini, NYSEG's Project Manager for the investigation, at (607) 762-8787.

Respectfully submitted,

The RETEC Group, Inc.

James H. Edwards

James H. Edwards
Geologist

JHE/mlr

Attachment

cc: Mr. John Ruspantini – NYSEG
Mr. Bruce Coulombe, P.G. – RETEC (w/o attachment)
Mr. John Finn, P.E. – RETEC (w/o attachment)

Project file: NYSG2-19552

RETEC

Work Plan for Supplemental Remedial Investigation

Penn Yan Water Street MGP Site
Penn Yan, New York
NYSDEC Site No.: 8-62-009
Index #: D0-0002-9309

Prepared by:

The RETEC Group, Inc.
1001 West Seneca Street, Suite 204
Ithaca, NY 14850-3342

RETEC Project Number: NYSG2-19552

Prepared for:

NYSEG
James A. Carrigg Center
18 Link Drive
P.O.Box 5224
Binghamton, New York 13902-5224

August 18, 2006

Work Plan for Supplemental Remedial Investigation

Penn Yan Water Street MGP Site
Penn Yan, New York
NYSDEC Site No.: 8-62-009
Index #: D0-0002-9309

Prepared by:

The RETEC Group, Inc.
1001 West Seneca Street, Suite 204
Ithaca, NY 14850-3342

RETEC Project Number: NYSG2-19552

Prepared for:

NYSEG
James A. Carrigg Center
18 Link Drive
P.O.Box 5224
Binghamton, New York 13902-5224

Prepared by:

James H. Edwards

James H. Edwards, Senior Geologist

Reviewed by:

Bruce D. Coulombe

Bruce D. Coulombe, P.G. Senior Hydrogeologist

August 18, 2006

Table of Contents

Table of Contents

List of Appendices

Appendix A – Historic Sanborn Fire Insurance Maps

Appendix B – Previous Investigation Borelogs and Well Construction Logs

Appendix C – Previous Remedial Work Site Maps and Diagrams

Appendix D – Field Sampling and Analytical Plan (FSAP)

Appendix E – Quality Assurance Project Plan (QAPP)

Appendix F – Community Air Monitoring Plan (CAMP)

Appendix G – Site-specific Health and Safety Plan (HASP)

List of Tables

List of Figures

1 Introduction

This Supplemental Remedial Investigation (SRI) Work Plan has been prepared for NYSEG (New York State Electric and Gas) by The RETEC Group, Inc. (RETEC) for a property located on Water Street in the Village of Penn Yan, New York. This property was the site of a former manufactured gas plant (MGP) that was operated by the Penn Yan Gas Light Company in the late 1800's and early 1900's.

The investigation of the property is being conducted pursuant to a Multi-site Order on Consent between NYSEG and the New York State Department of Environmental Conservation (NYSDEC), Index # D0-0002-9309, which was executed on March 25, 1994, and in accordance with applicable guidelines of the NYSDEC, the New York State Department of Health (NYSDOH), the United States Environmental Protection Agency (U.S. EPA) and the National Contingency Plan (NCP).

This SRI Work Plan provides background information regarding site conditions and describes the project objectives and outlines the strategies and methodologies that will be implemented during the investigation. Four appendices have been developed which detail the procedures and protocols outlined in this Work Plan.

- The Field Sampling and Analytical Plan (FSAP) provides information regarding field sampling methods and procedures that will be used during the investigation.

- The Quality Assurance Project Plan (QAPP) specifies the quality assurance/quality control procedures that will be implemented during the fieldwork and in the laboratory which performs the chemical analyses of the samples collected during the SRI.

- A Community Air Monitoring Program (CAMP) provides information regarding the procedures to be used to monitor and control, if necessary, the potential release of airborne constituents at the downwind perimeters of the investigation work areas. Included in the CAMP are procedures regarding the control of odors that may be present as a result of the intrusive site investigation activities.

- A Site-Specific Health and Safety Plan (HASP) has been prepared to outline procedures that will be undertaken to protect site workers and visitors, and the public in the areas adjacent to the site from potential hazards that may exist as a result of the fieldwork performed at the site.

1.1 Project Objectives

The objectives of the SRI include the following:

- To collect additional data to more completely determine the surface and subsurface characteristics of the site;
- To more completely determine the nature and extent of MGP-related residuals that are present at the site and surrounding areas;
- To identify the potential routes of off-site migration from on-site sources of MGP-related residuals;
- To perform an exposure assessment to evaluate the pathways by which a human or ecological receptor (either on-site or off-site) may be exposed to a MGP-related residual; and
- To obtain sufficient data to facilitate the selection of remedial actions to address MGP-residuals at the site.

1.2 Work Plan Organization

Following this introduction, the remainder of this Work Plan describes the planned SRI activities.

- **Section 2** – provides a description of the site, summary information regarding site ownership and operational history, and the results of the previous investigation and remedial work performed at the site.
- **Section 3 –** presents the objectives for the investigation followed by a description of the specific tasks that will be undertaken to gather sufficient information to meet the project objectives.
- **Section 4 –** describes the companion documents that are included as appendices to the Work Plan, including the FSAP, QAPP, CAMP, and HASP.
- **Section 5** – describes the Community Outreach Plan to be undertaken by NYSEG for this project.
- **Section 6** – provides the project duration and approximate schedule, with key milestones.
- **Section 7 –** provides a list of the references cited in the Work Plan.

Appendices to the Work Plan include the following:

- Historic Sanborn Fire Insurance Maps are included in Appendix A.
- Previous investigation test pit, soil boring, and well completion logs are included in Appendix B.
- Maps and figures summarizing the previous remedial work performed at the site are included in Appendix C.
- The FSAP is included as Appendix D.
- The QAPP is included as Appendix E.
- The CAMP is included as Appendix F.
- The HASP is included as Appendix C.

2 Site Description and History

This section presents a description of the site, summary information regarding site ownership and operational history, and summary information for the results of previous investigation and remedial work performed at the site.

2.1 Site Description

The site is located between Water Street and the Keuka Lake Outlet in the Village of Penn Yan, Yates County, New York. The location of the site is shown on Figure 2-1.

The site is comprised of two contiguous parcels of land which are both currently owned by NYSEG. The larger parcel includes the former MGP process area which is identified by the Village of Penn Yan Tax Assessment Office as Section/Block/Lot # 46.17-2-68. This parcel covers a total land area of approximately 0.805 acres.

A small parcel in the northeast corner of the site, identified by the Village of Penn Yan Tax Assessment Office as Section/Block/Lot # 46.17-2-74, is currently used by NYSEG as a gas regulating station.

The site is located in an urban setting where land surrounding the site is used for residential and commercial purposes. The former MGP Building is present in the southeastern area of the site. The remaining areas of the site are grass-covered areas or are covered by a driveway and a concrete floor slab from a former warehouse/garage that was demolished in 2004. The site layout and current features are shown on Figure 2-2.

2.1.1 Adjacent Properties

Immediately to the north of the site is Water Street and then commercial properties beyond (a restaurant and a car dealership).

To the south of the site is the Keuka Lake Outlet. The outlet is classified as a Class C waterway by the NYSDEC. The water level in the outlet is controlled by the Village of Penn Yan at a dam approximately 600 feet downstream of the site at Main Street. Previous sampling has been performed in the outlet in the area adjacent to, and downstream of the site (discussed below).

Immediately to the west of the site is the adjacent property located at the corner of Liberty and Water Streets. One building is present at this location which is currently being renovated as a real estate sales office. The remaining areas of this property are covered by grass or driveways. Subsurface soil and groundwater sampling were performed in the northwestern corner of this property during a previous investigation performed at the site.

To the east of the site is a commercial property (the Yates-Blodgett Grainery) which is covered by grassy areas, driveways and commercial buildings. Contingent on obtaining an access agreement, SRI soil and groundwater sampling is planned at this property during the SRI (discussed below).

2.2 Site History

An extensive review of available historical information for the site was performed during a Preliminary Site Evaluation by TRC Environmental Consultants, Inc. (TRC) in December 1986 [TRC, 1986]. A summary of the historical information obtained during this evaluation is presented in Table 2-1. To show the historical features that comprised the MGP over time, the Sanborn Fire Insurance Maps for the site for the years 1903, 1909, 1915, 1922, and 1938 have been included in Appendix A.

From the historical review, it appears that the former MGP parcel was initially developed as a malt house and wood storage facility. The MGP was constructed in 1899 and operated until 1931. During this period gas was manufactured using a coal gasification process by the Penn Yan Gas Light Company.

The historical research identified various former site features which could have been potential source areas for MGP residuals; as such, those areas are targeted for investigation. The key features of the MGP which will be investigated are shown on Figure 2-2, and are summarized as follows:

- A Coke Pile was present in the northern area of the site.
- A 45-foot diameter Gas Holder was present in the northeastern area of the site.
- The former MGP Process Building was located in the eastern area of the site. A Condenser, Scrubber, Purifier Boxes, Retorts, and a Coal Storage Area were present within the footprint of the building.
- A Coke Shed that was later used as a Tool Shed was present to the west of the MGP Building.
- Located between the Coke Shed and the MGP Building were areas that were used for coke and coal storage.
- Also located between the Coke Shed and the MGP Building was a subsurface tar tank (Tar Tank A). The brick structure and associated piping for the tank were removed from the site during a remedial action performed in 1991 (see Section 2.3).

- Tar Storage Tank B was located between the former process area and the Keuka Lake Outlet. This was a 26-foot long underground steel tank which was removed from the site in 1992 (see Section 2.3).

- Located to the northwest of the MGP Building was an area that was used to store ash and wood chips.

- Unknown Structure #1, believed to be a former dwelling, was located in the northwestern area of the site.

- A second structure (Unknown Structure #2), was located along the western boundary of the parcel. The purpose of this structure was not identified in the available historical information.

The Gas Holder and accessory buildings were demolished sometime following the cessation of the gas manufacturing activities in 1931.

2.2.1 Other Site Uses

The property was later purchased by Penn Yan Wine Cellars, Inc., and was used as a wine distribution center. During this time, a warehouse structure was erected which was attached to the west side of the MGP Building at the location shown on Figure 2-2.

The warehouse was later used as a garage for an auto sales and repair business (Lake County Ford Mercury, Inc.). The warehouse/garage was recently demolished in 2004; however, the concrete floor for the structure is still present at the location shown on Figure 2-2. Note that the concrete floor was recently covered with soil to deter recreational use of this area.

The MGP Building has recently been designated as a historic structure by the New York State Office of Parks, Recreation, and Historic Preservation in accordance with Section 106 of the National Historic Preservation Act of 1996.

2.3 Previous Investigations

Between 1986 and 1990, TRC performed fieldwork at the site that included the excavation of test pits, the completion of soil borings, the installation of monitoring wells, and the analyses of soil, groundwater, and sediment samples [TRC, 1990a and 1990b]. The sample locations for this investigation are shown on Figure 2-3. The borelogs and well construction logs for the sampling performed by TRC are included in Appendix B.

During the period between September 1991 to May 1992, SLC Consultants/Constructors, Inc. (SLC) performed remedial work at the site

[SLC, 1991 and 1992]. Tar Tank A (Figure 2-3) was uncovered, decomissioned and cleaned out. The 3,000 gallon underground storage tank located between the warehouse/garage building and the outlet (Tar Tank B) was also decommissioned, cleaned-out and removed. Impacted soil was also excavated from the tank pit area to the south to the shoreline of the outlet channel. Site maps and drawings prepared by SLC and NYSEG are included in Appendix C to show the location and configuration of Tar Tanks A and B, and the limits of the remedial excavation performed in the tank pit area for Tar Tank B.

A Supplemental Investigation (SI), which included the completion of three soil borings and the collection of additional sediment samples, was performed by Geraghty and Miller, Inc. in June 1994 [Geraghty and Miller, 1994a]. The locations of the SI sample points are shown on Figure 2-3. The SI borelogs and sediment core logs for this investigation are included in Appendix B.

The results of surface and subsurface soil sampling previously performed at the site are summarized on Figure 2-4. Included on the Figure are the sample designations, sample depths, the date sampled, and the total BTEX, total PAH (TPAH), and total cyanide results for each location.

The results of the most recent (April 23, 1998) groundwater sampling event performed at the site are shown on Figure 2-5. Included on Figure 2-5 are the monitoring well designations, the date sampled, and the total BTEX, total PAH (TPAH), and total cyanide results for each well.

2.4 Site Physical Characteristics

Information obtained during the previous investigations performed at the site regarding the site topography, geology and hydrogeology is summarized in the following sections.

2.4.1 Site Topography and Drainage

The ground surface at the site slopes from about 734 feet above mean sea level (MSL) at Water Street, to about 714 feet above MSL at the shoreline of Keuka Lake Outlet. Surface water flow direction across the site is likely to mimic the slope of the ground surface with discharge to the Keuka Lake Outlet. The surface water flow in the outlet is towards the northeast. The rate of flow in the outlet is controlled by the Village at a dam at the Main Street Bridge which is located approximately 600 feet to the northeast of the site. The contour lines for the ground surface for the site are shown on Figure 2-2.

2.4.2 Site Geology

Three cross-sectional views have been prepared to illustrate the subsurface conditions observed during the previous investigations performed at the site.

The locations of the cross-sections are shown on Figure 2-6, and the cross-sections are included as Figure 2-7 (A-A'), Figure 2-8 (B-B'), and Figure 2-9 (C-C').

Three subsurface units were identified as a result of the previous work performed at the site, which include:

- **Fill** – Fill was observed to be present in all areas of the site in thicknesses that ranged from 13 feet in the area adjacent to Water Street, to approximately 4 feet in the area around the MGP Building. The thickness of the fill adjacent to the outlet is approximately 8 feet.

- **Silt –** Beneath the fill is a silt unit that ranges in thickness from 10 to 20 feet thick. The silt unit may be acting as a potential aquitard beneath the site.

- **Sand** – A sand unit of unknown thickness is present beneath the silt unit.

From sediment cores obtained in the outlet channel, it appears that an organic silt unit is present in a thickness of approximately 4 feet. Beneath the silt is a clay unit of unknown thickness.

The depth to bedrock beneath the site is not known; however, information reported from a local well driller who has a shop well in the area to the west of Liberty Street indicates that the bedrock unit is likely found at a depth greater than 300 feet bgs in the area of the site.

2.5 Site Hydrogeology

From water level measurements obtained on September 28, 2004 from the six existing site wells, the groundwater table is between 3 and 15 feet below ground surface (bgs) at the site. As shown on Figure 2-10, groundwater flows from the northwest (MW1S – 722.28 feet MSL) to the southeast (MW2S – 714.59 feet MSL) with an approximate gradient of 0.03 feet/foot.

From previous testing performed at the site, the range of horizontal hydraulic conductivities measured in the shallow wells was from 3.0×10^{-5} centimeters per second (cm/sec) to 6.0×10^{-4} cm/sec.

3 SRI Objectives and Field Activities

Although investigation and remedial work has been performed at the site, data gaps remain for the characterization of the site media and impacts in the areas of interest discussed above. The specific objectives for the SRI and the activities that will be undertaken to meet these objectives are discussed below. The discussion of investigation activities has been grouped by environmental media of concern or field task in the following sections. The location of each SRI sample point is shown in red on Figure 3-1.

3.1 Surface Soil

3.1.1 Surface Soil Data Objectives

Although two surface soil samples were collected during a previous investigation performed at the site, additional data is needed in order to assess the potential for direct exposure of on-site and off-site workers or the public to site-related residuals. The area to the west of the MGP Building will not be sampled as this area is covered by the former concrete floor of the former warehouse. Some surface soil is present in grassy areas in the peripheral areas of the site and the SRI sampling will be focused to obtain data in these areas.

3.1.2 Surface Soil Sampling

Four surface soil samples will be collected from the locations shown in red on Figure 3-1. Table 3-1 presents information regarding the surface soil sampling including the sample identification, sample rationale, sampling depth, and the laboratory analyses to be performed. As shown in Table 3-1, each of the surface soil samples will be analyzed for the full Target Compound List (TLC) SVOCs, Target Analyte List (TAL) metals, and total cyanide. Additional information regarding the soil sampling methods and laboratory analyses is presented in the FSAP and QAPP.

3.2 Test Pit Excavation

3.2.1 Test Pit Objectives

Although test pits have been completed during the previous investigations performed at the site, additional sampling is needed in several areas of interest to assess the presence of foundations and residuals in subsurface soil adjacent to several former MGP features. These areas include the area to the southeast of the Gas Holder, the off-site area to the east of the Retort/MGP Building, and the area of Tar Tank B. Five test pits will be excavated at the locations shown in red on Figure 3-1. Table 3-1 presents information regarding the test pit sampling including the sample identification, sample rationale, completion and sampling depth, and the laboratory analyses to be performed.

3.2.2 Test Pit Sampling

The test pits will be excavated using a conventional rubber-tired backhoe or track-mounted excavator to a target depth of 10-12 feet below ground surface (bgs) or to the extent practicable considering depth-to-groundwater limitations. The test pits will be continuous except for where they approach existing groundwater monitoring wells (MW2S and MW3S) to avoid disruption of the subsurface at these locations. The on-site geologist will make a determination of how close to excavate to the monitoring wells in an effort to preserve the integrity of the wells and avoid damage that could make them unreliable for the future groundwater samples that will need to be collected and analyzed from these locations.

If a significant amount of source material (determined in consultation with the NYSDEC) is identified in a test pit, the excavation may be continued in the direction to which accumulation of source material leads. If a substantial amount of source material is located, its location will be documented so that it can be addressed during the remedial action phase of this project.

Soil samples will be collected from every two-foot depth interval within the test pit (and continuously along its length) and field-screened with a photo-ionization detector (PID) for the presence of organic vapors. Up to five laboratory samples may be collected from the test pits at the discretion of the field geologist. In general, if field conditions suggest that collection and analysis of a sample would be beneficial delineating the nature and extent of MGP-residuals, samples will be collected and analyzed accordingly. The final plan for the test pit sampling will be determined in the field, in consultation with the NYSDEC.

The test pits will be backfilled with the material that was excavated by placing the material back in the excavation in the same order as it was removed, to the extent practical. The backfill material will be placed in the trenches and compacted in lifts with the backhoe or excavator bucket. Visibly impacted material will not be left exposed at the ground surface. Note that for TP3 on the adjacent off-site property, it may be necessary to add topsoil and grass seed to restore the ground surface in this area.

3.3 Subsurface Soil

3.3.1 Subsurface Soil Objectives

Soil borings and sampling will be performed to obtain additional subsurface soil data in the following areas of interest:

- A boring (MW5S) will be completed along Water Street to assess soil and groundwater conditions at a location assumed to be upgradient of the site.

- Borings will be completed in the footprint of (SB16 and SB23), and downgradient of (MW9S) the Gas Holder to assess the presence of residuals in soil and groundwater at this location.

- A boring (SB14) will be completed in the footprint of the Ash and Wood Chip Disposal Area to assess the presence of residuals in soil at this location.

- Soil borings will be completed in the footprint of the site driveway (SB15) and the former warehouse/garage (SB11 and SB13) for general coverage in these areas.

- Three borings will be completed inside the MGP Process Building (SB17, SB18 and SB19) to assess the presence of residuals in the former process area (Purifiers, Retorts and Coal Storage areas).

- A boring, completed as a monitoring well (MW6S), will be completed to the east of the MGP Building/Retorts to assess soil and groundwater conditions at the adjacent off-site property to the east.

- Borings will be completed in all directions surrounding the former Tar Tanks A and B (SB12, SB20, SB21, SB22 and MW7S), to assess the presence of residuals in these areas.

The data obtained from these borings will be used along with the data obtained from the previous investigations performed at the site to evaluate the vertical and areal extent of MGP residuals. As indicated above, borings are also needed to install the new SRI monitoring wells. Additional information regarding the subsurface soil borings is presented in Table 3-1 including the sample identifications, the sampling rationale, the anticipated completion depths, and the laboratory analyses to be completed. The locations of the borings are shown in red on Figure 3-1 and, for several of the borings, on the cross-sectional views of the site provided in Figures 2-7, 2-8 and 2-9.

As shown on the cross-sectional views of the site, the anticipated completion depth of the borings is approximately 30 feet bgs. The final depth for the borings will be determined in the field based on the subsurface conditions encountered. Where impacts are observed, the borings will be advanced to a sufficient depth to delineate the vertical extent of MGP residuals. Note, however, that care will be exercised during drilling to ensure that a potential pathway for downward migration will not be created during deeper drilling in areas where NAPL is observed.

If impacts are not observed, the borings will be advanced to the top of the sand unit to investigate the composition and thickness of the silt unit across the site to determine if this unit may be considered as a potential aquitard for the site.

3.3.2 Soil Boring Methods

The subsurface borings will be advanced by either a direct-push (Geoprobe™) drilling rig equipped with Macro-Core™ samplers, or by a conventional hollow-stem auger (HSA) drill rig equipped with 2-inch diameter split-spoon samplers. Either method will allow for continuous soil samples to be taken from the ground surface to the bottom of the borehole for both field characterization (PID screening and observations) and for the collection of samples for the chemical analyses.

Initially, a direct-push boring will be attempted at each location shown on Figure 3-1. The sampling barrel will be equipped with a mechanism to obtain discrete samples of soil (e.g. a closed-piston Macro-Core™) to ensure maximum recovery and maintain the integrity of the soil interval. If this sampling method does not successfully obtain the required soil samples at a given location, or if the direct-push tools encounter refusal above the target sampling depths, hollow stem auger (HSA) drilling and split-spoon sampling will be used as an alternative.

The soil samples obtained by either method will be logged by a geologist recording such data as the presence of fill material or subsurface structures, the nature of each geologic unit encountered, observations regarding moisture content, the results of the PID readings, and visual and olfactory observations regarding the presence of hydrocarbon-like residuals.

It is anticipated that one to two samples for laboratory analyses will be collected from each boring. Samples will be collected from the most apparently impacted intervals based on the PID screening and field observations regarding the presence of MGP-related residuals. If impacts are not encountered, a sample will be collected from the 1-foot interval immediately below the water table and possibly a second from the bottom of the boring to confirm non-impacted conditions.

Samples of grossly impacted soil containing visible tar-like or oil-like NAPL will not be sampled for laboratory analyses. These “MGP source materials” will be assumed to be impacted to the extent that remediation will be required by the NYSDEC. Information regarding the vertical extent of this material will be recorded on the borelogs by the field geologist and areas with this material will be surveyed during the survey task. Representative samples of

MGP residuals will be taken for forensic analyses, so that the results can be compared with sediment results.

A minimum of two samples from the most visibly impacted materials encountered during the soil borings (or test pits) be collected for the analysis of hazardous characteristics.

3.4 Groundwater Monitoring

3.4.1 Monitoring Well Objectives

The objectives for the SRI monitoring wells include the following:

- **MW5S** – to assess soil and groundwater conditions at a location believed to be up gradient of the site;
- **MW6S** – to assess soil and groundwater conditions at the off-site property located to the east of the MGP Building;
- **MW7S** – to assess soil and groundwater conditions at a location between former Tar Tank B and the outlet channel;
- **MW8S** – to assess soil and groundwater conditions at a location down gradient from the impacts observed at TP19; and
- **MW9S** – to assess soil and groundwater conditions at a location down gradient of the Gas Holder.

The locations of the wells are shown in red on Figure 3-1. In addition, several of the wells are also shown on the cross-sectional views of the site. Table 3-1 provides summary information regarding the wells, including the well designation, anticipated completion depth, and the laboratory analyses to be performed.

3.4.2 Well Development

Each of the new monitoring wells will be developed a minimum of 24 hours after their installation to evacuate fine-grained sediments that may have accumulated within the well during installation.

3.4.3 Groundwater Sampling

Following completion of the well development, the wells will be allowed to stabilize for at least two weeks, and then sampled. All new and existing wells will be checked for the presence of light phase non-aqueous liquids (LNAPL) or dense phase non-aqueous liquids (DNAPL). Water levels will be measured in all the new and existing wells and a groundwater flow direction map will be prepared and included in the SRI Report. Table 3-1 provides summary information for the groundwater samples including the sample designations, sample rationale, and the laboratory analyses to be completed.

3.4.4 Surface Water Elevation Monitoring

A surface water elevation reference point (SWRP-1) with a known elevation above MSL will be established on the Liberty Street Bridge. The depth-to-surface water measurements obtained at this location will be used to determine the surface water elevation at the same time as the groundwater elevation measurements are taken at the site. The surface water elevation data will be included on the groundwater flow direction maps that will be prepared for the SRI Report.

3.5 Sediment Investigation

The field activities for the investigation of sediment quality in the Keuka Lake Outlet adjacent to the site include the completion of a bathymetric survey, the hand probing of sediments, and the collection of both surface (0-6 inches) and deeper sediment samples.

For discussion purposes, three areas of the outlet have been identified. The location of each area is shown on Figure 3-2. The areas include an area considered upstream from the site (Area A), an area adjacent to the site (Area B), and an area downstream of the site between the site and the dam at Main Street (Area C). The field activities for the outlet area are discussed in the following sections.

3.5.1 Bathymetric Survey

A bathymetric survey will be performed in all three areas of the stream to obtain sufficient data to prepare a contour map of the top of the sediment surface in the investigation area.

3.5.2 Sediment Probing

Sediment probing will be performed to determine whether visible evidence of MGP-related residuals is present in the sediments in Areas B and C of the outlet. Sediment probing will also be performed in Area A; however, MGP-related residuals and not expected in this area. Transect locations will be marked out approximately 25 feet apart along the shoreline at the locations shown on Figure 3-2. A series of probe points will be established out into the stream (Figure 3-2) using a rope with measured increments attached to a small boat. Sediments at each probe point will be probed (agitated) by hand using a threaded steel bar and/or bucket auger (if possible) to observe the sediment physical characteristics, including the presence of hydrocarbon-like sheen or

NAPL. The bar or bucket auger will be advanced by hand as deep as possible at each probe point, with a target depth of 2-3 feet below the sediment surface. The transect locations along the stream bed will be surveyed during the survey task.

3.5.3 Surface Sediment Sampling

Surface sediment samples will be collected in all three areas of the stream. Twenty background samples will be collected in Area A at the tentative locations shown on Figure 3-2.

Surface samples will also be collected in Areas B and C to determine the extent of MGP-related COI in areas considered adjacent to, and downstream of the site. The tentative locations of sediment samples in Area B and Area C are shown in blue on Figure 3-2, in a modified grid pattern which will provide general coverage in the area adjacent to the site. Note however, that if visible evidence of residuals is observed during the probing task, the location of the sediment samples may be modified to delineate the extent of any residuals observed. A minimum of 20 surface sediment samples will be collected for laboratory analysis from Area B and Area C during the SRI. The final location of the shallow sediment samples in these areas will be determined in consultation with the NYSDEC following completion of the probing task.

All surface sediment samples will be collected from a depth of 0 to 6 inches below sediment surface with a ponar dredge or shovel. Table 3-1 lists the samples to be obtained and the laboratory analyses to be performed. Sufficient material will be collected at each sampling point to archive a portion of the sample for possible future forensic analysis.

As shown on Figure 3-2, additional surface sediment samples will be collected at the storm sewer outfalls in all three areas of the site. The objective of the samples will be to identify and assess any ongoing, uncontrolled loadings of MGP-related COI in the investigation area sediments that may be attributed to urban run-off from the Village of Penn Yan. Portions of these samples may also be archived by freezing for possible future forensic analysis.

3.5.4 Sediment Coring

In addition to the surface sediment samples discussed above, the quality of the deeper sediments in Area B will be investigated with a vibra-core drill to delineate the vertical and areal extent of impacts previously identified in the outlet.

It is anticipated that a sediment core will be completed at select locations shown in red in Area B on Figure 3-2; however, the locations and depths for the cores may be modified as the subsurface conditions become known on the

MGP parcel, or the locations may be modified to delineate impacted areas identified during the probing task.

As shown on the cross-sectional views of the site, based on the previous sampling performed in the outlet, a clay layer is suspected to be present beneath the organic silt in the channel which may be acting to limit the potential downward migration of residuals. An additional goal for the deeper sediment sampling will be to show the presence or absence of the suspected clay layer at the selected core locations.

The sediment cores will be collected from a small boat that will be used to advance a 3-inch diameter vibra-core sampler approximately 5 to 10 feet below the sediment surface. Cores may be advanced to deeper depths if impacted sediments are observed at this target depth. Each core location will be mapped using a GPS system and the locations included in the SRI Report.

To meet the objectives for this task, the sampling and laboratory analyses will be performed as follows:

- The core sampler equipped with a plastic liner will be driven and extracted at each of the designated sample locations;
- The core liner will be extracted from the core barrel and split open.
- The sediment sample will be screened for organic vapors with a PID and logged for physical characteristics and the presence of MGP residuals;
- Areas within the core sampler that exhibit visible evidence of residuals will be sampled for laboratory analyses with bias towards the most impacted interval observed.
- Samples from below impacted intervals may also be collected to verify non-impacted conditions.
- If impacts are not observed in the core, selected samples may be collected to verify non-impacted areas of the outlet.
- Samples from the cores may be archived for possible future forensic analysis. Each core sample will be re-sealed in the plastic core liner, and frozen for possible future analyses.

A minimum of 20 samples will be collected from the cores for laboratory analyses.

3.6 Soil Vapor Intrusion Investigation

The need for a soil vapor intrusion investigation (SVI) will be discussed with the NYSDEC once the extent of the coal tar NAPL and MGP-impacted groundwater plume have been adequately delineated and approved by the NYSDEC.

3.7 Site Survey

A survey of the investigation sampling points and important site features will be conducted at the end of the fieldwork by a NYSEG survey crew. The results of the survey will be used to update the base map for the site and will also be included on the borelogs and figures presented in the SRI Report.

3.8 Investigation-derived Residuals Management

All soil cuttings used disposable sampling equipment, personal protective equipment (PPE), and well and decontamination water will be containerized in drums, sampled, and properly disposed of offsite at a permitted disposal facility.

3.9 Analytical Program

The laboratory samples for each media and the chemical analyses to be performed, including the QA/QC samples are summarized in Table 3-2. These analyses are summarized below.

3.9.1 Surface Soil Analyses

The surface soil samples will be analyzed for the following parameters:

- Target Compound List (TCL) SVOC compounds by U.S. EPA SW-846 Method 8270C;
- Target Analyte List (TAL) Metals by U.S EPA SW-846 Methods 6010b/6020/7471A; and
- Total Cyanide by U.S EPA SW-846 Method 9012A.

3.9.2 Subsurface Soil Analyses

The subsurface soil samples will be analyzed for the following parameters:

- TCL VOC compounds by U.S. EPA SW-846 Method 8260B;
- TCL SVOC compounds by U.S. EPA SW-846 Method 8270C;
- TAL Metals by U.S EPA SW-846 Methods 6010b/6020/7471A; and
- Total Cyanide by U.S EPA SW-846 Method 9012A.

3.9.3 Groundwater Analyses

The groundwater samples will be analyzed for the following parameters:

- TCL VOC compounds by U.S. EPA SW-846 Method 8260B;
- TCL SVOC compounds by U.S. EPA SW-846 Method 8270C;
- TAL Metals by U.S EPA SW-846 Methods 6010b/6020/7471A; and
- Total Cyanide by U.S EPA SW-846 Method 9012A.

Note that based on the existing data from the site, cyanide is not expected to be found at a significant concentration in soil or groundwater. If total cyanide is detected at concentrations of concern (greater than the groundwater standard concentration of 200 ug/L), additional analysis of samples for available cyanide by U.S EPA SW-846 Method OIA-1677, free cyanide by microdiffusion method, or metal cyanide complex determination by IC (Dionex Application Note 161) may be performed.

Analysis of groundwater samples for natural attention parameters is not included at this time in the SRI investigation, as the investigations to date have not identified significant groundwater impacts. If necessary, analysis for parameters which may indicate intrinsic biological degradation of the COI will be added to the sampling and analysis program. The analyses will include the following:

- Total Iron by U.S EPA Method 6010;
- Ferrous Iron by Standard Method SM3500;
- Total and dissolved Manganese by U.S EPA Method 6010;
- Nitrate by U.S EPA Method 353.2;
- Sulfate by U.S EPA Method 375.4;
- Sulfide by U.S EPA Method 376.1; and
- Methane by U.S EPA Method RSK-175.

3.9.4 Sediment Analyses

Surface (0-6 inches) sediment samples will be analyzed for the following parameters:

- TCL SVOC compounds by U.S. EPA SW-846 Method 8270C;
- Total cyanide by U.S EPA SW-846 Method 9012A; and
- Total organic carbon by the Lloyd-Kahn Method.

Sediment samples from the cores will be analyzed for the following parameters:

- TCL SVOC compounds by U.S. EPA SW-846 Method 8270C;
- Total organic carbon by the Lloyd-Kahn Method.

3.9.5 Source Material Sampling and Forensic Analysis

Portions of soil or sediment samples which are representative of potential sources of impact to the sediments in the outlet area will be collected and archived by freezing for possible future forensic analysis. This will include at a minimum: soil containing NAPL or high concentrations of MGP residual material immediately adjacent to the former tar tank location near the stream, sediment material obtained from highly-impacted surface samples and/or cores containing NAPL, a sample of treated wood from the abandoned railroad bridge downstream of the site, and samples of sediments found within storm sewer or other outlet pipes. If necessary, these samples will be subjected to forensic analysis to distinguish sediment impacts related to MGP operations from other sources. The analyses include the following:

- Saturated Hydrocarbon SHC/TPH - U.S. EPA SW-846 Method 8100 mod.; and
- Alkylated PAHs via GC/MS-SIM - U.S. EPA SW-846 Method 8270C mod.

If it is determined that forensic analyses are needed for the SRI, discussions will be held with the NYSDEC regarding the methods for the interpretation of the data and the reporting for this task.

3.9.6 Soil Profiling

Two to three soil samples may be collected during the investigation and analyzed for full RCRA Hazardous Characteristics testing. The objective of the sampling will be to determine if materials exhibiting hazardous characteristics may be present at the site. These analyses may also be utilized for waste disposal profiling purposes. The samples will be chosen from the most impacted soil collected during the investigation as determined by the field geologist. The analyses to be performed include the following:

- TCLP ZHE Extraction - U.S. EPA Method 1311;
- TCLP VOC – U.S. EPA Method 8260B;
- TCLP SVOC – U.S. EPA Method 8270C;
- TCLP ICP Metals U.S. EPA Method 6010B (Mercury 7470A);
- Corrosivity – U.S. EPA SW-846 Chapter 7;
- Ignitability - U.S. EPA SW-846 Method 1010;
- Reactive Cyanide - U.S. EPA SW-846 Chapter 7; and
- Reactive Sulfide - U.S. EPA SW-846 Chapter 7.

3.10 QA/QC Sampling

Field and laboratory quality control samples for the investigation will be collected and analyzed to document the accuracy and precision of the samples. The QA/QC samples, summarized in Table 3-2, include trip blanks, field equipment blanks, field duplicates and matrix spikes, and matrix spike duplicates. The data quality level for the investigation will be Level IV and will be consistent with procedures outlined in the NYSDEC Analytical Services Protocol (ASP) July 2005 methodologies. A full data package will be prepared by the laboratory for all samples. The data will be reviewed, and a Data Usability Summary Report (DUSR) will be prepared by a qualified chemist.

3.11 Fish and Wildlife Impact Assessment

A Fish and Wildlife Impact Assessment (FWIA) will be conducted according to NYSDEC's guidance document *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites, October 1994*. The assessment will include the following:

- Step I – Site Description
- Step IIA – Pathway Analysis
- Step IIB – Criteria-Specific Analysis

4 Additional Work Plan Documents

Four companion documents have been prepared to detail the methods and procedures to be used during the SRI. Each of the documents is included as an Appendix to this Work Plan.

4.1.1 Field Sampling and Analytical Plan

All sampling and analyses will be conducted in accordance with the methods described in the site-specific Field Sampling and Analytical Plan (FSAP). The FSAP provides a description of the objectives and methods for each of the investigation field activities, and details concerning the project organization.

4.1.2 Quality Assurance Project Plan

In addition to the FSAP, a full Quality Assurance Project Plan (QAPP) has been developed for use on this project. The QAPP identifies the quality assurance objectives for the measurement data, the QA/QC procedures to be used in the field, the sample chain-of-custody methods to be used, and the analytical procedures to be followed. The QAPP will also include a description of the manner in which each type of data is to be used.

4.1.3 CAMP

A Community Air Monitoring Plan (CAMP) has been developed for this project that will be followed during all invasive fieldwork (soil borings, borings for well installations, and test pitting). Included in the CAMP is a description of methods that may be used to control odors during the SRI if needed.

4.1.4 Site-Specific Health and Safety Plan

A site-specific health and safety plan (HASP) has been prepared to outline health and safety risks and procedures for all site workers and visitors. Included in the HASP is information regarding physical and chemical hazards at the site, emergency procedures and contact information, incident reporting procedures, and the route to the hospital.

5 Community Outreach Activities

Community outreach efforts will be initiated as directed by the NYSDEC, or if interest from the public suggests the need. The outreach efforts will consist of the following:

- Preparation and maintenance of a mailing list;
- Fact sheets;
- Establishment of document repositories; and
- Participation and preparation for public meetings.

The Community Outreach Plan would be patterned to meet the needs of the community and would be modeled after other community outreach programs NYSEG has established on other projects. The plans will be shared with the NYSDEC's Regional Public Participation Specialists to refine the program, and to ensure that the NYSDEC's concerns with respect to community awareness of the project are met.

6 Project Schedule and Deliverables

6.1 Schedule

The SRI fieldwork will be initiated following approval of the scope-of-work presented in this Work Plan by the NYSDEC. If approval is obtained in the late summer of 2006, it is anticipated that the investigation phase of the project will be performed in the fall of 2006, with laboratory analyses of soil and groundwater samples completed by the winter of 2006. A revised schedule with more specific dates will be submitted upon approval of the Work Plan by the NYSDEC. The initial target dates for the project milestones are as follows:

1. **Early August 2006 –**SRI Work Plan and attached documents submitted to the NYSDEC for review, comment and approval.

2. **Late August – Early September 2006** – NYSDEC approves the SRI Work Plan.

3. **Mid-Late September 2006** – After the SRI Work Plan is approved, the field investigation activities will be initiated.

4. **Winter 2006** – The SRI Report will be prepared.

5. **Spring 2007** – The SRI Report will be submitted to the NYSDEC for review and approval.

The milestones presented above are subject to change based on the planning and scheduling of the consulting engineer and delays caused by weather and unforeseen circumstances. However, it is intended to maintain a schedule to complete the project as expeditiously as possible.

6.2 Deliverables

6.2.1 SRI Report

Upon completion of the field activities, an SRI Report will be prepared to document the findings of the investigations performed at the site. The report will be consistent with the specifications presented in the Draft DER 10 [NYSDEC, 2002] document and will include:

- An executive summary;

- A site description and history;

- Summary information regarding previous investigations and remedial work performed at the site;
- Descriptions of all field activities performed;
- A summary of all field observations, field measurements, and laboratory analytical data summarized in tabular format;
- Plan view and cross-section figures presenting laboratory analytical data and field observations of surface and subsurface soil and groundwater impacts;
- A qualitative risk assessment which assesses the sources of impact, on and off-site human and ecological receptors, and exposure pathways;
- A Fish and Wildlife Impact Analysis (FWIA) through Step IIB.
- An integration of field observations and measurements with laboratory analytical data to evaluate the nature and extent of impacts;
- A depiction of the distribution of NAPL and soil above and below the water table that is impacted with PAH compounds in concentrations greater than 500 ppm;
- A set of conclusions for the investigation; and
- Recommendations.

The SRI Report will be reviewed and approved by a qualified senior geologist. The report and site data will be prepared and organized such that it can be used for the preparation of a FS (Feasibility Study) for the site. If appropriate, recommendations for additional site activities will be furnished.

7 References

Geraghty & Miller, Inc. 1993. Work Plan, Data Collection Quality Assurance Plan, and Health and Safety Plan for a Supplemental Investigation of a Former Manufactured Gas Plant Site, Water Street, Penn Yan, New York. October 1993.

Geraghty & Miller, Inc. 1994a. Risk Assessment for a Manufactured Gas Plant Site, Water Street, Penn Yan, New York. June 1994.

Geraghty & Miller, Inc. 1994b. Task 3 Report. Supplemental Investigation of a Former Manufactured Gas Plant Site. Water Street, Penn Yan, New York. June 1994.

NYSDEC, 1990. Water Quality Standards and Guidance Values, September 25, 1990 (TOGS 1.1.1), Division of Water, Albany, New York.

NYSDEC, 1990. Revised TAGM – Selection of Remedial Actions at Inactive Hazardous Waste Sites, memo from Michael J. O'Toole, HWR-90-4.030, revised May 15, 1990.

NYSDEC, 1991. Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites. Prepared by: New York State Department of Environmental Conservation, Division of Fish and Wildlife, June 1991.

NYSDEC, 1994a. Division Technical and Administrative Guidance Memorandum [TAGM 4046]: Determination of Soil Cleanup Objectives and Cleanup Levels. Division of Hazardous Waste Remediation, Albany, New York, January 24, 1994.

NYSDEC, 1994b. Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (FWIA), October, 1994.

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values, Division of Water Technical and Operational Guidance Series (I.I.I), October.

NYSDEC, 1998. Technical Guidance for Screening Contaminated Sediments. NYSDEC Division of Fish and Wildlife.

NYSDEC, 1999. Technical Guidance for Screening Contaminated Sediments, Division of Fish and Wildlife and Marine Resources, January 1999.

NYSDEC, 2002. Draft DER-10 Technical Guidance for Site Investigation and Remediation, December 2002.

Order on Consent, 1994. Between NYSDEC and NYSEG, Index #D0-0002-9309, May 1994.

SLC Consultants/Constructors, Inc. Remedial Investigation Report for the Penn Yan Gas Light Company Location, Penn Yan, New York. November 26, 1991.

SLC Consultants/Constructors, Inc. Summary Report. New York State Electric & Gas. Penn Yan, New York. March 1992.

Sanborn Fire Insurance Maps, Village of Penn Yan, New York (1903, 1909, 1915, 1922, 1931 and 1938).

TRC Environmental Consultants, Inc. 1986. New York State Electric & Gas Corporation, Investigation of the Former Coal Gasification Site in Penn Yan, New York. Task 1 Final Report, Preliminary Site Evaluation. December 19, 1986.

TRC 1990 Environmental Consultants, Inc. 1990a. Final Task 2 Report. New York State Electric & Gas Corporation, Investigation of the Former Coal Gasification Site in Penn Yan, New York. Volume I, Technical Report. February 21, 1990.

TRC Environmental Consultants, Inc. 1990b. Final Task 2 Report. New York State Electric & Gas Corporation, Investigation of the Former Coal Gasification Site in Penn Yan, New York. Volume II, Technical Report, Appendices A-I. February 21, 1990.

TRC Environmental Consultants, Inc. 1990c. Final Task 4 Report. New York State Electric & Gas Corporation, Risk Assessment for the Former Coal Gasification Site in Penn Yan, New York. Technical Report October 1990.

U.S. EPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA Interim Final EPA/g-89/004, OSWER Directive 9355.3-01, October.

U.S. EPA, 1989. Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual (Part A), Office of Emergency and Remedial Response: Washington, DC, EPA 540/1-89/002.

U.S. EPA, 1992. Assessing Potential Indoor Air Impacts for Superfund Sites. United States Environmental Protection Agency, Office of Air Quality, Research Triangle Park, North Carolina. September 1992.

U.S. EPA, 1996. Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, EPA/540/S-95/504, April 1996.

Table 2-1
Historical Information Summary
Penn Yan Water Street Site

Year	Source of Information	Comments
1899	TRC Report	The property has been developed by this time as the H. Tuttle and Son Malt House and Wood Storage Company.
1889-1890	TRC Report	Penn Yan Gas Light Company purchased the property.
1903	Sanborn Fire Insurance Map	The Sanborn Map shows the location of the Gas Holder, the MGP Building and a shed located to the west of the building.
1909	Sanborn Fire Insurance Map	No changes to the configuration of the MGP are shown from the 1903 map.
1915	Sanborn Fire Insurance Map	The map shows that the shed to the west of the MGP Building is being used as a Coke Shed.
1922	Sanborn Fire Insurance Map	The map shows that a structure in the northwest area of the property has been added (Unknown Structure #1).
1926	TRC Report	Penn Yan Gas Light Company is purchased by the New York Central Electric Company.
1931	Sanborn Fire Insurance Map	The 1931 Sanborn Map shows the MGP in operation; however, this year is believed to be the last year of gas production.
1930-1931	TRC Report	Gas Holder decomissioned and the area of the holder converted to a garage and storage area.
1937	TRC Report	New York Central Electric Company merged with New York State Electric and Gas Corporation.
1943	TRC Report	The property is sold to the Penn Yan Wine Cellar Company.
1954	TRC Report	Penn Yan Wine Cellar sells the property to Bert R. Lantz.
1978	TRC Report	Bert R. Lantz sells the property and Penn Yan Wine Cellar to Stanley Levinson.
1990	Geraghty & Miller Report	Lake Country Ford Mercury Inc. utilizes the garage area for auto sales.
Present	Geraghty & Miller Report	NYSEG owns both parcels of the site. A natural gas meter house is present in the northeast corner of the site. The above-ground portions of the garage/warehouse has been demolished and the MGP Building is still present at the site.

Sources:
TRC Environmental Consultants, Inc. 1986. New York State Electric & Gas Corporation
Investigation of the Former Coal Gasification Site in Penn Yan, New York. Task 1 Final Report, Preliminary Site Evaluation. December 19, 1986.
Geraghty & Miller, Inc. 1994b. Task 3 Report.
Supplemental Investigation of a Former Manufactured Gas Plant Site. Water Street, Penn Yan, New York. June 1994.

Table 3-2
SRI Laboratory Sample Summary
Penn Yan Water Street MGP Site

Sample Designation	Soil Analyses				Groundwater Analyses					Sediment Analyses			Sediment Forensic Analyses		Hazardous Characteristics
Analyses Method	TCL VOC 8260B	TCL SVOC 8270C	TAL Metals 6000-7000	Total CN 9012A	TCL VOC 8260B	TCL SVOC 8270C	TAL Metals 6000-7000	Total CN 9012A	Available CN OIA 1677	TCL SVOC 8270C	Total CN 9012A	TOC Lloyd Kahn	Saturated Hydrocarbon SHC/TPH - 8100 mod.	Alkylated PAHs 8270C mod.	SW846 Methods
Surface Soil Samples															
SS3		1	1	1											
SS4		1	1	1											
SS5		1	1	1											
SS6		1	1	1											
Test Trenches															
TP1	1	1	1	1											
TP2	1	1	1	1											
TP3	1	1	1	1											
TP4	1	1	1	1											
TP5	1	1	1	1											
Subsurface Soil Borings (Note 1)															
SB8	2	2	2	2											
SB9	2	2	2	2											
SB10	2	2	2	2											
SB11	2	2	2	2											
SB12	2	2	2	2											
SB13	2	2	2	2											
SB14	2	2	2	2											
SB15	2	2	2	2											
SB16	2	2	2	2											
SB17	2	2	2	2											
SB18	2	2	2	2											
SB19	2	2	2	2											
SB20	2	2	2	2											
SB21	2	2	2	2											
SB22	2	2	2	2											
SB23	2	2	2	2											
Monitoring Well Soil Borings (Note 1)															
MW5S	2	2	2	2											
MW6S	2	2	2	2											
MW7S	2	2	2	2											
MW8S	2	2	2	2											
MW9S	2	2	2	2											
Soil QA/QC															
Duplicates	3	3	3	3											
MS (Matrix Spike Samples)	3	3	3	3											
MSD (Matrix Spike Duplicate Samples)	3	3	3	3											
Equipment Blank					3	3	3	3							
Trip Blank					2										
Groundwater															
Existing Site Wells															
MW1S					1	1	1	1	TBD						
MW1D					1	1	1	1	TBD						
MW2S					1	1	1	1	TBD						
MW3S					1	1	1	1	TBD						
MW4S					1	1	1	1	TBD						
MW4D					1	1	1	1	TBD						
SRI Wells															
MW5S					1	1	1	1	TBD						
MW6S					1	1	1	1	TBD						
MW7S					1	1	1	1	TBD						
MW8S					1	1	1	1	TBD						
MW9S					1	1	1	1	TBD						
Groundwater QA/QC															
Duplicate					1	1	1	1							
MS (Matrix Spike Sample)					1	1	1	1							
MSD (Matrix Spike Duplicate Sample)					1	1	1	1							
Equipment Blank					1	1	1	1							
Trip Blank					1										
Sediment Investigation															
Surface Sediment Investigation															
Area A - Background															
BSD1 - BSD20										20	20	20	TBD	TBD	
Areas B and C - Adjacent/downstream of Site															
SD1 - SD31										20	20	20	TBD	TBD	
Deep Sediment Investigation - Area E															
SDC1 - SDC20										20		20	TBD	TBD	
Sediment QA/QC															
Duplicates										3	3	3			
Sediment Matrix Spikes										3	3	3			
Sediment Matrix Spike Duplicates										3	3	3			
Equipment Blank						3	3	3							
Trip Blank															
Hazardous Characteristics Analyses															2
Total	**56**	**60**	**60**	**60**	**21**	**21**	**21**	**21**	**TBD**	**69**	**49**	**69**	**TBD**	**TBD**	**2**

TBD - To be determined based on field conditions
Note 1: Either 1 or 2 subsurface soil samples will be collected from the soil borings and from borings completed for the monitoring wells.
The final number of samples will be determined based on field conditions encountered.

Table 3-1 Continued
SRI Sample Summary and Rationale
Penn Yan Water Street MGP Site

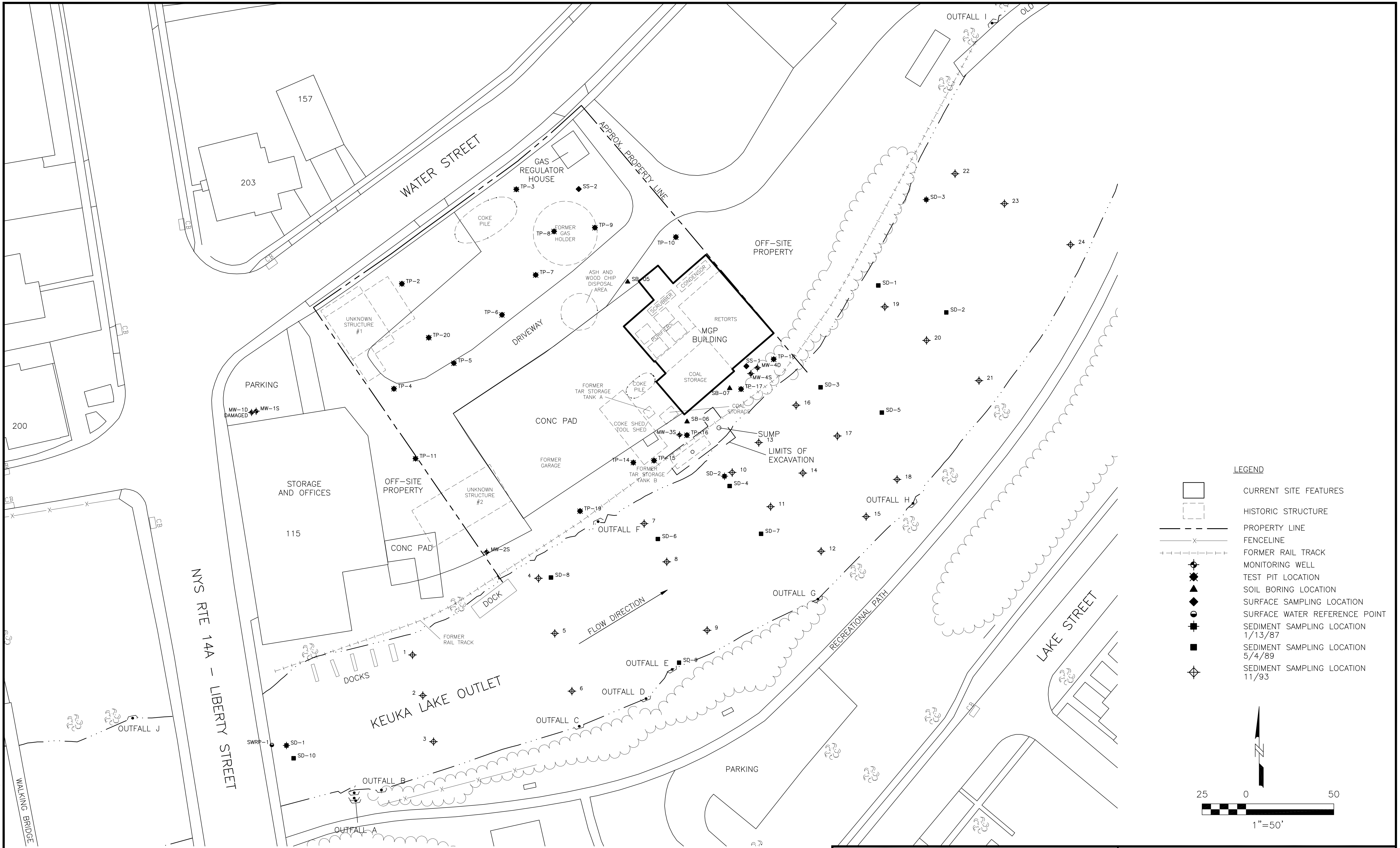
Sample ID	Rationale	Completion Depth	Laboratory Sample Depth	No. of Samples	Laboratory Analyses
Background Sediment Samples					
BSD1 - 20	Area A - upstream of the site to assess background conditions	0 - 6 inches below sediment surface	0 - 6 inches below sediment surface	20	SVOC Total CN TOC
Sediment Samples Adjacent to Site in Area B, and in Area C					
SD11 - 31	Areas B and C - To assess shallow sediment conditions adjacent to, and downstream of the site	0 - 6 inches below sediment surface Locations to be determined in the field	0 - 6 inches below sediment surface	20	SVOC Total CN TOC
Sediment Core Samples					
SDC1 - 20	Area B - To assess deeper sediment conditions adjacent to the site	0 - 10 feet below sediment surface Locations to be determined in the field	To be determined in the field	20	SVOC TOC

Table 3-1
SRI Sample Summary and Rationale
Penn Yan Water Street MGP Site

Sample ID	Rationale	Completion Depth	Laboratory Sample Depth	No. of Samples	Laboratory Analyses
Surface Soil Samples					
SS3	Assess the presence of MGP residuals in surface soil in the western area of the site	0 to 2 inches below ground surface with vegetation or gravel removed	0-2 inches	1	SVOC Metals Total CN
SS4	Assess the presence of MGP residuals in surface soil in the southwestern area of the site	0 to 2 inches below ground surface with vegetation or gravel removed	0-2 inches	1	SVOC Metals Total CN
SS5	Assess the presence of MGP residuals in surface soil in the eastern area of the site	0 to 2 inches below ground surface with vegetation or gravel removed	0-2 inches	1	SVOC Metals Total CN
SS6	Assess the presence of MGP residuals in surface soil in the northern area of the site	0 to 2 inches below ground surface with vegetation or gravel removed	0-2 inches	1	SVOC TAL Metals Total CN
Test Trenches					
TP1 (depth)	Assess the presence of MGP residuals in subsurface soil adjacent to the former Gas Holder	10 -14 feet bgs To be determined by field conditions	To be determined depending on field conditions	Up to five samples may be collected from the test trenches	VOC SVOC Metals Total CN
TP2 (depth)	To determine whether a foundation is present at the location of the former Gas Holder and to assess the presence of MGP residuals at this location	Bottom of foundation To be determined by field conditions	To be determined depending on field conditions	Up to five samples may be collected from the test trenches	VOC SVOC Metals Total CN
TP3 (depth)	Assess the presence of MGP residuals to the east of the Retorts	10 -14 feet bgs To be determined by field conditions	To be determined depending on field conditions	Up to five samples may be collected from the test trenches	VOC SVOC Metals Total CN
TP4 (depth)	Assess the presence of MGP residuals in the area of Tar Tanks A and B	10 -14 feet bgs To be determined by field conditions	To be determined depending on field conditions	Up to five samples may be collected from the test trenches	VOC SVOC Metals Total CN
TP5 (depth)	Assess the presence of MGP residuals in the area of Tar Tank B	10 -14 feet bgs To be determined by field conditions	To be determined depending on field conditions	Up to five samples may be collected from the test trenches	VOC SVOC Metals Total CN
Subsurface Soil Boings					
SB8 (depth)	Delineate impacts at TP19	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB9 (depth)	Delineate impacts at TP19; southwestern corner of site	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB10 (depth)	Unknown Structure # 2	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB11 (depth)	West of MGP process area	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB12 (depth)	Former Tar Storage Tank A	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB13 (depth)	Purifiers and Tar Storage Tank A	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB14 (depth)	Ash and woodchip disposal area	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB15 (depth)	Coke storage area	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB16 (depth)	Former Gas Holder	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB17 (depth)	Purifiers inside MGP Process Building	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB18 (depth)	Retorts inside MGP Process Building	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN

Table 3-1 Continued
SRI Sample Summary and Ratinale
Penn Yan Water Street MGP Site

Sample ID	Rationale	Completion Depth	Laboratory Sample Depth	No. of Samples	Laboratory Analyses
Subsurface Soil Boings Continued					
SB19 (Depth)	Coal Storage area MGP Process Building	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB20 (Depth)	East of Former Tar Storage Tank B	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB21 (Depth)	North of Former Tar Storage Tank B	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB22 (Depth)	West Former Tar Storage Tank B	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
SB23 (Depth)	Former Gas Holder	25 - 30 feet bgs To be determined by field conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
Subsurface Soil Borings for Monitoring Wells					
MW5S (depth)	Anticipated upgradient location; adjacent to Coke Pile	15 - 25 feet bgs To be determined by groundwater and soil conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
MW6S (depth)	On adjacent off-site property east of MGP Process Building	15 - 25 feet bgs To be determined by groundwater and soil conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
MW7S (depth)	Between Former Tar Storage Tank B and Keuka Lake Outlet	15 - 25 feet bgs To be determined by groundwater and soil conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
MW8S (depth)	Between TP19 and Keuka Lake Outlet	15 - 25 feet bgs To be determined by groundwater and soil conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
MW9S (depth)	Downgradient of former Gas Holder	15 - 25 feet bgs To be determined by groundwater and soil conditions	Most impacted interval, and/or 1 foot below water table or bottom of boring depending on field conditions	1 - 2	VOC SVOC Metals Total CN
Groundwater Samples					
MW1S	Upgradient location, shallow	Screened Interval 15 - 30 feet bgs	NA	1	VOC SVOC Metals Total CN
MW1D	Upgradient location, deep	Screened Interval 44 - 54 feet bgs	NA	1	VOC SVOC Metals Total CN
MW2S	Side-gradient	Screened Interval 3.3 - 19 feet bgs	NA	1	VOC SVOC Metals Total CN
MW3S	Tar Tank Area	Screened Interval 1.3 - 17 feet bgs	NA	1	VOC SVOC Metals Total CN
MW4S	Downgradient of MGP Building	Screened Interval 2 - 17 feet bgs	NA	1	VOC SVOC Metals Total CN
MW4D	Downgradient of MGP Building	Screened Interval 29 - 39 feet bgs	NA	1	VOC SVOC Metals Total CN
MW5S	Upgradient location	To be determined by field conditions	NA	1	VOC SVOC Metals Total CN
MW6S	On adjacent off-site property east of MGP Process Building	To be determined by field conditions	NA	1	VOC SVOC Metals Total CN
MW7S	Between Former Tar Storage Tank B and Keuka Lake Outlet	To be determined by field conditions	NA	1	VOC SVOC Metals Total CN
MW8S	Between TP19 and Keuka Lake Outlet	To be determined by field conditions	NA	1	VOC SVOC Metals Total CN
MW9S	Downgradient of former Gas Holder	To be determined by field conditions	NA	1	VOC SVOC Metals Total CN



File: J:\19552\SITE_LAYOUT.dwg Layout: ANSI_BI-LJ User: mwilliamson Plotted: Aug 03, 2006 - 3:02pm Xref's:

RETEC

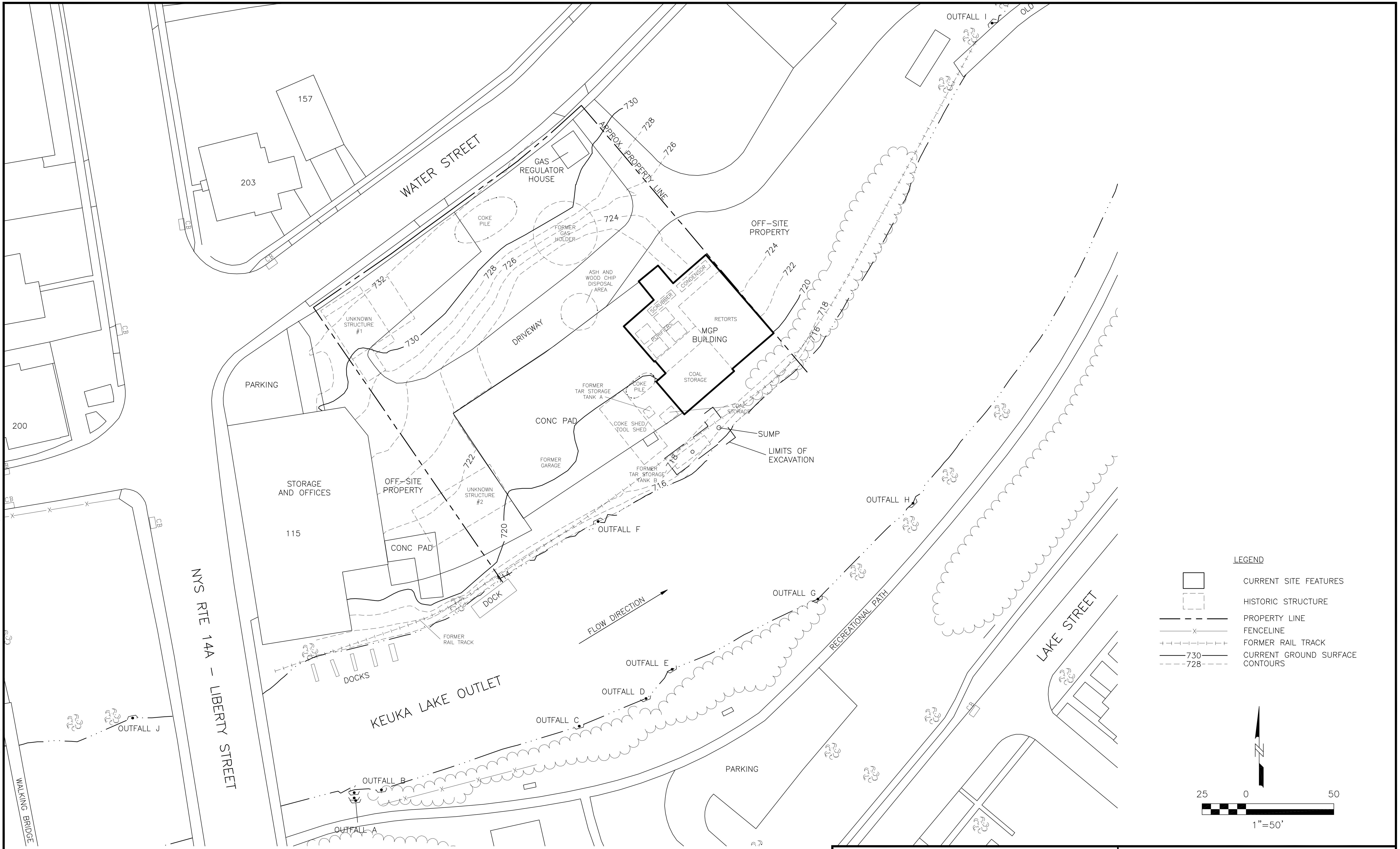
PENN YAN WATER STREET
FORMER MGP SITE

PREVIOUS INVESTIGATION
SAMPLE LOCATIONS

DATE: 8/03/06

DRWN: MAW/BIL

FIGURE 2-3



File: J:\19552\CUR_HIST_FEATURES.dwg Layout: ANSI_BI-LJ User: mwilliamson Plotted: Aug 07, 2006 – 2:52pm Xref's:

RETEC

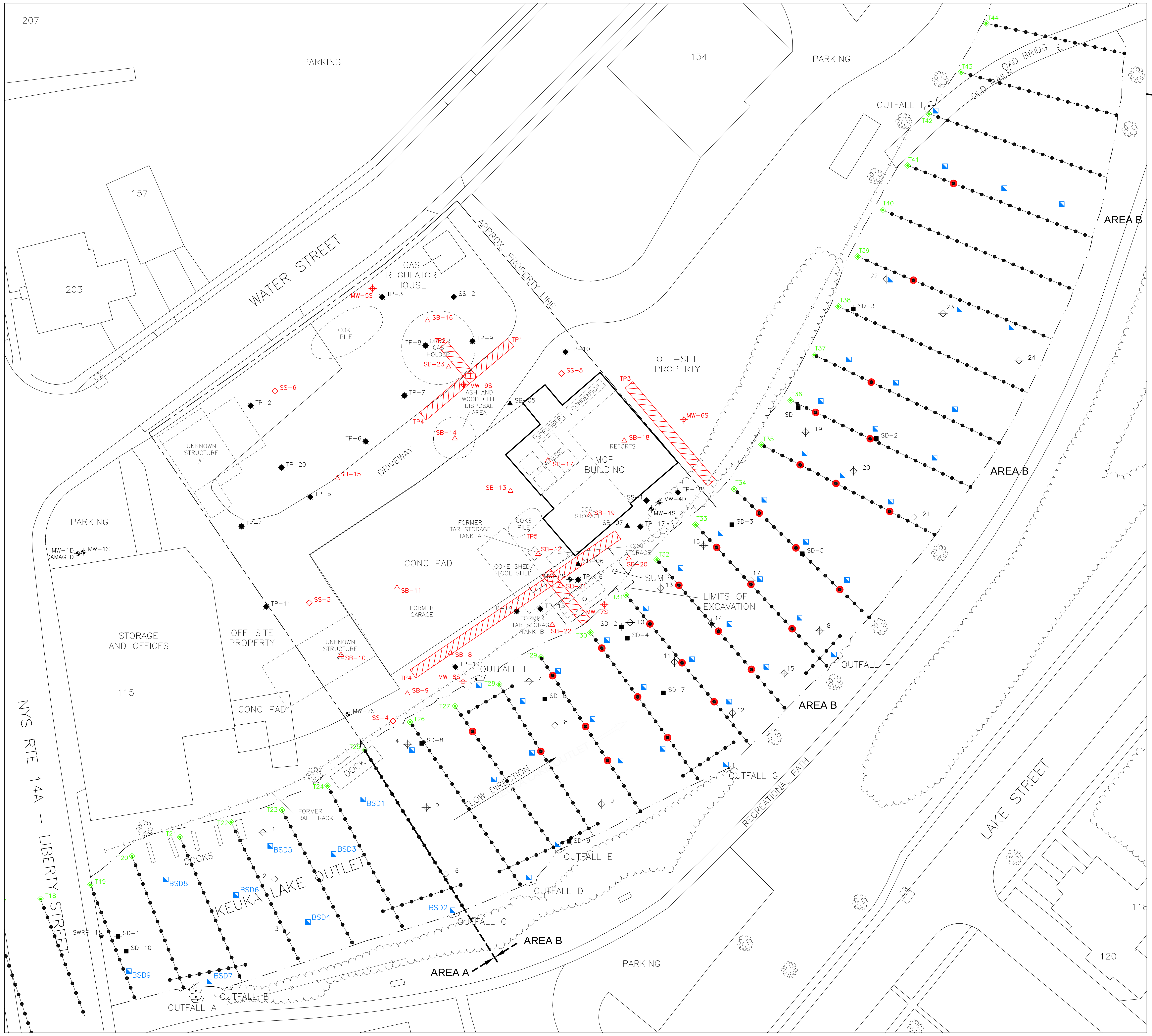
PENN YAN WATER STREET
FORMER MGP SITE

CURRENT AND HISTORICAL SITE FEATURES

DATE: 8/07/06

DRWN: MAW/BIL

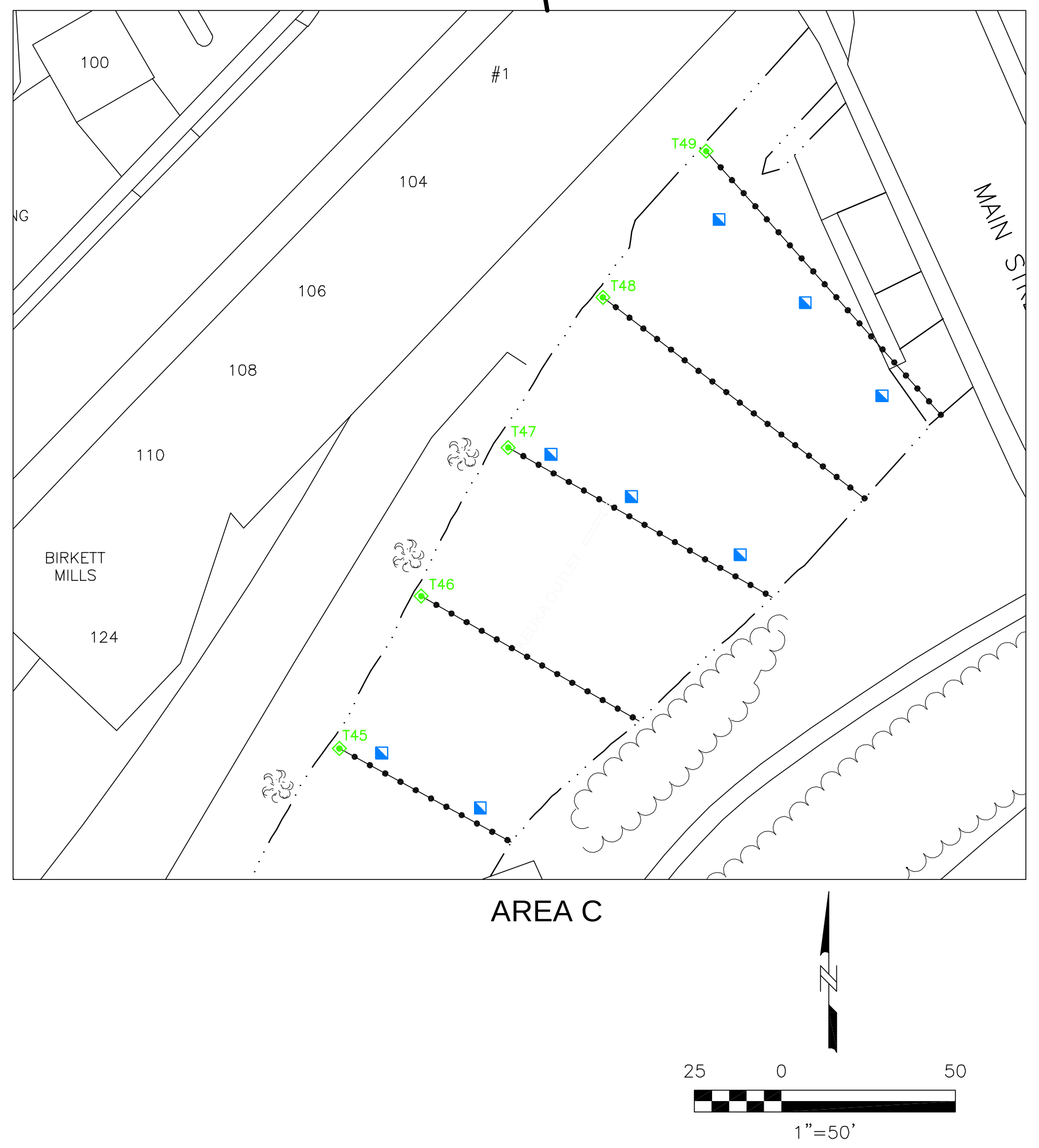
FIGURE 2-2



LEGEND

☐	CURRENT SITE FEATURES	△	SRI SOIL BORING LOCATION
⬚	HISTORIC STRUCTURE	⌖	SRI MONITORING WELL LOCATION
⊕	EXISTING MONITORING WELL	◇	SRI SURFACE SOIL LOCATION
◆	EXISTING TEST PIT LOCATION	▨	SRI TEST TRENCH LOCATION
▲	EXISTING SOIL BORING LOCATION	◈	SEDIMENT TRANSECT LOCATION
◆	EXISTING SURFACE SAMPLING LOCATION	◪	0–6" SEDIMENT SAMPLE LOCATION
■	EXISTING SEDIMENT SAMPLING LOCATION 1/13/87	— - —	PROPERTY LINE
■	EXISTING SEDIMENT SAMPLING LOCATION 5/4/89	—x—x—	FENCELINE
⌖	EXISTING SEDIMENT SAMPLING LOCATION 11/93	+-+-+	FORMER RAIL TRACK
		—●—	SEDIMENT PROBING LOCATION
		—●—	SEDIMENT CORING LOCATION
		⇨	RIVER FLOW DIRECTION

KEY MAP



AREA C

AREA A

RETEC

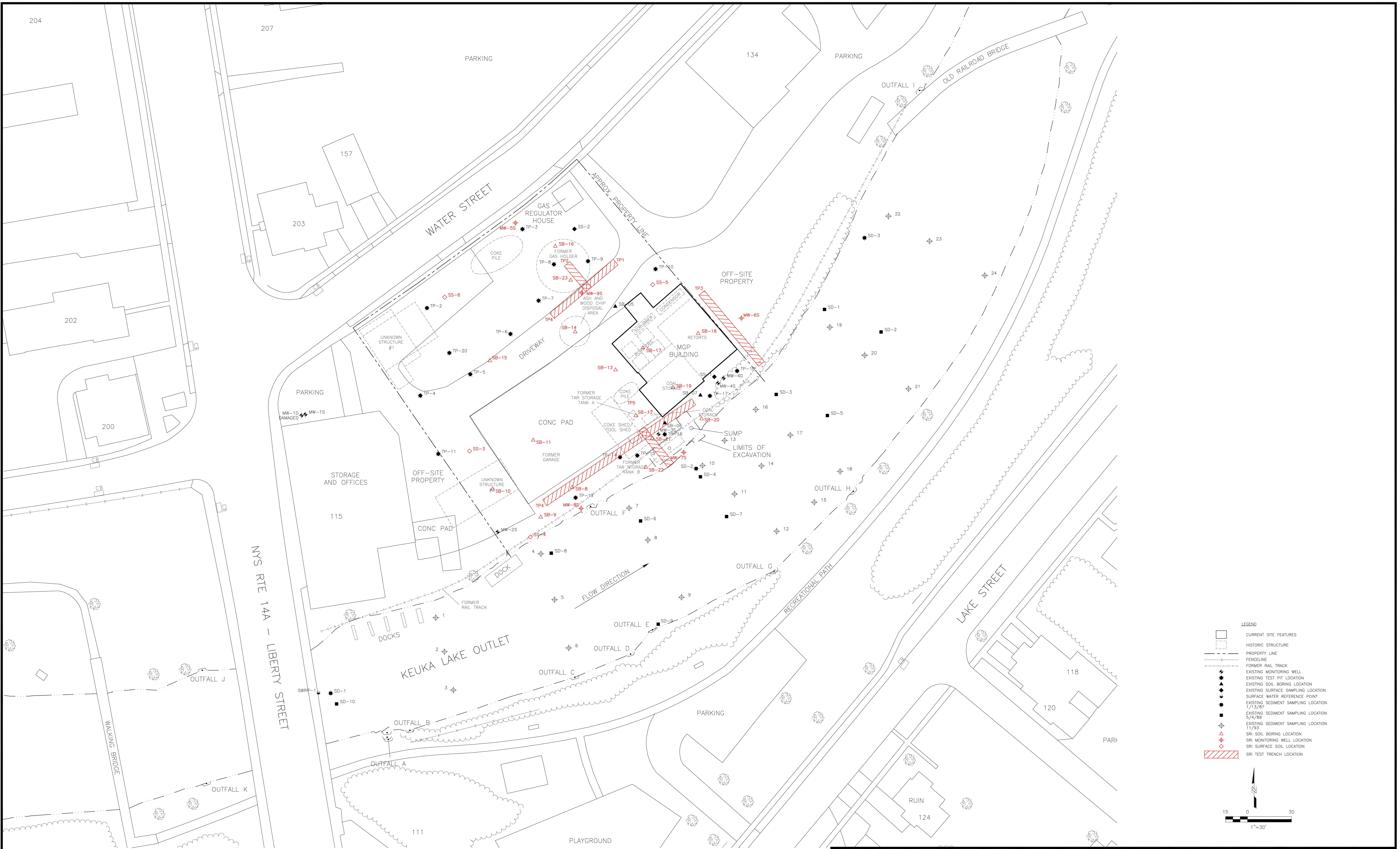
PENN YAN WATER STREET
FORMER MGP SITE

SEDIMENT INSTRUCTION

DATE: 8/17/06
DRWN: MAW/BIL

FIGURE 3-2

File: J:\19552\TRANSECTS.dwg Layout: ANSI_D1 User: mwilliamson Plotted: Aug 17, 2006 – 10:53am Xref's:



File: J:\19552\PROP_SAMP_LOC.dwg Layout: ANSI_BI-LJ User: mwilliamson Plotted: Aug 17, 2006 – 10:41am Xref's:

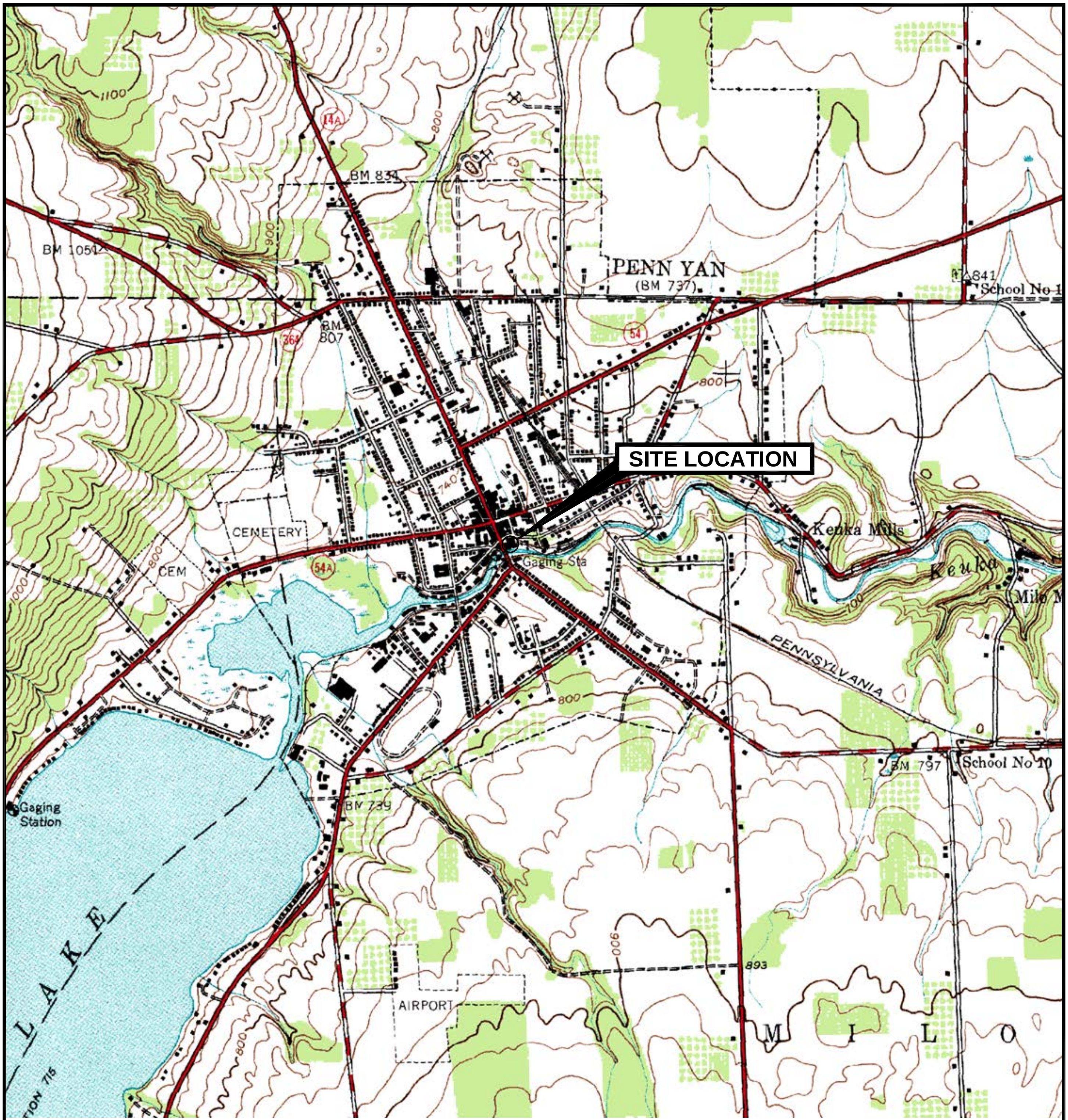
RETEC

PENN YAN WATER STREET
FORMER MGP SITE

SRI SAMPLE LOCATIONS

DATE: 8/07/06
DRWN: MAW/BIL

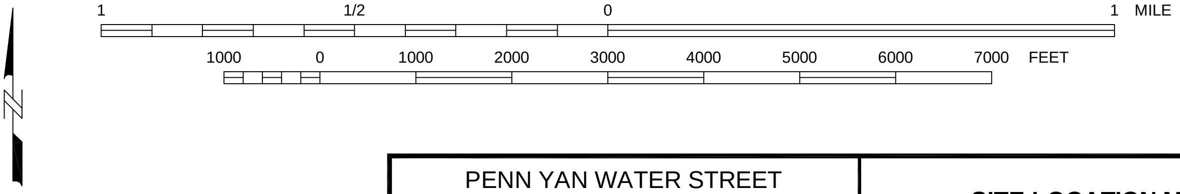
FIGURE 3-1



UNITED STATES GEOLOGIC SURVEY
PENN YAN QUADRANGLE
NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHY)

PENN YAN, NY.
1983
PHOTOREVISED 1995

SCALE 1:24000



RETEC

PENN YAN WATER STREET
FORMER MGP SITE

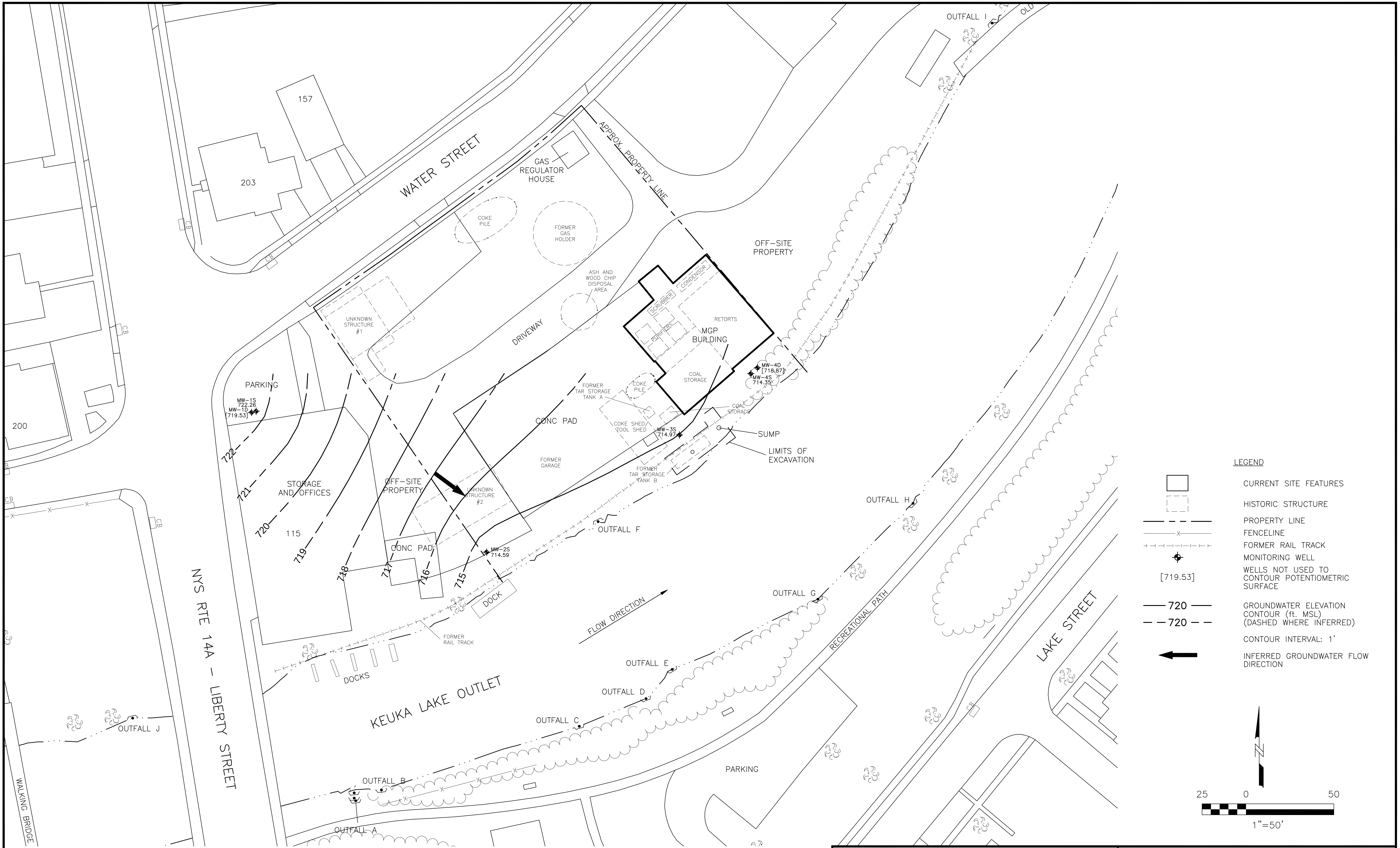
DATE: 8/03/06
DRWN: MAW/BIL

SITE LOCATION MAP

PENN YAN , NEW YORK

FIGURE 2-1

File: J:\19552\SITE_LOC.dwg Layout: ANSI_AVI-LJ User: mwilliamson Plotted: Aug 03, 2006 - 3:03pm Xref's:



File: J:\19552\GW_9-04.dwg Layout: ANSI_B1-LJ User: mwilliamson Plotted: Aug 03, 2006 - 3:02pm Xref's:

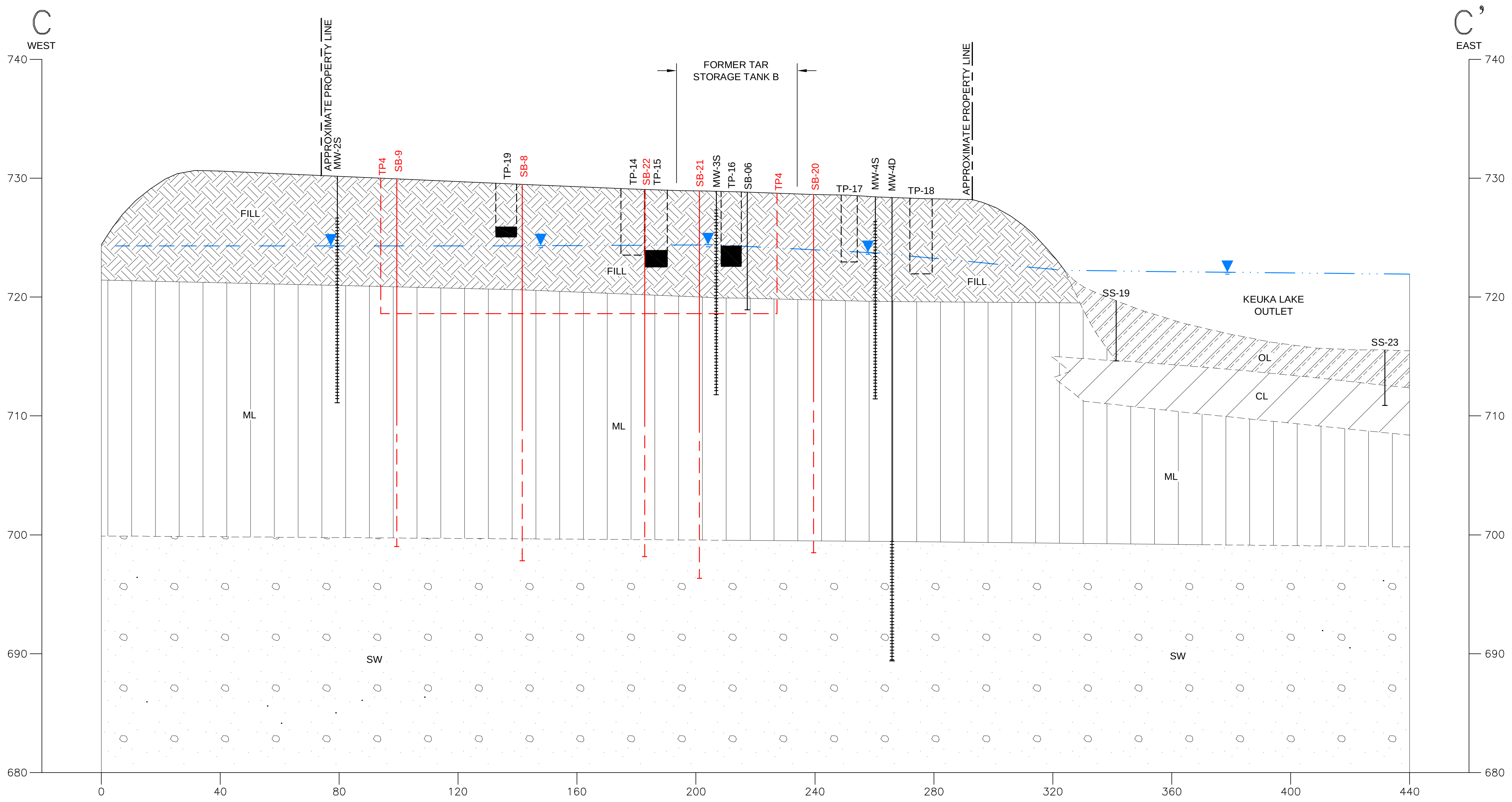
RETEC

PENN YAN WATER STREET
FORMER MGP SITE

DATE: 8/03/06
DRWN: MAW/BIL

**GROUNDWATER POTENTIOMETRIC
SURFACE MAP
SEPTEMBER 28, 2004**

FIGURE 2-10



HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=10'

LEGEND

PREVIOUS REMEDIAL EXCAVATION	SRI MONITORING WELL	FORMER OR CURRENT STRUCTURE LOCATION	▨ FILL
PREVIOUS TEST PIT EXCAVATION	SRI SOIL BORING	HISTORIC SUBSURFACE STRUCTURE	ML – SILT, SANDY SILT, CLAYEY SILT
EXISTING MONITORING WELL SCREEN	SRI TEST PIT	EXISTING SUBSURFACE STRUCTURE	CL – CLAY
PREVIOUS SOIL BORING		WATER TABLE	■ NAPL OBSERVED
			SW – SAND
			OL – ORGANIC SILT

RETEC

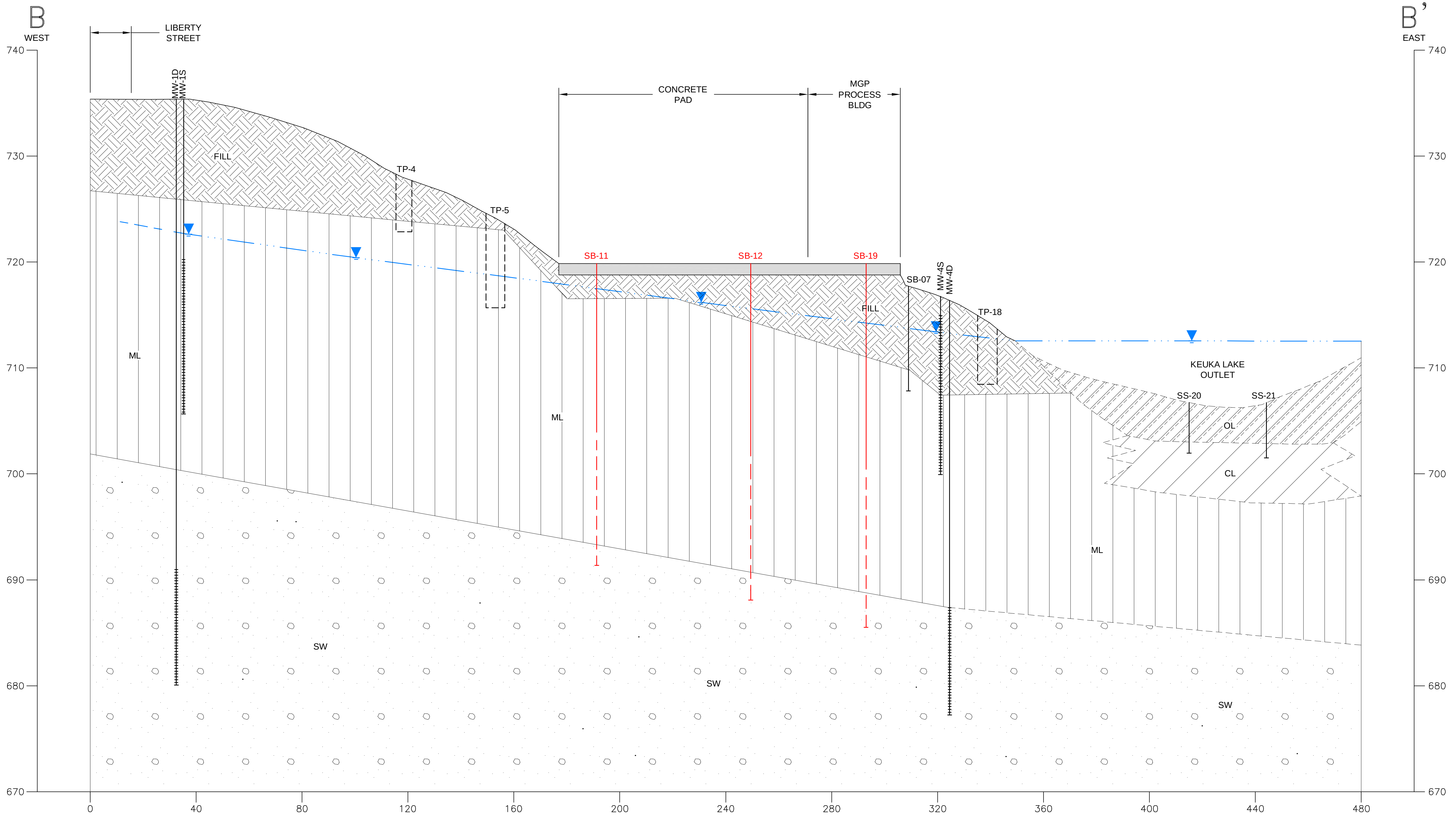
PENN YAN WATER STREET
FORMER MGP SITE

CROSS-SECTION C-C'

DATE: 8/03/06
DRWN: MAW/BIL

FIGURE 2-9

File: J:\19552\CC_FINAL.dwg Layout: ANSI_B(-LJ User: mwilliamson Plotted: Aug 03, 2006 – 3:01pm Xref's:



HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=10'

LEGEND

⊔	PREVIOUS REMEDIAL EXCAVATION
⊔	PREVIOUS TEST PIT EXCAVATION
┆	EXISTING MONITORING WELL SCREEN
│	PREVIOUS SOIL BORING
┆	SRI MONITORING WELL
│	SRI SOIL BORING
⊔	SRI TEST PIT
↔	FORMER OR CURRENT STRUCTURE LOCATION
▭	HISTORIC SUBSURFACE STRUCTURE
▬	EXISTING SUBSURFACE STRUCTURE
▼	WATER TABLE
▩	FILL
▥	ML – SILT, SANDY SILT, CLAYEY SILT
▨	CL – CLAY
⁘	SW – SAND
▨	OL – ORGANIC SILT
■	NAPL OBSERVED

RETEC

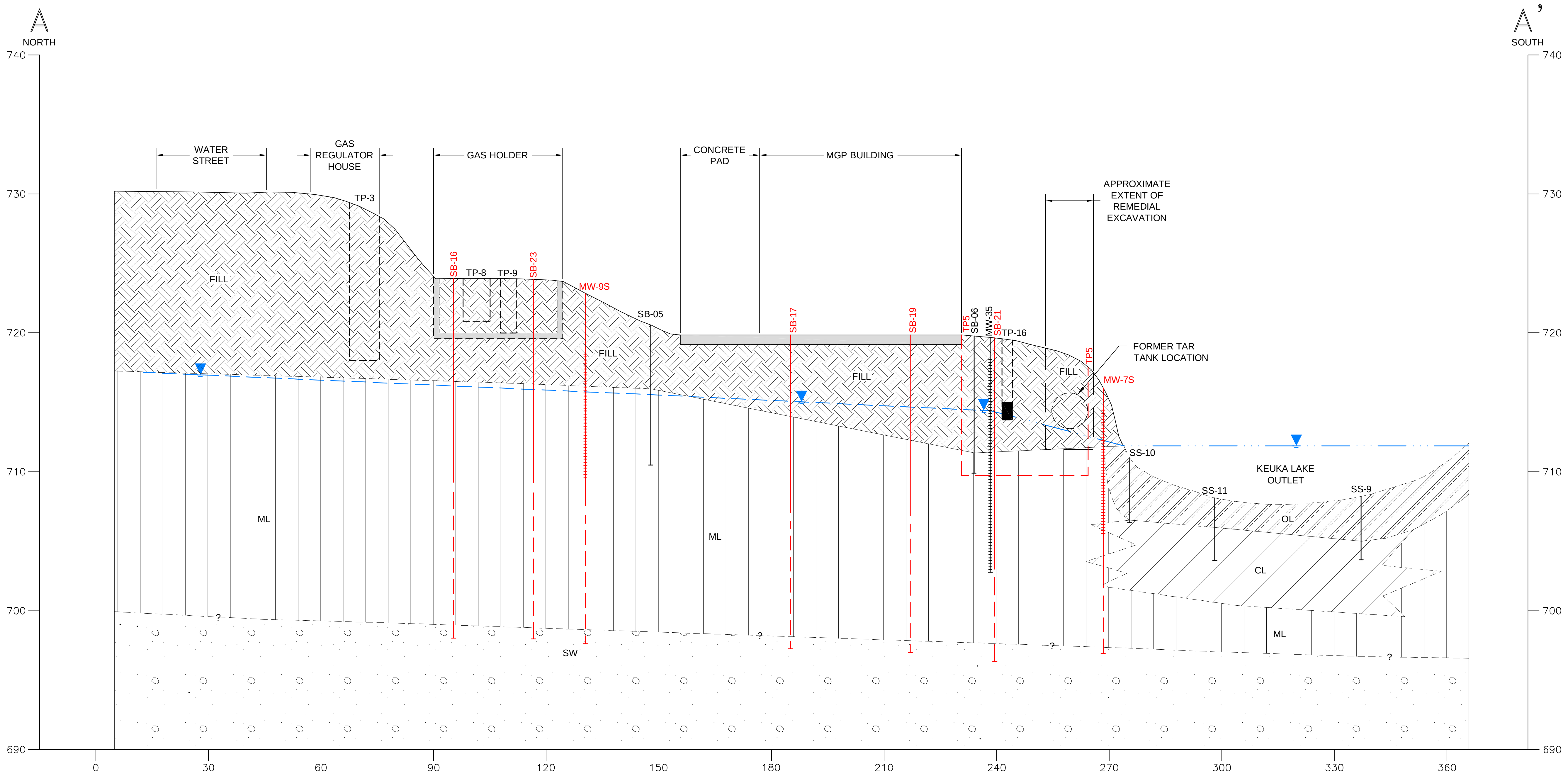
PENN YAN WATER STREET
FORMER MGP SITE

CROSS-SECTION B-B'

DATE: 8/03/06
DRWN: MAW/BIL

FIGURE 2-8

File: J:\19552\BB_FINAL.dwg Layout: ANSL_BI-LJ User: mwilliamson Plotted: Aug 03, 2006 – 3:01pm Xref's:



HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=8'

LEGEND

- PREVIOUS REMEDIAL EXCAVATION
- PREVIOUS TEST PIT EXCAVATION
- EXISTING MONITORING WELL SCREEN
- PREVIOUS SOIL BORING
- SRI MONITORING WELL
- SRI SOIL BORING
- SRI TEST PIT
- FORMER OR CURRENT STRUCTURE LOCATION
- HISTORIC SUBSURFACE STRUCTURE
- EXISTING SUBSURFACE STRUCTURE
- WATER TABLE
- ▨ FILL
- ML – SILT, SANDY SILT, CLAYEY SILT
- CL – CLAY
- SW – SAND
- OL – ORGANIC SILT
- ■ NAPL OBSERVED

RETEC

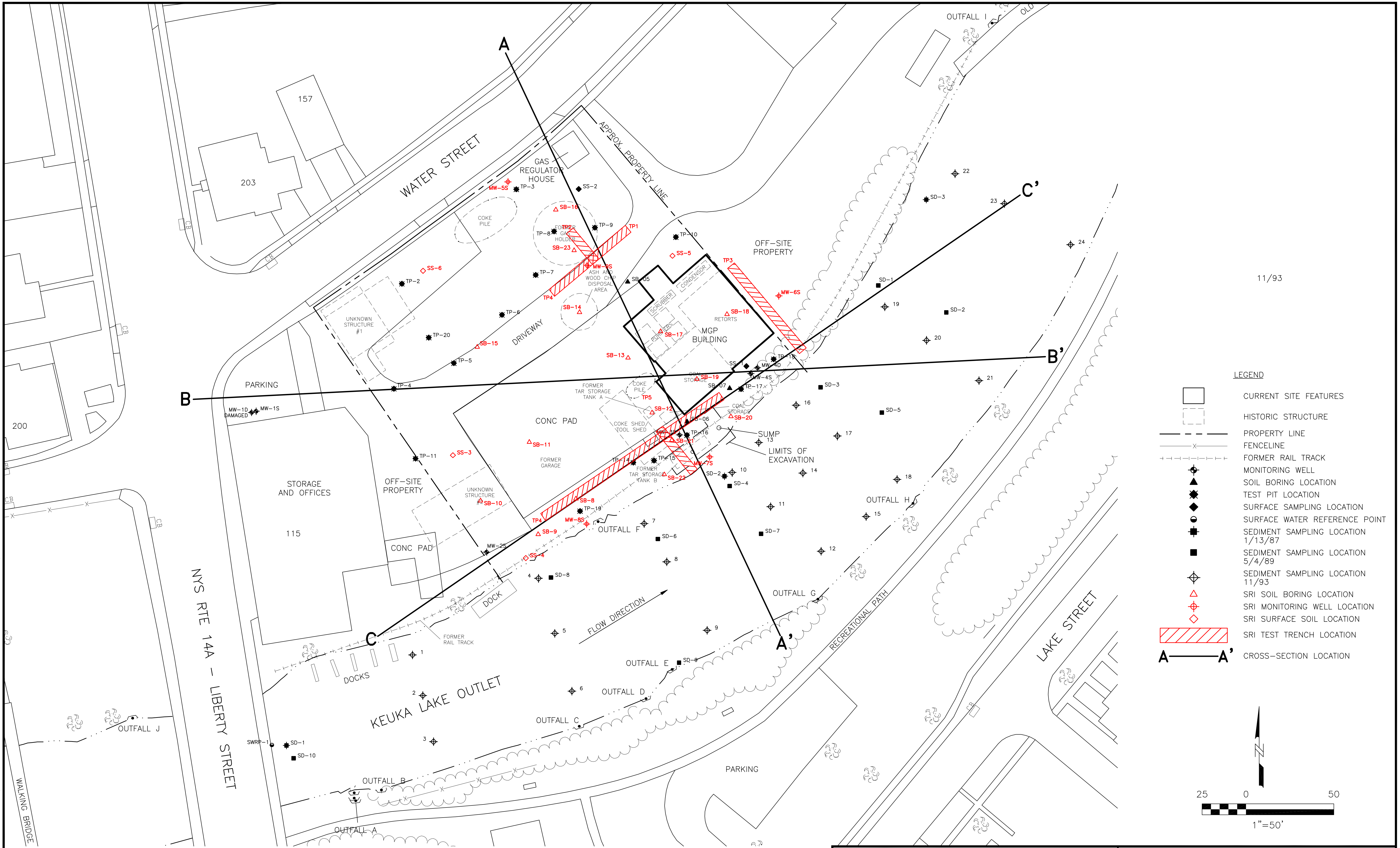
PENN YAN WATER STREET
FORMER MGP SITE

CROSS-SECTION A-A'

DATE: 8/03/06
DRWN: MAW/BIL

FIGURE 2-7

File: J:\19552\A4_FINAL.dwg Layout: ANSI_B-LJ User: mwilliamson Plotted: Aug 17, 2006 - 10:40am Xref's:



File: J:\19552\XSECT_LOC.dwg Layout: ANSL_BI-LJ User: mwilliamson Plotted: Aug 17, 2006 – 10:42am Xref's:

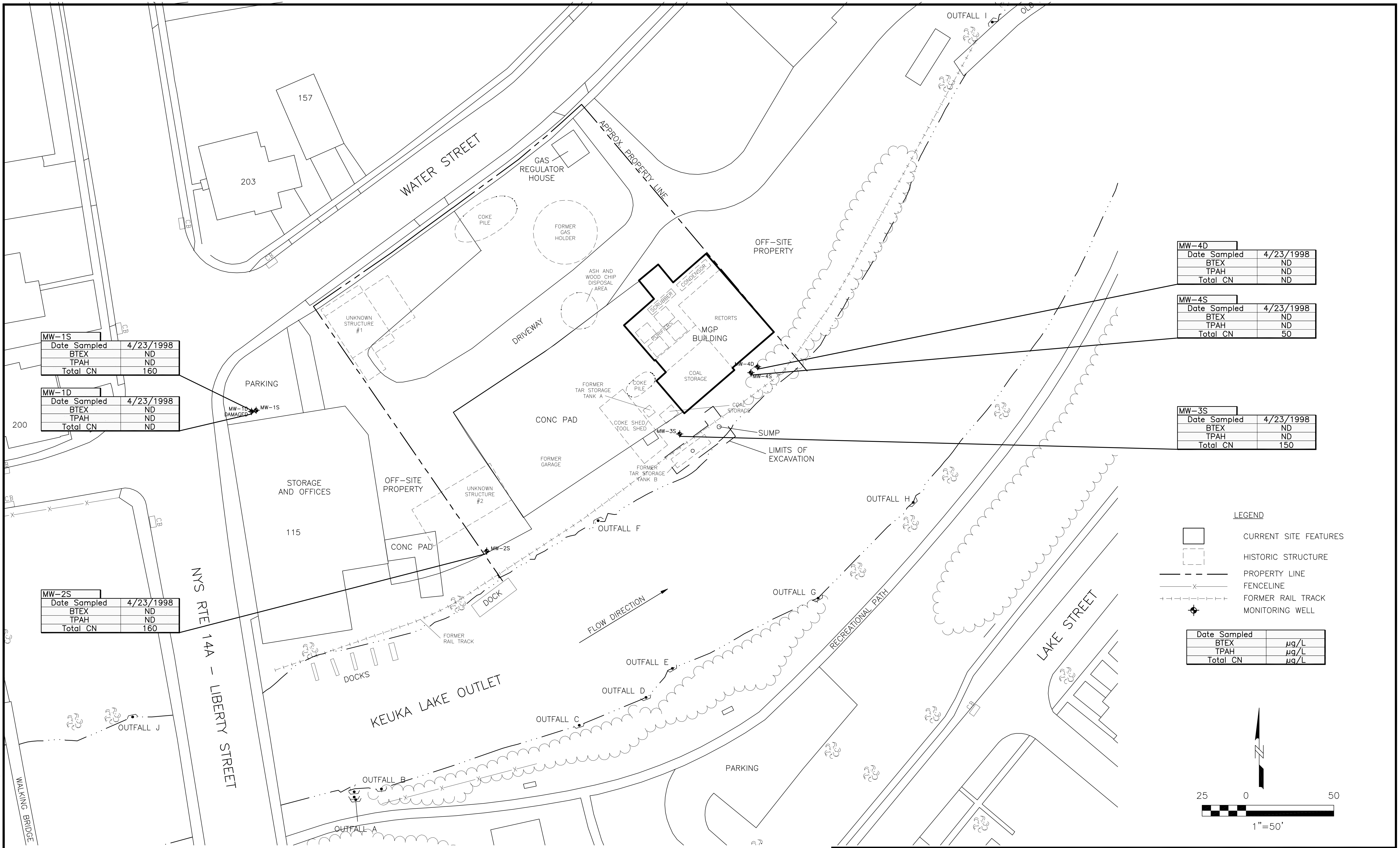
RETEC

PENN YAN WATER STREET
FORMER MGP SITE

CROSS SECTION LOCATIONS

DATE: 8/07/06
DRWN: MAW/BIL

FIGURE 2-6



MW-1S

Date Sampled	4/23/1998
BTEX	ND
TPAH	ND
Total CN	160

MW-1D

Date Sampled	4/23/1998
BTEX	ND
TPAH	ND
Total CN	ND

MW-2S

Date Sampled	4/23/1998
BTEX	ND
TPAH	ND
Total CN	160

MW-4D

Date Sampled	4/23/1998
BTEX	ND
TPAH	ND
Total CN	ND

MW-4S

Date Sampled	4/23/1998
BTEX	ND
TPAH	ND
Total CN	50

MW-3S

Date Sampled	4/23/1998
BTEX	ND
TPAH	ND
Total CN	150

LEGEND

- CURRENT SITE FEATURES
- HISTORIC STRUCTURE
- PROPERTY LINE
- FENCELINE
- FORMER RAIL TRACK
- MONITORING WELL

Date Sampled	
BTEX	µg/L
TPAH	µg/L
Total CN	µg/L

RETEC

PENN YAN WATER STREET
FORMER MGP SITE

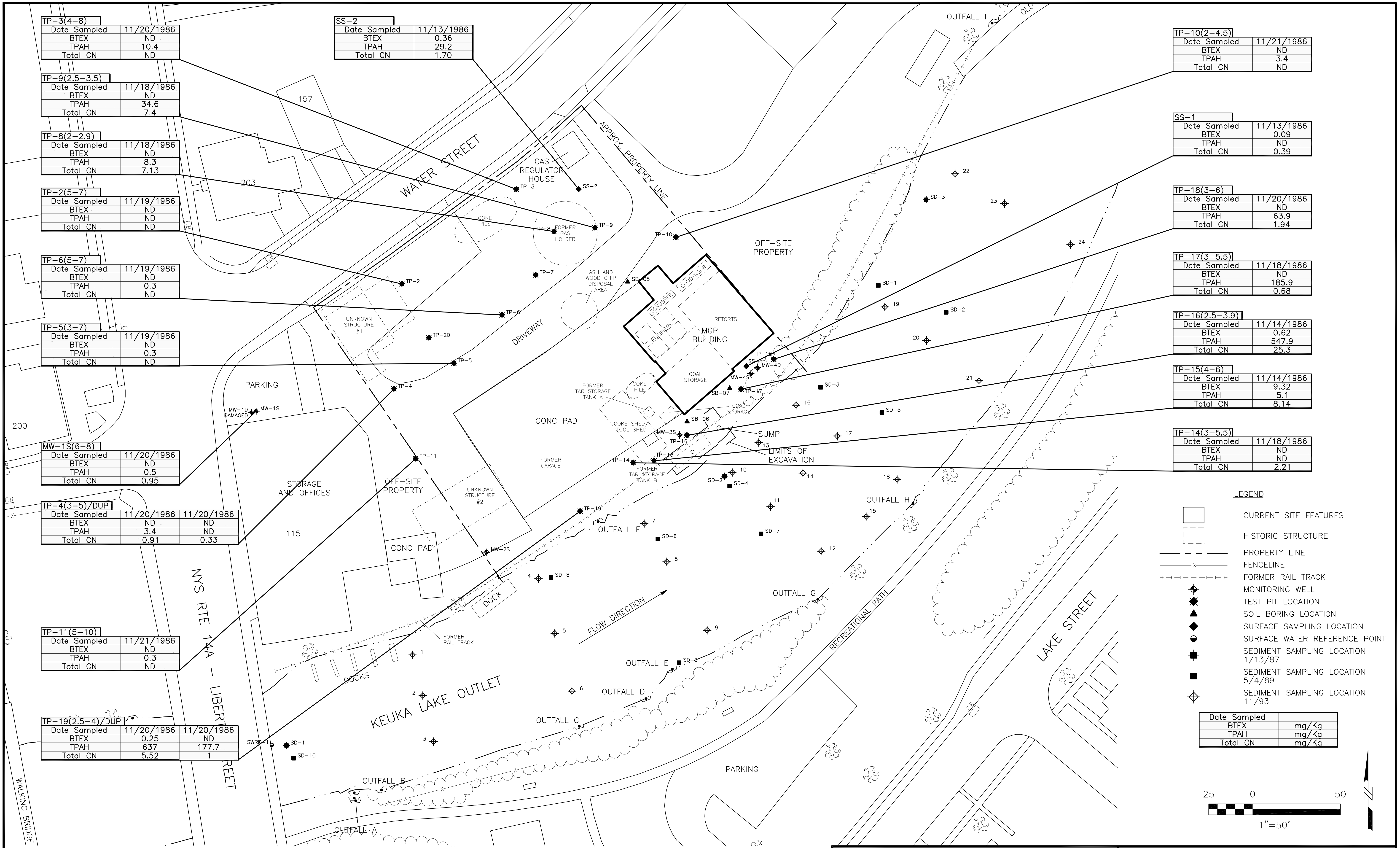
DATE: 8/03/06

DRWN: MAW/BIL

PREVIOUS GROUNDWATER SAMPLE RESULTS

FIGURE 2-5

File: J:\19552\GW_ANALYTICAL.dwg Layout: ANSI_B1-LJ User: mwilliamson Plotted: Aug 03, 2006 - 3:02pm Xref's:



TP-3(4-8)	
Date Sampled	11/20/1986
BTEX	ND
TPAH	10.4
Total CN	ND

TP-9(2.5-3.5)	
Date Sampled	11/18/1986
BTEX	ND
TPAH	34.6
Total CN	7.4

TP-8(2-2.9)	
Date Sampled	11/18/1986
BTEX	ND
TPAH	8.3
Total CN	7.13

TP-2(5-7)	
Date Sampled	11/19/1986
BTEX	ND
TPAH	ND
Total CN	ND

TP-6(5-7)	
Date Sampled	11/19/1986
BTEX	ND
TPAH	0.3
Total CN	ND

TP-5(3-7)	
Date Sampled	11/19/1986
BTEX	ND
TPAH	0.3
Total CN	ND

MW-1S(6-8)	
Date Sampled	11/20/1986
BTEX	ND
TPAH	0.5
Total CN	0.95

TP-4(3-5)/DUP		
Date Sampled	11/20/1986	11/20/1986
BTEX	ND	ND
TPAH	3.4	ND
Total CN	0.91	0.33

TP-11(5-10)	
Date Sampled	11/21/1986
BTEX	ND
TPAH	0.3
Total CN	ND

TP-19(2.5-4)/DUP		
Date Sampled	11/20/1986	11/20/1986
BTEX	0.25	ND
TPAH	637	177.7
Total CN	5.52	1

SS-2	
Date Sampled	11/13/1986
BTEX	0.36
TPAH	29.2
Total CN	1.70

TP-10(2-4.5)	
Date Sampled	11/21/1986
BTEX	ND
TPAH	3.4
Total CN	ND

SS-1	
Date Sampled	11/13/1986
BTEX	0.09
TPAH	ND
Total CN	0.39

TP-18(3-6)	
Date Sampled	11/20/1986
BTEX	ND
TPAH	63.9
Total CN	1.94

TP-17(3-5.5)	
Date Sampled	11/18/1986
BTEX	ND
TPAH	185.9
Total CN	0.68

TP-16(2.5-3.9)	
Date Sampled	11/14/1986
BTEX	0.62
TPAH	547.9
Total CN	25.3

TP-15(4-6)	
Date Sampled	11/14/1986
BTEX	9.32
TPAH	5.1
Total CN	8.14

TP-14(3-5.5)	
Date Sampled	11/18/1986
BTEX	ND
TPAH	ND
Total CN	2.21

Date Sampled	
BTEX	mg/Kg
TPAH	mg/Kg
Total CN	mg/Kg

File: J:\19552\SUBSURF_ANALYTICAL.dwg Layout: ANSI_BI-LJ User: mwilliamson Plotted: Aug 03, 2006 – 3:07pm Xref's:

RETEC

PENN YAN WATER STREET
FORMER MGP SITE

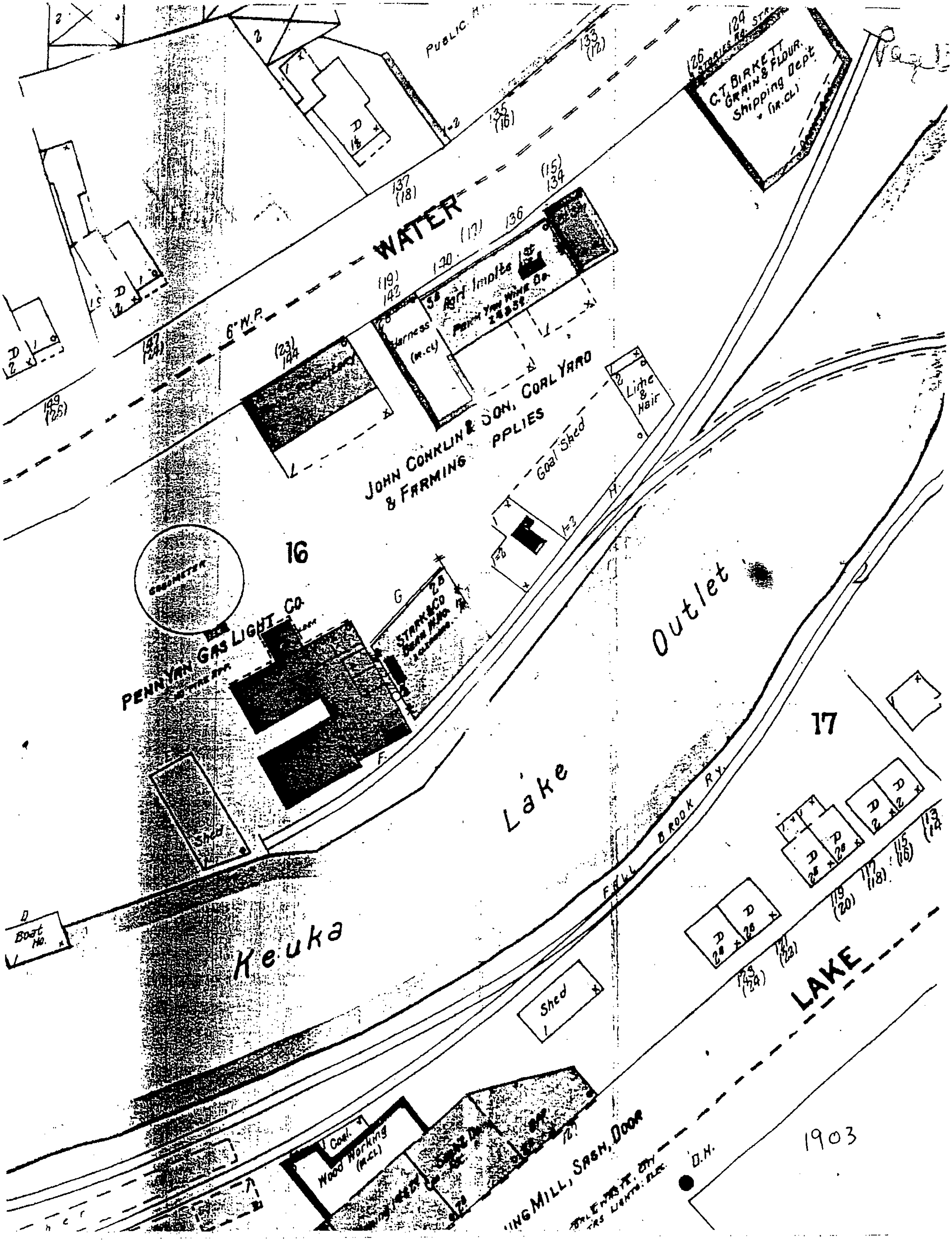
PREVIOUS SURFACE AND SUBSURFACE SOIL RESULTS

DATE: 8/02/06
DRWN: MAW/BIL

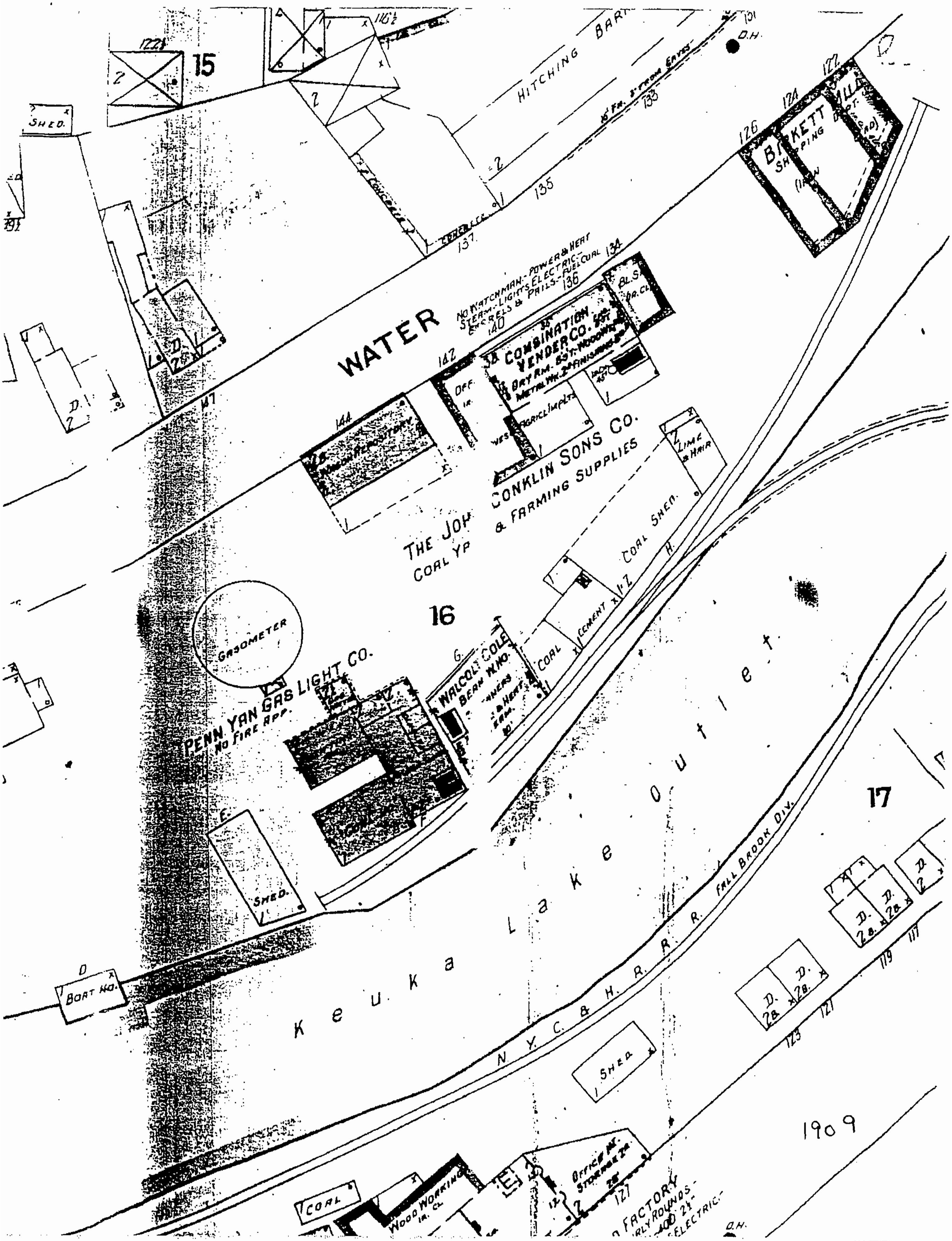
FIGURE 2-4

Appendix A

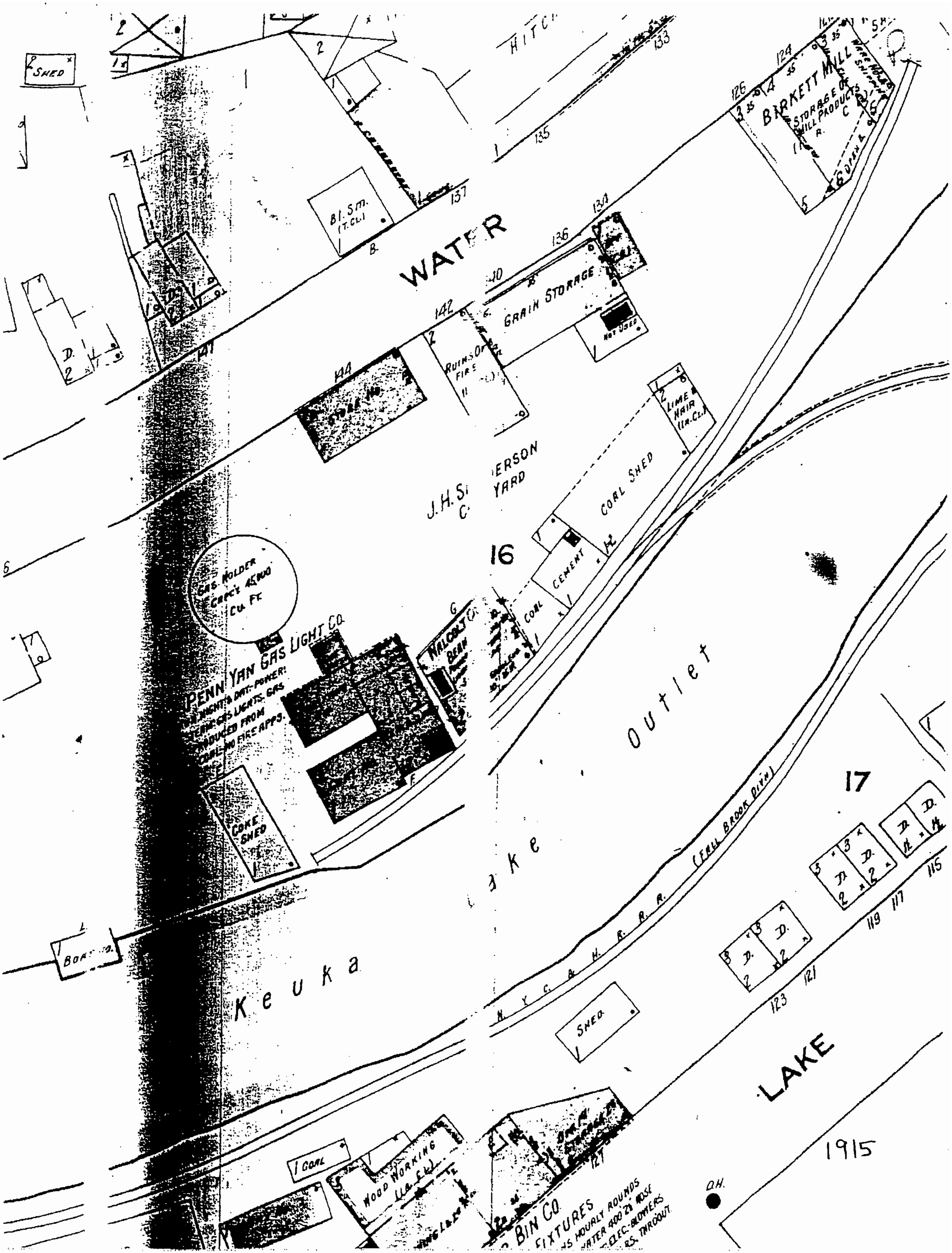
Historic Fire Insurance Maps


PUBLIC
WATER
6" W.P.
C.T. BIRKETT GRAIN & FLOUR Shipping Dept. (IR.CL)
2 STORIES
Agri Implts
PENN YAN WINE CO.
Harness (IR.CL)
JOHN CONKLIN & SON, COAL YARD & FARMING PPLIES
Coal Shed
Lime & Hair
16
GASOMETER
PENN YAN GAS LIGHT CO.
STARK & CO
Shed
Boat Ho.
Outlet
Lake
Keuka
FALL BROOK RY.
17
LAKE
Shed
Coal
Wood Working (IR.CL)
ING MILL, SASH, DOOR
D.H.
133 (12)
135 (16)
137 (18)
134 (15)
136 (17)
140 (19)
142
144 (23)
147 (24)
149 (25)
126
129
113 (14)
115 (16)
117 (18)
119 (20)
121 (22)
123 (24)

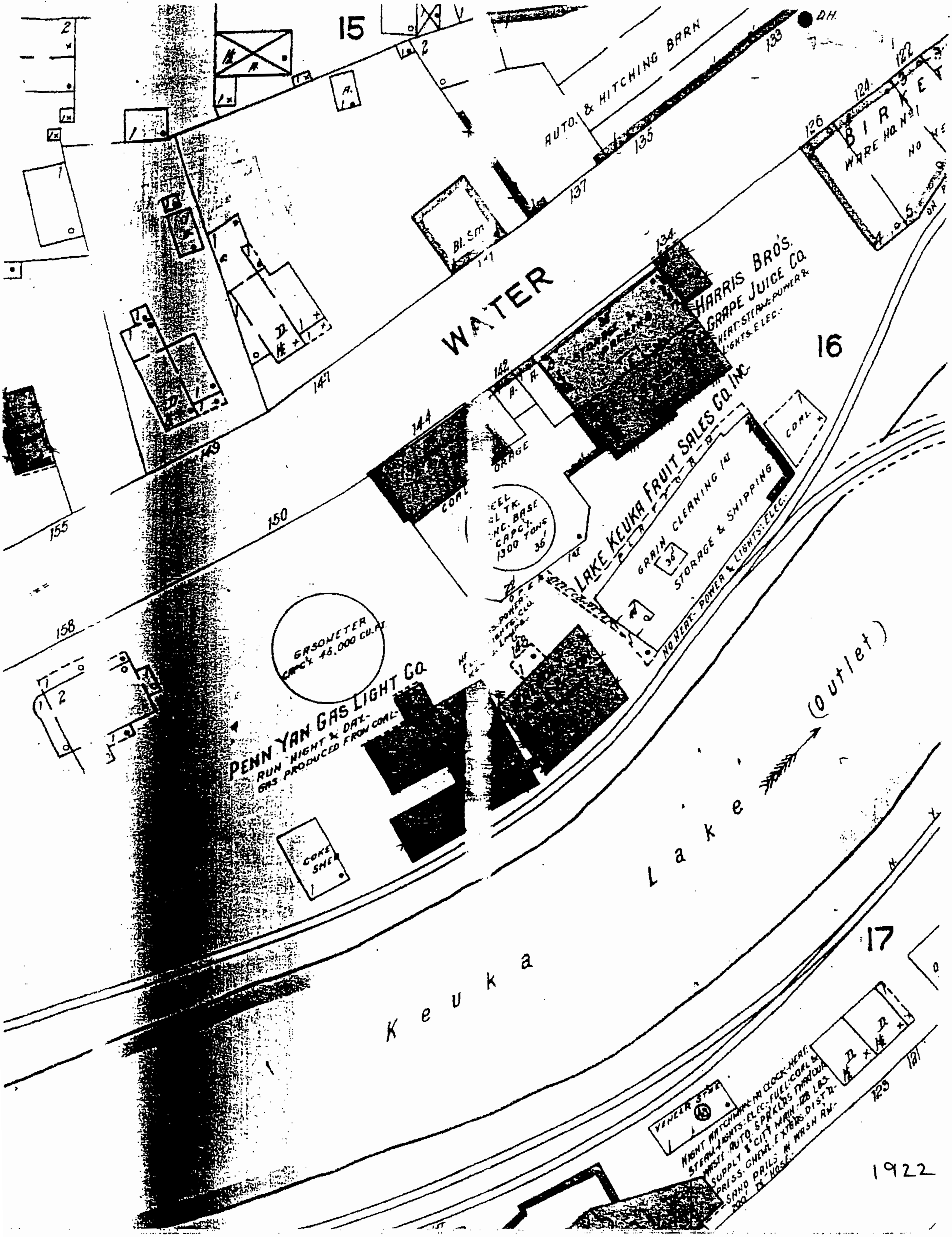
1903


15
16
17
WATER
HITCHING BARN
SHED
GASOMETER
PENN YAN GAS LIGHT CO.
NO FIRE APP.
THE JOHN CONKLIN SONS CO.
COAL YD & FARMING SUPPLIES
COMBINATION VENDER CO.
WAGON REPOSITORY
AGRIC'L IMPL'TS
LIME & HAIR
COAL SHED
CEMENT
COAL
WALCOTT COLE BEAN WHO.
NO WATCHMAN - POWER & HEAT STEAM - LIGHTS ELECTRIC - FUEL COAL
BIRKETT MILL
SHIPPING
Keuka Lake Outlet
N.Y.C. & H.R.R.R. FALL BROOK DIV.
BOAT HO.
SHED
COAL
WOOD WORKING
OFFICE & STORAGE
FACTORY
D.H.
122
116½
101
133
135
137
126
124
122
134
136
140
142
144
147
191
117
119
121
123
127

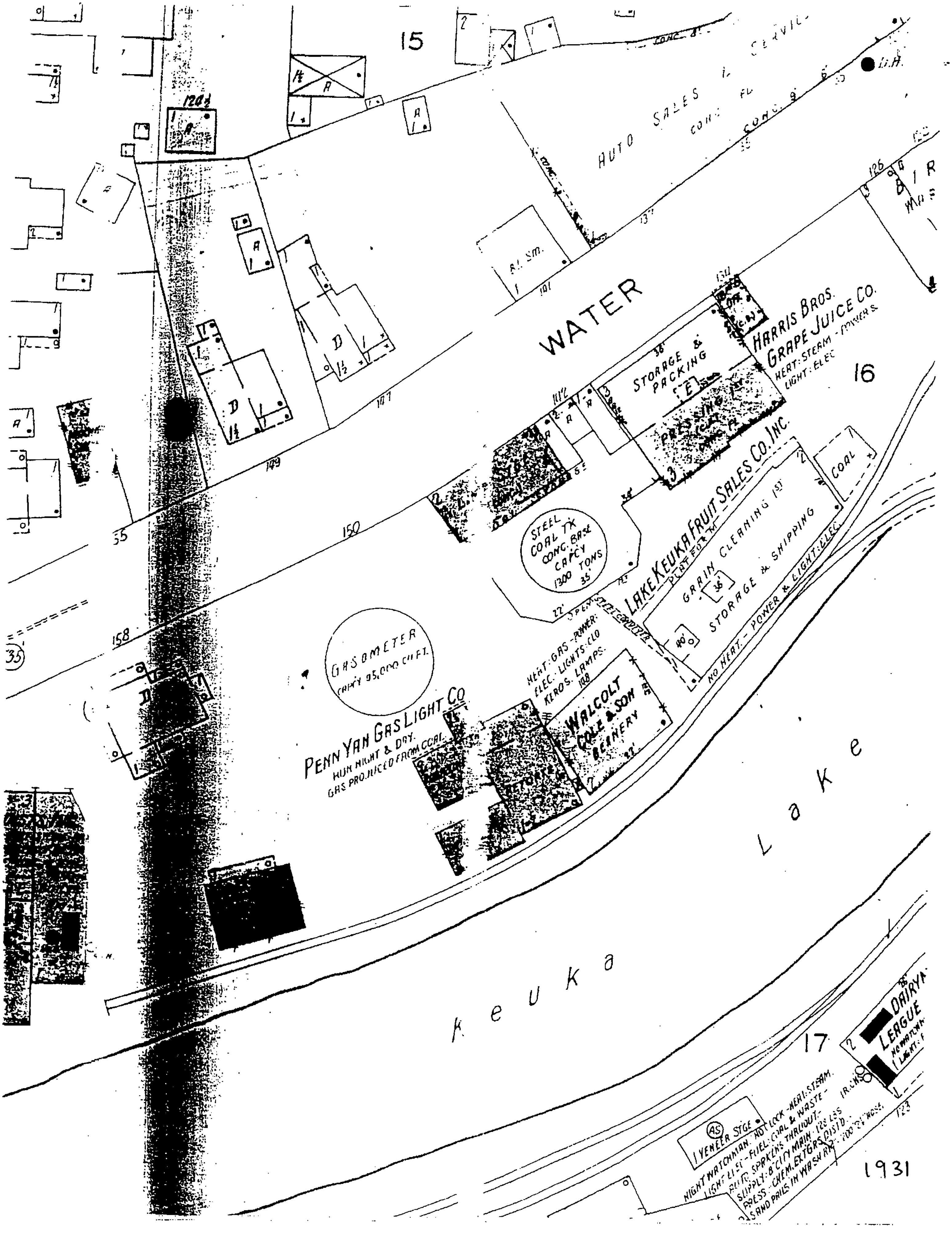
1909


SHED
HITCH
133
135
137
124
126
BIRKETT MILL
STORAGE OF MILL PRODUCTS
WAREHOUSE SHIPPING
OPEN
WATER
134
136
140
GRAIN STORAGE
NOT USED
142
RUINS OF FIRE
81 Sm. (T. CL.)
B.
141
144
STORE HO.
LIME & HAIR (IN. CL.)
J. H. S ERSON
C YARD
COAL SHED
CEMENT
COAL
16
GAS HOLDER CAPC'Y 45000 CU. FT.
PENN YAN GAS LIGHT CO.
NIGHT & DAY POWER:
GAS LIGHTS. GAS
PRODUCED FROM
COAL. NO FIRE APPS.
WALCOTT C
G
F.
COKE SHED
BOAT HO.
L.
Keuka Lake Outlet
N. Y. C. & H. R. R. R. (FALL BROOK DIVN)
17
D.
119
117
115
123
121
SHED
LAKE
1 COAL
WOOD WORKING
127
BIN CO.
FIXTURES
HOURLY ROUNDS
WATER 400' 2½" HOSE
ELEC. BLOWERS
RS. THROUT
O.H.

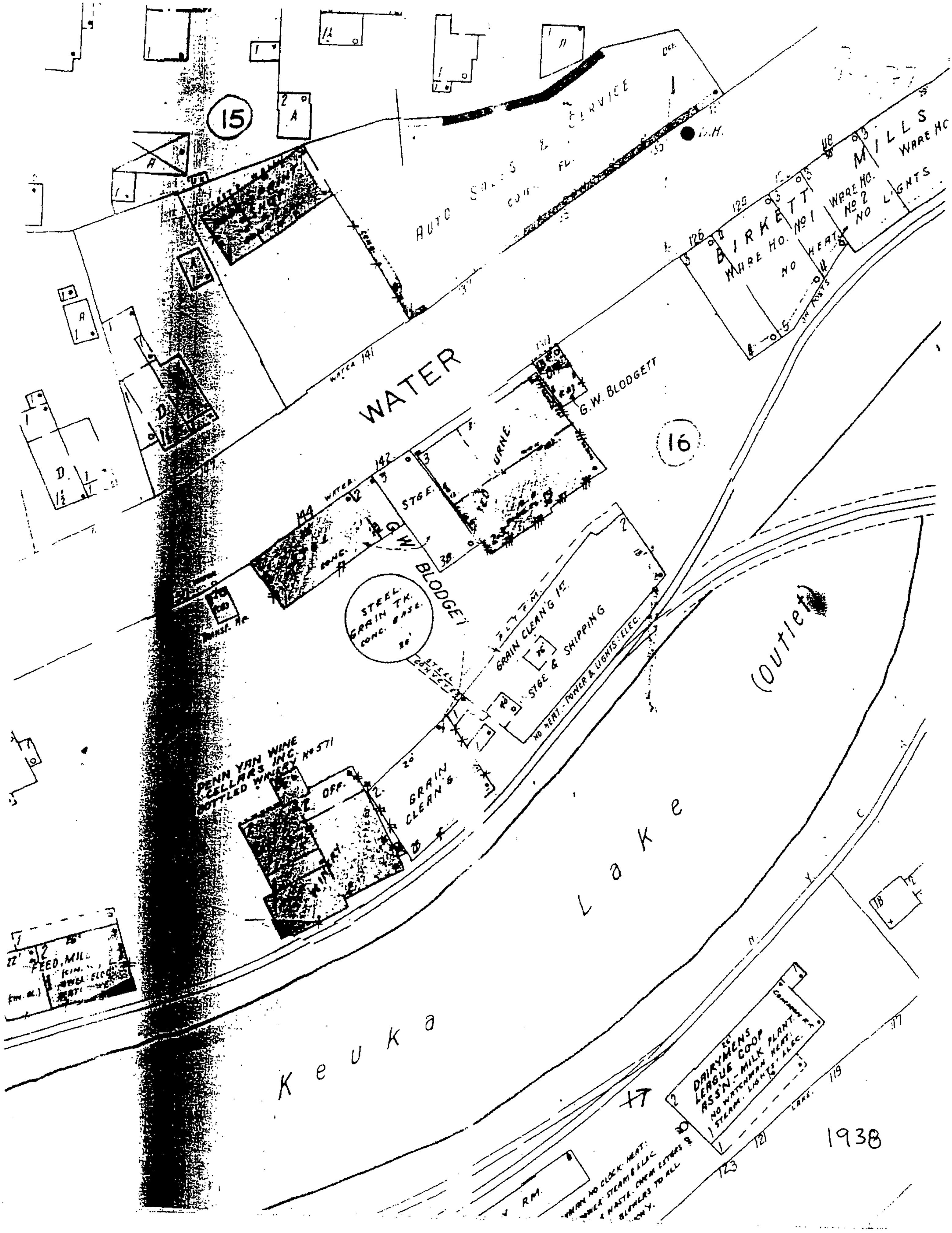
1915


15
D.H.
AUTO. & HITCHING BARN
133
135
137
141
Bl. Sm
122
124
126
BIRKE
WARE HO. No 1
WATER
147
149
144
142
134
HARRIS BRO'S.
GRAPE JUICE CO.
HEAT: STEAM: POWER & LIGHTS: ELEC.
16
LAKE KEUKA FRUIT SALES CO. INC.
GRAIN CLEANING 1st
STORAGE & SHIPPING
NO HEAT: POWER & LIGHTS: ELEC.
COAL
COAL
ORAGE
EEL
L TK.
NG. BASE
CAPCY.
1300 TONS
36'
OFFICE
150
155
158
GASOMETER
CAPCY 46,000 CU. FT.
PENN YAN GAS LIGHT CO.
RUN NIGHT & DAY.
GAS PRODUCED FROM COAL.
COKE SHED
Keuka Lake
(Outlet)
17
VENEER STGE
15
NIGHT WATCHMAN NO CLOCK: HEAT:
STEAM: LIGHTS: ELEC: FUEL: COAL &
WASTE. AUTO. SPRKLRS THROUGH.
SUPPLY & CITY MAIN: 120 LBS.
PRESS. CHEM. EXTGRS. DIST'D.
SAND PAILS IN WASH RM.
300' 1½" HOSE.
121
123

1922


15
16
17
WATER
AUTO SALES & SERVICE
CONC. FL.
HARRIS BROS. GRAPE JUICE CO.
HEAT: STEAM - POWER &
LIGHT: ELEC.
STORAGE & PACKING
PRESSING
LAKE KEUKA FRUIT SALES CO. INC.
GRAIN CLEANING
STORAGE & SHIPPING
NO HEAT - POWER & LIGHT: ELEC.
COAL
STEEL COAL TK. CONC. BASE CAP'CY 1300 TONS
GASOMETER CAP'CY 95,000 CU. FT.
PENN YAN GAS LIGHT CO.
RUN NIGHT & DAY.
GAS PRODUCED FROM COAL.
HEAT: GAS - POWER: ELEC. LIGHTS: ELEC. KEROS. LAMPS.
WALCOLT COLE & SON BEANERY
RETORTS
Keuka Lake
DAIRYMEN'S LEAGUE
1 VENEER STGE
AS
NIGHT WATCHMAN. NO CLOCK - HEAT: STEAM.
LIGHT: ELEC. - FUEL: COAL & WASTE -
AUTO. SPRKLRS. THRUOUT.
SUPPLY: 8" CITY MAIN. 125 LBS
PRESS. - CHEM. EXTGRS. DIST'D.
SAND PAILS IN WASH RM. - 100' 2½" HOSE.
120½
126
149
150
158
35
55
107
101
123
Bl. Sm.

1931


15
16
17
AUTO SALES & SERVICE
WATER
BIRKETT MILLS
WARE HO. No 1
WARE HO. No 2
WARE HO.
NO HEAT
NO LIGHTS
G.W. BLODGETT
G.W. BLODGETT
STGE.
CONC.
STEEL GRAIN TK. CONC. BASE 36'
STEEL CONVEYOR
GRAIN CLEAN'G 1ST
STGE & SHIPPING
NO HEAT. POWER & LIGHTS: ELEC.
TRANSF. HO.
PENN YAN WINE CELLARS INC. BOTTLED WINERY No 571
OFF.
GRAIN CLEAN'G
FEED MILL
Keuka Lake (Outlet)
DAIRYMENS LEAGUE COOP ASS'N. MILK PLANT
NO WATCHMAN NO HEAT.
STEAM. LIGHTS: ELEC.
LAKE
119
121
123
RM.

1938

Appendix B

Previous Investigation Borelogs and Well Construction Logs

TRC Environmental Consultants, Inc.
Previous Investigation Test Pit and Well Construction Logs

APPENDIX A

TEST PIT LOGS

TEST PIT LOG

PROJECT NO.: 3437-N61
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG
CONTRACTOR: City Hill Construction, Inc.

TEST PIT NO. TP-2

LOCATION: Penn Yan, N.Y.
TRC Inspector: R. Fox

DATE STARTED: 11/19/86
DATE COMPLETED: 11/19/86
PIT DIMENSIONS (W X L X D)): 3.0' x 10.0' x 8.0'

Depth (ft)	Description
0.0-1.0	Dark brown silt and clay fill, with gravel.
1.0-8.0	Same material as above, including small boulders, whole bricks and occasional large boulders. Wood fragments found at 2.0 ft.

OVA response - backhoe sample from 8.0 ft. Ambient.

Composite sample taken from 5.0 ft. to 7.0 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61
TEST PIT NO. TP-3
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG
LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc.
TRC Inspector: R. Fox

DATE STARTED: 11/20/86
DATE COMPLETED: 11/20/86
PIT DIMENSIONS (W X L X D)): 2.0' x 9.8' x 11.2'

Depth (ft)	Description
0.0-0.5	Found partial concrete foundation at 0.5 ft. Moved pit to south of foundation and continued excavation.
0.0-1.0	Dark brown soil fill, including cobbles and brick fragments.
1.0-3.0	Same material as above with increasing amounts of red clay, coal clinkers and wood fragments.
3.0-5.0	Same as above, with concrete slab fragments.
5.0-11.2	Same as above, with increasing amounts of brick fragments.

OVA response - backhoe sample from 8 ft. Ambient.

Composite sample taken from 4.0 ft. to 8.0 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61 TEST PIT NO. TP-4
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc. TRC Inspector: R. Fox

DATE STARTED: 11/20/86 DATE COMPLETED: 11/20/86
PIT DIMENSIONS (W X L X D)): 2.0' x 10.8' x 5.0'

Depth (ft)	Description
0.0-0.5	Compacted fill.
0.5-5.0	Black sandy fill containing wood, concrete and brick fragments.

OVA response - backhoe sample from 5.0 ft. 10 ppm.

Composite sample taken from 3.0 ft. to 5.0 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61 TEST PIT NO. TP-5
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc. TRC Inspector: R. Fox

DATE STARTED: 11/19/86 DATE COMPLETED: 11/19/86
PIT DIMENSIONS (W X L X D)): 2.0' x 9.3' x 8.4'

Depth (ft)	Description
0.0-0.5	Dark brown gravel fill.
0.5-8.4	Medium brown clay, some silt with fine sand and coarse gravel.

OVA response - backhoe sample from 7.0 ft. Ambient.

Composite sample taken from 3.0 ft. to 7.0 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG
CONTRACTOR: City Hill Construction, Inc.

TEST PIT NO. TP-6

LOCATION: Penn Yan, N.Y.
TRC Inspector: R. Fox

DATE STARTED: 11/19/86
DATE COMPLETED: 11/19/86
PIT DIMENSIONS (W X L X D)): 2.0' x 9.0' x 8.9'

Depth (ft)	Description
0.0-8.9	Medium brown clay, some silt, little fine sand and gravel.

OVA response - backhoe sample from 7.0 ft. Ambient.

Composite sample taken from 5.0 ft. to 7.0 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61
TEST PIT NO. TP-7
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG
LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc.
TRC Inspector: R. Fox

DATE STARTED: 11/18/86
DATE COMPLETED: 11/18/86
PIT DIMENSIONS (W X L X D)): 2.0' x 13.9' x 6.8'

Depth (ft)	Description
0.0-6.8	Red-brown silt, some clay, fine sand and gravel. Pit extended 3 ft. to the north.

OVA response - backhoe sample taken from 6.8 ft. Ambient.

Sample for laboratory analysis not taken here.

TEST PIT LOG

PROJECT NO.: 3437-N61
TEST PIT NO. TP-8
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG
LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc.
TRC Inspector: R. Fox

DATE STARTED: 11/18/86
DATE COMPLETED: 11/18/86
PIT DIMENSIONS (W X L X D)): 2.0' x 8.0' x 2.9'

Depth (ft)	Description
0.0-1.0	Gravel fill with brick fragments.
1.0-2.9	Rubble fill, including wood, brick and glass fragments. Concrete floor of relief gas holder found at 2.9 ft.

OVA response - backhoe sample from 2.9 ft. Ambient.

Composite sample taken from 2.0 ft. to 2.9 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61	TEST PIT NO. TP-9
PROJECT: Penn Yan Gas Plant	
CLIENT: NYSEG	LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc.	TRC Inspector: L. Stewart
DATE STARTED: 11/18/86	DATE COMPLETED: 11/18/86

PIT DIMENSIONS (W X L X D)): 2.0' x 12.0' x 3.8'

Depth (ft)	Description
0.0-0.5	Dark brown soil fill.
0.5-3.8	Brown-black rubble fill, including large coal clinkers. Brick wall of tank relief gas holder at 1.0 ft. with clinkers found outside of holder perimeter. Sandy, soil fill found inside of holder perimeter. Hit cement footer at 3.0 ft. Hit cement floor of holder at 3.8', extended pit 6 ft. to the west.

OVA response - backhoe sample from 3.5 ft. Ambient.

Composite sample taken from 2.5 ft. to 3.5 ft. from inside of holder perimeter for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61
TEST PIT NO. TP-10
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG
LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc.
TRC Inspector: R. Fox

DATE STARTED: 11/21/86
DATE COMPLETED: 11/21/86
PIT DIMENSIONS (W X L X D)): 2.0' x 8.0' x 4.8'

Depth (ft)	Description
0.0-3.0	Brown sand and gravel. Cobble sizes increase with depth.
3.0-4.8	Reddish brown clay fill, including brick fragments. Hit 1.5 inch pipe at 4.7 ft.

Composite sample taken from 2.0 ft to 4.5 ft for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61
TEST PIT NO. TP-11
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG
LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc.
TRC Inspector: R. Fox

DATE STARTED: 11/21/86
DATE COMPLETED: 11/21/86
PIT DIMENSIONS (W X L X D)): 2.0' x 9.2' x 10.0'

Depth (ft)	Description
0.0-2.0	Dark brown coarse sand fill with medium cobbles.
2.0-10.0	Medium brown undisturbed clay. Water at 10.0 ft.

OVA response - backhoe sample from 10.0 ft. Ambient.

Composite sample taken from 5.0 ft. to 10.0 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61
TEST PIT NO. TP-14
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG
LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc.
TRC Inspector: R. Fox

DATE STARTED: 11/18/86
DATE COMPLETED: 11/18/86
PIT DIMENSIONS (W X L X D)): 2.0' x 5.0' x 5.5'

Depth (ft)	Description
0.0-3.0	Gravel fill, including wood chips and brick fragments. Large foundation stones found at 3.0 ft.
3.00-5.5	Rubble fill, including brick and wood fragments, and large foundation stones. Backhoe could not continue through wood timbers found at 5.5 ft.

OVA response - backhoe sample from 5.5 ft. Ambient.

Composite sample taken from 3.0 ft. to 5.5 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61
TEST PIT NO. TP-15
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG
LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc.
TRC Inspector: L. Stewart

DATE STARTED: 11/14/86
DATE COMPLETED: 11/14/86
PIT DIMENSIONS (W X L X D)): 2.0' x 8.0' x 6.0'

Depth (ft)	Description
0.0-0.5	Coarse sand and gravel fill. Railroad tie found at 0.5 ft.
0.5-3.0	Fill, including coal clinkers, ash, and fragments of brick, wood and glass.
3.0-4.0	Tan clay.
4.0-6.0	Clay darkens to black. Strong coal odor at 4.0 ft. Backhoe bucket sample shows coal tar contamination in clay.

OVA response - backhoe sample from 6.0 ft. 520 ppm.

Composite sample taken from 4.0 ft. to 6.0 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61 TEST PIT NO. TP-16
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc. TRC Inspector: L. Stewart

DATE STARTED: 11/14/86 DATE COMPLETED: 11/14/86
PIT DIMENSIONS (W X L X D)): 2.0' x 8.0' x 5.8'

Depth (ft)	Description
0.0-0.5	Black fill, including ash, coal clinkers, wood and brick fragments.
1.6-5.8	Sandy, fill with clay. Blue-green and orange zone, 3 in. thick at 2.5 ft. (Moderate coal tar odor at 4.5 ft.) A black, low-viscosity material seeped from western side of pit.

OVA response - backhoe sample from 3.9 ft. 3 ppm.

Composite sample taken from 2.5 ft. to 3.9 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61 TEST PIT NO. TP-17
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc. TRC Inspector: L. Stewart

DATE STARTED: 11/18/86 DATE COMPLETED: 11/18/86
PIT DIMENSIONS (W X L X D)): 2.0' x 6.0' x 5.5'

Depth (ft)	Description
0.0-0.5	Soil fill.
0.5-5.5	Black, sandy rubble fill, including light gray ash, coal clinkers, wood chips, brick fragments. Water at 5.5 ft.

OVA response - backhoe sample from 5.5' Ambient.

Composite sample taken from 3.0 ft. to 5.5 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG
CONTRACTOR: City Hill Construction, Inc.

TEST PIT NO. TP-18

LOCATION: Penn Yan, N.Y.
TRC Inspector: L. Stewart

DATE STARTED: 11/14/86
PIT DIMENSIONS (W X L X D)): 2.0' x 6.0' x 6.3'

DATE COMPLETED: 11/14/86

Depth (ft)	Description
0.0-0.5	Soil fill, sand and gravel
0.5-6.3	Black rubble fill, including fragments of bricks and wood beams. Purifier waste found at 4.7 ft.

OVA response - backhoe sample from 6.3 ft. 4.0 ppm.

Composite sample taken from 3.0 ft. to 6.0 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61
TEST PIT NO. TP-19
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG
LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc.
TRC Inspector: L. Stewart

DATE STARTED: 11/20/86
DATE COMPLETED: 11/20/86
PIT DIMENSIONS (W X L X D)): 2.0' x 3.0' x 4.0'

Depth (ft)	Description
0.0-0.5	Gravel fill.
0.5-4.0	Dark brown to black clay fill. Coal tar contamination visible in clay. Brick fragments found in clay. Strong coal tar odor, but OVA response was ambient. Water at 4.0 ft.

OVA response - backhoe sample from 4.0 ft. 1.2 ppm.

Composite sample taken from 2.5 ft. to 4.0 ft. for laboratory analysis.

TEST PIT LOG

PROJECT NO.: 3437-N61 TEST PIT NO. TP-20
PROJECT: Penn Yan Gas Plant
CLIENT: NYSEG LOCATION: Penn Yan, N.Y.
CONTRACTOR: City Hill Construction, Inc. TRC Inspector: R. Fox

DATE STARTED: 11/21/86 DATE COMPLETED: 11/21/86
PIT DIMENSIONS (W X L X D)): 2.0' x 8.0' x 3.9'

Depth (ft)	Description
0.0-2.0	Brown soil fill with cobbles.
2.0-3.9	Same material as above, with brick fragments. Water at 3.9 ft.

OVA response - backhoe sample from 3.9 ft. Ambient.

Sample for laboratory analysis not taken here.

APPENDIX B

BORING LOGS AND WELL CONSTRUCTION DIAGRAMS

BOR. . OG

PROJECT NO. 3437 N61

PAGE ___ OF ___

BORING NO. MW 1D

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, New York

DRILLING CONTRACTOR: Empire Soils Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 736.03'

WELL DEPTH: 54.0'

CASING STICK UP: 0.33"

WATER LEVEL: 17.3'

DATE STARTED: 11/17/86

COMPLETED: 11/18/86

TOP OF SCREEN: 44.0'

BOTTOM OF SCREEN: 54.0'

DRILLING METHOD: Spun Casing/Hollow Stem Auger - 4"

COMPLETION AND DEVELOPMENT: 2" Stainless Steel Monitoring Well Pumped Until Clear

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
0-5'					Loose, brown/dark brown, medium SAND and SILT, rubble (brick fragments, coal clinkers).	Hollow stem auger to 2', spun casing starting at 2'.
5-7'	2-3-2-4	50	ND		Same as above including cobbles.	ND = Non Detected <0.1 ppm.
7-9'	2-4-6-7	50	ND		Same as above grading to medium dense, moist, including wood chips.	
9-11'	3-6-7-10	75	ND		Medium dense, brown, SILT, little clay, trace fine gravel.	

BOR LOG

PROJEC. J. 3437 N61 PAGE ___ OF __

BORING NO. MW 1D

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, New York

DRILLING CONTRACTOR: Empire Soils Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 736.03'

WELL DEPTH: 54.0'

CASING STICK UP: 0.33"

WATER LEVEL: 17.3'

DATE STARTED: 11/17/86

COMPLETED: 11/18/86

TOP OF SCREEN: 44.0'

BOTTOM OF SCREEN: 54.0'

DRILLING METHOD: Spun Casing/Hollow Stem Auger 4"

COMPLETION AND DEVELOPMENT: 2" Stainless Steel Monitoring Well Pumped Until Clear

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
11 13'	3 6-7-10	75	ND		Same as above.	
13 15'	4-7-10 15	65	ND		Same as above.	
15 17'					No recovery.	
17 19'	7 14 17 19	90	ND		Hard, brown, SILT, little clay, moist.	Hollw stem auger - 4". Water at 17.3'.

BOF LOG

PROJECT NO. 3437-N61

PAGE OF

BORING NO. MW 1D

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, New York

DRILLING CONTRACTOR: Empire Soils Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 736.03'

WELL DEPTH: 54.0'

CASING STICK UP: 0.33"

WATER LEVEL: 17.3'

DATE STARTED: 11/17/86

COMPLETED: 11/18/86

TOP OF SCREEN: 44.0'

BOTTOM OF SCREEN: 54.0'

DRILLING METHOD: Spun Casing/Hollow Stem Auger - 4"

COMPLETION AND DEVELOPMENT: 2" Stainless Steel Monitoring Well Pumped Until Clear

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
19-21'	7-7-10-15	80	ND		Very stiff, brown, CLAY, little silt.	
21-23	28-32-20-30	80	ND		.8' Hard, brown, SILT, little clay, trace fine gravel. .9' Very dense, brown, SAND, some silt, trace shale and sandstone fragments.	
23-25'	13-20-20-10	50	ND		.5' Same as above. .5' Hard, brown, SILT, some clay.	
25-27'	10-8-8-10	50	ND		Same as above, grading to very stiff and trace fine gravel.	

BO LOG

PROJEC .0. 3437 NG1 PAGE OF

BORING NO. MW-10

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, New York

DRILLING CONTRACTOR: Empire Soils Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 736.03'

WELL DEPTH: 54.0'

CASING STICK UP: 0.33"

WATER LEVEL: 17.3'

DATE STARTED: 11/17/86

COMPLETED: 11/18/86

TOP OF SCREEN: 44.0'

BOTTOM OF SCREEN: 54.0'

DRILLING METHOD: Spun Casing/Hollow Stem Auger - 4"

COMPLETION AND DEVELOPMENT: 2" Stainless Steel Monitoring Well Pumped Until Clear

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
27 29'	7-8-9-10	90	ND		Same as above.	
29-31'	5-4-6-5	100	ND		Stiff, dark brown, SILT and CLAY, trace fine gravel.	
31-33'	4-5-5-5	100	ND		Same as above.	
33 35'	3-3-3-4	100	ND		Firm, same as above.	

BORING LOG

PROJECT NO. 3437-N61

PAGE OF

BORING NO. MW 10

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, New York

DRILLING CONTRACTOR: Empire Soils Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 736.03'

WELL DEPTH: 54.0'

CASING STICK UP: 0.33"

WATER LEVEL: 17.3'

DATE STARTED: 11/17/86

COMPLETED: 11/18/86

TOP OF SCREEN: 44.0'

BOTTOM OF SCREEN: 54.0'

DRILLING METHOD: Spun Casing/Hollow Stem Auger - 4"

COMPLETION AND DEVELOPMENT: 2" Stainless Steel Monitoring Well Pumped Until Clear

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
35 37'	3-3 10-20	100	ND		Medium dense, grayish brown, grading to fine SAND.	
37-39'	10-12-14 16	50	ND		Grading to medium SAND.	
39 41'	8-10 12-12	60	ND		Grading to coarse SAND.	
41 43'	8-10-12-12	100	ND		Grading to fine SAND.	

BORING LOG

PROJ. NO. 3437 N61

PAGE ___ OF

BORING NO. MW-10

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, New York

DRILLING CONTRACTOR: Empire Soils Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 736.03'

WELL DEPTH: 54.0'

CASING STICK UP: 0.33"

WATER LEVEL: 17.3'

DATE STARTED: 11/17/8

COMPLETED: 11/18/8

TOP OF SCREEN: 44.0'

BOTTOM OF SCREEN: 54.0'

DRILLING METHOD: Spun Casing/Hollow Stem Auger - 4"

COMPLETION AND DEVELOPMENT: 2" Stainless Steel Monitoring Well Pumped Until Clear

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
43 45'	9-11-13-13	80	ND		Same as above.	
45 47	10-10-10-10	100	ND		Same as above.	
47-49'	10-10-10-8	65	ND		Grading to medium sand.	
49 51	12-8-10-10	70	ND		Grading to medium GRAVEL including large cobbles.	

BORING LOG

PROJECT NO. 3437-N61
PAGE __ OF
BORING NO. MW 1D

PROJECT: NYSEG - Penn Yan
CLIENT: New York State Electric and Gas Corp.
LOCATION: Penn Yan, New York
DRILLING CONTRACTOR: Empire Soils Inv., Inc.
DRILLER: A. Bo
TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 736.03'
WELL DEPTH: 54.0'
CASING STICK UP: 0.33"
WATER LEVEL: 17.3'

DATE STARTED: 11/17/8
COMPLETED: 11/18/8
TOP OF SCREEN: 44.0'
BOTTOM OF SCREEN: 54.0'

DRILLING METHOD: Spun Casing/Hollow Stem Auger - 4"
COMPLETION AND DEVELOPMENT: 2" Stainless Steel Monitoring Well Pumped Until Clear.

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
51-53'	10-14-18-24	65	ND		Dense, grading to coarse SAND.	
53-55'	18-26-50-65	25	ND		Very dense, grading to medium SAND.	Monitoring well set and completed at 54'.

3QRI G

PROJEC . 3437-N61

PAGE ___ OF ___

BORING NO. MW-1S

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, NY

DRILLING CONTRACTOR: Empire Soils Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 735.96'

WELL DEPTH: 30'

CASING STICK UP: 0.52"

WATER LEVEL: 22'

DATE STARTED: 11/20/86

COMPLETED: 11/20/86

TOP OF SCREEN: 15'

BOTTOM OF SCREEN: 30'

DRILLING METHOD: Spun Casing/Hollow Stem Auger - 4"

COMPLETION AND DEVELOPMENT: 2" Stainless Steel Monitoring Well. Pumped until clear.

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
					See MW-1D.	Monitoring well set and completed at 30'. See Boring Log No. MW-1D for description

BO[illegible] LOG

PROJECT NO. 3437-N61

PAGE __ OF

BORING NO. MW 2S

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, NY

DRILLING CONTRACTOR: Empire Soils Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 720.14'

WELL DEPTH: 19'

CASING STICK UP: 0.57"

WATER LEVEL: 6'

DATE STARTED: 11/24/86

COMPLETED: 11/25/86

TOP OF SCREEN: 3.3

BOTTOM OF SCREEN: 19'

DRILLING METHOD: Hollow stem auger - 4"

COMPLETION AND DEVELOPMENT: 2" Stainless steel monitoring well. Pumped until clear.

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
0-5'			ND		Rubble, fill, including bricks and wood fragments, wood chips, and large stone slabs.	Augered first 5' without taking a split spoon sample.
5-7'	5-4-4-4	60	ND		Black FILL, including coal clinker, ash, brick, wood fragments.	Water at 6.0'.
9-11'	3-5-8-12	60	ND		Same as above.	
13-15'	4-5-7-8	75	ND		Firm, reddish-brown, SILT, little clay, trace fine gravel.	

B G LOG

PROJ NO. 3437 N61

PAGE ___ OF ___

BORING NO. MW-2S

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, NY

DRILLING CONTRACTOR: Empire Soils Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 720.14'

WELL DEPTH: 19'

CASING STICK UP: 0.57"

WATER LEVEL: 6'

DATE STARTED: 11/24/86

COMPLETED: 11/25/86

TOP OF SCREEN: 3.3

BOTTOM OF SCREEN: 19'.

DRILLING METHOD: Hollow stem auger - 4".

COMPLETION AND DEVELOPMENT: 2" Stainless steel monitoring well. Pumped until clear.

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
17-19'	3-3-4-4	100	ND		Same as above.	Monitoring well set at 19'.

BOR OG

PROJECT NO. 3437-N61

PAGE __ OF __

BORING NO. MW-3S

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, NY

DRILLING CONTRACTOR: Empire Soils Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 718.17'

WELL DEPTH: 17'

CASING STICK UP: 0.56"

WATER LEVEL: 4'

DATE STARTED: 11/25/86

COMPLETED: 11/25/86

TOP OF SCREEN: 1.3'

BOTTOM OF SCREEN: 17'

DRILLING METHOD: Hollow stem auger - 4"

COMPLETION AND DEVELOPMENT: 2" Stainless steel monitoring well. Pumped until clear.

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
0-5'			ND		Black rubble FILL, including light gray ash, wood chips, and coal clinkers.	Augered first 5' without taking split spoon samples.
5-7'	3-2-2-3	60	ND		Very loose, dark brown fine sand and silt, FILL, including coal clinkers and wood fragments.	
9-11'	4-5-5-6	90	≥10 ppm		Very loose, reddish brown fine SAND and CLAY, little silt.	Could be fill.
13-15'	2-2-2-2	60	ND		Same as above, grading to very loose, including a wood fragment.	Augered to 17' and set monitoring well. Could be fill.

BO - 06

PROJ NO. 3437-N61

PAGE ___ OF ___

BORING NO. MW-40

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, NY

DRILLING CONTRACTOR: Empire Soil Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 718.87'

WELL DEPTH: 39'

CASING STICK UP: 0.49"

WATER LEVEL: 4'

DATE STARTED: 11/21/

COMPLETED: 11/24/

TOP OF SCREEN: 29'

BOTTOM OF SCREEN: 39'

DRILLING METHOD: Hollow stem auger - 4".

COMPLETION AND DEVELOPMENT: 2" Stainless steel monitoring well. Pumped until clear.

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
0 5'					Black rubble FILL, including brick fragments and intact railroad ties.	Augered first 5' without taking split spoon samples. Water at 4'.
5 7'	1-1-1-1*	10	ND		0.3' Very loose black ash FILL. 0.3' SILT and fine SAND, trace clay, trace gravel.	*300 lb hammer. ND - Non detected. <0.1 ppm.
7 9'	3-2 1-1*	40	ND		Same as above, including wood fragment.	
9 11'	3-2-3-4*	55	ND		Firm, reddish brown, CLAY, some silt, trace fine gravel.	

BORING LOG

PROJECT NO. 3437 N61

PAGE ___ OF ___

BORING NO. MW 4D

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, NY

DRILLING CONTRACTOR: Empire Soil Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 718.87'

WELL DEPTH: 39'

CASING STICK UP: 0.49"

WATER LEVEL: 4'

DATE STARTED: 11/21/86

COMPLETED: 11/24/86

TOP OF SCREEN: 29'

BOTTOM OF SCREEN: 39'

DRILLING METHOD: Hollow stem auger 4".

COMPLETION AND DEVELOPMENT: 2" Stainless steel monitoring well. Pumped until clear.

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
11-13'	3-3-4-3'	80	ND		Same as above.	
13-15'	1-2-1-2'	60	ND		Same as above, grading to soft.	
15-17'	1-2-1-1'	70	ND		Soft, grayish brown, CLAY.	
17-19'	WOH, WOH, WOH, 1'	100	ND		Same as above.	WOH = Weight of hammer

B .OG

PROJ. NO. 3437-N61 PAGE _ OF _

BORING NO. MW-4D

PROJECT: NYSEG - Penn Yan

TOP OF CASING ELEVATION: TSSC 718.87'

DATE STARTED: 11/21/86

CLIENT: New York State Electric and Gas Corp.

WELL DEPTH: 39'

COMPLETED: 11/24/86

LOCATION: Penn Yan, NY

CASING STICK UP: 0.49"

TOP OF SCREEN: 29'

DRILLING CONTRACTOR: Empire Soil Inv., Inc.

WATER LEVEL: 4'

BOTTOM OF SCREEN: 39'

DRILLER: A. Bo

DRILLING METHOD: Hollow stem auger - 4".

TRC INSPECTOR: BEG

COMPLETION AND DEVELOPMENT: 2" Stainless steel monitoring well. Pumped until clear.

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
19 21'	WOH, WOH, 2 3"	100	ND		Same as above including some silt, trace fine gravel.	
21 23'	2-3-4 7"	100	ND		Same as above grading into loose, fine SAND.	
23-25'	4-4-5 6"	35	ND		Loose, brown, SILT, trace fine sand and fine gravel.	
25 27'	3 3-6-9"	50	ND		Same as above.	

BOR OG

PROJECT NO. 3437 N61

PAGE __ OF __

BORING NO. MW 40

PROJECT: NYSEG - Penn Yan

CLIENT: New York State Electric and Gas Corp.

LOCATION: Penn Yan, NY

DRILLING CONTRACTOR: Empire Soil Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 718.87'

WELL DEPTH: 39'

CASING STICK UP: 0.49"

WATER LEVEL: 4'

DATE STARTED: 11/21/86

COMPLETED: 11/24/86

TOP OF SCREEN: 29'

BOTTOM OF SCREEN: 39'

DRILLING METHOD: Hollow stem auger - 4".

COMPLETION AND DEVELOPMENT: 2" Stainless steel monitoring well. Pumped until clear.

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
27 29'	5-7-9-11"	100	ND		Same as above grading into medium dense, trace clay.	
29 31'	2-3-4-4"	100	ND		Loose grayish brown, fine SAND.	
31 33'	2-3-2-3"	65	ND		Grading to medium SAND.	
33 35'	5-3-3-3"	50	ND		Grading to fine SAND.	

JO' LOG

PROJEC . 3437 N61
PAGE OF
BORING NO. MW 4D

PROJECT: NYSEG - Penn Yan
CLIENT: New York State Electric and Gas Corp.
LOCATION: Penn Yan, NY
DRILLING CONTRACTOR: Empire Soil Inv., Inc.
DRILLER: A. Bo
TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 718.87'
WELL DEPTH: 39'
CASING STICK UP: 0.49"
WATER LEVEL: 4'
DRILLING METHOD: Hollow stem auger 4".
COMPLETION AND DEVELOPMENT: 2" Stainless steel monitoring well. Pumped until clear.

DATE STARTED: 11/21/86
COMPLETED: 11/24/86
TOP OF SCREEN: 29'
BOTTOM OF SCREEN: 39'

DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
35 37	4-3 3 5"	60%	ND		Firm, gray, SILT and fine SAND, trace clay and fine gravel.	
37-39'	3-3 3-3"	100	ND		Same as above.	
39-41'	10-18-24 22	75	ND		Same as above.	140 lb hammer. Monitoring well set and completed at 39'.

BOF LOG

PROJECT NO. 3437-N61

PAGE ___ OF ___

BORING NO. MW-4S

PROJECT: NYSEG - Penn Yan

CLIENT: New York STate Electric and Gas Corp.

LOCATION: Penn Yan

DRILLING CONTRACTOR: Empire Soils Inv., Inc.

DRILLER: A. Bo

TRC INSPECTOR: BEG

TOP OF CASING ELEVATION: TSSC 718.70'

WELL DEPTH: 17'

CASING STICK UP: 0.28"

WATER LEVEL: 4'

DATE STARTED: 11/24/8

COMPLETED: 11/24/8

TOP OF SCREEN: 2'

BOTTOM OF SCREEN: 17'

DRILLING METHOD: Hollw stem auger - 4".

COMPLETION AND DEVELOPMENT: 2" Stainless stell monitoring well. Pumped until clear.

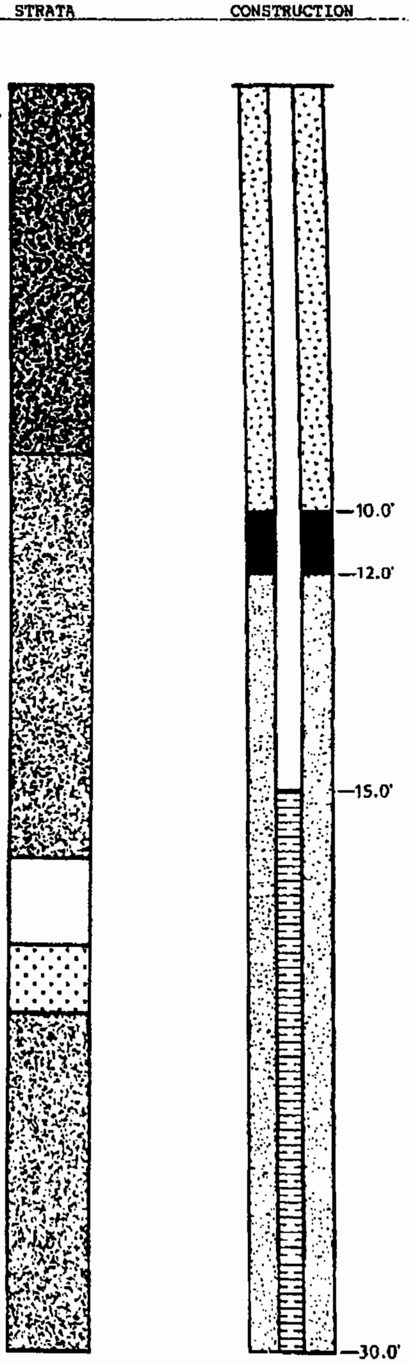
DEPTH INTERVAL	BLOW ON SPLIT SPOON	PERCENT RECOVERY	(ppm) HNU/OVA	SAMPLES ANALYZED	SAMPLE DESCRIPTION	REMARKS
					See MW-4D.	Monitoring well set and
						completed at 17'.
						See Boring Log No.
						MW-4D for descriptio

BORING LOG

BORING NO. MW-1S

PROJECT NO. 3437-N61
BORING DEPTH: 30'
DATE STARTED: 11/20/86
PROJECT: Penn Yan
DRILLER: A. Bo
DATE COMPLETED: 11/20/86
CLIENT: NYSEG
TRC INSPECTOR: Beverly Gewanter
WATER TABLE ELEVATION: 720.70' (10/87)
LOCATION: Penn Yan, N.Y.
DRILLING METHOD: Spun Casing/Hollow Stem Auger
GROUND ELEVATION: 736.48'
DRILLING CONTRACTOR: Empire Soils

DEPTH INTERVAL (Feet)	BLOW COUNTS	OVA (ppm)	BORING DEPTH (Feet)	SOIL DESCRIPTION
0.0-5.0			0	Loose, brown/dk-brown, medium grained SAND and SILT, some rubble, some brick fragments, some coal clinkers, moist, FILL
			-	
			-	
			-	
			-	
5.0-7.0	2 3	ND	5	Same as above, including cobbles
	2 4		-	
7.0-9.0	2 4	ND	-	Same as above, grading to dense medium grained, SAND and SILT, moist, some wood chips
	6 7		-	
9.0-11.0	3 6	ND	-	Medium dense, brown, SILT, little clay, trace fine gravel
	7 10		10	
11.0-13.0	3 6	ND	-	Same as above
	7 10		-	
13.0-15.0	4 7	ND	-	Same as above
	10 15		-	
15.0-17.0	-	ND	15	
			-	
17.0-19.0	7 14	ND	-	Hard, brown SILT, little clay, moist
	17 19		-	
19.0-21.0	7 7	ND	-	Very stiff, brown CLAY, little silt
	10 15	2	20	
21.0-23.0	28 32	ND	-	Same as above, grading to very dense, brown, SAND, some silt
	20 30		-	
23.0-25.0	13 20	ND	-	Same as above, grading to hard, brown SILT, some clay
	20 10		-	
25.0-27.0	10 8	ND	25	Same as above, grading to very stiff, trace fine gravel
	8 10		-	
27.0-29.0	7 8	ND	-	Same as above
	9 10		-	
29.0-31.0	5.4	ND	-	Stiff, dk-brown, SILT and CLAY, trace fine gravel
			30	



Bottom of Boring - 31 feet

BORING LOG

BORING NO. MN-1D

PROJECT NO. 3437-N61
BORING DEPTH: 55'
DATE STARTED: 11/17/86

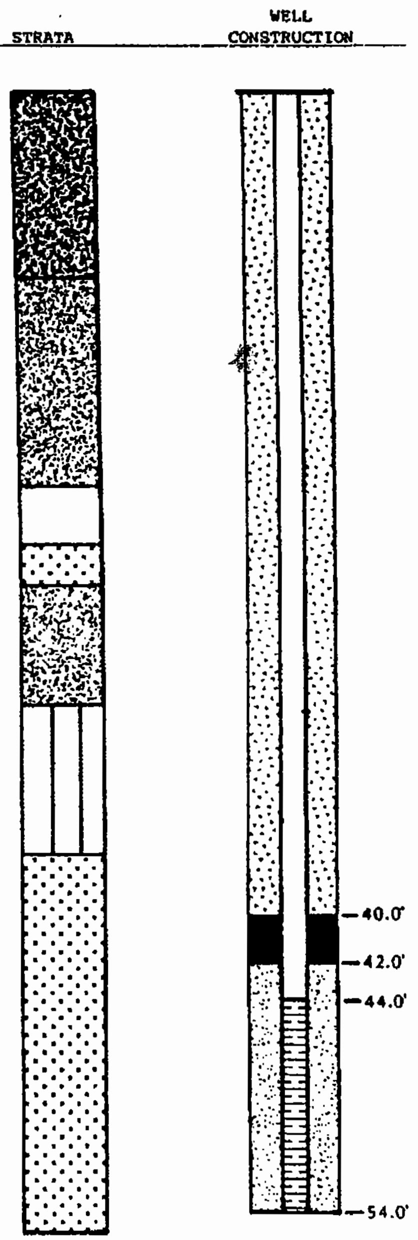
PROJECT: Penn Yan
DRILLER: A. Bo
DATE COMPLETED: 11/18/86

CLIENT: NYSEG
TRC INSPECTOR: Beverly Gewanter
WATER TABLE ELEVATION: 718.82' (10/87)

LOCATION: Penn Yan, N.Y.
DRILLING METHOD: Spun Casing/Hollow Stem Auger - 4"
GROUND ELEVATION: 736.36'

DRILLING CONTRACTOR: Empire Soils

DEPTH INTERVAL (Feet)	BLOW COUNTS	OVA (ppm)	BORING DEPTH (Feet)	SOIL DESCRIPTION
0.0-5.0			0 - - - -	Loose, brown/dk-brown, medium grained SAND and SILT, some rubble, some brick fragments, some coal clinkers, moist, FILL
5.0-7.0	2 3 2 4	ND	5 -	Same as above, including cobbles
7.0-9.0	2 4 6 7	ND	- -	Same as above, grading to dense medium grained SAND and SILT, moist, some wood chips
9.0-11.0	3 6 7 10	ND	- 10	Medium dense, brown, SILT, little clay, trace fine gravel
11.0-13.0	3 6 7 10	ND	- -	Same as above
13.0-15.0	4 7 10 15	ND	- -	Same as above
15.0-17.0	-	ND	15 -	
17.0-19.0	7 14 17 19	ND	- -	Hard, brown SILT, little clay, moist
19.0-21.0	7 7 10 15	ND	- 20	Very stiff, brown CLAY, little silt
21.0-23.0	28 32 20 30	ND	- -	Same as above, grading to very dense, brown, SAND, some silt
23.0-25.0	13 20 20 10	ND	- -	Same as above, grading to hard, brown SILT, some clay
25.0-27.0	10 8 8 10	ND	25 -	Same as above, grading to very stiff, trace fine gravel
27.0-29.0	7 8 9 10	ND	- -	Same as above
29.0-31.0	5 4 6 5	ND	- 30	Stiff, dk-brown, SILT and CLAY, trace fine gravel
31.0-33.0	4 5 5 5	ND	- -	Same as above
33.0-35.0	3 3 3 4	ND	- -	Firm, same as above
35.0-37.0	3 3 10 20	ND	35 -	Medium dense, grayish-brown, grading to fine grained SAND
37.0-39.0	8 10 12 12	ND	- -	Grading to medium grained SAND
39.0-41.0	8 10 12 12	ND	- 40	Grading to coarse grained SAND
41.0-43.0	8 10 12 12	ND	- -	Grading to fine grained SAND
43.0-45.0	9 11 13 13	ND	- -	Same as above
45.0-47.0	10 10 10 10	ND	45 -	Same as above
47.0-49.0	10 10 10 8	ND	- -	Grading to medium grained SAND
49.0-51.0	12 8 10 10	ND	- 50	Grading to medium grained GRAVEL, some large cobbles
51.0-53.0	10 14 18 24	ND	- -	Dense, grading to coarse grained SAND
53.0-55.0	18 26 50 65	ND	- - 55	Very dense, grading to medium grained SAND



Bottom of boring - 55 feet

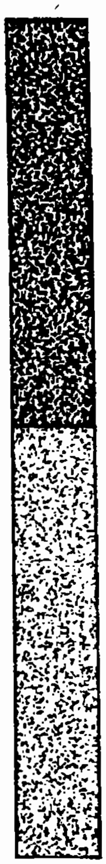
BORING LOG

BORING NO. MW-2S

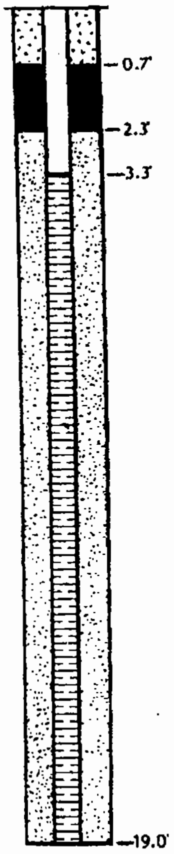
PROJECT NO. 3437-N61
BORING DEPTH: 19'
DATE STARTED: 11/24/86
PROJECT: Penn Yan
DRILLER: A. Bo
DATE COMPLETED: 11/25/86
CLIENT: NYSEG
TRC INSPECTOR: Beverly Gewanter
WATER TABLE ELEVATION: 714.29' (10/87)
LOCATION: Penn Yan, N.Y.
DRILLING METHOD: Hollow Stem Auger
GROUND ELEVATION: 720.61'
DRILLING CONTRACTOR: Empire Soils

DEPTH INTERVAL (Feet)	BLOW COUNTS	OVA (ppm)	BORING DEPTH (Feet)	SOIL DESCRIPTION
0.0-3.0			0	Brown, GRAVEL, some cobbles, some sand, some silt, moist, FILL
			-	
			-	
3.0-5.0			-	RUBBLE, some brick frags, some wood chips, some large stone slabs, FILL
			-	
5.0-7.0	5 4	ND	5	Black, SILT and SAND, some coal clinkers, some ash, some wood fragments, FILL
	4 4		-	
			-	
			-	
9.0-11.0	3 5	ND	-	Firm, Reddish-brown, SILT, some clay, trace fine sand, trace fine gravel
	8 12		10	
			-	
			-	
13.0-15.0	4 5	ND	-	Firm, reddish-brown SILT, little clay, trace fine gravel
	7 8		-	
	-	ND	15	
			-	
17.0-19.0	3 3	ND	-	Same as above
	4 4		-	
			19	

STRATA



WELL CONSTRUCTION



Bottom of Boring - 19 feet

BORING LOG

BORING NO. MW-3S

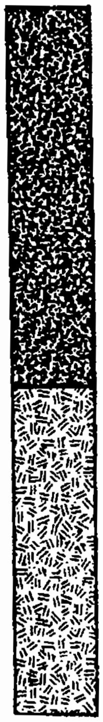
PROJECT NO. 3437-N61
PROJECT: Penn Yan
CLIENT: NYSEG
LOCATION: Penn Yan, N.Y.
DRILLING CONTRACTOR: Empire Soils

BORING DEPTH: 17'
DRILLER: A. Bo
TRC INSPECTOR: Beverly Gewanter
DRILLING METHOD: Hollow Stem Auger - 4"

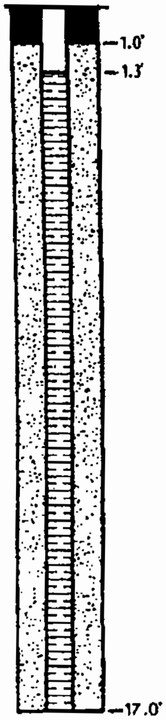
DATE STARTED: 11/25/86
DATE COMPLETED: 11/25/86
WATER TABLE ELEVATION: 715.21' (10/87)
GROUND ELEVATION: 718.73'

DEPTH INTERVAL (Feet)	BLOW COUNTS	OVA (ppm)	BORING DEPTH (Feet)	SOIL DESCRIPTION
0.0-5.0			0	Black, RUBBLE, some light gray ash, some wood chips, some coal clinkers, moist, FILL
			-	
			-	
			-	
			-	
5.0-7.0	3 2	ND	5	Very loose, dark brown, fine SAND and SILT, some coal clinkers, some wood fragments, FILL
	2 3		-	
			-	
			-	
9.0-11.0	4 5	>10ppm	-	Very loose, reddish-brown fine SAND and CLAY, little silt
	5 6		10	
			-	
			-	
13.0-15.0	2 2	ND	-	Reddish-brown fine grained SAND and CLAY, little silt, grading to very loose, some wood frags.
	2 2		-	
	-	ND	15	
			-	
			-	

STRATA



WELL CONSTRUCTION



Bottom of Boring - 17 feet

BORING LOG

BORING NO. MW-4S

PROJECT NO. 3437-N61
PROJECT: Penn Yan
CLIENT: NYSEG
LOCATION: Penn Yan, N.Y.
DRILLING CONTRACTOR: Empire Soils

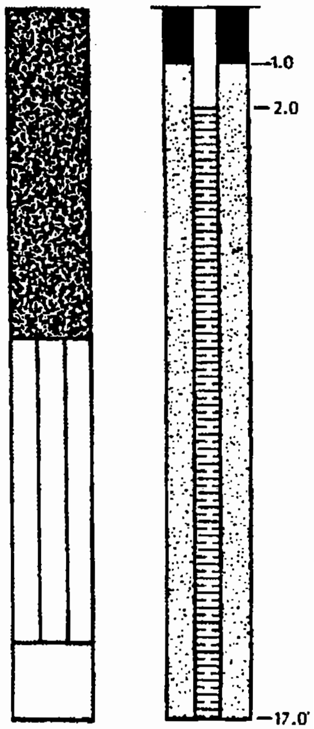
BORING DEPTH: 17'
DRILLER: A. Bo
TRC INSPECTOR: Beverly Gewanter
DRILLING METHOD: Hollow Stem Auger

DATE STARTED: 11/24/86
DATE COMPLETED: 11/24/86
WATER TABLE ELEVATION: 714.57' (10/87)
GROUND ELEVATION: 728.98'

DEPTH INTERVAL (Feet)	BLOW COUNTS	OVA (ppm)	BORING DEPTH (Feet)	SOIL DESCRIPTION
0.0-5.0			0	Black, RUBBLE, some brick fragments, some intact railroad ties, FILL
			-	
			-	
			-	
			-	
5.0-7.0	1 1	ND	5	Very loose, black, ASH
	1 1		-	SILT and fine grained SAND, trace clay, trace gravel, FILL
7.0-9.0	3 2	ND	-	Same as above, including some wood fragment
	1 1		-	
9.0-11.0	3 2	ND	-	Firm, reddish brown CLAY, some silt, trace fine gravel
	3 4		10	
11.0-13.0	3 3	ND	-	Same as above
	4 3		-	
13.0-15.0	1 2	ND	-	Same as above, grading to soft
	1 2		-	
15.0-17.0	1 2	ND	15	Soft, grayish-brown, CLAY
	1 1		-	
			-	

STRATA

WELL CONSTRUCTION



Bottom of Boring - 17 feet

BORING LOG

BORING NO. -4D

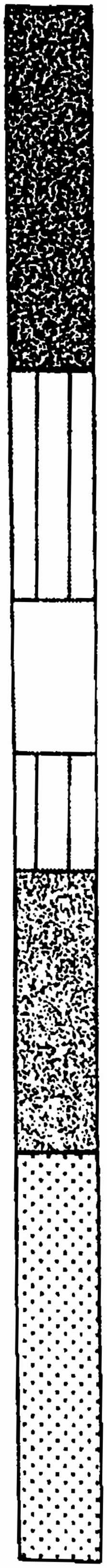
PROJECT NO. 3437-N61
PROJECT: Penn Yan
CLIENT: NYSEG
LOCATION: Penn Yan, N.Y.
DRILLING CONTRACTOR: Empire Soils

BORING DEPTH: 39'
DRILLER: A. Bo
TRC INSPECTOR: Beverly Gewanter
DRILLING METHOD: Hollow Stem Auger - 4"

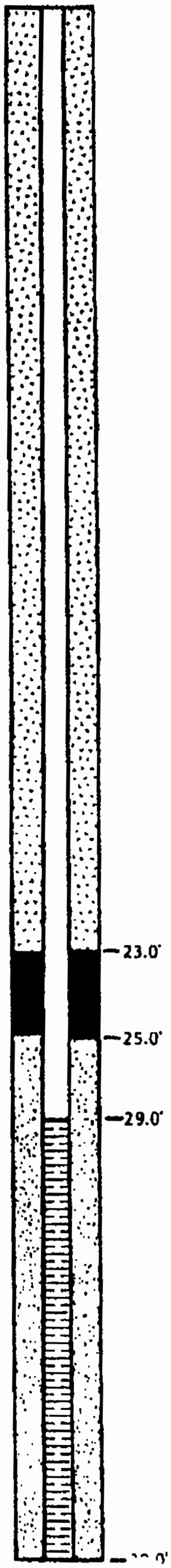
DATE STARTED: 11/7/86
DATE COMPLETED: 11/24/86
WATER TABLE ELEVATION: Artesian
GROUND ELEVATION: 719.36'

DEPTH INTERVAL (Feet)	BLOW COUNTS	OVA (ppm)	BORING DEPTH (Feet)	SOIL DESCRIPTION
0.0-5.0			0	Black RUBBLE, some brick fragments, some intact railroad ties, FILL
			-	
			-	
			-	
			-	
5.0-7.0	1 1	ND	5	Very loose, black, ASH
	1 1		-	SILT and fine grained SAND, trace clay, trace gravel, FILL
7.0-9.0	3 2	ND	-	Same as above, including some wood fragment
	1 1		-	
9.0-11.0	3 2	ND	-	Firm, reddish brown, CLAY, some silt, trace fine gravel
	3 4		10	
11.0-13.0	3 3	ND	-	Same as above
	4 3		-	
13.0-15.0	1 2	ND	-	Same as above, grading to soft
	1 2		-	
15.0-17.0	1 2	ND	15	Soft, grayish-brown, CLAY
	1 1		-	
17.0-19.0	WOH, WOH	ND	-	Same as above
	WOH, 1		-	
19.0-21.0	WOH, WOH	ND	-	Same as above, including some silt, trace fine gravel
	2 3		20	
21.0-23.0	2 3	ND	-	Same as above grading into loose, fine grained SAND
	4 7		-	
23.0-25.0	4 4	ND	-	Loose, brown, SILT, trace fine grained sand trace fine gravel
	5 6		-	
25.0-27.0	3 3	ND	25	Same as above
	6 9		-	
27.0-29.0	5 7	ND	-	Same as above, grading into medium dense, trace clay
	9 11		-	
29.0-31.0	2 3	ND	-	Loose grayish brown, fine grained SAND
	4 4		30	
31.0-33.0	2 3	ND	-	Grading to medium grained SAND
	2 3		-	
33.0-35.0	5 3	ND	-	Grading to fine grained SAND
	3 3		-	
35.0-37.0	4 3	ND	35	Firm, gray, SILT and fine grained SAND, trace clay, trace fine gravel
	3 5		-	
37.0-39.0	3 3	ND	-	Same as above
	3 3		-	
39.0-41.0	10 18	ND	-	Firm, gray SILT and fine grained SAND, trace clay, trace fine gravel
	24 22		40	

STRATA



WELL CONSTRUCTION



WOH - Weight of hammer

Bottom of Boring - 39 Feet

Geraghty & Miller, Inc.
Previous Investigation Soil Boring and Sediment Core Logs

APPENDIX A

SOIL BORING/SEDIMENT CORING LOGS

GERAGHTY
& MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SB-05 Project No. NYSEG/AY0153.002 Page 1 of 1

Location 150 Water Street., Penn Yan, NY Drilling Started 11/2/93 Drilling Completed 11/2/93

Total Depth Drilled 10 feet Hole Diameter 6.5 inches Type of Sample/ Coring Device Split spoon

Length and Diameter of Coring Device 24" x 2" Sampling Interval 2 feet

Land-Surface Elevation 720.5 feet ☒ Surveyed ☐ Estimated Datum

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor Buffalo Drilling Company, Inc. Driller Mike Saly Helper Mark

Prepared By P . Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
From	To				
0	2	2.0	9-10-15-12	FILL; brown-black SAND, coarse; and Gravel fine to coarse; little to trace coal,	0.0
				cinders, dry loose.	
2	4	1.5	14-15-10-17	Same FILL to 3.5', most at 3.0'; then yellow brown silty CLAY; trace fine Gravel, angular;	0.0
				appears disturbed, moist.	
4	6	1.8	4-2-4-7	Same silty CLAY to 5.0'; then becomes green mottled silty CLAY, trace fine Gravel; stiff,	
				moist.	
6	8	2.0	6-7-9-14	Same moist, plastic.	0.0
8	10	2.0	3-7-11-16	Same to 9.0'; then laminated yellow brown SILT and red CLAY.	0.0

GERAGHTY
& MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SB-06 **Project No.** NYSEG/AY0153.002 **Page** 1 **of** 1

Site Location 150 Water Street., Penn Yan, NY **Drilling Started** 11/2/93 **Drilling Completed** 11/2/93

Total Depth Drilled 10 feet **Hole Diameter** 6.5 inches **Type of Sample/ Coring Device** Split spoon

Length and Diameter of Coring Device 24" x 2" **Sampling Interval** 2 feet

Land-Surface Elevation 718.55 feet ☒ Surveyed ☐ Estimated **Datum**

Drilling Fluid Used None **Drilling Method** Hollow Stem Auger

Drilling Contractor Buffalo Drilling Company, Inc. **Driller** Mike Saly **Helper** Mark

Prepared By P . Holloway **Hammer Weight** 140 **Hammer Drop** 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	2	2.0	5-5-7-3	FILL: Brown-black SAND medium to coarse, and Gravel, fine to coarse, some coal	0.0
				cinders, chips; loose, dry.	
2	4	2.0	3-2-3-4	FILL: Disturbed yellow-brown silty CLAY, dry, some green-gray mottling.	0.0
4	6	1.5	3-3-5-5	Same, with trace cinders, coal; moist.	0.0
6	8	1.8	3-3-2-4	Same, moist.	
8	10	2.0	3-9-10-15	Same to 8.5'; then yellow-brown silty CLAY; some fine Gravel, angular, dense,	0.0
				undisturbed, dry.	0.0

GERAGHTY
& MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SB-07 **Project No.** NYSEG/AY0153.002 **Page** 1 **of** 1

Location 150 Water Street., Penn Yan, NY **Drilling Started** 11/2/93 **Drilling Completed** 11/2/93

Total Depth Drilled 10 feet **Hole Diameter** 6.5 inches **Type of Sample/ Coring Device** Split spoon

Length and Diameter of Coring Device 24" x 2" **Sampling Interval** 2 feet

Land-Surface Elevation 718.65 feet ☒ Surveyed ☐ Estimated **Datum**

Drilling Fluid Used None **Drilling Method** Hollow Stem Auger

Drilling Contractor Buffalo Drilling Company, Inc. **Driller** Mike Saly **Helper** Mark

Prepared By P . Holloway **Hammer Weight** 140 **Hammer Drop** 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	2	1.5	3-3-4-3	FILL: Brown-balck SAND, medium to coarse; and GRAVEL, fine; little coal cinders, wood chips loose, dry.	0.0
2	4	0.5	2-2-2-1	Same, loose, dry.	0.0
4	6	0.5	.45-32-16	Wood chips; void 4.0-4.5.	8.0
6	8	1.0	13-9-7-8	Same; yellow-brown silty CLAY in shoe.	0.0
8	10	1.8	4-3-5-4	Yellow-brown silty CLAY, some fine gravel; moist, plastic.	0.0

GERAGHTY
& MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 01 Project/No. NYSEG AY0153.002 Page 1 of 1

Site Location 150 Water Street, Penn Yan, NY Drilling Started 11/5/93 Drilling Completed 11/5/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 3" Sampling Interval feet

Land-Surface Elevation feet ☐ Surveyed ☐ Estimated Datum

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dan, Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	3.5		Gray-black SILT with organics; gray-black fine to medium Sand, and Silt, then 1 foot of	1.1
				gray-brown Clay, plastic.	

GERAGHTY
& MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 02 Project/No. NYSEG AY0153.002 Page 1 of 1

Location 150 Water Street, Penn Yan, NY Drilling Started 11/5/93 Drilling Completed 11/5/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 3" Sampling Interval ____ feet

Land-Surface Elevation ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dan, Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	4.5		Gray-black SILT with organics then gray-black fine and medium Sand, some Silt; then	1.4
				lower 2' is gray-brown Clay, soft, plastic.	

GERAGHTY
& MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 03 **Project/No.** NYSEG AY0153.002 **Page** 1 **of** 1

Site Location 150 Water Street, Penn Yan, NY **Drilling Started** 11/5/93 **Drilling Completed** 11/5/93

Total Depth Drilled 5 feet **Hole Diameter** 3 inches **Type of Sample/ Coring Device** Split spoon

Length and Diameter of Coring Device 3" **Sampling Interval** ____ feet

Land-Surface Elevation ____ feet ☐ Surveyed ☐ Estimated **Datum** ____

Drilling Fluid Used None **Drilling Method** Tripod

Drilling Contractor Buffalo Drilling Company, Inc. **Driller** Dan **Helper** Dan, Ed

Prepared By P. Holloway **Hammer Weight** 140 **Hammer Drop** 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	1.5		Gray-black SILT, with organics then 1.0' of gray-brown Clay, soft, plastic.	1.4

GERAGHTY & MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 04 **Project/No.** NYSEG AY0153.002 **Page** 1 of 1

Location 150 Water Street, Penn Yan, NY **Drilling Started** 11/5/93 **Drilling Completed** 11/5/93

Total Depth Drilled 5 feet **Hole Diameter** 3 inches **Type of Sample/Coring Device** Split spoon

Length and Diameter of Coring Device 3" **Sampling Interval** ____ feet

Land-Surface Elevation ____ feet ☐ Surveyed ☐ Estimated **Datum** ____

Drilling Fluid Used None **Drilling Method** Tripod

Drilling Contractor Buffalo Drilling Company, Inc. **Driller** Dan **Helper** Dan, Ed

Prepared By P. Holloway **Hammer Weight** 140 **Hammer Drop** 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	2.3		Gray-black SILT with organics then 0.9' of gray-brown Clay, soft, plastic.	1.1

GERAGHTY
& MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 05 **Project/No.** NYSEG AY0153.002 **Page** 1 **of** 1

Site Location 150 Water Street, Penn Yan, NY **Drilling Started** 11/5/93 **Drilling Completed** 11/5/93

Total Depth Drilled 5 **feet** **Hole Diameter** 3 **inches** **Type of Sample/ Coring Device** Split spoon

Length and Diameter of Coring Device 3" **Sampling Interval** ____ **feet**

Land-Surface Elevation ____ **feet** ☐ Surveyed ☐ Estimated **Datum** ____

Drilling Fluid Used None **Drilling Method** Tripod

Drilling Contractor Buffalo Drilling Company, Inc. **Driller** Dan **Helper** Dan, Ed

Prepared By P. Holloway **Hammer Weight** 140 **Hammer Drop** 30 **inches**

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	2.9		Gray-black sandy SILT with organics then 0.8' of gray-brown Clay, soft, plastic.	0.0

GERAGHTY & MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 06 **Project/No.** NYSEG AY0153.002 **Page** 1 **of** 1

Location 150 Water Street, Penn Yan, NY **Drilling Started** 11/5/93 **Drilling Completed** 11/5/93

Total Depth Drilled 5 feet **Hole Diameter** 3 inches **Type of Sample/ Coring Device** Split spoon

Length and Diameter of Coring Device 3" **Sampling Interval** ____ feet

Land-Surface Elevation ____ feet ☐ Surveyed ☐ Estimated **Datum** ____

Drilling Fluid Used None **Drilling Method** Tripod

Drilling Contractor Buffalo Drilling Company, Inc. **Driller** Dan **Helper** Dan, Ed

Prepared By P. Holloway **Hammer Weight** 140 **Hammer Drop** 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	3.6		Gray-black SILT with organics then 0.6' of gray-brown Clay, soft, plastic.	0.0

GERAGHTY & MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 07 Project/No. NYSEG AY0153.002 Page 1 of 1

Site Location 150 Water Street, Penn Yan, NY Drilling Started 11/5/93 Drilling Completed 11/5/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spoon

Length and Diameter of Coring Device 3" Sampling Interval ______ feet

Land-Surface Elevation ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dan, Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	3.1		Gray-black SILT with organics, little fine Sand then 1.3' of gray-brown Clay, soft plastic.	0.0

GERAGHTY
& MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 08 Project/No. NYSEG AY0153.002 Page 1 of 1

Location 150 Water Street, Penn Yan, NY Drilling Started 11/5/93 Drilling Completed 11/5/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spoon

Length and Diameter of Coring Device 3" Sampling Interval ____ feet

Land-Surface Elevation ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dan, Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
From	To				
0	5	2.3		Gray-black SILT with organics; little fine Sand then 1.5' of gray-brown Clay, soft plastic.	1.1

GERAGHTY & MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 09 Project/No. NYSEG AY0153.002 Page 1 of 1

Site Location 150 Water Street, Penn Yan, NY Drilling Started 11/5/93 Drilling Completed 11/5/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spoon

Length and Diameter of Coring Device 3" Sampling Interval ____ feet

Land-Surface Elevation ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dan, Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	3.0		Gray-black SILT with organics then 0.7' of gray-brown Clay, soft, plastic.	1.1

GERAGHTY
& MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 10 Project/No. NYSEG AY0153.002 Page 1 of 1

ation 150 Water Street, Penn Yan, NY Drilling Started 11/4/93 Drilling Completed 11/4/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 3" Sampling Interval ____ feet

Land-Surface Elevation ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dan, Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	1.0		Gray-black SILT with organics, trace fine Sand, product odor, globules then 0.4' of	64.8
				gray blue-brown Clay, soft, plastic.	

GERAGHTY & MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 11 Project/No. NYSEG AY0153.002 Page 1 of 1

Site Location 150 Water Street, Penn Yan, NY Drilling Started 11/4/93 Drilling Completed 11/4/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spoon

Length and Diameter of Coring Device 3" Sampling Interval ______ feet

Land-Surface Elevation ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dan, Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	4.2		Gray-black SILT with organics then 2.3' of gray-brown Clay, soft, plastic.	1.7

GERAGHTY
& MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well SS 12 Project/No. NYSEG AY0153.002 Page 1 of 1

Location 150 Water Street, Penn Yan, NY Drilling Started 11/4/93 Drilling Completed 11/4/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spoon

Length and Diameter of Coring Device 3" Sampling Interval feet

Land-Surface Elevation feet ☐ Surveyed ☐ Estimated Datum

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dan, Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	1.6		Gray-black SILT with organics then 0.5' of gray-brown Clay, soft, plastic.	2.6

GERAGHTY & MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 13 **Project No.** NYSEG AY0153.002 **Page** 1 **of** 1

Site Location 150 Water Street, Penn Yan, NY **Drilling Started** 11/4/93 **Drilling Completed** 11/4/93

Total Depth Drilled 5 feet **Hole Diameter** 3 inches **Type of Sample/ Coring Device** Split spooon

Length and Diameter of Coring Device 3" **Sampling Interval** ______ feet

Land-Surface Elevation ______ feet ☐ Surveyed ☐ Estimated **Datum** ______

Drilling Fluid Used None **Drilling Method** Tripod

Drilling Contractor Buffalo Drilling Company, Inc. **Driller** Dan **Helper** Dam. Ed

Prepared By P. Holloway **Hammer Weight** 140 **Hammer Drop** 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	1.8		Gray-black SILT with organics then 0.7' of gray-brown Clay, soft, plastic.	22.6

GERAGHTY
& MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 14 **Project No.** NYSEG AY0153.002 **Page** 1 **of** 1

Location 150 Water Street, Penn Yan, NY **Drilling Started** 11/4/93 **Drilling Completed** 11/4/93

Total Depth Drilled 5 **feet** **Hole Diameter** 3 **inches** **Type of Sample/ Coring Device** Split spooon

Length and Diameter of Coring Device 3" **Sampling Interval** **feet**

Land-Surface Elevation **feet** ☐ Surveyed ☐ Estimated **Datum**

Drilling Fluid Used None **Drilling Method** Tripod

Drilling Contractor Buffalo Drilling Company, Inc. **Driller** Dan **Helper** Dam. Ed

Prepared By P. Holloway **Hammer Weight** 140 **Hammer Drop** 30 **inches**

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
From	To				
0	5	3.5		Gray-black SILT with organics, then 0.9' of gray-brown Clay; soft, plastic.	11.3

GERAGHTY
& MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 15 Project No. NYSEG AY0153.002 Page 1 of 1

Site Location 150 Water Street, Penn Yan, NY Drilling Started 11/4/93 Drilling Completed 11/4/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spooon

Length and Diameter of Coring Device 3" Sampling Interval ____ feet

Land-Surface Elevation ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dam. Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
From	To				
0	5	4.0		Gray-black SILT with organics then 1.7' of gray-brown Clay; soft, plastic.	6.0

GERAGHTY
& MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 16 Project No. NYSEG AY0153.002 Page 1 of 1

Location 150 Water Street, Penn Yan, NY Drilling Started 11/4/93 Drilling Completed 11/4/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spooon

Length and Diameter of Coring Device 3" Sampling Interval feet

Land-Surface Elevation feet ☐ Surveyed ☐ Estimated Datum

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dam. Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	1.8		Gray-black SILT with organics then 0.2' of gray-brown Clay; soft, plastic.	1.4

GERAGHTY
& MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 17 Project No. NYSEG AY0153.002 Page 1 of 1

Site Location 150 Water Street, Penn Yan, NY Drilling Started 11/4/93 Drilling Completed 11/4/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spooon

Length and Diameter of Coring Device 3" Sampling Interval ____ feet

Land-Surface Elevation ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dam. Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
From	To				
0	5	3.1		Gray-black SILT with organics then 0.5' of gray-brown Clay; soft, plastic.	1.7

GERAGHTY & MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 18 Project No. NYSEG AY0153.002 Page 1 of 1

ation 150 Water Street, Penn Yan, NY Drilling Started 11/4/93 Drilling Completed 11/4/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spooon

Length and Diameter of Coring Device 3" Sampling Interval ___ feet

Land-Surface Elevation ___ feet ☐ Surveyed ☐ Estimated Datum ___

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dam. Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	2.9		Gray-black SILT with organics, then 1.8' of gray-brown Clay; soft, plastic.	2.3

GERAGHTY
& MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 19 **Project No.** NYSEG AY0153.002 **Page** 1 **of** 1

Site Location 150 Water Street, Penn Yan, NY **Drilling Started** 11/4/93 **Drilling Completed** 11/4/93

Total Depth Drilled 5 feet **Hole Diameter** 3 inches **Type of Sample/ Coring Device** Split spooon

Length and Diameter of Coring Device 3" **Sampling Interval** ______ feet

Land-Surface Elevation ______ feet ☐ Surveyed ☐ Estimated **Datum** ______

Drilling Fluid Used None **Drilling Method** Tripod

Drilling Contractor Buffalo Drilling Company, Inc. **Driller** Dan **Helper** Dam. Ed

Prepared By P. Holloway **Hammer Weight** 140 **Hammer Drop** 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
From	To				
0	5	3.6		Gray-black SILT with organics, then 0.8' of gray-brown Clay; soft, plastic.	0.0

GERAGHTY
& MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 20 Project No. NYSEG AY0153.002 Page 1 of 1

Location 150 Water Street, Penn Yan, NY Drilling Started 11/4/93 Drilling Completed 11/4/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spooon

Length and Diameter of Coring Device 3" Sampling Interval ______ feet

Land-Surface Elevation ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dam. Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	3.9		Gray-black SILT with organics, then 1.4' of gray-brown Clay; soft, plastic.	0.0

GERAGHTY
& MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 21 Project No. NYSEG AY0153.002 Page 1 of 1

Site Location 150 Water Street, Penn Yan, NY Drilling Started 11/4/93 Drilling Completed 11/4/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spooon

Length and Diameter of Coring Device 3" Sampling Interval ______ feet

Land-Surface Elevation ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dam. Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	3.8		Gray-black SILT with organics then 1.3' of gray-brown Clay; soft, plastic.	0.0

GERAGHTY
& MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 22 Project No. NYSEG AY0153.002 Page 1 of 1

Location 150 Water Street, Penn Yan, NY Drilling Started 11/4/93 Drilling Completed 11/4/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spooon

Length and Diameter of Coring Device 3" Sampling Interval ______ feet

Land-Surface Elevation ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dam. Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	3.3		Gray-black SILT with organics, then 0.6' of gray-brown Clay; soft, plastic.	0.0

GERAGHTY
& MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 23 Project No. NYSEG AY0153.002 Page 1 of 1

Site Location 150 Water Street, Penn Yan, NY Drilling Started 11/5/93 Drilling Completed 11/5/93

Total Depth Drilled 5 feet Hole Diameter 3 inches Type of Sample/ Coring Device Split spooon

Length and Diameter of Coring Device 3" Sampling Interval ____ feet

Land-Surface Elevation ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used None Drilling Method Tripod

Drilling Contractor Buffalo Drilling Company, Inc. Driller Dan Helper Dam. Ed

Prepared By P. Holloway Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	4.3		Gray-black SILT with organics, then 1.6' of gray-brown Clay; soft, plastic.	0.0

GERAGHTY
& MILLER, INC.
Environmental Services

SOIL BORING LOG

Boring/Well SS 24 **Project No.** NYSEG AY0153.002 **Page** 1 **of** 1

Location 150 Water Street, Penn Yan, NY **Drilling Started** 11/4/93 **Drilling Completed** 11/4/93

Total Depth Drilled 5 **feet** **Hole Diameter** 3 **inches** **Type of Sample/ Coring Device** Split spooon

Length and Diameter of Coring Device 3" **Sampling Interval** ____ **feet**

Land-Surface Elevation ____ **feet** ☐ **Surveyed** ☐ **Estimated** **Datum** ____

Drilling Fluid Used None **Drilling Method** Tripod

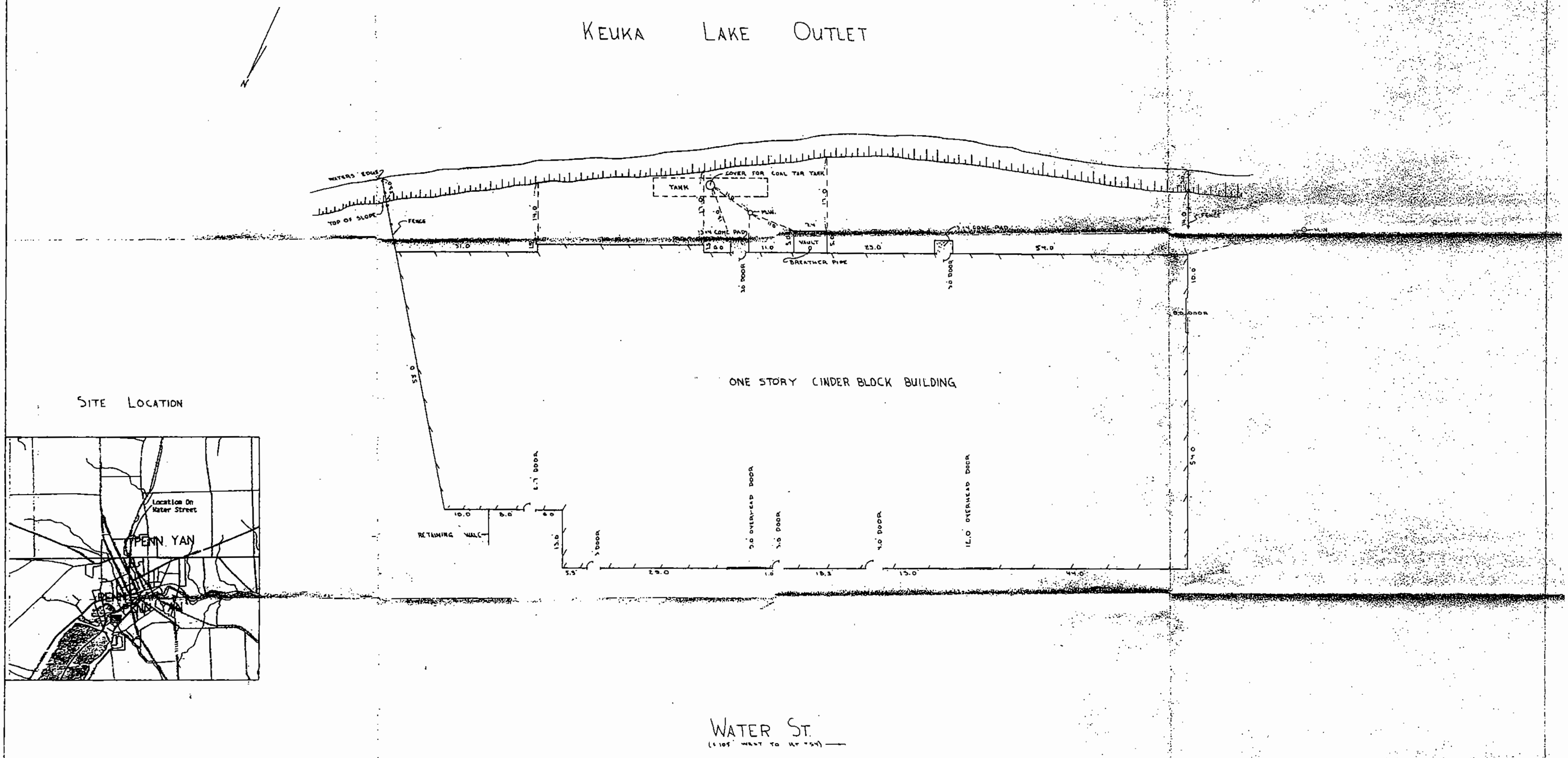
Drilling Contractor Buffalo Drilling Company, Inc. **Driller** Dan **Helper** Dam. Ed

Prepared By P. Holloway **Hammer Weight** 140 **Hammer Drop** 30 **inches**

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	PID
0	5	2.1		Gray-brown SILT with organics, then 0.9' of gray-brown Clay; soft, plastic.	0.0

Appendix C

Previous Remedial Work –
Site Maps and Diagrams



SITE FORMERELY KNOWN AS: PENN YAN GAS LIGHT COMPANY STORAGE & DISPOSAL SITE (NOW NYSE&G)

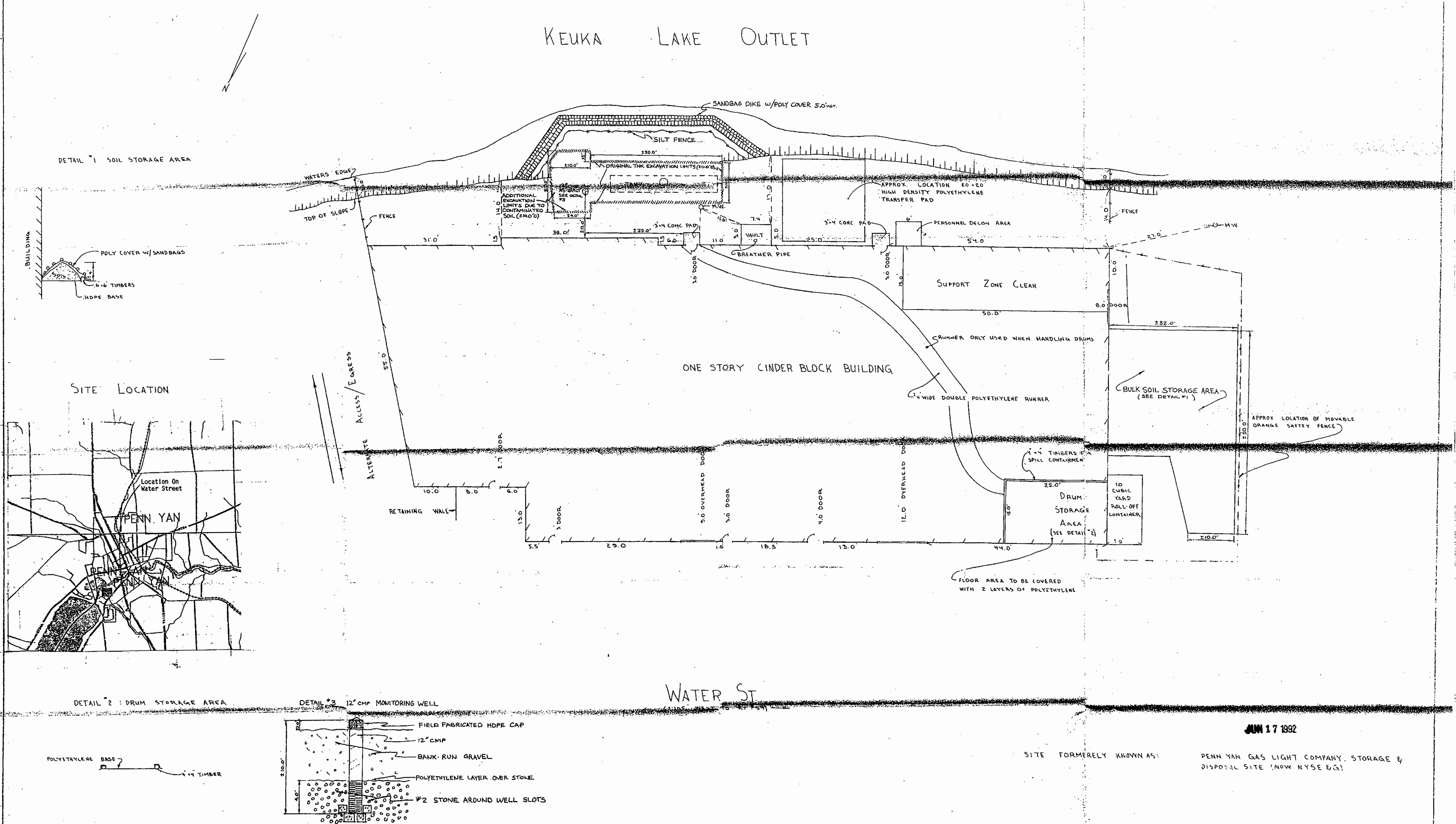
DRAWN DATE	12-10-1991
CHECKED DATE	1-9-1992 GBC
APPROVED	1-9-1992 AC

DWG NO.	REFERENCE DWG	DWG NO	REFERENCE DWG	REV.	DESCRIPTION	DRAWN	DATE	CHKD.	APPR.

LSLC CONSULTANTS/ CONSTRUCTORS, INC.

NYSE&G
PENN YAN, N.Y.

PROJECT NO.	SCALE	DRAWING NUMBER	REV.
291-89	1"=10'	291-89.1	



JUN 17 1992

SITE FORMERLY KNOWN AS: PENN YAN GAS LIGHT COMPANY, STORAGE & DISPOSAL SITE (NOW NYSE&G)

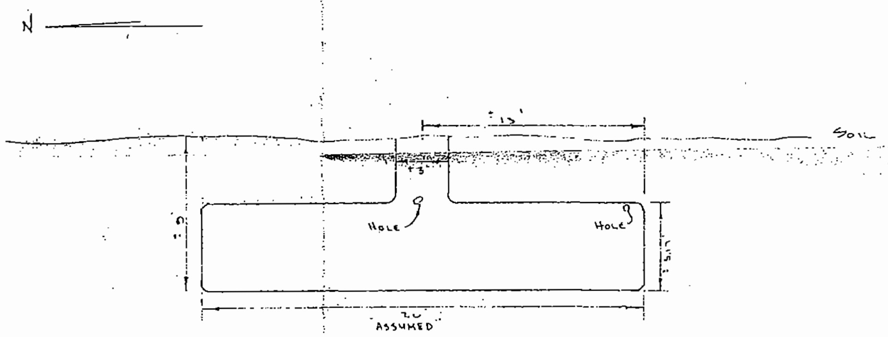
DWG NO	REFERENCE DWG	DWG NO	REFERENCE DWG	REV.	DESCRIPTION	DRAWN	DATE	CHKD.	APPR.
				01	AS-BUILT CONDITIONS - BULK SOIL STORAGE AREA; DRUM STORAGE AREA; SANDBAG DIKE/SILT FENCE LOCATIONS;				
				"	TANK EXCAVATION LIMITS; CONTAMINATED SOIL EXCAVATION LIMITS; 12" CMP MONITORING WELL				
				"	LOCATION AND DETAIL.	Wnp	3/16/92	Rop	

DRAWN DATE	12-10-1991
CHECKED DATE	1-9-1992 GSC
APPROVED	1-9-1992 GSC
DRAWN	JWP

SLC
CONSULTANTS/
CONSTRUCTORS, INC.

N.Y.S.E.&G.
PENN. YAN. N.Y.

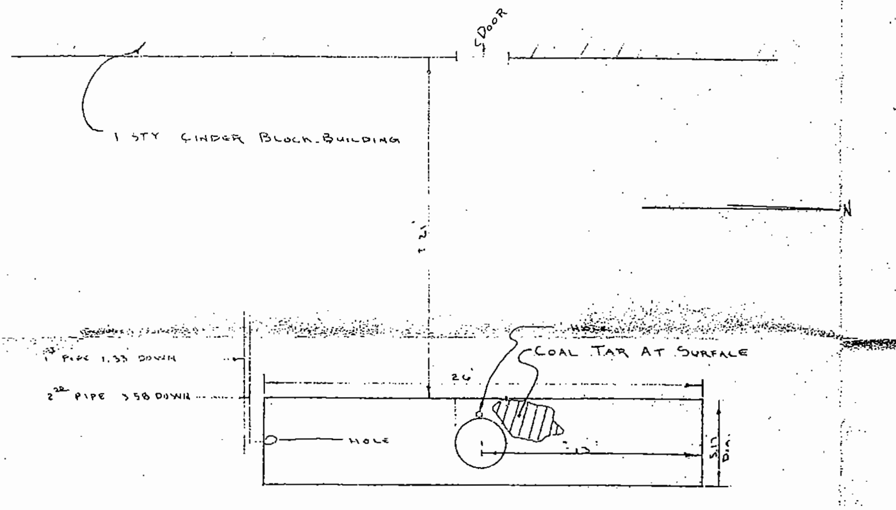
PROJECT NO.	SCALE	DRAWING NUMBER	REV.
291-89	1"=10'	291-89-1	01



Profile Of Tar Storage Tank

Scale: 1" = 5'

Figure 5

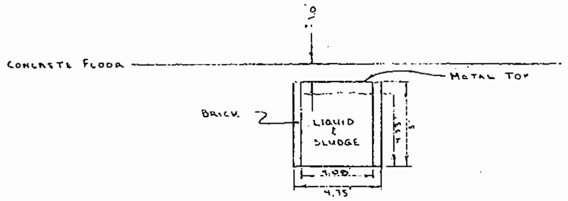


Keuka Outlet Flow →

Detail of Tar Storage Tank.

Scale: 1" = 5'

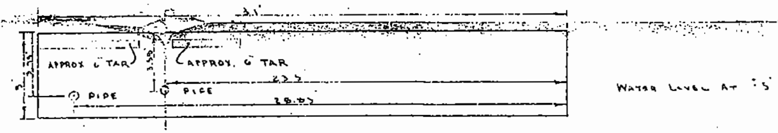
Figure 4



Profile Of Brick Tank

Scale: 1" = 5'

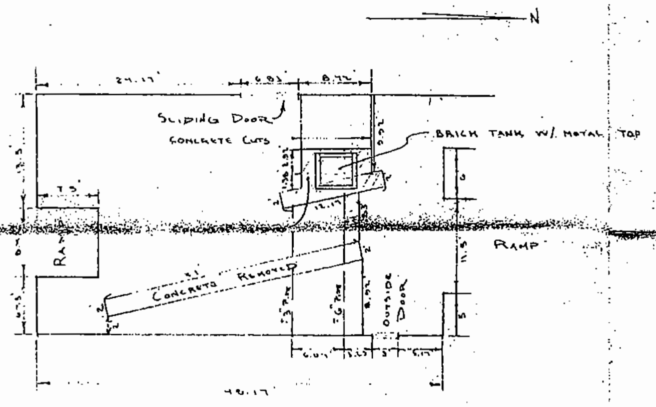
Figure 3



Profile Of Large Concrete Cut With Tar Seams And Pipes

Scale 1" = 5'

Figure 2



Keuka Outlet Flow →

Location Of Concrete Cuts & Brick Tank In Building

Scale: 1" = 10'

Figure 1

DWG NO	REFERENCE DWG	DWG NO	REFERENCE DWG	REV.	DESCRIPTION	DRAWN	DATE	CHKD.	APPR.

DRAWN DATE 11-20-1991
CHECKED DATE
APPROVED

SLC CONSULTANTS/ CONSTRUCTORS, INC.

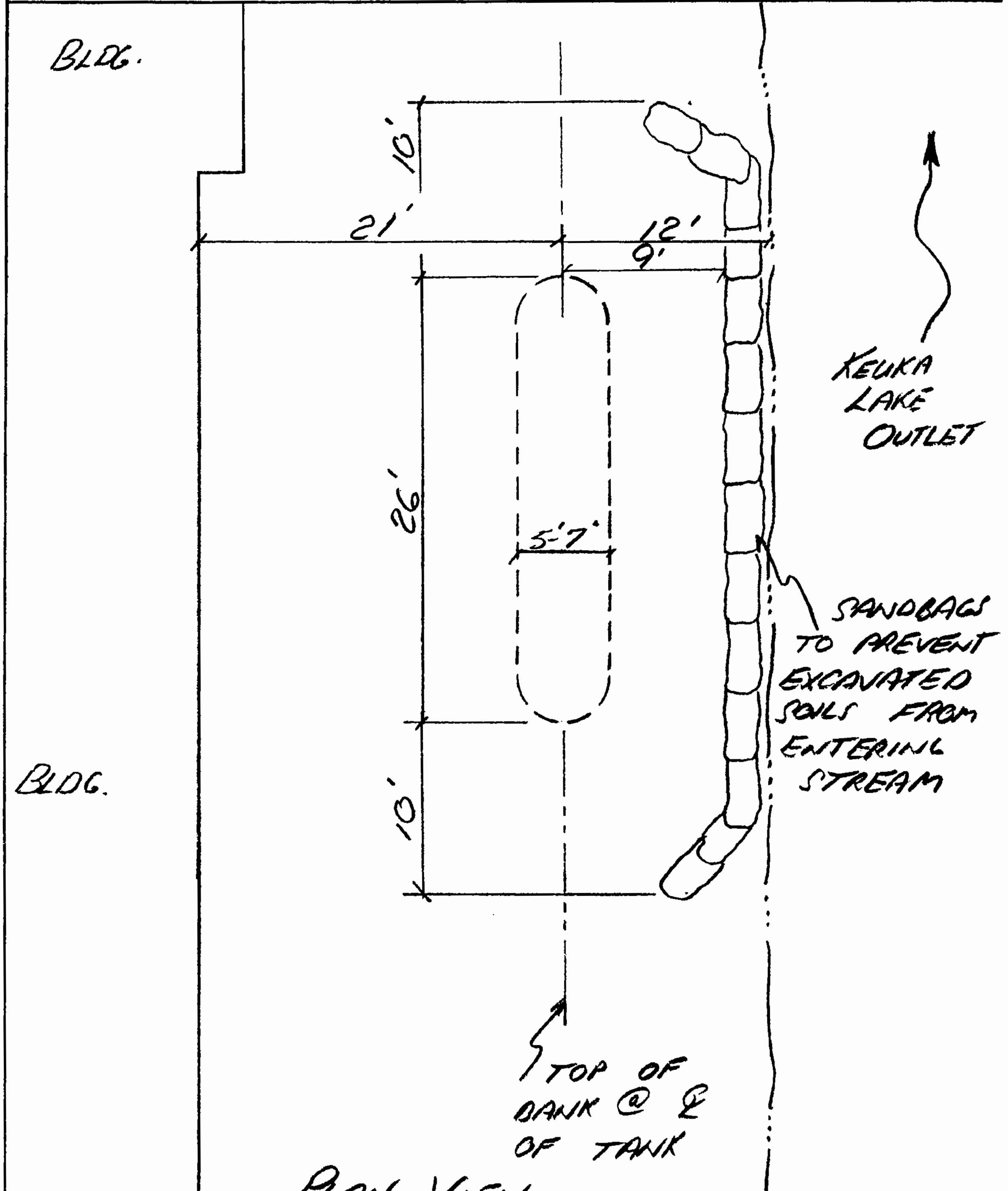
N.Y.S.E.&G
Penn Yan, N.Y.

PROJECT NO. 2-91-8-8
SCALE
DRAWING NUMBER
REV.

NYSEG

SUBJECT: PENN YAN - MGP TANK REMOVAL PLAN VIEW

JOB NUMBER C-560
FILE NUMBER
SHEET 3 OF 4
BY KCD DATE 12-4-91
APP. DATE

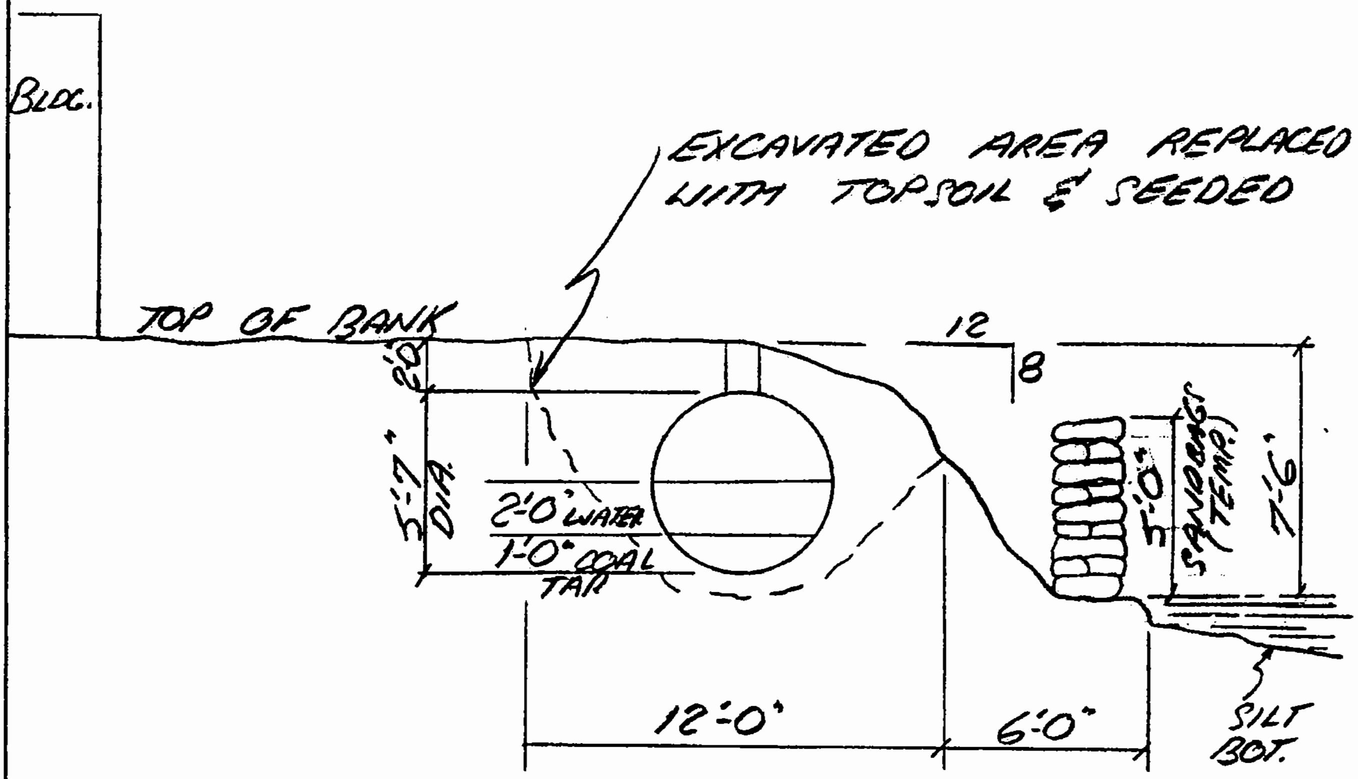


PLAN VIEW
SCALE: 1/8" = 1'-0"

NYSEG

SUBJECT: PENN YAN - MGP TANK REMOVAL CROSS-SECTION A-A

JOB NUMBER C-360
FILE NUMBER
SHEET 4 OF 4
BY KCD DATE 12-4-91
APP. DATE



NOTE: TANK IS 26 FT LONG:
CARBON STEEL CONSTRUCTION

SECTION A-A

SCALE: 3/16" = 1'-0"

Appendix D

Field Sampling and Analytical Plan
Supplemental Remedial Investigation

Penn Yan Water Street MGP Site
Penn Yan, New York
NYSDEC Site No.: 8-62-009
Index #: D0-0002-9309

Prepared by:

The RETEC Group, Inc.
1001 W. Seneca St., Suite 204
Ithaca, NY 14850-3342

RETEC Project Number: NYSG2-19552

Prepared for:

NYSEG
James A. Carrigg Center
18 Link Drive
P.O. Box 5224
Binghamton, New York 13902-5224

August 18, 2006

Appendix D

Field Sampling and Analytical Plan Supplemental Remedial Investigation

Penn Yan Water Street MGP Site
Penn Yan, New York
NYSDEC Site No.: 8-62-009
Index #: D0-0002-9309

Prepared by:

The RETEC Group, Inc.
1001 West Seneca Street, Suite 204
Ithaca, NY 14850-3342

RETEC Project Number: NYSG2-19552

Prepared for:

NYSEG
James A. Carrigg Center
18 Link Drive
P.O.Box 5224
Binghamton, New York 13902-5224

Prepared by:

James H. Edwards

James H. Edwards, Senior Geologist

Reviewed by:

Bruce D. Coulombe

Bruce D. Coulombe, P.G. Senior Hydrogeologist

August 18, 2006

Contents

Table of Contents

Table of Contents

List of Figures

1 Introduction

This Field Sampling and Analytical Plan (FSAP) presents the methods and procedures to be used for conducting the Supplemental Remedial Investigation (SRI) at the Penn Yan former Manufacturing Gas Plant (MGP) Site on Water Street in the Village of Penn Yan, New York.

1.1 Overview of Field Activities

The following field activities will be performed as part of the SRI:

- **Surface Soil Samples** – Four surface soil samples will be collected from the site.
- **Test Pit Excavation** – Six test pits will be excavated at the site.
- **Soil Boring Installation** – There will be 20 soil borings (including five borings advanced for monitoring well installation) with approximately 40 soil samples collected.
- **Monitoring Well Installation and Groundwater Sampling** – Five monitoring wells will be installed. Groundwater samples will be collected from the five new wells in addition to the six existing wells.
- **Probing of Sediments** – The sediments in Keuka Lake Outlet will be probed at 30 transect locations.
- **Bathymetric Survey** – A survey of the stream bed will be performed.
- **Surface Sediment Sampling** – Approximately 48 surface sediment (0-6 inches) samples will be collected.
- **Sediment Coring** – Approximately 20 sediment cores will be advanced to a depth of between five and ten feet. Twenty samples will be collected for laboratory analyses from the cores.
- **Surveying** – The locations and elevations of the SRI data points and important site features will be surveyed.

2 General Field Guidelines

2.1 Site Hazards

Potential on-site surface hazards, such as sharp objects, overhead power lines, energized areas, and building hazards will be identified prior to initiation of fieldwork. Generally, potential hazards at the site will be identified during a site reconnaissance by the project team on the first day of the investigation field activities.

2.2 Underground Utilities

Underground utilities, including electric lines, gas lines, storm and sanitary sewers and communication lines will be identified prior to initiation of drilling and other subsurface work. Underground utility location will be accomplished as follows:

- All SRI data points will be flagged or marked out with white paint.
- Dig Safely of New York (800) 272-4480 will be contacted to initiate the locating activities. New York State law requires that Dig Safely of New York be notified at least two working days, and not more than ten working days, before subsurface work is conducted.
- Companies with subsurface utilities present will locate and mark out all subsurface utility lines.

2.3 Field Log Books

All field activities will be carefully documented in field log books. Entries will be of sufficient detail that a complete daily record of significant events, observations, and measurements is developed. The field log book will provide a legal record of the activities conducted at the site. Accordingly:

- Field books will be assigned a unique identification number.
- Field books will be bound with consecutively numbered pages.
- Field books will be controlled by the Site Manager while fieldwork is in progress.
- Entries will be written with waterproof ink.
- Entries will be signed and dated at the conclusion of each day of fieldwork.

- Erroneous entries made while fieldwork is in progress will be corrected by the field person that made the entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing the correction.

- Corrections necessary after departing the field will be made by the person who entered the original information. Corrections will be made by drawing a line through the error, entering the correct information, and initialing and dating the time of the correction.

At a minimum, daily field book entries will include the following information:

- Location of field activity,
- Date and time of entry,
- Names and titles of field team members on-site and site contacts,
- Names, titles of any site visitors as well as the date and time entering and leaving the site,
- Weather information, for example: temperature, cloud coverage, wind speed and direction,
- Purpose of field activity,
- A detailed description of the field work conducted,
- Sample media (soil, sediment, groundwater, etc.),
- Sample collection method,
- Number and volume of sample(s) taken,
- Description of sampling point(s),
- Volume of groundwater removed before sampling,
- Preservatives used,
- Analytical parameters,
- Date and time of collection,
- Sample identification number(s),
- Sample distribution (e.g., laboratory),
- Field observations,
- All field measurements made, such as VOCs using a PID, pH, temperature, conductivity, water level, etc.,
- References for all maps and photographs of the sampling site(s); and
- Information pertaining to sample documentation such as:
  - Bottle lot numbers,
  - Dates and method of sample shipments,
  - Chain-of-Custody (COC) Record numbers, and
  - Federal Express Air Bill Number.

3 Field Equipment Decontamination and Management of Investigation Derived Residuals

3.1 Decontamination Area

A temporary decontamination area lined with polyethylene sheeting will be constructed on-site for use during decontamination of the drilling and test pitting equipment. Water collected from the decontamination of activities will be collected in 55-gallon drums and managed as described in Section 3.3.

3.2 Equipment Decontamination

The following procedures will be used to decontaminate equipment used during the SRI activities.

- All drilling equipment including the backhoe, bucket, and drilling rig, augers, bits, rods, tools, split-spoon samplers and tremie pipes will be cleaned with a high-pressure, hot water pressure washing unit before beginning work.
- Tools, drill rods, and augers will be placed on polyethylene plastic sheets following pressure washing. Direct contact with the ground will be avoided.
- All augers, rods, and tools will be decontaminated between each drilling location according to the above procedures.
- The back of the drill rig and all tools, augers, and rods will be decontaminated at the completion of the work and prior to leaving the site.

3.2.1 Sampling Equipment Decontamination

Suggested Materials:

- Potable water
- Phosphate-free detergent (such as Alconox ™ or Simple Green ™)
- Reagent-grade methanol or isopropanol
- Distilled water
- Aluminum foil
- Plastic/polyethylene sheeting
- Plastic buckets and brushes
- Personal protective equipment in accordance with the HASP

Procedures:

- Prior to sampling, all non-dedicated sampling equipment (bowls, spoons, interface probes, etc.) will be washed with potable water and a phosphate-free detergent (such as Alconox™). Decontamination may take place at the sampling location as long as all liquids are contained in pails, buckets, etc.

- The sampling equipment will then be rinsed with potable water followed by a deionized water rinse.

- Between rinses, equipment will be placed on polyethylene sheets or aluminum foil if necessary. At no time will washed equipment be placed directly on the ground.

- Equipment will be wrapped in polyethylene plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

3.3 Management of Investigation Derived Residuals

3.3.1 Decontamination Fluids

Hot water pressure wash and decontamination fluids will be collected in 55-gallon drums. The drums will be labeled as "pending analysis - investigation derived residual decon water" and temporarily stored on wooden pallets in a plastic-lined containment area pending characterization and proper disposal.

3.3.2 Drill Cuttings

Drill cuttings will be contained in 55-gallon drums. The drums will be labeled as "pending analysis - investigation derived residual – soil from drill cuttings" and temporarily stored on wooden pallets in a plastic-lined containment area pending characterization and proper disposal.

3.3.3 Development and Purge Water

All development and purge water will be contained in 55-gallon drums. The drums will be labeled as "pending analysis - investigation derived residual development and purge water" and temporarily stored on wooden pallets in a plastic-lined containment area pending characterization and proper disposal.

3.3.4 Personal Protective Equipment

All personal protective equipment (PPE) will be placed in 55-gallon drums or roll-off containers for proper disposal.

3.3.5 Dedicated Sampling Equipment

All dedicated groundwater sampling equipment (dedicated disposable polyethylene bailer and dedicated polypropylene line) will be placed in 55-gallon drums for disposal.

4 Surface and Subsurface Soil Sampling Procedures

4.1 Introduction

Surface and subsurface investigation activities to be conducted at the Water Street MGP site consist of:

- Exploratory test pit excavation;
- Completion of soil borings;
- Installation of monitoring wells; and
- Sediment probing, coring, and sampling.

Procedures for these activities are described in the following sections.

4.2 Surface Soil Sampling

Surface soil samples will be collected at the locations indicated in the SRI Work Plan. A one square meter area will be measured at each sample location. Five locations will be identified within the measured square meter area. A stainless steel or disposable trowel will be used to collect soil from a depth of 0 – 2 inches from each of the five locations. If vegetation is present at the locations, the vegetation layer will be removed prior to sampling. The soil from the five locations will be homogenized by mixing the soil in a stainless steel bowl. The composite sample will be analyzed for all of the parameters identified in the SRI work plan

All samples collected for analysis will be placed immediately into laboratory sample jars and properly stored in a cooler with ice to 4°C before transport to the laboratory.

Duplicate samples will be collected at the frequency detailed in the QAPP by alternately filling two sets of sample containers. Composite samples may be required to obtain a sufficient soil volume.

In addition, surface soil samples will be described by including the following information in the project field book:

- Site;
- Location number;
- Interval sampled;
- Date;
- Initials of sampling personnel;

- Soil type;
- Color;
- Moisture content;
- Texture;
- Grain size and shape;
- Relative density;
- Consistency;
- Visible evidence of residues; and
- Miscellaneous observations (including organic vapor readings).

4.3 Test Pit Excavations

Test pits will be excavated using a rubber-tired or track backhoe. In the event deep excavations are anticipated, a track hoe will be utilized. Locations of test pits are specified in the SRI Work Plan, and will be finalized in the field, based on the location of existing underground utilities. If the prospective test pit location is covered by asphalt or concrete, the area will be saw-cut prior to excavation.

During excavation activities, personnel will stand upwind of the excavation area to the extent possible. Air monitoring and odor mitigation (if necessary) will be conducted in accordance with the CAMP and HASP. Test pit materials will be photographed and logged for future reference. Material removed from the test pit will be placed on polyethylene sheeting. Should sampling of excavated material be performed, samples will be collected from the center of the backhoe bucket. Upon completion, the materials from the test pit will be placed back in the excavation in the reverse order in which it was excavated. The location and size of the test pit will be measured and described in the field logbook.

Visually clean soils, such as surface soils, will be segregated from soils that may be impacted. The visually clean soils will be used to cover the impacted soils/source materials when placed back in the excavation. At a minimum, the top two feet of backfilled soil will be visually clean. Test pits will be backfilled as soon as possible after completion and in general prior to the cessation of activities at the end of the day.

For gravel roadways and parking areas, the backfill will be tamped down in 18-inch lifts. A 6-inch layer of clean run-of-crush gravel will be tamped in-place as the final lift. For test pits located in asphalt-covered areas, the surface will be replaced with cold or hot asphalt mix, compacted by rolling, and trimmed flush with the adjoining surface. Test pits located in grass covered areas will be returned to original grade, and covered with topsoil and reseeded if necessary. Following restoration of the excavation, the test pit will be staked/marked to facilitate subsequent location by surveying crews.

4.4 Soil Borings and Subsurface Soil Sampling

The following methods will be used during installation of the soil borings.

Required Equipment

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- Stakes, flagging and marking paint
- Plastic bags for soil screening samples
- Tape measure
- Decontamination supplies
- Water level indicator
- Photo-ionization detector (PID) with a 10.2 or 10.6 eV lamp
- Camera
- Clear tape, duct tape
- Laboratory sample bottles
- Coolers and ice
- Shipping supplies

4.4.1 Drilling and Geologic Logging Methods

- Soil borings will be sampled initially with a direct-push drilling method. It is likely that the hollow stem auger method will be utilized for some of borings installed at the site due to the likely presence of non-homogeneous fill materials and buried foundations of former structures. The use of either drilling methods will also allow for a more accurate determination of the depths and thicknesses of geologic units.

- Soil samples will be collected continuously from the ground surface to the bottom of the borings using 4-foot long, 2-inch diameter MacroCore^{TM} samplers, or 2-foot long by 2-inch diameter split-spoon samplers.

- Soil samples retrieved from the borehole will be visually described for: 1) percent recovery, 2) soil type, 3) color, 4) moisture content, 5) texture, 6) grain size and shape, 7) consistency, 8) visible evidence of staining or other hydrocarbon-related impacts, and 9) any other relevant observations. The descriptions will be in accordance with the Unified Soil Classification System (USCS). American Society for Testing and Materials (ASTM) guidelines and the modified Burmeister system.

- Immediately after describing the core, a representative portion of the sample will be placed in a re-sealable plastic (e.g. “ziplock”) bag filled approximately half full. The bag will be labeled with the boring number and interval sampled.

- After allowing the bagged soil to warm the tip of the sample probe attached to the PID will be inserted into the bag to measure the headspace for organic vapors.
- Soil remaining after completion of sample description, collection and field screening will be disposed of properly.
- All borings will be sealed with bentonite or cement/bentonite grout following completion.
- All drilling equipment will be decontaminated between each boring in accordance with methods specified in Section 3.2.
- The field geologist will log borehole geology and headspace measurements in the field book and the Drilling Record shown in Figure 4-1, or similar form and any other observations (e.g. odors, NAPL, soil staining, etc.).

4.4.2 Soil Sampling

- The number and frequency of samples to be collected from each boring and the associated analytical parameters are summarized on Table 3-1 and 3-2 on the SRI Work Plan.
- Samples for Laboratory analyses will be collected directly from the acetate liners or split-spoons, placed into appropriate containers, and compacted to minimize head space and pore space. Soil used for headspace analysis will not be used for laboratory VOC analysis.
- The sample containers will be labeled, placed in a laboratory-supplied cooler and packed with ice. The coolers will then be shipped to the laboratory for analysis.
- If there is a delay of sample shipment due to insufficient samples to warrant overnight delivery, the samples will be stored in a cool, secure place with sufficient ice to maintain a temperature of 4° C.
- Chain-of-custody procedures will be followed as outlined in the QAPP.
- The sampling equipment will be decontaminated between samples in accordance with procedures described in Section 3.

- Soil remaining after completion of sample description, collection and field screening will be disposed of properly.

- The sample locations, descriptions, and depths will be recorded on the borelogs in the field book.

4.4.3 Borehole Abandonment

Boreholes for the direct-push borings will be filled with bentonite chips. All auger soil borings not used for the construction of monitoring wells will be grouted to the ground surface following the completion of the soil sampling to prevent cross-contamination of permeable zones. The borings will be filled using a cement/bentonite grout mixture with the following specifications:

- Bentonite will be powdered sodium montmorillonite furnished in moisture resistant sacks without additives.

- Cement shall be a low-alkaline Portland cement, Type I in conformance with ASTM C-150 and without additives.

The cement/bentonite grout mixture shall be to the following proportion:

- Three sacks (94 pounds) of Type I Portland cement;
- 14 pounds of granular bentonite (5% mix); and
- 25 gallons of water.

The cement will be mechanically mixed, above ground, with water from a potable water source. Bentonite will be added to ensure a lump-free consistency. The mixture will be pumped through a tremie pipe as the drill is being withdrawn.

4.5 Monitoring Well Installation and Development

The following methods will be used for drilling, installing, and developing the monitoring wells.

Required Equipment

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- Plastic bags for soil screening samples
- Tape measure
- Decontamination supplies
- Electronic oil/water interface probe
- PID

- Camera
- Clear tape, duct tape
- Aluminum foil
- Laboratory sample bottles
- Coolers and ice
- Shipping supplies
- Clear polyethylene disposable bailers (NAPL confirmation)
- Polyethylene disposable bailers (development)
- Polypropylene rope (development)
- Waterra pump or other purge pump (development)
- Submersible electric pump (development)
- Stainless steel or glass beakers (development)
- Turbidity meter (development)
- Temperature, conductivity, pH meter (development)

4.5.1 Monitoring Well Installation

Figure 4-2 illustrates the constructon details for a typical groundwater monitoring well. The monitoring wells will be installed according to the following specifications:

- The monitoring well borings will be advanced with 4.25-inch inner diameter (ID) hollow stem augers.

- Wells will be constructed with two-inch ID, threaded, flush-joint, PVC casings and screens.

- Screens will be 10-feet long with 0.02-inch slot openings with a two-foot DNAPL sump at the base. Alternative screen lengths up to 20’ long may be used at the discretion of the field geologist and with the approval of NYSEG and NYSDEC, based on site conditions.

- The annulus around the screens will be backfilled with clean silica sand having appropriate size (e.g., Morie No. 1) to a minimum height of two feet above the top of the screen. Auger flights will be withdrawn as sand is poured in a manner that will minimize hole collapse and bridging.

- A bentonite chip seal with a minimum thickness of two feet will be placed above the sand pack. The bentonite seal will be hydrated with clean, potable water before placement of grout above the seal layer.

- The remainder of the annular space will be filled with cement-bentonite grout to ground surface. The grout will be allowed to set for a minimum of 24 hours before wells are developed.

- Each monitoring well will be a flush-mounted installation with a locking cap.

- The concrete seal or pad will be sloped to channel water away from the well, and be deep enough to remain stable during freezing and thawing of the ground.

- The top of the PVC well casing and ground surface will be marked and surveyed to 0.01 foot, and the elevation will be determined relative to a fixed benchmark or datum.

- The measuring point on all wells will be on the innermost PVC casing.

- Monitoring well construction details will be recorded in the field book and on the Construction Log shown in Figure 4-3, or similar form.

4.5.2 Monitoring Well Development

- After a minimum of 24 hours after installation, the monitoring wells will be developed by surging and pumping. Surging will be performed periodically, across the lengths of screen in 2-foot increments prior to, at interim periods of pumping, and immediately before the final pumping. Pumping methods may include using a centrifugal, submersible, or peristaltic pump and dedicated polyethylene tubing, using a Waterra positive displacement pump and dedicated polyethylene tubing, or other methods at the discretion of the field geologist.

- Water levels will be measured in each well to the nearest 0.01 foot prior to development.

- The wells will be developed until the water in the well is reasonably free of visible sediment (50 NTU if possible or until pH, temperature and specific conductivity stabilize). A portable nephelometer will be used to make the turbidity measurement.

- Development water will be contained in and properly disposed of.

- Following development, wells will be allowed to recover for at least 14 days before groundwater is purged and sampled. All monitoring well development will be performed or overseen by a field geologist and recorded in the field book.

5 Groundwater Sampling Procedures

5.1 Introduction

Procedures for obtaining samples of groundwater are described in this section. Groundwater samples will be collected using low-flow, low-stress purge and sampling methods.

5.2 Groundwater Sampling

The number and frequency of the samples that will be collected for laboratory analysis from each well and the analytical parameters are listed in Table 3-1 and Table 3-2 in Section 3 of the SRI Work Plan.

The following method will be used to collect groundwater samples from monitoring wells.

Required Equipment and Supplies

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- Electronic oil/water interface probe
- Disposable polyethylene bailers and low-flow sampling pump
- Polypropylene rope
- Temperature, conductivity, and pH meter
- Turbidity meter
- Flow through cell
- Decontamination supplies
- Peristaltic or submersible pump capable of achieving low-flow rates (i.e. 0.5 liters per minute or less)
- Plastic tubing
- Plastic sheeting
- PID
- Clear tape, duct tape
- Coolers and ice
- Laboratory sample bottles
- Federal Express labels

5.2.1 Groundwater Sampling Method

Purging

- Prior to sampling, the static water level and thickness of any LNAPL or DNAPL will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurement will be recorded in the field book.

- The probe will be decontaminated between uses.
- Groundwater from the well will be purged until field parameters stabilize, up to three well volumes are removed, or 1 hour of continuous purging is performed. Field parameters are considered to be stable when three consecutive readings are within the stabilization criteria for that parameter. The stabilization criteria are as follows: 10% or below 10 NTUs for turbidity, 3% for conductivity and temperature, 0.1 unit for pH, and 10 mV for ORP. Purging will be conducted using the low-flow sampling technique specified by the U.S. EPA Region 1 in its guidance document entitled Low-Stress (low flow) Purging and Sampling Procedure for the "Collection of Groundwater Samples from Monitoring Wells".
- The flow rate measurement will be approximately 0.5 liter per minute or less.
- If a well goes dry before the required volumes are removed, it will be allowed to recover, purged a second time until dry or the required parameters are met, and sampled when it recovers sufficiently, in accordance with low-flow sampling protocol.
- Purge water will be managed and disposed of properly.

Sampling

- Samples will be collected using dedicated ¼- or $^3/_8$-inch polyethylene tubing and/or bailers.
- Prior to filling the sample bottles, the temperature, pH, conductivity, and oxidation reduction potential (ORP) will be measured within a flow-through cell. Turbidity will be measured with a hand-held turbidity meter. All measurements will be recorded in the field book.
- Three 40-ml VOA vials with Teflon lined septa and hydrochloric acid as a preservative will be filled for analysis of volatile organic compounds (VOCs). The VOA vials will be filled to ensure that no bubbles are in the sample. Two one-liter amber glass sample jars for SVOC analysis will then be filled followed by a 500 milliliter (mL) plastic bottle preserved with nitric acid for the total metals

analysis. An opaque, 250 mL plastic bottle, with sodium hydroxide added for preservative will then be filled for the analysis of cyanide.

- The sample containers will be labeled, placed in a laboratory-supplied cooler and packed on ice (to maintain a temperature of 4° C). The cooler will be shipped overnight or delivered to the laboratory for analysis.
- Chain-of-custody procedures will be followed as outlined in the QAPP.
- Well sampling data will be recorded on the Groundwater Sampling Record shown in Figure 5-1, or similar form.

6 Sediment Investigation

6.1 Surface Sediment Probing and Sampling

Shallow sediments will be investigated by physically probing the sediments. Based on the findings of the probing, locations will be selected for the collection of analytical samples. These samples will be collected with a ponar dredge sampler or shovel from the top six inches of sediment. The procedures to be used are described below.

6.1.1 Sediment Probing and Sampling Methods

Required Equipment

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- 300 foot tape measure
- Stakes, flagging
- Tape measure
- Decontamination supplies
- Photo-ionization detector (PID) with a 10.2 or 10.6 eV lamp
- Ten-foot, threaded metal rod
- GPS unit
- Sample jars
- Coolers
- Shipping supplies
- Ziplock bags
- Boat (if necessary)
- Dredge sampling device
- Camera

6.1.2 Sediment Probing

- Prior to collecting sediment samples, probing of sediments will be conducted to visually identify areas of hydrocarbon impacts.

- Probing will be conducted along a series of transects as described in the SRI Work Plan. Stakes shall be installed along the shoreline at 25 foot distances to mark each transect.

- Sediment accumulations will be probed by hand along each transect with a steel bar and/or bucket auger (if possible) to observe the sediment physical characteristics, including the presence of hydrocarbon-like sheen or non-aqueous phase liquids (NAPL). If possible, sediments will be probed to a depth of 2 to 3 feet below the surface of the river channel bottom. The probing locations will be a maximum of five feet apart along the transect, or as dictated by site conditions.

- All observations, including odors and sheens will be recorded in a field notebook. Photographs should be taken, when possible, to document significant findings.

6.1.3 Shallow Sediment Sampling

- Based on the results of the probing, shallow sediment sampling locations will be selected in consultation with NYSDEC.

- Where possible, shallow water areas at or near the shoreline will be sampled by walking directly into the sampling area with waders. Samples will be collected with a shovel at these locations.

- Sample locations not accessible by wading will be sampled using a boat. While collecting the sediments at each station, the boat will be anchored. The vessel will be mobilized in such a way as to minimize the potential for disturbance of the sediment and surface water via wave or propeller action.

- A GPS unit will be used to position the sampling personnel at the sample station coordinates. If obstructions such as boulders or cobbles are encountered at a specific station, the location of the station may be changed to collect fine-grained (< 4 mm) sediments required by the laboratory tests. In the case that cobbles or boulders are encountered, samples will be collected as close as possible to the specified sample location.

- Upon arrival at each sampling station a depth-to-sediment measurement will be collected to record the water depth. Measurements will be taken with the boat's navigational depth finder or a hand held depth-to-water meter. The water depth will be recorded with an accuracy of 0.1 feet.

- A ponar grab sampler (standard size) will be used for collecting sediments. The ponar grab sampler is suitable for collecting soft sediments and also for harder sediments containing significant quantities of sand, gravel, and firm clay. The sample depth for this device is from 0 to 6 inches. The ponar grab sampler will be lowered and raised from the sediment surface, by hand or using a hand-winch and cable.

- Field personnel will record observations of the physical characteristics of the sediment encountered at each sampling station and also important observations regarding the physical characteristics of the study area. Information recorded will include: 1) sample station designation; 2) Presence of fill material, coal or coke, or asphalt- or tar-like materials at the shoreline; 3) Apparent depositional and erosional environment at the station; 4) Presence or absence of aquatic vegetation; 5) Sediment color, texture, and particle size; and 6) Odor and presence of sheens or non-aqueous phase liquids (NAPL).

- After each sample is collected, the station will be located so that the site may be re-sampled in the future. The mapping will include the following: 1) The location (latitude and longitude) identified using a GPS receiver. 2) A hand-plotted estimate of the location on a field map of the study area. 3) Where possible, significant features on the shore will be photographed as location references. 4) Notes will also be added to the field map showing any important site features that may have bearing on the sediment condition (e.g. pipe outfalls or subsurface debris). The locations of the important site features, if not previously mapped, will be located using the GPS unit.
- Sediments collected at each station will be placed into clean, laboratory-supplied glassware for analysis and archiving.
- Samples will be carefully packed to avoid breakage during shipment. The cooler will be shipped overnight or delivered to the laboratory for analysis.
- Chain-of-custody procedures will be followed as outlined in the QAPP.
- All measurements and observations discussed above for both the field sampling and field processing of the sediments will be recorded in a field book.

6.2 Sediment Coring

Sediment coring will be conducted to determine whether MGP impacts may be present in sediments deeper than those collected with the dredge-sampler. The cores will also be used to investigate the geologic material present beneath the Keuka Lake Outlet. The procedures to be used are described below.

6.2.1 Sediment Coring Methods

Required equipment:

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP

- Decontamination supplies
- Water level indicator
- Photo-ionization detector (PID) with a 10.2 or 10.6 eV lamp
- Permanent markers
- GPS unit
- Sample jars
- Coolers
- Shipping supplies
- Ziplock bags
- Temperature, conductivity, dissolved oxygen and pH meter
- Turbidity meter
- Boat equipped with Vibra-core sampler
- Camera

The sediment cores will be collected with a small boat that will be used to advance a 3-inch diameter vibra-core sampler approximately 5 to 10 feet below the sediment surface. Cores may be advanced to deeper depths if impacted sediments are observed at this target depth. Each core location will be mapped using a GPS system.

To meet the objectives for this task the sampling and laboratory analyses will be performed as follows:

- The core sampler equipped with a plastic liner will be driven and extracted at each of the designated sample locations;

- The core liner will be extracted from the core barrel and split open.

- The sediment sample will be screened for organic vapors with a PID and logged for physical characteristics and the presence of MGP residuals;

- Areas within the core sampler that exhibit visible evidence of residuals will be sampled for laboratory analyses with bias towards the most impacted interval observed.

- Samples from below impacted intervals may also be collected to verify non-impacted conditions.

- If impacts are not observed in the core, selected samples may be collected to verify non-impacted areas of the stream.

- Samples from the cores may be archived for possible future forensic analysis. Each core sample will be re-sealed in the plastic core liner, and sent to the laboratory or other sample storage facility to be frozen for possible future analyses.

- A minimum of 20 samples will be collected for laboratory analyses. Additional samples may be collected and archived for possible future analyses.

7 Air Monitoring

7.1 Introduction

Two types of air monitoring will be performed during the site investigation: 1) work zone monitoring for protection of the workers performing the site investigation, and 2) community air monitoring at the perimeter of the work site for protection of the local community.

7.2 Breathing Zone Air Monitoring During Drilling and Sampling

Monitoring of air in the breathing zone within the work site will be conducted periodically during all drilling and sampling activities.

- An organic vapor meter (OVM) equipped with a PID will be used to monitor for volatile organic compounds or other organic vapors in the breathing zone and borehole, and to screen the samples.

- Additional air monitoring may be required as specified in the site-specific health and safety plan (HASP).

The PID readings will be recorded in the field book and on the boring log during drilling activities. The procedure for the PID operation and calibration is included in Section 8 and the Site Specific Health and Safety Plan. Note that equipment calibration will be performed as often as needed to account for changing conditions or instrument readings. The minimum frequency of calibration is specified in Section 8; more frequent calibration will be performed if spurious readings are observed or there are other problems with the instruments.

7.3 Community Air Monitoring

Community air monitoring requires real-time monitoring for volatile organic compounds (VOCs), particulates (i.e., dust), and MGP related odors at the downwind perimeter of each designated work area when certain activities are in progress at impacted sites. The community air monitoring is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels for community air monitoring require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, community air monitoring helps to confirm that work activities do not spread contamination off-site through the air.

The procedures and action levels for community air monitoring are presented in Community Air Monitoring Plan (CAMP) that has been prepared for the SRI at the Penn Yan MGP Site.

8 Field Instruments and Calibration

All field analytical equipment will be calibrated immediately prior to each day's use and more frequently if required. The calibration procedures will conform to manufacturer's standard instructions. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. All instrument calibrations will be documented in the project field book and in an instrument calibration log. Records of all instrument calibration will be maintained by the Field Team Leader. Copies of all of the instrument manuals will be maintained on-site by the Field Team Leader. All changes to instrumentation will be noted in the field log book.

The following field instruments will be used during the investigation:

- PID;
- Particulate monitors;
- pH , specific conductivity and temperature meter; and
- Turbidity meter.

8.1 Portable Photo-ionization Analyzer

- The photo-ionization analyzer will be equipped with either a 10.2 or 10.6 eV lamp. The PID is capable of ionizing and detecting compounds with an ionization potential of less than 10.6 eV. This accounts for up to 73% of the volatile organic compounds on the U.S. EPA Target Compound List.

- Calibration must be performed at the beginning of each day of use with a standard calibration gas having a concentration of 100 parts per million of isobutylene. If the unit experiences abnormal perturbation or erratic readings more frequent or additional calibration will be required.

- All calibration data must be recorded in the project field notebooks.

- A battery check must be completed at the beginning and end of each working day.

- All changes to the PID will be noted in the field notes (such as lamp or filter cleaning or replacement or change of instrument).

8.2 pH Meter

- Calibration of the pH meter must be performed at the start of each day of use, and after very high or low readings as required by this plan, according to manufacturer's instructions.

- National Institute of Standards and Technology - traceable standard buffer solutions which bracket the expected pH range will be used. The standards will be pH of 4.0, 7.0 and 10.0 standard units.

- The use of the pH calibration must be used to set the meter to display the value of the standard being checked.

- The calibration data must be recorded in the project fieldbook.

8.3 Specific Conductivity Meter and Temperature Probe

- Calibration checks using the conductivity standard must be performed at the start of each day of use, after five to ten readings or after very high or low readings as required by this plan, according to manufacturer's instructions.

- The portable conductivity meter must be calibrated using a reference solution of 200 uohms/cm (or the manufacturer's specified concentration) on a daily basis. The date and lot number of the reference solution must be recorded. Readings must be within five percent to be acceptable.

- The thermometer of the meter must be calibrated against the field thermometer on a weekly basis.

8.4 Turbidity Meter

- The turbidity meter must be checked at the start of each day of use according to manufacturer's instructions.

9 Analytical Program

9.1 Environmental Sample Analyses

The laboratory samples for each media and the chemical analyses to be performed, including the QA/QC samples are summarized in Table 3-1 and Table 3-2 of the SRI Work Plan.

9.1.1 Surface Soil Analyses

The surface soil samples will be analyzed for the following parameters:

- Target Compound List (TCL) SVOC compounds by U.S. EPA Method 8270C;
- Target Analyte Lists (TAL) Metals by U.S. EPA Method 6010B/6020/7471A; and
- Total Cyanide by U.S. EPA Method 9012A.

9.1.2 Subsurface Soil Analyses

The subsurface soil samples will be analyzed for the following parameters:

- TCL VOC compounds by U.S. EPA Method 8260B;
- TCL SVOC compounds by U.S. EPA Method 8270C;
- TAL Metals by U.S. EPA Method 6010B/6020/7471A; and
- Total Cyanide by U.S. EPA Method 9012A.

9.1.3 Groundwater Analyses

The groundwater samples will be analyzed for the following parameters:

- TCL VOC compounds by U.S. EPA Method 8260B;
- TCL SVOC compounds by U.S. EPA Method 8270C;
- TAL Metals by U.S. EPA Method 6010B/6020/7471A; and
- Total Cyanide by U.S. EPA Method 9012A.

Note that based on the existing data from the site, cyanide is not expected to be found at a significant concentration in soil or groundwater. If total cyanide is detected at concentrations of concern (greater than 200 ug/L), additional analysis of samples for available cyanide by U.S. EPA Method OIA-1677, free cyanide by microdiffusion method or metal cyanide complex determination by IC (Dionex application Note 161) may be performed.

Analysis of groundwater samples for natural attention parameters is not included at this time in the SRI investigation, as the investigations to date have not identified significant groundwater impacts. If necessary, analysis for parameters which may indicate intrinsic biological degradation of COI can be added to the sampling and analysis program.

9.1.4 Sediment Analyses

Surface (0-6 inches) sediment samples will be analyzed for the following parameters:

- TCL SVOC compounds by U.S. EPA Method 8270C;
- Total Cyanide by U.S. EPA Method 9012A; and
- Total Organic Carbon by Lloyd-Kahn Method.

Sediment samples from the cores will be analyzed for the following parameters:

- TCL SVOC compounds by U.S. EPA Method 8270C;
- Total organic carbon by Lloyd-Kahn Method.

9.1.5 Soil Profiling

Two to three soil samples may be collected during the investigation and analyzed for full RCRA Hazardous Characteristics testing. The objective of the sampling will be to determine if materials exhibiting hazardous characteristics may be present at the site. These analyses may also be utilized for waste disposal profiling purposes. The samples will be chosen from the most impacted soil collected during the investigation as determined by the field geologist. The hazardous characteristics testing will include the following analyes:

- TCLP ZHE Extraction U.S. EPA Method 1311
- TCLP VOC U.S. EPA Method 1311/8260B
- TCLP SVOC U.S. EPA Method 1311/8270C
- TCLP ICP Metals U.S. EPA Method 6010B (Mercury 7470A)
- Corrosivity U.S. EPA Method Chapter 7
- Ignitability U.S. EPA 1010
- Reactive Cyanide U.S. EPA SW-846 Chapter 7
- Reactive Sulfide U.S. EPA SW-846 Chapter 7

9.2 Field Quality Control Samples

Field quality control samples will be collected and analyzed to document the accuracy and precision of the samples. Table 3-2 provides a summary of the quality control samples, which are described as follows:

- ***Trip Blank:*** One trip blank will accompany each shipment of samples for VOC analysis sent to the laboratory. The trip blank will be analyzed to test for any contaminants introduced while samples are being stored or transported to the laboratory. The trip blanks will be analyzed for volatiles only.

- ***Field Equipment Blanks:*** The purpose of the equipment blank is to detect any contamination from sampling equipment, cross-contamination from previously sampled locations, and contamination caused by conditions at sampling locations (e.g., airborne contaminants). One equipment blank will be collected for every twenty samples collected during sampling. The samples will be collected by pouring analyte-free water, prepared in the laboratory, over decontaminated sampling equipment and collecting it in sample jars. The blanks will be collected in the vicinity of a sample location. This field blank will be analyzed for VOCs, SVOCs, total cyanide, and TAL metals. An equipment blank will not be collected if sampling is conducted with dedicated sampling equipment.

- ***Field Duplicates:*** Field duplicates are collected to determine the precision of the soil samples collected. This is achieved by compositing soil and splitting it evenly between separate sample jars. Duplicate samples will be collected and analyzed for VOC, SVOCs, total cyanide, and TAL metals. The minimum required number of field duplicates is one for every twenty samples.

- ***Matrix Spikes, and Matrix Spike Duplicates:*** These samples are laboratory quality control samples and will be completed as part of the laboratory analytical batch quality control. These samples will be collected in the same manner as the field duplicates. Both the matrix spike and matrix spike duplicate will be collected at the same sample location.

9.3 Sample Location Numbering System

- Surface soil samples will be numbered consecutively beginning with SS1.

- Subsurface soil borings will be numbered consecutively beginning with SB1 (soil borings) or MW1 (monitoring well borings). Individual samples will also be designated with a depth code (see below).

- Monitoring wells will be numbered consecutively beginning with MW1.

- Sediment samples will be numbered consecutively beginning with SD1.

9.4 Sample Identification

Each sample will be given a unique alphanumeric identifier in accordance with the following classification system:

SAMPLE IDENTIFICATION

LL*	NN*	N-N	LL
Sample Type	Sample Number	Depth Code	QC Identifier

	Solid	Water
Sample Type:	MW – Monitoring Well Boring	MW – Monitoring Well
	SB – Soil Boring	
	BSS – Background Surface Sediment	
	SD – Surface Sediment (0-6 inches)	
	SDC – Deeper Sediment (>6 inches)	

Sample Number: Number referenced to a sample location map.

Depth Code: Depth in feet of sample interval (0-0.5, 2-4, 10-12, etc.)

QC Identifier:	TB – Trip Blank	MS – Matrix Spike
	EB – Equipment Blank	MSD–Matrix Spike Duplicate
		MB – Matrix Blank

* L = Letter
* N = Number

Field duplicate samples will be assigned identifiers that do not allow the laboratory to distinguish them as field duplicates. Each sample container will be labeled prior to packing for shipment. The sample identifier, site name, date and time of sampling, and analytical parameters will be written on the label in waterproof ink and recorded in the field book.

9.5 Chain-of-Custody

- A Chain-of-Custody (COC) record (Figure 9-1 or similar) will accompany the sample containers during selection and preparation at the laboratory, during shipment to the field, and during return shipment to the laboratory.

- The COC will include the sample identities each sample container and the analytical parameters for each, and will list the field personnel that collected the samples, preservation method, the project name and number, the name of the analytical laboratory that will receive the samples, and the method of sample shipment.

- If samples are split and sent to different laboratories, such as to a specialty laboratory for fingerprint analysis, a copy of the COC record will be sent with each sample shipment.

- The COC will be completed by field personnel as samples are collected and packed for shipment.
- Erroneous markings will be crossed-out with a single line and initialed by the author.
- The REMARKS space will be used to indicate if the sample is a matrix spike, matrix spike duplicate, or matrix duplicate.
- Trip and field blanks will be listed on separate rows.
- After the samples have been collected and sample information has been listed on the COC form, the method of shipment, the shipping cooler identification number(s), and the shipper airbill number will be entered on the COC.
- Finally, a member of the sampling team will write his/her signature, the date, and time on the first RELINQUISHED BY space.
- One copy of the COC will be retained by sampling personnel. The other copy and the original will be sealed in a plastic bag and taped inside the lid of the shipping cooler.
- Sample shipments will be refrigerated at 4°C, typically by packing with bagged ice, to preserve the samples during shipment.
- After the shipping cooler is closed, custody seals provided by the laboratory will be affixed to the latch and across the front and back of the cooler lid, and signed by the person relinquishing the samples to the shipper.
- The seal will be covered with clear tape, and the cooler lid will be secured by wrapping with packing tape.
- The cooler will be relinquished to the shipper, typically an overnight carrier.
- The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the samples will not be analyzed until directed to do so.
- The samples must be delivered to the laboratory within 48 hours of collection.

9.6 Sample Documentation

The field team leader will retain a copy of the COC, and, in addition, the field team leader will ensure that the following information about each sample is recorded in the field book:

- Sample identifier;
- Identification of sampled media (e.g., soil, sediment, groundwater);
- Sample location with respect to known reference point;
- Physical description of sample location;
- Field measurements, (e.g., pH, temperature, conductivity, and water levels);
- Date and time of collection;
- Sample collection method;
- Volume of groundwater purged before sampling;
- Number of sample containers;
- Analytical parameters;
- Preservatives used; and
- Shipping information:
    - Dates and method of sample shipments;
    - Chain-of-Custody Record numbers;
    - Federal Express Air Bill numbers; and
    - Sample recipient (e.g., laboratory name).

Figures

RETEC
1001 W. Seneca Street, Ste 204, Ithaca, NY 14850
(607) 277-5716 - office, (607) 277-9057 - fax

Figure 4-1

Boring/Well ID:________________

Page ______ of ______

Project Name:	**Drilling Company:**	**Surface Comp:**
Project Number:	**Drilling Method:**	**Grout (bgs):**
Date Pre-Cleared:	**Rig Type:**	**Filter Pack (bgs):**
Date Started Drilling:	**Casing ID:**	**Riser (bgs):**
Date Finished Drilling:	**Water Level While Drilling (bgs):**	**Well Screen (bgs):**
Logged By:	**Total Depth of Boring (bgs):**	**Sump (bgs):**

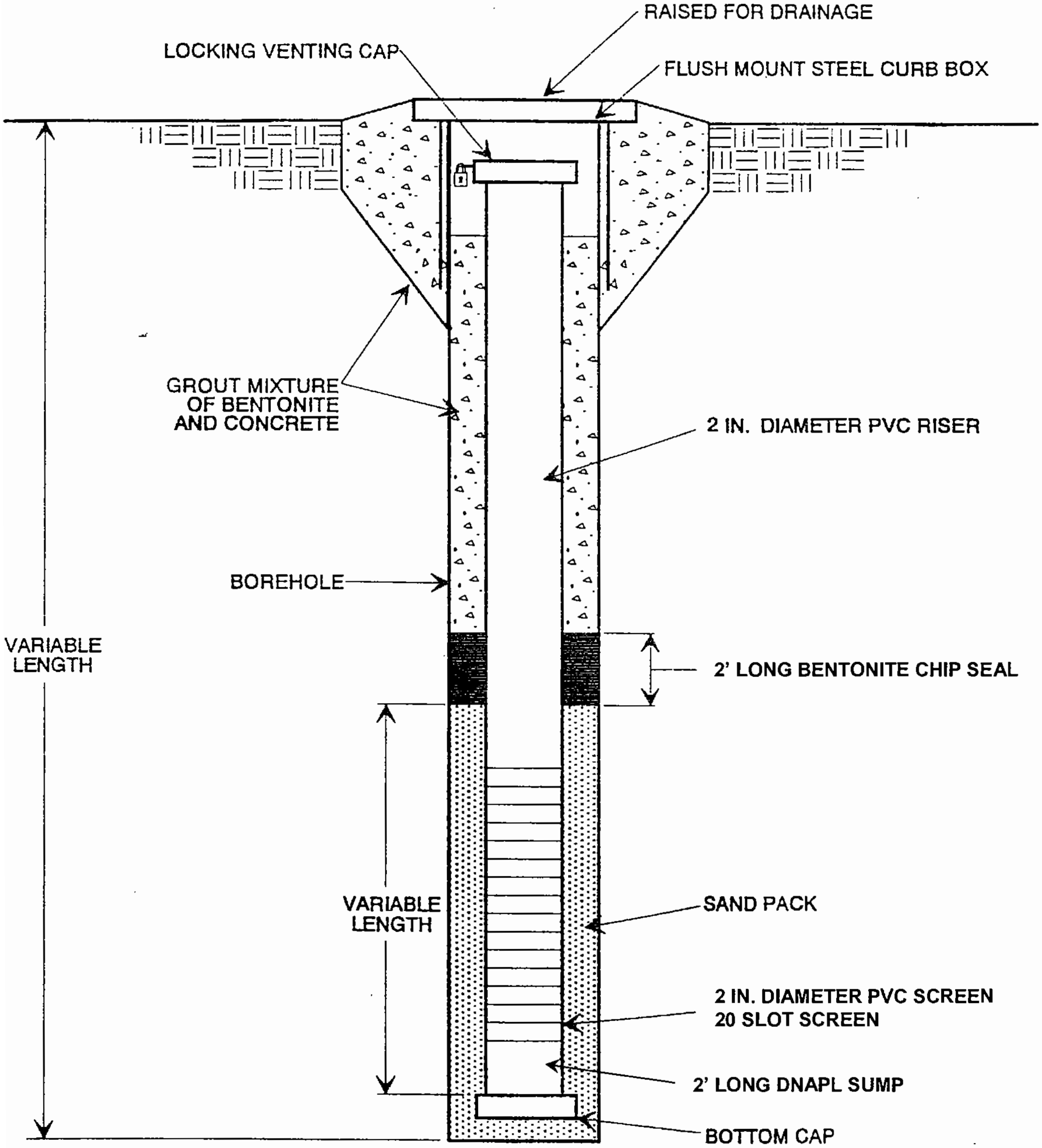
(Note: bgs = below ground surface)

Depth Range	Blow per 6 Inch	Re-covery ft/ft	PID	Lab Sample ID	USCS	Geologic Description Method:____________________

Lithology:		Comments:
1.)	5.)	
2.)	6.)	
3.)	7.)	
4.)	8.)	

FIGURE 4-2

TYPICAL MONITORING WELL CROSS SECTION

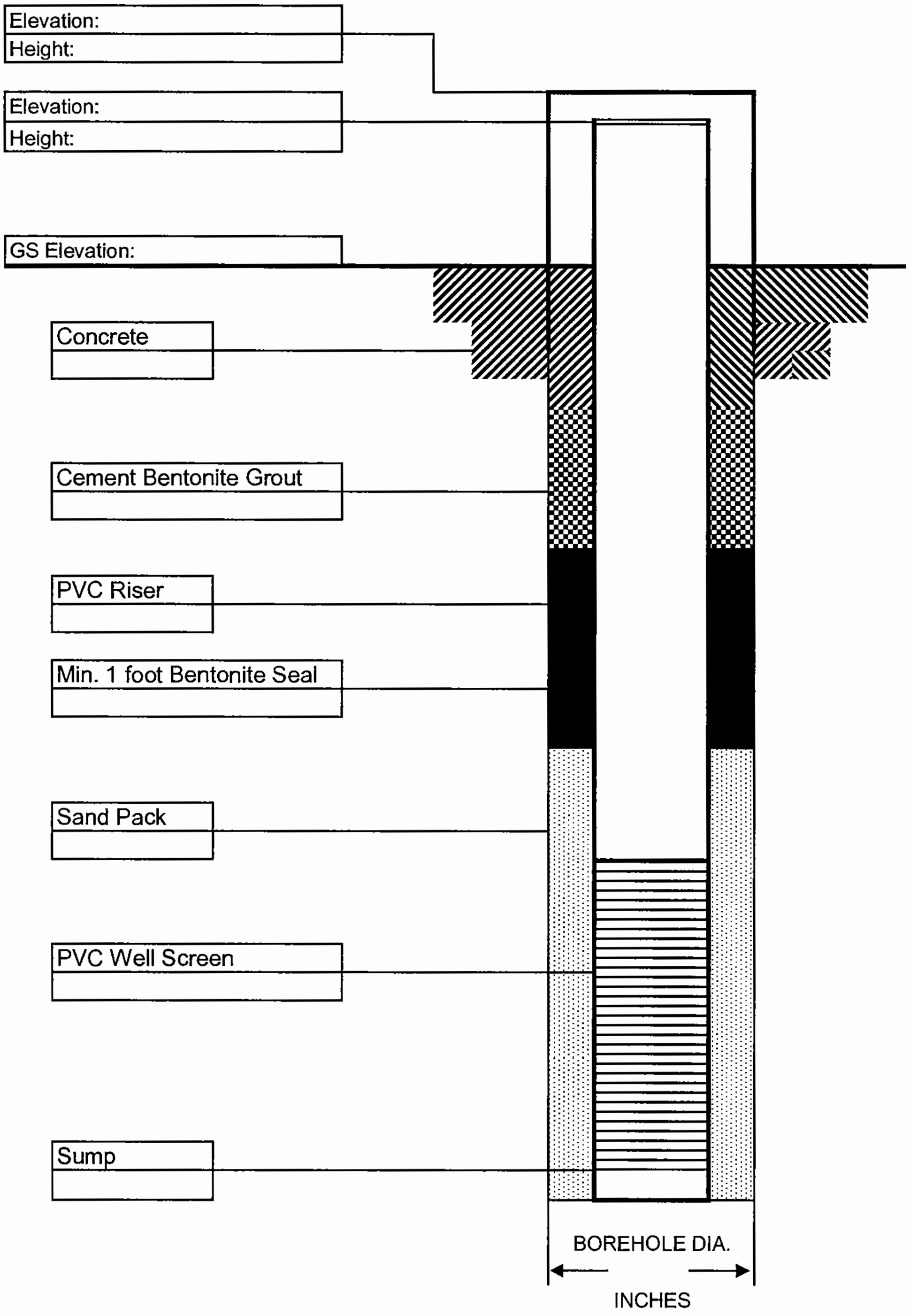


NOT TO SCALE

FIGURE 4-3

WELL CONSTRUCTION LOG

WELL NO.:	FACILITY/SITE NAME:
PROJ. NO.:	CLIENT:
INSPECTOR:	DRILLING CONTACTOR:
DATE START:	DATE END:
LOCATION:	DRILLING METHOD:



PROTECTIVE CASING

Material:
Diameter:
Depth BGS:
Water Tight Seal:
Flushmount:
Weep hole:

GUARD POSTS

Material:
No. & Size:

SURFACE PAD

Composition:
Size:

RISER PIPE

Material:
Schedule:
Joint Type:
O-ring:
Diameter:

GROUT

Amt cement:
Amt bentonite:
Amt water:
Tremied:
Interval:

SEAL

Material:
Type:
Amount Used:
Interval:

FILTER PACK

Material:
Brand Name:
Amount Used:
Grain Size Dist.:
Interval:
Tremied:

SCREEN

Material:
Diameter:
Slot Size & Type:
Interval BGS:

SUMP

Interval BGS:
Bottom Cap:

BACKFILL PLUG

Material:
Setup/Hydration Time:

Figure 5-1

LOW-STRESS GROUND WATER SAMPLING FORM

Project Number:
Project Name:
Date:
Weather:

Well ID:
Sample ID:
Permit Number:
Well Condition:

PRE-PURGE INFORMATION

Protective Casing Diameter (inch):
Inner Casing Diameter (inch):
Inner Casing Material:
Purge/Sample Method:
Pump Intake Setting* (feet):
PID/FID Reading of Well Headspace (ppm)
Before Cap Removal:
After Cap Removal:

Depth to Product* (feet):
Initial Depth to Water* (feet):
Product Thickness (feet):
Depth to Top of Screen* (feet):
Total Depth* (feet):
Water Column (feet):
Casing Volume (gal):
DTW After Pump Installed:

PURGING/SAMPLING INFORMATION

Time	Rate (gpm)	Gallons Purged	pH (SI Units)	Conductivity (µohms/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mv)	Depth to Water (ft)	Comments

Start Purge Date/Time:
End Purge Date/Time:
Total Volume Purged (gal):
Depth to Water After Purge* (feet):

Pre-Sample Depth to Water* (feet):
Start Sample Date/Time:
End Sample Date/Time:
Sampler Names:

Observations During Sampling (e.g. slow recharge, turbidity, odor, sheen, PID/FID readings):

Figure 5-1

LOW-STRESS GROUND WATER SAMPLING FORM

Sampling Sequence:

Analysis	Method	Container	Number of Bottles	Preservative	Comments
Volatile Organics					
Base/neutrals					
TPH					
Total Metals					
Dissolved Metals					
Cyanide					
Sulfate and Chloride					
Nitrate and Ammonia					
Preserved Inorganics					
Non-Preserved Inorg					
Bacteria					

Complete those analyses that apply.

Stabilization Ranges
Dissolved Oxygen: +/- 10%
Turbidity: +/- 10%
Specific Conductance: +/- 3%
Temperature: +/-3 %
pH: +/- 0.1 unit
Redox Potential: +/- 10mv

* = Measured from top of inner casing
DTW - Depth to Water
Thermo Environmental Instruments Model 580s OVM w/ 10.2 ev bulb
Water Levels Measured with an Electronic Water Level Meter
Field parameter meter calibration results are recorded in the field book.

Figure 9-1

Chain of Custody Record

№ 0476

The RETEC Group, Inc.
1001 W. Seneca Street, Suite 204 • Ithaca, NY 14850-3342
(607) 277-5716 Phone • (607) 277-9057 Fax
www.retec.com

RETEC

Project Name:	Project Number:	Page ____ of ____
Send Report To:	Sampler (Print Name):	
Address:	Sampler (Print Name):	
	Shipment Method:	
	Airbill Number:	
Phone:	Laboratory Receiving:	Purchase Order #:
Fax:		

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analysis Requested											Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By Laboratory):

QA/QC Level	Turnaround	Sample Receipt	
Level I ☐	Routine ☐	Total # Containers Received?	
Level II ☐	24 Hour ☐	COC Seals Present?	
Level III ☐	1 Week ☐	COC Seals Intact?	
Other ☐	Other ______	Received Containers Intact?	
		Temperature?	

White: Lab Copy   Yellow: PM Copy   Pink: Field Copy   Gold: PM/QA/QC Copy

Appendix E

Quality Assurance Project Plan Supplemental Remedial Investigation

Penn Yan Water Street MGP Site
Penn Yan, New York
NYSDEC Site No.: 8-62-009
Index #: D0-0002-9309

Prepared by:

The RETEC Group, Inc.
1001 W. Seneca St., Suite 204
Ithaca, NY 14850-3342

RETEC Project Number: NYSG2-19552

Prepared for:

NYSEG
James A. Carrigg Center
18 Link Drive
P.O. Box 5224
Binghamton, New York 13902-5224

August 18, 2006

Appendix E

Quality Assurance Project Plan Supplemental Remedial Investigation

Penn Yan Water Street MGP Site
Penn Yan, New York
NYSDEC Site No.: 8-62-009
Index #: D0-0002-9309

Prepared by:

The RETEC Group, Inc.
1001 West Seneca Street, Suite 204
Ithaca, NY 14850-3342

RETEC Project Number: NYSG2-19552

Prepared for:

NYSEG
James A. Carrigg Center
18 Link Drive
P.O. Box 5224
Binghamton, New York 13902-5224

Prepared by:

James H. Edwards

James H. Edwards, Senior Geologist

Reviewed by:

Greg Malzone BC

Greg Malzone, Project Chemist

August 9, 2006

Contents

Table of Contents

Table of Contents

List of Tables

List of Figures

1 Project Description

This Quality Assurance Project Plan (QAPP) specifies the quality control and quality assurance procedures to ensure the generation of statistically valid data. All procedures are equivalent to those specified in the U.S. EPA's QA/R-5 "U.S. EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations," "Test Methods for Evaluating Solid Waste," EPA SW-846, Third Edition, and its promulgated updates, and NYSDEC Analytical Services Protocols (ASP). to be used to ensure that data from the Supplemental Remedial Investigation (SRI) at the Penn Yan Water Street MGP site in Penn Yan, New York are precise, accurate, representative, comparable, and complete.

1.1 Introduction

The Penn Yan Water Street MGP site is approximately 0.8 acres in size and contains the former MGP Process Building, along with subsurface remnants of other MGP-related structures. MGP-related residuals have been identified in the vicinity of two former tar storage tanks and the Keuka Lake Outlet during previous investigations performed at the site. Additional investigation is required to fully delineate the MGP-related impacts. Additional information regarding the impacts observed at the site is included in the SRI Work Plan.

1.2 Scope of Work

The scope of work for the SRI is described in the project Work Plan. Samples will be collected from surface soil, soil borings, groundwater monitoring wells and shallow and deep sediments. The majority of these samples will be analyzed using United States Environmental Protection Agency (U.S. EPA) SW-846 Methods with NYSDEC ASP Category B laboratory data deliverables. Samples submitted for TCLP analysis will be analyzed using U.S. EPA SW-846 "Test Methods for Evaluating Solid Waste," November 1986, 3rd edition (and subsequent updates). Samples may also be analyzed for forensic purposes using non-standard methods.

1.3 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements to ensure that data of known and appropriate quality are obtained during sampling and analysis activities. Data developed during the site investigation will be used to fulfill the overall objectives of the program.

1.3.1 Data Quality Levels

There are five analytical levels of data quality which may be used to accomplish these site objectives. They are typically designated as follows:

- **Level I** - field screening or analysis using portable instruments, calibrated to non-compound specific standards;
- **Level II** - field analysis using portable instruments, calibrated to specific compounds;
- **Level III** - non-Contract Laboratory Program (ASP-CLP) laboratory methods;
- **Level IV** - ASP-CLP Routine Analytical Services methods; and
- **Level V** - non-standard analytical methods.

To meet the specific objectives of this project, Levels I, IV and V data quality objectives will be utilized.

Level I - Field Screening Methods

Level I screening will be performed for health and safety purposes according to procedures provided in the site specific health and safety plan (HASP) as well as to qualitatively assess the presence of VOCs in soil at the site.

Level IV - CLP/ASP Methodologies

Soil, sediment, and groundwater samples will be analyzed according to the U.S. EPA SW-846 Methods following procedures specified in the most recent edition of the NYSDEC ASP (July, 2005). Analytical reports will be prepared in accordance with NYSDEC ASP Category B laboratory data deliverable specifications. This level of data quality will ensure the generation of legally, and technically defensible data for project use. Level IV data will also be provided for the hazardous characteristics testing. If available cyanide is analyzed, a CLP-equivalent data package will be prepared for this analysis.

Level V - Non-Standard Methodologies

Hydrocarbon “fingerprint” testing and other forensic analyses are performed using non-standard analytical methods.

2 Project Organization

This SRI will be performed for NYSEG by The RETEC Group, Inc. (RETEC), an environmental consultant (the Consultant). RETEC will arrange for the drilling and analytical services and provide on-site field representative to perform the soil characterization, soil sampling, sediment, and groundwater sampling. The consultant will also perform the data interpretation and reporting tasks.

Key contacts for this project are as follows:

NYSEG Project Manager:

John Ruspantini
New York State Electric and Gas
James A. Carrigg Center
18 Link Drive
P.O. Box 5224
Binghamton, New York 13902-5224
Telephone: (607) 762-8787
Fax: (607) 762-8451

Consultant Project Manager/Senior Technical Advisor (RETEC):

Bruce Coulombe, P.G.
The RETEC Group, Inc.
1001 West Seneca Street, Suite 204
Ithaca, New York 14850
Telephone: (607) 277-5716
Fax: (607) 277-9057
Cell: (607) 351-9545

Consultant Site Manager (RETEC):

James H. Edwards
The RETEC Group, Inc.
1001 West Seneca Street, Suite 204
Ithaca, New York 14850
Telephone: (607) 277-5716
Fax: (607) 277-9057
Cell: (607) 351-2316

Consultant Field Team Leader (RETEC):

Scott Hauswirth
The RETEC Group, Inc.
1001 West Seneca Street, Suite 204
Ithaca, New York 14850
Telephone: (607) 277-5716
Fax: (607) 277-9057
Cell: (607) 342-4274

Consultant Quality Assurance Manager (RETEC):

Greg Malzone	The RETEC Group, Inc. Corporate One Office Park Building II, Suite 400 4075 Monroeville Boulevard Monroeville, Pennsylvania 15146 Telephone: (412) 380-0140 Fax: (412) 380-0141

Laboratory Representative (STL):

Dave Dunlap	STL Pittsburgh 301 Alpha Drive, RIDC Park Pittsburgh, PA 15238 Telephone: (412) 963-7058 Fax: (412) 963-2468

3 Quality Assurance/Quality Control (QA/QC) Objectives for Measurement of Data

3.1 Introduction

The quality assurance and quality control objectives for all quantitative measurement data include precision, accuracy, representativeness, completeness, and comparability. These objectives are defined in following subsections. They are formulated to meet the requirements of the NYSDEC ASP and U.S. EPA SW-846. The analytical methods and Contract Required Quantitation Limits (CRQLs) are provided in Section 7.

3.2 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value [U.S. EPA, 1987]. Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), range (maximum value minus minimum value), relative range, and relative percent difference (RPD) are common.

For this project, field sampling precision will be determined by analyzing coded duplicate samples (labeled so that the laboratory does not recognize them as duplicates) for the same parameters, and then, during data validation (Section 8), calculating the RPD for duplicate sample results.

Analytical precision will be determined by the laboratory by calculating the RPD for the results of the analysis of internal QC duplicates and matrix spike duplicates. The formula for calculating RPD is as follows:

$$RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where:

RPD = Relative Percent Difference.
V1, V2 = The two values to be compared.
|V1 - V2| = The absolute value of the difference between the two values.
(V1 + V2)/2 = The average of the two values.

The data quality objectives for analytical precision, calculated as the RPD between duplicate analyses, are presented in Tables 3.1 and 3.2.

3.3 Accuracy

Accuracy is a measure of the degree of agreement between a measured value and the true or expected value of the quantity of concern [Taylor, 1987], or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material, and is expressed as the percent of the known quantity which is recovered or measured. The recovery of a given analyte is dependent upon the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes which are close to the detection limits are less accurate because they are more affected by such factors as instrument "noise". Higher concentrations will not be as affected by instrument noise or other variables and thus will be more accurate.

Sampling accuracy may be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks. Additionally, initial and continuing calibrations must be performed and accomplished within the established method control limits to define the instrument accuracy before analytical accuracy can be determined for any sample set.

Accuracy is normally measured as the percent recovery (%R) of a known amount of analyte, called a spike, added to a sample (matrix spike) or to a blank (blank spike). The %R is calculated as follows:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

where:

%R = Percent recovery.
SSR = Spike sample result: concentration of analyte obtained by analyzing the sample with the spike added.
SR = Sample result: the background value, i.e., the concentration of the analyte obtained by analyzing the sample.
SA = Spiked analyte: concentration of the analyte spike added to the sample.

The acceptance limits for accuracy for each parameter are presented in Tables 3-1 and 3-2.

3.4 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter which is most concerned with the proper design of the sampling program [U.S. EPA, 1987]. Samples must be representative of the environmental media being sampled. Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree that is technically possible, that the data derived represents the in-place quality of the material sampled. Every effort will be made to ensure chemical compounds will not be introduced into the sample via sample containers, handling, and analysis. Decontamination of sampling devices and digging equipment will be performed between samples as outlined in the Field Sampling and Analysis Plan (FSAP). Analysis of field blanks, trip blanks, and method blanks will also be performed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded field duplicate samples. The analytical laboratory will also follow U.S. EPA-approved procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis, so the reported results are representative of the sample received.

Chain-of-custody procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling. Details of blank, duplicate and chain-of-custody procedures are presented in Sections 4 and 5.

3.5 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid (U.S. EPA, 1987). The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested. Completeness is defined as follows for all sample measurements:

$$\%C = \frac{V}{T} \times 100$$

where:

%C = Percent completeness.

V = Number of measurements judged valid.

T = Total number of measurements.

3.6 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another [U.S. EPA, 1987]. The comparability of all data collected for this project will be ensured by:

- Using identified standard methods for both sampling and analysis phases of this project;
- Requiring traceability of all analytical standards and/or source materials to the U.S. EPA or National Institute of Standards and Technology (NIST);
- Requiring that all calibrations be verified with an independently prepared standard from a source other than that used for calibration (if applicable);
- Using standard reporting units and reporting formats including the reporting of QC data;
- Performing a complete data validation on a representative fraction of the analytical results, including the use of data qualifiers in all cases where appropriate; and
- Requiring that all validation qualifiers be used any time an analytical result is used for any purpose.

These steps will ensure all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

4 Sampling Program

4.1 Introduction

The sampling program was developed to provide analytical and field data that can be used to satisfy the project objectives (as outlined in Section 1.2). This section presents sample container preparation procedures, sample preservation procedures, sample holding times, and field QC sample requirements. Sample locations, and the number of environmental and QC samples to be collected are summarized in Table 4-1. The sampling procedures are presented in the FSAP.

4.2 Sample Container Preparation and Sample Preservation

Sample containers delivered to the field will be new and certified clean by the vendor. Copies of the sample container QC analyses will be provided by the laboratory for each container lot used to obtain samples. The containers will be tagged, and the appropriate chemical preservatives will be added. The types of containers are shown in Tables 4-2 and 4-3.

Samples shall be preserved according to the preservation techniques listed in Tables 4-2 and 4-3. Preservatives will be added to the sample bottles by the laboratory prior to their shipment in sufficient quantities to ensure that proper sample pH is met. Following sample collection, the sample bottles should be placed on ice in the shipping cooler, cooled to 4°±2° C with ice, and delivered to the laboratory within 48 hours of collection under chain-of-custody. Chain-of-custody (COC) procedures are described in Section 5.

4.3 Sample Holding Times

The sample holding times for organic and inorganic parameters are listed in Tables 4-2 and 4-3 and are in accordance with the NYSDEC ASP requirements. Holding times for Toxicity Characteristic Leaching Procedure (TCLP) samples are given in Table 4-4. The NYSDEC ASP holding times must be strictly adhered to by the field and laboratory personnel.

4.4 Field QC Samples

Field QC samples will consist of a series of blanks and duplicates that will be collected to assess field sampling and decontamination performance. Two types of blanks to assess the collection of field samples will be collected and submitted to the laboratory for analyses (trip and equipment blanks). In addition, the precision of the laboratory analytical procedures will be assessed by collecting coded field duplicates and matrix spike/matrix spike duplicates (MS/MSDs). The blanks will include:

a. **Trip Blanks** - A Trip Blank will be prepared before the sample containers are sent by the laboratory. The trip blank will consist of one or more 40-ml VOA vials containing U.S.EPA Type 2 water, that accompanies all water sample bottles into the field and back to the laboratory. A trip blank will be included in each shipping container of water samples for volatiles analysis. The trip blank will be analyzed for volatile organic compounds to assess any contamination from sampling, storage, transport, and internal laboratory procedures.

b. **Equipment Blanks** - Equipment blanks are collected to determine the effectiveness of the decontamination procedures for sampling equipment. Equipment blanks are collected by passing U.S. EPA Type 2 water provided by the laboratory through decontaminated sampling equipment. It is usually collected as a last step in the decontamination procedure, prior to taking an environmental sample. The equipment blank will be analyzed for all of the parameters of interest.

The duplicates will consist of:

a. **Coded Field Duplicate** - To determine the representativeness of the sampling methods, coded field duplicates will be collected. The samples are termed "coded" because they will be labeled in such a manner that the laboratory will not be able to determine that they are duplicate samples. This will eliminate any possible bias that could arise.

b. **Matrix Spike/Matrix Spike Duplicate** - MS/MSD samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be taken at a frequency of one pair per 20 field samples. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes. The percent recoveries and RPDs are listed in Tables 3-1 and 3-2.

4.5 Forensic Analyses

Samples may be collected, archived, and analyzed for forensic purposes to differentiate impacted areas and/or sources at the site and area-wide setting of the site. The analyses will include:

- Saturated hydrocarbon SHC/TPH by U.S. EPA SW-846 Method 8100 mod.; and
- Alkylated PAHs via GC/MS-SIM Mode by U.S. EPA SW-846 Method 8270C mod.

The PAH fingerprint target analyte list is presented in Table 4-5.

5 Sample Tracking and Custody

5.1 Introduction

This section presents sample custody procedures for both the field and laboratory. Implementation of proper custody procedures for samples generated in the field is the responsibility of field personnel. Both laboratory and field personnel involved in the COC and transfer of samples will be trained on the purpose of the COC and specific procedures prior to implementation.

Evidence of sample traceability and integrity is developed by implementation of, and adherence to, the COC procedures. These procedures document the sample traceability from the selection and preparation of the sample containers by the laboratory, to sample collection, to sample shipment, to laboratory receipt and analysis. The sample custody flowchart is presented in Figure 5-1. A sample is considered to be in a person's custody if the sample is:

- In a person's possession;
- Maintained in view after possession is accepted and documented;
- Locked and tagged with Custody Seals so that no one can tamper with it after having been in physical custody; or
- In a secured area which is restricted to authorized personnel.

5.2 Field Sample Custody

A COC record (Figure 5-2 or equivalent) accompanies the sample containers from selection and preparation at the laboratory, during shipment to the field for sample containment and preservation, and during return to the laboratory. Triplicate copies of the COC must be completed for each sample set collected.

The COC lists the field personnel responsible for taking samples, the project name and number, the name of the analytical laboratory to which the samples are sent, and the method of sample shipment. The COC also lists a unique description of every sample bottle in the set. If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample.

The REMARKS space on the COC is used to indicate if the sample is an MS/MSD, or any other sample information for the laboratory. Since they are not specific to any one sample point, trip and equipment blanks are indicated on separate rows. Once all bottles are properly accounted for on the form, a sampler will write his or her signature and the date and time on the first

RELINQUISHED BY space. The sampler will also write the method of shipment, the shipping cooler identification number, and the shipper airbill number on the top of the COC. Errors will be crossed out with a single line in ink and initialed and dated by the author.

One copy of the COC is retained by sampling personnel and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler lid is closed, custody seals provided by the laboratory are affixed to the latch and across the back and front lids of the cooler, and the person relinquishing the samples signs their name across the seal. The seal is taped, and the cooler is wrapped tightly with clear packing tape. It is then relinquished by field personnel to personnel responsible for shipment, typically an overnight carrier. The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the sample(s) will not be analyzed.

5.3 Laboratory Sample Custody

The Project Manager or Field Team Leader will notify the laboratory of upcoming field sampling activities, and the subsequent shipment of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The following laboratory sample custody procedures will be used:

- The laboratory will designate a sample custodian who will be responsible for maintaining custody of the samples, and for maintaining all associated records documenting that custody.

- Upon receipt of the samples, the custodian will check cooler temperature, and check the original COC documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian will sign the COC record and record the date and time received.

- Care will be exercised to annotate any labeling or description errors. In the event of discrepant documentation, the laboratory will immediately contact the Project Manager or Field Team Leader as part of the corrective action process. A qualitative assessment of each sample container will be performed to note any anomalies, such as broken or leaking bottles. This assessment will be recorded as part of the incoming chain-of-custody procedure.

- The samples will be stored in a secured area and, if required, stored at a temperature of 4°±2° C. .

- A laboratory tracking record will accompany the sample or sample fraction through final analysis and final storage for control.
- A copy of the tracking record will accompany the laboratory report and will become a permanent part of the project records.

6 Calibration Procedures

6.1 Field Instruments

All field analytical equipment will be calibrated immediately prior to each day's use. The calibration procedures will conform to manufacturer's standard instructions and are described in the FSAP. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. Records of all instrument calibration will be maintained by the Field Team Leader in a notebook. Copies of all the instrument manuals will be maintained on-site by the Field Team Leader.

Calibration procedures for instruments used for monitoring health and safety hazards (e.g., photo-ionization detector and explosimeter) are provided in the Health and Safety Plan. More frequent calibration may be needed depending on conditions encountered in the field.

6.2 Laboratory Instruments

The laboratory will follow all calibration procedures and schedules as specified in the sections of the U.S. EPA SW-846 and NYSDEC ASP and subsequent updates as they apply to the instruments used for the analytical methods listed in Section 7.

7 Analytical Procedures

7.1 Introduction

Samples will be analyzed according to methods approved by the NYSDEC Analytical Services Protocol (ASP) program or U.S. EPA SW-846 "Test Methods for Evaluating Solid Waste," November 1986, 3rd edition and subsequent updates. The methods to be used for the laboratory analysis of water and soil samples are listed in Table 4-1. These methods were selected because they attain the DQOs required for the project, and the quantitation limits that are listed in Tables 7-1 and 7-2.

Should an analytical method be required that is outside the scope to the references cited above, the method used will be published by a nationally recognized authority (e.g., U. S. EPA, API) and approved for use by the regulatory agency.

The Project Manager shall ensure that laboratories (primary or subcontracted) generating data in support of NYSEG remediation and investigative projects maintain the relevant state and federal government regulatory accreditations, certifications, and/or registrations to perform the required analyses.

8 Data Reduction, Assessment, and Reporting

8.1 Data Reduction

Data collected during the field investigation will be reduced in accordance with NYSDEC ASP protocols. The procedures for identification and quantification of the analytes will be specified in the NYSDEC ASP or U.S. EPA SW-846 "Test Methods for Evaluating Solid Waste," November 1986, 3rd edition and subsequent updates and subsequent updates and peer reviewed by laboratory supervising personnel..

8.2 Data Quality Assessment

NYSDEC generally recommends two levels of data review for data collected during site investigations. The basic review is a Data Usability Summary Report (DUSR). Current NYSDEC policy is to require a DUSR for data collected during investigations on most sites. The more rigorous full data validation procedure is called for at sites where the data will be used in litigation. The laboratory deliverables (i.e., NYSDEC ASP Category B) are the same in both cases, and a DUSR can be upgraded to full validation at a later time if necessary. For this investigation a DUSR will be generated.

Based on the results of data assessment, the validated analytical results reported by the laboratory will be assigned one of the following usability flags by the data validator.

- "U" - Not detected. The associated number indicates the approximate sample concentration necessary to be detected..
- "UJ" - Not detected. The quantiation limit may be inaccurate of imprecise.
- "J" – Analyte is present. The reported value must be considered and estimated concentration because it may not be accurate or precise.
- “N” – Tentative identification. Consider present. Special methods may be needed to confirm it presence or absence in future sampling efforts.
- "R" – Unreliable result. Analyte may or may not be present in the sample. More supporting data are necessary to confirm the result.
- No Flag – Confirmed identification. The result was accepted without qualification.

Trained and experienced data assessors, who meet NYSDEC approval criteria, will perform the data assessment. Resumes of people performing data assessments and generating DUSRs will be provided to NYSDEC for review and approval.

8.2.1 Data Usability Summary Report (DUSR)

Data for this investigation will be evaluated accordance with the "U.S. EPA National Functional Guidelines for Organic Data Review," October 1999 and "U.S. EPA Validation Functional Guidelines for Inorganic Data Review," October 2004. A DUSR will be generated in accordance with U.S. EPA Region II guidelines.

A Data Usability Summary Report (DUSR) will be prepared which will include a review and an evaluation of all the analytical results. To ensure compliance with the analytical method protocols the following will be reviewed:

- Chain-of-custody forms;
- Holding times;
- Initial and continuing calibrations;
- Blanks;
- Laboratory control standards and matrix spikes;
- Surrogate recoveries;
- Matrix interference checks;
- Field and laboratory duplicates; and
- Sample data.

The DUSR will contain a description of the samples and parameters reviewed. Any deficiencies identified during the review will be noted and the effect on the generated data will be discussed. Any resampling or reanalysis recommendations will be then be made to the investigation's Project Manager. The results of the evaluation will be incorporated into the final investigative report.

8.2.2 Data Validation

The determination to validate data will be made based on the presence of data anomalies, suspect data, or laboratory issues. Data will be validated in accordance with the "U.S. EPA National Functional Guidelines for Organic Data Review," October 1999 and "U.S. EPA Validation Functional Guidelines for Inorganic Data Review," October 2004. If applicable, a data validation report will be prepared and reviewed by the Quality Assurance Officer (QAO) before issuance. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each sample delivery group will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times;

- Instrument tuning;
- Instrument calibrations;
- Blank results;
- System monitoring compounds or surrogate recovery compounds (as applicable);
- Internal standard recovery results;
- MS and MSD results;
- Field duplicate results;
- Target compound identification;
- Result calculations;
- Pesticide cleanup (if applicable);
- Compound quantitation and reported detection limits;
- System performance; and
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times;
- Calibrations;
- Blank results;
- Interference check sample;
- Laboratory check samples;
- Duplicates;
- Matrix Spike(s);
- Furnace atomic absorption analysis QC;
- ICP serial dilutions;
- Results verification and reported detection limits; and
- Result calculations.

8.3 Data Reporting

The data package provided by the laboratory will contain all items discussed above in a "CLP-equivalent" format. Data quality issues will be discussed in a case narrative included with the data report. The completed copies of the chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

Two copies of the analytical data packages and an electronic disk deliverable will be provided by the laboratory approximately 30 days after receipt of a complete sample delivery group. The Project Manager will immediately arrange for filing one package; a second copy, and the disk deliverable, will be used to generate summary tables. These tables will form the database for the assessment of the extent of the MGP-related impacts at the site.

The electronic deliverable format required is usually an ASCII comma-delimited file with the fields and character lengths summarized in Table 8-1. Alternatively, a comma-delimited MS Excel file may be issued. The final electronic deliverable format for each project will be determined in consultation with the NYSDEC project manager.

9 Internal Quality Control Checks and Frequency

9.1 Quality Assurance Batching

Each set of up to 20 samples submitted to the laboratory will be analyzed concurrently with associated calibration standards, method blanks, MS/MSD or laboratory duplicates, and QC check samples (if required by the protocol). Note that the MS/MSD samples will be provided with the field samples and identified by the field personnel.

9.2 Calibration Standards and Surrogates

All organic standard and surrogate compounds are checked by the method of mass spectrometry for correct identification and gas chromatography for degree of purity and concentration. All standards are traceable to a source of known quality certified by the U.S. EPA or NIST, or other similar nationally-recognized program. When the compounds pass the identity and purity tests, they are certified for use in standard and surrogate solutions. Concentrations of the solutions are checked for accuracy before release for laboratory use. Standard working solutions are replaced monthly or more frequently, based upon data indicating deterioration. No stock or working standard will be used past the manufacturer's expiration date.

9.3 Organic Blanks and Matrix Spike

Analysis of blank samples verifies that the analytical method does not introduce contaminants or detect "false positives". The blank water can be generated by reverse osmosis and Super-Q filtration systems, or distillation of water containing $KMnO_4$. The matrix spike is generated by addition of analyte and surrogate standards to a designated field sample.

9.4 Trip and Field Blanks

Trip blanks and equipment blanks will be utilized in accordance with the specifications in Section 4. These blanks will be analyzed to provide a check on sample bottle preparation and to evaluate the possibility of atmospheric or cross-contamination of the samples.

10 Quality Assurance Performance Audits and System Audits

10.1 Introduction

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the project QAO. These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate quality assurance management, the QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

10.2 System Audits

System audits may be performed by the QAO or designated auditors, and encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Project Manager requests, additional audits may occur.

10.3 Performance Audits

The laboratory is required to perform periodic analyses of Performance Evaluation (PE) samples to maintain NELAP accreditation and/or state regulatory certifications. Performance Evaluation samples obtained from a U.S. EPA-approved vendor or a state agency must be analyzed by the laboratory at least semi-annually.

10.4 Formal Audits

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria. Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be out of compliance shall be identified at exit interviews conducted with the involved management. Compliance deviation will be logged, and documented through audit findings which are attached to and are a part of the integral audit report. These audit finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

The Project Manager has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Project Manager within fifteen days of completion of the audit. Serious deficiencies will be reported to the Project Manager within 24 hours. All audit checklists, audit reports, audit findings, and acceptable resolutions are approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

11 Preventive Maintenance Procedures and Schedules

11.1 Preventive Maintenance Procedures

Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedure developed by the operators.

A list of critical spare parts will be established by the operator. These spare parts will be available for use in order to reduce downtime, if any. A service contract for rapid instrument repair or backup instruments may be substituted for the spare part inventory.

11.2 Schedules

Written procedures will establish the schedule for servicing critical items in order to minimize the downtime of the measurement system. The laboratory will adhere to the maintenance schedule, and arrange any necessary and prompt service. Required service will be performed by qualified personnel.

11.3 Records

Logs shall be established to record and control maintenance and service procedures and schedules. All maintenance records will be documented and traceable to the specific equipment, instruments, tools, and gauges. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories. The QAO may audit these records to verify complete adherence to these procedures.

12 Corrective Action

12.1 Introduction

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

12.2 Procedure Description

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Project Manager, Field Team Leader and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Corrective actions will be initiated as follows:

- When predetermined acceptance standards are not attained;
- When procedure or data compiled are determined to be deficient;
- When equipment or instrumentation is found to be faulty;
- When samples and analytical test results are not clearly traceable;
- When quality assurance requirements have been violated;
- When designated approvals have been circumvented;
- As a result of system and performance audits;
- As a result of a management assessment;
- As a result of laboratory/field comparison studies; and
- As required by U.S. EPA SW-846, and subsequent updates, or by the NYSDEC ASP.

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities, or documents ascertained to be noncompliant with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 12.1 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The Project Manager will be responsible for ensuring that all recommended corrective actions were implemented and effective, documented, and approved.

13 References

Taylor, J. K., 1987. Quality Assurance of Chemical Measurements. Lewis Publishers, Inc., Chelsea, Michigan

U.S. EPA, 1986. SW-846 "Test Method for Evaluating Solid Waste," dated November 1986 and subsequent updates. U.S. Environmental Protection Agency, Washington, D.C.

U.S. EPA, 1987. Data Quality Objectives for Remedial Response Actions Activities: Development Process, EPA/540/G-87/003, OSWER Directive 9355.0-7B U.S. Environmental Protection Agency, Washington, D.C.

U.S. EPA, 2001. CLP Organics Data Review and Preliminary Review based on CLP/SOW OLM04.2. SOP No. HW-6, Revision 12 dated September 2005. U.S. EPA Region II.

U.S. EPA, 2005. Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW - ILM05.3. SOP No. HW-2, Revision 13, dated January 1992. U.S. EPA Region II.

Tables

Table 3-1
Quality Control Limits for Water Samples

		Laboratory Accuracy and Precision					
Analytical Parameters	**Analytical Method (a)**	**Matrix Spike (MS) Compounds**	**MS/MSD (b) % Recovery**	**MS/MSD RPD (c)**	**LCS (d) % Recovery**	**Surrogate Compounds**	**Surrogate % Recovery**
VOCs (e)	8260 B	1,1-Dichloroethane	61-145	14	NA	Toluene-d8	88-110
		Trichloroethene	71-120	14	NA	Bromofluorobenzene	86-115
		Benzene	76-127	11	NA	1,2-Dichloroethane-d4	76-114
		Toluene	76-125	13	NA		
		Chlorobenzene	75-130	13	NA		
SVOCs (f)	8270 C	Phenol	12-110	42	NA	Nitrobenzene-d5	35-114
		2-Chlorophenol	27-123	40	NA	2-Fluorobiphenyl	43-116
		1,4-Dichlorobenzene	36-97	28	NA	Terphenyl-d14	33-141
		N-Nitroso-di-n-propylamine	41-116	38	NA	Phenol-d5	10-110
		1,2,4-Trichlorobenzene	39-98	28	NA	2-Fluorophenol	21-110
		4-Chloro-3-methylphenol	23-97	42	NA	2,4,6-Tribromophenol	10-123
		Acenaphthene	46-118	31	NA	2-Chlorophenol-d4	33-110 (g)
		4-Nitrophenol	10-80	50	NA	1,2-Dichlorobenzene-d4	16-110 (g)
		2,4-Dinitrotoluene	24-96	38	NA		
		Pentachlorophenol	9-103	50	NA		
		Pyrene	26-127	31	NA		
Inorganics (i)	6010B/6020 7470A (metals)	Inorganic Analyte	75-125 (j)	20 (k)	80-120	NA	NA
	9012 A (total cyanide)		75-125 (j)	20 (k)	80-120	NA	NA
	OIA-1677 (available cyanide)		75-125 (j)	25 (k)	85-115	NA	NA

(a) Analytical Methods: NYSDEC ASP-CLP Methods with Category B data deliverables, NYSDEC, 2000 and U.S. EPA SW-846, 3rd edition, Revision 1, November 1990.
(b) Matrix Spike/Matrix Spike Duplicate
(c) Relative Percent Difference
(d) Laboratory Control Sample
(e) Target Compound List Volatile Organic Compounds
(f) Target Compound List Semi-volatile Organic Compounds
(g) Limits are advisory only
(i) Target Analyte List Inorganics (metals and cyanide
(j) Matrix spike only
(k) Laboratory duplicate RPD
NA - Not Applicable

Table 3-2
Quality Control Limits for Soil Samples

		Laboratory Accuracy and Precision					
Analytical Parameter	**Analytical Method (a)**	**Matrix Spike (MS) Compounds**	**MS/MSD (b) % Recovery**	**MS/MSD RPD (c)**	**LCS (d) % Recovery**	**Surrogate Compounds**	**Surrogate % Recovery**
VOCs (e)	8260 B	1,1-Dichloroethane	59-172	22	NA	Toluene-d8	84-138
		Trichloroethene	62-137	24	NA	Bromofluorobenzene	59-113
		Benzene	66-142	21	NA	1,2-Dichloroethane-d4	70-121
		Toluene	59-139	21	NA		
		Chlorobenzene	60-133	21	NA		
SVOCs (f)	8270 C	Phenol	26-90	35	NA	Nitrobenzene-d5	23-120
		2-Chlorophenol	25-102	50	NA	2-Fluorobiphenyl	30-115
		1,4-Dichlorobenzene	28-104	27	NA	Terphenyl-d14	18-137
		N-Nitroso-di-n-propylamine	41-126	38	NA	Phenol-d5	24-113
		1,2,4-Trichlorobenzene	38-107	23	NA	2-Fluorophenol	25-121
		4-Chloro-3-methylphenol	26-103	33	NA	2,4,6-Tribromophenol	19-122
		Acenaphthene	31-137	19	NA	2-Chlorophenol-d4	20-130 (g)
		4-Nitrophenol	11-114	50	NA	1,2-Dichlorobenzene-d4	20-130 (g)
		2,4-Dinitrotoluene	28-89	47	NA		
		Pentachlorophenol	17-109	47	NA		
		Pyrene	35-142	36	NA		
Inorganics (i)	6010B/6020 7471A (metals)	Inorganic Analyte	75-125 (j)	20 (k)	80-120	NA	NA
	9012 A (total cyanide)		75-125 (j)	20 (k)	80-120	NA	NA

(a) Analytical Methods: NYSDEC ASP-CLP Methods with Category B data deliverables, NYSDEC, 2000 and U.S. EPA SW-846, 3rd edition, Revision 1, November 1990,

(b) Matrix Spike/Matrix Spike Duplicate
(c) Relative Percent Difference
(d) Laboratory Control Sample
(e) Target Compound List Volatile Organic Compounds
(f) Target Compound List Semi-volatile Organic Compounds
(g) Limits are advisory only

(h) Target Analyte List Inorganics (metals and cyanide)
(i) Matrix spike only
(j) Laboratory duplicate RPD
NA - Not Applicable

Table 4-1
Summary of Sampling and Analytical Program

Matrix	Parameter	Analytical Method	Field Samples				QC Blanks		Total
			Field Samples	Field Duplicate	MS/MSD$^{(a)}$ (Total)	Sub-Total	Trip Blank	Equip-ment Blank	
Surface Soil Samples*	SVOCs	U.S. EPA SW 8270C	4	1	1	6		1	7
	Total Cyanide	U.S. EPA SW 9012A	4	1	1	6		1	7
	TAL Metals	U.S. EPA SW 6010B/6020/7471A	4	1	1	6		1	7
Soil Boring and Test Pit Samples (approximate maximum total)	VOCs	U.S. EPA SW 8260B	47	2	4	53	2	2	57
	SVOCs	U.S. EPA SW 8270C	47	2	4	53		2	57
	Total Cyanide	U.S. EPA SW 9012A	47	2	4	53		2	57
	TAL Metals	U.S. EPA SW 6010B/6020/7471A	47	2	4	53		2	57
Groundwater Samples	VOCs	U.S. EPA SW 8260B	16	1	2	19	3	1	23
	SVOCs	U.S. EPA SW 8270C	16	1	2	19		1	20
	Total Cyanide	U.S. EPA SW 9012A	16	1	2	19		1	20
	TAL Metals	U.S. EPA SW 6010B/6020/7471A	16	1	2	19		1	20
	Available Cyanide (Note 1)	U.S. EPA OIA-1677	TBD	TBD	TBD	TBD		TBD	TBD
Sediment Samples (Note 2)	SVOCs	U.S. EPA SW 8270C	68	9	9	86		2	88
	Total Cyanide	U.S. EPA SW 9013/9012A	48	9	9	66		2	68
	TOC	Lloyd Kahn	68	9	9	86		2	88
Hazardous Characterization (soils)	TCLP Extraction	U.S. EPA Method 1311	2			2			2
	TCLP VOCs	U.S. EPA SW 1311/8260B	2	-	-	2	-	-	2
	TCLP SVOCs	U.S. EPA SW 1311/8270C	2	-	-	2	-	-	2
	TCLP Metals	U.S. EPA SW 1311/6010B/7470A	2	-	-	2	-	-	2
	Corrosivity	U.S. EPA SW-846 Chapter 7	2			2			2
	Ignitability	U.S. EPA 1010	2			2			2
	Reactive Cyanide	U.S. EPA SW-846 Chapter 7	2			2			2
	Reactive Sulfide	U.S. EPA SW-846 Chapter 7	2			2			2

(a) Matrix spike / matrix spike duplicate for organic analyses; matrix spike and laboratory duplicate for inorganic analysis.

* The number of duplicates, MS/MSD, and field QC samples can be reduced if these samples are obtained in conjunction with the sampling of other media during the sampling event.

\+ Rinse blanks not required if dedicated sampling equipment is used.

Note 1 Available Cyanide may be analyzed if significant concentrations of Total Cyanide are detected.

Note 2 Sediment analyses for deeper core samples include SVOC and TOC only.

TBD To be determined

Table 4-2
Water Sample Containerization, Preservation, and Holding Times

Analysis (b)	Bottle Type	Preservation (a)	Holding Time (b)
Volatile Organic Compounds (VOCs)	3-40 mL glass vial w/ Teflon septum	Cool to 4°C	10 days
Semi-volatile Organics Compounds (SVOCs)	2-1000 mL glass w/ Teflon lined cap	Cool to 4°C	5 days*
TAL Metals	1000 mL plastic bottle	Nitric Acid to pH < 2 Cool to 4°C	6 months, except mercury (26 days)
Total Cyanide	500 mL plastic bottle	NaOH to pH > 12 Cool to 4°C	10 days
Available Cyanide	500 mL plastic bottle	NaOH to pH > 12 Cool to 4°C	10 days

(a) All samples to be preserved in ice during collection and transport.

(b) Days from validated time of sample receipt (VTSR).

* Continuous liquid-liquid extraction is the required extraction for water samples for SVOCs. Continuous liquid-liquid extraction and concentration of water samples for SVOCs analysis must begin within 5 days and be completed within 7 days of VTSR. Extracts of water samples must be analyzed within 40 days of extraction.

Table 4-3
Soil and Hazardous Characteristics
Sample Containerization and Holding Times

Analysis [(b)]	Bottle Type	Preservation [(a)]	Holding Time[(b)]
Volatile Organic Compounds (VOCs)	Wide-mouth glass w/ teflon lined cap	Cool to 4°±2°C	10 days
Semi-Volatile Organic Compounds	Wide-mouth glass w/ teflon lined cap	Cool to 4°±2°C	10 days*
TAL Metals	Wide-mouth glass	Cool to 4°±2°C	6 months, except mercury (26 days)
Total Cyanide	Wide-mouth glass	Cool to 4°±2°C	10 days
TCLP Organic Compounds	Wide-mouth glass w/ teflon lined cap	Cool to 4°±2°C	See Table 4-4
TCLP Metals	Wide-mouth glass	Cool to 4°±2°C	See Table 4-4
Corrosivity	Wide-mouth glass	Cool to 4°±2°C	2 days
Ignitability	Wide-mouth glass	Cool to 4°±2°C	NA
Reactive Cyanide	Wide-mouth glass	Cool to 4°±2°C	14 days
Reactive Sulfide	Wide-mouth glass	Cool to 4°±2°C	7 days

(a) All samples to be preserved in ice during collection and transport.

(b) Days from date of sample collection.

* Sohxlet or sonication procedures for extraction and concentration of soil/waste samples for SVOCs must be completed within 5 days of VTSR. Extracts of soil samples must be analyzed within 40 days of extraction.

NA Not Applicable

Table 4-4
TCLP[a] Sample Holding Times

Analytical Parameter	From: Sample Collection To: TCLP Extraction*	From: TCLP Extraction To: Preparative Extraction	From: Preparative Extraction To: Determinative Analysis
Volatiles	7 days	NA	7 days
Semivolatiles	5 days	7 days	40 days
Mercury	5 days	NA	28 days
Metals (except Mercury)	180 days	NA	180 days

(a) Toxicity Characteristic Leaching Procedure

NA - Not Applicable

*Times shown are from verified time of sample receipt.

Table 4-5
PAH Fingerprinting Target Analyte List [1]

Compound

*Naphthalene (N)
C_1-Naphthalenes (N1)
C_2-Naphthalenes (N2)
C_3-Naphthalenes (N3)
C_4-Naphthalenes (N4)

Benzothiophene (BT)
C_1-Benzothiophenes (BT1)

Biphenyl (BP)
*Acenaphthylene (ACY)
*Acenaphthene (ACE)

Dibenzofuran (DBF)

Carbazole (CZ)

*Fluorene (F)
C_1-Fluorenes (F1)
C_2-Fluorenes (F2)
C_3-Fluorenes (F3)

Dibenzothiophene (D)
C_1-Dibenzothiophenes (D1)
C_2-Dibenzothiophenes (D2)
C_3-Dibenzothiophenes (D3)

*Anthracene (A)
*Phenanthrene (P)
C_1-Phenanthrenes/Anthracenes (P1)
C_2-Phenanthrenes/Anthracenes (P2)
C_3-Phenanthrenes/Anthracenes (P3)
C_4-Phenanthrenes/Anthracenes (P4)

Compound

Naphthobenzothiophene (NBT)
C_1-Naphthobenzothiophenes (NBT1)
C_2-Naphthobenzothiophenes (NBT2)
C_3-Naphthobenzothiophenes (NBT3)

*Fluoranthene (FL)
*Pyrene (PY)
C_1-Fluoranthenes/Pyrenes (FP1)
C_2-Fluoranthenes/Pyrenes (FP2)
C_3-Fluoranthenes/Pyrenes (FP3)

*Benz(a)anthracene (BAA)
*Chrysene (C)
C_1-Chrysenes/Benz(a)anthracenes (C1)
C_2-Chrysenes/Benz(a)anthracenes (C2)
C_3-Chrysenes/Benz(a)anthracenes (C3)
C_4-Chrysenes/Benz(a)anthracenes (C4)

*Benzo(b)fluoranthene (BBF)

*Benzo(k)fluoranthene (BKF)

Benzo(e)pyrene (BEP)

*Benzo(a)pyrene (BAP)

*Indeno(1,2,3-c,d)pyrene (INDP)

*Dibenzo(a,h)anthracene (DAHA)

*Benzo(g,h,i)perylene (BGHI)

Perylene (PER)

---

[1] *C_1, C_2, C_3, C_4 refer to number of alkyl carbon substitutes on the parent compound.*
* *Priority pollutant PAHs*

Table 7-1
Project Quantitation Limits

		Quantitation Limits		State of New York Standards	
Analysis/Compound	Method	Water (ug/L)	Soil (ug/Kg)	Water (ug/L) [(a)]	Soil (ug/Kg) [(b)]
Volatile Organics					
1 1,1,1-Trichloroethane	8260B	1	5	5	800
2 1,1,2,2-Tetrachloroethane	8260B	1	5	5	600
3 1,1,2-Trichloroethane	8260B	1	5	1	
4 1,1-Dichloroethane	8260B	1	5	5	200
5 1,1-Dichloroethene	8260B	1	5	5	400
6 1,2-Dichloroethane	8260B	1	5	0.6	100
7 1,2-Dichloroethene(total)	8260B	1	5	5	300
8 1,2-Dichloropropane	8260B	1	5	1	
9 2-Butanone (MEK)	8260B	10	20		300
10 2-Hexanone	8260B	10	20		
11 4-Methyl-2-pentanone(MIBK)	8260B	5	20		1000
12 Acetone	8260B	10	20		200
13 Benzene	8260B	1	5	1	60
14 Bromodichloromethane	8260B	1	5		
15 Bromoform	8260B	1	5		
16 Bromomethane	8260B	2	10	5	
17 Carbon Disulfide	8260B	1	5		2700
18 Carbon Tetrachloride	8260B	1	5	5	600
19 Chlorobenzene	8260B	1	5	5	1700
20 Chloroethane	8260B	2	10	5	1900
21 Chloroform	8260B	1	5	7	300
22 Chloromethane	8260B	2	10	5	
23 cis-1,3-Dichloropropene	8260B	1	5	0.4	
24 Dibromochloromethane	8260B	1	5	5	
25 Ethyl Benzene	8260B	1	5	5	5500
26 Methylene Chloride	8260B	1	5	5	100
27 Styrene	8260B	1	5	5	
28 Tetrachloroethene	8260B	1	5	5	1400
29 Toluene	8260B	1	5	5	1500
30 trans-1,3-Dichloropropene	8260B	1	5	0.4	
31 Trichloroethene	8260B	1	5	5	700
32 Vinyl Chloride	8260B	2	10	2	200
33 Xylenes(total)	8260B	1	5	5	1200

Table 7-1 (Continued)
Project Quantitation Limits

			Quantitation Limits		State of New York Standards	
	Analysis/Compound	Method	Water (ug/L)	Soil (ug/kg)	Water (ug/L)	Soil (ug/kg)
	Semivolatile Organics					
1	1,2,4-Trichlorobenzene	8270C	10	330	5	3400
2	1,2-Dichlorobenzene	8270C	10	330	3	7900
3	1,3-Dichlorobenzene	8270C	10	330	3	1600
4	1,4-Dichlorobenzene	8270C	10	330	3	8500
5	2,2'-oxybis(1-chloropropane)	8270C	10	330	5	
6	2,4,5-Trichlorophenol	8270C	25	330	1	100
7	2,4,6-Trichlorophenol	8270C	10	330	1	
8	2,4-Dichlorophenol	8270C	10	330	1	400
9	2,4-Dimethylphenol	8270C	10	330	1	
10	2,4-Dinitrophenol	8270C	25	330	1	200
11	2,4-Dinitrotoluene	8270C	10	330	5	
12	2,6-Dinitrotoluene	8270C	10	330	5	1000
13	2-Chloronaphthalene	8270C	10	330		
14	2-Chlorophenol	8270C	10	330	1	800
15	2-methyl-4,6-Dinitrophenol	8270C	25	330		
16	2-Methylnaphthalene	8270C	10	330		36400
17	2-Methylphenol	8270C	10	330	1	100
18	2-Nitrolaniline	8270C	25	330	5	430
19	2-Nitrophenol	8270C	10	330	1	330
20	3,3'-Dichlorobenzidine	8270C	10	330	5	
21	3-Nitroaniline	8270C	25	330	5	500
22	4-Bromophenyl-phenyl ether	8270C	10	330		
23	4-Chloro-3-methylphenol	8270C	10	330		240
24	4-Chloroaniline	8270C	10	330	5	220
25	4-Chlorophenyl-phenyl ether	8270C	10	330		
26	4-Methylphenol	8270C	10	330	1	900
27	4-Nitroaniline	8270C	25	330	5	
28	4-Nitrophenol	8270C	25	330	1	100
29	Acenaphthene	8270C	10	330		50000
30	Acenaphthylene	8270C	10	330		41000
31	Anthracene	8270C	10	330		50000
32	Benzo(a)anthracene	8270C	10	330		224
33	Benzo(a)pyrene	8270C	10	330		61
34	Benzo(b)fluoranthene	8270C	10	330		1100
35	Benzo(g,h,i)perylene	8270C	10	330		50000
36	Benzo(k)fluoranthene	8270C	10	330		1100
37	bis(2-Chloroethoxy) methane	8270C	10	330	5	
38	bis(2-Chloroethyl) ether	8270C	10	330	1	
39	bis(2-ethylhexyl)phthalate	8270C	10	330	5	50000
40	Butylbenzylphthalate	8270C	10	330		50000
41	Carbazole	8270C	10	330		
42	Chrysene	8270C	10	330		400
43	Di-n-butylphthalate	8270C	10	330	50	8100
44	Di-n-octylphthalate	8270C	10	330		50000
45	Dibenz(a,h)anthracene	8270C	10	330		14
46	Dibenzofuran	8270C	10	330		6200
47	Diethylphthalate	8270C	10	330		7100
48	Dimethylphthalate	8270C	10	330		2000
49	Fluoranthene	8270C	10	330		50000
50	Fluorene	8270C	10	330		50000
51	Hexachlorobenzene	8270C	NA (8081A)	330		410
52	Hexachlorobutadiene	8270C	10	330	0.5	
53	Hexachlorocyclopentadiene	8270C	10	330	5	
54	Hexachloroethane	8270C	10	330	5	
55	Indeno(1,2,3-cd)pyrene	8270C	10	330		3200
56	Isophorone	8270C	10	330		4400
57	N-Nitroso-di-n-propylamine	8270C	10	330		
58	N-nitrosodiphenylamine	8270C	10	330		
59	Naphthalene	8270C	10	330		13000
60	Nitrobenzene	8270C	10	330	0.4	200
61	Pentachlorophenol	8270C	25	330	1	1000
62	Phenanthrene	8270C	10	330		50000
63	Phenol	8270C	10	330	1	30
64	Pyrene	8270C	10	330		50000

Table 7-1 (Continued)
Project Quantitation Limits

		Estimated Quantitation Limits		State of New York Standards	
Analysis/Compound	Method	Water (ug/L)	Soil (ug/kg)	Water (ug/L)	Soil (ug/kg)
Metals					
1 Antimony	6000-7000	0.006	5.0	0.003	
2 Arsenic	6000-7000	0.01	1	0.025	7.5
3 Barium	6000-7000	0.01	1	1	300
4 Beryllium	6000-7000	0.005	0.5	0.003	0.16
5 Cadmium	6000-7000	0.005	0.5	0.005	1
6 Chromium	6000-7000	0.01	1	0.05	10
7 Copper	6000-7000	0.03	2.5	0.2	25
8 Lead	6000-7000	0.01	0.5	0.025	400(c)
9 Mercury	6000-7000	0.0002	0.01	0.0007	0.1
10 Nickel	6000-7000	0.04	4	0.1	13
11 Selenium	6000-7000	0.01	1	0.01	2
12 Silver	6000-7000	0.01	1	0.05	
13 Thallium	6000-7000	0.002	1	0.0005	
14 Zinc	6000-7000	0.02	2	2	20
15 Vanadium	6000-7000	0.05	1	0.0005	150
16 Cobalt	6000-7000	0.05	1		30
17 Aluminum	6000-7000	0.2	20		
18 Calcium	6000-7000	5	500		
19 Iron	6000-7000	0.1	10	0.3	2000
20 Magnesium	6000-7000	5	500	35	
21 Manganese	6000-7000	0.015	1.5	0.3	
22 Potassium	6000-7000	5	500		
23 Sodium	6000-7000	5	500	20	
24 Cyanide	9012A	0.01	0.01	200	
25 Cyanide (available)	OIA-1677	2	40		

Notes:
N/A - Not Applicable
(a) - Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, NYSDEC, October 1993
(b) - Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994
(c) - EPA Guidance on Residential Lead-Based Paint, Lead Contaminated Dust, and Lead Contaminated Soil, July 14, 1994

Table 7-2
TCLP
Practical Quantitation Limits (PQLs)

TCLP VOLATILE	SW-846 Analysis	Water (ug/L)
Benzene	8260B	5
Carbon Tetrachloride	8260B	5
Chloroform	8260B	5
1,2-Dichlorethane	8260B	5
1,1-Dichloroethene	8260B	5
2-Butanone	8260B	100
Tetrachloroethene	8260B	5
Trichloroethene	8260B	5
Vinyl Chloride	8260B	100

TCLP SEMIVOLATILE	SW-846 Analysis	Water (ug/L)
2-Methylphenol	3510 / 8270C	10
3 & 4-Methylphenol	3510 / 8270C	10
1,4-Dichlorobenzene	3510 / 8270C	10
2,4-Dinitrotoluene	3510 / 8270C	10
Hexachlorobutadiene	3510 / 8270C	10
Hexachloroethane	3510 / 8270C	10
Hexachlorobenzene	3510 / 8270C	10
Nitrobenzene	3510 / 8270C	10
Pentachlorophenol	3510 / 8270C	50
Pyridine	3510 / 8270C	ND
2,4,5-Trichlorophenol	3510 / 8270C	10
2,4,6-Trichlorophenol	3510 / 8270C	10

TCLP METALS	SW-846 Analysis	Water (mg/L)
Arsenic	3010 / 6010	0.05
Barium	3010 / 6010	0.002
Cadmium	3010 / 6010	0.004
Chromium	3010 / 6010	0.007
Lead	3010 / 6010	0.04
Selenium	3010 / 6010	0.07
Silver	7760 / 6010	0.007
Mercury	7470	0.0002

ND - Not Determined

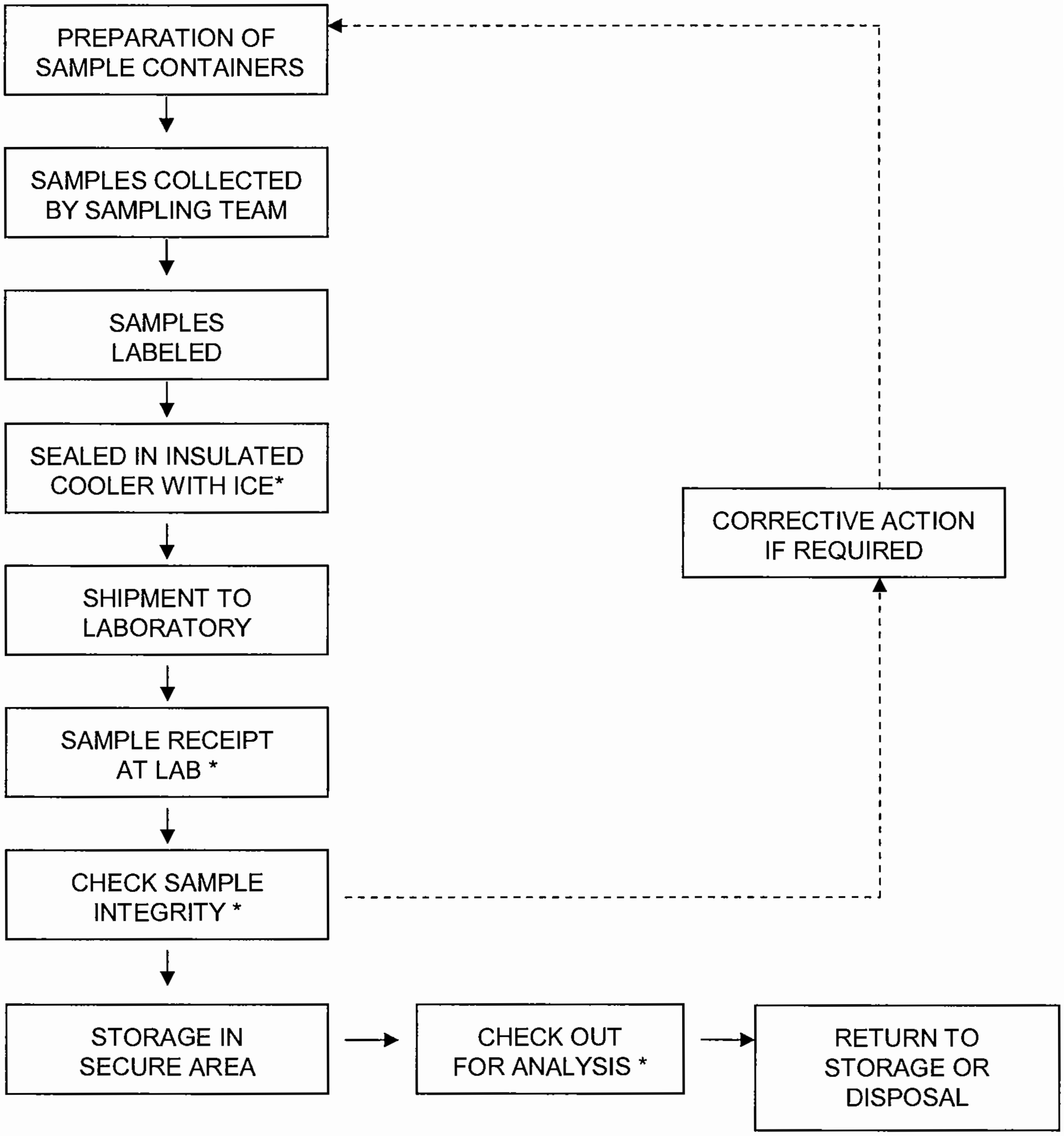
Table 8-1
Field and Character Lengths for Disk Deliverable

Description	Length	Format
Field Sample ID (as shown on COC)	15	Character
CAS. No. (including -'s)	10	Character
Parameter Name	31	Character
Concentration	13	Numeric
Qualifier	4	Character
Units	8	Character
SDG	8	Character
Lab Sample ID	15	Character
Date Sampled (from COC)	D	Date
Matrix (soil/water/air)	5	Character
Method Detection Limit	13	Numeric
Method Code	8	Character
Lab Code	6	Character

Figures

Figure 5-1

SAMPLE CUSTODY



* REQUIRES SIGN-OFF ON CHAIN-OF-CUSTODY FORM

Figure 5-2

Chain of Custody Record

№ 0476

The RETEC Group, Inc.
1001 W. Seneca Street, Suite 204 • Ithaca, NY 14850-3342
(607) 277-5716 Phone • (607) 277-9057 Fax
www.retec.com

RETEC

Page____of____

Purchase Order #:____________

Project Name:	Project Number:
Send Report To:	Sampler (Print Name):
Address:	Sampler (Print Name):
	Shipment Method:
	Airbill Number:
Phone:	Laboratory Receiving:
Fax:	

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analysis Requested											Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By Laboratory):

QA/QC Level	Turnaround	Sample Receipt	
Level I ☐	Routine ☐	Total # Containers Received?	
Level II ☐	24 Hour ☐	COC Seals Present?	
Level III ☐	1 Week ☐	COC Seals Intact?	
Other ☐	Other _____	Received Containers Intact?	
		Temperature?	

White: Lab Copy Yellow: PM Copy Pink: Field Copy Gold: PM/QA/QC Copy

Figure 12-1 Corrective Action Request

CORRECTIVE ACTION REQUEST

Number: ____________________________ Date: _____________

TO: ____

You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _______________

CONDITION:

REFERENCE DOCUMENTS:

RECOMMENDED CORRECTIVE ACTIONS:

___________	______	___________	_________	____________	_________
Originator	Date	Approval	Date	Approval	Date

RESPONSE

CAUSE OF CONDITION

CORRECTIVE ACTION

(A) RESOLUTION

(B) PREVENTION

(C) AFFECTED DOCUMENTS

C.A. FOLLOWUP:

CORRECTIVE ACTION VERIFIED BY: _______________________________ DATE: ______________

Appendix F

Community Air Monitoring Plan Supplemental Remedial Investigation

Penn Yan Water Street MGP Site
Penn Yan, New York

Prepared by:

The RETEC Group, Inc.
1001 W. Seneca St., Suite 204
Ithaca, NY 14850-3342

RETEC Project Number: NYSG2-19552

Prepared for:

NYSEG
James A. Carrigg Center
18 Link Drive
P.O. Box 5224
Binghamton, New York 13902-5224

August 18, 2006

Appendix F

Community Air Monitoring Plan Supplemental Remedial Investigation

Penn Yan Water Street MGP Site
Penn Yan, New York

Prepared by:

The RETEC Group, Inc.
1001 W. Seneca St., Suite 204
Ithaca, NY 14850-3342

RETEC Project Number: NYSG2-19552

Prepared for:

NYSEG
James A. Carrigg Center
18 Link Drive
P.O. Box 5224
Binghamton, New York 13902-5224

Prepared by:

Scott Hauswirth, Geologist

Reviewed by:

James d. Edwards
James Edwards, Senior Geologist

August 18, 2006

Contents

Table of Contents

List of Tables

List of Figures

List of Appendices

1 Introduction

This document provides the Community Air Monitoring Plan (CAMP) that will be implemented during the Supplemental Remedial Investigation (SRI) of the NYSEG (New York State Electric and Gas Corporation) manufactured gas plant (MGP) site, located on Water Street in the Village of Penn Yan, New York. The location and layout of the site is shown on Figure 1.

The Water Street MGP site is located in a commercial and residential neighborhood. This CAMP presents methods and procedures that will be used to provide protection to potential receptors by assuring that the investigation work activities do not spread constituents off-site through the air.

This CAMP specifically applies to the SRI phase of work for the Water Street site. The SRI fieldwork is scheduled to be performed in the fall of 2006, as described in the document "*Supplemental Remedial Investigation Work Plan, Penn Yan Water Street MGP Site, Penn Yan, New York*", dated August 18, 2006.

The SRI fieldwork involves the completion of test pits, subsurface soil borings, the installation of monitoring wells, the collection of soil and groundwater samples, and the installation of sediment vibra-cores and sediment sample collection.

The objectives of this CAMP are to:

- Ensure that the airborne concentrations of constituents of concern (COC) are minimized to protect human health and the environment;
- Provide an early warning system so that potential emissions can be controlled on site at the source; and
- Measure and document the concentrations of airborne COC to confirm compliance with regulatory limits.

The community air monitoring will be performed around the site perimeter, and will measure the concentrations of organic vapors and dust during all ground-intrusive activities (soil boring and well installations).

This CAMP is a companion document to RETEC's site-specific Health and Safety Plan (HASP). The HASP is a separate document and is directed primarily toward protection of on-site workers within the designated work zones.

2 Constituents of Concern and Action Levels

The Water Street MGP site is known to have tar impacts dating from the site's historical use as a MGP. As such, the constituents of concern are volatile and semi-volatile organic compounds (VOCs and SVOCs). The primary VOCs of concern are benzene, ethylbenzene, toluene, and xylene (the BTEX compounds). VOCs are more volatile than SVOCs and are generally of greater concern when monitoring the air quality during MGP site investigations.

Airborne dust is also a concern and must be monitored and controlled due to its ability to co-transport adsorbed constituents and because of its nuisance properties.

Odors, though not necessarily indicative of high constituent concentrations, could create a nuisance and will be monitored and controlled to the extent practicable.

State and federal regulatory agencies have provided action levels for many of these constituents. The action levels are the allowable airborne concentrations above which respiratory protection or other health and safety controls are required. For work at the Water Street MGP site, the following levels should not be exceeded for more than 15 consecutive minutes at the downwind perimeter of the site:

Benzene	1 part per million (ppm).
Total VOCs	5 ppm.
Dust	150 micrograms per cubic meter ($\mu g/m^3$).

The action levels cited here are above (in addition to) the background ambient (upwind) concentration.

3 Air Monitoring Equipment and Methods

Air quality monitoring will be performed for total VOCs, benzene, and dust as outlined below.

Two perimeter locations will be established each day and an air monitoring technician will check the instrumentation at each of these locations frequently during the work. Typically there will be monitoring locations at one upwind site perimeter location and one downwind perimeter locations. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. Field personnel will be prepared to monitor multiple locations in the event that there is little wind or if the wind direction changes frequently.

The monitoring instruments will be calibrated at the start of each workday, and again during the day if the performance of an instrument is in question.

3.1 VOC and Benzene Monitoring

3.1.1 Ambient Air Monitoring

VOC monitoring will be performed using three field photoionization detectors (PIDs) (RAE Systems MiniRAE or equivalent). The monitoring instruments will be checked by a technician every 15 minutes, and the real-time measurements recorded. The PIDs will be equipped with an audible alarm to indicate exceedance of the action level.

If requested by the NYSDEC, 15-minute running average concentrations may be calculated, which can then be compared to the action levels. If real-time measurements of total VOCs indicates that the action level is exceeded, then the benzene concentration will also be determined at that location using benzene-specific colorimetric tubes.

PID measurements will be made at one upwind and one downwind location around the work area. The locations of the instruments may be changed during the day to adapt to changing wind directions.

3.2 Particulate (Dust) Monitoring

Particulate (dust) monitoring will be performed during drilling activity at the Site. Two particulate monitors (TSI DustTrak or equivalent) will be used for continuous real-time dust monitoring. The monitoring instruments will be checked by a technician every 15 minutes, and the real-time measurements recorded. If requested by the on-site NYSDEC representative, a 15-minute average concentration may be determined.

In addition, fugitive dust migration will be visually assessed during all work activities, and the observations recorded.

Measurements will be made at one upwind and one downwind locations around the work area. The locations of the instruments may be changed during the day to adapt to changing wind directions.

4 Emission Control Plan

4.1 Ambient Air

Odor, vapor, and dust control will be required for this project due to the close proximity commercial buildings and public roadways and sidewalks. The attached Table 1 provides a response chart for the monitoring and control of vapor emissions. Table 2 provides a list of emergency contacts.

If the concentration of total VOCs at the site perimeter exceeds 5 ppm (or the benzene level exceeds 1 ppm) above background over a 15-minute period, then work activities will be temporarily halted. If the total VOC level then decreases below 5 ppm (and the benzene level drops below 1 ppm) over background, work activities will resume. If the total VOC levels at the site perimeter persist at levels in excess of 5 ppm (or the benzene level persists over 1 ppm) over background, work activities will be halted, the source of the vapors identified, and corrective actions taken to abate the emissions until the concentrations drop below the action levels.

Site perimeter dust concentrations will also be monitored continuously. In addition, dust migration will be visually assessed during all work activities. If the downwind dust level is 150 $\mu g/m^3$ greater than the background level for a 15-minute period, or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind dust levels do not exceed 150 $\mu g/m^3$ above the background level and provided that no visible dust is migrating from the work area.

Typical emission control measures may include:

- Apply water for dust suppression;
- Relocate operations, if applicable; and
- Reassess the existing control measures.

5 Odor Control Procedures

This section outlines the procedures to be used to control odors that may be generated during the SRI field activities. The investigation program will be conducted using two principal remedial investigation techniques that may generate odors: test pit excavations and subsurface soil borings. The remainder of this section is intended to provide site managers, representatives of NYSEC and NYSDOH, and the public with information summarizing typical odor control options, and to provide some guidance for their implementation. A description of potential sources of odors and methods to be used for odor control is presented in the following sections.

5.1 Potential Sources of Odors

Generally, the residuals encountered at former MGP sites are well defined. They are related to residual coal tar-like materials and petroleum, and principally contain VOCs, polynuclear aromatic hydrocarbons (PAHs), and a number of inorganic constituents, including metal-complexed cyanide compounds, and metals. Constituents of MGP tar or petroleum products can produce odor emissions during investigation activities when they are unearthed during in backhoe test pits and soil borings. When this occurs, VOCs and light-end SVOCs can volatilize into the ambient air. Some MGP residuals can cause distinctive odors that are similar to mothballs, roofing tar, or asphalt driveway sealer. However, the constituent concentrations generally associated with these odors are typically significantly less than levels that might pose a potential health risk. It is important to note that the CAMP will provide for continual monitoring of VOCs and dust during the fieldwork to monitor for any potential release of constituents which may pose a threat to health.

5.2 Odor Monitoring

The field investigation personnel will record observations of odors generated during the implementation of the Work Plan. When odors attributable to the uncovering of impacted media are generated in the work area during intrusive activities such as soil borings or excavation of test pits, observations will also be made at the down-wind limit of the MGP site, in order to assess the potential for off-site odors. The down-wind odor monitoring will be performed in conjunction with the PID and dust monitoring program described in this CAMP.

Upon detection of odors at the site perimeter, site controls, starting in the work area, will be implemented. The site controls described in the following sections will be used to assist with odor mitigation. Note that the goal of the Odor Mitigation Plan is to minimize, and to prevent where practicable, the off-site migration of odors. Due to the short distances between any work area at the site and the property line, site controls will be implemented proactively when odors are detected in the breathing zone at any work area.

5.3 General Site Controls

Several general excavation or drilling procedure site controls that will be implemented include:

- Every effort will be made to minimize the amount of time that impacted material is exposed to ambient air at the site.
- For the test pit excavations, it may be possible to move some amount of soil around within the footprint of the test pit excavation in order to minimize the amount of soil removal and subsequent stockpiling of impacted soil at the ground surface. The use of in-excavation stockpiling of test pit soil will be evaluated on a case-by-case basis, and will only be performed with the approval of the NYSDEC field representative, and will be completed only if it does not impede the collection of subsurface soils or the full delineation of the subsurface features being investigated.
- Drill cuttings from the hollow stem auger borings will be containerized as soon as possible during completion of each soil boring.
- Loading of excavated debris or soil that has been found by the site manager to be unsuitable material to return to test pits may generate odors. Every effort will be made to complete this work as quickly as possible and to keep these materials covered at all times.
- Meteorological conditions are also a factor in the generation and migration of odors. Some site activities may be limited to times when specific meteorological conditions prevail, such as when winds are blowing away from a specific receptor.

5.4 Secondary Site Controls

If substantial odors still present an issue following implementation of the above procedures, secondary controls will be enacted. The site manager will work through the applicable list of secondary controls until the perimeter odor issues are resolved. The site manager will work closely with NYSEG and NYSDEC during this task. Final selection of controls will be dependent on field conditions encountered. Secondary controls include the following:

- For stockpiled impacted soil, temporary tarps or polyethylene covers will be used to control odors.
- The placement of portable barriers close to small active source areas (test pits) can elevate the discharge point of emissions to facilitate dispersion and minimize the effect on downwind receptors. The barriers can be constructed using materials such as

plastic "Jersey barriers", or fence poles and visual barrier fabric/plastic. The barriers are placed as temporary two or three-sided structures around active test pit or other intrusive investigation areas, oriented such that the barriers are placed on the upwind and downwind sides of the source. If only one side of the source can be accessed, then the barrier should be placed on the downwind side.

- Two agents that can be sprayed over impacted soil have been determined to be effective in controlling emissions. They include odor suppressant solution (BioSolve™), and hydro-mulch. These agents may be used where tarps cannot be effectively deployed over the source material, or where tarps are ineffective in controlling odors:
  - BioSolve™ can provide immediate, localized control of odor emissions. Information regarding the preparation and use of BioSolve™ is provided in Appendix A.
  - Hydromulch - Although it is unlikely that it will be necessary, a modified hydromulch slurry may be used to cover inactive sources for extended periods of time (up to several days). The hydromulch, typically cellulose fibers (HydroSealR) is modified by mixing a tackifier (glue) with the mulch and water to form a slurry. It is applied using a standard hydroseed applicator to a thickness of ¼ inch. The material forms a sticky, cohesive, and somewhat flexible cover. Reapplication may be necessary if the applied layer becomes desiccated or begins to crack.

5.5 Record Keeping and Communication

Similar to readings recorded during the monitoring specified in the CAMP, all odor monitoring results will be recorded in the field log book or other air monitoring forms, and be available for review by the agencies.

The site supervisor will also provide information on odor monitoring and odor management to residents of the neighborhood should they inquire. In the event that odors persist after these efforts, work will be temporarily discontinued until a mutually agreeable solution with NYSEG, NYSDEC, and NYSDOH staff can be worked out which allows the work to be completed while minimizing the off-site transport of nuisance odors.

6 Documentation and Reporting

Data generated during perimeter air monitoring will be recorded in field logs and summarized daily in spreadsheets. The electronic measurements from the PIDs and dust meters will be downloaded each day, reviewed, and archived. Exceedances of the action levels, if any, and the actions to be taken to mitigate the situations, will be discussed immediately with the on-site representatives. Summaries of all air monitoring data will be provided to NYSDEC as requested.

Tables

Table 1 Vapor Emission Response Chart

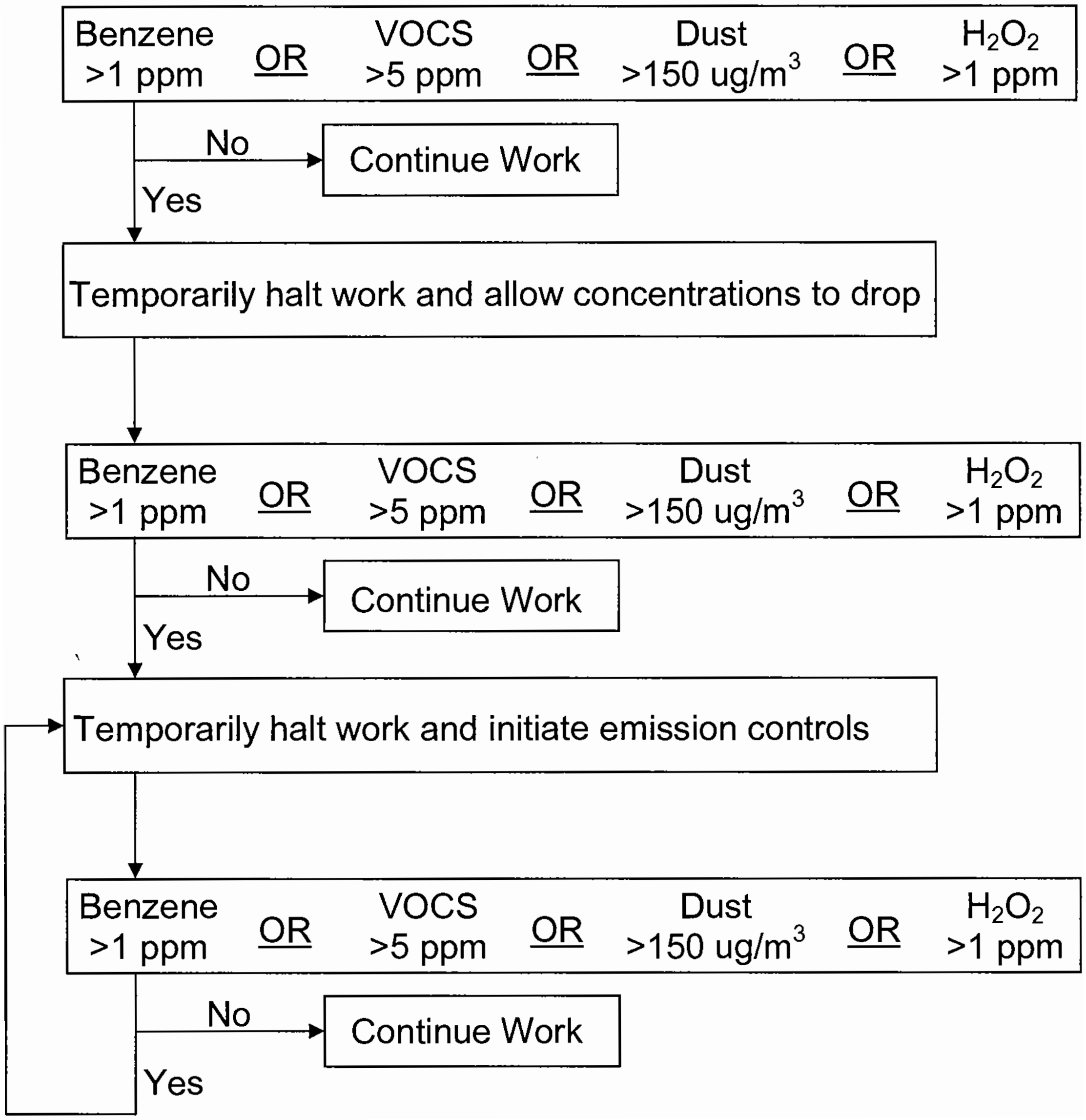
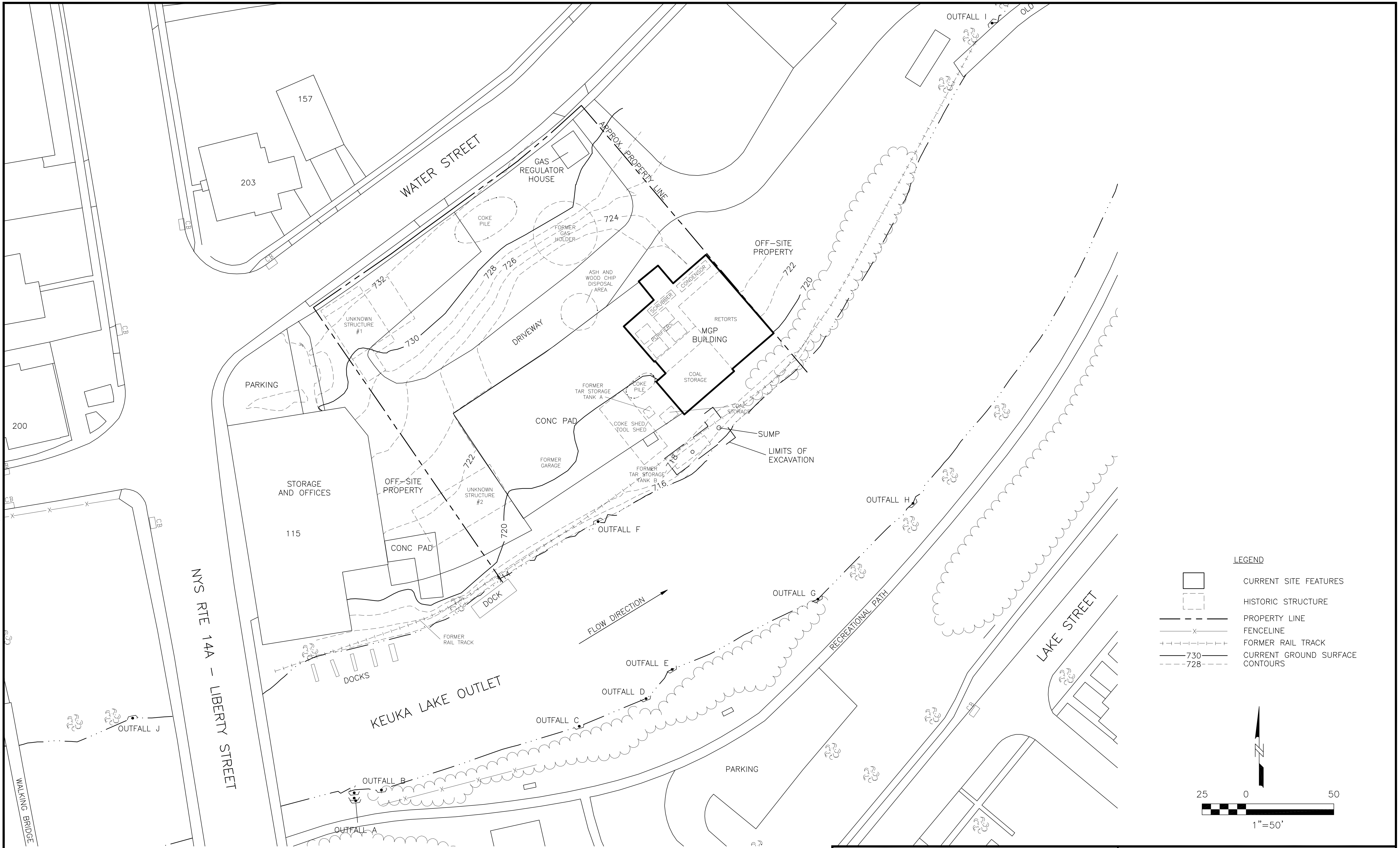


Table 2 Emergency Contacts and Telephone Numbers

Fire:	911	
Police:	911	
Ambulance:	911	
RETEC Contacts	James Edwards Bruce Coulombe Scott Hauswirth	(607) 351-2316 (cellular) (607) 351-9545 (cellular) (607) 342-4274 (cellular)
NYSEG Contact	John Ruspantini	(607) 762-8787

Figures



File: J:\19552\CUR_HIST_FEATURES.dwg Layout: ANSI_BI-LJ User: mwilliamson Plotted: Aug 03, 2006 - 3:01pm Xref's:

RETEC

PENN YAN WATER STREET
FORMER MGP SITE

CURRENT AND HISTORICAL
SITE FEATURES

DATE: 8/03/06

DRWN: MAW/BIL

FIGURE 1

Appendix A

Vapor Control Information

BioSolve® Hydrocarbon Mitigation Technology

...Is Making A Difference!

VAPOR SUPPRESSION / ODOR CONTROL

BioSolve® offers a relatively simple and cost effective method of suppressing Odors and VOC release from soils, during excavation, loading, stockpiling, etc. The following guidelines will apply to the most common situations encountered on site.

In most cases a 3% BSW solution (1 part **BioSolve®** concentrate to 33 parts water) will be adequate to keep vapor emissions within acceptable limits and control fugitive odor problems on contact. Although, some sites may only require a 2% solution, up to a 6% solution may be recommended on sites with elevated levels or particularly difficult/ mixed stream contaminants are present.

The **BioSolve®** solution should be applied evenly to the soil surface in sufficient quantity to saturate the surface area. As a general rule, use 1-3 litres of **BioSolve®** solution to 1 square metre of surface area. (1 gallon of **BioSolve®** per solution will cover approximately 4-sq. yd. of soil surface area) **BioSolve®** is a water-based surfactant that will apply like water.

BioSolve®, in its concentrated form, is a viscous liquid material that must be diluted with water. A fluorescent red tracing dye is present in the formula allowing **BioSolve®** to be detected during application. Once diluted, **BioSolve®** can be applied with virtually any equipment that can spray water. **BioSolve®** will not harm equipment or clog pipes. For large sites, applicators such as water truck, portable agricultural sprayers, foam inductors & pressure sprayers can be used. For smaller jobs, garden sprayers, water extinguishers or a garden hose with a fertiliser attachment on the nozzle can be used effectively. This characteristic makes **BioSolve®** very adaptable and much most convenient to use in almost any situation. **BioSolve®** is equally effective when used with all types of water (soft, hard, salt or potable).

On stockpiled soil or other soil that will be left undisturbed, a single application of **BioSolve®** to the exposed surfaces may last up to 10 to 14 days or more (depending on environmental conditions). **BioSolve®,** when applied, will form a "cap" of clean soil. If the soil is not disturbed, via weather, movement, etc. this "cap" will remain functional. During excavation, loading or other movement of the soil, it may be required to spray an additional amount of **BioSolve®** to the freshly exposed surface area to keep emissions at an acceptable level.

In case of an extremely high level of emissions, or if the soil is heavily contaminated, it may be necessary to increase the strength of the **BioSolve®** solution or apply more solution per square metre to reduce emissions adequately. It is important that the site be monitored regularly and that the **BioSolve®** solution be reapplied if and when necessary to insure that VOC emissions and odors remain under control.

BioSolve® is packaged and readily available in 55 gallon (208 liter) drums, 5 gallon (19 liter) pails and in 4X1 gallon (3.8 liter X 4) cases. Contact The Westford Chemical Corporation® Toll Free @ 1-800-225-3909, via e-mail at info@biosolve.com or your Local BioSolve distributor for pricing.

BioSolve® should only be used in accordance with all regulatory rules and regulations.

This material is made available or use by professionals or persons having technical skill to be used at the own discretion and risk. These protocols are guidelines only and may need to be modified to site specific conditions. Nothing included herein is a warrantee or to be taken as a license to use **BioSolve** without the proper permits, approvals, etc. of the appropriate regulatory agencies, nor are the protocols provided as instructions for any specific application of **BioSolve**.

SOIL VAPOR SUPPRESSION UTILIZING BIOSOLVE

BioSolve is being utilized by numerous environmental consultants, response contractors, and fire departments to suppress VOC's & LEL's as well as problem odors. BioSolve encapsulates the source of the vapor rather than temporarily blanketing it like a foam or other physical barrier. Vapor reduction is so fast and effective that BioSolve is used to comply with the tough emission standards regulated by each State.

BioSolve offers a relatively simple and cost effective method of suppressing VOC vapor release from soils during excavation, loading, stockpiling… The following guidelines will apply to the most common situations encountered on site.

In most cases a 3% solution of BioSolve will be adequate to keep vapor emissions within acceptable limits. Dilute BioSolve concentrate with water at a ratio of 1 part BioSolve to 33 parts water to make a 3% solution.

The BioSolve solution should be applied evenly to the soil surface in sufficient quantity to dampen the surface well, (as a general rule, 1 gallon of BioSolve solution will cover approximately 4 sq. yd. of soil surface area). BioSolve is not a foam, it is a surfactant based product that will apply like water. The solution may be applied with a hand sprayer, high pressure power sprayer, water truck, etc., whichever method best suits the site and/or conditions.

NOTE: In the case of extremely high emission levels and/or very porous soil it may be necessary to increase the strength of the BioSolve solution (6%) or apply more per sq. yd. to reduce emissions adequately. On stockpiled soil or other soil that will be undisturbed, a single application of BioSolve to the exposed surfaces may last 10-14 days or more. During excavation, loading, or other movement of soil it may be necessary or required to spray each freshly exposed surface to keep emissions below acceptable levels.It is important that the site be monitored regularly and the BioSolve solution be reapplied if/when necessary to insure that vapor emissions remain at or below acceptable standards.

MATERIAL SAFETY DATA SHEET

THE WESTFORD CHEMICAL CORPORATION®
P.O. Box 798
Westford, Massachusetts 01886 USA

Ref. No.: 2001
Date: 1/1/2002

Phone: (978) 392-0689
Phone: (508) 878-5895
Emergency Phone-24 Hours: 1-800-225-3909

Fax: (978) 692-3487
Web Site: http://www.BioSolve.com
E-Mail: info@BioSolve.com

SECTION I - IDENTITY

Name:	**BioSolve®**
CAS #:	138757-63-8
Formula:	Proprietary
Chemical Family:	Water Based, Biodegradable, Wetting Agents & Surfactants
HMIS Code:	Health 1, Fire 0, Reactivity 0
HMIS Key:	4 = Extreme, 3 = High, 2 = Moderate, 1 = Slight, 0 = Insignificant

---

SECTION II - HAZARDOUS INGREDIENTS

Massachusetts Right to Know Law or 29 C.F.R. (Code of Federal Regulations) 1910.1000 require listing of hazardous ingredients.

This product does not contain any hazardous ingredients as defined by CERCLA, Massachusetts Right to Know Law and California's Prop. 65.

SECTION III - PHYSICAL - CHEMICAL CHARACTERISTICS

Boiling Point	: 265°F	Specific Gravity	: 1.00 +/-.01
Melting Point	: 32°F	Vapor Pressure mm/Hg	: Not Applicable
Surface Tension- 6% Solution	: 29.1 Dyne/cm at 25°C	Vapor Density Air = 1	: Not Applicable
Reactivity with Water	: No	Viscosity - Concentrate	: 490 Centipoise
Evaporation Rate	: >1 as compared to Water	Viscosity - 6% Solution	: 15 Centipoise
Appearance	: Clear Liquid unless Dyed	Solubility in Water	: Complete
Odor	: Pleasant Fragrance	pH	: 9.1+/-.3
Pounds per Gallon	: 8.38		

SECTION IV - FIRE AND EXPLOSION DATA

Special Fire Fighting Procedures	: None	Flammable Limit	: None
Unusual Fire and Explosion Hazards	: None	Auto Ignite Temperature	: None
Solvent for Clean-Up	: Water	Fire Extinguisher Media	: Not Applicable
Flash Point	: None		

SECTION V - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be taken in Handling and Storage: Use good normal hygiene.
Precautions to be taken in case of Spill or Leak -
Small spills, in an undiluted form, contain. Soak up with absorbent materials.
Large spills, in an undiluted form, dike and contain. Remove with vacuum truck or pump to storage/salvage vessel. Soak up residue with absorbent materials.
Waste Disposal Procedures -
Dispose in an approved disposal area or in a manner which complies with all local, state, and federal regulations.

SECTION VI - HEALTH HAZARDS

Threshold Limit Values: Not applicable
Signs and Symptoms of Over Exposure-
Acute : Moderate eye irritation. Skin: Causes redness, edema, drying of skin.
Chronic: Pre-existing skin and eye disorders may be aggravated by contact with this product.
Medical Conditions Generally Aggravated by Exposure: Unknown
Carcinogen: No
Emergency First Aid Procedures -
Eyes: Flush thoroughly with water for 15 minutes. Get medical attention.
Skin: Remove contaminated clothing. Wash exposed areas with soap and water. Wash clothing before reuse. Get medical attention if irritation develops.
Ingestion: Get medical attention.
Inhalation: None considered necessary.

SECTION VII - SPECIAL PROTECTION INFORMATION

Respiratory Protection	: Not necessary	Local Exhaust Required	: No
Ventilation Required	: Normal	Protective Clothing	: Gloves, safety glasses Wash clothing before reuse.

SECTION VIII - PHYSICAL HAZARDS

Stability	: Stable	Incompatible Substances	: None Known
Polymerization	: No	Hazardous Decomposition Products	: None Known

---

SECTION IX - TRANSPORT & STORAGE

DOT Class	: Not Regulated/Non Hazardous		
Freeze Temperature	: 28°F	Storage	: 35°F-120°F
Freeze Harm	: None (thaw & stir)	Shelf Life	: Unlimited Unopened

---

SECTION X - REGULATORY INFORMATION

The Information on this Material Safety Data Sheet reflects the latest information and data that we have on hazards, properties, and handling of this product under the recommended conditions of use. Any use of this product or method of application, which is not described on the Product label or in this Material Safety Data Sheet, is the sole responsibility of the user. This Material Safety Data Sheet was prepared to comply with the OSHA Hazardous Communication Regulation and Massachusetts Right to Know Law.

Appendix G

Site-Specific Health & Safety Plan

Penn Yan Water Street MGP Site
Penn Yan, New York

Prepared by:

The RETEC Group, Inc.
1001 W. Seneca Street, Suite 204
Ithaca, New York 14850

RETEC Project Number: NYSG2-19552

Prepared for:

NYSEG
James A Carrigg Center
18 Link Drive
P.O. Box 5224
Binghamton, New York 13902-5224

On-Site Emergency Phone Numbers	
Fire:	911
Police:	911
Ambulance:	911
For more emergency numbers and directions to the hospital, turn to page 7-1.	

August 18, 2006

Appendix G

Site-Specific Health & Safety Plan

Penn Yan Water Street MGP Site
Penn Yan, New York

Prepared by:

The RETEC Group, Inc.
1001 W. Seneca Street, Suite 204
Ithaca, New York 14850

RETEC Project Number: NYSG2-19552

Prepared for:

New York State Electric and Gas
James A Carrigg Center
18 Link Drive
P.O. Box 5224
Binghamton, New York 13902-5224

Prepared by:

Scott Hauswirth, Geologist

Reviewed by:

Jennifer Koch, Regional Health and Safety Coordinator

August 18, 2006

Contents

Table of Contents

Table of Contents

Table of Contents

List of Appendices

List of Tables

List of Figures

ANNUAL HEALTH AND SAFETY PLAN CHECKLIST
(For Verification Purposes Only)

Project Number: NYSG2-19552	**Date:**
Client: NYSEG	**Verified by:**
Site: Water Street MGP, Penn Yan, NY	

The purpose of this checklist is to guide and document the annual review of all RETEC Site-Specific Health and Safety Plans (HASPs) and determine whether amendment of the HASP is necessary. The project manager must ensure this checklist is completed annually.

Please make sure that you verify compliance with the following items:

Has the generic RETEC HASP been modified since issuance of this site-specific HASP? Y ☐ N☐

If yes, the HASP must be amended using the updated format.

All site personnel are current for:

- Training Requirements (Section 1.3) ☐
- Medical Monitoring Requirements (Section 1.4) ☐
- Fit-Testing Requirements (Section 1.5) ☐

The following items are accurate:

- Emergency Telephone Numbers Verified & Posted (Section 7) ☐
- Hospital Route Verified & Posted (Section 7) ☐
- Material Safety Data Sheets Included (Appendix G) ☐

If any of these items are changed, the HASP must be amended.

The following items are in place on site:

- Emergency Telephone Numbers Posted (Section 7) ☐
- Hospital Route Posted (Section 7) ☐
- Appendix E Notice Posted (Section 1.7) ☐
- Hazard Communication Program Material Posted (Section 1.8) ☐
- Appropriate PPE Available (Section 3) ☐
- Work Zones Established (Section 5.1) ☐
- Appropriate Signage in Place (Section 5.1) ☐
- Appropriate Decontamination Equipment and Procedures in Place (Section 6.6) ☐
- Evacuation Routes Established (Section 7.6) ☐

Reread HASP Section 2 and referenced sections:

- Are there changes in on-site activities? Y ☐ N☐
- Are there changes in hazards at the site? Y ☐ N☐

If yes to either question, the HASP must be amended.

Signature ______________________________

Name, Title

Note: ( ) Location in HASP

This completed verification sheet should be inserted at the front of all copies of the HASP on an annual basis.

HEALTH AND SAFETY PLAN AMENDMENT RECORD

Client: NYSEG

Project No.: NYSG2-19552

Project Manager: Bruce Coulombe

Site Safety and Health Officer: Scott Hauswirth

Amendment No.	Date	Description

NOTE: See HASP Amendments (Appendix A) for Complete Description

1 Introduction

This document describes the health and safety protocols developed for the Penn Yan Water Street MGP Site, located in the Village of Penn Yan, New York. This plan was developed to protect The RETEC Group, Inc. (RETEC) personnel and make others involved with the project (subcontractors directly contracted by RETEC, visitors, and the public) aware of known or suspected health and safety hazards. General site information is summarized in Table 1 in the attachments. Background information pertaining to site history and general hazards is listed in Table 2 in the attachments.

This document has been prepared for the Supplemental Remedial Investigation (SRI) phase of work for this project. The purpose of the SRI is to obtain sufficient information to identify the magnitude and extent of MGP-related impacts at the site. The tasks involved in this phase of work include: completion of soil borings, installation of monitoring wells, test pit excavation, collection of soil and groundwater samples, and sediment probing, coring, and sampling.

This is an “evergreen” document, so specific sections of this plan should be changed or revised when additional information is received or when conditions at the site change. Any changes or revisions to this plan will be made by a written amendment, which will become a permanent part of this plan and placed in Appendix A. Amendments must be approved by a RETEC Environmental Health and Safety (EHS) coordinator prior to implementation.

1.1 Site Safety Plan Acknowledgment and Acceptance

The project manager or site safety and health officer (SSHO) shall be responsible for informing all individuals assigned to work on the site, or visit the site beyond the clean/support zone, of the contents of this plan and ensuring that each person signs the Site Safety Plan Acknowledgment Form in Appendix B. By signing the Site Safety Plan Acknowledgment Form, individuals recognize the site health and safety hazards, known or suspected, and will adhere to the protocols required to minimize exposure to such hazards.

Additionally, all personnel visiting the site who do not visit the site beyond the clean/support zone must sign the visitor’s log in Appendix C.

1.2 Site Health and Safety Meetings

A pre-work meeting addressing site-specific EHS issues shall be held on the first day of mobilization to the site and prior to the commencement of any work activities. Mandatory attendance is required for all personnel assigned to the site. At the conclusion of the meeting, personnel are to sign the Site Safety Plan Acknowledgment Form in Appendix B, indicating their attendance and understanding of the health and safety protocols. As additional personnel are assigned to the site, it is the responsibility of the project manager and/or SSHO to ensure that new personnel are briefed on health and safety protocols and that they also have reviewed and signed the Site Safety Plan Acknowledgment Form.

Additional EHS tailgate meetings will be held on a daily basis. These meetings shall be conducted to inform all personnel of changing site conditions, to review the Safety Task Analysis Review (STAR) Form (Appendix H-8), to understand any near misses and “lessons learned,” to present pertinent site safety topics, and to address any worker health and safety concerns. The SSHO will complete the Site Safety Meeting form in Appendix D indicating the date, time, topics discussed, and personnel in attendance at all health and safety meetings. The STAR Form (Appendix H-8) may be used in place of the Site Safety Meeting Form if signed by all site personnel.

1.3 Training Requirements

All personnel assigned to work on this site beyond the support zone must have successfully completed 40 hours of Training for Hazardous Waste Site Work, in accordance with Occupational Safety Health Act (OSHA) 29 CFR 1910.120(e)(3), and be current with their 8-hour Refresher Training, in accordance with OSHA 29 CFR 1910.120(e)(8).

Personnel managing or supervising work on site must also have successfully completed 8 hours of Manager/Supervisor Training, meeting the requirements of 29 CFR 1910.120(e)(4). Documentation of RETEC staff training is maintained via the RETEC H&S Tracker database. For subcontractors, documentation of OSHA training is required prior to personnel being permitted to work on site.

Any exceptions to the training requirements will be explicitly specified either in this Health and Safety Plan (HASP) or through a HASP amendment.

1.4 Medical Monitoring Requirements

All personnel assigned to work on this site beyond the support zone must be enrolled in a medical surveillance program meeting the requirements of OSHA 29 CFR 1910.120(f). Personnel must have successfully passed an occupational physical during the past 12 months (24 months if approved by RETEC Corporate EHS), be medically cleared to work on hazardous waste sites, and be capable of wearing appropriate personal protective equipment (PPE), including any respiratory protection.

Any exceptions to the medical monitoring requirements will be explicitly specified either in this HASP or through a HASP amendment.

1.5 Fit Testing Requirements

All personnel assigned to work on this site beyond the support zone, and who must wear a respirator, must be familiar with the requirements in RETEC's respiratory protection program and the OSHA respiratory standard (29 CFR 1910.134). All personnel who are required to wear respiratory protection must have successfully passed a respirator fit test within the past 12 months. Personnel who do not have a current fit test are prohibited from working in areas where any potential exists for exceeding OSHA Permissible Exposure Limits. Documentation of a successful respirator fit test for the appropriate type of respirator needed for work on this specific site (half-face or full-face air-purifying respiratory [APR] or supplied air) will be required. The project manager or SSHO is to ensure that the respirator being worn by personnel is the same size, make, and model as that specified on any respirator fit test records from the past 12-month period.

1.6 Project Staff Responsibilities

The project manager or SSHO is responsible for overall project administration and for coordinating health and safety protocols and procedures for all personnel on site at all times. All applicable United States Environmental Protection Agency (U.S. EPA), OSHA, state, and local health and safety requirements, shall be maintained throughout the course of the project. This HASP covers all personnel on site; however, each subcontractor is also responsible for the health and safety of its employees. If there is a dispute with regards to health and safety, the following procedures shall be followed:

1) The project manager or SSHO shall attempt to resolve the issue independently with a complete written follow-up to RETEC’s Corporate EHS Director, or

2) If the issue cannot be resolved, the project manager shall consult the RETEC Corporate EHS Director immediately, and the specific task or operation in dispute shall be discontinued until the issue is resolved.

Any person who observes health and safety problems or infractions should immediately report the problem or infraction to appropriate personnel.

1.7 Access to Employee Exposure and Medical Records

OSHA provides employees and their designated representatives a right-of-access to relevant exposure and medical records (29 CFR 1910.20). The “Notification of Access to Employee Exposure and Medical Records” (Appendix E) is to be made accessible to all employees involved with RETEC field operations.

1.8 Hazard Communication

RETEC will advise everyone assigned to this site of the hazards associated with working on site and the methodology to be utilized to mitigate those hazards and prevent exposures. This information will be presented to personnel prior to initiation of any field activities.

The following information regarding hazardous materials will be presented to site personnel per RETEC's Hazard Communication Program:

- Material Safety Data Sheets (MSDS) located in Appendix G
- Chemical/physical hazards
- Appropriate PPE for protection from exposure
- Labeling

1.9 Behavior-Based Safety

RETEC utilizes a behavioral safety process rooted in periodic observation and feedback (O&F). This approach seeks to encourage safe behavior through 1) monitoring work activities to confirm safe practices, 2) providing immediate feedback to motivate safe behavior, and 3) taking preemptive actions to correct observed shortcomings before they might result in an accident or injury. These corrective actions focus on uncovering and addressing the root causes of unsafe behavior.

The O&F process consists of the following:

- Certain activities deemed most critical to safe performance are targeted for periodic observation on an O&F checklist. Checklists are included in RETEC O&F booklets.

- O&F checklists will be completed at a frequency of one per week.

- Assigned observers record whether the targeted activities are being performed “100% Safe” or note specific incidents of unsafe behavior (without identifying individuals).

- Observers provide immediate feedback, either commending safe performance or correcting unsafe behaviors.

- Completed O&F checklists are submitted to the local office EHS Coordinator.

More detail on RETEC’s safety O&F process can be found in the document entitled BEST: Employees’ Guide to Optimizing Environmental, Health and Safety Performance found on the RETEC EHS Forum Database and in the RETEC O&F booklet.

Table 1-1 General Information

Client: NYSEG	**Proj. No.: NYSG2-19552**
Site Name: Penn Yan Water Street MGP Site, Penn Yan, NY	
Site Location: Water Street (near corner of Liberty Street), adjacent to Keuka Lake Outlet, in Penn Yan, NY	
Description of Field Activities: Supplemental Remedial Investigation, including completion of soil borings, test pit excavation, well installation, soil and groundwater sampling, sediment probing, coring and sampling.	
Dates of Field Activities: August 2006 – December 2006	
Project Manager: Bruce Coulombe	**Project Manager Telephone Number:** (607) 277-5716
Site Manager: Scott Hauswirth	**Office:** Ithaca
Designated SSHO: Scott Hauswirth	
The following EHS Program requirements have been checked on the RETEC EHS Tracker database for each employee to work on site: ☐**Completed OSHA 40-Hour HAZWOPER Training** ☐**Current OSHA 8-Hour HAZWOPER Refresher (within last 12 months)** ☐**Current Medical Surveillance Examination (within last 12 months)** ☐**Current Respirator Fit-test (within last 12 months)** ☐**Current First Aid Training (within last 2 years)** ☐**Current CPR Training (within last 12 months)** **Note:** RETEC employees may not enter a site beyond the clean/support zone unless the training/qualifications listed above are current. Documentation and further information may be obtained from the RETEC Monroeville office from Tina McHugh, EHS Administrative Manager, at (412) 380-0140.	

Table 1-2 Background

Overall Hazard Is:			
High: ☐	**Low:** ☒	**Moderate:** ☐	**Unknown:** ☐
Facility Description: Stone-construction former MGP building present on-site. Later used as a winery distribution center and as a garage. A natural gas meter station is present on the property.			
Status: Currently vacant except for MGP building and natural gas house. Surrounding properties include active commercial and industrial properties.			
Unusual Features (containers, dikes, buildings, power lines, terrain, etc.): Keuka Lake Outlet is present immediately to the rear of the former MGP building. Large concrete slab covered with soil and gravel adjacent to former MGP building.			
Site History (worker injury, complaints, regulatory agency action): The gas metering building is currently active. Previous work completed at the site includes test pitting, sediment sampling, well installation, groundwater sampling, and the removal of two tar storage tanks.			
Waste Types:			
Liquid: ☒	**Solid:** ☒	**Sludge:** ☐	**Gas:** ☐
Characteristics:			
Corrosive: ☐	**Ignitable:** ☐	**Volatile:** ☒	**Toxic:** ☒
Reactive: ☐	**Unknown:** ☒	**Radioactive:** ☐	**Other (name):** ☐
Hazards posed by site activities (attach Job Hazard Analysis in Appendix H-9): Contact and inhalation of MGP residuals, physical hazards associated with heavy equipment use and water work.			
Unusual Hazards: Drilling will be conducted very near to a steep slope leading to the Keuka Lake Outlet, increasing trip/slip/fall hazards and potential drowning. Work will be completed in a boat in the Outlet, creating water work hazards.			

Table 1-3 Emergency Contacts/Telephone Numbers

Fire:	911
Police:	911
Ambulance:	911
Capable of Transporting Contaminated Personnel?	**Yes:** ☒ **No:** ☐
Hospital:	Soldiers and Sailor Memorial Hospital 418 North Main Street Penn Yan, NY 14527 (315) 531-2000
Chemical Trauma Capabilities?	**Yes:** ☒ **No:** ☐
Decontamination Capabilities?	**Yes:** ☒ **No:** ☐
Directions from Site to Hospital:	Turn right (east) onto Water Street. Turn Left of Main Street, hospital is 0.8 miles
Note: See map for route to hospital at the end of this section. ***The route to the hospital was verified by:*** Scott Hauswirth__________________. Distance from the Site to the hospital is: 1 mile. The approximate driving time is: 2 minutes.	
Poison Control Center:	1-800-222-1222
Electric Company:	(315) 536-3374
Gas Company: NYSEG	1(800) 572-1121
Water Company: Village of Penn Yan	(315) 536-3021
Airport: Penn Yan Airport	(315) 536-4102
National Response Center	1-800-424-8802
Center for Disease Control	1-800-232-4636 (24-hour)
ATF (explosion information)	(315) 536-9694
Chemtrec	1-800-262-8200
State Environmental Agency: NYSDEC (Avon)	(585) 226-5433
U.S. EPA Region Name: Region 2	1-800-424-8802
RETEC Corporate Office	Mr. Mike Knupp (978) 371-1422
RETEC Personnel Office	(607) 277-5716 (Ithaca)
RETEC Corporate EHS Director	Mr. Jim Colbert (970) 493-3700
RETEC Personnel Medical Consultant (Corporate)	Health Resources (800) 350-4511 600 West Cumming Park, Ste 3400 Woburn, MA 018101
RETEC Project Manager	Bruce Coulombe (607) 277-5716
Client Contact	John Ruspantini ((607) 762-8787 office

2 Health & Safety Risk Analysis

This section identifies the specific hazards associated with site operations and presents an analysis of documented or potential chemical hazards that exist at the site. Every effort must be made to reduce or eliminate these hazards. Hazards that cannot be eliminated must be abated by use of engineering controls and/or PPE.

2.1 Hazard Analysis Requirements

2.1.1 Job Hazard Analysis

A Job Hazard Analysis (JHA) Form, located in Appendix H-9, is a basic tool that allows personnel to think through the steps involved in each job and discuss how to complete the job safely prior to mobilizing to the field. Each JHA accomplishes the following:

- Breaks a job down into individual steps
- Lists the safety hazards in each step
- Lists appropriate precautions to be followed for each hazard and safety resources (equipment, permits, etc.) to be obtained and coordinated

Completion of a JHA requires thoroughness and attention to detail, as well as input of all those who participate in the job. As part of this HASP and prior to commencement of work, an initial JHA will be completed by the SSHO or field task manager, along with other personnel conducting the activity, and reviewed by the project manager or local office EHS Coordinator. This JHA will be modified as job scope or conditions change. The completed JHA for this project is included in Appendix I. If additional tasks are added to the scope of work in the field, the JHA form in Appendix H-9 will be completed and approved by the SSHO prior to the commencement of additional tasks.

2.1.2 Safety Task Analysis Review (STAR)

A STAR Form, located in Appendix H-8, will be completed daily as a more specific supplement to the pre-project JHA. Specific tasks for the day are listed, potential hazards are identified, and controls to mitigate hazards are identified. Team members sign the form, which can also serve to document the daily safety meeting.

2.2 Precautions When Working Around Heavy Equipment

The following precautions will be taken to minimize heavy equipment hazards:

- All equipment must have back-up alarms.

- All equipment must be equipped with roll-over protection structures (ROPS) meeting the minimum performance criteria established by OSHA in 29 CFR 1926.1001 and 1929.1002.

- Personnel must make eye contact with the operator before approaching the equipment and remain safely outside the swing radius of the equipment.

- Personnel must wear orange visibility vests in addition to standard Level D PPE.

- Personnel must never stand on track-hoe tracks to communicate with the operator.

- Operators must be aware of personnel in the area and use proper hand signals before maneuvering.

- Operators must wear hard hats when operating machines and when going to and from their equipment.

- Operators must wear seat belts at all times during equipment operation.

- Operators must use spotters and be cautious when maneuvering equipment within 15 feet of overhead power lines and utility pole guy wires, and maintain safe distances at all times (greater than 10 feet).

- Provisions will be made to prevent the unauthorized start-up of equipment when personnel leave the site at the end of the shift, such as battery ignition locks.

2.3 General Site Hazards

2.3.1 Lighting

Work areas must have adequate lighting for employees to see to work and identify hazards (5-foot candles minimum, comparable to a single 75- to 100-watt bulb). Personnel should have flashlights available in all indoor or dimly lighted areas for use in the event of a power failure, or if working outdoors after daylight hours. Applicable OSHA standards for lighting (29 CFR 1910.120(m)) shall apply.

2.3.2 Electrical Power

All electrical power must have a ground fault circuit interrupter as part of the circuit, including generators. All equipment must be suitable and approved for the class of hazardous atmosphere in which it is being used. Applicable OSHA standards for electric power (29 CFR 1910 Subpart S) shall apply.

2.3.3 Lockout/Tagout

Operations where the unexpected energization, or start-up of equipment, or release of stored energy could cause injury to personnel will be protected by the implementation of a lockout/tagout program meeting the requirements of 29 CFR 1910.147. See Section 11 of this HASP for more details.

Sites that have structural barriers preventing the equipment from being moved on to the tracks are not required to have these lockable disconnect switches. Fencing, ditches, and walls would be considered adequate structural barriers to equipment movement on the tracks.

2.3.4 Fall Protection

Work site slip, trip, and fall accidents can result in serious injuries or fatalities. Procedures to help prevent these types of incidents will be implemented. Elevated work (above 4 feet) where a fall potential exists will be performed using appropriate ladders and/or fall protection (i.e., body harness, lifeline, etc.) Applicable OSHA standards for fall protection (29 CFR 1910.21 through 29 CFR 1910.32) shall apply. See Section 12 of this HASP for more details.

2.3.5 Drum Handling

The movement, opening, and sampling of drums will be conducted in accordance with 29 CFR 1910.120(j). See Section 8 of this HASP for more details.

2.3.6 Cold Stress

When the temperature falls below 40°F, cold stress protocols shall be followed. Employees must be supplied with adequate clothing to maintain core temperature. Cold stress is discussed in detail in Appendix F.

2.3.7 Heat Stress

When the temperature exceeds 70°F and personnel are wearing personal protective clothing, a heat stress monitoring program shall be implemented. Employees shall have frequent break periods and access to drinking water. Heat stress is discussed in detail in Appendix F.

2.3.8 Eye Wash Protection

All operations involving the potential for eye injury, splash, etc., must have approved eye wash units locally available as per 29 CFR 1910.151(c).

2.3.9 Hearing Protection

When the noise level of any operation exceeds the 8-hour Time Weight Average (TWA) of 85 decibels (dB), a hearing protection program meeting the requirements of 29 CFR 1910.95 will be implemented.

2.3.10 Fire Prevention

Operations involving the potential for fire hazards shall be conducted in a manner that minimizes the risk. Non-sparking tools and fire extinguishers shall be used or available as required. Sources of ignition shall be removed. When necessary, explosion-proof instruments and/or bonding and grounding will be used to prevent explosion and/or fire.

2.3.11 Utilities

All underground utility hazards shall be identified and/or inspected prior to conducting operations involving potential contact.

2.3.12 Confined Space Entry

If any operation is conducted in an area classified as a permit-required confined space by OSHA, a “Confined Space Entry Permit” will be completed and all applicable procedures meeting the requirements of 29 CFR 1910.146 will be implemented. See Section 10 of this HASP for more details.

2.3.13 Excavation/Trenching

Any excavation/trench greater than units of 4 feet deep in which personnel must enter will be designed and constructed per all applicable requirements of 29 CFR 1926, Subpart P. See Section 9 of this HASP for more details.

2.3.14 Overhead Utilities and Power Lines

Anytime work is performed in the vicinity of overhead utilities, including power lines, a spotter will be assigned to help operators maneuver equipment in and around the wires.

The following distances will always be maintained around high-tension wires:

- For lines rated 50 Kilo Volt (kV) or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet.

- For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV, over 50 kV, or twice the length of the line insulator, but never less than 10 feet.

- In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV, 10 feet for voltages over 50 kV, up to and including 345 kV, and 16 feet for voltages up to and including 750 kV.

In addition, all utility pole "guy-wire" support cables will be identified, marked, and/or barricaded prior to work. Unintended equipment or vehicle contact with these guy wires may result in utility poles or power lines falling on personnel or equipment.

2.3.15 Hot Work

Prior to initiation of any hot work, a "Hot Work Permit" (Appendix H-6) must be approved by a client representative and the SSHO. Client forms meeting the substantive requirements of the RETEC permit form may be used in place of Appendix H-6.

2.3.16 Severe Weather and Lightning

The SSHO will monitor local media resources to identify possible severe weather situations at the project site. Site work may be delayed, postponed, or cancelled due to severe weather based on the project manager's discretion. In the event of a weather emergency, the site will be evacuated in accordance with Section 7 of this document.

Lightning can strike up to a distance of 10 miles, but thunder can only be heard at a distance of 8 miles. Therefore, if site personnel working outdoors hear thunder and/or see lightning, work will be stopped and personnel will move to an indoor location. If indoor facilities are not available, personnel will move inside of passenger vehicles such as cars and pickups. During a thunderstorm with thunder/lightning, avoid trees/poles, standing water, high areas, and metal structures (fences, scaffolding, etc.). Work will resume 30 minutes following the final observance of thunder and/or lightning.

2.3.17 Faulty Tools and Equipment

The SSHO will ensure that equipment is properly inspected and tested to reduce hazards posed by faulty tools and equipment. An inspection checklist for various types of equipment used on RETEC sites is included in Appendix H-10.

2.4 Chemical Hazards

Previous sampling and analytical data, or previous site history and investigation, have indicated that the chemical hazards listed in Table 2-1, either documented or suspected, exist at the site. Detailed hazard information for these chemicals is available through Material Safety Data Sheets (MSDS) in Appendix G. Workers will use appropriate PPE if exposure to a known or suspected contaminated medium is likely.

2.4.1 Chemicals Potentially Used

In addition to the site contaminants, chemical products will be purchased for use at the site. These chemicals may include diesel fuel, gasoline, bentonite, Portland cement, silica sand, and decontamination materials such as isopropyl alcohol, n-hexane, and soaps (e.g., Alconox). Other materials may be purchased as needed. MSDSs required by OSHA will be obtained for chemical products used at the site. Copies of the MSDSs will be maintained at the site for worker review.

Table 2-1 Chemical Hazards

Contaminant	PEL[a]	TLV[b]	REL[c]	STEL[d]	IDLH[e]	Odor Threshold	IP[f]
Benzene	1 ppm	0.3 ppm	0.1 ppm	5 ppm	500 ppm Ca	34-119 ppm	9.24
Toluene	200 ppm	50 ppm	100 ppm	150 ppm	500 ppm	0.16-37 ppm	8.82
Ethylbenzene	100 ppm	100 ppm	100 ppm	125 ppm	800 ppm	0.092-0.06 ppm	8.76
Xylenes	100 ppm	100 ppm	100 ppm	150 ppm	900 ppm	20 ppm	8.56
Phenol	5 ppm	5 ppm	5 ppm	NA	250 ppm	0.06 ppm	8.5
Cresol	5 ppm	5 ppm	2.3 ppm	NA	250 ppm	0.00005-0.0079 ppm	8.98
Naphthalene	10 ppm	10 ppm	10 ppm	15 ppm	250 ppm	0.038 ppm	8.12
Cyanide (as Fe in dust)	None	1 mg/M^{3}C	1 mg/M^{3}C	N/A	N/A	N/A	N/A

Note:

[a] OSHA Permissible Exposure Limit (PEL) (8-hour time weighted average [TWA])

[b] American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) (8-hour TWA)

[c] National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) (8-hour TWA)

[d] Short-Term Exposure Limit (15-minute TWA that should not be exceeded at anytime during the work day)

[e] Immediately Dangerous to Life & Health [f] Ionization Potential

C = Ceiling Limit (Concentration that should not be exceeded during any part of the working exposure)

CA = Carcinogenic

Mg/m^3: miligrams per cubic meter

2.4.2 Sample Preservatives

Preservatives including hydrochloric acid, nitric acid, sulfuric acid, zinc acetate, and sodium hydroxide may be encountered during sampling activities. Safe and proper handling techniques are to be used when collecting samples. Individuals should work upwind from the open sample keeping the bottle away from the breathing zone (approximately one arm's length) to minimize potential exposure. Personnel should be aware of any changes in wind direction that may also affect potential for exposure to vapors. Gloves and safety glasses will always be worn when collecting samples. Sample vessel seals should be immediately replaced after sample is gathered.

Should any sample preservatives come in contact with skin, the exposed area should be thoroughly irrigated with fresh water immediately.

2.5 Hazardous Plants and Animals

This section provides an overview of some of the major plant and animal hazards in the United States (U.S.) and information on identification and prevention of injury or illness from these hazards.

2.5.1 Hazardous Plants

Common poisonous plants in the U.S. that cause allergic reactions include 1) poison ivy, 2) poison oak, and 3) poison sumac. Plant descriptions and photographs to aid in the identification of these plants are shown on Figure 2-1.

Figure 2-2 Hazardous Plant Identification Guide

Poison Ivy • Grows in West, Midwest, Texas, East. • Several forms – vine, trailing shrub, or shrub. • Three leaflets (can vary 3-9). • Leaves green in summer, red in fall. • Yellow or green flowers. • White berries.	
Poison Oak • Grown in the East (NJ to Texas), Pacific Coast. • 6-foot tall shrubs or long vines. • Oak-like leaves, clusters of three. • Yellow berries.	

Poison Sumac

- Grows in boggy areas, especially in the Southwest and Northern states.
- Shrub up to 15 feet tall.
- Seven to 13 smooth-edged leaflets.
- Glossy pale yellow or cream-colored berries.

If you have been exposed to poison ivy, oak, or sumac, act quickly, because the toxin in the plants penetrates the skin within minutes. If possible, stay outdoors until you complete the first two steps:

1) Cleanse the exposed skin with generous amounts of isopropyl alcohol.

2) Wash the skin with water.

3) Take a regular shower with soap and warm water. Do not use soap until this point because it will pick up the toxin from the surface and move it around.

4) Wash clothes, tools, and anything else that may have been in contact with the toxin, with alcohol and water. Be sure to wear hand protection during that process.

Signs and symptoms of exposure include redness and swelling that appears 12 to 48 hours after exposure. Blistering and itching will follow. If you have had a severe reaction in the past, you should see a physician right away. Otherwise, according to the Federal Drug Administration (FDA), there are quite a few effective over-the-counter products to help with symptoms, including Cortaid and Lanacort, baking soda, Aveeno oatmeal bath, and calamine lotion. RETEC’s on-call nurse, or a pharmacist, can help you make an educated choice.

2.5.2 Bees and Wasps

On RETEC sites, most encounters with bees and wasps occur when nests built in well casings or excavation areas are disturbed. Before opening a well casing, take a few moments to observe whether or not insects are entering or exiting. If they are flying to and from the casing, avoid it if possible. If you must be in an area where disturbing a nest is likely, be sure to wear long pants and a long-sleeved shirt. Stinging insects fly around the top of their target, so if you get into trouble, pull a portion of your shirt over your head and run away.

If you get stung, look for a stinger, and, if present, remove it within 15 seconds of the sting. Several over-the-counter products or a simple cold compress can be used to alleviate the pain of the sting. If the sting is followed by severe symptoms, or if it occurs in the neck or the mouth, seek medical attention immediately because swelling could cause suffocation.

If you need to destroy a nest, consult with the site project manager and your EHS Coordinator first. Commercially available stinging insect control aerosols are very effective, but could potentially contaminate the well. Once the nest is destroyed, fine mesh may be applied over the exit and entry points of a well casing to prevent re-infestation.

2.5.3 Ticks

Ticks in North America can be carriers of several diseases, including Lyme Disease, Rocky Mountain Fever, and ehrlichiosis.

Limiting exposure to ticks reduces the likelihood of infection when you're exposed to tick-infested habitats. Here are some measures that you can take to prevent tick exposure:

- Remove leaf litter and brush in areas where you will be working prior to tick season.
- Wear light colored clothing so that ticks are visible.
- Tuck your pant legs into your socks.
- Apply repellents to discourage tick attachment.
- Promptly inspect your body and remove crawling or attached ticks when you leave a tick-infested area.

If a tick bites you, use the following procedure to remove it:

- Use fine-tipped tweezers or shield your fingers with tissue, paper towel, or rubber gloves.
- Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause mouthparts to break off and remain in the skin.
- Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms.
- Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin.
- After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.

- You may wish to save the tick for identification in case you become ill within 2-3 weeks. Place the tick in a zip lock bag in the freezer, and mark the bag with the date of the bite.

2.5.4 Mosquitoes

Mosquitoes in the U.S. have been known to carry West Nile Virus, St. Louis encephalitis, and Dengue Fever. To avoid mosquito bites:

- Apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when you're outdoors. Read and follow the product directions whenever you use insect repellent.

- Wearing long-sleeved clothes and long pants treated with repellent to further reduce your risk, as will staying indoors during peak mosquito feeding hours (dusk until dawn).

- Limit the number of places available for mosquitoes to lay their eggs by eliminating standing water sources from around the work area.

- Check to see if there is an organized mosquito control program near the project site. If no program exists, work with your local government officials to establish a program.

2.5.5 Spiders

The most dangerous spiders to humans in North America are black widows and brown spiders (also known as brown recluse or fiddleback spiders). A guide to identifying these spiders is presented in Figure 2-2.

Figure 2-3 Hazardous Spider Identification Guide

Black Widow Spider

- Abdomen usually shows hourglass marking.
- The female is 3-4 centimeters in diameter.
- Have been found in well casings and flush-mount covers.
- Not aggressive, but more likely to bite if guarding eggs.
- Light, local swelling and reddening of the bite are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea.
- If bitten, see physician as soon as possible.

Brown Spiders (Recluse)

- Central and South U.S., although in some other areas, as well.
- ¼-to-½-inch-long body, and size of silver dollar.
- Hide in baseboards, ceiling cracks, and undisturbed piles of material.
- Bite either may go unnoticed or may be followed by a severe localized reaction, including scabbing, necrosis of affected tissue, and very slow healing.
- If bitten, see physician as soon as possible.

2.5.6 Bird Droppings

Large populations of roosting birds may present a disease risk. The most serious health risks arise from disease organisms that grow in the accumulations of bird droppings, feathers, and debris under a roost—especially if roosts have been active for years. Among the fungal diseases associated with bird droppings, the two most common are Histoplasmosis and Cryptococcosis.

If you are working in an area where large quantities of droppings are present, follow certain precautions to minimize the risk from disease organisms in the droppings:

- Wear a respirator that can filter particles as small as 0.3 microns, such as a HEPA filter.
- Wear disposable protective gloves, hat, coveralls, and boots if you will be in close contact.
- Wash or shower at the work site after cleanup, if possible.
- Modify the structure or use methods to prevent birds from reestablishing the roost.

2.5.7 Snakes

Venomous snakes native to the U.S. include rattlesnakes, copperheads, and cottonmouths (water moccasins). Precautions to lower the risk of being bitten:

- Leave snakes alone. Many people are bitten because they try to kill a snake or get a closer look.
- Stay out of tall grass unless you wear thick leather boots, and remain on paths as much as possible.
- Keep hands and feet out of areas that you can’t see.

- If you encounter a snake, walk around it, giving it a berth of about 6 feet.

If someone is a snakebite victim, the following first aid should be administered:

- Wash the bite with soap and water.
- Immobilize the bitten area and keep it lower than the heart.
- Get medical help immediately.

There is a lot of false advice about how to treat snakebites. Do not ice or cool the bite, apply a tourniquet, or cut into the wound!

2.5.8 Chiggers

Chigger bites are from the tiny, six-legged larvae of the chigger mite, which are so small they can’t be seen without a magnifying glass. Chiggers hide out in the grass, weeds, and vegetation, and then bite their victim by inserting their mouthparts into a pore or hair follicle of the skin. Within 3 to 6 hours of exposure to a chigger, a small, inflamed welt will appear on the skin and will itch intensely. Itching can continue for a week or more, and if nothing is done to relieve itching, secondary infections may develop from scratching. Chiggers are not known to carry disease in the U.S.

If you have been working in a chigger-infested area, take these special precautions:

- Mow vegetation from the working area.
- Eliminate shade and moisture from the area.
- Wear high boots and pants made out of tightly woven fabric.
- Tuck your pants into your socks or boots.
- Wear an insect repellent that is applied to skin, clothing, and clothing openings.
- Bring a field chair to sit on—don’t sit on the grass.
- Stick to roads and trails.

When you return from a chigger-infested area in the field, do the following:

- Wash your clothes in hot, soapy water. If you can’t wash your clothes, put them in a sealed, plastic bag in your hotel room. Don’t wear clothes until they are washed in hot water or exposed to hot sunshine.

- Take a hot bath or shower, and wash with soap numerous times to dislodge larvae.

If you are bitten, there are numerous over-the-counter treatments that a pharmacist can recommend, such as benzocaine, hydrocortisone, and calamine lotion. Treat the itching as soon as possible to prevent secondary infection from scratching.

2.5.9 Feral Dogs

Feral dogs have shown up on several RETEC jobsites. Packs of feral dogs can be dangerous, so if you observe them on the site, call animal control immediately. If a dog approaches you, take the following steps to reduce your chances of being attacked:

- Don’t run away or run past the dog.
- Remain calm. Don’t scream. If you say anything, speak calmly and firmly. Avoid eye contact. Try to stay still until the dog leaves, or back away slowly until the dog is out of sight. Don’t turn and run.
- If you fall to the ground or are knocked down, curl into a ball, placing your hands over your head and neck. Protect your face.

If a dog bites someone, take the following steps:

- Restrain the dog immediately, if it is safe to do so. The dog will have to be quarantined or tested for rabies.
- Check on the victim’s condition. Call 911 if paramedic response is required.
- Call the EHS Department to arrange for medical treatment.

2.5.10 Rodent-Borne Diseases

Rodent infestation in the workplace has the potential to cause serious communicable diseases including hantavirus pulmonary syndrome and bubonic plague. The most common rodent-borne disease is hantavirus which may infect workers who inhale tiny droplets containing the virus when fresh rodent urine, droppings or nesting materials are stirred up.

Working conditions that my put workers at risk of hantavirus include:

- Contact with rodent feces or dried urine which may mobilize particles of these wastes into the air where they may be inhaled
- Entry into rooms or warehouses that have been closed up and infested for extended periods

- Activities that stir up dust which may mobilize hantavirus

If working in areas of obvious rodent infestation, take the following precautions:

- Do not enter rooms or warehouses that have been closed up unless absolutely necessary.
- If work in closed up areas or areas with rodent infestation is necessary, contact professional exterminators to eliminate the infestation and clean up the location
- If an exterminator is not available/possible, employees should clean up the infested area using the following steps
    - ▸ When going into outbuildings or rooms that have been closed for an extended period, open them up and air out before cleaning
    - ▸ Don an air purifying respirator equipped with HEPA P-100 cartridges and nitrile gloves before cleaning
    - ▸ Don't stir up dust by sweeping up or vacuuming up droppings, urine or nesting materials
    - ▸ Thoroughly wet contaminated areas with detergent or liquid to deactivate the virus. Most general-purpose disinfectants and household detergents are effective. However, a hypochlorite solution prepared by mixing 1 and 1/2 cups of household bleach in 1 gallon of water may be used in place of commercial disinfectant.
    - ▸ Once everything is wet, take up contaminated materials with a damp towel, then mop or sponge the area with disinfectant.
    - ▸ Spray dead rodents with disinfectant and flea repellent (to avoid bubonic plague), then double-bag and dispose in appropriate waste disposal system. Contact the local or state health department other disposal methods.
    - ▸ Finally, remove respirator and disinfect gloves before taking them off with disinfectant or soap and water. After taking off the clean gloves, thoroughly wash hands with soap and warm water.

If you experience hantavirus symptoms (fatigue, fever, and muscle aches) within 1 to 5 weeks of exposure to potentially affected rodents and their droppings, contact the Corporate EHS Department immediately.

3 Personal Protective Equipment

The following is a brief description of the PPE that may be required during various phases of the project. The U.S. EPA terminology for protective equipment will be used: Levels A, B, C, and D. A guide to the type of chemical protective clothing and respirator cartridges to be used for chemicals commonly encountered by RETEC is provided in Table 3-1.

Respiratory protective equipment shall be NIOSH-approved and use shall conform to OSHA 29 CFR 1910.134.

Table 3-1 RETEC PPE Selection Guide

Chemical Hazard	Glove Material	Coverall Material	Boot Material	Respirator Cartridge
Acids • Hydrochloric • Sulfuric	Butyl rubber	Saranex or Butyl rubber apron	Butyl rubber	Acid vapor
Coal Tar • Polyisocyanate • Naphtha	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor
Creosote	Butyl rubber	Polycoated Tyvek	Butyl rubber	Organic vapor
Dry Particulates • Metals • Asbestos	Nitrile rubber	Tyvek	Tyvek	HEPA
Fuel Hydrocarbons • Gasoline • Diesel	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor
Halogens, Aliphatic • Carbon tetrachloride • Ethylene dichloride	Teflon	Polycoated Tyvek	Nitrile rubber	Organic vapor
Halogens, Vinylic • Vinyl chloride	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor

Forsberg, K. and Mansdorf, S.Z., 1997. Quick Selection Guide to Chemical Protective Clothing, Third Edition. John Wiley & Sons, Inc.

3.1 Level A (MUST OBTAIN PRIOR APPROVAL FROM CORPORATE EHS)

Level A protection shall be used when:

- The hazardous substance requires the highest level of protection for skin, eyes, and the respiratory system
- Substances with a high degree of hazard to the skin are known or suspected
- Chemical concentrations are known to be above the Immediately Dangerous to Life and Health (IDLH) levels
- Biological hazards requiring Level A are known or suspected

Table 3-2 Level A PPE to Be Utilized

(Check Appropriate PPE)

☐	Positive-pressure (pressure demand), full-face piece self-contained, or in-line breathing apparatus with escape/egress pack (OSHA/NIOSH-approved)
☐	Fully encapsulating chemical-resistant suit (selected for resistance to chemicals at the site) **Fabric Type:**
☐	Disposable chemical-resistant inner gloves
☐	Disposable chemical-resistant outer gloves **Material Type:**
☐	Chemical-resistant boots with safety toe and steel shank (depending on suit boot construction, worn over or under suit boot) **Material Type:**
☐	Two-way radio communication (intrinsically safe)
☐	Retractable knife strapped to body for emergency egress from suit
☐	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA)
☐	Hard hat (under suit)
☐	Coveralls and/or long cotton underwear
☐	**Modifications:**

Note: Maximum distance personnel are allowed to travel from air source on an in-line system is 300 feet.

3.2 Level B (MUST OBTAIN PRIOR APPROVAL FROM CORPORATE EHS)

Level B protection shall be used when:

- The substance(s) has been identified and requires a high level of respiratory protection but a lesser degree of skin protection
- Concentrations in the air are IDLH or above the maximum use limit of Air Purifying Respirator (APR) with full-face mask
- Oxygen deficient or potentially oxygen deficient atmospheres (<19.5%) are possible

Table 3-3 Level B PPE to Be Utilized

(Check Appropriate PPE)

☐	Positive-pressure (pressure demand), full-face piece self-contained, or in-line breathing apparatus with escape/egress pack (OSHA/NIOSH-approved)

☐	Chemical-resistant clothing (check appropriate garments) with one- or two-piece chemical splash suit; or disposable chemical-resistant one-piece suit ☐ Hooded one- or two-piece chemical splash suit ☐ Disposable chemical-resistant one-piece suit **Fabric Type:**
☐	Disposable inner gloves (surgical)
☐	Disposable chemical-resistant outer gloves **Material Type:**
☐	Chemical-resistant boots with safety toe and steel shank **Material Type:**
☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots. Duct tape to be used over zippers and any other area where the potential for exposure exists.
☐	Two-way radio communication (intrinsically safe)
☐	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA)
☐	Hard hat
☐	Coveralls under splash suit
☐	Long cotton underwear
☐	**Modifications:**

Note: Maximum distance personnel are allowed to travel from air source on an in-line system is 300 feet.

3.3 Level C

Level C protection shall be used when:

- Substance(s) require the same level of skin protection as Level B, but a lesser level of respiratory protection
- The types of air contaminants have been identified, concentrations measured, and respirator decision logic indicates that APRs are sufficient to remove the contaminants
- The substance has adequate warning properties (odor threshold is below occupational exposure limits) and all criteria for the selection of APR has been met

Table 3-4 Level C PPE to be Utilized

(Check Appropriate PPE)

☒	Half-face APR (OSHA/NIOSH-approved)
☒	Full-face APR (OSHA/NIOSH-approved)
☒	**Type of Cartridges to be Used: AG/OV/P100**

☒	Chemical-resistant clothing <u>check appropriate garments</u> (one-piece coverall; hooded one- or two-piece; chemical splash suit; chemical-resistant hood and apron; disposable chemical coveralls [i.e., Tyvek]) ☒ One-piece coverall ☐ Hooded one- or-two piece chemical splash suit ☐ Chemical-resistant hood and apron ☒ Disposable chemical-resistant coveralls **Fabric Type:** Tyvek
☒	Disposable inner gloves (nitrile)
☒	Disposable chemical-resistant outer gloves **Material Type:** Latex or nitrile
☒	Chemical-resistant boots with safety toe and steel shank or disposable boot covers for safety toe/work boots **Material Type:** Vinyl or latex
☒	Work boots with steel toe
☒	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
☐	Safety goggles
☒	Safety glasses
☒	Hard hat
☒	Hard hat with face shield when splash potential exists
☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA).
☐	Two-way radio communication (intrinsically safe)
☐	Long cotton underwear
☐	**Modifications:**

3.4 Level D - Modified

Level D protection will be used when:

- Working near or in water
- The atmosphere contains no known hazard
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals
- Atmospheric concentrations of contaminants are less than the Threshold Limit Value (TLV)

Table 3-5 Level D PPE (Minimum Work Uniform Permitted)

(Check Appropriate PPE)

☒	Standard work uniform/coveralls
☒	Work boots with safety toe
☒	Work gloves
☐	Safety goggles
☒	Safety glasses
☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA)
☒	Hard hat
☐	Hard hat with face shield
☐	Two-way radio communication (intrinsically safe)
☐	Long cotton underwear
☒	**Modifications:** Nitrile gloves will be worn when collecting soil samples or contacting groundwater. Tyvek coveralls will be used where the potential exists for contact with impacted soils or groundwater. A personal floatation device (PFD) will be worn when in the water, from a boat and when working 10 feet from the water.

3.5 Level D

Level D protection will be used when:

- The atmosphere contains no known hazard
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals
- Atmospheric concentrations of contaminants are less than the Threshold Limit Value (TLV)

Table 3-6 Level D PPE (Minimum Work Uniform Permitted)

(Check Appropriate PPE)

☒	Standard work uniform/coveralls
☒	Work boots with safety toe
☒	Work gloves
☐	Safety goggles
☒	Safety glasses
☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB

	based on an 8-hour TWA)
☒	Hard hat
☐	Hard hat with face shield
☐	Two-way radio communication (intrinsically safe)
☐	Long cotton underwear
☒	**Modifications:** See table 3.5 for Level D PPE use when working in or near water, when collecting samples and when potential exists for coming in contact with impacted media.

Table 3-7 Activity vs. Level of Protection

Activity	Level of PPE	Special Requirements
Drilling soil borings, test pit excavation well installation	Modified D	Upgrade base on air readings and direct contact
Surface soil and groundwater sampling	Modified D	Upgrade base on air readings and direct contact
Sediment coring/sampling	Modified D	Flotation device must be worn in addition to standard Level D

4 Air Monitoring and Action Levels

According to 29 CFR 1910.120(h), air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection required for personnel working on site.

4.1 Initial Determination Air Monitoring Requirements

As part of the RETEC Respiratory Protection Program, "initial determination" personal air monitoring data is required for sites where the chemical hazards listed in Table 4-1 may be present. Initial determination data will consist of: 1) objective personal data collected within the last 12 months from another site with similar work operations, workplace conditions, and levels of chemical hazard to this project site; or 2) personal air monitoring laboratory analytical data collected at the site during tasks with the highest potential for chemical exposure. Table 4-2 includes initial determination data to be used for this project.

Table 4-1 Chemicals Requiring Initial Determination Air Monitoring

Chemical	OSHA Standard for Respiratory Protection
Acrylonitrile	1910.1045
Arsenic, inorganic	1910.1018
Asbestos	1910.1001 – General Industry 1926.1101 – Construction Sites
Benzene	1910.1028
1,3-Butadiene	1910.1051
Cadmium	1910.1027 1926.1127
Coal Tar Pitch Volatiles ► Acenaphthene ► Benzo(a)pyrene ► Chrysene ► Phenanthrene ► Pyrene	1910.1029
1,2-dibromo-3-chloropropane	1910.1044
Formaldehyde	1910.1048
Lead	1910.1025 – General Industry 1926.62 – Construction
Methylene chloride	1910.1052
Methylenedianiline	1910.1050 – General Industry 1926.60 – Construction
Vinyl chloride	1910.1017

Table 4-2 Initial Determination Personal Air Monitoring Matrix

<table>
<tr><th colspan="2">Type of Initial Determination (Check One)</th><th colspan="6">Initial Determination Data</th></tr>
<tr><td>☐</td><td colspan="7">Not Applicable – no chemical hazards from Table 4-1 will be encountered on site</td></tr>
<tr><td rowspan="8">☒</td><td rowspan="8">Objective Data[1]</td><td>Chemical</td><td>Work Activity</td><td>Date</td><td>Max Site Soil Concentration</td><td>TWA</td><td>Personal Air Monitoring Result</td></tr>
<tr><td>Anthracene</td><td>Excavation</td><td>2/2004</td><td>(1)</td><td>0.2 mg/m^3</td><td><0.0005 mg/m^3</td></tr>
<tr><td>Benzo (a) pyrene</td><td>Excavation</td><td>2/2004</td><td>(1)</td><td>0.2 mg/m^3</td><td><0.0005 mg/m^3</td></tr>
<tr><td>Chrysene</td><td>Excavation</td><td>2/2004</td><td>(1)</td><td>0.2 mg/m^3</td><td><0.0005 mg/m^3</td></tr>
<tr><td>Phenanthrene</td><td>Excavation</td><td>2/2004</td><td>(1)</td><td>0.2 mg/m^3</td><td><0.0005 mg/m^3</td></tr>
<tr><td>Pyrene</td><td>Excavation</td><td>2/2004</td><td>(1)</td><td>0.2 mg/m^3</td><td><0.0005 mg/m^3</td></tr>
<tr><td>Benzene</td><td>Excavation</td><td>2/2004</td><td>(1)</td><td>1 ppm</td><td><0.0046 ppm</td></tr>
<tr><td>Naphthalene</td><td>Excavation</td><td>5/2002</td><td>(2)</td><td>10 ppm</td><td><1.4 ppm</td></tr>
<tr><td rowspan="4">☐</td><td rowspan="4">Previous Personal Monitoring Data from Site[1]</td><td>Chemical</td><td>Work Activity</td><td>Date</td><td>Max Site Soil Concentration</td><td>TWA</td><td>Personal Air Monitoring Result</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">☐</td><td rowspan="3">Personal Monitoring Data to be Collected On Site</td><td colspan="2">Chemical</td><td colspan="2">Analytical Method</td><td colspan="2">Matrix (badge, filter)</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td></tr>
</table>

[1] Data are available on the RETEC Personal Air Monitoring Database in the RETEC Forum at T-EHS\\Respiratory Protection\\Initial Determination Database. Data must have been collected within the last 12 months.

4.2 Real Time Air Monitoring Requirements

Air monitoring shall be conducted at the following times or as specified by the SSHO:

- Upon initial entry to rule out oxygen deficient, flammable, and/or IDLH conditions

- When the possibility of an oxygen deficient, flammable, and/or IDLH condition or flammable atmosphere has developed

- As an on-going check of the levels of contaminants in the breathing zone
- When work is initiated on a different portion of the site
- When contaminants other than those previously identified are encountered
- When a different operation is initiated
- When work involves the handling of leaking drums, containers, or when working in areas with obvious liquid contamination
- During confined space entry
- At the perimeter of the site as required
- Outside the site perimeter as required (e.g., adjacent buildings)

Real time air monitoring with direct reading instruments will consist, at a minimum, of the criteria listed in Table 4-3. The results of all air monitoring data will be recorded on the “Air Quality Monitoring Record” in Appendix H-1. All air monitoring equipment calibration data is to be recorded on the “Equipment Calibration Log” in Appendix H-2. Upon request, this data will be made available for review to all interested persons. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications.

Table 4-3 Air Monitoring/Instrumentation

(Check Appropriate Instrumentation)

Use:	**Oxygen Meter** Detect Percent Oxygen Content in Air
Action Level:	<19.5% Oxygen – Discontinue work immediately and determine cause of O_2 deficiency - Monitor atmosphere in supplied air respirator. 19.5 to 22% Oxygen – Continue work. >22% Oxygen – FIRE HAZARD – **Evacuate Site Immediately.**
Frequency:	
Use:	**Combustible Gas Indicator (CGI)** Detection of Explosive/Flammable Atmospheres
Action Level:	<10% LEL – Continue work. 10 to 25% LEL – Continue work with caution; Stop all spark producing activities. >25% LEL – EXPLOSION HAZARD – **Evacuate Site Immediately.**
Frequency:	
Use:	**Radiation Meter** Detect Radiation

Action Level:	Background to 2m REM/hr – Continue work. >2m REM/hr – **Evacuate Site and Notify Corporate EHS Director.**
Frequency:	
X	**Photoionization Detector[1] (specify model):** Please Check Bulb Size: **9.5eV:** ☐ **10.2eV:** ☒ **11.7eV:** ☐
Use:	Detection of Organic Gases and Vapors
Action Level:	>1 ppm sustained for five minutes – check for benzene with colorimetric tubes. > 10 ppm sustained in the breathing zone for five minutes - upgrade to modified Level C PPE or Level C with minimum Half Face APR with combination organic vapor/P100 cartridges. >25 ppm sustained for five minutes - Upgrade to Level C PPE with minimum Full Face APR with combination organic vapor/P100 cartridges. >250 ppm sustained for five minutes, evacuate the work area and notify Corporate Health and Safety Officer. If >1 ppm sustained for five minutes, switch to monitoring every 15 minutes until measurements remain below action levels for at least one hour or per task specific work plans.
Frequency:	Periodically or as conditions warrant
X	**Colormetric Detector Tubes[1] Benzene Drager no. 0.5 or equivalent.**
Use:	Detection of Organic Gases and Vapors
Action Level:	>1 ppm-upgrade to Level C PPE with minimim half face APR with combination organic vapor/hepa (P100) cartridges. >10 ppm - upgrade to Level C PPE with minimum full face apr with combination organic vapor/hepa (P100) cartridges. > 50 ppm - Evacuate site
Frequency:	Periodically or as conditions warrant
X	**Specify Other Instrument: Aerosol Meter** – Mini Ram Dust Meter
Use:	Quantify Dust levels.
Action Level:	.02 mg/m3 sustained in the breathing zone for 5 minutes. Upgrade to modified Level C with half face APR with combination organic vapor/P100 cartridges.
Frequency:	Per PID reading, and continuous during intrusive soil handling activities or during dust generating activities.

4.3 Respirator Cartridge Change Out

Respirator cartridges will be replaced with new cartridges daily during field work. For organic cartridges, certain conditions may dictate that the cartridges are changed out more frequently as listed below:

- If the organic chemical’s boiling point is <70°F and the concentration is greater than 200 parts per million (ppm), contact the Corporate EHS Director to discuss cartridge change out and options for respiratory protection.

- If physical work rate exceeds a moderate level, replace cartridges every 4 hours of work.
- If relative humidity exceeds 85%, replace cartridges every 4 hours of work.

5 Site Control

5.1 Work Zones

The primary purpose for site controls is to establish the hazardous area perimeter, to reduce migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by personnel. At the end of each workday, the site should be secured and/or guarded to prevent unauthorized entry. Site work zones will include:

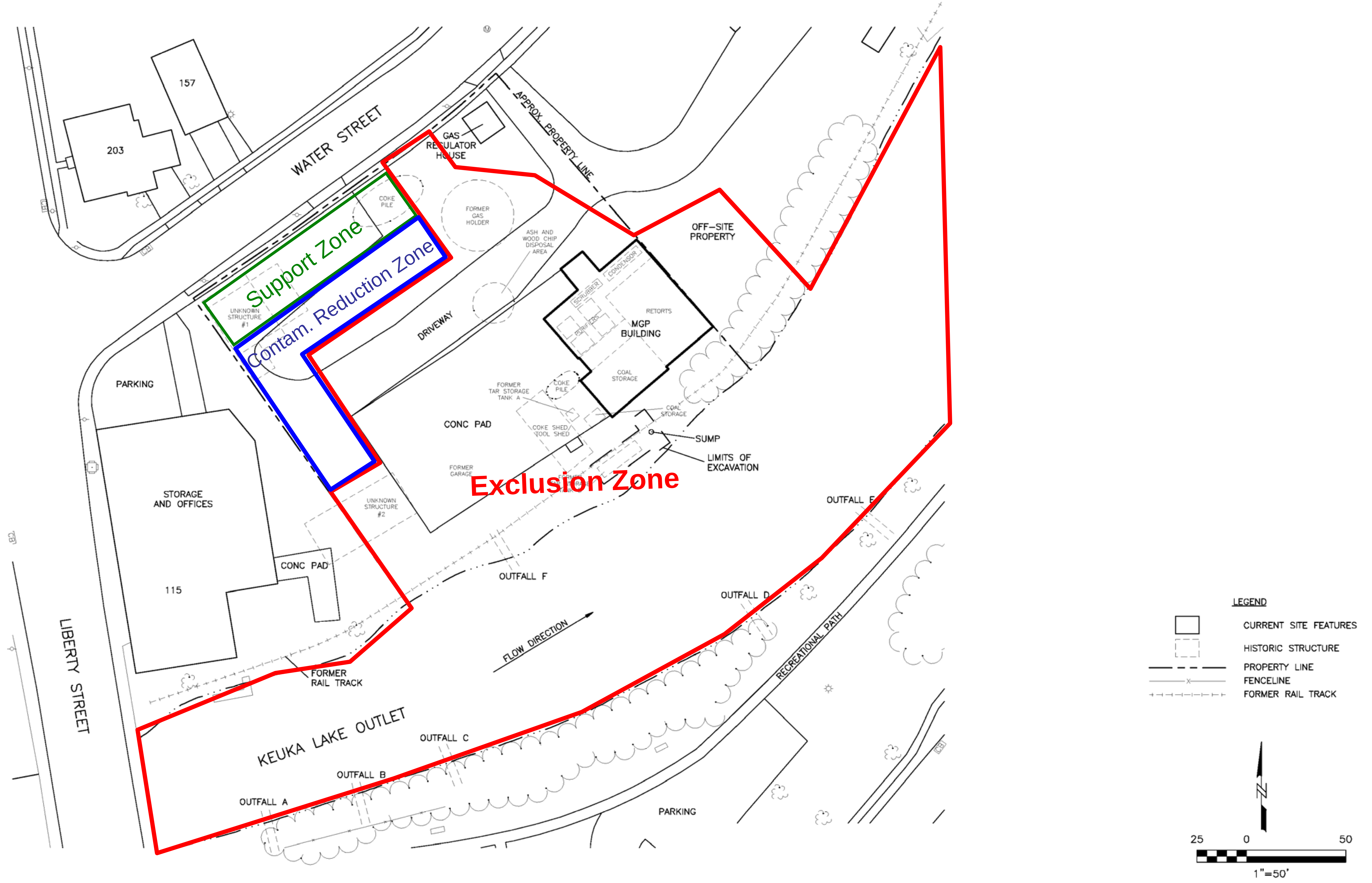
- Clean Zone/Support Zone. This uncontaminated zone will be the area outside the exclusion and decontamination (decon) zone and within the geographic perimeters of the site (typically the job trailer). This area is used for staging of materials, parking of vehicles, office and laboratory facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc., who will not necessarily be permitted in the exclusion zone.

  All personnel arriving in the support zone will report to the SSHO and sign the Visitor Sign-in Log in Appendix C of this HASP.

- Contaminant Reduction Zone (CRZ). The contaminant reduction zone will provide a location for removal of contaminated PPE and final decontamination of PPE. A separate decontamination area will be established for heavy equipment. All personnel and equipment must exit via the decon area.

- Exclusion Zone/Hot Zone. The exclusion zone will be the “hot zone” or contaminated area inside the site perimeter. Entry to and exit from this zone will be made through a designated point. Appropriate warning signs to identify the exclusion zone should be posted (*i.e.,* **DANGER**, **AUTHORIZED PERSONNEL ONLY**, **PROTECTIVE EQUIPMENT BEYOND THIS POINT**, *etc*.). Personnel and equipment decontamination must accompany exit from the exclusion zone.

A site map (Figure 5-1) depicting the location of the site and the delineation of the various work zones is shown on page 5-2 of this HASP.



File: J:\19552\CUR_HIST_FEATURES.dwg Layout: ANSI_B1-LJ User: mwilliamson Plotted: May 24, 2006 - 1:48pm Xref's:

RETEC

PENN YAN WATER STREET FORMER MGP SITE	Site Layout and Work Zones
DATE: 5/24/06 DRWN: MAW/BIL	Figure 5-1

- The **Buddy System** will be used at all times by all field personnel in the exclusion zone, especially if personnel are required to wear Level C or higher PPE. No one is to perform fieldwork alone unless approved by the office Health and Safety Coordinator and/or the Corporate EHS Director. Maintain visual, voice, and/or radio communication at all times.

- Whenever possible, avoid contact with contaminated (or potentially contaminated) surfaces. Walk around (not through) puddles and discolored surfaces. Do not kneel or set equipment on the ground. Stay away from waste drums unless it is necessary to sample or handle the drums. Protect equipment from contamination by bagging.

- Eating, drinking, and/or smoking are only permitted in designated areas in the support zone.

- Hands and face must be thoroughly washed upon leaving the decon area.

- Beards and/or other facial hair that interferes with respirator fit will preclude admission to the exclusion zone.

- All equipment must be decontaminated or properly discarded upon exit from the exclusion zone as determined by the SSHO.

- All personnel exiting the exclusion zone must go through the decontamination procedures as described in this HASP.

- PPE as described in this HASP will be required for all field personnel working on site.

- Contact lenses may be worn on the site provided safety glasses or goggles are also worn. Any exceptions to wearing of contact lenses will be specified in this HASP or through a HASP amendment.

6 Decontamination

In general, everything that enters the exclusion zone must either be decontaminated or properly discarded upon exit from the exclusion zone. All personnel, including any state or local officials, must enter and exit the exclusion zone through the decon area. Prior to demobilization, contaminated equipment will be decontaminated and inspected by the project manager/site engineer before it is moved into the clean zone. Any material that is generated by decontamination procedures will be stored in a designated area in the exclusion zone pending disposal approvals and disposition.

The type of decontamination solution to be used is dependent on the type of chemical hazards. The decontamination solution for this project can be determined from Table 6-1 based on the expected chemicals encounter. Decontamination solutions will be changed as required and collected and stored on site until disposal approvals are secured and the arrangements for their final disposition are finalized. A listing of appropriate decontamination solutions for the chemical contaminants commonly encountered at RETEC sites is available on the RETEC Forum database under T-EHS\Form Library\Health and Safety Plan.

6.1 Personnel Decontamination

Personnel may become contaminated in a number of ways including, but not limited to:

- Contacting vapors, gases, mists, or particulates in the air
- Being splashed by materials while sampling open containers
- Walking through puddles of liquids or on contaminated soil
- Using contaminated instruments or equipment

Even with safeguards, personnel contamination may occur. Harmful materials can be transferred into the clean area, exposing unprotected personnel. In removing contaminated clothing, personnel may contact contaminants on clothing or inhale them. To prevent such occurrences, decontamination procedures must be developed and established before anyone enters the site and must continue throughout site operations. Appropriate PPE (Level D and Modified Level D) will be worn during the decontamination processes to keep contact with contaminated media to a minimum.

Personnel decontamination procedures will be based on the contaminants of concern and the level of protection being worn by site personnel.

6.2 Sampling Equipment

Sampling devices, when used on site, require special cleaning procedures, which are delineated in Table 6-1.

6.3 Equipment Decontamination

Heavy equipment will be decontaminated by moving the equipment to the designated decon area and brushing off the heavy contamination with a broom, etc. The equipment will then be steam cleaned with the decon waters collected for proper disposition. Following the decontamination and prior to exiting the decontamination zone, the project manager and/or SSHO will inspect the equipment and, if it is properly decontaminated, make note of the date, time, method, and name of decon personnel in the field notebook. The equipment may then be tagged by using a tag containing the same information as that entered into the field log.

6.4 Disposal of Contaminated Materials

All materials and equipment used for decontamination must be disposed of properly. Clothing, tools, buckets, brushes, and all other equipment that is contaminated must be properly packaged and stored on site until disposal arrangements are finalized. Clothing not completely decontaminated on site should be secured in plastic bags before being removed from the site.

The proper disposal methods for the site are outlined in Table 6-1.

6.5 Emergency Decontamination

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment are required, decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

Emergency decontamination procedures for this site are discussed in the chart in Table 6-1.

6.6 Sanitizing of Personal Protective Equipment

Respirators, reusable protective clothing, and other personal articles not only must be decontaminated before being reused, but also sanitized. The insides of masks and clothing become soiled due to exhalation, body oils, and perspiration. Manufacturer's instructions should be used to sanitize the respirator masks. If practical, reusable protective clothing should be machine-washed after a thorough decontamination; otherwise, it must be cleaned by hand.

Table 6-1 Decontamination Procedures

☐	**Level A:** Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, tape removal, boot cover removal, outer glove removal, suit/hard hat removal, SCBA removal, inner glove wash, inner glove removal, field wash, re-dress. **Modifications:**
☐	**Level B:** Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, tape removal, boot cover removal, outer glove removal, suit/safety boot wash, suit/SCBA/boot/glove rinse, (tank change), safety boot removal, splash suit removal, SCBA removal, inner glove wash, inner glove rinse, face piece removal, inner glove removal, inner clothing removal, field wash, re-dress. **Modifications:**
☒	**Level C:** Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, boot cover removal, outer glove removal, suit/safety boot wash, suit/safety boot rinse, (canister or mask change), safety boot removal, splash suit removal, inner glove wash, face piece removal, inner glove removal, inner clothing removal, field wash, re-dress. **Modifications**:
☒	**Level D:** Segregated equipment drop, boot and glove wash, boot and glove rinse. **Modifications:**
☒	**Sampling Equipment:** Sampling equipment will be deconed by washing with water and detergent rinse, a methanol rinse, and rinse water. All decon solutions will be containerized in pails, drums or bulk liquid tanks, labeled, and disposed of appropriately.
☒	**Heavy Equipment Decontamination:** Pressure-wash all equipment that comes into contact with impacted soils or groundwater. All decon water will be containerized in 55-gallon drums or poly-tanks, labeled, and disposed of appropriately.
☒	**Decontamination Disposal Procedures:** All fluids and soils generated by this investigation will be contained on site in secure containers and labeled accordingly pending testing and proper disposal.
☒	**Emergency Decontamination Equipment Procedures:** Injured person(s) will be deconed in the same manner as normal unless injuries warrant the immediate transport or the decon procedure will further injure the person. The responding medical personnel will be briefed on the type of contamination on the victim before being transported. Site management team will always accompany contaminated personnel to the medical facility to advise on matters involving proper decontamination.

7 Emergency Response/Contingency Plan

It is essential that site personnel be prepared in the event of an emergency. Emergencies can take many forms: illnesses/injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in weather. Table 7-1 outlines the contact information for emergencies.

7.1 Emergency Contacts/Telephone Numbers

Emergency contacts for the Water Street Site are provided in Table 1-3.

Table 7-1 Emergency Equipment Available On Site

Communication Equipment:	
☐	Public Telephones
☐	Private Telephones
☒	Cellular Telephones
☐	Two-Way Radio (walkie-talkie)
☒	Emergency Alarms/Horns
Medical Equipment:	
☒	First Aid Kits
☐	Stretcher
☒	Eye Wash Station and/or Bottle
☐	Safety Shower
☐	Blankets
☐	Other (please specify):
Fire Fighting Equipment:	
☒	Fire Extinguisher Type: 15 lbs ABC
☐	Other:
Spill/Leak Equipment	
☒	Absorbent Boom Pads
☒	Dry Absorbent
Additional Safety Equipment:	

7.2 Incident Definitions and Reporting Criteria

RETEC definitions and classifications for the types of incidents that could occur on this site are listed in Table 7-3. The SSHO is responsible for executing the reporting and notification steps for each incident as outlined in Table 7-1. The RETEC EHS Incident Report Form is included in Appendix H-4.

Table 7-2 RETEC EHS Incident Determination and Reporting Matrix

Incident Type	**Classification Criteria**			**Notification and Reporting**	
	Injury/Illness	**Environmental Release/Impact**	**Property Damage**	**Verbal**	**Written**
Incident – Major	Professional medical treatment received (hospital, clinic)	>1 bbl material released	Cost estimate of damage >$10,000	Immediate call to Corporate EHS** and NYSEG Project Manager	Use RETEC Incident Report Form: Submit to the following within 24 hours 1. Project Manager 2. Office EHS Coordinator 3. Corporate EHS
Incident – Minor	First Aid with no professional follow-up or no treatment	1 qt* to 1 bbl of material released	Cost estimate of damage >$500	Call to the following within 24 hours: 1. Project Manager 2. Office EHS Coordinator 3. NYSEG Project Manager 4. Corp. EHS**	Use RETEC Incident Report Form Submit to the following within 72 hours: 1. Project Manager 2. Office EHS Coordinator 3. Corporate EHS
Near Miss	Event or condition with moderate to high potential for I/I, but no I/I occurs	<1 qt* released or event or condition with moderate to high potential for release	Damage occurs, but is estimated <$500	Call to the following in 48 hours: 1. Project Manager 2. Office EHS Coordinator	Use RETEC Near Miss Report Form Submit to the following within 72 hours: 1. Project Manager 2. Office EHS Coordinator 3. Corporate EHS
EHS Opportunity	Suggestion, observation, or idea to prevent I/I	Suggestions, observation, or idea to prevent release	Suggestions, observation, or idea to prevent property damage	No verbal notification required	Use RETEC Near Miss Report Form marked as 'EHS Opportunity' Submit to the following within 2 weeks: 1. Office EHS Coordinator

***Reportable quantities will vary based on the material released and federal and state regulations. One quart designated to inform necessary parties and allow for proper identification of reportable quantity for material released.**

**** Using call progression below, notify the first available individual:**
1. Tina McHugh – Monroeville office (Office Phone: (412) 380-0140, cell phone (412) 370-7458)
2. Jim Colbert – Fort Collins office (Office Phone (970) 493-3700, cell phone (970) 214-7371)
3. Jessica Cassens – Austin office (Office Phone (512) 477-8661, cell phone (512) 565-4630)
4. RETEC Occupational Nurse (business hour pager (800) 978-7003, after hour pager (888) 631-0129)
Determination and reporting requirements pertain to RETEC employees, RETEC subcontractors, clients, and third parties.

Information presented above pertains to work-related incidents only.

7.3 Injury/Illness Case Management

The following steps should be followed if an injury or illness case occurs:

1) Check the scene of the injury or illness and; either provide first aid, if trained and the conditions are safe to do so, or call an EMS (911) to care for the victim.

2) Ensure that appropriate decontamination treatment for exposed or injured personnel is obtained.

3) Once the victim is stabilized, contact the RETEC Corporate EHS Department immediately in the order of the employees listed below:

Tina McHugh - Pittsburgh	**(412) 380-0140 (Office)**
	(412) 370-7458 (Cellular)
Jim Colbert - Fort Collins	**(970) 493-3700 (Office)**
	(970) 214-7371 (Cellular)
Jessica Cassens - Austin	**(512) 477-8661 (Work)**
	(512) 565-4630 (Cellular)

4) If no one in the RETEC EHS Department is available, notify the RETEC occupational health nurse by dialing one of the following pager numbers:

   During business hours (8 a.m. – 5 p.m. Eastern Time) – (800) 978-7003; After hours – (888) 631-0129

   These numbers are pager numbers, so leave your call-back number at the tone, hang up, and wait for the nurse to call you back.

5) If the victim must be transported to the hospital, do not transport the victim yourself, but accompany the victim to the hospital.

6) Notify the victim to inquire with the medical care provider about whether there is an “over-the-counter” medication that would work as well as a prescription medication, or if non-prescription strengths of a medication may have the same therapeutic benefit. This is to avoid unnecessary prescriptions that would result in the incident being considered an OSHA recordable.

7) Per Table 7-3, notify the office EHS Coordinator, the Project Manager, the NYSEG Project Manager, and the Operations Manager at the numbers identified in Table 7-1.

8) Per Table 7-3, complete the Incident or Near-Miss report and collect additional information as necessary. Send the completed information to the office EHS Coordinator and Project Manager via fax.

9) If the incident results in one or more fatalities or hospitalization of three or more personnel, notify the local OSHA office within 8 hours.

10) The RETEC project manager or his designee will follow up with the victim after receiving medical attention to find out about the nature of the injury or illness, medical care given, and whether there are any work restrictions or modifications.

Any person transporting an injured/exposed person to a hospital for treatment should take directions to the hospital with them (Figure 7-1), and information on the chemicals involved. Any vehicle used to transport contaminated personnel will be cleaned or decontaminated as necessary.

7.4 Environmental or Property Damage Incident Response

The SSHO or designee has primary responsibility for responding to environmental and property damage incidents as defined in Table 7-3. The on site SSHO will:

1) Take appropriate measures to protect the public and the environment including isolating and securing the site, preventing run-off to surface waters, and ending and/or controlling the emergency to the extent possible.

2) Ensure that the appropriate federal, state, and local agencies are informed, and emergency response plans are coordinated. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted.

3) Per Table 7-3, notify the office Coordinator, the Project Manager, the NYSEG Project Manager, and the local Operations Manager.

4) Per Table 7-3, complete the Incident or Near-Miss report and collect additional information as necessary. Send the completed information to the RETEC EHS Coordinator or the project manager via fax.

5) The RETEC project manager or his designee will follow up with the victim after receiving medical attention to find out about the

nature of the injury or illness, medical care given, and whether there are any work restrictions or modifications.

7.5 Fire or Explosion

In the event of a fire or explosion, the local fire department must be summoned immediately. Upon their arrival, the project manager and/or SSHO will advise the fire commander of the location and nature of the fire and identification of all hazardous materials on site.

If it is safe to do so and personnel have been properly trained, site personnel may use fire-fighting equipment available on site, or remove or isolate flammable or other hazardous materials, which may contribute to the fire (i.e., incipient stage fire-fighting only).

7.6 Evacuation Routes and Resources

Evacuation routes will be established by work area locations for the site. Evacuation should be conducted immediately, without regard for equipment, under conditions of extreme emergency. See site map (Attachments 1-3, Figure 1) for evacuation routes.

- Evacuation notification will be a continuous blast on an air horn, vehicle horn, or by verbal communication via radio.

- Keep upwind of smoke, vapors, or spill location.

- Exit through the decontamination corridor, if possible.

- If evacuation is not via the decontamination corridor, site personnel should remove contaminated clothing once they are in a safe location and leave the clothing near the exclusion zone or in a safe place.

- The project manager or SSHO will conduct a head count to ensure all personnel have been evacuated safely.

- In the event a site evacuation is necessary, all personnel are to:

    - ► Escape the emergency situation

    - ► Decontaminate to the maximum extent practical

    - ► Meet at RETEC's site trailer, command post, or some other pre-arranged location

7.6.1 Near Miss

If anyone on site witnesses a near-miss (as defined in Table 7-3), they must complete the Near-Miss Report (Appendix H-5) and submit it to the SSHO, Corporate EHS, or the Local EHS Coordinator **within 72 hours.** Near misses are events that, depending on the circumstances, could have resulted in death, personal injury, and/or property/equipment damage. If the near-miss occurs during normal work hours, the SSHO will take action to prevent any possible incident/accidents from taking place. The SSHO will discuss the near-miss and actions taken with appropriate site personnel as soon as possible.

Figure 7-1 Route to Hospital

Directions to Soldiers and Sailors Memorial Hospital:

Turn Right on Water Street (Northeast)
Turn Left of Main Street
Arrive at Hospital after 0.8 miles

8 Drum Handling/Sampling

Will this project require the handling or sampling of drummed materials?

No: ☐	**Yes:** ☒

If the answer to this question is **NO**, proceed to the next section. If the answer is **YES**, read this section and follow all procedures for safe drum handling and sampling.

Accidents may occur during handling of drums and other hazardous waste containers. Hazards include detonation, fires, explosions, vapor generation, and/or physical injury resulting from moving heavy containers by hand and working around stacked drums, heavy equipment, and deteriorated drums. OSHA regulations (29 CFR Parts 1910 and 1926) include general requirements and standards for storing, containing, and handling chemicals and containers, and for maintaining equipment used for handling materials. U.S. EPA regulations 40 CFR Part 265 stipulate requirements for types of containers, maintenance of containers and containment structures, and design and maintenance of storage areas. Department of Transportation (DOT) regulations (49 CFR Parts 171 through 178) also stipulate requirements for containers and procedures for shipment of hazardous waste.

- Have a dry chemical fire extinguisher on hand to control small fires.

- Check for labels, markings, etc., and note conditions of containers. Are the drums bulging, deteriorated, or leaking?

- Before moving any drum or container, determine the most appropriate sequence in which the various containers should be moved.

- Exercise extreme caution in handling drums that are not intact or tightly sealed.

- Use the following types of equipment to move drums and/or containers: 1) drum grappler attached to a hydraulic excavator, 2) small front-end loader with a bucket sling, 3) rough terrain fork lift, or 4) drum cart.

- Train personnel in proper lifting and moving techniques to prevent back injuries.

- Have over packs ready before any attempt is made to move drums.

- Pressurized drums are extremely hazardous. If possible, do not move drums that may be under internal pressure as evidenced by bulging or swelling.

- If a pressurized drum has to be moved, handle the drum with a grappler unit constructed for explosive containment, if possible. Either move the drum only as far as necessary to allow seating on firm ground, or carefully over pack the drum.

- If a drum containing liquid cannot be moved without rupture, immediately transfer its contents to a sound drum using a pump designed for transferring the liquid.

- Unless drum contents are known, exercise extreme caution when opening drums.

- If an explosive situation exists, use non-sparking tools such as a bronze wrench.

- If a drum shows signs of swelling or bulging, relieve excess pressure prior to opening and, if possible, open using such remote devices as pneumatically operated impact wrenches, hydraulically or pneumatically operated drum piercers, or a backhoe equipped with bronze spikes for penetrating drum tops.

- DO NOT use picks, chisels, or firearms to open drums.

- If pressure must be released manually, place a barrier such as explosion-resistant plastic sheeting between the worker and bung to deflect any gas, liquid, or solid that may be expelled as the bung is loosened.

- Reseal open bungs and drill holes with new bungs or plugs to avoid explosions and/or vapor generation. If an open drum cannot be resealed, place the drum into an over pack. Plug any opening in pressurizing drums with pressure venting caps set for 5 psi.

- When manually sampling a drum, keep sampling personnel at a safe distance while drums are being opened. Sample only after opening operations are complete.

- Do not lean over other drums to reach the drum being sampled.

- Cover drum tops with plastic sheeting or other suitable non-chlorinated material to avoid excessive contact with drum tops.

- Never stand on drum tops.

- Obtain samples with either glass rods or vacuum pumps.

9 Excavation and Trenching

Will this project require any excavations or trenches greater than 4 feet in depth?

No: ☐	**Yes:** ☒

If excavations or trenches are required and are greater than 4 feet in depth, will personnel be required to enter the excavations and/or trenches?

No: ☒	**Yes:** ☐

If the answer to the last question is **NO**, proceed to the next section. If the answer is **YES**, OSHA's Final Rule for Excavations (29 CFR 1926 Subpart P) must be implemented, and personnel must comply with the following excavation guidelines and complete the attached excavation worksheet.

- Remove all surface encumbrances.
- Locate all underground installations prior to opening excavation.
- Supply means of egress so that no more than 25 feet of lateral travel is required by personnel in the excavation.
- Supply warning vests for personnel exposed to vehicular traffic.
- Utilize barricades, hand signals, or stop logs for equipment operating next to excavations and slope grade away from excavation.
- Check for hazardous atmospheres (oxygen deficient, flammable, toxic gases).
- Protect excavation and personnel from water accumulation.
- Check stability of adjacent structures.
- Protect personnel from loose rock or soil.
- Inspect excavations and record information from the inspection in the field logbook.
- Stockpile excavation spoils a minimum of 2 feet from edge of excavation.
- Provide for fall protection (Section 12).

- Classify soil.

- Describe in detail any protective system used for personnel protection (sloping and benching of sides, support systems, or shield systems).

Trench Dimensions		
Length:	Width:	Depth:

Soil Classification			
Stable Rock ☐	A ☐	B ☐	C ☐
Note: If soil class is unknown, assume Class C for trench/shoring design.			

Support System			
☐	Sloping or benching sides		
☐	Slope to be used based on soil class and trench dimensions		
☐	Shield System		
☐	Support System		
		☐	Upright Dimensions
		☐	Whale Dimensions
		☐	Cross-Bracing Dimensions

Sketch of Protective System To Be Utilized

10 Confined Space Entry

Confined spaces pose unique problems due to their unique contents and/or configuration. Some confined spaces, for example, pose entrapment hazards for entrants, while others restrict air circulation so that hazardous atmospheres may accumulate quickly. Confinement itself can increase the risk of injury or death by making personnel work closer to hazards than they would otherwise. OSHA considers an area to be a Permit Required Confined Space if it is an enclosed space which:

- Is large enough and so configured that an employee can bodily enter and perform assigned work
- Has limited or restricted means for entry and exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, pits, and diked areas)
- Is not designed for continuous employee occupancy
- Has one or more of the following characteristics:
    - Contains or has a potential to contain a hazardous atmosphere
    - Contains a material with the potential for engulfment of an entrant
    - Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or a floor which slopes downward and tapers to a smaller cross-section
    - Contains any other recognized serious safety or health hazard

Does this project require personnel to enter a Permit Required Confined Space as defined above?

No: ☒	**Yes:** ☐

If the answer is **NO**, proceed to the next section. If the answer is **YES**, OSHA regulations for Confined Space Entry (29 CFR 1910.146) must be implemented and personnel must comply with all Confined Space Entry procedures.

- Complete and submit a Confined Space Entry Permit (Appendix H-3) to the Director of Environmental Health and Safety for approval.

- Certify that all personnel have completed the OSHA 40-hour course in Health and Safety and are current with their 8-hour refresher training.

- Certify that all personnel are enrolled in a medical surveillance program and are physically capable of performing a confined space entry.

- Certify that all personnel have successfully passed a respirator fit-test within the past year.

- Identify entrants and ensure they are properly trained and understand their duties.

- Identify attendants and ensure they are properly trained and understand their duties.

- Identify a rescue team or make arrangements with an outside agency for rescue assistance. If site personnel are assigned to a rescue team, ensure that the personnel are properly trained and are familiar with the operation, capabilities, and maintenance of rescue equipment.

- Ensure that at least one member of the rescue team is current in his/her First Aid and CPR certification.

- Ensure that the entry permit contains the required information before authorizing entry.

- Determine that the necessary procedures, practices, and equipment for safe entry are in effect before allowing entry.

- Determine, at appropriate intervals, that entry operations remain consistent with the terms of the entry permit, and that acceptable entry conditions are present.

- Cancel the entry authorization and terminate entry whenever acceptable conditions are not present.

- Take the necessary measures for concluding an entry operation, such as closing off a permit space and canceling the permit, once the work authorized by the permit has been completed.

- Take the appropriate measures to remove unauthorized personnel who are in or near permit spaces.

11 Lockout/Tagout

Does this project involve the operation of machines and/or equipment in which the unexpected energization or start up of the machinery or equipment, or release of stored energy, could cause injury to personnel?

No: ☒	**Yes:** ☐

If the answer is **NO**, proceed to the next section. If the answer is **YES**, OSHA regulations for Lockout/Tagout (29 CFR 1910.147) must be implemented and personnel must comply with all Lockout/Tagout procedures.

To assure personnel are protected from equipment accidentally operating during maintenance and servicing, OSHA requires the utilization of lockout/tagout procedures. These procedures apply to maintenance and/or servicing of equipment and not to normal operations.

These procedures apply to operations when guards are removed or bypassed, other safety devices are bypassed, or any part of the body is in a danger zone for the servicing and/or maintenance of the equipment. The procedures do not apply to cord-plug-connected equipment, which is under the control of the operator.

Some of the common energy sources which require lockout/tagout procedures include, but are not limited to:

- Electrical
- Hydraulic
- Pneumatic
- Chemical
- Thermal

11.1 Tags

Tags are only warning devices and do not provide physical restraint. Tags **MUST NOT** be removed without authorization of the person responsible for its attachment and must never be bypassed or ignored. Tags must be legible, understandable, and used as part of the overall lockout/tagout program. Tagout devices shall warn against hazardous conditions and shall include verbiage such as:

- DO NOT START
- DO NOT OPEN
- DO NOT CLOSE
- DO NOT ENERGIZE
- DO NOT OPERATE

11.2 Locks

Locks are used as a positive means to hold energy isolating devices in the "safe" or "off" position. Locks prevent removal without excessive force or unusual techniques such as the use of bolt cutters, etc.

The lockout/tagout procedure requires the utilization of a lockout device on all energy isolating devices, which can be locked out, unless it can be demonstrated that a tagout device provides the equivalent amount of protection. If tagouts are authorized, they must be placed in the same location where the lock would be placed. All lockout/tagout devices shall be singularly identified, used only for controlling energy, durable, standardized, and identifiable.

11.3 Procedures

- **Prepare**. Notify affected personnel that work requiring lockout/tagout will be performed.

- **Shutdown**. Turn off or shut down the equipment by following an orderly shutdown procedure.

- **Isolation**. Locate and isolate the equipment energy isolating devices. Isolate equipment from both primary and secondary power sources.

- **Lockout/Tagout**. Lockout/tagout each energy isolating device in a "safe" or "off" position. If the tagout device is utilized, affix it at the same point where the lock would be used or as close as possible to that location.

- **Stored Energy**. Assure all potentially hazardous or residual energy is relieved or otherwise made safe. Make sure the stored energy will not reaccumulate by locking a vent valve in the open position.

- **Verify**. Verify proper isolation and/or de-energization by testing the start button to ensure that the equipment will not operate. Make sure you push the STOP button after activating the start button.

- **Perform Work**. After lockout/tagout procedures have been implemented, execute the maintenance and/or servicing work.

- **Release**. Ensure that all non-essential items (tools, etc.) have been removed and the equipment is operationally intact. Ensure that personnel are safely positioned and affected personnel have been notified.

- **Removal**. Only the authorized employee who applied the devices may remove lockout/tagout devices.

- **Notification**. Notify affected personnel that the maintenance and/or servicing is complete, the lockout/tagout devices have been removed, and the equipment is released for operation.

Testing or positioning may be required for some equipment. Before removing lockout/tagout devices, clear the machine, remove personnel, remove devices, energize, and proceed with testing. After testing, de-energize and reapply the lockout/tagout procedures.

Outside personnel, such as contractors, and RETEC personnel shall inform each other of their lockout/tagout procedures to assure compliance of all lockout/tagout procedures.

Some jobs may require lockout/tagout of numerous energy isolation devices. A group lockout/tagout is then used which provides equal protection. Group lockout/tagout must be under the primary responsibility of an authorized employee. Each group member must apply his/her own personal lockout/tagout device.

During shift changes, special procedures must be utilized to assure the continuity of lockout/tagout protection. There must be an orderly transfer between off-going and on-coming personnel.

Sites that have structural barriers preventing the equipment from being moved on to the tracks are not required to have these lockable disconnect switches. Fencing, ditches, and walls would be considered adequate structural barriers to equipment movement on the tracks.

12 Fall Protection

Does this project involve the use of any floors, platforms, and/or runways 4 feet or more above adjacent flooring or ground level, or the use of ladders, scaffolding, or power platforms?

No: ☒	**Yes:** ☐

If the answer is **NO**, proceed to the next section. If the answer is **YES**, OSHA regulations for Fall Protection (29 CFR 1910.21 through 29 CFR 1910.32) must be implemented and appropriate fall protection devices must be utilized.

Complete the questionnaire in Table 12-1 and ensure that all rules and regulations of this section are implemented for this project.

Table 12-1 Fall Protection

Describe the Areas and Operations On Site Where Fall Protection Will Be Required:	
Describe the Types of Fall Protection to Be Implemented:	
Check Type of Fall Protection Equipment to Be Utilized On Site:	
☐	Full-Body Harness
☐	Positioning Belt
☐	Rope Grab
☐	Vertical Lifeline
☐	Horizontal Lifeline (Static Line)
☐	Self-retracting Lifeline
☐	Lanyard
☐	Shock Absorbing Lanyard
☐	Locking Snap Hook
☐	Snap Hook
☐	Safety Net
☐	Non-Skid Surfaces
☐	Platforms, Walkways, or Temporary Flooring with Standard Guard Railing and Toeboard
☐	Appropriate Designed Ladders
☐	Stairs with Standard Railing

Rules and regulations include, but are not limited to, the following:

A. Floor Openings, Open Sides, etc.

- Every stairway and ladder way floor opening must be guarded by a standard railing with standard toeboard on all exposed sides except the entrance. The entranceway to ladder way openings will be guarded to prevent a person walking directly into the opening. For infrequently used stairways, the guards may consist of a hinged cover and removable standard railing.

- Every hatchway and chute floor opening must be guarded by a hinged floor opening cover equipped with standard railings which leave only one exposed side, or a removable railing with toeboard on not more than two sides and fixed standard railing with toeboards on all other exposed sides.

- Every floor hole into which persons can accidentally walk must be guarded by either a standard railing with standard toeboard on all exposed sides, or a floor hole cover which should be hinged in place. While the cover is not in place, the floor hole must be attended or must be protected by a removable standard railing.

- Every open-sided floor, platform, or runway 4 feet or more above adjacent floor or ground level must be guarded by a standard railing with toeboard on all open sides, except where there is an open entrance to a ramp, stairway, or fixed ladder. Runways not less than 18 inches wide used exclusively for special purposes may have the railing on one side omitted where operating conditions necessitate.

- Regardless of height, all open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment must be guarded with standard railing and toeboard.

B. Stairs, Fixed Industrial

- Every flight of stairs having four or more risers must be provided with a standard railing on all open sides. Handrails must be provided on at least one side of closed stairways, preferably on the right side descending.

- Stairs must be constructed so that rise height and tread width is uniform throughout.

- Fixed stairways must have a minimum width of 22 inches.

- Fixed stairs must be provided for access from one structure level to another where operations necessitate regular travel between levels, and for access to operating platforms at any equipment, which requires attention routinely during operations. Fixed stairs must also be provided where access to elevations is daily or at each shift where such work may expose employees to harmful substances, or for which purposes the carrying of tools or equipment by hand is normally required.

- Spiral stairways must not be permitted except for special limited usage and secondary access situations where it is not practical to provide a conventional stairway.

C. Safety Nets

- Safety nets must be provided when workplaces are more than 25 feet above the surface where the use of ladders, scaffolds, catch platforms, temporary floors, and safety lines or safety belts is impractical.

- Where nets are required, operations must not be undertaken until the net is in place and has been tested.

As a general condition, a standard toeboard and guardrail are required whenever people walk near or beneath the open sides of a platform or under similar structures or where things could fall from the structures or could fall from the structures into machinery below.

A standard guardrailing consists of a top rail and posts. The normal distance from the upper surface of the top rail to the floor, platform, runway, or ramp should be 42 inches. There must be an intermediate rail spaced approximately halfway between the top rail and the floor. All handrails and railings should be provided with a clearance of not less than 3 inches between the handrail or railing and any other object.

A standard guardrailing can be of any configuration and construction that meets the basic dimension requirement (42 inches high with midrail), and can withstand 200 pounds applied in any direction at any point on the top rail. For wood railings, the rails and posts must be at least 2 x 4-inch stock with posts spaced not more than 6 feet apart. For pipe railings, the rails and posts must be at least 1-inch outside diameter (OD) pipe with posts spaced not more than 8 feet apart. For structural steel rails, posts and rails must be of 2 x 2 x 3/8-inch angles or other metal shapes of equivalent strength, with posts not more than 8 feet apart.

The standard toeboard must be approximately 4 inches in height from the floor to the top edge, with no more than a 1/4-inch gap between the toeboard and the floor. The toeboard may be constructed of any solid or perforated substantial material, as long as the openings are smaller than 1 inch.

OSHA considers a platform to be any elevated surface designed or used primarily as a walking or working surface, and any other elevated surface on which employees are required or allowed to walk or work while performing assigned tasks on a predictable or regular basis. Employee activities are considered predictable and regular when the activity is performed at least one (1) day every two (2) weeks or a total of four (4) man hours or more during any sequential four-week period.

If fall protection is required on a project, the following checklist should be used to check for walking and working surface problems:

- Are all places of operations kept clean and orderly?
- Are floors, aisles, and passageways kept clean and dry, and are spills cleaned up immediately?
- Are floor holes, such as drains, covered?
- Are permanent aisles appropriately marked?
- Are wet and/or greasy areas covered with non-slip materials?
- Are floor mats (rubber and wood) in good repair?
- Are signs showing floor-load capacities present?
- Are platform, storage lofts, balconies, etc., which are more than 4 feet above the floor, protected with standard guardrails?
- Are floor holes, through which a person could fall or accidentally walk into and trip, guarded by standard guardrails and toeboards?
- Have defective ladders (e.g., with broken rungs or split side rails) been tagged as “Dangerous, Do Not Use” and removed from service for repair or destruction?
- Are stepladders equipped with a metal spreader or locking device?
- Is the use of the top of an ordinary stepladder as a step prohibited?
- Do portable ladders have non-slip bases?
- Is the distance between the centerline of rungs on a fixed ladder and the nearest permanent object in back of the ladder at least 7 inches?

- Do all fixed ladders have a preferred pitch of 75° to 90° with the horizontal?
- Do stairs have at least 7 feet overhead clearance?
- Do stairs angle no more than 50° and no less than 30° off the horizontal?

13 Drilling Safety

Will this project require the use of a drill or direct push equipment rig for well installation and/or subsurface sampling?

No: ☐	**Yes:** ☒

If the answer to this question is **NO,** proceed to the next section. If the answer is **YES**, read this section and follow all procedures for safe work practices around a drill rig.

Note: The SSHO must complete the Drill Rig Inspection Log in Appendix H-7 prior to the initiation of any drilling operations.

Accidents may occur during drilling activities. Hazards include subsurface and overhead utilities, heavy machinery, heavy falling objects, slip/trip/fall, and potential flying debris. It is the SSHO's responsibility to ensure drilling activities are conducted safely. During the site safety meeting, the SSHO should check that all of the following requirements are in place:

- Personnel are 40-Hour OSHA trained
- Personnel are current with 8-Hour Annual Refresher Training
- Personnel are enrolled in a medical monitoring program
- Personnel have been successfully fit-tested within the last 12 months
- Personnel are trained in drill rig safe operating practices
- Personnel are trained in First Aid/CPR
- Personnel are trained in emergency procedures
- Emergency telephone numbers are posted
- Personnel have received site orientation
- Personnel have reviewed the HASP

Every drill crew should have a designated safety supervisor who has authority to enforce safety on the drilling site.

Prior to the commencement of any drilling activities, the SSHO must ensure the following:

PPE

- All drilling crewmembers are wearing appropriate PPE including, at a minimum: hard hat, safety shoes/boots, appropriate gloves, safety glasses, and any other PPE that may be required on a particular site.

- Clothing of drilling crew is close fitting without loose ends, straps, draw strings, belts, or other unfastened parts.

- Drilling crew is not wearing jewelry.

Housekeeping

- Suitable storage is used for tools, materials, and supplies.

- Pipes, drill rods, casings, augers, and other drilling tools are properly placed in racks or sills to prevent rolling and/or sliding.

- Penetration or other driving hammers are placed at a safe location on the ground and secure from moving.

- Work area, platforms, walkways, scaffolding, and other access ways are free of materials, debris, obstructions, and substances.

- All controls and control linkages, warning and operation lights, and lenses are free of oil and grease and/or ice.

- Gasoline is stored only in non-sparking red containers with a flame arrester in the fill spout and the word “gasoline” easily visible.

Maintenance

- The drill rig engine is shut down to make repairs and/or adjustments. Follow lockout/tagout procedures in Section 11.

- Wheels are blocked, leveling jacks are lowered, and hand breaks set before working under a drill rig.

- All pressure on hydraulics, fluid, and air systems, as appropriate, are released prior to performing maintenance.

- Personnel do not touch engine or exhaust systems immediately after a drilling operation.

- Personnel never climb the mast for maintenance or repairs.

- Personnel never weld or cut near fuel tank.

- Drill rig is kept well maintained with appropriate quantities and qualities of lubricants, hydraulic oils, etc.

- Filter plugs, guards, high-pressure hose clamps, chains, and cables that have been removed for maintenance are replaced.

Hand Tools

- All hand tools are kept in good condition.
- All damaged tools are either repaired or replaced immediately.
- Personnel must use the right tool for the right job.

Clear Work Area

- The site is adequately cleared and leveled prior to drilling to accommodate drill rig and supplies.

- Drainage is established to channel away drilling fluids or precipitation

Drilling Operations

- Drill rigs are not to be driven from hole to hole with derrick in raised position.

- Personnel must check for overhead obstruction before raising the derrick.

- The raised mast should be a minimum of one mast length from overhead power lines.

- Drill rig is leveled and stabilized with leveling jacks and/or solid cribbing before derrick is raised.

- Derrick is locked before initiating operations.

- Personnel only operate drill rig from position of controls.

- Exhaust fumes are vented out of area if drilling in a confined or enclosed area.

- Personnel should clean mud and grease from their boots before stepping onto the drill rig platform and use handholds and railings.

- Personnel do not touch any metal parts with exposed flesh during freezing weather.

- All unattended boreholes are adequately covered and marked.

- All operations are terminated during electrical storms.

- Personnel working on an elevated derrick platform must wear appropriate fall protection and attach the lifeline to the derrick just above the derrick platform to a solid structural derrick.

- When drilling in areas of high-level soil and groundwater impact using air rotary methods, ensure the following precautions are taken to avoid splashing workers and equipment with free-phase product or highly impacted groundwater which may "air lift" rapidly from the borehole:

  - Attempt to complete the boring to total depth without work stoppages, which may allow liquids to accumulate in the boring (unless unsafe conditions arise).

  - Upgrade to modified Level D, including polycoated Tyvek, if impacted soil is expected or encountered.

  - Ensure the work zone is properly ventilated by positioning personnel and potential ignition sources upwind of the boring or utilizing engineering controls such as fans or blowers.

  - Use the minimum amount of air pressure necessary to evacuate cuttings from the boring once impacted soil is encountered.

- All tools are attached to derrick with safety lines.

- While working on a derrick platform, never guide drill rods or pipe into racks or other supports by taking hold of a moving hoist line or traveling block.

- Loose tools are never left on derrick platform.

- Personnel must use appropriate lifting techniques to prevent bodily injury.

Overhead and Buried Utilities

- All overhead and buried utilities are identified and located and noted on all boring location plans and boring assignment sheets.

- Utility pole guy wires will be identified, marked, and avoided.

Supplying Power to Job Site

- All wiring and fixtures used to provide electricity for drilling operations are installed by a qualified person in accordance with the National Electric Code (NFPA 70-1984) with consideration with the American Petroleum Institutes recommended practices for electrical installation for production facilities (API-RP-500 B).

- Ground fault protection should be used for all separators and remote power sources.

Contact with Electricity

- If a drilling rig or a drill rig carrier makes contact with overhead or underground electrical wiring, that the operator and the person in the seat of the vehicle remain seated and not leave the vehicle and not touch any part of the vehicle or drill rig.

- If personnel must evacuate the drill rig, they must jump clear, as far as possible, and land with both feet together, and then hop from the scene.

Safety Operating Practices

- There exists a system of responsibility between the operator and the tool handler when connecting and disconnecting auger sections.

- Handler stands away from rotating auger when connecting and disconnecting auger sections.

- A pin is inserted and tapped in place, using a hammer or similar device, when securing the augur to a power coupling.

- A tool hoist is used when lowering second section of auger into place.

- Both operators stand clear of auger as it is being lifted into place.

- Long-handled shovels are used to move dirt away from auger.

- No attempt shall be made to exceed manufacturers’ ratings of speed, force, torque, pressure, flow, etc. The drill rig and tools are to be used only for the purposes for which they are intended and designed.

- Soil and mud are cleaned from rotating augers using appropriate tools and not by hand.

14 Work in Watercraft

Hazards present in watercraft work include slip, trip, and fall, especially in rainy weather, and the hazard of falling overboard. All persons working on the deck of the watercraft will wear U.S. Coast Guard approved life vests in addition to any other work required PPE. A minimum of two RETEC employees (or a RETEC employee and a subcontractor) is required when core collection activities are performed from watercraft.

Watercraft will be inspected daily to ensure that all equipment is functioning properly, safe working conditions are present, and safety equipment are available and accessible. A watercraft inspection form is included in Appendix H-9, and although the form should be filled out weekly, watercraft should be inspected daily for crew and boat items on the form.

Accidents may occur during sediment sampling activities. Hazards include, subsurface and overhead utilities, heavy machinery, heavy falling objects, slip/trip/fall, and potential flying debris. It is the Site Engineer/SSHO's responsibility to ensure activities on the boat are conducted safely. During the site safety meeting, the Site Engineer/SSHO should check that **all** of the following requirements are in place:

- Personnel are 40-Hour OSHA trained.
- Personnel are current with 8-Hour Annual Refresher Training.
- Personnel are enrolled in a medical monitoring program.
- Personnel have been successfully fit-tested within the last 12 months.
- Personnel are trained in sediment sampling safe operating practices.
- Personnel are trained in First Aid/CPR.
- Personnel are trained in emergency procedures.
- Emergency telephone numbers are posted.
- Personnel have received site orientation.
- Personnel have reviewed the HASP.

Every crew should have a designated safety supervisor who has authority to enforce safety on the work site.

Prior to the commencement of any sampling activities, the Site Engineer/SSHO must ensure the following:

PPE

- All persons working on the deck of the watercraft will wear USCG approved life vests in addition to any other work required PPE, including, at a minimum: hardhat, safety shoes/boots, appropriate gloves, safety glasses, and any other PPE that may be required on a particular site.
- Clothing of crew is close fitting without loose ends, straps, drawstrings, belts, or other unfastened parts.
- Crew is not wearing jewelry.

Housekeeping

- Suitable storage is used for tools, materials, and supplies.
- Pipes and other sampling tools are properly placed in racks or sills to prevent rolling and/or sliding.
- Work area, walkways, and other access ways are free of materials, debris, obstructions, and substances.

Maintenance

- All pressure on hydraulics, fluid, and air systems, as appropriate, are released prior to performing maintenance.
- Personnel never climb the A-frame or darit for maintenance or repairs.
- Coring or sampling device is kept well maintained with appropriate quantities and qualities of lubricants, hydraulic oils, etc.

Hand Tools

- All hand tools are kept in good condition.
- All damaged tools are either repaired or replaced immediately.
- Personnel must use the right tool for the right job.

Sampling Activities

- Personnel must be aware of overhead obstruction when the A-frame is in use.

- Hand communication with the deck crew and captain in the cabin is established and well understood by all crew members.
- Personnel should clean mud and grease from their boots while working on the deck and use handholds and railings.
- Personnel do not touch any metal parts with exposed flesh during freezing weather.
- All operations are terminated during electrical storms.
- When sampling in highly contaminated areas, ensure the following precautions are taken to avoid splashing workers and equipment with contaminated sediment or water:
    - Upgrade to modified Level D including polycoated Tyvek or rain gear if impacted media is expected or encountered.
    - Ensure the work zone is properly ventilated by positioning personnel and potential ignition sources upwind of the sampling.
- Loose tools are never left on the boat deck.
- Personnel must use appropriate lifting techniques to prevent bodily injury.

Appendix A

Site Safety Plan Amendments

PLEASE USE THIS DOCUMENT TO MAKE ANY CHANGES TO THE HEALTH AND SAFETY PLAN

Site Safety Plan Amendments

Amendment No.:______________________________

Client:	**Project Number:**
Location:	**Date:**
Project Manger:	**Site Engineer:**
Site EHS Officer:	
Amendment:	
Reason for Amendment:	
Alternative Safeguard Procedures:	
Required Changes in PPE:	

____________________________________ ____________________________________

Site EHS Officer **Date**

____________________________________ ____________________________________

Corp. EHS Manager **Effective Date**

Appendix B

Site Safety Plan Acknowledgment Form

Site Safety Plan Acknowledgment Form

I have been informed, understand, and will abide by all the procedures and protocols set forth in this Site Health and Safety Plan for the ________________ site.

Name (Print)	Signature	Affiliation	Date

Appendix C

Visitor Sign-In Log

Visitor Sign-In Log

Client:____

Location:______________________________________

Project Mgr.:___________________________________

Project Number:________________________________

Site Engr.:____________________________________

Site EHS Officer:_______________________________

Date	Name	Affiliation	Purpose of Visit	Site EHS Training		Do you have Level D PPE?		Time In	Time Out
				Yes	No	Yes	No		

Appendix D

Site Safety Meeting Form

Our behavior-based safety process is the key to our success!

Site Safety Meeting Form

Project Name:______________________ **Location**:___________________________
Date:_______________________________ **Time**:_______________________________
Project Number:____________________ **Instructor**:___________________________

Safety Topics Presented

JHA/STAR:____
____
____
____

Lessons Learned:____
____
____

BEST O&F:____
____
____

General Safety Topics:____
____
____

Name	Attendee’s Signature

Appendix E
Notification of Access to Employee Exposure and Medical Records

Notice

To All Employees: This Notice Is to Provide Information for Compliance with 29 CFR Part 1910 Subpart C - General Safety and Health Provisions - Paragraph 1910.1020, Access to Employee Exposure and Medical Records.

(i) The existence, location, and availability of any records covered by this section is as follows:

The RETEC Group, Inc.

One Monroeville Center, Suite 1015
Monroeville, PA 15146
PH: (412) 380-0140
FAX: (412) 380-0141

Attn: Tina McHugh

tmchugh@retec.com

Corporate Environmental Health and Safety Administrative/Workers' Comp. Manager

(ii) The person responsible for maintaining and providing access to these records is RETEC's Corporate Environmental Health and Safety Administrative Manager.

(iii) Each employee has the right to access these records.

(iv) A copy of this standard and its appendices are available to all affected employees at each RETEC office location.

For More Information or Questions Contact:

Ms. Tina L. McHugh
Corporate EHS Administrative/Worker's Comp. Manager
(412) 380-0140

Appendix F

Cold & Heat Stress and Other Physiological Factors

Cold Stress

These Threshold Limit Values (TLVs) are intended to protect workers from the severe effects of cold stress (hypothermia) and cold injury and to describe exposures to cold working conditions under which it is believed that nearly all workers can be repeatedly exposed without adverse health effects. The TLV objective is to prevent the deep body core temperature from falling below 36ºC and to prevent cold injury to body extremities. Deep body temperature is the core temperature of the body as determined by rectal temperature measurements. For a single, occasional exposure to a cold environment, a drop in core temperature to no lower than 35ºC should be permitted. In addition to provisions for total body protection, TLV objective is to protect all parts of the body, with emphasis on hands, feet, and head, from cold injury.

Introduction

Fatal exposures to cold among workers have almost always resulted from accidental exposures involving failure to escape from low environmental air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body. The clinical presentations of victims of hypothermia are shown in Table 1 (taken from Dembert in AFP, January 1982). Workmen should be protected from exposure to cold so that the deep core temperature does not fall below 36ºC (96.8ºF); lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision-making, or loss of consciousness with the threat of fatal consequences.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35ºC (95ºF). This must be taken as a sign of danger to the workers and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Since prolonged exposure to cold air or to immersion in cold water in temperatures well above freezing can lead to dangerous hypothermia, whole body protection must be provided.

1. Adequate insulating clothing to maintain core temperatures above 36ºC must be provided to workers if work is performed in air temperatures below 4ºC (40ºF). Wind chill factor[1] or the cooling power of the air is a critical factor. An equivalent chill temperature chart relating the actual dry bulb air temperature and the wind velocity is presented in Table 2. The equivalent chill temperatures on exposed skin are determined by estimating the combined cooling effect of wind and low air temperatures.

2. Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating

---

[1] Wind chill factor is a unit of heat loss from a body defined in watts per meter squared per hour being a function of the air temperature and wind velocity upon the exposed body.

clothing and/or a reduction in the duration of the exposure period are among the special precautions, which should be considered. The precautionary action to be taken will depend upon the physical condition of the worker and should be determined with the advice of a physician with knowledge of the cold stress factors and the medical condition of the worker.

Evaluation and Control

For exposed skin, continuous exposure should not be permitted when the air speed and temperature result in an equivalent chill temperature of -32ºC (-25ºF). Superficial or deep local tissue freezing will occur only at temperatures below -1ºC regardless of wind speed.

At air temperatures of 2ºC (35.6ºF) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.

Table 1 Progress Clinical Presentations of Hypothermia[2]

Core Temperature		Clinical Signs
ºC	**ºF**	
37.6	99.6	"Normal" rectal temperature
37.0	98.6	"Normal" oral temperature
36.0	96.8	Metabolic rate increases in an attempt to compensate for heat loss
35.0	95.0	Maximum shivering
34.0	93.2	Victim conscious and responsive, with normal blood
33.0	91.4	Severe hypothermia below this temperature
32.0 31.0	89.6 87.8	Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated but react to light; shivering ceases
30.0 29.0	86.0 84.2	Progressive loss of consciousness; muscular rigidity increases; pulse and blood pressure difficult to obtain; respiratory rate decreases
28.0	82.4	Ventricular fibrillation possible with myocardial irritability
27.0	80.6	Voluntary motion ceases; pupils non-reactive to light; deep tendon and superficial reflexes absent
26.0	78.8	Victim seldom conscious
25.0	77.0	Ventricular fibrillation may occur spontaneously
24.0	75.2	Pulmonary edema
22.0 21.0	71.6 69.8	Maximum risk of ventricular fibrillation
20.0	68.0	Cardiac standstill
18.0	64.4	Lowest accidental hypothermia victim to recover
17.0	62.6	Isoelectric electroencephalogram
9.0	48.2	Lowest artificially cooled hypothermia patient to recover

---

[2] Presentations approximately related to core temperature. Reprinted from the January 1982 issue of American Family Physician published by the American Academy of Fandly Physicians.

Table 2 Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)

Est. Wind Speed (mph)	**Actual Temperature Reading (ºF)**											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (ºF)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-131
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect).	**Little Danger** In < 1 hr. with dry skin. Maximum danger of false sense of security.				**Increasing Danger** Danger from freezing of exposed flesh within one minute.			**Greater Danger** Flesh may freeze within 30 seconds.				
	Trench foot and immersion foot may occur at any point on this chart.											

Note:
Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

Recommended limits for properly clothed workers for periods of work at temperatures below freezing are shown in Table 3. Special protection of the hands is required to maintain manual dexterity for the prevention of accidents:

1. If fine work is to be performed with bare hands for more than 10 to 20 minutes in an environment below 16ºC (60ºF), special provisions should be established for keeping the workers' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars shall be covered by thermal insulating material at temperatures below -1ºC (30ºF).

To prevent contact frostbite, the workers should wear anti-contact gloves.

1. When cold surfaces below -7ºC (20ºF) are within reach, a warning should be given to each worker by his supervisor to prevent inadvertent contact by skin.
2. If the air temperature is -17.5ºC (9ºF) or less, the hands should be protected by mittens. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens.

Provisions for additional total body protection are required if work is performed in an environment at or below 4ºC (40ºF). The workers shall wear cold protective clothing appropriate for the level of cold and physical activity:

1. If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind shall be reduced by shielding the work area, or by wearing an easily removable outer windbreak layer garment. Wind chill cooling rates are illustrated in Table 4.
2. If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing used may be of a type impermeable to water. With more severe work under such conditions, the outer layer should be water repellent and the outerwear should be changed as it becomes wet. The outer garments must include provisions for easy ventilation in order to prevent wetting of inner layers by sweat. If work is done at normal temperatures or in a hot environment before entering the cold area, and the clothing is wet, the employee shall change into dry clothes before entering the cold area. The workers shall change socks and any removable felt insoles at regular daily intervals or use vapor barrier boots. The optimal frequency of change shall be determined empirically and will vary individually and according to the type shoe worn and how much the individual's feet sweat.
3. If extremities (ears, toes, and nose) cannot be protected sufficiently to prevent sensation of excessive cold or frostbite by handwear, footwear, and facemasks, these protective items shall be supplied in auxiliary heated versions.

4. If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.

5. Workers handling evaporative liquid (gasoline, alcohol, or cleaning fluids) at air temperature below 4ºC (40ºF) shall take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of "cryogenic fluids" or those liquids with a boiling point only just above ambient temperatures.

Table 3 Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift

Air Temp – Sunny Sky		Non-Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
ºC	ºF	Max. Work Period (min.)	No. of Breaks	Max. Work Period (min.)	No. of Breaks	Max. Work Period (min.)	No. of Breaks	Max. Work Period (min.)	No. of Breaks	Max. Work Period (min.)	No. of Breaks
-26º to -28º	-15º to -1º	Normal Breaks		Normal Breaks		75	2	55	3	40	4
-29º to -31º	-20º to -24º	Normal Breaks		75	2	55	3	40	4	30	5
-32º to -34º	-25º to -29º	75	2	55	3	40	4	30	5	Non-emergency work should cease	
-35º to -37º	-30º to -34º	55	3	40	4	30	5	Non-emergency work should cease			
-38º to -39º	-35º to -39º	40	4	30	5	Non-emergency work should cease					
-40º to -42º	-40º to -44º	30	5	Non-emergency work should cease							
-43º & below	-45º & below	Non-emergency work should cease									

Notes:

1. Schedule applies to moderate-to-heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For light-to-moderate work (limited physical movement): apply the schedule one step lower. For example, at 30ºF with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (5).
2. The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph - light flag moves; 10 mph - light flag fully extended; 15 mph - raises newspaper sheet; 20 mph - blowing and drifting snow.
3. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be:
   (1) special warm-up breaks should be initiated at a wind chill of about 1720 Wm/2
   (2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m2.

   In general, the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.

   Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labor.

Table 4 Wind Chill Cooling Rate Effects*

Wind Chill Rates (Watts/m^3)	Comments/Effects
700	Conditions considered comfortable when dressed skiing.
1200	Conditions no longer pleasant for outdoor activities on overcast days.
1400	Conditions no longer pleasant for outdoor activities on sunny days.
1600	Freezing of exposed skin begins for most people depending on the degree of activity and the amount of sunshine.
2300	Conditions for outdoor travel such as walking become dangerous. Exposed areas of the face freeze in less than 1 minute for the average person.
2700	Exposed flesh will freeze within half a minute for the average person.

**Adapted from Canadian Department of the Environment, Atmospheric Environment Service.*

Work-Warming Regimen

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below -7ºC (20ºF), heated warming shelters (tents, cabins, rest rooms, etc.) shall be made available nearby and the workers should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostbite, the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for the immediate return to the shelter. When entering the heated shelter, the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation. Also, a change of dry work clothing may be provided. A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of the diuretic and circulatory effects.

For work practices at or below -12ºC (10ºF) ECT, the following shall apply:

1. The worker shall be under constant protective observation (buddy system or supervision).
2. The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, rest periods must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.
3. New employees shall not be required to work full time in cold in the first days until they become accustomed to the working conditions and required protective clothing.

4. The weight and bulkiness of clothing shall be included in estimating the required work performance and weights to be lifted by the worker.

5. The work shall be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats shall not be used. The worker should be protected from drafts to the greatest extent possible.

6. The workers shall be instructed in safety and health procedures. The training program shall include, at a minimum, instruction in:

   a) Proper re-warming procedures and appropriate first aid treatment
   b) Proper clothing practices
   c) Proper eating and drinking habits
   d) Recognition of impending frostbite
   e) Recognition of signs and symptoms of impending hypothermia or excessive cooling of body even when shivering does not occur
   f) Safe work practices

Special Workplace Recommendations

Special design requirements for refrigerator rooms include the following:

1. In refrigerator rooms, the air velocity should be minimized as much as possible and should not exceed 1 meter per second (200 fpm) at the job site. This can be achieved by properly designed air distribution systems.

2. Special wind-protective clothing shall be provided based upon existing air velocities to which workers are exposed.

Special caution shall be exercised when working with toxic substances and when workers are exposed to vibration. Cold exposure may require reduced exposure limits.

Eye protection for workers employed outdoors in a snow and/or ice-covered terrain shall be supplied. Special safety goggles to protect against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) and blowing ice crystals are required when there is an expanse of snow coverage causing a potential eye exposure hazard.

Workplace Monitoring is Required as Follows:

1. Suitable thermometry should be arranged at any workplace where the environmental temperature is below 16ºC (60ºF) to enable overall compliance with the requirements of the TLV to be maintained.

2. Whenever the air temperature at a workplace falls below -1ºC (30ºF), the dry bulb temperature should be measured and recorded at least every 4 hours.
3. In an indoor workplace, the wind speed should also be recorded at least every 2 hours whenever the rate of air movement exceeds 2 meters per second (5 miles per hour).
4. In an outdoor work situation, the wind speed should be measured and recorded together with the air temperature whenever the air temperature is below -1ºC (30ºF).
5. The equivalent chill temperature shall be recorded with the other data whenever the equivalent chill temperature is below -7ºC (20ºF).

Employees shall be excluded from work in cold at -1ºC (30ºF) or below if they are suffering from diseases or taking medication, which interferes with normal body temperature regulation or reduces tolerance to work in cold environments. Workers who are routinely exposed to temperatures below -24ºC (-10ºF) with wind speeds less than 5 miles per hour should be medically certified as suitable for such exposures.

Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues, in addition to providing first aid treatment.

Heat Stress and Other Physiological Factors

Wearing PPE puts a hazardous waste worker at considerable risk of developing heat stress. This can result in health effects ranging from transient heat and fatigue to serious illness or death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of most common (and potentially serious) illnesses at hazardous wastes sites, regular monitoring and other preventative precautions are vital.

Individuals vary in their susceptibility to heat stress. Factors that may predispose someone to heat stress include:

- Lack of physical fitness
- Lack of acclimatization
- Age
- Dehydration
- Obesity
- Alcohol and drug use
- Infection
- Sunburn
- Diarrhea
- Chronic disease

Reduced work tolerance and the increased risk of excessive heat stress is directly influenced by the amount and type of PPE worn. PPE adds weight and bulk, severely reduces the body's access to normal heat exchange mechanisms (evaporation, convection, and radiation), and increases energy expenditure. Therefore, when selecting PPE, each item's benefit should be carefully evaluated in relation to its potential for increasing the risk of heat stress. Once PPE is selected, the safe duration of work/rest periods should be determined based on the following:

- Anticipated work rate
- Ambient temperature and other environmental factors
- Type of protective ensemble
- Individual worker characteristics and fitness

Monitoring

Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored.

- For workers wearing permeable clothing (*e.g.*, standard cotton or synthetic work clothes), follow recommendations for monitoring requirements and suggested work/rest schedules in the current American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values for Heat Stress. If the actual work clothing differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, change the monitoring requirements and work/rest schedules accordingly.

- For workers wearing semi-permeable or impermeable[1] encapsulating ensembles, the ACGIH standard cannot be used. For these situations, workers should be monitored when the temperature in the work area is above 21ºC (70ºF).

To monitor the worker, measure the following:

- **Heart Rate.** Count the radial pulse during a 30-second period as early as possible in the rest period.

  If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.

  If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

- **Oral Temperature.** Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).

  If the oral temperature exceeds 37.7ºC (99.6ºF) at the beginning of the next rest period, shorten the following work cycle by one-third.

  Do not permit a worker to wear a semi-permeable or impermeable garment when his/her oral temperature exceeds 38.1ºC (100.6ºF).

- **Body Water Loss, If Possible.** Measure weight on a scale accurate to +0.25 pounds at the beginning and end of each workday to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing. The body water loss should not exceed 1.5 percent total body weight loss in a workday.

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see Table 1). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

---

[1] Although no protective ensemble is "completely" impermeable, for practical purposes an outfit may be considered impermeable when calculating heat stress risk.

Table 1 Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers[1]

Adjusted Temperature[2]		**Normal Ensemble[3]**	**Impermeable Ensemble**
ºF	ºC		
90 or above	32.2 or above	After each 45 minutes of work	After each 15 minutes of work
87.5 – 90	30.8 – 32.2	After each 60 minutes of work	After each 30 minutes of work
87.5 – 85.5	28.1 – 30.8	After each 90 minutes of work	After each 60 minutes of work
77.5 – 82.5	25.3 – 28.1	After each 120 minutes of work	After each 90 minutes of work
72.5 – 77.5	22.5 – 25.3	After each 150 minutes of work	After each 120 minutes of work

[1] For work levels of 250 Kilocalories/hour.

[2] Calculate the adjusted air temperature (ta adj) using this equation: ta adj = ta º = (13 + % sunshine). Measure air temp. (ta) with a standard thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distant shadow, 0 percent sunshine = no shadows).

[3] A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

Prevention

Proper training and preventive measures will help avert serious illness and decrease in productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion, the person may be predisposed to additional heat injuries. To avoid heat stress, management should take the following steps.

- Adjust work schedules:
    - Modify work/rest schedules according to monitoring requirements.
    - Mandate work slowdowns as needed.
    - Rotate personnel: alternate job functions to minimize overstress or overexertion at one task.
    - Add additional personnel to work teams.
    - Perform work during cooler hours of the day, if possible, or at night, if adequate lighting can be provided.
    - Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
    - Maintain workers' body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat. The normal thirst mechanism is not sensitive enough to ensure that enough water will

be drunk to replace lost water. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:

  - Maintain water temperature at 10º to 15.6ºC (50º to 60ºF)
  - Provide small disposable cups that hold about 4 ounces (0.1 liter)
  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or diluted drinks) before beginning work
  - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight
  - Weigh workers before and after work to determine if fluid replacement is adequate

- Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure. Cooling devices include:
  - Field showers or hose-down areas to reduce body temperature and/or to cool off protective clothing
  - Cooling jackets, vests, or suits
- Train workers to recognize and treat heat stress. As part of training, identify the signs and symptoms of heat stress.

Other Factors

PPE decreases worker performance as compared to an unequipped individual. The magnitude of this effect varies considerably, depending on both the individual and the PPE ensemble used. This section discusses the demonstrated physiological responses to PPE, the individual human traits that play a factor in these responses, and some of the precautionary and training measures that need to be taken to avoid PPE-induced injury.

The physiological factors, which may affect worker ability to function using PPE, include:

- Physical condition
- Level of acclimatization
- Age
- Gender
- Weight

Physical Condition. Physical fitness is a major factor influencing a person's ability to perform work under heat stress. The more fit someone is, the more work they can safely perform. At a given level of work a fit person, relative to an unfit person, will have:

- Less physiological strain
- A lower heart rate
- A lower body temperature, which indicates less retained body heat (a rise in internal temperature precipitates heat injury)
- A more efficient sweating mechanism
- Slightly lower oxygen consumption
- Slightly lower carbon dioxide production

Level of Acclimatization. The degree to which a worker's body has physiologically adjusted or acclimatized to working under hot conditions affects his or her ability to do work. Acclimatized individuals generally have lower heart rates and body temperatures than non-acclimatized individuals and sweat sooner and more profusely. This enables them to maintain lower skin and body temperatures at a given level of environmental heat and work loads than non-acclimatized workers. Sweat composition also becomes more dilute with acclimatization, which reduces salt loss.

Acclimatization can occur after just a few days of exposure to a hot environment. NIOSH recommends a progressive 6-day acclimatization period for the non-acclimatized worker before allowing him/her to do full work on a hot job. Under this regimen, the first day of work on site is begun using only 50 percent of the anticipated workload and exposure time, and is increased slowly over the next several days. If the workers can acclimatize quickly, this period may be shortened by two or three days. If this period includes time off, however, workers can lose acclimatization in a matter of days, and work regimens should be adjusted taking this into account.

When enclosed in an impermeable suit, fit-acclimatized individuals sweat more profusely than un-fit or non-acclimatized individuals and may, therefore, actually face a greater danger of heat exhaustion due to rapid dehydration. Consuming adequate quantities of water can prevent this. See previous section on prevention for additional information.

Age. Generally, maximum work capacity declines with increasing age, but this is not always the case. Active, well-conditioned seniors often have performance capabilities equal to or greater than young sedentary individuals. However, there is some evidence, indicated by lower sweat rate and higher body core temperatures, that older individuals are less effective in compensating for a given level of environmental heat and work load. At moderate thermal loads, however, the physiological responses of "young" and "old" are similar and performance is not affected.

Age should not be the sole criterion for judging whether or not an individual should be subjected to moderate heat stress. Fitness level is a more important factor.

Gender. The literature indicates that women tolerate heat stress at least as well as their male counterparts. Generally, a woman's work capacity averages 10 to 30 percent less than that of a man. The primary reasons for this are the greater oxygen-carrying capacity and the stronger heart in the male. However, a similar situation exists as with aging: not all men have greater work capacities than all women.

Weight. The ability of a body to dissipate heat depends on the ratio of its surface area to its mass (surface area/weight). Heat loss (dissipation) is a function of surface area and heat production is dependent on mass. Therefore, heat balance is described by the ratio of the two.

Since overweight individuals (those with a low ratio) produce more heat per units of surface area than thin individuals (those with a high ratio), overweight individuals should be given special consideration in heat stress situations. However, when wearing impermeable clothing, the weight of an individual is not a critical factor in determining the ability to dissipate excess heat.

Signs and Symptoms of Heat Stress

- Heat rash may result from continuous exposure to heat or humid air.

- Heavy sweating with inadequate electrolyte replacement causes heat cramps. Signs and symptoms include:

  - Muscle spasms
  - Pain in the hands, feet, and abdomen

- Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

  - Pale, cool, moist skin
  - Heavy sweating
  - Dizziness
  - Nausea
  - Fainting

- Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occurs. Competent medical help must be obtained. Signs and symptoms are:

  - Red, hot, usually dry skin
  - Lack of or reduced perspiration
  - Nausea
  - Dizziness and confusion
  - Strong, rapid pulse
  - Coma

References

American Conference of Governmental Industrial Hygienists. 1985. Threshold Limit Values for Chemical Substances and Physical Agents in the Workplace Environment and Biological Exposure Indices with Intended Changes for 1985-86. Cincinnati, OH.

Astrand, I.; Axelson, O.; Erikson, U.; and L. Olander. 1975. Heat stress in occupational work. Ambio 4:37-42.

Dukes-Dubos, F.N., and a Henschel, eds. 1980. Proceeding of a NIOSH Workshop on Recommended Heat Stress Standards. U.S. Department of Health and Human Services, Cincinnati, OH p. 153.

Eocjma. L.W.; Park, C.R.; Nelson, N.; Horvarth, S.M.; and E.D. Palmes. 1950. Thermal regulation during acclimatization in a hot, dry (desert type) environment. Am. J. Physiol. 163:50-56.

Goldman, R.F. 1970. Tactical implications of the Physiological Stress Imposed by Chemical Protective Clothing Systems. Army Science Conference, Natick, MA.

Goldman, R.F. 1983. Heat Stress in Industrial Protective Encapsulating Garments. Contract deliverable to U.S. Department of Health and Human Services, Order No. 83-211.

Henschel, A. 1985. Memorandum to Sheldon Rabinovitz from Austin Henschel, NIOSH, Cincinnati, OH June 20,1985.

Lind, A.R.; Humphreys, P.W.; Collins, K.J.; Foster, K; and K.F. Sweetland. 1970. Influence of age and daily duration of exposure on responses of men to work in heat. J. Appl. Physiol. 28:50-56.

McArdle, W.D.; Katch, F.1; and V.L. Katch. 1981. Exercise Physiology: Energy, Nutrition, and Human Performance. Lea and Febiger, Philadelphia, PA.

NIOSH. 1981. Chemical Control Corporation, Elizabeth New Jersey. Hazard Evaluation Report. TA-80-77-853.

Ramsey, J.D. 1976. NIOSH, Standards Advisory Committee on Heat Stress - Recommended Standard for Work in Hot Environments. Appendix C in Standards for Occupation Exposure to Hot Environments, proceedings of symposium, Cincinnati, OH.

Shapiro, Y.; Pandolf, K.B.; Avellini, B.A.; Pimental, N.A.; and R.F. Goldman. 1981. Heat balance and heat transfer in men and women exercising in hot-dry and hot-wet condition. Ergonomics 24:375-386.

U.S. EPA, 1984. Standard Operating Safety Guides. Office of Emergency and Remedial Response, Hazardous Response Support Division, Edison, NJ. November, 1984.

Appendix G

Material Safety Data Sheets

MSDS LIST

Alconox
Bentonite
Benzene
BioSolve
Coal Tar Pitch
Cresol
Cyanide (ferric)
Diesel fuel
Ethylbenzene
Gasoline
Hydrochloric Acid (HCl)
Hydrogen cyanide (HCN)
Isobutylene
Isopropyl alcohol
Methanol
Methylnaphthalene (2-)
Naphthalene
Nitric Acid (HNO_3)
Phenol
Portland Cement
Simple Green Cleaner/Degreaser
Toluene
Xylenes (m-, o-, and p- isomers)

Alconox® Material Safety Data Sheet

Alconox, Inc.
30 Glenn Street, Suite 309
White Plains, NY 10603

24 Hour Emergency Number - Chem-Tel (800) 255-3924

Click Here for a printable version of this document

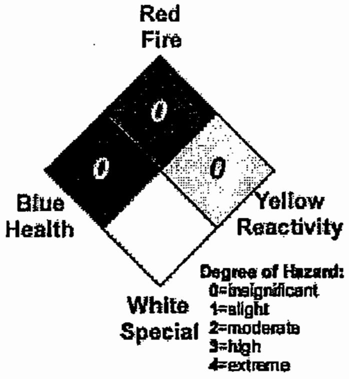
Get a PDF version of this document

Get Acrobat Reader

I. Identification

Product Name (shown on label):	ALCONOX
CAS Registry Number:	Not Applicable
Effective Date:	January 1, 2001
Chemical Family:	Anionic Powdered Detergent
Mfr. Catalog #s for Sizes:	1104, 1125, 1150, 1101, 1103, 1112

National Fire Protection Association 704 Labeling:



NJTSRN: 1100

II. Hazardous Ingredients/Identity Information

There are no hazardous ingredients in ALCONOX as defined by the OSHA Standard and Hazardous Substance List 29 CFR 1910 Subpart Z.

III. Physical/Chemical Characteristics

Boiling Point (F):	Not Applicable
Vapor Pressure (mm Hg):	Not Applicable
Vapor Density (AIR=1):	Not Applicable
Specific Gravity (Water=1):	Not Applicable
Evaporation Rate (Butyl Acetate=1):	Not Applicable
Melting Point:	Not Applicable
Solubility in Water:	Appreciable-Soluble to 10% at ambient conditions
Appearance:	White powder interspersed with cream colored flakes.
pH:	9.5 (1%)

IV. Fire and Explosion Data

Flash Point (Method Used):	None
Flammable Limits:	LEL: No Data UEL: No Data
Extinguishing Media:	Water, dry chemical, CO2, foam
Special Fire fighting Procedures:	Self-contained positive pressure breathing apparatus and protective clothing should be worn when fighting fires involving chemicals.
Unusual Fire and Explosion Hazards:	None

V. Reactivity Data

Stability:	Stable
Hazardous Polymerization:	Will not occur
Incompatibility (Materials to Avoid):	None
Hazardous Decomposition or Byproducts:	May release CO2 on burning

VI. Health Hazard Data

Route(s) of Entry:	Inhalation? Yes Skin? No Ingestion? Yes
Health Hazards (Acute and Chronic):	Inhalation of powder may prove locally irritating to mucous membranes. Ingestion may cause discomfort and/or diarrhea. Eye contact may prove irritating.
Carcinogenicity:	NTP? No IARC Monographs? No OSHA Regulated? No
Signs and Symptoms of Exposure:	Exposure may irritate mucous membranes. May cause sneezing.
Medical Conditions Generally Aggravated by Exposure:	Not established. Unnecessary exposure to this product or any industrial chemical should be avoided. Respiratory conditions may be aggravated by powder.
Emergency and First Aid Procedures:	Eyes: Immediately flush eyes with water for at least 15 minutes. Call a physician. Skin: Flush with plenty of water. Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs administer fluids. See a physician for discomfort.

VII. Precautions for Safe Handling and Use

Steps to be Taken if Material is Released or Spilled:	Material foams profusely. Recover as much as possible and flush remainder to sewer. Material is biodegradable.
Waste Disposal Method:	Small quantities may be disposed of in sewer. Large quantities should be disposed of in accordance with local ordinances for detergent products.
Precautions to be Taken in Storing and Handling:	Material should be stored in a dry area to prevent caking.
Other Precautions:	No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical.

VII. Control Measures

Respiratory Protection (Specify Type):	Dust mask - Recommended
Ventilation:	Local Exhaust-Normal Special-Not Required Mechanical-Not Required Other-Not Required
Protective Gloves:	Impervious gloves are useful but not required.
Eye Protection:	Goggles are recommended when handling solutions.
Other Protective Clothing or Equipment:	None
Work/Hygienic Practices:	No special practices required

MATERIAL SAFETY DATA SHEET

HOLEPLUG® 3/8

00040 1.00 US EA 07.01.1999 MSDS_US

1. PRODUCT AND COMPANY IDENTIFICATION

Product Code	00040
Trade Name	HOLEPLUG® 3/8
Generic Description	BENTONITE, SODIUM MONTMORILLONITE (CAS# 1302-78-9)
Manufacturer/Supplier	Baroid
Address	P.O. Box 1675 Houston, TX 77251
Phone Number	(281) 871-5900
Emergency Phone Number	(281) 871-5900
Chemtrec Number	(800)424-9300
MSDS first issued	7 January 1999
MSDS data revised	

2. COMPOSITION/INFORMATION ON THE COMPONENTS

Hazardous Components in Preparation for US

Component Name	Codes	Concentration
SILICA, CRYSTALLINE AS QUARTZ	14808-60-7	2.00 - 6.00

3. HAZARD IDENTIFICATION

Routes of Entry	- Inhalation of dusts - Eye contact - Skin contact
Carcinogenic Status	An ingredient is: - Listed as carcinogenic by: - IARC
Target Organs	- Eye - Skin - Lung
Health Effects - Eyes	Dust may cause slight transient irritation.
Health Effects - Skin	Material may cause slight irritation on prolonged or repeated contact.
Health Effects - Ingestion	Swallowing may have the following effects: - irritation of mouth, throat and digestive tract
Health Effects - Inhalation	Exposure to dust may have the following effects: - irritation of nose, throat and respiratory tract Prolonged inhalation of dust may result in cancerous and noncancerous lung disease. Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans.

4. FIRST AID MEASURES

First Aid - Eyes	Immediately flood the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention if soreness or redness persists.
First Aid - Skin	Wash skin thoroughly with soap and water.
First Aid - Ingestion	Wash out mouth with water.
First Aid - Inhalation	Remove from exposure. If there is difficulty in breathing, give oxygen. Seek medical attention if symptoms persist.
Advice to Physicians	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Extinguishing Media	Not readily combustible. Select extinguishing agent appropriate to other materials involved.
Special Hazards of Product	Avoid the formation of dust clouds.
Protective Equipment for Fire-Fighting	No specific measures necessary.

6. ACCIDENTAL RELEASE MEASURES

Spill Procedures	Avoid creating a dust. Sweep or preferably vacuum up and collect in suitable containers for recovery or disposal. Avoid accumulation of dust.
Personal Precautions	Wear appropriate protective clothing. Wear respiratory protection. Material can create slippery conditions underfoot.
Environmental Precautions	No specific measures necessary.

7. HANDLING AND STORAGE

Handling	Avoid creating a dust. Use in well ventilated area. Avoid inhaling dust.
Storage	Store in original containers. Storage area should be: - cool - dry - well ventilated - under cover

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Standards

SILICA, CRYSTALLINE AS QUARTZ	OSHA (respirable): 10 mg/m3 / %SiO2 + 2 OSHA (Total Dust): 30 mg/m3 / %SiO2 + 2 Dust, respirable: ACGIH: TLV 0.1mg/m3 8h TWA. UK EH40: MEL 0.4mg/m3 8h TWA.
Engineering Control Measures	Engineering methods to prevent or control exposure are preferred. Methods include process or personnel enclosure, mechanical ventilation (dilution and local exhaust), and control of process conditions. If engineering controls and work practices are not effective in preventing or controlling exposure, then suitable personal protective equipment, which is known to perform satisfactorily, should be used. Use of the basic principles of Industrial Hygiene will enable this material to be used safely.
Respiratory Protection	The specific respirator selected must be based on the airborne concentration found in the workplace and must not exceed the working limits of the respirator.
Hand Protection	Work gloves
Eye Protection	Dust tight goggles.
Body Protection	Normal work wear. - overall or apron

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Pellets

9. PHYSICAL AND CHEMICAL PROPERTIES

Color	Light Brown - Grey - Varies with product.
Odor	Odorless
pH	Not applicable.
Specific Gravity	2.5
Boiling Range/Point (°C/F)	Not determined.
Flash Point (PMCC) (°C/F)	None.
Explosion Limits (%)	None.
Vapor Pressure	Not applicable.
Density	49.5 lb/cu ft at 20 °C. (loose)
Solubility in Water	Not applicable.
Vapor Density (Air = 1)	Not applicable.
Evaporation Rate	Not applicable.
VOC (g/l)	0

10. STABILITY AND REACTIVITY

Stability	Stable under normal conditions.
Materials to Avoid	None known.
Hazardous Polymerization	Will not occur.
Hazardous Decomposition Products	None known.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity	Low order of acute toxicity predicted.
Chronic Toxicity/Carcinogenicity	IARC assessment: one of the components of this product is carcinogenic to humans (Group 1).
Genotoxicity	No relevant studies identified.
Reproductive/Developmental Toxicity	No relevant studies identified.

12. ECOLOGICAL INFORMATION

Mobility	The product is insoluble in water.
Persistence/Degradability	No relevant studies identified.
Bio-accumulation	No relevant studies identified.
Ecotoxicity	No relevant studies identified.

13. DISPOSAL

Product Disposal	Dispose of in accordance with all applicable local and national regulations.
Container Disposal	Dispose of containers with care.

14. TRANSPORT INFORMATION

DOT CFR 172.101 Data	Proper Shipping Name: Not Regulated
UN Proper Shipping Name	Not Regulated
UN Class	None.
UN Number	None.

15. REGULATORY INFORMATION

TSCA Listed	Yes.
MA Right To Know Law	Listed.
PA Right To Know Law	Listed
NJ Right to Know Law	Listed
California Proposition 65	This product contains the following chemicals that have been found by the State of California to cause cancer, birth defects or other reproductive harm: - Silica, crystalline
SARA Title III Sect. 302 (EHS)	Not listed.
SARA Title III Sect. 311/312 Categorization	Delayed (Chronic) Health Hazard
SARA Title III Sect. 313	This product does not contain a chemical which is listed in Section 313 at or above de deminis concentrations.

16. OTHER INFORMATION

NFPA Ratings	NFPA Code for Health 1 NFPA Code for Flammability 0 NFPA Code for Reactivity 0
Abbreviations	® Registered trademark of Baroid Technology (TM) Trademark of Halliburton Energy Services N/A: Denotes no applicable information found or available CAS#: Chemical Abstracts Service Number ACGIH: American Conference of Governmental Industrial Hygienists OSHA: Occupational Safety and Health Administration TLV: Threshold Limit Value PEL: Permissible Exposure Limit STEL: Short Term Exposure Limit NTP: National Toxicology Program IARC: International Agency for Research on Cancer R: Risk S: Safety LC50: Lethal Concentration 50% LD50: Lethal Dose 50% BOD: Biological Oxygen Demand KoC: Soil Organic Carbon Partition Coefficient
Prepared By:	Environmental Services

All information recommendations and suggestions herein concerning our product are based on tests and data believed to be reliable, however, it is the user's responsibility to determine the safety, toxicity and suitability for his own use of the product described herein. Since the actual use by others is beyond our control, no guarantees, expressed or implied, is made by Baroid as to the effects of such use, the results to be obtained, or the safety and toxicity of the product nor does Baroid assume any liability arising from the use, by others, of the product referred to herein. Nor is the information

16. OTHER INFORMATION

herein to be construed as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations.

1.1 MATERIAL SAFETY DATA SHEET

BENZENE (AMOCO/TOTAL)

MSDS No. 11697000 ANSI/ENGLISH

1.1.1 1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: BENZENE (AMOCO/TOTAL)

MANUFACTURER/SUPPLIER:

Amoco Oil Company
200 East Randolph Drive
Chicago, Illinois 60601 U.S.A.

EMERGENCY HEALTH INFORMATION:
1 (800) 447-8735
EMERGENCY SPILL INFORMATION:
1 (800) 424-9300 CHEMTREC (USA)
OTHER PRODUCT SAFETY INFORMATION:
(312) 856-3907

1.1.2 2.0 COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS#	Range % by Wt.
Benzene	71-43-2	99.80
Toluene	108-88-3	0.20

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

1.1.3 3.0 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Danger! Extremely flammable. Causes eye and skin irritation. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs. Danger! Contains Benzene. Cancer hazard. Can cause blood disorders. Harmful when absorbed through the skin.

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: Causes mild eye irritation.

SKIN CONTACT: Causes mild skin irritation. Causes skin irritation on prolonged or repeated contact. Harmful when absorbed through the skin.

INHALATION: Cancer hazard. Can cause blood disorders. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. See "Toxicological Information" section (Section 11.0).

INGESTION: Harmful or fatal if liquid is aspirated into lungs. See "Toxicological Information" section (Section 11.0).

HMIS CODE: (Health:2) (Flammability:3) (Reactivity:0)
NFPA CODE: (Health:2) (Flammability:3) (Reactivity:0)

1.1.4 4.0 FIRST AID MEASURES

EYE: Flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation persists.
SKIN: Wash exposed skin with soap and water. Remove contaminated clothing, including shoes, and thoroughly clean and dry before reuse. Get medical attention if irritation develops.
INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.
INGESTION: If swallowed, drink plenty of water, do NOT induce vomiting. Get immediate medical attention.

1.1.5 5.0 FIRE FIGHTING MEASURES

FLASHPOINT: 12°F(-11°C)
UEL: 8.0%
LEL: 1.5%
AUTOIGNITION TEMPERATURE: 928°F (498°C)
FLAMMABILITY CLASSIFICATION: Extremely Flammable Liquid.
EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Extremely flammable liquid. Vapor may explode if ignited in enclosed area.
FIRE-FIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.
PRECAUTIONS: Keep away from sources of ignition (e.g., heat and open flames). Keep container closed. Use with adequate ventilation.
HAZARDOUS COMBUSTION PRODUCTS: Incomplete burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

1.1.6 6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Remove mechanically or contain on an absorbent material such as dry sand or earth. Increase ventilation if possible. Wear respirator and spray with water to disperse vapors. Keep out of sewers and waterways.

1.1.7 7.0 HANDLING AND STORAGE

HANDLING: Use with adequate ventilation. Do not breathe vapors. Keep away from ignition sources (e.g., heat, sparks, or open flames). Ground and bond containers when transferring materials. Wash thoroughly after handling. After this container has been emptied, it may contain flammable vapors; observe all warnings and precautions listed for this product.
STORAGE: Store in flammable liquids storage area. Store away from heat, ignition sources, and open flame in accordance with applicable regulations. Keep container closed. Outside storage is recommended.

1.1.8 8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE: Do not get in eyes. Wear eye protection.
SKIN: Do not get on skin or clothing. Wear protective clothing and gloves.
INHALATION: Do not breathe mist or vapor. If heated and ventilation is inadequate, use supplied-air respirator approved by NIOSH/MSHA.
ENGINEERING CONTROLS: Control airborne concentrations below the exposure guidelines.
EXPOSURE GUIDELINES:

Component	CAS#	Exposure Limits
Benzene	71-43-2	OSHA PEL: 1 ppm OSHA STEL: 5 ppm ACGIH TLV-TWA: 10 ppm
Toluene	108-88-3	OSHA PEL: 100 ppm (1989); 200 ppm (1971) OSHA STEL: 150 ppm (1989); Not established. (1971) OSHA Ceiling: 300 ppm (1971) ACGIH TLV-TWA: 50 ppm (skin)

1.1.9 9.0 CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE AND ODOR: Liquid. Colorless. Sweet odor.
pH: Not determined.
VAPOR PRESSURE: 74.6 mm Hg at 20 °C
VAPOR DENSITY: Not determined.
BOILING POINT: 176°F(80°C)
MELTING POINT: 42°F(6°C)
SOLUBILITY IN WATER: Slight, 0.1 to 1.0%.
SPECIFIC GRAVITY (WATER=1): 0.88

1.1.10 10.0 STABILITY AND REACTIVITY

STABILITY: Stable.
CONDITIONS TO AVOID: Keep away from ignition sources (e.g. heat, sparks, and open flames).
MATERIALS TO AVOID: Avoid chlorine, fluorine, and other strong oxidizers.
HAZARDOUS DECOMPOSITION: None identified.
HAZARDOUS POLYMERIZATION: Will not occur.

1.1.11 11.0 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA:

EYE IRRITATION: Testing not conducted. See Other Toxicity Data.
SKIN IRRITATION: Testing not conducted. See Other Toxicity Data.

DERMAL LD50: Testing not conducted. See Other Toxicity Data.
ORAL LD50: 3.8 g/kg (rat).
INHALATION LC50: 10000 ppm (rat)

OTHER TOXICITY DATA: Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC) and OSHA consider benzene to be a human carcinogen. Chronic exposures to benzene at levels of 100 ppm and below have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.

Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to the higher dosage levels (greater than 100 ppm) resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level.

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

1.1.12 12.0 ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this product.

1.1.13 13.0 DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations. Enclosed-controlled incineration is recommended unless directed otherwise by applicable ordinances. Residues and spilled material are hazardous waste due to ignitability.

1.1.14 14.0 TRANSPORTATION INFORMATION

U.S. DEPT OF TRANSPORTATION

Shipping Name	Benzene
Hazard Class	3
Identification Number	UN1114
Packing Group	II
RQ	RQ

INTERNATIONAL INFORMATION:

Sea (IMO/IMDG)

Shipping Name Not determined.

Air (ICAO/IATA)

Shipping Name Not determined.

European Road/Rail (ADR/RID)

Shipping Name Not determined.

Canadian Transportation of Dangerous Goods

Shipping Name Not determined.

1.1.15 15.0 REGULATORY INFORMATION

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR Part 302.4): This product is reportable under 40 CFR Part 302.4 because it contains the following substance(s):

Component/CAS Number	Weight %	Component Reportable Quantity (RQ)
Benzene 71-43-2	99.80	10 lbs.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR Part 355): This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR Part 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).

SARA TITLE III SECTION 313 (40 CFR Part 372): This product contains the following substance(s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
Benzene 71-43-2	99.80

U.S. INVENTORY (TSCA): Listed on inventory.

OSHA HAZARD COMMUNICATION STANDARD: Flammable liquid. Carcinogen. Irritant. CNS Effects. Target organ effects.

EC INVENTORY (EINECS/ELINCS): In compliance.

JAPAN INVENTORY (MITI): Not determined.

AUSTRALIA INVENTORY (AICS): Not determined.

KOREA INVENTORY (ECL): Not determined.

CANADA INVENTORY (DSL): Not determined.

PHILIPPINE INVENTORY (PICCS): Not determined.

1.1.16 16.0 OTHER INFORMATION

Prepared by:

Environment, Health and Safety Department

Issued: November 14, 1995

This material Safety Data Sheet conforms to the requirements of ANSI Z400.1.

This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate *for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.*

MATERIAL SAFETY DATA SHEET

THE WESTFORD CHEMICAL CORPORATION®
P.O. Box 798
Westford, Massachusetts 01886 USA

Ref. No.: 2001
Date: 1/1/2002

Phone: (978) 392-0689
Phone: (508) 878-5895
Emergency Phone-24 Hours: 1-800-225-3909

Fax: (978) 692-3487
Web Site: http://www.BioSolve.com
E-Mail: info@BioSolve.com

SECTION I - IDENTITY

Name:	**BioSolve®**
CAS #:	138757-63-8
Formula:	Proprietary
Chemical Family:	Water Based, Biodegradable, Wetting Agents & Surfactants
HMIS Code:	Health 1, Fire 0, Reactivity 0
HMIS Key:	4 = Extreme, 3 = High, 2 = Moderate, 1 = Slight, 0 = Insignificant

SECTION II - HAZARDOUS INGREDIENTS

Massachusetts Right to Know Law or 29 C.F.R. (Code of Federal Regulations) 1910.1000 require listing of hazardous ingredients.

This product does not contain any hazardous ingredients as defined by CERCLA, Massachusetts Right to Know Law and California's Prop. 65.

SECTION III - PHYSICAL - CHEMICAL CHARACTERISTICS

Boiling Point	: 265°F	Specific Gravity	: 1.00 +/-.01
Melting Point	: 32°F	Vapor Pressure mm/Hg	: Not Applicable
Surface Tension- 6% Solution	: 29.1 Dyne/cm at 25°C	Vapor Density Air = 1	: Not Applicable
Reactivity with Water	: No	Viscosity - Concentrate	: 490 Centipoise
Evaporation Rate	: >1 as compared to Water	Viscosity - 6% Solution	: 15 Centipoise
Appearance	: Clear Liquid unless Dyed	Solubility in Water	: Complete
Odor	: Pleasant Fragrance	pH	: 9.1+/-.3
Pounds per Gallon	: 8.38		

SECTION IV - FIRE AND EXPLOSION DATA

Special Fire Fighting Procedures	: None	Flammable Limit	: None
Unusual Fire and Explosion Hazards	: None	Auto Ignite Temperature	: None
Solvent for Clean-Up	: Water	Fire Extinguisher Media	: Not Applicable
Flash Point	: None		

SECTION V - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be taken in Handling and Storage: Use good normal hygiene.
Precautions to be taken in case of Spill or Leak -
 Small spills, in an undiluted form, contain. Soak up with absorbent materials.
 Large spills, in an undiluted form, dike and contain. Remove with vacuum truck or pump to storage/salvage vessel. Soak up residue with absorbent materials.
Waste Disposal Procedures -
 Dispose in an approved disposal area or in a manner which complies with all local, state, and federal regulations.

SECTION VI - HEALTH HAZARDS

Threshold Limit Values: Not applicable
Signs and Symptoms of Over Exposure-
 Acute : Moderate eye irritation. Skin: Causes redness, edema, drying of skin.
 Chronic: Pre-existing skin and eye disorders may be aggravated by contact with this product.
Medical Conditions Generally Aggravated by Exposure: Unknown
Carcinogen: No
Emergency First Aid Procedures -
 Eyes: Flush thoroughly with water for 15 minutes. Get medical attention.
 Skin: Remove contaminated clothing. Wash exposed areas with soap and water. Wash clothing before reuse. Get medical attention if irritation develops.
 Ingestion: Get medical attention.
 Inhalation: None considered necessary.

SECTION VII - SPECIAL PROTECTION INFORMATION

Respiratory Protection	: Not necessary	Local Exhaust Required	: No
Ventilation Required	: Normal	Protective Clothing	: Gloves, safety glasses Wash clothing before reuse.

SECTION VIII - PHYSICAL HAZARDS

Stability	: Stable	Incompatible Substances	: None Known
Polymerization	: No	Hazardous Decomposition Products	: None Known

---

SECTION IX - TRANSPORT & STORAGE

DOT Class	: Not Regulated/Non Hazardous		
Freeze Temperature	: 28°F	Storage	: 35°F-120°F
Freeze Harm	: None (thaw & stir)	Shelf Life	: Unlimited Unopened

---

SECTION X - REGULATORY INFORMATION

The Information on this Material Safety Data Sheet reflects the latest information and data that we have on hazards, properties, and handling of this product under the recommended conditions of use. Any use of this product or method of application, which is not described on the Product label or in this Material Safety Data Sheet, is the sole responsibility of the user. This Material Safety Data Sheet was prepared to comply with the OSHA Hazardous Communication Regulation and Massachusetts Right to Know Law.

MATERIAL SAFETY DATA SHEET
REILLY INDUSTRIES, INC.

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	**Coal Tar Pitch**		
Chemical Name:	Pitch, coal tar, high-temperature	**Synonyms:**	Roofing Pitch Type I; Roofing Pitch Type III; Electrode Binder Pitch; Anode Binder Pitch; Cathode Binder Pitch; Rod Pitch; 15 Vac Pitch; 925 Pitch; 425 Pitch; CPO-202 Pitch
CAS Number:	65996-93-2	**Product Use:**	waterproofing, roofing, industrial anodes
Manufacturer Information:	Reilly Industries, Inc. 300 North Meridian Street Suite 1500 Indianapolis, Indiana 46204 USA	**Emergency Phone Number (24 hr.):** **CHEMTREC Phone Number (24 hr.):** **Non-Emergency Phone Number:** **Non-Emergency Fax Number:**	(317) 247-8141 (800) 424-9300 (collect calls are accepted) (317) 247-8141 (317) 248-6413

SECTION 2: COMPOSITION AND INFORMATION ON INGREDIENTS

			Exposure Limits	
Ingredient	**CAS Number**	**Concentration (%)**	**OSHA PEL**	**ACGIH TLV**
Coal Tar Pitch	65996-93-2	100 %	0.2 mg/m^3 as 8-hr TWA (for coal tar pitch volatiles)	0.2 mg/m^3 as 8-hr TWA (for coal tar pitch volatiles)

SECTION 3: HAZARDS IDENTIFICATION

Emergency Overview:

A black solid with a slight aromatic odor, which intensifies into a tarry odor upon melting. Carcinogen. Toxic. Irritant. Sensitizer (skin).

Signs and Symptoms of Potential Overexposure:	Coal tar pitch vapors and dust are irritating to the skin, eyes and respiratory tract. Direct skin contact with coal tar pitch dust and/or high vapor concentrations may cause burning and itching, changes in pigmentation, and skin eruptions. When accentuated by sunlight, skin exposure may result in a phototoxic skin reaction. Direct eye contact with the dust may cause inflammation, discomfort, conjunctivitis, and possible abrasion of the cornea. In general, acute oral toxicity is expected to be moderate, but ingestion is not likely to be a primary route of exposure. Symptoms of systemic poisoning after ingestion of other coal tar products include salivation, nausea, vomiting, abdominal discomfort, respiratory difficulties, dizziness, headache, loss of pupillary reflex, cyanosis, hypothermia, and mild convulsions. It is assumed that ingestion of pitch would produce similar symptoms. Care should be taken to ensure that exposure limits for dust are not exceeded if pitch dust is present (OSHA PEL for particulates = 15 mg/m3 for total dust; 5 mg/m3 for respirable fraction).
Primary Route(s) of Entry:	skin contact, skin absorption, eye contact, inhalation, ingestion
Medical Conditions Aggravated by Exposure:	Persons with pre-existing skin disorders or central nervous functional illnesses may be at increased risk from overexposure. Exposure to vapors may aggravate pre-existing lung conditions. This is not likely to be a problem when appropriate procedures are used to minimize exposure.

SECTION 4: FIRST AID MEASURES

Skin Contact:	For contact with solid pitch, remove contaminated clothing and wash exposed area twice with waterless hand cleaner, soap and water, or a mild detergent. Do not use solvents on skin, as they may promote absorption of this material. The exposed area should be examined by medical personnel if irritation or pain persists after washing.
Eye Contact:	Rinse eyes immediately with large amounts of water for at least 15 minutes, occasionally lifting the eyelids. GET MEDICAL ATTENTION.

Inhalation: Remove from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Keep affected person warm and at rest. Give oxygen if respiration is shallow. GET MEDICAL ATTENTION.

Ingestion: If conscious, induce vomiting to prevent further absorption. Give oxygen if respiration is shallow. GET MEDICAL ATTENTION. Do not give anything by mouth to an unconscious person.

Thermal Exposure: Contact with molten pitch causes serious burns. For contact with molten product, do not remove contaminated clothing. Flush skin immediately with large amounts of cold water. If possible, submerge area in cold water. Pack affected area with ice and GET MEDICAL ATTENTION immediately.

Delayed Effects: none known

Note to Physician: No specific antidote known. Treatment should be based on the judgment of the physician in response to the reactions of the patient.

SECTION 5: FIRE FIGHTING MEASURES

Flash Point: > 374°F **Method:** TCC **Autoignition Temperature:** > 750°F (399°C)

Flammable Limits: **UFL :** not available **LFL:** not available

Flammability Classification (OSHA): not applicable

Hazardous Products of Combustion: Toxic vapors may be released upon thermal decomposition (nitrogen oxides, carbon monoxide, carbon dioxide, sulfur dioxide, PAH's).

Potential for Dust Explosion: Fine pitch dust has a dust explosion potential similar to coal dust, with a minimum cloud ignition temperature of 710°C (1310°F). Dust explosion concentration is 0.035 ounces/cubic foot (1000 mg/0.03 m3).

Special Flammability Hazards: Liquid pitch at elevated temperatures will sustain combustion, and may generate vapors that may ignite in the presence of air and a source of ignition. Closed containers may explode when exposed to extreme heat. Solid pitch dust is sensitive to static discharge.

Appropriate Extinguishing Media: Water fog, carbon dioxide, dry chemical, foam, sand, steam. Water spray can control unconfined pitch fires, but may cause frothing or eruption in closed tanks.

Basic Fire Fighting Guidance: Wear self-contained breathing apparatus and full protective clothing. Skin and eye contact should be avoided. Normal fire fighting procedures may be used.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Containment Techniques: If solid pitch is spilled, shovel the spilled material into disposal containers. If liquid pitch is spilled, contain the material using inert solids (i.e., sand, earth, etc.) and allow the material to solidify and cool. Cooled pitch may then be shoveled into disposal containers.

Clean-up Procedures & Equipment: Wear protective equipment during clean-up. Remove all ignition sources. Ventilate area of spill or leak. Collect material for later disposal. After collection of product, flush area with water.

Evacuation Procedures: Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Special Instructions: Avoid dust generation or exposure to hot product during clean up. Ensure thorough decontamination of the release area and clean-up personnel.

Special Reporting Requirements: Notify appropriate authorities if required by regulation.

SECTION 7: HANDLING AND STORAGE

Storage Precautions: Protect containers from physical damage, sparks and flames.

Storage Recommendations: Outside or detached storage is preferable. Maintain dry, ventilated conditions for storage. Containers should be periodically inspected.

Precautions for Unique Hazards: This material may present a dust explosion hazard in solid form and is sensitive to ignition by electrostatic discharge. Maintain areas below flammable vapor/explosive dust concentrations.

Practices to Minimize Risk: Wear appropriate protective equipment when performing maintenance on contaminated equipment. Avoid prolonged or repeated contact with skin or breathing of dust and vapors. Do not smoke or eat in areas where this material is handled. Wash hands thoroughly before eating or smoking. A complete soap and water shower should be taken at the end of each work day. Contaminated clothing should not be rewom until cleaned. Launder contaminated clothing separately from other laundry before reuse.

Special Handling Equipment: Closed system handling of liquid pitch may create excessive vapor concentrations in confined spaces; i.e., tanks, rail cars, tank trailers. Follow appropriate confined space entry procedures when entering any confined space that has been in liquid pitch service.

Dangerous Incompatibility Reactions: Keep away from strong oxidizing agents.

Incompatibilities with Materials of Construction: none known

SECTION 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: **OSHA PEL:** 0.2 mg/m³ as 8-hr TWA (coal tar pitch volatiles) **ACGIH TLV:** 0.2 mg/m³ as 8-hr TWA (coal tar pitch volatiles)

Personal Protective Equipment: Use NIOSH-approved chemical cartridge respirator with organic vapor cartridges, or any supplied-air respirator as necessary for protection from coal tar pitch volatiles. Wear impervious gloves (i.e., latex rubber), boots, work uniform and safety glasses or chemical goggles. Application of certain protective creams for coal tar products and sunscreens (SPF of at least 15) before and during work may be beneficial in reducing the risk of overexposure.

Respirator Caution: Observe OSHA regulations for respirator use (29 CFR 1910.134). Air-purifying respirators must not be used in oxygen-deficient atmospheres.

Ventilation: All operations should be conducted in well-ventilated conditions. Local exhaust ventilation should be provided.

Other Engineering Controls: All appropriate engineering controls should be used to minimize exposure potential.

Thermal Hazards: When handling liquid pitch (i.e., taking samples), wear appropriate thermal protection equipment and use tongs as needed. Use of chemical goggles or faceshields is highly recommended when handling molten material.

Additive or Synergistic Effects: Overexposure to this material causes photosensitization of the skin. See sunscreen recommendations above.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Molecular Formula: a complex hydrocarbon mixture which includes polynuclear aromatic hydrocarbons (PAH's)

Molecular Weight: not available

Appearance, State & Odor (ambient temperature): black solid with slight aromatic odor; becomes black liquid with strong tarry odor upon melting

pH: not available

Vapor Pressure: < 1 mm Hg @ 20°C

Vapor Density (air = 1): > 1.0

Boiling Point: > 250°C (initial)

Freezing Point: not available

Melting Point: not available

Solubility in Water: insoluble to slightly soluble

Specific Gravity or Density: 1.3 +/- 0.04 @ 15.5°C

VOC Content: not available

Softening Point: 60°C to 140°C, depending on the specific product

Bulk Density: > 10.0 lbs/gal

Octanol / Water Partition Coefficient: not available

Odor Threshold: not available

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability: Stable

Conditions to Avoid:	Avoid static discharge and generation of dust. Contact with water can cause frothing or eruption of closed tanks.
Incompatibilities:	strong oxidizers
Hazardous Decomposition Products:	none known
Hazardous Polymerization:	will not occur

SECTION 11: TOXICOLOGICAL INFORMATION

Acute Oral LD$_{50}$:	6200 mg/kg	**Species:**	rat		
Acute Dermal LD$_{50}$:	not available	**Species:**	not available		
Acute Inhalation LC$_{50}$:	not available	**Duration:**	not available	**Species:**	not available
Skin / Eye Irritation:	Mild skin irritant / Mild eye irritant				
Target Organs:	Skin, possibly lungs, bladder, kidney and central nervous system.				
Carcinogenicity:	Coal tar pitch volatiles, soots, tars and oils are listed as a carcinogenic category by OSHA, ACGIH, the National Toxicology Program (NTP) and the International Agency for Research on Cancer (IARC). Prolonged or repeated contact may lead to dermatitis, and with poor hygienic practices, to more serious skin disorders such as ulcerations, benign skin growths and skin cancer. Some epidemiological studies have suggested that workers exposed to coal tar pitch emissions in Soderberg aluminum manufacturing facilities may have a slightly increased risk of developing lung or bladder cancer. It is important to note, however, that the relevance of these findings to non-Soderberg facilities is currently unknown.				
Teratogenicity:	No data available.				
Reproductive Effects:	No scientific study supports an association between coal tar pitch exposures and human reproductive hazards.				
Neurotoxicity:	No data available.				
Mutagenicity:	Available data characterizes coal tar pitch as a mutagen.				
Additional Toxicity Information:	Overexposures may lead to photosensitization of the skin.				

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity:	No data available.
Environmental Fate:	No data available.

SECTION 13: DISPOSAL CONSIDERATIONS

US EPA Waste Number:	not applicable
Classification of Waste as Manufactured: **(per federal regulations)**	Non Hazardous NOTE: Generator is responsible for proper waste characterization. State hazardous waste regulations may differ substantially from federal regulations.
Waste Disposal:	Dispose of this material in accordance with standard practice for disposal of potentially hazardous materials as required by applicable federal, state or local laws. Note that disposal regulations may also apply to empty containers and equipment rinsates.

SECTION 14: TRANSPORT INFORMATION

DOT Proper Shipping Name:

When shipped < 212°F: RQ Environmentally hazardous substance, solid, n.o.s., (Contains Benzo(a)pyrene and Dibenz(a,h)anthracene), 9, UN3077, PG III.

OR

RQ Other Regulated Substance, solid, n.o.s., (Contains Benzo(a)pyrene and

Dibenz(a,h)anthracene), 9, NA3077, PG III.

When shipped 212°F to 374°F: RQ Elevated Temperature Liquid, n.o.s., (Contains Benzo(a)pyrene and Dibenzo(a,h)anthracene), 9, UN3257, PG III.

When shipped > 374°F: RQ Elevated Temperature Liquid, Flammable, n.o.s., (Contains Benzo(a)pyrene and Dibenzo(a,h)anthracene), 3, UN3256, PG III

Emergency Guidebook Numbers: **NAERG:** 171 for UN3077 or NA3077; 128 for elevated temperature shipments

SECTION 15: REGULATORY INFORMATION

OSHA Hazards: Carcinogen. Toxic. Irritant. Sensitizer (skin).

Chemical Inventory Status:

TSCA:	Yes	**EINECS:**	Yes	**Canada:**	Yes - DSL
Japan:	Yes	**Korea:**	Yes	**Australia:**	Yes
China:	Yes	**Philippines:**	Yes		

SARA 313:

Phenanthrene (CAS #: 85-01-8)	1 - 4.5%
Anthracene (CAS #: 120-12-7)	0.5 - 1.5%
Polycyclic Aromatic Compounds (PAC's)	4.5 – 5.0%

Other Regulatory Listings:
WHMIS Classification:
Class D Division 2 Subdivision A: Very Toxic Material.
Class D Division 2 Subdivision B: Irritant
Class D Division 2 Subdivision B: Sensitizer

Reportable Quantities: Approximately 167 – 222 lbs. (17 – 22 gallons) based on content of benzo(a)pyrene.

State Regulations:
MA Haz Substance
CA Prop 65: Contains chemicals known to the State of California to cause cancer.

SECTION 16: OTHER INFORMATION

Precautionary Statement: Please note that the information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers.

Reilly Industries Hazard Rating System: **H:** 3* **F:** 1 **R:** 0

Revision Date: 02 October 2002 **Original Date of Issue:** 1985

Revision Details: Revised Section 14

Material Safety Data Sheet
Cresol, tech.

ACC# 37930

Section 1 - Chemical Product and Company Identification

MSDS Name: Cresol, tech.
Catalog Numbers: AC405720000, AC405720010, AC405720030
Synonyms: Hydroxytoluene; Methylphenol.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
1319-77-3	Cresol	100	215-293-2
7732-18-5	Water	<0.2	231-791-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: light yellow to light pink liquid. Flash Point: 82 deg C.
Danger! Corrosive. Causes eye and skin burns. Causes digestive and respiratory tract burns. Harmful if swallowed or absorbed through the skin. **Combustible liquid and vapor.** May be harmful if inhaled. May cause central nervous system effects. Air sensitive. Light sensitive. May cause liver and kidney damage. Hygroscopic (absorbs moisture from the air). Marine pollutant.
Target Organs: Kidneys, central nervous system, liver, eyes, skin, mucous membranes.

Potential Health Effects
Eye: Causes eye burns. May result in corneal injury. May cause conjunctivitis and keratitis.
Skin: Harmful if absorbed through the skin. May cause dermatitis. Causes severe skin irritation and burns. Allergic reactions have been reported. When it comes in contact with the skin, it may not produce any burning sensation immediately.
Ingestion: Harmful if swallowed. May cause severe gastrointestinal tract irritation with nausea, vomiting and possible burns. May cause liver and kidney damage. May cause central nervous system depression, convulsions, coma, and possible death due to respiratory paralysis.
Inhalation: Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. May cause effects similar to those described for ingestion. Inhalation of appreciable amounts of vapor under normal conditions is unlikely because of the material's low vapor pressure. Hazardous concentrations may develop at elevated temperatures.
Chronic: Prolonged or repeated skin contact may cause dermatitis. May cause liver and kidney damage. May cause digestive tract disturbances. Repeated exposure may cause central nervous system damage.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid immediately.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. Combustible liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: 82 deg C (179.60 deg F)
Autoignition Temperature: 558 deg C (1,036.40 deg F)
Explosion Limits, Lower:1 - 1.4%
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation. Approach spill from upwind. U.S. regulations require reporting spills and releases to soil, water and air in excess of reportable quantities. Control runoff and isolate discharged material for proper disposal.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Discard contaminated shoes. Use only with adequate ventilation. Keep away from heat and flame.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area. Store protected from light and air. Separate from oxidizing materials.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Cresol	5 ppm TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	none listed	5 ppm TWA; 22 mg/m3 TWA
Water	none listed	none listed	none listed

OSHA Vacated PELs: Cresol: 5 ppm TWA; 22 mg/m3 TWA Water: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear chemical splash goggles.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: light yellow to light pink
Odor: phenolic
pH: Not available.
Vapor Pressure: 1 mm Hg @38-53 deg C
Vapor Density: 3.7 (Air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 200 deg C
Freezing/Melting Point:12-30 deg C
Decomposition Temperature: Not available.
Solubility: 2% @ 25°C
Specific Gravity/Density:1.0400g/cm3
Molecular Formula:C_7H_8O
Molecular Weight:108.14

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures. Darkens on exposure to light and air.

Conditions to Avoid: Light, ignition sources, excess heat, prolonged exposure to air.

Incompatibilities with Other Materials: Strong acids, oxidizing agents, alkalies, aliphatic

amines, amides (e.g. butyramide, diethyltoluamide, dimethyl formamide), chlorosulfonic acid, oleum, brass, bronze, aluminum.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, formaldehyde.
Hazardous Polymerization: Has not been reported

Section 11 - Toxicological Information

RTECS#:
CAS# 1319-77-3: GO5950000
CAS# 7732-18-5: ZC0110000
LD50/LC50:
CAS# 1319-77-3:
  Oral, mouse: LD50 = 760 mg/kg;
  Oral, mouse: LD50 = 860 mg/kg;
  Oral, rat: LD50 = 1454 mg/kg;
  Skin, rabbit: LD50 = 2 gm/kg;
  Skin, rabbit: LD50 = 200 mg/kg;
.

CAS# 7732-18-5:
  Oral, rat: LD50 = >90 mL/kg;
.

Carcinogenicity:
CAS# 1319-77-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: 7 workers exposed to cresol vapor for 1.5-3 yrs experienced headaches with nausea and vomiting. 4 of these workers also had elevated blood pressure, signs of impaired kidney function, blood calcium imbalance, and marked tremors.
Teratogenicity: No data available.
Reproductive Effects: See actual entry in RTECS for complete information.
Mutagenicity: See actual entry in RTECS for complete information.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: In air, cresols quickly break down into other chemicals. Cresols do not evaporate quickly from water, but they can be removed by bacteria. Cresols may last longer in deep groundwater or water that does not have bacteria. In soil, half the total amount of cresols will break down in about a week. Cresols do not appear to accumulate in fish or meat.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a

hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 1319-77-3: waste number U052.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	CRESOLS, LIQUID	CRESOLS
Hazard Class:	6.1	6.1(8)
UN Number:	UN2076	UN2076
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 1319-77-3 is listed on the TSCA inventory.
CAS# 7732-18-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 1319-77-3: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
Section 313
This material contains Cresol (CAS# 1319-77-3, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 1319-77-3 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 1319-77-3 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 1319-77-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:
T C

Risk Phrases:
R 34 Causes burns.
R 24/25 Toxic in contact with skin and if swallowed.

Safety Phrases:
S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)
CAS# 1319-77-3: No information available.
CAS# 7732-18-5: No information available.

Canada - DSL/NDSL
CAS# 1319-77-3 is listed on Canada's DSL List.
CAS# 7732-18-5 is listed on Canada's DSL List.

Canada - WHMIS
not available.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List
CAS# 1319-77-3 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 10/15/1997
Revision #4 Date: 3/04/2004

ACROS ORGANICS
HELP CATALOGS SEARCH ORDER LIST CONTENTS

MATERIAL SAFETY DATA SHEET

Prussian blue
62402

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Prussian blue

C.I. 77510 ; Ferric ferrocyanide ; Pigment Blue 27
Company Identification: Acros Organics N.V.
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
14038-43-8	PRUSSIAN BLUE		237-875-5

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: purple.
Caution! The toxicological properties of this material have not been fully investigated. May cause eye and skin irritation. May cause respiratory and digestive tract irritation.
Target Organs: None known.

Potential Health Effects
Eye:
May cause eye irritation.
Skin:
May cause skin irritation.
Ingestion:
May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated.
Inhalation:
May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated.
Chronic:
Not available.
None

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid.

Skin:
Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water.

Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation:
Remove from exposure to fresh air immediately. Get medical aid if cough or other symptoms appear.

Notes to Physician:
Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Substance is noncombustible.

Extinguishing Media:
Use extinguishing media most appropriate for the surrounding fire.

Autoignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating: Not published.
Explosion Limits, Lower: Not available.
Upper: Not available.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:
Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal. Avoid generating dusty conditions.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid breathing dust, vapor, mist, or gas. Avoid contact with skin and eyes. Avoid ingestion and inhalation.

Storage:
Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:
Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
PRUSSIAN BLUE	as Fe: 1 mg/m3 TWA (listed under IRON SALTS	1 mg/m3 TWA (listed under IRON SALTS	none listed

```
|                    | (SOLUBLE)).       |(SOLUBLE)).         |                 |
+--------------------+-------------------+--------------------+-----------------+
```

OSHA Vacated PELs:
PRUSSIAN BLUE:
as Fe: 1 mg/m3 TWA (listed under IRON SALTS (SOLUBLE))

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Solid
Appearance:	purple
Odor:	Not available.
pH:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	Not available.
Freezing/Melting Point:	Not available.
Decomposition Temperature:	Not available.
Solubility:	practically insoluble in water
Specific Gravity/Density:	Not available.
Molecular Formula:	C18Fe7N18
Molecular Weight:	859.25

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials.
Incompatibilities with Other Materials:
Strong acids - strong oxidizing agents, reducing agents, bases.
Hazardous Decomposition Products:
Hydrogen cyanide, nitrogen oxides, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 14038-43-8: LJ8200000
LD50/LC50:
Not available.
Carcinogenicity:

PRUSSIAN BLUE -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology:
No data available.

Teratogenicity:
No data available.

Reproductive Effects:
No data available.

Neurotoxicity:
No data available.

Mutagenicity:
No data available.

Other Studies:
No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:
Not available.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.
RCRA D-Series Maximum Concentration of Contaminants:
None listed.
RCRA D-Series Chronic Toxicity Reference Levels: None listed.
RCRA F-Series: None listed.
RCRA P-Series: None listed.
RCRA U-Series: None listed.
Not listed as a material banned from land disposal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
No information available

IMO
Not regulated as a hazardous material.

IATA
Not regulated as a hazardous material.

RID/ADR
Not regulated as a hazardous material.

Canadian TDG
No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA
CAS# 14038-43-8 is listed on the TSCA inventory.

Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.

Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)
None of the chemicals in this material have an RQ.

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

Section 313

No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

PRUSSIAN BLUE can be found on the following state right to know lists: California, (listed as IRON SALTS (SOLUBLE)), Pennsylvania, (listed as IRON SALTS (SOLUBLE)), Minnesota, (listed as IRON SALTS (SOLUBLE)).

California No Significant Risk Level:
None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: Not available.
Risk Phrases:
Safety Phrases:
S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 14038-43-8: 0

Canada

CAS# 14038-43-8 is listed on Canada's DSL/NDSL List.
WHMIS: Not available.
CAS# 14038-43-8 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 6/04/1992 Revision #2 Date: 9/02/1997

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Back to product information.

CITGO No. 2 Diesel Fuel, High Sulfur, All Grades

Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 3758
Tulsa, OK 74102-3758

MSDS No. DF2HS
Revision Date 10/08/2003

Hazard Rankings

	HMIS	NFPA
Health Hazard	* 2	0
Fire Hazard	2	2
Reactivity	0	0

*** = Chronic Health Hazard**

IMPORTANT: Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.

Emergency Overview

Physical State	Liquid.		
Color	Transparent, clear to yellow or red.	**Odor**	Characteristic, kerosene-like.

WARNING!
Combustible liquid; vapor may cause flash fire.
Harmful or fatal if swallowed - can enter lungs and cause damage.
Can cause eye, skin or respiratory tract irritation.
May be harmful if inhaled or absorbed through the skin.
Overexposure can cause central nervous system (CNS) depression and/or other target organ effects.
Possible Cancer Hazard (See Section 3)
Harmful to aquatic organisms.

Protective Equipment

Minimum Recommended
See Section 8 for Details

SECTION 1. PRODUCT IDENTIFICATION

Trade Name	CITGO No. 2 Diesel Fuel, High Sulfur, All Grades	**Technical Contact**	(918) 495-5940 or (918) 495-5933
Product Number	Various	**Medical Emergency**	(918) 495-4700
CAS Number	68476-34-6	**CHEMTREC Emergency (United States Only)**	(800) 424-9300
Product Family	Motor fuels.		
Synonyms	No. 2 Grade Diesel Fuel Oil; Diesel No. 2; Off-Road Diesel Fuel; Diesel Motor Fuel No. 2; High Sulfur Diesel Fuel; HS Diesel Fuel; Gas Oil (Medium); C9-C16 Petroleum Hydrocarbons.		

SECTION 2. COMPOSITION

This product may be composed, in whole or in part, of any of the following refinery streams:

Diesel Fuel No. 2 [CAS No.: 68476-34-6]
Hydrodesulfurized Middle Distillate (petroleum) [CAS No.: 64742-80-9]
Straight-run Middle Distillate (Petroleum) [CAS No.: 64741-44-2]
Hydrodesulfurized Light Catalytic Cracked Distillate (Petroleum) [CAS No.: 68333-25-5]
Kerosene [CAS No.: 8008-20-6]
Hydrodesulfurized Kerosine (Petroleum) [CAS No.: 64742-81-0]
Light Catalytic Cracked Distillate (Petroleum) [CAS No.: 64741-59-9]

This product contains the following chemical components:

Component Name(s)	CAS Registry No.	Concentration (%)
Nonane, all isomers	Mixture	1 - 10
Trimethylbenzenes, all isomers	25551-13-7	0 - 2
Naphthalene	91-20-3	0 - 2
Biphenyl (Diphenyl)	92-52-4	0 - 2
Cumene	98-82-8	0 - 1
Ethylbenzene	100-41-4	0 - 1

SECTION 3. HAZARDS IDENTIFICATION

Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.

Major Route(s) of Entry Skin contact. Inhalation.

Signs and Symptoms of Acute Exposure

Inhalation Breathing high concentrations may be harmful. Mist or vapor can irritate the throat and lungs. Breathing this material may cause central nervous system depression with symptoms including nausea, headache, dizziness, fatigue, drowsiness, or unconsciousness.

Eye Contact This material can cause eye irritation with tearing, redness, or a stinging or burning feeling. Further, it can cause swelling of the eyes with blurred vision. Effects may become more serious with repeated or prolonged contact.

Skin Contact This material can cause skin irritation. Symptoms include redness, itching, and burning of the skin. This material can be absorbed by the skin and produce central nervous system depression (headache, nausea, fatigue and/or other symptoms including unconsciousness). If the skin is damaged, absorption increases. Prolonged and/or repeated contact may cause severe dermatitis and/or more serious skin disorders. Chronic symptoms may include drying, swelling, scaling, blistering, cracking, and/or severe tissue damage.

Ingestion If swallowed, this material may irritate the mouth, throat, and esophagus. It can be absorbed into the blood stream through the stomach and intestinal tract. Symptoms may include a burning sensation of the mouth and esophagus, nausea and vomiting. In addition, it can cause central nervous system effects characterized by dizziness, staggering, drowsiness, delirium and/or loss of consciousness.

Because of the low viscosity, this material can enter the lungs directly by aspiration during swallowing or subsequent vomiting. Aspiration of a small amount of liquid can cause severe lung damage and/or death.

Chronic Health Effects Summary Secondary effects of ingestion and subsequent aspiration into the lungs may cause pneumatocele (lung cavity) formation and chronic lung dysfunction.

This product contains petroleum middle distillates similar to those shown to produce skin tumors on laboratory rodents following repeated application. All tumors appeared during the latter portion of the typical 2-year lifespan of the animals. Certain studies have shown that washing the exposed skin of the test animal with soap and water between treatments greatly reduces the potential tumorigenic effects. These data suggest that good personal hygiene is effective in reducing the risk of this potential adverse health effect.

This material and/or its components have been associated with developmental toxicity, reproductive toxicity, genotoxicity, immunotoxicity, and/or carcinogenicity. Refer to Section 11 of this MSDS for additional health-related information.

Conditions Aggravated by Exposure Disorders of the following organs or organ systems that may be aggravated by significant exposure to this material or its components include: Skin, Respiratory System, Liver, Kidneys, Central Nervous System (CNS)

Target Organs

Continued on Next Page

This material may cause damage to the following organs: kidneys, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).

Carcinogenic Potential This material may contain ethylbenzene and naphthalene at concentrations above 0.1%. IARC has identified ethylbenzene and naphthalene as possibly carcinogenic to humans (Group 2B) based on laboratory animal studies. NTP has determined that exposure to diesel exhaust particulates, a complex mixture of combustion products of diesel fuel, is reasonably anticipated to be a human carcinogen.

OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).

OSHA Health Hazard Classification				OSHA Physical Hazard Classification					
Irritant	☒	Sensitizer	☐	Combustible	☒	Explosive	☐	Pyrophoric	☐
Toxic	☐	Highly Toxic	☐	Flammable	☐	Oxidizer	☐	Water-reactive	☐
Corrosive	☐	Carcinogenic	☐	Compressed Gas	☐	Organic Peroxide	☐	Unstable	☐

SECTION 4. FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.

Inhalation Move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If breathing is difficult, 100 percent humidified oxygen should be administered by a qualified individual. Seek medical attention immediately. Keep the affected individual warm and at rest.

Eye Contact Check for and remove contact lenses. Flush eyes with cool, clean, low-pressure water for at least 15 minutes while occasionally lifting and lowering eyelids. Do not use eye ointment unless directed to by a physician. Seek medical attention if excessive tearing, irritation, or pain persists.

Skin Contact Remove contaminated shoes and clothing. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. Do not use ointments. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists.

Ingestion Do not induce vomiting. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Never give anything by mouth to a person who is not fully conscious. Do not leave victim unattended. Seek medical attention immediately.

Notes to Physician INHALATION: Inhalation overexposure can produce toxic effects. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Administer supplemental oxygen with assisted ventilation, as required.

INGESTION: If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

SECTION 5. FIRE FIGHTING MEASURES

NFPA Flammability Classification	NFPA Class-II combustible liquid.
Flash Point	Closed cup: AP 52°C (AP 125°F). (Pensky-Martens.)
Lower Flammable Limit	AP 0.6 %
Upper Flammable Limit	AP 7.5 %
Autoignition Temperature	>254°C (>489°F)
Hazardous Combustion Products	Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons and oxides of sulfur and nitrogen.
Special Properties	Combustible Liquid! This material releases vapors when heated above ambient temperatures. Vapors can cause a flash fire. Vapors can travel to a source of ignition and flashback. A vapor and air mixture can create an explosion hazard in confined spaces such as sewers. Use only with adequate ventilation. If container is not properly cooled, it can rupture in the heat of a fire.
Extinguishing Media	SMALL FIRE: Use dry chemicals, carbon dioxide, foam, water fog, or inert gas (nitrogen). LARGE FIRE: Use foam, water fog, or water spray. Water fog and spray are effective in cooling containers and adjacent structures. However, water can cause frothing and/or may not extinguish the fire. Water can be used to cool the external walls of vessels to prevent excessive pressure, autoignition or explosion. DO NOT use a solid stream of water directly on the fire as the water may spread the fire to a larger area.
Protection of Fire Fighters	Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles. Cover pooling liquid with foam. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines. Be aware that burning liquid will float on water. Notify appropriate authorities if liquid enter sewers or waterways.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.

Combustible Liquid! Release can result in a fire hazard. Evacuate all non-essential personnel from release area. Establish a regulated zone with site control and security. Eliminate all ignition sources. Stop the leak if it can done without risk. A vapor-suppressing foam may be used to reduce vapors. Properly bond or ground all equipment used when handling this material. Avoid skin contact. Do not walk through spilled material. Verify that responders are properly trained and wearing appropriate personnel protective equipment. Dike far ahead of a liquid spills. Do not allow released material to entry waterways, sewers, basements, or confined areas. This material will float on water. Absorb or cover with dry earth, sand or other non-combustible material. Use clean, non-sparking tools to collect absorbed material. Place spent sorbent materials, free liquids and other clean-up debris into proper waste containers for appropriate disposal. Certain releases must be reported to the National Response Center (800/424-8802) and state or regulatory authorities. Comply with all laws and regulations.

SECTION 7. HANDLING AND STORAGE

Handling

Combustible Liquid!
A static electrical charge can accumulate when this material is flowing through pipes, nozzles or filters and when it is agitated. A static spark discharge can ignite accumulated vapors particularly during dry weather conditions. Always bond receiving containers to the fill pipe before and during loading. Always keep nozzle in contact with the container throughout the loading process. Do not fill any portable container in or on a vehicle. Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously containing gasoline or similar low flash point products).

Fire hazard increases as product temperature approaches its flash point. Keep container closed and drum bungs in place. Remove spillage immediately from walking areas. Do not handle or store near heat, sparks or other potential ignition sources. Do not handle or store with oxidizing agents. Avoid breathing mist or vapor. Never siphon by mouth. Do not taste or swallow. Avoid contact with eyes, skin and clothing. Use gloves constructed of impervious materials and protective clothing if direct contact is anticipated. Provide ventilation to maintain exposure potential below applicable exposure levels. Avoid water contamination. Wash thoroughly after handling. Prevent contact with food or tobacco products.

When performing repairs and maintenance on contaminated equipment, keep unnecessary persons from hazard area. Eliminate heat, flame and other potential ignition sources. Drain and purge equipment, as necessary, to remove material residues. Remove contaminated clothing. Wash exposed skin thoroughly with soap and water after handling.

Do not use this material as fuel for equipment, such as portable heaters, in enclosed areas. Hazardous combustion products can cause death.

Protect the environment from releases of this material. Prevent discharges to surface waters and groundwater. Maintain handling and transfer equipment in proper working order.

Misuse of empty containers can be dangerous. Empty containers may contain material residues which can ignite with explosive force. Cutting or welding of empty containers can cause fire, explosion, or release of toxic fumes from residues. Do not pressurize or expose empty containers to open flame, sparks, or heat. Keep container closed and drum bungs in place. All label warnings and precautions must be observed. Return empty drums to a qualified reconditioner. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling, or disposing of empty containers and/or waste residues of this material.

Storage

Store in a cool, dry, well-ventilated place. Keep containers tightly closed. Do not store this product near heat, flame or other potential ignition sources. Do not store with oxidizers. Do not store this product in unlabeled containers. Do not puncture or incinerate containers. Ground all equipment containing this material. All electrical equipment in areas where this material is stored or handled must meet all applicable requirements of the NFPA's National Electrical Code (NEC). Store and transport in accordance with all applicable laws.

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below the applicable workplace exposure limits indicated below. All electrical equipment should comply with the National Electric Code. An emergency eye wash station and safety shower should be located near the work-station.

Continued on Next Page

Personal Protective Equipment Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.

Eye Protection Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. Suitable eye wash water should be readily available.

Hand Protection Avoid skin contact. Use gloves (e.g., disposable PVC, neoprene, nitrile, vinyl, or PVC/NBR). Wash hands with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities or leaving work. DO NOT use gasoline, kerosene, solvents or harsh abrasives as skin cleaners.

Body Protection Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discarded contaminated leather goods.

Respiratory Protection Airborne concentration will determine the level of respiratiory protection required. Respiratory protection is normally not required unless the product is heated or misted. For known or anticipated vapor or mist concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator equipped with a dust/mist prefilter if adequate protection is provided. For unknown vapor concentrations or concentrations exceeding respirator protection factors, use a positive-pressure, pressure-demand, self-contained breathing apparatus (SCBA). Due to fire and explosion hazards, do not enter atmospheres containing concentrations greater than 20% of the lower flammable limit under any circumstances. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134).

General Comments Warning! Use of this material in spaces without adequate ventilation may result in generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

Occupational Exposure Guidelines

Substance	**Applicable Workplace Exposure Levels**
Diesel Fuel No. 2	**ACGIH TLV (United States). Skin** TWA: 100 mg/m³ 8 hour(s).
Kerosene	**NIOSH REL (United States).** TWA: 100 mg/m³ 8 hour(s).
Nonane, all isomers	**ACGIH (United States).** TWA: 200 ppm 8 hour(s).
Trimethylbenzenes, all isomers	**ACGIH (United States).** TWA: 25 ppm 8 hour(s).
Naphthalene	**ACGIH (United States). Skin** TWA: 10 ppm 8 hour(s). STEL: 15 ppm 15 minute(s). **OSHA (United States).** TWA: 10 ppm 8 hour(s).
Biphenyl (Diphenyl)	**ACGIH TLV (United States).**

	TWA: 0.2 ppm 8 hour(s). **OSHA PEL Z2 (United States).** TWA: 0.2 ppm 8 hour(s).
Ethylbenzene	**ACGIH (United States).** TWA: 100 ppm 8 hour(s). STEL: 125 ppm 15 minute(s). **OSHA (United States).** TWA: 100 ppm 8 hour(s).

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

Physical State	Liquid.	**Color**	Transparent, clear to yellow or red.	**Odor**	Characteristic, kerosene-like.
Specific Gravity	0.84 (Water = 1)	**pH**	Not Applicable.	**Vapor Density**	5.1 (Air = 1)
Boiling Range	154° C (309° F) to 371° C (700° F)			**Melting/Freezing Point**	Not available.
Vapor Pressure	0.3 kPa (2.1 mmHg) (at 20°C)			**Volatility**	840 g/l VOC (W/V)
Solubility in Water	Very slightly soluble in cold water.			**Viscosity (cSt @ 40°C)**	AP 3
Additional Properties	Density = 7.2 lbs/gal.				

SECTION 10. STABILITY AND REACTIVITY

Chemical Stability	Stable.	**Hazardous Polymerization**	Not expected to occur.
Conditions to Avoid	Keep away from all ignition sources and strong oxidizing conditions.		
Materials Incompatibility	Strong acids, alkalies, and oxidizers such as liquid chlorine, other halogens, hydrogen peroxide and oxygen.		
Hazardous Decomposition Products	No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS.		

SECTION 11. TOXICOLOGICAL INFORMATION

For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.

Toxicity Data	**Diesel Fuel No. 2**: ORAL LD50, Acute: 12,000 to 17,500 mg/kg or 9.0 ml/kg [Rat] DERMAL LD50, Acute: >5.0 ml/kg [Rabbit screen level]. DRAIZE EYE, Acute: Mild irritant [Rabbit] DRAIZE DERMAL, Acute: Severe skin irritant [Rabbit]. BUEHLER DERMAL, Acute: Non-sensitizing [Guinea Pig] 14-Day DERMAL, Sub-chronic: 0% and 67% mortality at 4.0 and 8.0 ml/kg [Rabbit] 62-Week DERMAL, Chronic: 0.05 ml/kg 3x/week [Mouse] - Extreme skin irritation. 97-Week DERMAL, Chronic: 243 g/kg applied 3x/week [Mouse] - Extreme skin irritation. Moderate increase in contact-point skin tumors. MUTAGENICITY: Modified Ames Assay: Negative. [Salmonella typhimurium]

In-vitro SCE Ovary Assay: Negative. [Chinese Hamster]
In-vitro Lymphoma Assay: Negative. [Mouse]
In-vivo Dominant Lethal Assay: Negative. [Mouse]
In-vivo Bone Marrow Assay: Clastogenic at 2.0 ml/kg and 6.0 ml/kg [Rat]

Diesel exhaust particulate:
Lung tumor and lymphomas were identified in rats and mice exposed to unflitered diesel fuel exhaust in chronic inhalation studies. Further, epidemiological studies have identified increase incidences of lung cancer in US railroad workers and bladder cancer in bus and truck drivers possibly associated with exposure to diesel engine exhaust. NTP has determined that exposure to diesel exhaust particulates, a complex mixture of combustion products of diesel fuel, is reasonably anticipated to be a human carcinogen. In addition, NIOSH has identified complete diesel exhaust as a potential carcinogen.

Middle distillates, petroleum:
Long-term repeated (lifetime) skin exposure to similar materials has been reported to result in an increase in skin tumors in laboratory rodents. The relevance of these findings to humans is not clear at this time.

Hydrodesulfurized Middle Distillate (petroleum):
INHALATION LC50, Acute: 4.6 to 7.64 mg/L for four hours [Rat] - Dyspnea, nasal discharge, alopecia and excessive salivation.
ORAL LD50, Acute >500 g/kg [Rat Screening Level] Diarrhea, hyperactivity, ptosis and somnolence.
DERMAL LD50, Acute: >2,000 mg/kg [Rabbit Screening Level]
BUEHLER DERMAL, Acute: Non-sensitizing [Guinea Pig].
14-Day DERMAL, Subchronic: 0.05 ml/kg applied 3 times per week [Mouse, Human skin grafted to Athymic nude Mice] - Irritation and epidermal hyperplasia.
62-Week DERMAL, Chronic: 0.05 ml/kg applied 3 times per week [Mouse] - Extreme skin irritation; moderate increase in contact-point skin tumors.

Straight-run Middle Distillate (Petroleum):
INHALATION, LC50, Acute: 1.72 mg/L for four hours [Male Rat].
INHALATION, LC50, Acute: 1.82 mg/L for 4 hours [Female Rat].
ORAL, LD50, Acute: >5,000 mg/kg [Rat screening level] - Diarrhea, hypoactivity and somnolence.
DERMAL, LD50, Acute: >2,000 mg/kg [Rabbit screen].
BUEHLER DERMAL, Acute: Non-sensitizing [Guinea Pig].
28-Day DERMAL, Subchronic: Moderate irritation at 200 to 2,000 mg/kg with no other treatment-related clinical effects observed.

Kerosene:

ORAL (LD50):	Acute: 2835 mg/kg [Rabbit]. >5000 mg/kg [Rat].
DERMAL (LD50):	Acute: 2000 mg/kg [Rabbit].
INHALATION (LC50):	
(PARTICULATE):	Acute: >5000 mg/m^3 4 hour(s) [Rat].

Trimethylbenzenes, all isomers:
The TCLo for humans is 10 ppm, with somnolence and respiratory tract irritation noted. In inhalation studies with rats, four of ten animals died after exposures of 2400 ppm for 24 hours. An oral dose of 5 mL/kg resulted in death in one of ten rats. Minimum lethal intraperitoneal doses were 1.5 to 2.0 mL/kg in rats and 1.13 to 12 mL/kg in guinea pigs. Levels of total hydrocarbon vapors present in the breathing atmosphere of these workers ranged from 10 to 60 ppm. Mesitylene (1, 3, 5 Trimethylbenzene) inhalation at concentrations of 1.5, 3.0, and 6.0 mg/L for six hours was associated with dose-related changes in white blood cell counts in rats. No significant effects on the complete blood count were noted with six hours per day exposure for five weeks, but elevations of alkaline phosphatase and SGOT were observed. Central nervous system depression and ataxia were noted in rats exposed to 5,100 to 9,180 ppm for two hours.

Naphthalene:
ORAL (LD50): Acute: 1800 mg/kg [Rat]. 533 mg/kg [Mouse].

DERMAL (LD50): Acute: 969 mg/kg [Mouse].
INHALATION (LC50): Acute: >340 mg/m^3 1 hour(s) [Rat].
Naphthalene is a potential irritant to eyes, skin and respiratory system. Ingestion of naphthalene has been associated with severe red blood cell and liver damage. With prolonged or repeated exposures, naphthalene was associated with cataracts, optical neuritis, hemolytic and aplastic anemia, jaundice and possibly neurotoxicity. In animal studies, naphthalene associated with fetal effects and decreased spleen weights in pregnant female mice. In an NTP sponsored study, naphthalene produced a dose related increase in tumors at the 30 and 60 ppm exposure level in both male and female rats. Higher incidences of respiratory epithelial adenomas, olfactory epithelial neuroblastomas and non-neoplastic lesions of the nose were observed as compared to controls. Cytogenic studies with Chinese hamster ovary cells have demonstrated sister chromatid exchanges and chromosomal aberrations. The relevance of these studies to human health is unclear. Based upon this data, IARC has designated naphthalene as possibly carcinogenic to humans (Group 2B).

Biphenyl (Diphenyl):
INHALATION, TCLo, Acute: 4,400 ug/m^3 for 4 hours [Human] - Flaccid paralysis of peripheral nerves without anesthesia and nausea or vomiting.
ORAL, LD50, Acute: >2,600 mg/kg [Cat screening level].
ORAL, LD50, Acute: 2,400 mg/kg [Rat and Rabbit].
ORAL, LD50, Acute: 1,900 mg/kg [Mouse] - Somnolence, hypermotility and diarrhea.
DERMAL, LD50, Acute: >5,010 mg/kg [Rabbit screening level].

Ethylbenzene:
ORAL (LD50): Acute: 3,500 mg/kg [Rat].
DERMAL (LD50): Acute: 17,800 uL/kg [Rabbit].
INTRAPERITONEAL (LD50): Acute: 2,624 mg/kg [Rat].
NTP completed a 2-year inhalation bioassay of ethylbenzene in rodents. The study was conducted in rats and mice at exposure concentrations of 0, 75, 200 and 750 ppm. No significant effects were observed at the 75 and 200 ppm levels. However, compared to chamber controls, the severity of nephropathy was increased in rats at the 750 ppm level; and male rats had higher incidences of renal tubule carcinomas. Step section analyses of the kidneys found a significant increase hyperplasia and renal tubule adenomas in both male and female rats. Also at this 750 ppm level, male mice had a higher incidence of alveolar/bronchiolar adenomas and carcinomas and female mice had increased hepatocellular adenomas and carcinomas when compared to chamber controls. Also, hyperplasia was observed in the thyroid gland of both sexes of mice and in the pituitary gland of female mice. The relevance of these findings to human health is unclear. Based upon this data, IARC has designated ethylbenzene as possibly carcinogenic to humans (Group 2B).

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Freshwater Toxicity:
Concentration: 2400 ppm Exposure: 48 hrs. Species: Juven. Am. Shad (*Squalius cephalus*) Assay: TLM
Concentration: >127 ppm Exposure: 96 hrs. Species: Bluegill (*Lepomis macrochirus*) Assay: LC50

Saltwater Toxicity
Concentration: 10 ppm Exposure: 96 hrs. Species: Menhaden (*Brevoortia patronus*) Assay: LC50
Concentration: 10 ppm Exposure: 96 hrs. Species: Grass Shrimp Assay: LC50

Environmental Fate

Continued on Next Page

If spilled, this material will normally evaporate. Hydrocarbon components may contribute to atmospheric smog. If released to the subsoils, petroleum middle distillate fuels will strongly adsorb to soils. Groundwater should be considered as an exposure pathway. Liquid and vapor can migrate through the subsurface and preferential pathways (such as utility line backfill) to downgradient receptors.

Middle distillates are potentially toxic to freshwater and saltwater ecosystems. Distillate fuels will normally float on water. In stagnant or slow-flowing waterways, a hydrocarbon layer can cover a large surface area. As a result, this oil layer can limit or eliminate natural atmospheric oxygen transport into the water. With time, if not removed, oxygen depletion in the waterway can cause a fish kill or create an anaerobic environment. Also, this coating action can also kill plankton, algae, and water birds.

SECTION 13. DISPOSAL CONSIDERATIONS

Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.

Maximize material recovery for reuse or recycling. Recovered non-usable material may be regulated by US EPA as a hazardous waste due to its ignitibility (D001) and/or its toxic (D018) characteristics. In addition, conditions of use may cause this material to become a hazardous waste, as defined by Federal or State regulations. It is the responsibility of the user to determine if the material is a hazardous waste at the time of disposal. Transportation, treatment, storage, and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR Parts 260 through 271). State and/or local regulations might be even more restrictive. Contact the RCRA/Superfund Hotline at (800) 424-9346 or your regional US EPA office for guidance concerning case specific disposal issues.

SECTION 14. TRANSPORT INFORMATION

The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.

US DOT Status	A U.S. Department of Transportation (DOT) regulated material. The following U. S. DOT hazardous materials shipping description applies to bulk packaged material that is transported by highway or rail. Alternate shipping descriptions may be required for product transported by marine vessel, air or other method and for non-bulk packaged material.		
Proper Shipping Name	Diesel Fuel, Combustible liquid, NA1993, PG III		
Hazard Class	DOT Class: Combustible liquid with a flash point greater than 37.8°C (100°F).	**Packing Group(s)**	III
		UN/NA Number	NA 1993 or UN 1202
Reportable Quantity	A Reportable Quantity (RQ) has not been established for this material.		
Placard(s)		**Emergency Response Guide No.**	128
		HAZMAT STCC No.	49 122 12
		MARPOL III Status	Not a DOT "Marine Pollutant" per 49 CFR 171.8.

SECTION 15. REGULATORY INFORMATION

TSCA Inventory	This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory.
SARA 302/304 Emergency Planning and Notification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified.
SARA 311/312 Hazard Identification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories: Fire, Acute (Immediate) Health Hazard, Chronic (Delayed) Health Hazard
SARA 313 Toxic Chemical Notification and Release Reporting	This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA: Naphthalene [CAS No.: 91-20-3] Concentration: 0 - 2% 1, 2, 4 Trimethylbenzene [CAS No.: 95-63-6] Concentration: 0 - 1%
CERCLA	The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are: Naphthalene [CAS No.: 91-20-3] RQ = 100 lbs. (45.36 kg) Concentration: 0 - 2% Cumene [CAS No.: 98-82-8] RQ = 5000 lbs. (2268 kg) Concentration: 0 - 1%
Clean Water Act (CWA)	This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.
California Proposition 65	This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): Diesel exhaust particulate (following combustion) Naphthalene: 0 - 2% Toluene: <0.05% Benzene: <0.05%
New Jersey Right-to-Know Label	Diesel Fuel
Additional Regulatory Remarks	As minimum requirements, CITGO recommends that the following advisory information be displayed on equipment used to dispense diesel fuel. Additional warnings specified by various regulatory authorities may be required: "**Diesel Fuel DANGER: Combustible Liquid. Use as a Motor Fuel Only.** DO NOT FILL CONTAINERS THAT HAVE PREVIOUSLY CONTAINED GASOLINE OR OTHER FLAMMABLE LIQUIDS. Sparks From static electricity can ignite flammable vapor residues. PLACE CONTAINER ON GROUND. DO NOT FILL ANY PORTABLE CONTAINER IN OR ON A VEHICLE. Containers must be metal or other material approved for storing diesel fuel. Keep nozzle spout in contact with the container during the entire filling operation. NO SMOKING! Do not leave nozzle unattended during filling. **HARMFUL OR FATAL IF SWALLOWED.** If swallowed, do not induce vomiting. Call Physician Immediately. Keep Out of Reach of Children. Avoid prolonged breathing of vapors.

Never siphon by mouth. Do not store in vehicle or living space. Store and use in a well ventilated area. Do not use near heat, spark or flame. Keep container closed."

SECTION 16. OTHER INFORMATION

Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.

REVISION INFORMATION

Version Number	4.0
Revision Date	10/08/2003
Print Date	Printed on 10/08/2003.

ABBREVIATIONS

AP: Approximately EQ: Equal >: Greater Than <: Less Than NA: Not Applicable ND: No Data NE: Not Established

ACGIH: American Conference of Governmental Industrial Hygienists
IARC: International Agency for Research on Cancer
NIOSH: National Institute of Occupational Safety and Health
NPCA: National Paint and Coating Manufacturers Association
NFPA: National Fire Protection Association
AIHA: American Industrial Hygiene Association
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration
HMIS: Hazardous Materials Information System
EPA: US Environmental Protection Agency

DISCLAIMER OF LIABILITY

THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED REGARDING ITS CORRECTNESS. SOME INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE SUBSTANCE ITSELF. THIS MSDS WAS PREPARED AND IS TO BE USED ONLY FOR THIS PRODUCT. IF THE PRODUCT IS USED AS A COMPONENT IN ANOTHER PRODUCT, THIS MSDS INFORMATION MAY NOT BE APPLICABLE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION OR PRODUCTS FOR THEIR PARTICULAR PURPOSE.

THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.

***** END OF MSDS *****

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Ethylbenzene, 99%
Catalog Numbers:
AC118080000, AC118080010, AC118080025, AC118080250
Synonyms:
Ethylbenzol, phenylethane
Company Identification (Europe): Acros Organics BVBA
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
100-41-4	Ethylbenzene	99.0	202-849-4

Hazard Symbols: XN F
Risk Phrases: 11 20

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear, colorless. Flash Point: 21 deg C.
Warning! Flammable liquid and vapor. Causes skin irritation. Causes eye irritation. May cause central nervous system depression. Aspiration hazard if swallowed. Can enter lungs and cause damage. May be absorbed through intact skin. Causes digestive and respiratory tract irritation.
Target Organs: Central nervous system.

Potential Health Effects

Eye:

Causes moderate eye irritation. Vapors may cause eye irritation.

Skin:

Causes skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin. Contact with the liquid may cause erythema (redness), exfoliation and vesiculation (blistering).

Ingestion:

May cause irritation of the digestive tract. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. Vapors may cause dizziness or suffocation.

Chronic:

Chronic inhalation may cause effects similar to those of acute inhalation.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion:

Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and

Antidote:

None reported.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Containers may explode when heated.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Contact professional fire-fighters immediately. Cool containers with flooding quantities of water until well after fire is out.

Autoignition Temperature:810 deg F (432.22 deg C)
Flash Point: 21 deg C (69.80 deg F)
Explosion Limits, lower:0.8
Explosion Limits, upper:6.7
NFPA Rating: (estimated) Health: 3; Flammability: 4; Reactivity: 0

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Ethylbenzene	100 ppm; 125 ppm STEL	100 ppm TWA; 435 mg/m3 TWA 800 ppm IDLH (10 percent lower explosive limit)	100 ppm TWA; 435 mg/m3 TWA

OSHA Vacated PELs:

Ethylbenzene:

100 ppm TWA; 435 mg/m3 TWA; 125 ppm STEL; 545 mg/m3 STEL

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:

Wear appropriate protective gloves and clothing to prevent skin exposure.

Clothing:

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear, colorless
Odor:	aromatic odor
pH:	Not available.
Vapor Pressure:	7.1 mm Hg @ 20 C
Vapor Density:	3.7
Evaporation Rate:	<1 (butyl acetate=1)
Viscosity:	0.63 mPa s 20 C
Boiling Point:	277 deg F
Freezing/Melting Point:	-139 deg F
Decomposition Temperature:	Not available.
Solubility in water:	Insoluble.
Specific Gravity/Density:	0.9
Molecular Formula:	C8H10
Molecular Weight:	106.07

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable under normal temperatures and pressures.

Conditions to Avoid:

Incompatible materials, ignition sources, excess heat.

Incompatibilities with Other Materials:

Oxidizing agents.

Hazardous Decomposition Products:

Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 100-41-4: DA0700000

LD50/LC50:

CAS# 100-41-4: Draize test, rabbit, eye: 500 mg Severe; Oral, rat: LD50 = 3500 mg/kg; Skin, rabbit: LD50 = 17800 uL/kg.

Carcinogenicity:

Ethylbenzene -

OSHA: Possible Select carcinogen

IARC: Group 2B carcinogen

Epidemiology:

No information available.
Teratogenicity:
No information available.
Reproductive Effects:
No information available.
Neurotoxicity:
No information available.
Mutagenicity:
Mutation in mammalian somatic cells (Rodent,mouse) Lymphocyte = 80 mg/L.
Other Studies:
Standard Draize Test: Administration into the eye (rabbit) = 500 mg (Severe). Standard Draize Tes (Rabbit, Skin) = 15 mg/L; Mild.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:
Shrimp (mysidoposis bahia), LC50=87.6 mg/L/96hr. Sheepshead minnow LC50=275 mg/L/96hr. Fathead minnow LC50=42.3 mg/L/96hr in hard water &48.5 mg/L/96hr in softwater.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
Shipping Name: ETHYLBENZENE
Hazard Class: 3
UN Number: UN1175
Packing Group: II
Canadian TDG
Shipping Name: ETHYLBENZENE
Hazard Class: 3(9.2)
UN Number: UN1175
Other Information: FLASHPOINT 15 C

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 100-41-4 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 100-41-4: Effective Date: June 19, 1987; Sunset Date: June 19, 19
19
97
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
CAS# 100-41-4: final RQ = 1000 pounds (454 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 100-41-4: acute, chronic, flammable.
Section 313
This material contains Ethylbenzene (CAS# 100-41-4, 99 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.
Clean Air Act:
CAS# 100-41-4 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 100-41-4 is listed as a Hazardous Substance under the CWA.
CAS# 100-41-4 is listed as a Priority Pollutant under the Clean Water Act.
CAS# 100-41-4 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
Ethylbenzene can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level:
None of the chemicals in this product are listed.
European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XN F
Risk Phrases:
R 11 Highly flammable.
R 20 Harmful by inhalation.
Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 24/25 Avoid contact with skin and eyes.
S 29 Do not empty into drains.
WGK (Water Danger/Protection)
CAS# 100-41-4: 1
United Kingdom Occupational Exposure Limits
CAS# 100-41-4: OES-United Kingdom, TWA 100 ppm TWA; 441 mg/m3 TWA
CAS# 100-41-4: OES-United Kingdom, STEL 125 ppm STEL; 552 mg/m3 STEL
Canada
CAS# 100-41-4 is listed on Canada's DSL List.
This product has a WHMIS classification of B2, D2B.
CAS# 100-41-4 is listed on Canada's Ingredient Disclosure List.
Exposure Limits
CAS# 100-41-4: OEL-AUSTRALIA:TWA 100 ppm (435 mg/m3);STEL 125 ppm (545 mg/m3)
OEL-BELGIUM:TWA 100 ppm (434 mg/m3);STEL 125 ppm (543 mg/m3)
OEL-CZECHOSLOVAKIA:TWA 200 mg/m3;STEL 1000 mg/m3
OEL-DENMARK:TWA 50 ppm (217 mg/m3)
OEL-FINLAND:TWA 100 ppm (435 mg/m3);STEL 150 ppm (655 mg/m3)

OEL-FRANCE:TWA 100 ppm (435 mg/m3)
OEL-GERMANY:TWA 100 ppm (440 mg/m3);Skin
OEL-HUNGARY:TWA 100 mg/m3;STEL 200 mg/m3;Skin
OEL-JAPAN:TWA 100 ppm (430 mg/m3)
OEL-THE NETHERLANDS:TWA 100 ppm (435 mg/m3)
OEL-THE PHILIPPINES:TWA 100 ppm (435 mg/m3)
OEL-POLAND:TWA 100 mg/m3
OEL-RUSSIA:TWA 100 ppm;STEL 50 mg/m3
OEL-SWEDEN:TWA 50 ppm (200 mg/m3);STEL 100 ppm (450 mg/m3)
OEL-SWITZERLAND:TWA 100 ppm (435 mg/m3);STEL 500 ppm
OEL-TURKEY:TWA 100 ppm (435 mg/m3)
OEL-UNITED KINGDOM:TWA 100 ppm (435 mg/m3);STEL 125 ppm
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 4/28/1999 Revision #2 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

CITGO Gasolines, All Grades Unleaded

Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210

MSDS No.	UNLEAD
Revision Date	05/23/2005

IMPORTANT: Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.

Hazard Rankings

	HMIS	NFPA
Health Hazard	* 2	1
Fire Hazard	3	3
Reactivity	0	0

*** = Chronic Health Hazard**

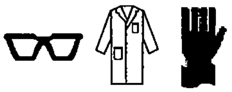
Emergency Overview

Physical State	Liquid.		
Color	Transparent, clear to amber or red.	**Odor**	Pungent, characteristic gasoline.

DANGER:
Extremely flammable liquid; vapor may cause flash fire or explosion.
Vapor may travel considerable distance to source of ignition and flash back.
Use Only as a Motor Fuel. Do Not Siphon by Mouth.
Harmful or fatal if swallowed - Can enter lungs and cause damage.
High concentrations of vapor reduce oxygen available for breathing and may cause suffocation.
May be harmful if inhaled or absorbed through the skin.
Mist or vapor may irritate the eyes, mucous membranes, and respiratory tract.
Liquid contact may cause eye and skin irritation.
Overexposures may cause central nervous system (CNS) depression and target organ effects (See Section 3).
Harmful or fatal if swallowed - Can enter lung and cause damage.
Inhalation overexposure can increase the heart's susceptibility to arrhythmias (irregular beats).
Contains Benzene - Cancer Hazard.
Long term exposure to gasoline vapor has caused cancer in laboratory animals.
Avoid Spills. Spills may present both a physical and an environmental hazard.

Protective Equipment

Minimum Recommended
See Section 8 for Details



SECTION 1. PRODUCT IDENTIFICATION

Trade Name	CITGO Gasolines, All Grades Unleaded	**Technical Contact**	(800) 248-4684
Product Number	Various	**Medical Emergency**	(832) 486-4700
CAS Number	Mixture.	**CHEMTREC Emergency (United States Only)**	(800) 424-9300

Product Family	Motor fuels.
Synonyms	Unleaded Gasolines; Motor Gasolines; Petrol; Automobile Motor Fuels; Finished Gasolines; Gasoline, Regular Unleaded; Gasoline, Mid-grade Unleaded; Gasoline, Premium Unleaded; Reformulated Gasolines (RFG); Reformulated Motor Fuels; Oxygenated Motor Spirits; Gasoline, Regular Reformulated; Gasoline, Mid-grade Reformulated; Gasoline, Premium Reformulated.

SECTION 2. COMPOSITION

Gasoline is a complex and variable mixture that originates from finished refinery streams. These streams can contain the hydrocarbons and oxygenated chemicals (oxygenates) listed below that are regulated or are associated with certain potential health effects. The typical concentration of oxygenates in gasoline does not exceed 18% (v/v).

Component Name(s)	CAS Registry No.	Concentration (%)
Methyl tertiary-Butyl Ether (MTBE)	1634-04-4	0 - 15
Tertiary-Amyl Methyl Ether (TAME)	994-05-8	0 - 15
Ethyl tertiary Butyl Ether (ETBE)	637-92-3	0 - 15
Tertiary-Amyl Ethyl Ether (TAEE)	919-94-8	0 - 15
Diisopropyl Ether (DIPE)	108-20-3	0 - 15
Ethanol	64-17-5	0 - 10
Toluene	108-88-3	<20
Xylene, all isomers	1330-20-7	<18
n-Hexane	110-54-3	<8
Trimethylbenzenes, all isomers	25551-13-7	<5
Benzene	71-43-2	<5
Cumene	98-82-8	<4
Ethylbenzene	100-41-4	<4
Cyclohexane	110-82-7	<3
Naphthalene	91-20-3	<2
Styrene	100-42-5	<1

SECTION 3. HAZARDS IDENTIFICATION

Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.

Major Route(s) of Entry Skin contact. Eye contact. Inhalation. Ingestion.

Signs and Symptoms of Acute Exposure

Inhalation	Breathing high concentrations may be harmful. Mist or vapor can irritate the throat and lungs. Breathing this material may cause central nervous system depression with symptoms including nausea, headache, dizziness, fatigue, drowsiness, or unconsciousness. Breathing high concentrations of this material, for example, in an enclosed space or by intentional abuse, can cause irregular heartbeats which can cause death.
Eye Contact	This product can cause eye irritation with short-term contact with liquid, mists or vapor. Symptoms include stinging, watering, redness, and swelling. In severe cases, permanent eye damage can result.
Skin Contact	This material can cause skin irritation. The severity of irritation will depend on the amount of material that is applied to the skin and the speed and thoroughness that it is removed. It is likely that some components of this material are able to pass into the body through the skin and may cause similar effects as from breathing or swallowing it. If the skin is damaged, absorption increases.
Ingestion	

Continued on Next Page

If swallowed, this material may irritate the mucous membranes of the mouth, throat, and esophagus. It can be readily absorbed by the stomach and intestinal tract. Symptoms include a burning sensation of the mouth and esophagus, nausea, vomiting, dizziness, staggered gait, drowsiness, loss of consciousness and delirium, as well as additional central nervous system (CNS) effects.

Due to its light viscosity, there is a danger of aspiration into the lungs during swallowing and subsequent vomiting. Aspiration can result in severe lung damage or death. Cardiovascular effects include shallow rapid pulse with pallor (loss of color in the face) followed by flushing (redness of the face). Also, progressive CNS depression, respiratory insufficiency and ventricular fibrillation leads to death.

Chronic Health Effects Summary

Intentional misuse by deliberately concentrating and inhaling gasoline can be harmful or fatal. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage ("Petrol Sniffers Encephalopathy"), delirium, seizures and sudden death are associated with repeated abuse of gasoline or naphtha.

Chronic effects of ingestion and subsequent aspiration into the lungs may include pneumatocele (lung cavity) formation and chronic lung dysfunction.

Benzene, a component of this product, causes blood disorders and damages the bone marrow (certain types of anemia, leukemia, and lymphoma). It is also capable of causing changes in living cells' genetic material (chromosomes). Benzene is considered to be a mutagen and a cancer-causing agent (leukemogen).

Repeated and prolonged overexposure to n-hexane has been associated with peripheral nerve tissue damage. Adverse effects include numbness, tingling, pain, and loss of muscle control in the extremities, disorientation, impaired vision and reflexes, decline in motor function and paralysis.

Prolonged or repeated overexposure to toluene, a component of this product, has been associated with reproductive effects in experimental animals and in long-term chemical abuse situations. Long-term overexposure to toluene has been associated with impaired color vision. Also, long-term overexposure to toluene in occupational environments have been associated with hearing damage.

Prolonged or repeated overexposure to xylene, a component of this product, has been associated with hearing damage in laboratory animals. Repeated overexposure may cause injury to bone marrow, blood cells, kidney, and liver.

Refer to Section 11 of this MSDS for additional health-related information.

Conditions Aggravated by Exposure

Disorders of the following organs or organ systems that may be aggravated by significant exposure to this material or its components include: Skin, Respiratory System, Liver, Kidneys, Central Nervous System (CNS), Cardiovascular System, Blood-forming system

Target Organs

May cause damage to the following organs: blood, kidneys, lungs, the reproductive system, liver, mucous membranes, heart, peripheral nervous system, cardiovascular system, upper respiratory tract, skin, auditory system, bone marrow, central nervous system (CNS), eye, lens or cornea.

Carcinogenic Potential

This material may contain benzene, ethylbenzene, naphthalene or styrene at concentrations above 0.1%. Benzene is considered to be a known human carcinogen by OSHA, IARC and NTP. IARC has identified ethylbenzene, styrene, naphthalene, gasoline and gasoline engine exhaust as possibly carcinogenic to humans (Group 2B) based on laboratory animal studies.

OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).

OSHA Health Hazard Classification		OSHA Physical Hazard Classification		
Irritant ☒	Sensitizer ☐	Combustible ☐	Explosive ☐	Pyrophoric ☐
Toxic ☐	Highly Toxic ☐	Flammable ☒	Oxidizer ☐	Water-reactive ☐
Corrosive ☐	Carcinogenic ☒	Compressed Gas ☐	Organic Peroxide ☐	Unstable ☐

SECTION 4. FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.

Inhalation	Immediately move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). If breathing is difficult, 100 percent humidified oxygen should be administered by a qualified individual. Seek medical attention immediately. If exposed to benzene in an emergency situation, a medical evaluation should be completed at the end of the work-shift in accordance with OSHA requirements.
Eye Contact	Flush eyes with cool, clean, low-pressure water for at least 15 minutes. Hold eyelids apart to ensure complete irrigation of the eye and eyelid tissue. If easily accomplished, check for and remove contact lenses. If contact lenses cannot be removed, seek immediate medical attention. Do not use eye ointment. Seek medical attention.
Skin Contact	Remove contaminated shoes and clothing. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. Do not use ointments. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists.
Ingestion	Do not induce vomiting. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Never give anything by mouth to a person who is not fully conscious. Do not leave victim unattended. Seek medical attention immediately.
Notes to Physician	INHALATION: Inhalation overexposure can produce toxic effects. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Administer supplemental oxygen with assisted ventilation, as required. This material (or a component) sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administion of sympathomimetic drugs should be avoided. INGESTION: If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

SECTION 5. FIRE FIGHTING MEASURES

NFPA Flammability Classification	NFPA Class-IB flammable liquid.
Flash Point	Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56])
Lower Flammable Limit	AP 1.4 %
Upper Flammable Limit	AP 7.6 %
Autoignition Temperature	280°C (536°F)
Hazardous Combustion Products	Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons, aldehydes and other products of incomplete combustion.
Special Properties	Flammable Liquid! This material releases vapors at or below ambient temperatures. When mixed with air in certain proportions and exposed to an ignition source, its vapor can cause a flash fire. Use only with adequate ventilation. Vapors are heavier than air and may travel long distances along the ground to an ignition source and flash back. A vapor and air mixture can create an explosion hazard in confined spaces such as sewers. If container is not properly cooled, it can rupture in the heat of a fire.
Extinguishing Media	SMALL FIRE: Use dry chemicals, carbon dioxide, foam, or inert gas (nitrogen). Carbon dioxide and inert gas can displace oxygen. Use caution when applying carbon dioxide or inert gas in confined spaces. LARGE FIRE: Use foam, water fog, or water spray. Water May Be Ineffective. Water may not extinguish the fire. Water fog and spray are effective in cooling containers and adjacent structures. However, water can be used to cool the external walls of vessels to prevent excessive pressure, autoignition or explosion. DO NOT use a solid stream of water directly on the fire as the water may spread the fire to a larger area.
Protection of Fire Fighters	Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles. Cover pooling liquid with foam. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines. Be aware that burning liquid will float on water. Notify appropriate authorities of potential fire and explosion hazard if liquid enter sewers or waterways.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.

Flammable Liquid! Release causes an immediate fire or explosion hazard. Evacuate all non-essential personnel from immediate area and establish a "regulated zone" with site control and security. A vapor-suppressing foam may be used to reduce vapors. Eliminate all ignition sources. All equipment used when handling this material must be grounded. Stop the leak if it can done without risk. Do not touch or walk through spilled material. Remove spillage immediately from hard, smooth walking areas. Prevent spilled material from entering waterways, sewers, basements, or confined areas. Absorb or cover with dry earth, sand, or other non-combustible material and transfer to appropriate waste containers. Use clean, non-sparking tools to collect absorbed material.

For large spills, secure the area and control access. Prevent spilled material from entering sewers, storm drains, other drainage systems, and natural waterways. Dike far ahead of a

Continued on Next Page

liquid spill to ensure complete collection. Water mist or spray may be used to reduce or disperse vapors; but, it may not prevent ignition in closed spaces. This material will float on water and its run-off may create an explosion or fire hazard. Verify that responders are properly HAZWOPER-trained and wearing appropriate respiratory equipment and fire-resistant protective clothing during cleanup operations. In an urban area, cleanup spill as soon as possible; in natural environments, cleanup on advice from specialists. Pick up free liquid for recycle and/or disposal if it can be accomplished safely with explosion-proof equipment. Collect any excess material with absorbant pads, sand, or other inert non-combustible absorbent materials. Place into appropriate waste containers for later disposal. Comply with all applicable local, state and federal laws and regulations.

SECTION 7. HANDLING AND STORAGE

Handling

FLAMMABLE LIQUID AND VAPOR. **USE ONLY as a motor fuel.** DO NOT siphon by mouth. DO NOT use as a lighter fluid, solvent or cleaning fluid. Prior to handling or refueling, stop all engines and auxillary equipment. Turn off all electronic equipment including cellular telephones. DO NOT leave nozzle unattended during filling or refueling a vehicle. DO NOT re-enter vehicle while refueling. Keep nozzle spout in contact with the container during the entire filling operations.

A static electrical charge can accumulate when this material is flowing through pipes, nozzles or filters and when it is agitated. A static spark discharge can ignite accumulated vapors particularly during dry weather conditions. Always bond receiving containers to the fill pipe before and during loading. Always keep nozzle in contact with the container throughout the loading process. Do not fill any portable container in or on a vehicle. Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously contained middle distillates or similar products).

A spill or leak can cause an immediate fire hazard. Keep containers closed and do not handle or store near heat, sparks, or any other potential ignition sources. Do not contact with oxidizable materials. Do not breathe vapor. Use only with adequate ventilation and personal protection. Never siphon by mouth. Avoid contact with eyes, skin, and clothing. Prevent contact with food and tobacco products. Do not take internally.

When performing repairs and maintenance on contaminated equipment, keep unnecessary persons away from the area. Eliminate all potential ignition sources. Drain and purge equipment, as necessary, to remove material residues. Follow proper entry procedures, including compliance with 29 CFR 1910.146 prior to entering confined spaces such as tanks or pits. Use gloves constructed of impervious materials and protective clothing if direct contact is anticipated. Provide ventilation to maintain exposure potential below applicable exposure limits. Use appropriate respiratory protection when concentrations exceed any established occupational exposure level (See Section 8). Promptly remove contaminated clothing. Wash exposed skin thoroughly with soap and water after handling.

Protect the environment from releases of this material. Prevent discharges to surface waters and groundwater. Maintain handling, transfer and storage equipment in proper working order.

Misuse of empty containers can be dangerous. Empty containers may contain material residues which can ignite with explosive force. **Cutting or welding of empty containers can cause fire, explosion, or release of toxic fumes from residues.** Do not pressurize or expose empty containers to open flame, sparks, or heat. Keep container closed and drum bungs in place. All label warnings and precautions must be observed. Return empty drums to a qualified reconditioner. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling, or disposing of empty containers and/or waste residues of this material.

Storage Store and transport in accordance with all applicable laws. Keep containers tightly closed. Store in a cool, dry, well-ventilated place. Clearly label all containers. Do not allow containers to be kept in enclosed vehicles. Keep away from all ignition sources. Ground all equipment containing this material. Containers must be able to withstand pressures that are created from changes in product temperature. Product samples and other small containers of this flammable liquid should be stored in a separate safety cabinet or room. All electrical equipment in areas where this material is stored or handled should be installed and operated in accordance with applicable regulatory requirements and the National Electrical Code.

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls Provide ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below the applicable workplace exposure limits indicated below. All electrical equipment should comply with the National Electric Code. An emergency eye wash station and safety shower should be located near the work-station.

Personal Protective Equipment Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.

Eye Protection Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. A suitable emergency eye wash water and safety shower should be located near the work station.

Hand Protection Avoid skin contact. Use gloves (e.g., disposable PVC, neoprene, nitrile, vinyl, or PVC/NBR). Wash hands with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities or leaving work. DO NOT use this material as a skin cleaner.

Body Protection Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discard contaminated leather goods.

Respiratory Protection For known vapor concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator if adequate protection is provided. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134). For airborne vapor concentrations that exceed the recommended protection factors for organic vapor respirators, use a full-face, positive-pressure, supplied air respirator. Due to fire and explosion hazards, do not enter atmospheres containing concentrations greater than 10% of the lower flammable limit of this product.

General Comments Warning! Use of this material in spaces without adequate ventilation may result in generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

Occupational Exposure Guidelines

Substance **Applicable Workplace Exposure Levels**

Continued on Next Page

Gasoline	**ACGIH (United States).** TWA: 300 ppm 8 hour(s). STEL: 500 ppm 15 minute(s).
Toluene	**ACGIH (United States). Skin** TWA: 50 ppm 8 hour(s). **OSHA (United States).** TWA: 200 ppm 8 hour(s). CEIL: 300 ppm PEAK: 500 ppm
Xylene, all isomers	**ACGIH (United States).** TWA: 100 ppm 8 hour(s). STEL: 150 ppm 15 minute(s). **OSHA (United States).** TWA: 100 ppm 8 hour(s).
Tertiary-Amyl Methyl Ether (TAME)	**ACGIH TLV (United States).** TWA: 20 ppm 8 hour(s).
Methyl tertiary-Butyl Ether (MTBE)	**ACGIH (United States).** TWA: 50 ppm 8 hour(s).
Ethyl tertiary Butyl Ether (ETBE)	**ACGIH TLV (United States).** TWA: 5 ppm 8 hour(s).
n-Hexane	**ACGIH (United States). Skin** TWA: 50 ppm 8 hour(s). **OSHA (United States).** TWA: 500 ppm 8 hour(s).
Cumene	**ACGIH (United States).** TWA: 50 ppm 8 hour(s). **OSHA (United States). Skin** TWA: 50 ppm 8 hour(s).
Trimethylbenzenes, all isomers	**ACGIH (United States).** TWA: 25 ppm 8 hour(s).
Benzene	**ACGIH (United States). Skin** TWA: 0.5 ppm 8 hour(s). STEL: 2.5 ppm 15 minute(s). **OSHA (United States). Skin Notes: See Table Z-2 for exclusions in 20 CFR 1910.1028 to the PEL.** TWA: 1 ppm 8 hour(s). STEL: 5 ppm 15 minute(s).
Ethylbenzene	**ACGIH (United States).** TWA: 100 ppm 8 hour(s). STEL: 125 ppm 15 minute(s). **OSHA (United States).** TWA: 100 ppm 8 hour(s).
Cyclohexane	**ACGIH (United States).** TWA: 100 ppm 8 hour(s). **OSHA (United States).** TWA: 300 ppm 8 hour(s).
Naphthalene	**ACGIH (United States). Skin** TWA: 10 ppm 8 hour(s). STEL: 15 ppm 15 minute(s). **OSHA (United States).** TWA: 10 ppm 8 hour(s).
Styrene	**ACGIH (United States).** TWA: 20 ppm 8 hour(s). STEL: 40 ppm 15 minute(s). **OSHA (United States).** TWA: 100 ppm 8 hour(s). STEL: 200 ppm 15 minute(s). PEAK: 600 ppm

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

Physical State	Liquid.	**Color**	Transparent, clear to amber or red.	**Odor**	Pungent, characteristic gasoline.
Specific Gravity	0.72 - 0.77 (Water = 1)	**pH**	Not applicable	**Vapor Density**	3 to 4 (Air = 1)

Boiling Range	38 to 204°C (100 to 400°F)	**Melting/Freezing Point**	Not available.
Vapor Pressure	220 to 450 mm Hg at 20°C (68°F) or 6 to 15 Reid-psia at 37.8°C (100°F).	**Volatility**	720 to 770 g/l VOC (w/v)
Solubility in Water	Hydrocarbon components of gasoline are slightly soluble in water. Oxygenate components, such as MTBE, are more soluble than the hydrocarbon components. Ethanol has greater solubility in water than hydrocarbon components or other oxygenate components.	**Viscosity (cSt @ 40°C)**	<1

Flash Point	Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56])
Additional Properties	Average Density at 60°F = 6.0 to 6.4 lbs./gal. (ASTM D-2161)

SECTION 10. STABILITY AND REACTIVITY

Chemical Stability	Stable.	**Hazardous Polymerization**	Not expected to occur.

Conditions to Avoid	Keep away from heat, flame and other potential ignition sources. Keep away from strong oxidizing conditions and agents.
Materials Incompatibility	Strong acids, alkalies and oxidizers such as liquid chlorine, other halogens, hydrogen peroxide and oxygen.
Hazardous Decomposition Products	No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS.

SECTION 11. TOXICOLOGICAL INFORMATION

For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.

Toxicity Data

Gasoline:
VAPOR (TELo) Acute: 140 ppm (Human) (8 hours) - Mild eye irritant.
VAPOR (TELo) Acute: 500 ppm (Human) (1 hour) - Moderate eye irritant.
INHALATION (TCLo) Acute: 900 ppm (Human) (1 hour) - CNS and pulmonary effects.
DERMAL (TDLo) Acute: 53 mg/kg (Human) - Skin allergy effects.
INHALATION (LC50) Acute: 101,200 ppm (Rat, Mouse, & Guinea Pig) (5 minutes).

Gasoline Containing 15% MTBE:
ORAL (LD50) Acute: >5,000 mg/kg (Rat screen level).
DERMAL (LD50) Acute: >2,000 mg/kg (Rabbit screen level).
INHALATION (LC50) Acute: >5,200 ppm (Rat screen level) (8 hours).
DRAIZE EYE Acute: Mild eye irritant. (Rabbit).

DRAIZE DERMAL Acute: Moderate skin irritant. (Rabbit).
BUEHLER DERMAL Acute: Non-sensitizing. (Guinea Pig).
28-Day DERMAL Sub-Chronic: Severe skin irritant. (Rabbit).

A major epidemiological study concluded that there was no increased risk of kidney cancer associated with gasoline exposures for petroleum refinery employees or neighboring residents. Another study identified a slight trend in kidney cancers among service station employees following a 30-year latency period. Two-year inhalation toxicity studies with fully vaporized unleaded gasoline (at concentrations of 67, 292 and 2,056 ppm in air) produced kidney damage and kidney tumors in male rats, but not in female rats or mice of either sex. Results from subsequent scientific studies suggest that the kidney damage, and probably the kidney tumor response, is limited to the male rat. The kidney tumors apparently were the result of the formation of alpha-2u-globulin, a protein unique to male rats. This finding is not considered relevant to human exposure. Under conditions of the study, there was no evidence that exposure to unleaded gasoline vapor is associated with developmental toxicity. Experimental studies with laboratory animals did suggest that overexposure to gasoline may adversely effect male reproductive performance. Also, in laboratory studies with rats, the maternal and developmental "no observable adverse effect level" (NOAEL) was determined to be 9,000 ppm (75% of the LEL value). Female mice developed a slightly higher incidence of liver tumors compared to controls at the highest concentration. In a four week inhalation study of Sprague Dawley® rats, gasoline vapor condensate was determined to induce sister chromatid exchanges in peripheral lymphocytes. IARC has listed gasoline as possibly carcinogenic to humans (Group 2B).

Pentanes, all isomers:
Studies of pentane isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol.%) may induce cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

Toluene:
Effects from Acute Exposure:
Deliberate inhalation of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system and can cause CNS depression, cardiac arrhythmias and death. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects.

Effects from Repeated or Prolonged Exposure:
Studies of workers indicate long-term exposure may be related to impaired color vision and hearing. Some studies of workers suggest long-term exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest long-term exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals were largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

Heptane, all isomers:
n-Heptane was not mutagenic in the Salmonella/microsome (Ames) assay and is not considered to be carcinogenic.

Continued on Next Page

Xylene, all isomers:
Effects from Acute Exposure:
ORAL (LD_{50}), Acute: 4,300 mg/kg [Rat].
INHALATION (LC_{50}), Acute: 4,550 ppm for four hours [Rat].
DERMAL (LD_{50}), Acute: 14,100 uL/kg [Rabbit].
Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross over-exposure.

Effects from Prolonged or Repeated Exposure:
Impaired neurological function was reported in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

Ethyl tertiary Butyl Ether (ETBE):
ETBE can cause eye, skin and mucous membrane irritation. In a four week inhalation study, moderate ataxia was observed in rats at the highest dose level (4,000 ppm). The test animals appeared normal within 15 minutes of termination of exposure. A no observed adverse effect level (NOAEL) of 500 ppm was indicated by the study authors based on neurotoxic effects. In two unpublished 90 day inhalation studies, rats and mice were exposed six hour/day, five days/week at concentrations of 0, 500, 1750 and 5000 ppm of ETBE vapor. The male rats exhibited time and concentration-dependent nephropathy consistent with alpha-2µ-globulin formation. An ETBE NOAEL for male rats of 500 ppm was suggested based on a finding of testicular lesions. In human studies with eight males, slight, but significant ($p<0.05$) decreases in objective pulmonary function measures after exposure to ETBE at concentrations of 25 and 50 ppm for two hours.

Tertiary-Amyl Methyl Ether (TAME):
TAME was found to be negative for the induction of structural chromosome aberrations (both metabolically-activated and non-activated) in Chinese hamster ovary (CHO) cells. Inhalation of TAME vapors at concentrations above 250 ppm produced reversible CNS depression in rats and mice. In a four week inhalation study, increases in liver weights with no tissue injury were observed in rats exposed to a TAME concentration of 500 ppm. Birth defects in mice and fetotoxicity in both rats and mice were observed after inhalation exposures to maternally toxic concentrations of TAME.

Methyl tertiary-Butyl Ether (MTBE):
Acute symptoms associated with human exposure to MTBE appear to be mild and transient. In laboratory studies, rats and mice exposed to high doses of MTBE exhibited blood chemistry changes and liver and kidney abnormalities. In laboratory studies, MTBE vapor exposure at the high dose concentration was associated with an increased incidence of liver tumors in female mice. Also, at high dose concentration exposures, MTBE was associated with an increased incidence of kidney and testicular (Leydig cell) tumors in male rats. Additional oncogenicity studies on rats resulted in testicular tumors following administration by ingestion. These data are not generally considered relevant to humans. NTP has not identified MTBE as either a known carcinogen or reasonably anticipated to be carcinogenic to humans. In animal studies, developmental and reproductive toxicity related to MTBE inhalation exposures was observed only at concentrations that were maternally toxic. MTBE was shown to be maternally toxic at 4,000 and 8,000 ppm levels when mice were exposed for six hours per day during their pregnancy. Also, a decrease in the number of successful pregnancies and a reduction in birth weights were observed at these exposure levels. Birth defects (cleft palate) were observed at the high dose level. These data suggest that the risk of developmental and reproductive toxicity in humans is negligible as a result of anticipated

Continued on Next Page

exposures to MTBE.

Diisopropyl Ether (DIPE):
Increased kidney and liver weights were observed in rats and mice in subchronic and chronic inhalation studies of DIPE. Also, evidence of microscopic changes (hyaline droplets) were reported in liver tissue and kidney tubules of rabbits and male rats exposed to DIPE at concentrations of 7,100 ppm. These findings were similar those found in gasoline studies. Overexposure by inhalation of pregnant rats to DIPE at concentrations of 3,095 and 6,745 ppm increased the frequency of rudimentary 14th ribs in the offspring. This effect was not observed at exposure concentrations of 430 ppm. The significance of these findings to human exposure is unclear.

Ethanol:
Inhalation exposure to ethanol vapor at concentrations above applicable workplace exposure levels is expected to produce eye and mucus membrane irritation. Human exposure at concentrations from 1000 to 5000 ppm produced symptoms of narcosis, stupor and unconsciousness. Subjects exposed to ethanol vapor in concentrations between 500 and 10,000 ppm experienced coughing and smarting of the eyes and nose. At 15,000 ppm there was continuous lacrimation and coughing. While extensive acute and chronic effects can be expected with ethanol consumption, ingestion is not expected to be a significant route of exposure to this product.

Butane, all isomers:
Studies in laboratory animals indicate exposure to extremely high levels of butanes (1-10 or higher vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

n-Hexane:
This material contains n-hexane. Long-term or repeated exposure to n-hexane can cause permanent peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. Co-exposure to methylethyl ketone or methyl isobutyl ketone increases the neurotoxic properties of n-hexane. In laboratory studies, prolonged exposure to elevated concentrations of n-hexane was associated with decreased sperm count and degenerative changes in the testicles of rats.

Cumene:
Effects from Acute Exposure:
Overexposure to cumene may cause upper respiratory tract irritation and severe CNS depression.

Effects from Prolonged or Repeated Exposure:
Studies in laboratory animals indicate evidence of adverse effects on the kidney and adrenal glands following high level exposure. The relevance of these findings to humans is not clear at this time.

Trimethylbenzenes, all isomers:
Studies of Workers:
Levels of total hydrocarbon vapors present in the breathing atmosphere of these workers ranged from 10 to 60 ppm. The TCLo for humans is 10 ppm, with somnolence and respiratory tract irritation noted.

Studies in Laboratory Animals:
In inhalation studies with rats, four of ten animals died after exposures of 2400 ppm for 24 hours. An oral dose of 5 mL/kg resulted in death in one of ten rats. Minimum lethal intraperitoneal doses were 1.5 to 2.0 mL/kg in rats and 1.13 to 12 mL/kg in guinea pigs. Mesitylene (1, 3, 5 Trimethylbenzene) inhalation at concentrations of 1.5, 3.0, and 6.0 mg/L for six hours was associated with dose-related changes in white blood cell counts in rats. No significant effects on the complete blood count were noted with six hours per day exposure

for five weeks, but elevations of alkaline phosphatase and SGOT were observed. Central nervous system depression and ataxia were noted in rats exposed to 5,100 to 9,180 ppm for two hours.

Benzene:

ORAL (LD50):	Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse].
INHALATION (LC50):	
(VAPOR):	Acute: 10000 ppm 7 hour(s) [Rat]. 9980 ppm 8 hour(s) [Mouse].

Studies of Workers Over-Exposed to Benzene:
Studies of workers exposed to benzene show clear evidence that over-exposure can cause cancer of the blood forming organs (acute myelogenous leukemia) and aplastic anemia, an often fatal disease. Studies also suggest over-exposure to benzene may be associated with other types of leukemia and other blood disorders. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of aplastic anemia have been reported in the offspring of persons severely over-exposed to benzene.

Studies in Laboratory Animals:
Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and skeletal variations.

Ethylbenzene:
Effects from Acute Exposure:
ORAL (LD50), Acute: 3,500 mg/kg [Rat].
DERMAL (LD50), Acute: 17,800 uL/kg [Rabbit].
INTRAPERITONEAL (LD50), Acute: 2,624 mg/kg [Rat].

Effects from Prolonged or Repeated Exposure:
Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). Also, the incidence of tumors was elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as “possibly carcinogenic to humans” (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

Cyclohexane:
Cyclohexane can cause eye, skin and mucous membrane irritation, CNS depressant and narcosis at elevated concentrations. In experimental animals exposed to lethal concentrations by inhalation or oral route, generalized vascular damage and degenerative changes in the heart, lungs, liver, kidneys and brain were identified.

Cyclohexane has been the focus of substantial testing in laboratory animals. Cyclohexane was not found to be genotoxic in several tests including unscheduled DNA synthesis, bacterial and mammalian cell mutation assays, and in vivo chromosomal aberration. An increase in chromosomal aberrations in bone marrow cells of rats exposed to cyclohexane was reported in the 1980's. However, a careful re-evaluation of slides from this study by the laboratory which conducted the study indicates these findings were in error, and that no significant chromosomal effects were observed in animals exposed to cyclohexane. Findings indicate long-term exposure to cyclohexane does not promote dermal tumorigenesis.

Naphthalene:
Studies in Humans Overexposed to Naphthalene:
Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from over-exposure to naphthalene. Persons with Glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have also been reported from over-exposure to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect.

Studies in Laboratory Animals:
Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) *in vitro.*

Styrene:
Neurological injury associated with chronic styrene exposure include distal hypesthesia, decreased nerve conduction velocity, and altered psychomotor performance. These effects did not occur with exposures to airborne concentrations that were less than 100 ppm. Increased deaths from degenerative neurological disorders were found in a comprehensive epidemiological study of Danish reinforced plastics workers. These workers were reported to have a 2.5-fold increased risk for myeloid leukemia with clonal chromosome aberrations. Also, there are several studies that suggest potential reproductive effects in humans and experimental animals from overexposure to styrene. Styrene was not mutagenic in the standard (liquid phase) Ames Salmonella/microsome assay, but was weakly positive when tested in the vapor phase. IARC has listed styrene as possibly carcinogenic to humans (Group 2B).

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Unleaded gasoline is potentially toxic to freshwater and saltwater ecosystems. Various grades of gasoline exhibited range of lethal toxicity (LC_{100}) from 40 PPM to 100 PPM in ambient stream water with Rainbow Trout (*Salmo irideus*). A 24-hour TLm (Median Toxic Limit) was calculated to be 90 PPM with juvenile American Shad (*Squalius cephalus*). In Bluegill Sunfish (*Lepomis macrochirus*), Grey Mullet (*Chelon labrosus*) and Gulf Menhaden (*Brevoortia patronus*), gasoline exhibited a 96-hour LC_{50} of 8 PPM, 2 PPM, and 2 PPM, respectively.

The aquatic toxicity of Methyl tertiary-Butyl Ether (MTBE) is considered to be relatively low. In the crustacean Harpacticoid Copepods (*Nitrocra spinipes*), MTBE exhibited an LC_{50} (96-hour) of 1,000 PPM to 10,000 PPM depending upon various water temperatures. In Bleak Fish (*Alburnus alburnus*), MTBE exhibited an LC_{50} (24-hour) of 1,700 PPM and an LC_{50} (96-hour) of 1,000 PPM at 10° C. In Golden Orfe Fish (*Leuciscus idus melanotus*), MTBE exhibited an LC_{50} (48-hour) of 1,000 PPM and an LC_{100} of 2,000 PPM.

Environmental Fate

Continued on Next Page

Avoid spilling gasoline. Spilled gasoline can result in environmental damage. Spilled gasoline can penetrate soil and contaminate ground water. Although gasoline is biodegradable, it may persist for prolonged time periods, particularly where oxygen levels are reduced. The hydrocarbon components of gasoline are slightly soluble in water. Gasoline hydrocarbon components do not readily dissolve in water but can be adsorbed to soils.

Gasoline contains components that are potentially toxic to freshwater and saltwater ecosystems. It will normally float on water. The components of gasoline will evaporate rapidly. Evaporated hydrocarbon components may contribute to atmospheric smog.

MTBE and other oxygenates are more soluble than other gasoline components. In addition, oxygenates such as MTBE do not adsorb to soils, sediments or suspended particulate matter as readily as other gasoline components. MTBE does not degrade as readily as other gasoline components once in ground water or subsoil. MTBE is not expected to bioconcentrate in the aquatic environment.

SECTION 13. DISPOSAL CONSIDERATIONS

Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.

Maximize material recovery for reuse or recycling. Recovered non-usable material may be regulated by US EPA as a hazardous waste due to its ignitibility (D001) and/or its toxic (D018) characteristics. Conditions of use may cause this material to become a "hazardous waste", as defined by federal or state regulations. It is the responsibility of the user to determine if the material is a RCRA "hazardous waste" at the time of disposal. Transportation, treatment, storage and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR 260 through 40 CFR 271). State and/or local regulations may be more restrictive. Contact your regional US EPA office for guidance concerning case specfic disposal issues.

SECTION 14. TRANSPORT INFORMATION

The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.

US DOT Status	A U.S. Department of Transportation regulated material.
Proper Shipping Name	Gasoline, 3, UN 1203, PG II Gasohol, 3, NA 1203, PGII (Use only for gasoline blended with less than 20% ethanol)
Hazard Class	3 DOT Class: Flammable liquid.
Packing Group(s)	II
UN/NA Number	UN1203 or NA1203
Reportable Quantity	A Reportable Quantity (RQ) has not been established for this material.

Placard(s)

Emergency Response Guide No.	128
MARPOL III Status	Not a DOT "Marine Pollutant" per 49 CFR 171.8.

SECTION 15. REGULATORY INFORMATION

TSCA Inventory

This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory.

SARA 302/304 Emergency Planning and Notification

The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified.

SARA 311/312 Hazard Identification

The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories:

fire, Acute (Immediate) Health Hazard, Chronic (Delayed) Health Hazard

SARA 313 Toxic Chemical Notification and Release Reporting

This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA:
Toluene [CAS No.: 108-88-3] Concentration: <20%
Xylene, all isomers [CAS No.: 1330-20-7] Concentration: <18%
Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] Concentration: <15%
n-Hexane [CAS No.: 110-54-3] Concentration: <8%
Cumene [CAS No.: 98-82-8] Concentration: <4%
Benzene [CAS No.: 71-43-2] Concentration: <5%
Ethylbenzene [CAS No.: 100-41-4] Concentration: <4%
1, 2, 4 Trimethylbenzene [CAS No.: 95-63-6] Concentration: <4%
Cyclohexane [CAS No.: 110-82-7] Concentration: <3%
Naphthalene [CAS No.: 91-20-3] Concentration: <2%
Styrene [CAS No.: 100-42-5] Concentration: <1%

CERCLA

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are:
Toluene [CAS No.: 108-88-3] RQ = 1000 lbs. (453.6 kg) Concentration: <20%
Xylene, all isomers [CAS No.: 1330-20-7] RQ = 100 lbs. (45.36 kg) Concentration: <18%
Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] RQ = 1000 lbs. (453.6 kg) Concentration: <15%
n-Hexane [CAS No.: 110-54-3] RQ = 5000 lbs. (2268 kg) Concentration: <8%
2,2,4-Trimethylpentane [CAS No.: 540-84-1] RQ = 1000 lbs. (453.6 kg) Concentration: <5%
Benzene [CAS No.: 71-43-2] RQ = 10 lbs. (4.536 kg) Concentration: <5%
Cumene [CAS No.: 98-82-8] RQ = 5000 lbs. (2268 kg) Concentration: <4%
Ethylbenzene [CAS No.: 100-41-4] RQ = 1000 lbs. (453.6 kg) Concentration: <4%
Cyclohexane [CAS No.: 110-82-7] RQ = 1000 lbs. (453.6 kg) Concentration: <3%
Naphthalene [CAS No.: 91-20-3] RQ = 100 lbs. (45.36 kg) Concentration: <2%
Styrene [CAS No.: 100-42-5] RQ = 1000 lbs. (453.6 kg) Concentration: <1%

Clean Water Act (CWA)

This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.

California Proposition 65

	This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): Gasoline (Wholly Vaporized and Engine Exhaust), Benzene [CAS No. 71-43-3], Toluene [CAS No. 108-88-3], Ethylbenzene [CAS No.100-41-4] and Naphthalene [CAS No.91-20-3]
New Jersey Right-to-Know Label	Gasoline [NJDEP CAS No. 8006-61-9]
Additional Regulatory Remarks	As minimum requirements, CITGO recommends that the following advisory information be displayed on equipment used to dispense gasoline in motor vehicles. Additional warnings specified by various regulatory authorities may be required: "DANGER: Extremely Flammable. Use as a Motor Fuel Only. No Smoking. Stop Engine. Turn Off All Electronic Equipment including Cellular Telephones. Do Not Overfill Tank. Keep Away from Heat and Flames. Do Not leave nozzle unattended during refueling. **Static Sparks Can Cause a Fire, especially when filling portable containers.** Containers must be metal or other material approved for storing gasoline. PLACE CONTAINER ON GROUND. DO NOT FILL ANY PORTABLE CONTAINER IN OR ON A VEHICLE. Keep nozzle spout in contact with the container during the entire filling operation. **Harmful or Fatal if Swallowed. Long-Exposure Has Caused Cancer in Laboratory Animals.** Avoid prolonged breathing of vapors. Keep face away from nozzle and gas tank. Never siphon by mouth." WHMIS Class B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). WHMIS Class D-2B: Material causing other toxic effects (TOXIC).

SECTION 16. OTHER INFORMATION

Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.

REVISION INFORMATION

Version Number	7.0
Revision Date	05/23/2005
Print Date	Printed on 05/23/2005.

ABBREVIATIONS

AP: Approximately EQ: Equal >: Greater Than <: Less Than NA: Not Applicable ND: No Data NE: Not Established

ACGIH: American Conference of Governmental Industrial Hygienists	AIHA: American Industrial Hygiene Association
IARC: International Agency for Research on Cancer	NTP: National Toxicology Program
NIOSH: National Institute of Occupational Safety and Health	OSHA: Occupational Safety and Health Administration
NPCA: National Paint and Coating Manufacturers Association	HMIS: Hazardous Materials Information System
NFPA: National Fire Protection Association	EPA: US Environmental Protection Agency

DISCLAIMER OF LIABILITY

THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED REGARDING ITS CORRECTNESS. SOME INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE SUBSTANCE ITSELF. THIS MSDS WAS PREPARED AND IS TO BE USED ONLY FOR THIS PRODUCT. IF THE PRODUCT IS USED AS A COMPONENT IN ANOTHER PRODUCT, THIS MSDS INFORMATION MAY NOT BE APPLICABLE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION OR PRODUCTS FOR THEIR PARTICULAR PURPOSE.

THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.

* * * * *   END OF MSDS   * * * * *

Material Safety Data Sheet

Hydrochloric Acid 0.01 to 2.5N

ACC# 40067

Section 1 - Chemical Product and Company Identification

MSDS Name: Hydrochloric Acid 0.01 to 2.5N
Catalog Numbers: S70041-2, S71944, S74855, S74856, S748561, S74856MF, S80036, S80039, S93259, A48520, A4854, EMHX0607-1, FLSA4820LC, GILHYDCHLOR, LC153305, NC9193346, NC9668809, NC9691487, NC9751601, S70041-3, SA50-1, SA50-20, SA50-4, SA52-20, SA52-500, SA54-1, SA54-10, SA54-20, SA54-4, SA55, SA60-1, SA62-1, SA81410, SA81420, SA8144, XX41704L, XX4200LI, XXAVENHCLNF1LI, XXHCL0.5N200LI, XXSA50200LI, XXSLN4426200, XXSLNALL0200
Synonyms: Chlorohydric acid; Hydrogen chloride; Muriatic acid; Spirits of salt; Hydrochloride.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7732-18-5	Water	>89.1	231-791-2
7647-01-0	Hydrochloric acid	.04-9.12	231-595-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless to slight yellow clear liquid.
Warning! May cause eye, skin, and respiratory tract irritation. Corrosive to metal.
Target Organs: No data found.

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation.
Ingestion: May cause irritation of the digestive tract. May cause circulatory system failure.
Inhalation: May cause respiratory tract irritation. Exposure to the mist and vapor may erode exposed teeth.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Repeated exposure may cause erosion of teeth. May cause fetal effects. Laboratory experiments have resulted in mutagenic effects. Prolonged exposure may cause conjunctivitis, photosensitization, and possible blindness.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Do NOT use sodium bicarbonate in an attempt to neutralize the acid. Treat symptomatically and supportively.
Antidote: Do NOT use oils or ointments in eye.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Not flammable, but reacts with most metals to form flammable hydrogen gas. Use water spray to keep fire-exposed containers cool. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Reaction with water may generate much heat which will increase the concentration of fumes in the air. Containers may explode when heated. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products.
Extinguishing Media: For large fires, use water spray, fog, or alcohol-resistant foam. Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Do NOT use straight streams of water. Most foams will react with the material and release corrosive/toxic gases. Cool containers with flooding quantities of water until well after fire is out. For small fires, use carbon dioxide (except for cyanides), dry chemical, dry sand, and alcohol-resistant foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 0; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Large spills may be neutralized with dilute alkaline solutions of soda ash (sodium carbonate, Na_2CO_3), or lime (calcium oxide, CaO). Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation. Do not get water inside containers. A vapor suppressing foam may be used to reduce vapors. Cover with dry earth, dry sand, or other non-combustible material followed with plastic sheet to minimize spreading and contact with water.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Use with adequate ventilation. Contents may develop pressure upon prolonged storage. Avoid contact with eyes, skin, and clothing. Do not breathe dust, vapor, mist, or gas. Keep container tightly closed. Avoid ingestion and inhalation. Discard contaminated shoes. Use caution when opening. Keep from contact with moist air and steam.
Storage: Do not store in direct sunlight. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area. Do not store in metal containers. Do not store near flammable or oxidizing substances (especially nitric acid or chlorates). Store away from alkalies.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Water	none listed	none listed	none listed
Hydrochloric acid	2 ppm Ceiling	50 ppm IDLH	5 ppm Ceiling; 7 mg/m3 Ceiling

OSHA Vacated PELs: Water: No OSHA Vacated PELs are listed for this chemical. Hydrochloric acid: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear neoprene or polyvinyl chloride gloves to prevent exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: colorless to slight yellow
Odor: strong, pungent
pH: 0.10 (1.0N soln)
Vapor Pressure: 160 mm Hg @ 20 deg C
Vapor Density: 1.26 (air=1)
Evaporation Rate:>1(N-butyl acetate = 1)
Viscosity: Not available.
Boiling Point: 81.5-110 deg C @ 760 mmHg
Freezing/Melting Point:-17 deg C
Decomposition Temperature: Not available.
Solubility: Soluble.
Specific Gravity/Density:1.16 (water=1)
Molecular Formula:HCl
Molecular Weight:36.46

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents, bases, acetic anhydride, alkali metals, aluminum, amines, copper, copper alloys, fluorine, iron, sodium hydroxide, steel, sulfuric acid, vinyl acetate, zinc, potassium permanganate, cesium acetylene carbide, rubidium acetylene carbide, rubidium carbide, sodium, chlorosulfonic acid, oleum, carbonates, perchloric acid, calcium phosphide, metal oxides, acetates, cesium carbide, beta-propiolactone, ethyleneimine, propylene oxide, lithium silicides, alcohols + hydrogen cyanide, 2-aminoethanol, ammonium hydroxide, calcium carbide, 1,1-difluoroethylene, ethylene diamine, magnesium boride, mercuric sulfate, uranium phosphide.
Hazardous Decomposition Products: Hydrogen chloride.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7732-18-5: ZC0110000
CAS# 7647-01-0: MW4025000; MW4031000
LD50/LC50:
CAS# 7732-18-5:
    Oral, rat: LD50 = >90 mL/kg;
.

CAS# 7647-01-0:
    Inhalation, mouse: LC50 = 1108 ppm/1H;
    Inhalation, mouse: LC50 = 20487 mg/m3/5M;
    Inhalation, mouse: LC50 = 3940 mg/m3/30M;
    Inhalation, mouse: LC50 = 8300 mg/m3/30M;
    Inhalation, rat: LC50 = 3124 ppm/1H;
    Inhalation, rat: LC50 = 60938 mg/m3/5M;
    Inhalation, rat: LC50 = 7004 mg/m3/30M;
    Inhalation, rat: LC50 = 45000 mg/m3/5M;
    Inhalation, rat: LC50 = 8300 mg/m3/30M;
    Oral, rabbit: LD50 = 900 mg/kg;
.

Carcinogenicity:
CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7647-01-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 3.6 mg/L; 48 Hr; Lethal (unspecified)
Fish: Bluegill/Sunfish: LD50; 96 Hr; pH 3.0-3.5

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	**Canada TDG**
Shipping Name:	HYDROCHLORIC ACID	HYDROCHLORIC ACID SOLUTION
Hazard Class:	8	8
UN Number:	UN1789	UN1789
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7732-18-5 is listed on the TSCA inventory.
CAS# 7647-01-0 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 7647-01-0: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
CAS# 7647-01-0: 500 lb TPQ
SARA Codes
CAS # 7647-01-0: immediate.
Section 313
This material contains Hydrochloric acid (CAS# 7647-01-0, .04-9.12%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:

CAS# 7647-01-0 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 7647-01-0 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

CAS# 7647-01-0 is considered highly hazardous by OSHA.

STATE

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
CAS# 7647-01-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

Safety Phrases:

S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 7732-18-5: No information available.
CAS# 7647-01-0: 1

Canada - DSL/NDSL

CAS# 7732-18-5 is listed on Canada's DSL List.
CAS# 7647-01-0 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7647-01-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 4/14/1999
Revision #6 Date: 4/25/2005

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
959 ROUTE 46 EAST
PARSIPPANY, NEW JERSEY USA 07054-0624 OR
530 WATSON STREET
WHITBY, ONTARIO, CANADA L1N 5R9

EMERGENCY CONTACT:
CHEMTREC 1-800-424-9300

INFORMATION CONTACT:
(USA) 973-257-1100
(WHITBY) 905-668-3570
(EDMONTON) 780-471-4036

SUBSTANCE: HYDROGEN CYANIDE, ANHYDROUS, STABILIZED

TRADE NAMES/SYNONYMS:
MTG MSDS 119; HYDROCYANIC ACID; PRUSSIC ACID; FORMONITRILE; CARBON HYDRIDE NITRIDE; HYDROCYANIC ACID, LIQUEFIED; HYDROGEN CYANIDE; RCRA P063; STCC 4920125; NA 1051; CHN; MAT11160; RTECS MW6825000

CHEMICAL FAMILY: inorganic, gas

CREATION DATE: Jan 24 1989
REVISION DATE: Mar 22 2001

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: HYDROGEN CYANIDE, ANHYDROUS, STABILIZED
CAS NUMBER: 74-90-8
EC NUMBER (EINECS): 200-821-6
EC INDEX NUMBER: 006-006-01-7
PERCENTAGE: 100.0

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=4 FIRE=4 REACTIVITY=2

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: almond odor
MAJOR HEALTH HAZARDS: potentially fatal if inhaled or swallowed, respiratory tract irritation, eye irritation
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. May polymerize. Containers may rupture or explode. May react on contact with air, heat, light or water.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, rash, nausea, chest pain, irregular heartbeat, headache, blindness, bluish skin color, suffocation, lung congestion, paralysis, convulsions, coma, death
LONG TERM EXPOSURE: vomiting, digestive disorders, dizziness
SKIN CONTACT:
SHORT TERM EXPOSURE: suffocation

LONG TERM EXPOSURE: same as effects reported in long term inhalation, rash, itching
EYE CONTACT:
SHORT TERM EXPOSURE: irritation, suffocation, death
LONG TERM EXPOSURE: same as effects reported in short term exposure
INGESTION:
SHORT TERM EXPOSURE: suffocation, death
LONG TERM EXPOSURE: no information is available

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

SECTION 4 FIRST AID MEASURES

INHALATION: When safe to enter area, remove from exposure. Use a bag valve mask or similar device to perform artificial respiration (rescue breathing) if needed. Get medical attention immediately.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

ANTIDOTE: amyl nitrite, inhalation; sodium nitrite, intravenous; sodium thiosulfate, infusion; oxygen.

NOTE TO PHYSICIAN: Consider amyl nitrite inhalation, 1 ampoule (0.2 mL) every 5 minutes, and oxygen. For ingestion, consider gastric lavage. Consider oxygen.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Containers may rupture or explode if exposed to heat. Vapor/air mixtures are explosive. Gas or vapor is lighter than air. Vapors or gases may ignite at distant ignition sources and flash back.

EXTINGUISHING MEDIA: Let burn unless leak can be stopped immediately. Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. Cool containers with water spray until well after the fire is out. Keep unnecessary people away, isolate hazard area and deny entry. For tank, rail car or tank truck, evacuation radius: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

FLASH POINT: 0 F (-18 C) (CC)
LOWER FLAMMABLE LIMIT: 5.6%
UPPER FLAMMABLE LIMIT: 40%
AUTOIGNITION: 1000 F (538 C)

SECTION 6 ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:
Do not touch spilled material. Stop leak if possible without personal risk. Avoid heat, flames, sparks and other sources of ignition. Remove sources of ignition. Reduce vapors with water spray. Do not get water directly on material. Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas. Ventilate closed spaces before entering. Evacuation radius: 150 feet. For tank, rail car or tank truck: 800 meters (1/2 mile). Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. Protect from physical damage. Store outside or in a detached building. Store with flammable liquids. Avoid heat, flames, sparks and other sources of ignition. Shelf life is 90 days. Keep separated from incompatible substances. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30).

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
HYDROGEN CYANIDE, ANHYDROUS, STABILIZED:
HYDROGEN CYANIDE:
10 ppm (11 mg/m3) OSHA TWA (skin)
4.7 ppm (5 mg/m3) OSHA STEL (skin) (vacated by 58 FR 35338, June 30, 1993)
4.7 ppm(CN) ACGIH ceiling (skin)
4.7 ppm (5 mg/m3) NIOSH recommended STEL (skin)

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
47 ppm
Any supplied-air respirator.
Any self-contained breathing apparatus.
50 ppm
Any supplied-air respirator.
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.
Escape -
Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless
ODOR: almond odor
MOLECULAR WEIGHT: 27.03
MOLECULAR FORMULA: H-C-N
BOILING POINT: 79 F (26 C)
FREEZING POINT: 7 F (-14 C)
VAPOR PRESSURE: 620 mmHg @ 20 C
VAPOR DENSITY (air=1): 0.941
SPECIFIC GRAVITY (water=1): 0.699 @ 22 C
WATER SOLUBILITY: soluble
PH: weakly acidic
VOLATILITY: Not available
ODOR THRESHOLD: 2-5 ppm
EVAPORATION RATE: Not available
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: alcohol
Slightly Soluble: ether

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: May react with evolution of heat on contact with water.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Minimize contact with material. Avoid inhalation of material or combustion by-products. Keep out of water supplies and sewers.

INCOMPATIBILITIES: combustible materials, bases, amines, oxidizing materials, acids

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: cyanides

POLYMERIZATION: Polymerizes with evolution of heat. Avoid contact with air, light, water, incompatible material or storage and use above room temperature.

SECTION 11 TOXICOLOGICAL INFORMATION

HYDROGEN CYANIDE, ANHYDROUS, STABILIZED:
TOXICITY DATA:
160 ppm/30 minute(s) inhalation-rat LC50; 3700 ug/kg oral-mouse LD50
LOCAL EFFECTS:
Irritant: inhalation, eye
ACUTE TOXICITY LEVEL:
Highly Toxic: inhalation, ingestion
TARGET ORGANS: blood
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: blood system disorders, heart or cardiovascular disorders, nervous system disorders

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 5 ug/L 12 week(s) (Physiological) Atlantic salmon (Salmo salar)
INVERTEBRATE TOXICITY: 21 ug/L 83 hour(s) NOEC (Reproduction) Scud (Gammarus pseudolimnaeus)

SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): P063.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Hydrogen cyanide, stabilized with less than 3 percent water
ID NUMBER: UN1051
HAZARD CLASS OR DIVISION: 6.1
PACKING GROUP: I
LABELING REQUIREMENTS: Poison; Flammable liquid
QUANTITY LIMITATIONS:
PASSENGER AIRCRAFT OR RAILCAR: Forbidden
CARGO AIRCRAFT ONLY: Forbidden

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
HYDROGEN CYANIDE: 10 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
HYDROGEN CYANIDE: 100 LBS TPQ

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
HYDROGEN CYANIDE: 10 LBS RQ

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: No
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: Yes

SARA TITLE III SECTION 313 (40 CFR 372.65):
HYDROGEN CYANIDE

OSHA PROCESS SAFETY (29CFR1910.119):
HYDROGEN CYANIDE: 1000 LBS TQ

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: ABD1F

EUROPEAN REGULATIONS:
EC CLASSIFICATION (ASSIGNED):
T+ Very Toxic

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:
[Image]

EC RISK AND SAFETY PHRASES:

R 26/27/28	Very toxic by inhalation, in contact with skin and if swallowed.
S 1/2	Keep locked-up and out of reach of children.
S 7/9	Keep container tightly closed and in a well-ventilated place.
S 16	Keep away from sources of ignition - No smoking.
S 36/37	Wear suitable protective clothing and gloves.
S 38	In case of insufficient ventilation, wear suitable respiratory equipment.
S 45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

CONCENTRATION LIMITS:
C>=7% T+ R 26/27/28
1%<=C<7% T R 23/24/25
0.1%<=C<1% Xn R 20/21/22

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL): Not determined.

CANADA INVENTORY (NDSL): Not determined.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES
SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION
SECTION 3 HAZARDS IDENTIFICATION
SECTION 7 HANDLING AND STORAGE
SECTION 14 TRANSPORT INFORMATION
SECTION 15 REGULATORY INFORMATION

MATHESON TRI-GAS, INC. MAKES NO EXPRESS OR IMPLIED WARRANTIES, GUARANTEES OR REPRESENTATIONS REGARDING THE PRODUCT OR THE INFORMATION HEREIN, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR USE. MATHESON TRI-GAS, INC. SHALL NOT BE LIABLE FOR ANY PERSONAL INJURY, PROPERTY OR OTHER DAMAGES OF ANY NATURE, WHETHER COMPENSATORY, CONSEQUENTIAL, EXEMPLARY, OR OTHERWISE, RESULTING FROM ANY PUBLICATION, USE OR RELIANCE UPON THE INFORMATION HEREIN.

PORTAGAS Inc.
P.O. BOX 230039 HOUSTON, TX 77223 (800) 648-2268

Material Safety Data Sheet

PRODUCT NAME
(Description)

MSDS # 1037X/10386XXX
REVISION 2 - APR/1997

25 - 2000ppm vol. Isobutylene
Balance Air

TRADE NAME & SYNONYMS

Calibration Gas -

25 - 2000ppm molar Isobutylene
Balance Air

CHEMICAL NAME & SYNONYMS

25 - 2000ppm vol. Isobutene, or

25 - 2000ppm vol. 2-Methylpropene
Balance Air

FORMULA (minor component)

(iso) C_4H_8, or Iso-C_4=

CAS NUMBERS

Isobutylene 115-11-7
Air N/A

CHEMICAL FAMILY
Compressed Gas (Monolefin Mixture)

Material Safety Data Sheet

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE (TWA) EXPOSURE LIMITS (ACGIH 1984-85 and later)

Isobutylene is defined as a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent, but less than 23 molar percent at normal atmospheric pressures; however there is an inadequate amount of Isobutylene in this mixture to cause the air to be unfit for human respiration.

SYMPTOMS OF EXPOSURE

Very slight anesthetic effects may cause under prolonged exposure drowsiness, headaches, dizziness loss of coordination, or nausea, plus a slight irritation to the mucous membranes; however there is an insufficient amount of isobutylene in this mixture to manifest most of these symptoms.

TOXICOLOGICAL PROPERTIES

The concentration of Isobutylene and the balance gas of Air present in this mixture are both nontoxic.

RECOMMENDED FIRST AID TREATMENT

Relocate personnel affected to uncontaminated area and inhale fresh air.

POTENTIALLY HAZARDOUS MIXTURES WITH OTHER CHEMICALS

None

Material Safety Data Sheet

PHYSICAL DATA

MOLECULAR WEIGHT
28.97 - 29.02

SPECIFIC GRAVITY
1 (Air = 1)

VAPOR PRESSURE
@70F, above Critical Temperatures

LIQUID DENSITY AT BOILING POINT
54.7 lb/ft^3 average

GAS DENSITY AT STP
0.075 lb/ft^3 average

FREEZING TEMPERATURE
-318F

SOLUBILITY IN WATER
Slight

APPEARANCE AND ODOR
Shipped in compressed gas cylinders under pressure (typically 240 - 1000 psig). Vapor is colorless and odorless.

FIRE & EXPLOSION HAZARD DATA

FLAMMABLE LIMITS % BY VOLUME
N/A

EXTINGUISHING MEDIA
N/A (Nonflammable gas), use water if involved in a fire.

NFPA 704 NUMBER (HFR)
0 0 0

ELECTRICAL CLASSIFICATION
Nonhazardous

FLASH POINT
N/A

AUTO IGNITION TEMPERATURE
N/A

SPECIAL FIRE FIGHTING PROCEDURES
When the mixture is involved in a fire, the compressed air balance gas at high pressures will accelerate the burning of materials at a greater rate.

UNUSUAL HAZARDS
None

Material Safety Data Sheet

REACTIVITY DATA

STABILITY
Stable

INCOMPATIBILITY
None

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION PRODUCTS
None

CONDITIONS TO AVOID
Cylinder temperatures should not exceed 130F (54C).

ACTIONS TO BE TAKEN IN THE EVENT OF AN UNINTENDED RELEASE (LEAK)

FOR EMERGENCIES INVOLVING THIS PRODUCT CALL INFOTRAC (800)535-5053

Evacuate all personnel from the affected area. Use appropriate protective equipment. Shut off flow of gas, and purge lines with an inert gas.

WASTE DISPOSAL METHODS
Do not attempt to dispose of any unused quantites of product or their containers without contacting Portagas for instructions.

PERSONAL PROTECTION INFORMATION

RESPIRATORY/VENTILATION
Hood with forced ventilation.

GLOVES
Plastic or Rubber (neoprene, butyl, poly)

EYES AND OTHER
Safety goggles or glasses only, contact lenses are not recommended.

15 minute shower/eyewash, steel toed/metatarsal protection shoes.

Material Safety Data Sheet

SPECIAL SAFETY AND REGULATORY CONSIDERATIONS

LABELING	DOT Shipping name:	Compressed gases, n.o.s.
	Tech. Description:	(Isobutylene, Air)
	Identification No.:	UN 1956
	Hazard Class, Div.:	Nonflammable Gas, 2.2
	IATA Packing Inst.:	200

HANDLING

Use only in well ventilated areas. The cylinder should be secured with a chain, strap on its side or by use of a stand when connected to a regulator. Do not drag, drop or roll the cylinder. Use both hands when carrying the cylinder. Do not heat the cylinder. One-way check valves in the use line are recommended to prevent backflow. Systems should be cleaned "for Oxygen service" before first use.

STORAGE

Protect the cylinders from physical damage. Store the cylinders in a cool (<130F), dry, ventilated, posted "no smoking or open flames" area constructed of non-combustible materials, and away from ailes and other traffic areas. Keep full cylinders separated from empties. Rotate stock first-in, first-out (FIFO).

PACKAGING

Use the cylinders as provided, with the recommended regulator. Do not attempt to refill the cylinder or transfill the product from one container to another.

OTHER PRECAUTIONS

Conduct monitoring of gas exposure to personnel, do not rely on odor as a way to detect the presence of gas.

MSDS List Previous MSDS Next MSDS

MSDS

MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION
70% Isopropyl Alcohol

PRODUCT CODE: HH-70% ISO ALCO, REFERENCE #: 77305
PRODUCT NAME: 70% Isopropyl Alcohol CHEMICAL FAMILY: Alcohol Mixture

MANUFACTURER NAME AND ADDRESS:		TELEPHONE NUMBERS:	DATES:
Farnam Companies, Inc.	24 hour emergency number	(602)285-1660	Date Created: 09/08/1994
301 West Osborn Road	Business hours	(602)285-1660	Revision: 04/23/2001
Phoenix, AZ. 85013	Marketing	(602)285-1660	Printed: 01/12/2005

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS
70% Isopropyl Alcohol

	HAZARDOUS COMPONENTS (CHEMICAL NAME)	CAS #	OSHA PEL	ACGIH TLV	OTHER LIMITS	PERCENTAGE	RTECS #
1.	Isopropyl alcohol {sec-Propyl alcohol; IPA; 2-Propanol}	67-63-0	400 ppm	400 ppm		70.0 %	NT8050000

SECTION 3. HAZARDS IDENTIFICATION
70% Isopropyl Alcohol

EMERGENCY OVERVIEW

ROUTE(S) OF ENTRY: Inhalation? Yes , Skin? Yes , Eyes? Yes , Ingestion? Yes
POTENTIAL HEALTH EFFECTS (ACUTE AND CHRONIC)

CARCINOGENITICY: NTP? , IARC Monographs? , OSHA Regulated?
CARCINOGENICITY/OTHER INFORMATION

SIGNS AND SYMPTOMS OF EXPOSURE
Early to moderate CNS depression may be evidenced by giddiness, headache, dizziness and nausea; in extreme cases, unconsciousness, respiratory depression and death may occur.
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
Pre-existing eye and/or skin irritation, respiratory, and/or digestive disorders.

SECTION 4. FIRST AID MEASURES
70% Isopropyl Alcohol

EMERGENCY AND FIRST AID PROCEDURES
INHALATION = Remove victim to fresh air and provide oxygen if breathing is difficult. Obtain medical attention.
SKIN CONTACT = Flush skin with plenty of water. If irritation occurs, seek medical attention.
INGESTION = Do not give liquids if victim is unconscious or drowsy. Otherwise give no more than 2 glasses of water and induce vomiting. Obtain medical attention.
EYE CONTACT = Immediately flush eyes with plenty of water for at least 15 minutes. Obtain medical attention.
NOTE TO PHYSICIAN

SECTION 5. FIRE FIGHTING MEASURES
70% Isopropyl Alcohol

FLASH PT: 70.00 F METHOD USED: open cup
EXPLOSIVE LIMITS: LEL: 2% UEL: 12%
AUTOIGNITION PT: N.A. EXTINGUISHING MEDIA
Use water spray, water fog, "alcohol" foam, dry chemical or CO2
FIRE FIGHTING INSTRUCTIONS
Warning. Flammable. Clear fire area of unprotected personnel. Do not enter confined fire space without full bunker gear (helmet with face shield, bunker coats, gloves and rubber boots), including a positive pressure NIOSH approved self-contained breathing apparatus. Cool fire exposed containers with water.
FLAMMABLE PROPERTIES AND HAZARDS
Containers exposed to intense heat from fires should be cooled with water to prevent vapor pressure buildup which could result in container rupture. Container areas exposed to direct flame contact should be cooled with large quantities of water as needed to prevent weakening of container structure.
HAZARDOUS COMBUSTION PRODUCTS

SECTION 6. ACCIDENTAL RELEASE MEASURES
70% Isopropyl Alcohol

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Keep out of surface waters, sewers, and waterways entering or leading to surface waters. Notify authorities if any exposure to the general public or environment occurs or is likely to occur.

SECTION 7. HANDLING AND STORAGE
70% Isopropyl Alcohol

PRECAUTIONS TO BE TAKEN IN HANDLING
Avoid heat or sparks.
PRECAUTIONS TO BE TAKEN IN STORING

OTHER PRECAUTIONS
None known.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION
70% Isopropyl Alcohol

RESPIRATORY EQUIPMENT (SPECIFY TYPE)
A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed

whenever workplace conditions warrant a respirator's use.
EYE PROTECTION
Wear chemical goggles to protect eyes.
PROTECTIVE GLOVES
Wear chemical resistant gloves.
OTHER PROTECTIVE CLOTHING

ENGINEERING CONTROLS (VENTILATION ETC.)
Provide local exhaust ventilation and supply fresh air to maintain a safe work environment.
WORK/HYGIENIC/MAINTENANCE PRACTICES
Safety showers and eye wash stations should be available.
Odor Threshold; Isopropanol = 43 ppm.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES
70% Isopropyl Alcohol

PHYSICAL STATES:	[ ] Gas , [X] Liquid , [ ] Solid
BOILING POINT:	176.00 F to N.A.
MELTING POINT:	N.A. to N.A.
SPECIFIC GRAVITY (WATER = 1):	0.878N.A.
VAPOR PRESSURE (VS. AIR OR MM HG):	
VAPOR DENSITY (VS. AIR = 1):	1.6N.A.
EVAPORATION RATE (VS BUTYL ACETATE=1):	1.7N.A.
SOLUBILITY IN WATER:	
OTHER SOLUBILITY NOTES:	Complete
PERCENT VOLATILE:	
PH:	

APPEARANCE AND ODOR
Appearance = Clear Colorless Liquid
Odor = Mild alcohol odor

SECTION 10. STABILITY AND REACTIVITY
70% Isopropyl Alcohol

STABILITY: Unstable [ ] Stable [X]
CONDITIONS TO AVOID - INSTABILITY
Avoid heat, sparks, and flame.
INCOMPATIBILITY - MATERIALS TO AVOID
Avoid contact with strong oxidizing agents. Do not store or handle in aluminum equipment at temperatures above 120 F.
HAZARDOUS DECOMPOSITION OR BYPRODUCTS
Carbon monoxide, and unidentifed organic compounds may be formed during combustion.
HAZARDOUS POLYMERIZATION: Will occur [ ] Will not occur [X]
CONDITIONS TO AVOID - HAZARDOUS POLYMERIZATION

SECTION 11. TOXICOLOGICAL INFORMATION
70% Isopropyl Alcohol

SECTION 12. ECOLOGICAL INFORMATION
70% Isopropyl Alcohol

SECTION 13. DISPOSAL CONSIDERATIONS
70% Isopropyl Alcohol

WASTE DISPOSAL METHOD
Under EPA-RCRA (40 CFR 261), If this product becomes a waste material, it is not hazardous waste. Refer to latest EPA or state regulations regarding proper disposal.

SECTION 14. TRANSPORT INFORMATION
70% Isopropyl Alcohol

DOT PROPER SHIPPING NAME

DOT HAZARD LABEL: Consumer Commodity ORM-D
UN/NA NUMBER:
ADDITIONAL TRANSPORT INFORMATION

SECTION 15. REGULATORY INFORMATION
70% Isopropyl Alcohol

SECTION 16. OTHER INFORMATION
70% Isopropyl Alcohol

This product contains the following toxic chemicals currently subject to the reporting requirements of SARA Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372.

CAS Number 67-63-0 Name Isopropanol Weight <70%
The information and data herein are believed to be accurate and have been compiled from sources believed to be reliable. It is offered for your consideration, investigation and verification.

Material Safety Data Sheet

Infosafe No. A000L	Issue Date: July 2000	ISSUED by:
Product Name:	**METHANOL**	Coogee Energy Pty Ltd

This product is a Hazardous Substance as defined in the *List of Designated Hazardous Substances [NOHSC: 10005 (1994)]*

COMPANY DETAILS

Company Name	Coogee Energy Pty Ltd (A.C.N. 092 473 795 A.B.N. 69 092 473 795)
Address	171 Fitzgerald Road, North Laverton, Vic, 3026
Tel/Fax	Ph: 9360 2000 (24 hours), Fax: 9360 2011

IDENTIFICATION

Product Name	METHANOL
Proper Shipping Name	METHANOL (METHYL ALCOHOL)
Other Names	Methyl Alcohol
UN Number	1230
DG Class	3
Sub.Risk	6.1
Packing Group	II
Hazchem Code	2WE
Poisons Schedule	S6
Product Use	Manufacture of formaldehyde, acetic acid and dimethyl terephthalate; chemical synthesis; antifreeze; solvent; denaturant for ethanol; fuel; feedstock for the manufacture of synthetic proteins.

Physical Data

Appearance	Clear, colourless, very mobile liquid with an alcoholic odour
Melting Point	-97.7°C
Boiling Point	64.7°C
Vapour Pressure	127 mm Hg @ 25°C
Specific Gravity	0.79
Flash Point	12°C
Flamm. Limit LEL	6.7%
Flamm. Limit UEL	36.5%
Solubility in Water	Miscible

Other Properties

Volatile Component	100%
Auto ignition temp.	470°C
Vapour Density	1.11
pH Value	Not applicable
Viscosity	0.541 mPa-S @ 25°C
Specific Properties or Risk	Highly flammable; poisonous
Materials to Avoid	Strong oxidizers
Formula	CH40
Molecular Weight	32.05
Other Information	Miscible with water and most organic solvents. Characteristic pungent odour.

Burns with a non-luminous, bluish flame.

Ingredients

Name	CAS	Proportion
Methanol	67-56-1	100%

HEALTH HAZARD INFORMATION

Health Effects

Acute - Swallowed	Toxic if swallowed. Ingestion can result in nausea, vomiting, severe abdominal pain, back pain, central nervous system effects including optic nerve damage (hyperemia, etc), convulsions, blindness, loss of consciousness and ultimately proceed to coma and death. See "chronic" effects.
Acute - Eye	A moderate eye irritant. May cause watering of the eyes, stinging or blurred vision, and sensitivity to light.
Acute - Skin	Contact with skin will result in defatting and moderate irritation. Can be absorbed through the skin in harmful amounts. See "chronic" effects.
Acute - Inhaled	Toxic by inhalation. The vapour is irritating to the mucous membranes and respiratory tract. Inhalation of vapour can cause headache, nausea, central nervous system effects, and visual impairment, possibly blindness. Continued exposure can result in health effects as per ingestion.
Chronic	Prolonged, chronic exposure from skin contact, inhalation or swallowing of methanol can result in dermatitis, systemic effects to the liver, heart and possibly kidneys, permanent blindness and central nervous system effects.

First Aid

Swallowed	If less than 15 minutes from a hospital, give one to two glasses of water to drink and transport patient immediately to hospital/medical centre. Do not induce vomiting. If medical assistance is not immediately available, carefully induce vomiting, protecting against aspiration or material into the lungs, by placing patient head lower than knees. Use fingers, Ipecac Syrup (APF) or similar emetic. Continue to seek medical assistance.
Eye	Gently rinse the eyes with clean, lukewarm water for at least 15 minutes, holding eyelids open. Have victim remove contact lenses. In all cases of eye contamination it is a sensible precaution to seek medical advice.
Skin	Immediately rinse affected area with mild soap and lukewarm water for 20 minutes. Remove contaminated clothing during rinsing. If irritation or other effects persist, seek medical advice. Separately wash contaminated clothing before re-use.
Inhaled	Remove victim from exposure - avoid becoming a casualty. If breathing laboured and patient cyanotic (blue), ensure airways are clear and have qualified person give oxygen through a face mask. If breathing has stopped apply artificial respiration at once. In the event of cardiac arrest, apply external cardiac massage.

	For all but the most minor symptoms arrange for patient to be seen by a doctor as soon as possible - either on site or at the nearest hospital.
First Aid Facilities	Eye wash station, normal washroom and shower facilities must be made available.

Advice to Doctor

Watch for toxic effects which may be delayed, including chemical pneumonitis. Contact Poison Information Centre for antidote treatment with ethyl alcohol. Central nervous system depression, and acidosis from methanol metabolites, including formaldehyde, liver function and optic nerve, and other effects should be treated symptomatically.

OTHER HEALTH HAZARD INFORMATION

Precautions For Use

Exposure Limits	Worksafe Australia has assigned the following exposure standards for methanol: TWA: 200 ppm, 263 mg/m3 STEL: 250 ppm, 328 mg/m3 Notices - Sk TWA is the time weighted average concentration of the work atmosphere over a normal 8-hour work day and a 40-hour work week. Nearly all workers may be repeatedly exposed to this level, day after day, without adverse effect. A “skin” notation indicates that absorption through the skin may be a significant source of exposure. STEL means a 15 minute exposure which should not be exceeded at any time during a working day. STEL exposures should not be repeated more than four times per day.
Eng. Controls	Use sufficient ventilation to maintain air concentration below the exposure standard. Use with local exhaust ventilation or while wearing appropriate respirator. The performance of the ventilation system should be checked regularly.

Personal Protection

Respirator Type (AS 1716)	Where the air concentration approaches the exposure standard the following respiratory protection is recommended: ◊ Short elevated exposure - organic filter respirator. If exposures greater than 10 times the TWA use air line respirators. ◊ Prolonged elevated exposure - air line respirator.
Eye Protection	Safety glasses, goggles or faceshield as appropriate
Glove Type	Neoprene or PVC gloves
Clothing	PVC splash apron
Work/Hygienic Practices	Good work-hygiene practice must be followed when handling this material. That is, always wash hands before eating, drinking, smoking, toilet and work breaks

Flammability

Fire Hazards	Highly flammable Flameproof equipment necessary in area where this chemical is being used.

Nearby equipment must be earthed.
Avoid all ignition sources.
May form explosive mixtures with air.

SAFE HANDLING INFORMATION

Storage and Transport

Storage Precautions Keep out of reach of children. Store in a well ventilated area away from heat and sources of ignition. Store away from incompatible materials such as materials that support combustion (oxidising materials). Store in suitable, labelled containers. Use approved storage cabinets, tanks, rooms and buildings. Inspect periodically for deficiencies such as damage or leaks. Consider leak detection and alarm systems. Have appropriate fire extinguishers available in and near the storage area. Methanol is a Schedule (S6) poison and must be stored, handled and labelled according to appropriate regulations.

Transport Class 3 Flammable liquids shall not be loaded in the same vehicle with:

◊ Class 1 Explosives
◊ Class 2.1 Flammable gases
◊ Class 2.3 Poisonous gases
◊ Class 4.2 Spontaneously combustible substances
◊ Class 5.1 Oxidising agents
◊ Class 5.2 Organic peroxides
◊ Class 7 Radioactive substances

Proper Shipping Name	METHANOL (METHYL ALCOHOL)
EPG Number	3A3
IERG Number	16

Spills and Disposal

Spills

Do not approach without full protective clothing.
Shut off all possible sources of ignition.
Remove any naked lights and strong heat sources.
Evacuate unprotected personnel from danger area. Move them up wind.
Send message to notify emergency services.
For large spills, or tank rupture, consider initial evacuation distance of 200 metres in all directions.
If available use water spray to disperse vapour.
Isolate leaking containers and stop leak if safe to do so.
Small spill: absorb in sand or other non-combustible material. Scoop up and place in labelled drum. Flush area with water.
Large spill: Prevent spilled material from entering drains by banking with sand or earth. Pick up liquid with vacuum truck. Flush area with water.
Contact local waste disposal authority for disposal procedures.

Disposal Prevent material from entering into drains or waterways.

Dispose in accordance with all relevant local, state and federal legislation.

Fire/Explosion Hazard

	Highly flammable liquid. On burning will emit noxious fumes including carbon monoxide and carbon dioxide. Heating can cause expansion or decomposition leading to violent rupture of containers. Keep containers cool with water spray.
Hazardous Decomposition or By-products	Oxides or carbon and other noxious smoke.
Fire Fighting Procedures	Fire fighters to wear self contained breathing apparatus and full protective clothing in a fire situation.
Extinguishing Media	Water fog, foam or dry agent.
Hazardous Reaction	Stable under normal conditions of use. Incompatible with inorganic acids, aldehydes, alkylene oxides, halogens, acid anhydrides, monomers and polymerizable esters.
Hazchem Code	2WE

OTHER INFORMATION

Toxicology	Oral LD50 (rat): 5628 mg/kg Inhalation LC50 (rat): 64000 ppm/4 hr Eye (rabbit): moderate 100 mg/24 hr Skin (rabbit): moderate 20 mg/24 hr Methanol has shown a variety of effects in animal and in-vitro toxicity testing, including fetal toxicity, developmental abnormalities in rats, effects on mouse sperm development and mutagenic effects on human white blood cells and strains of bacteria. An incomplete rat inhalation study has shown no evidence of carcinogenicity.
Environ. Protection	This substance may be hazardous to the environment. Aquatic toxicity: Arthropoda (Daphnia): no effect at 10 g/L, 48 hours Fish (trout): TLm (48 hr) 8000 mg/L Amphibian (frog): LDLo 59 gm/kg Avoid contaminating waterways.
Risk Statement	R11 Highly flammable. R23/25 Toxic by inhalation and if swallowed.
Safety Statement	S2 Keep out of reach of children. S7 Keep container tightly closed. S16 Keep away from sources of ignition - No smoking. S24 Avoid contact with skin
Packaging and Labelling	Correct Shipping Name: METHANOL (METHYL ALCOHOL) UN 1230, Packaging Group II, Class 3, Subsidiary Risk 6.1, according to the Australian Code for the Transport of Dangerous Goods by Road and Rail. Both the ICAO Rules and the IMDG Code require a Subsidiary Risk 6.1 label for this material and a Subsidiary Risk 6.1 label may be used for land transport if the product is intended for transport by sea or air. Packaging - Drums or Jerricans with non-removable head.
Hazard Category	Toxic

CONTACT POINT

Coogee Energy Pty Ltd
171 Fitzgerald Road
Laverton North VIC 3026
Tel: (03) 9360 2000 (24 hours)
Fax: (03) 9360 2011

The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another. It is the buyer's responsibility to ensure that its activities comply with the relevant laws and regulations.

END OF REPORT

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: 2-Methylnaphthalene, 95-97%
Catalog Numbers:
AC127170000, AC127170050, AC127175000
Synonyms:
Company Identification (Europe): Acros Organics BVBA
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
91-57-6	2-Methylnaphthalene	95-97.0	202-078-3

Hazard Symbols: XN
Risk Phrases: 22

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: Not available.
Caution! Causes skin irritation. May cause allergic skin reaction. May be harmful if swallowed. May cause respiratory and digestive tract irritation. Causes eye irritation.
Target Organs: None.

Potential Health Effects
- Eye:
  - Causes eye irritation.
- Skin:
  - Causes skin irritation. May cause photosensitization in certain individuals.
- Ingestion:
  - May be harmful if swallowed.
- Inhalation:
  - Inhalation of dust may cause respiratory tract irritation.
- Chronic:
  - No information found.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes,

occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Dusts at sufficient concentrations can form explosive mixtures with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:

Use water spray, dry chemical, carbon dioxide, or chemical foam.

Autoignition Temperature:529 deg C (984.20 deg F)
Flash Point: 82 deg C (179.60 deg F)
Explosion Limits, lower:Not available.
Explosion Limits, upper:Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 1; Reactivity: 0

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

Storage:

Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
2-Methylnaphthalene	none listed	none listed	none listed

OSHA Vacated PELs:
2-Methylnaphthalene:
No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Solid
Appearance:	Not available.
Odor:	None reported
pH:	Not available.
Vapor Pressure:	< 1 mm Hg @25c
Vapor Density:	Not available.
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	241.1 deg C
Freezing/Melting Point:	37-38c
Decomposition Temperature:	
Solubility in water:	Insoluble.
Specific Gravity/Density:	1.0000g/cm3
Molecular Formula:	C11H10
Molecular Weight:	142.20

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.

Conditions to Avoid:
Incompatible materials, dust generation, strong oxidants.

Incompatibilities with Other Materials:
Strong oxidizing agents.
Hazardous Decomposition Products:
Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 91-57-6: QJ9635000
LD50/LC50:
CAS# 91-57-6: Oral, rat: LD50 = 1630 mg/kg.
Carcinogenicity:
2-Methylnaphthalene -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
No information available
Canadian TDG
Shipping Name: CAESIUM HYDROXIDE SOLUTION
Hazard Class: 8
UN Number: UN2681

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 91-57-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)

None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 91-57-6: acute.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE
2-Methylnaphthalene is not present on state lists from CA, PA, MN, MA, FL, or NJ.
California No Significant Risk Level:
None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XN
Risk Phrases:
R 22 Harmful if swallowed.
Safety Phrases:
WGK (Water Danger/Protection)
CAS# 91-57-6: No information available.
United Kingdom Occupational Exposure Limits

Canada
CAS# 91-57-6 is listed on Canada's DSL List.
This product has a WHMIS classification of D2A.
CAS# 91-57-6 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits
CAS# 91-57-6: OEL-RUSSIA:STEL 20 mg/m3

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 7/15/1998 Revision #1 Date: 8/02/2000

MSDS *Material Safety Data Sheet*

24 Hour Emergency Telephone. 908-859-2151
CHEMTREC: 1-800-424-9300

National Response In Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

1.1 NAPHTHALENE

MSDS Number: N0090 --- *Effective Date: 11/02/01*

1.2 1. Product Identification

Synonyms: Naphthene; mothballs; tar camphor; naphthaliin; white-tar
CAS No.: 91-20-3
Molecular Weight: 128.16
Chemical Formula: C10H8
Product Codes: J.T. Baker: 2718
Mallinckrodt: 6348

1.3 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Naphthalene	91-20-3	90 - 100%	Yes

1.4 3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION. MAY AFFECT LIVER, KIDNEY, BLOOD AND CENTRAL NERVOUS SYSTEM. COMBUSTIBLE.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate

Flammability Rating: 2 - Moderate
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of dust or vapors can cause headache, nausea, vomiting, extensive sweating, and disorientation. The predominant reaction is delayed intravascular hemolysis with symptoms of anemia, fever, jaundice, and kidney or liver damage.

Ingestion:
Toxic. Can cause headache, profuse perspiration, listlessness, dark urine, nausea, vomiting and disorientation. Intravascular hemolysis may also occur with symptoms similar to those noted for inhalation. Severe cases may produce coma with or without convulsions. Death may result from renal failure.

Skin Contact:
Can irritate the skin and, on prolonged contact, may cause rashes and allergy. "Sensitized" individuals may suffer a severe dermatitis.

Eye Contact:
Vapors and solid causes irritation, redness and pain. Very high exposures can damage the nerves of the eye.

Chronic Exposure:
Has led to cataract formation in eyes. May cause skin allergy.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin, blood or vascular disorders or impaired respiratory function may be more susceptible to the effects of the substance. Particularly susceptible individuals are found in the general population, most commonly in dark skinned races.

1.5 4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:
Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

1.6 5. Fire Fighting Measures

Fire:
Flash point: 87C (189F) CC
Autoignition temperature: 526C (979F)
Combustible. May be ignited by heat, sparks or flame. May burn rapidly with flare-burning effect. Fire may produce irritating or poisonous gases.
Explosion:
Explosive limits, volume % in air: lel: 0.9; uel: 5.9. Above flashpoint, vapor-air mixtures are explosive within flammable limits noted above. Closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire or explosion.
Fire Extinguishing Media:
Dry chemical, foam, water or carbon dioxide. Foam or direct water spray on molten naphthalene may cause extensive foaming. Molten napthalene spatters in contact with water; apply water from as far a distance as possible.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

1.7 6. Accidental Release Measures

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

1.8 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Keep away from moisture and oxidizers. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

1.9 8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
10 ppm, 50 mg/m3.

- ACGIH Threshold Limit Value (TLV):
TWA= 10 ppm, 52 mg/m3
STEL= 15 ppm, 79 mg/m3.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face respirator with an organic vapor cartridge and particulate filter (NIOSH type P95 or R95 filter) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with an organic vapor cartridge and particulate filter (NIOSH P100 or R100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. Please note that N series filters are not recommended for this material. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

1.109. Physical and Chemical Properties

Appearance:
White crystals.

Odor:
Strong coal tar odor (moth balls).

Solubility:
Insoluble in water.

Specific Gravity:
1.2

pH:

No information found.
% Volatiles by volume @ 21C (70F):
No information found.
Boiling Point:
218C (424F)
Melting Point:
80C (176F)
Vapor Density (Air=1):
4.4
Vapor Pressure (mm Hg):
1 @ 53C (127F)
Evaporation Rate (BuAc=1):
< 1

1.1110. Stability and Reactivity

Stability:
Stable at room temperature in sealed containers. Sublimes appreciably at temperatures above melting point.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizers, strong alkalis and strong mineral acids, mixtures of aluminum trichloride and benzoyl chloride. Reacts violently with chromic anhydride. Melted naphthalene will attack some forms of plastics, rubber, and coatings.
Conditions to Avoid:
Avoid heat, sparks, flames and other ignition sources and incompatibles.

1.1211. Toxicological Information

Oral rat LD50: 490 mg/kg;
Inhalation rat LC50: 340 mg/m3, 1 hour;
Skin rabbit LD50: > 20 g/kg;
Irritation data: skin (open Draize) rabbit 495 mg, mild; eye (standard Draize) rabbit 100 mg, mild;
Investigated as a tumorigen, mutagen and reproductive effector.

--------\Cancer Lists\---

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Naphthalene (91-20-3)	No	No	None

1.1312. Ecological Information

Environmental Fate:
When released into the soil, this material may biodegrade to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material may bioaccumulate to some extent. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day.
Environmental Toxicity:
No information found.

1.1413. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

1.1514. Transport Information

Domestic (Land, D.O.T.)

\-

Proper Shipping Name: NAPHTHALENE, REFINED
Hazard Class: 4.1
UN/NA: UN1334
Packing Group: III
Information reported for product/size: 1KG

International (Water, I.M.O.)

\-

Proper Shipping Name: NAPHTHALENE, REFINED
Hazard Class: 4.1
UN/NA: UN1334
Packing Group: III
Information reported for product/size: 1KG

International (Air, I.C.A.O.)

\-

Proper Shipping Name: NAPHTHALENE, REFINED

Hazard Class: 4.1
UN/NA: UN1334
Packing Group: III
Information reported for product/size: 1KG

1.1615. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Naphthalene (91-20-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Naphthalene (91-20-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Naphthalene (91-20-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Naphthalene (91-20-3)	100	U165	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: 2Z
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

1.1716. Other Information

NFPA Ratings: Health: 2 Flammability: 2 Reactivity: 0

Label Hazard Warning:

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION. MAY AFFECT LIVER, KIDNEY, BLOOD AND CENTRAL NERVOUS SYSTEM. COMBUSTIBLE.

Label Precautions:

Avoid contact with eyes, skin and clothing.
Avoid prolonged or repeated contact with skin.
Avoid breathing dust.
Avoid breathing vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat, sparks and flame.

Label First Aid:

In all cases call a physician. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 8.

Disclaimer:

****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MATERIAL SAFETY DATA SHEET

SECTION 1 - MATERIAL IDENTIFICATION

PRODUCT NAME	**NITRIC ACID**
PRODUCT CODE	NITRI
MSDS REVISION NUMBER	12
MANUFACTURER	Air Products and Chemicals, Inc. 7201 Hamilton Blvd., Allentown, PA 18195-1501 www.airproducts.com/msds
TELEPHONE NUMBER	800-345-3148
EMERGENCY TELEPHONE NUMBER(S)	800-523-9374 (Continental U.S.) 610-481-7711 (Outside Continental U.S.)
REVISION DATE	JUNE 2002

EMERGENCY OVERVIEW

HMIS HEALTH	3	**FLAMMABILITY**	1	**REACTIVITY**	0

PHYSICAL FORM	Mobile liquid
COLOR	Colorless / Light Brown
ODOR	Pungent
HAZARDS	Corrosive to eyes. Corrosive to respiratory system. Corrosive to skin. Severe eye irritant. Severe respiratory tract irritant. Severe skin irritant.
EXTINGUISHING MEDIA	Ignition will give rise to a Class B fire. In case of large fire use: Water streams, alcohol foam. In case of small fire use: carbon dioxide (CO2), dry chemical, dry sand or limestone.

C.A.S. CHEMICAL NAME	Mixture
SYNONYMS	None
CHEMICAL FAMILY	Inorganic Acids
EMPIRICAL FORMULA	Mixture
INTENDED USE	Solvent
REVISION NOTES	None

SECTION 2 - INGREDIENTS

	%	CAS Number and Chemical Name
1.	56.00	7697-37-2 NITRIC ACID
2.	44.00	7732-18-5 Water

OSHA (ACGIH) EXPOSURE LIMITS

		TWA		STEL		CEILING	
		ppm	mg/m3	ppm	mg/m3	ppm	mg/m3
		--------	--------	--------	--------	--------	--------
1.	OSHA	2.0000	5.0000	4.0000	10.0000	N/E	N/E
	ACGIH	2.0000	5.2000	4.0000	10.0000	N/E	N/E
2.	OSHA	N/E	N/E	N/E	N/E	N/E	N/E
	ACGIH	N/E	N/E	N/E	N/E	N/E	N/E

N/E = Not Established.

SECTION 3 - HEALTH HAZARDS

ROUTES OF EXPOSURE

Eye Contact
Skin Contact
Ingestion
Inhalation

EXPOSURE STANDARDS

See Section 2 for exposure standards on ingredients. Maintain air contaminant concentrations in the workplace at the lowest feasible levels.

HEALTH HAZARDS

Corrosive to eyes.
Corrosive to respiratory system.
Corrosive to skin.
Severe eye irritant.
Severe respiratory tract irritant.
Severe skin irritant.

TARGET ORGANS

Eye
Skin
Respiratory system

SIGNS AND SYMPTOMS OF EXPOSURE (Acute effects)

Burns of the eye may cause blindness. Contact of undiluted product with the eyes or skin quickly causes severe irritation and pain and may cause burns, necrosis and permanent injury. Nitrogen dioxide (NO2) Inhalation of vapors may severely damage contacted tissue and produce scarring. Inhalation of aerosols and mists may severely damage contacted tissue and produce scarring.

SIGNS AND SYMPTOMS OF EXPOSURE (Possible Longer Term Effects)

Repeated and/or prolonged exposures may result in: adverse respiratory effects (such as cough, tightness of chest or shortness of breath), adverse eye effects (such as conjunctivitis or corneal damage), adverse skin effects (such as rash, irritation or corrosion).

Repeated and/or prolonged exposure to low concentrations of vapor may cause: sore throat which are transient.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

Asthma
Chronic respiratory disease (e.g. Bronchitis, Emphysema)
Eye disease
Skin disorders and Allergies

CARCINOGENS UNDER OSHA, ACGIH, NTP, IARC, OTHER

This product contains no carcinogens in concentrations of 0.1 percent or greater.

SECTION 4 - FIRST AID

EYE CONTACT

Hold eyelids apart and immediately flush eyes with plenty of water for at least 15 minutes. Seek medical advice.

SKIN CONTACT

Remove contaminated clothing and shoes. Remove product and immediately flush affected area with water for at least 15 minutes. Cover the affected area with a sterile dressing or clean sheeting and transport for medical care. Do not apply greases or ointments. Control shock, if present.

INHALATION

Move patient to fresh air. If breathing has stopped or is labored give assisted respiration (e.g. mouth-to-mouth). Supplemental oxygen may be indicated. Seek medical advice. Evidence of damage to the lungs following exposure to oxides of nitrogen characteristically appears after a delay of 4-30 hours. Prevent aspiration of vomit. Turn victim's head to the side.

INGESTION

In the event of ingestion, administer 3-4 glasses of milk or water. Do not induce vomiting. Seek medical advice. Note to physicians: This product is highly injurious to all tissues, similar to that of ammonia or ammonia gas. Chemical pneumonitis, pulmonary edema, laryngeal edema and delayed scarring of the airway or other affected tissues may occur following exposure. There is no specific treatment. Clinical management is based on supportive treatment, which is similar to that for thermal burns.

SECTION 5 - FIRE AND EXPLOSION DATA

FLASH POINT (closed cup)	>200.00 C (>392.00 F)
UPPER EXPLOSION LIMIT (UEL)	No Data
LOWER EXPLOSION LIMIT (LEL)	No Data

AUTOIGNITION TEMPERATURE	No Data
FIRE HAZARD CLASSIFICATION (OSHA/NFPA)	Class IIIB

EXTINGUISHING MEDIA

Ignition will give rise to a Class B fire. In case of large fire use: Water streams, alcohol foam. In case of small fire use: carbon dioxide (CO2), dry chemical, dry sand or limestone.

SPECIAL FIRE FIGHTING PROCEDURES

A face shield should be worn. Firefighters should wear butyl rubber boots, gloves, and body suit and a self-contained breathing apparatus.
Retain expended liquids from fire fighting for later disposal.

UNUSUAL FIRE AND EXPLOSION HAZARDS

May generate toxic or irritating combustion products.
Contact of liquid with skin must be prevented.

Sudden reaction and fire may result if product is mixed with an oxidizing agent.
Personnel in vicinity and downwind should be evacuated.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

CONTAINMENT TECHNIQUES (Removal of ignition sources, diking etc)

Stop the leak, if possible. Ventilate the space involved. Shut off or remove all ignition sources. Construct a dike to prevent spreading (includes molten liquids until they freeze).

CLEAN-UP PROCEDURES

If recovery is not feasible, admix with dry soil, sand or non-reactive absorbent and place in an appropriate chemical waste container. Transfer to containers by suction, preparatory for later disposal. Place in metal containers for recovery or disposal. Flush area with water spray. Clean-up personnel must be equipped with self contained breathing apparatus and butyl rubber protective clothing. For large spills, recover spilled material with a vacuum truck. Spilled material and contaminated surfaces should be covered with sodium bicarbonate or a soda ash-slaked lime mixture (50-50). Mix and add water to form a slurry.

OTHER EMERGENCY ADVICE

Open enclosed spaces to outside atmosphere. Wear protective clothing, boots, gloves, and eye protection.

SECTION 7 - HANDLING AND STORAGE

STORAGE

Keep away from: alkalis, oxidizers, metal powders, carbides, hydrogen sulfide, turpentine. Keep in cool, dry, ventilated storage and in closed containers. Store in stainless steel 55 gallon drums. DOT specification 5C. Tank motor vehicles, DOT specification MC-310, MC-311 and MC-312. Tank cars, DOT specifications 103CW, 111A60W7, 103A-AL2 and 111A60ALW2.

HANDLING

Avoid contact with skin or eyes. Avoid breathing of vapors. Handle in well ventilated work space. When handling, do not eat, drink, or smoke. Avoid using in any spray application without strict conformance to all applicable electrical codes and the OSHA limit for maximum allowable airborne concentrations.

OTHER PRECAUTIONS

Emergency showers and eye wash stations should be readily accessible. Adhere to work practice rules established by government regulations (e.g. OSHA).

SECTION 8 - PERSONAL PROTECTION / EXPOSURE CONTROLS

EYE PROTECTION

Full face shield with goggles underneath.

HAND PROTECTION

Neoprene rubber gloves. Impermeable gloves. The breakthrough time of the selected glove(s) must be greater than the intended use period.

RESPIRATORY PROTECTION

Not required under normal conditions in a well-ventilated workplace. Under the following conditions a respirator may be required: when product vapor concentration exceeds the limits listed in section 2, during repair and cleaning of equipment, during transfer or discharge of the product, sampling, spray applications. Types of respirators that may be used include the following: Chemical Cartridge Respirator with face piece to protect against the organic vapor, Supplied air respirator with full face piece (NIOSH Approved), Self-contained breathing apparatus in pressure demand mode. In emergency conditions use a self-contained breathing apparatus in pressure demand mode.

PROTECTIVE CLOTHING

Impervious clothing. Slicker Suit. Rubber boots. Full rubber suit (rain gear). Butyl or latex protective clothing. If bulk quantities of product are handled, the person who is involved in the transfer operation must wear: hard hat.

ENGINEERING CONTROLS

Maintain air concentrations in work spaces in accord with standards outlined in Sections 2 and 3.

WORK AND HYGIENIC PRACTICES

Provide readily accessible eye wash stations and safety showers. Wash at the end of each workshift and before eating, smoking or using the toilet. Promptly remove clothing that becomes contaminated.

SECTION 9 - TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL FORM	Mobile liquid
COLOR	Colorless / Light Brown
ODOR	Pungent
pH	ACIDIC
VAPOR PRESSURE (mm Hg at 21C (70F))	6.00
VAPOR DENSITY (Air = 1)	No Data
BOILING POINT	122.00 C (251.60 F)
MELTING POINT	No Data
SOLUBILITY IN WATER	Completely (100%)
SPECIFIC GRAVITY (Water = 1)	1.32
MOLECULAR WEIGHT	Mixture

SECTION 10 - STABILITY AND REACTIVITY

CHEMICAL STABILITY

Stable

CONDITIONS TO AVOID (if unstable)

Not applicable

INCOMPATIBILITY (Materials to Avoid)

Alkalis (i.e. Sodium or Potassium Hydroxide etc.). Reducing agents (i.e. hydrides, sulfites etc.). Oxidizing Agents (i.e. perchlorates, nitrates etc.). Amines. Nitric acid attacks most metals vigorously with evolution of nitric oxide(s) fumes, hydrogen fumes, and formation of metallic nitrate salts. Strong nitric acid may cause spontaneous ignition when mixed with organic materials such as sawdust, shavings, cellulose (cotton) or burlap. Such materials ignite very readily from spark sources. If fire does start, it will burn vigorously. Corrosion rates will be directly dependent upon acid strength. An explosion may occur when nitric acid is contacted with hydrogen sulfide, carbides, metallic powders and turpentine. Nitration reactions evolve heat and may cause spontaneous ignition if confined. Reaction with peroxides may result in violent decomposition of peroxide possibly creating an explosion.

HAZARDOUS DECOMPOSITION PRODUCTS (from burning, heating, or reaction with other materials).

Irritating and toxic fumes at elevated temperatures.

HAZARDOUS POLYMERIZATION

Will not occur

CONDITIONS TO AVOID (if polymerization may occur)

Not applicable

SECTION 11 - TOXICOLOGICAL PROPERTIES

ACUTE ORAL TOXICITY (LD50, RAT)

>2000.00 mg/kg (No deaths) (Estimate)

ACUTE DERMAL TOXICITY (LD50, RABBIT)

>2000.00 mg/kg (No deaths) (Estimate)

ACUTE INHALATION TOXICITY (LC50, RAT)

98.00 mg/l / 1 hr

OTHER ACUTE EFFECTS

No Data

IRRITATION EFFECTS DATA

No irritation data are known for this product.

CHRONIC/SUBCHRONIC DATA

No delayed, subchronic or chronic test data are known.

SECTION 12 - ECOLOGICAL INFORMATION

No Data

SECTION 13 - DISPOSAL CONSIDERATIONS

WASTE DISPOSAL

Comply with all Federal, State and Local Regulations.

SECTION 14 - TRANSPORT INFORMATION

DOT BULK SHIPPING NAME	Refer to Bill of Lading.
IMO SHIPPING DATA	Refer to Bill of Lading.

SECTION 15 - REGULATORY INFORMATION

US FEDERAL REGULATIONS

TOXIC SUBSTANCES CONTROL ACT (TSCA)-

All components are included in the EPA Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

TOXIC SUBSTANCE CONTROL ACT (TSCA) 12(b) COMPONENT(S)

None

OSHA Hazard Communication Standard (29CFR1910.1200) hazard class(es)

Corrosive.

EPA SARA Title III Section 312 (40CFR370) hazard class

Immediate Health Hazard.

EPA SARA Title III Section 313 (40CFR372) toxic chemicals above "de minimis" level are

NITRIC ACID

STATE REGULATIONS

PROPOSITION 65 SUBSTANCES (component(s) known to the State of California to cause cancer and/or reproductive toxicity and subject to warning and discharge requirements under the "Safe Drinking Water and Toxic Enforcement Act of 1986")

None

NEW JERSEY TRADE SECRET REGISTRY NUMBER(S)

None

SECTION 16 - INTERNATIONAL REGULATIONS

CANADA

DSL

Included on Inventory.

WHMIS HAZARD CLASSIFICATION

Class E Corrosive

WHMIS INGREDIENT DISCLOSURE LIST

NITRIC ACID

WHMIS TRADE SECRET REGISTRY NUMBER(S)

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

None

WHMIS SYMBOLS

Test tube/hand

EUROPEAN ECONOMIC COMMUNITY (EEC)

EINECS/ELINCS MASTER INVENTORY

Included on EINECS inventory or polymer substance, monomers included on EINECS inventory or no longer polymer.

EEC SYMBOL

CORROSIVE (C)

EEC RISK (R) PHRASES

Causes severe burns (R35).

EEC SAFETY PHRASES

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice (S26). Wear suitable protective clothing, gloves and eye/face protection (S36/37/39). In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible) (S45).

AUSTRALIA

AICS

Included on Inventory.

JAPAN

MITI

Included on Inventory.

PHILIPPINES

PICCS

Included on Inventory.

KOREA

ECL

Included on Inventory.

CHINA

SEPA

Included on Inventory.

MSDS Number: **P1952** * * * * * *Effective Date:* ***11/10/05*** * * * * * *Supercedes:* ***02/03/03***

---

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

MSDS ***Material Safety Data Sheet***

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

PHENOL, LIQUEFIED

1. Product Identification

Synonyms: Carbolic acid; Phenic acid; Phenylic acid; Hydroxybenzene; Monohydroxybenzene
CAS No.: 108-95-2
Molecular Weight: 94.11
Chemical Formula: C6H5OH in H2O
Product Codes:
J.T. Baker: 2856, 2859, 2864, 2865
Mallinckrodt: 0025, 0221, 0276, 0610

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Phenol	108-95-2	88 - 92%	Yes
Water	7732-18-5	8 - 12%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. RAPIDLY ABSORBED THROUGH SKIN. CORROSIVE. CAUSES SEVERE BURNS TO EVERY AREA OF CONTACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. COMBUSTIBLE LIQUID AND VAPOR.

SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 2 - Moderate
Reactivity Rating: 1 - Slight
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

The major hazard of phenol is its ability to penetrate the skin rapidly, particularly when liquid, causing severe injury which can be fatal. Phenol also has a strong corrosive effect on body tissue causing severe chemical burns. Due to its local anesthetizing properties, skin burns may be painless.

Inhalation:
Breathing vapor, dust or mist results in digestive disturbances (vomiting, difficulty in swallowing, diarrhea, loss of appetite). Will irritate, possibly burn respiratory tract. Other symptoms listed under ingestion may also occur.
Ingestion:
Poison. Symptoms may include burning pain in mouth and throat, abdominal pain, nausea, vomiting, headache, dizziness, muscular weakness, central nervous system effects, increase in heart rate, irregular breathing, coma, and possibly death. Acute exposure is also associated with kidney and liver damage. Ingestion of 1 gram has been lethal to humans.
Skin Contact:
Corrosive. Rapidly absorbed through the skin with systemic poisoning effects to follow. Discoloration and severe burns may occur, but may be disguised by a loss in pain sensation.

Eye Contact:
Corrosive. Eye burns with redness, pain, blurred vision may occur. May cause severe damage and blindness.
Chronic Exposure:
Repeated exposure may cause symptoms described for acute poisoning as well as eye and skin discoloration.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin, eye or central nervous system disorders, or impaired liver, kidney, or pulmonary function may be more susceptible to the effects of this substance.

4. First Aid Measures

IN CASE OF PHENOL POISONING, start first aid treatment immediately, then get medical attention. People administering first aid should take precautions to avoid contact with phenol. A phenol antidote kit (castor oil or other vegetable oil, polyethylene glycol 300) should be available in any phenol work area. Actions to be taken in case of phenol poisoning should be planned and practiced before beginning work with phenol. Castor oil and or polyethylene glycol can be given by a first responder before medical help arrives.

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:
If swallowed, immediately administer castor oil or other vegetable oil. Never give anything by mouth to an unconscious person. Be ready to induce vomiting at the advice of physician or poison control center. Castor oil (or vegetable oil) dosage should be between 15 and 30 cc. Get medical attention immediately.

Skin Contact:
In case of skin contact, immediately flush skin with large amounts of water while removing contaminated clothing and shoes. As soon as possible, repeatedly apply polyethylene glycol to affected area. Destroy contaminated clothing and shoes. Flush skin with water for at least 30 minutes. It is very important to avoid rubbing or wiping affected parts which would aggravate irritation and cause product dispersion. Continue treatment until the burned area changes color from white to pink. Expect that this can take a long period of time (20 minutes or more). The polyethylene glycol application should be done during transportation to the hospital. If polyethylene glycol is not available, flush with water for at least 30 minutes prior to going to hospital. Get medical attention immediately.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Treat ingestion with gastric lavage using 40% aqueous Bacto-Peptone, milk or water until phenolic odor is eliminated. Then give 15 to 50 cc castor or vegetable oil. Debride necrotic skin. Monitor vital signs, fluid status, electrolytes, BUN, renal and hepatic function, and electrocardiogram. Manage sedation, seizures, renal failure, and fluid electrolyte imbalances symptomatically as indicated.

---

5. Fire Fighting Measures

Fire:
Flash point: 79C (174F) CC
Autoignition temperature: 715C (1319F)
Flammable limits in air % by volume:
lel: 1.3; uel: 8.6
Combustible. Contact with strong oxidizers may cause fire.

Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Sealed containers may rupture when heated.

Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! Dry lime or soda ash may be used on spill for neutralization. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container. Store in a cool, dry, ventilated area away from sources of heat or ignition. Protect against physical damage. Store separately from reactive or combustible materials, and out of direct sunlight. All phenol workers should be properly trained on its hazards and the proper protective measures required. This training should also include emergency actions. All phenol operations should be enclosed to eliminate any potential exposure routes. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Phenol:
-OSHA Permissible Exposure Limit (PEL):
5 ppm (TWA) (skin)

-ACGIH Threshold Limit Value (TLV):
5 ppm (TWA) (skin)
Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge and dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Butyl rubber and neoprene are suitable materials for personal protective equipment.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Congealing Point: 10.5-14C (50.9-57.2F)

Appearance:

Colorless to light pink liquid.

Odor:

Sharp, medicinal, sweet, tarry.

Solubility:

1 g/15 ml of water; very soluble in alcohol.

Specific Gravity:

1.06 @ 20C/4C

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

182C (360F)

Melting Point:

No information found.

Vapor Density (Air=1):

3.2

Vapor Pressure (mm Hg):

0.4 @ 20C (68F)

Evaporation Rate (BuAc=1):

< 0.01

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Heat will contribute to instability.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition. Toxic gases and vapors may be released if involved in a fire.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Oxidizers, aluminum chloride and nitrobenzene, calcium hypochlorite, butadiene, halogens, formaldehyde, mineral oxidizing acids, isocyanates, sodium nitrite and many other materials. Hot liquid phenol will attack aluminum, magnesium, lead, and zinc metals.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Oral rat LD50: 317 mg/Kg; skin rabbit LD50:630 mg/kg; inhalation rat LC50: 316 mg/m3; irritation data: skin rabbit, standard Draize, 500 mg/24H severe; eye rabbit, standard Draize 5 mg/30S rinse, mild. Investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\--

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Phenol (108-95-2)	No	No	3
Water (7732-18-5)	No	No	None

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is not expected to leach into groundwater. When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to have a half-life between 1 and 10 days. When released into water, this material is expected to readily biodegrade. When released into water, this material is not expected to evaporate significantly. When released into water, this material is expected to have a half-life between 10 and 30 days. This material has an estimated bioconcentration factor (BCF) of less than 100. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material is expected to have a half-life of less than 1 day.
Environmental Toxicity:

This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: PHENOL SOLUTIONS
Hazard Class: 6.1
UN/NA: UN2821
Packing Group: II
Information reported for product/size: 50LB

International (Water, I.M.O.)

Proper Shipping Name: PHENOL SOLUTIONS
Hazard Class: 6.1
UN/NA: UN2821
Packing Group: II
Information reported for product/size: 50LB

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Phenol (108-95-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Phenol (108-95-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Phenol (108-95-2)	1000	500*	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
Phenol (108-95-2)	1000	U188	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2X
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **4** Flammability: **2** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. RAPIDLY ABSORBED THROUGH SKIN. CORROSIVE. CAUSES SEVERE BURNS TO EVERY AREA OF CONTACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. COMBUSTIBLE LIQUID AND VAPOR.
Label Precautions:
Do not breathe vapor.
Do not get in eyes, on skin, or on clothing.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat, sparks and flame.
Label First Aid:
IN ALL CASES, GET MEDICAL ATTENTION IMMEDIATELY. KEEP A PHENOL ANTIDOTE KIT in area of product use or storage. Administer castor oil and/or polyethylene glycol per pre-planned directions. If swallowed, immediately administer castor oil or other vegetable oil. Never give anything by mouth to an unconscious person. In case of skin contact, immediately flush skin with large amounts of water while removing contaminated clothing and shoes. As soon as possible, repeatedly apply polyethylene glycol to affected area. Destroy contaminated clothing and shoes. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of eye

contact, immediately flush eyes with plenty of water for at least 15 minutes while lifting lower and upper eyelids.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet

for

PORTLAND CEMENT

Section 1 - IDENTIFICATION

Product Names: Mountain Cement Portland Cement - Types I/II, V, Oilwell Class G

MSDS Information

This MSDS was produced in May 1999 and replaces any prior versions.

Product Code

Standard Industrial Classification: 3241

Chemical family

Calcium compounds. Calcium silicate compounds and other calcium compounds containing iron and aluminum make up the majority of this product. Major compounds:

$3CaO\cdot SiO_2$	Tricalcium silicate	CAS#12168-85-3
$2CaO\cdot SiO_2$	Dicalcium silicate	CAS#10034-77-2
$3CaOAl_2O_3$	Tricalcium aluminate	CAS#12042-78-3
$4Ca0\cdot Ai2O_{3.}\ Fe_2O_3$	Tetracalcium aluminoferrite	CAS#12068-35-8
$CaSO_{4.}\ 2H_2O$	Calcium sulfate dihydrate or Gypsum	CAS#7778-18-9

Chemical name and synonyms

Portland cement. Also known as hydraulic cement.

Formula

This product consists of finely ground portland cement clinker mixed with a small amount of calcium sulfate.*

Supplier/Manufacturer

Mountain Cement Company

5 Sand Creek Road

Laramie, WY 82070

Emergency contact information

Scott Nielson 307-745-4879, Ext. 121

*Trace Elements

Portland cement is made from materials mined from the earth and is processed using energy provided by fuels; and therefore may contain trace amounts of naturally occurring materials which might be detected during chemical analysis. For example: Portland cement may contain up to 0.75% insoluble residue, of which <0.1% may be free crystalline silica. Other trace constituents may include potassium and sodium sulfate compounds, chromium compounds, and nickel compounds.

Section 2 - COMPONENTS

	OSHA PEL	**ACGIF TLV-TWA**	**NIOSH REL**
Hazardous Substances	**(8-hour TWA)**	**(1995-1996)**	**(8-Hour TWA**
Portland Cement Clinker (CAS #65997-15-1)	50 million particles/ft^3	10mg total dust/m^3	
Nominal 95% by weight			
Calcium sulfate (CAS #7778-18-9)	5mg respirable dust/m^3	10mg total dust/m^3	
[Gypsum (CAS #13397-24-5)]	10mg total dust/m^3		
Nominal 5% weight			
Calcium oxide (CAS #1306-78-8)	5mg/m^3	2mg/m^3	
(Free Lime)			
< 4% by weight			
Magnesium Oxide (CAS #1309-48-4)	15mg total dust/ m^3	10mg total dust/m^3	
< 5% by weight			

Section 3 - HAZARDS IDENTIFICATION/TOXICOLOGICAL INFORMATION

Emergency Overview:

Portland cement is a light gray powder that poses little immediate hazard. A single short-term exposure to the dry powder is not likely to cause serious harm. However, exposure of sufficient duration to wet portland cement can cause serious, potentially irreversible tissue (including skin or eye) destruction in the form of chemical (caustic) burns, including third degree burns. The same type of tissue destruction can occur if wet or moist areas of the body are exposed for sufficient duration to dry portland cement.

Potential Health Effects:

Potential effects resulting from **eye contact:**

Exposure to airborne dust may cause immediate or delayed irritation or inflammation.

Eye contact by larger amounts of dry powder or splashes of wet portland cement may cause effects ranging from moderate eye irritation to chemical burns and blindness. Such exposures require immediate first aid (see Section 4) and medical attention to prevent significant damage to the eye.

Potential effects resulting from **skin contact:**

Discomfort or pain cannot be relied upon to alert a person to a hazardous skin exposure. Consequently, the only effective means of avoiding skin injury or illness involves minimizing or avoiding skin contact, particularly contact with wet cement. Persons exposed to wet cement may not feel discomfort until hours after the exposure has ended and significant injury has occurred.

Exposure to dry portland cement may cause drying of the skin with consequent mild irritation or more significant effects attributable to aggravation of other conditions. Dry portland cement contacting wet skin or exposure to moist or wet portland cement may cause more severe skin effects including thickening, cracking, or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of (caustic) chemical burns.

Some individuals may exhibit an allergic response upon exposure to portland cement, possibly due to trace amounts of chromium. The response may appear in a variety of forms ranging from a mild rash to severe skin ulcers. Persons already sensitized may react to their first contact with the product. Other persons may experience this effect after years of contact with hydraulic cement products.

Potential effects resulting from **inhalation:**

Portland cement may contain trace amounts (<0.1%) of free crystalline silica. Prolonged exposure to respirable free crystalline silica may aggravate other lung conditions. It may also cause delayed lung injury including silicosis, a disabling and potentially fatal lung disease.

Exposure to portland cement may cause irritation to the moist mucous membranes of the nose, throat, and upper respiratory system. It may also leave unpleasant deposits in the nose.

Potential effects resulting from **ingestion:**

Although small quantities of dust are not known to be harmful, ill effects are possible if larger quantities are consumed. Portland cement should not be eaten under any circumstances.

Carcinogenic Potential:

Portland cement is not listed as a carcinogen by IARC, NTP, or OSHA. It may, however, contain trace amounts (<0.1%) of substances listed as carcinogens by these organizations. Crystalline silica is now classified by IARC as a known human carcinogen (Group I). NTP had characterized respirable crystalline silica as "reasonably anticipated to be (a) carcinogen."

Medical Conditions Which May Be Aggravated By Inhalation or Dermal Exposure:

- Pre-existing upper respiratory and lung diseases.

- Unusual (hyper) sensitivity to hexavalent chromium (chromium +6) salts.

Section 4 - FIRST AID

Eyes

Immediately flush eyes thoroughly with water. Continue flushing eye for at least 15 minutes, including under lids, to remove all particles. Call physician immediately.

Skin

Wash skin with cool water and pH-neutral soap or a mild detergent intended for use on skin. Seek medical treatment in all cases of prolonged exposure to wet cement, cement mixtures, liquids from fresh cement products, or prolonged wet skin exposure to dry cement.

Inhalation of Airborne Dust

Remove to fresh air. Seek medical help if coughing and other symptoms do not subside. (Inhalation of gross amounts of portland cement requires immediate medical attention.)

Ingestion

Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician immediately.

Section 5 - FIRE & EXPLOSION DATA

Flash Point	None
Lower Explosive Limit	None
Upper Explosive Limit	None
Auto Ignition Temperature	Not combustible
Extinguishing Media	Not combustible
Special Fire Fighting Procedures	None. (Although portland cement poses no fire-related hazards, a self-contained breathing apparatus is recommended to limit exposure to combustion products when fighting any fire.)
Hazardous Combustion Products	None
Unusual Fire and Explosion Hazards	None

Section 6 - ACCIDENTAL RELEASE MEASURES

Collect dry material using a scoop. Avoid actions that cause dust to become airborne. Avoid inhalation of dust and contact with skin. Wear appropriate personal protective equipment as described in Section 8.

Scrape up wet material and place in an appropriate container. Allow the material to "dry" before disposal. Do not attempt to wash portland cement down drains.

Dispose of waste material according to local, state, and federal regulations.

Section 7 - HANDLING AND STORAGE

Keep portland cement dry until used. Normal temperature and pressure do not affect the material.

Promptly remove dusty clothing or clothing which is wet with cement fluids and launder before reuse. Wash thoroughly after exposure to dust or wet cement mixtures or fluids.

Section 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Skin Protection

Prevention is essential to avoiding potentially severe skin injury. Avoid contact with unhardened (wet) portland cement products. If contact occurs, promptly wash affected area with soap and water. Where prolonged exposure to unhardened portland cement products might occur, wear impervious clothing and gloves to eliminate skin contact.

Respiratory Protection

Avoid actions that cause dust to become airborne. Use local or general ventilation to control exposures below applicable exposure limits. Use NIOSH/MSHA-approved respirators in poorly ventilated areas when dust causes discomfort or irritation, or where there is an applicable exposure limit (Advisory: Respirators and filters purchased after July 10, 1998 must be certified under 42 CFR 84).

Ventilation

Use local exhaust or general dilution ventilation to control exposure within applicable limits.

Eye Protection

When engaged in activities where cement dust or wet cement or concrete could contract the eye, wear safety glasses with side shields or goggles. In extremely dusty environments and unpredictable environments, wear unvented or indirectly vented goggles to avoid eye irritation or injury. Contact lenses should not be worn when working with portland cement or fresh cement products.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Gray or White powder
Odor	No distinct odor
Physical state	Solid (powder)
pH (in water) (ASTM D 1293-95)	12 to 13
Solubility in water	Slightly soluble (0.1 to 1.0%)
Vapor pressure	Not applicable
Vapor density	Not applicable
Boiling point	Not applicable (i.e., > 1000° C)
Melting point	Not applicable
Specific gravity ($H_2O = 1.0$)	3.15
Evaporation rate	Not applicable

Section 10 - STABILITY AND REACTIVITY

Stability

Stable

Conditions To Avoid

Unintentional contact with water

Incompatibility

Wet portland cement is alkaline. As such, it is incompatible with acids, ammonium salts, and aluminum metal.

Hazardous Decomposition

Will not spontaneously occur. Adding water results in hydration and produces (caustic) calcium hydroxide.

Hazardous Polymerization

Will not occur.

Section 11 - TOXICOLOGICAL INFORMATION – See Section 3

Section 12 - ECOLOGICAL INFORMATION

Ecotoxicity

No recognized unusual toxicity to plants or animals.

Relevant Physical and Chemical Properties

(See Sections 9 and 10.)

Section 13 - DISPOSAL

Dispose of waste material, including bags, according to local, state and federal regulations.

Section 14 - TRANSPORTATION DATA

Hazardous Materials Description/Proper Shipping Name

Portland cement is not hazardous under U.S. Department of Transportation (DOT) regulations.

Section 15 - OTHER REGULATORY INFORMATION

Status Under USDOL-OSHA Hazard Communication Rule, 29 CFR 1910.1200

Portland cement is considered a "hazardous chemical" under this regulation, and should be part of any hazard communication program.

Status Under CERCLA/Superfund 40 CFR 117 and 302 (v)

Not listed.

Hazard Category Under SARA (Title III) Section 311 and 312

Portland cement qualifies as a "hazardous substance" with delayed health effects.

Status Under SARA (Title III) Section 313

Not subject to reporting requirements under Section 313.

Status Under TSCA (as of May 1997)

Some substances in portland cement are on the TSCA inventory list.

Status Under the Federal Hazardous Substances Act

Portland cement is a "hazardous substance" subject to the statutes promulgated under the subject act.

Status Under WHMIS

Portland cement is considered to be a hazardous material under the Hazardous Products Act as defined by the Controlled Products regulations (Class E - corrosive material) and is therefore subject to the labeling and MSDS requirements of the workplace hazardous information system (WHMIS).

Section 16 - OTHER INFORMATION

Prepared By

Mountain Cement Company

5 Sand Creek Rd.

Laramie, WY 82070

Revision Date

May 1999

Other Important Information

Portland cement should only be used by knowledgeable persons. Inexperienced product users must obtain proper training before using this product. A key to using the product safely requires the user to recognize that portland cement chemically reacts with water, and that some of the intermediate products of this reaction (that is, those present while a portland cement product is "setting") pose a far more severe hazard than does portland cement itself.

While the information provided in this material safety data sheet is believed to provide a useful summary of the hazards of portland cement as it is commonly used, the sheet cannot, and does not, anticipate and provide all of the information that might be needed in every situation. In particular, the data furnished in this sheet do not address hazards that may be posed by other materials mixed with portland cement products. Users, therefore, should review other applicable material safety data sheets before working with this portland cement or working on portland cement products, for example, portland cement concrete.

MOUNTAIN CEMENT MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNNG THE ACCURACY OF ANY INFORMATION PROVIDED BY MOUNTAIN CEMENT COMPANY, EXCEPT THAT THE PRODUCT SHALL CONFORM TO CONTRACTED SPECIFICATIONS. THE INFORMATION PROVIDED HEREIN WAS BELIEVED BY MOUNTAIN CEMENT COMPANY TO BE ACCURATE AT THE TIME OF PREPARATION OR PREPARED FROM SOURCES BELIEVED TO BE RELIABLE, BUT IT IS THE RESPONSIBILITY OF THE USER TO INVESTIGATE AND UNDERSTAND OTHER PERTINENT SOURCES OF INFORMATION, TO COMPLY WITH ALL LAWS AND PROCEDURES APPLICABLE TO THE SAFE HANDLING AND USE OF THE PRODUCT, AND TO DETERMINE THE SUITABILITY OF THE PRODUCT FOR ITS INTENDED USE. BUYER'S EXCLUSIVE REMEDY SHALL BE FOR DAMAGES AND NO CLAIM OF ANY KIND, WHETHER AS TO PRODUCT DELIVERED OR NON-DELIVERY OF PRODUCT, AND WHETHER BASED ON CONTRACT, BREACH OF WARRANTY, NEGLIGENCE, OR OTHERWISE SHALL BE GREATER IN AMOUNT THAN THE PURCHASE PRICE OF THE QUANTITY OF PRODUCT IN RESPECT OF WHICH DAMAGES ARE CLAIMED. IN NO EVENT SHALL MOUNTAIN CEMENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER BUYER'S CLAIM IS BASED ON CONTRACT, BREACH OF WARRANTY, NEGLIGENCE OR OTHERWISE.

Back to Product Information

MATERIAL SAFETY DATA SHEET: SIMPLE GREEN®

I. PRODUCT & COMPANY INFORMATION

PRODUCT NAME: **SIMPLE GREEN® CLEANER / DEGREASER**

COMPANY NAME: **SUNSHINE MAKERS, INC.**
15922 Pacific Coast Highway
Huntington Harbour, CA 92649 USA
Telephone: 800-228-0709 • 562-795-6000
Fax: 562-592-3034
Website: www.simplegreen.com

Version No. 1006
Issue Date: March, 1999

For 24-hour emergency, call Chem-Tel, Inc.: 800-255-3924

USE OF PRODUCT: An all purpose cleaner and degreaser used undiluted or diluted in water for direct, spray, and dip tank procedures.

II. INGREDIENT INFORMATION

The only ingredient of Simple Green® with established exposure limits is undiluted 2-butoxyethanol (<6%) (Butyl Cellosolve; CAS No. 111-76-2): the OSHA PEL and ACGIH TLV is 25 ppm (skin). Note, however, that Butyl Cellosolve is only one of the raw material ingredients that undergo processing and dilution during the manufacture of Simple Green®. Upon completion of the manufacturing process, Simple Green® does not possess the occupational health risks associated with exposure to undiluted Butyl Cellosolve. Verification of this is contained in the independent test results detailed under "Toxicological Information" on Page 3 of this MSDS.

The Butyl Cellosolve in Simple Green® is part of a chemical category (glycol ethers) regulated by the Emergency Planning and Community Right-to-Know Act (SARA, Title III, section 313); therefore, a reporting requirement exists. Based upon chemical analysis, Simple Green® contains no known EPA priority pollutants, heavy metals, or chemicals listed under RCRA, CERCLA, or CWA. Analysis by TCLP (Toxicity Characteristic Leaching Procedure) according to RCRA revealed no toxic organic or inorganic constituents.

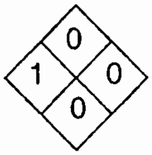
All components of Simple Green® are listed on the TSCA Chemical Substance Inventory.

III. HAZARDS IDENTIFICATION

UN Number:	Not required
Dangerous Goods Class:	Nonhazardous

Hazard Rating (NFPA/HMIS)

Health = 1*
Reactivity = 0
Fire = 0
Special = 0



Rating Scale

0 = minimal
1 = slight
2 = moderate
3 = serious
4 = severe

*Mild eye irritant, non-mutagenic and non-carcinogenic. **None of the ingredients in Simple Green® are regulated or listed as potential cancer agents by Federal OSHA, NTP, or IARC.**

IV. FIRST AID MEASURES

SYMPTOMS OF OVEREXPOSURE AND FIRST AID TREATMENT

Eye contact:	Reddening may develop. Immediately rinse the eye with large quantities of cool water; continue 10-15 minutes or until the material has been removed; be sure to remove contact lenses, if present, and to lift upper and lower lids during rinsing. Get medical attention if irritation persists.
Skin contact:	Minimal effects, if any; rinse skin with water, rinse shoes and launder clothing before reuse. Reversible reddening may occur in some dermal-sensitive users; thoroughly rinse area and get medical attention if reaction persists.
Swallowing:	Essentially non-toxic. Give several glasses of water to dilute; do not induce vomiting. If stomach upset occurs, consult physician.
Inhalation:	Non-toxic. Exposures to concentrate-mist may cause mild irritation of nasal passages or throat; remove to fresh air. Get medical attention if irritation persists.

V. FIRE FIGHTING MEASURES

Simple Green® is stable, not flammable, and will not burn.

Flash Point/Auto-Ignition:	Not flammable.
Flammability Limits:	Not flammable.
Extinguishing Media:	Not flammable/nonexplosive. No special procedures required.
Special Fire Fighting Procedures:	None required.

VI. ACCIDENTAL RELEASE MEASURES

Recover usable material by convenient method; residual may be removed by wipe or wet mop. If necessary, unrecoverable material may be washed to drain with large quantities of water.

VII. HANDLING, STORAGE & TRANSPORT INFORMATION

No special precautions are required. **This product is non-hazardous for storage and transport according to the U.S. Department of Transportation Regulations.** Simple Green® requires no special labeling or placarding to meet U.S. Department of Transportation requirements.

UN Number:	Not required
Dangerous Goods Class:	Nonhazardous

VIII. EXPOSURE CONTROLS

Exposure Limits: The Simple Green® formulation presents no health hazards to the user when used according to label directions for its intended purposes. Mild skin and eye irritation is possible (please see Eye contact and Skin contact in Section IV.).

Ventilation: No special ventilation is required during use.

Human Health Effects or Risks from Exposure: Adverse effects on human health are not expected from Simple Green®, based upon twenty years of use without reported adverse health incidence in diverse population groups, including extensive use by inmates of U.S. Federal prisons in cleaning operations.

Simple Green® is a mild eye irritant; mucous membranes may become irritated by concentrate-mist.

Simple Green® is not likely to irritate the skin in the majority of users. Repeated daily application to the skin without rinsing, or continuous contact of Simple Green® on the skin may lead to temporary, but reversible, irritation.

Medical Conditions Aggravated by Exposure: No aggravation of existing medical conditions is expected; dermal-sensitive users may react to dermal contact by Simple Green®.

IX. PERSONAL PROTECTION

Precautionary Measures:	No special requirements under normal use conditions.
Eye Protection:	Caution, including reasonable eye protection, should always be used to avoid eye contact where splashing may occur.
Skin Protection:	No special precautions required; rinse completely from skin after contact.
Respiratory Protection:	No special precautions required.
Work and Hygienic Practices:	No special requirements. Wash or rinse hands before touching eyes or contact lenses.

X. PHYSICAL AND CHEMICAL PROPERTIES

Appearance/odor: Translucent green liquid with characteristic sassafras odor.

Specific Gravity:	1.0257	**Vapor Pressure:**	17 mm Hg @ 20 °C; 22 mm Hg @ 25 °C
pH of concentrate:	9.5	**Vapor Density:**	1.3 (air = 1)
Evaporation:	>1 (butyl acetate = 1)	**Density:**	8.5 lbs./gallon
Boiling Point:	110 °C (231 °F)		

Freezing Point: -9 °C (16 °F) If product freezes, it will reconstitute without loss of efficacy when brought back to room temperature and agitated.

VOC Composite Partial Pressure: 0.006 mm Hg @ 20 °C
Volatile Organic Compounds (VOCs): 7.96 g/L per ASTM Method 3960-90. Per California AQMD's VOC test method, product must be diluted at least 2 parts of water to 1 part Simple Green® in order to meet SCAQMD Rule 1171 & Rule 1122 and BAAQMD Regulation 8-16 VOC requirements for solvent cleaning operations.

Water Solubility: Completely soluble in water. The higher salt concentrations in marine ecosystems will lead to complexes with Simple Green® that may become visible at ratios above one part Simple Green® to 99 parts seawater.

Ash Content:	At 600 °F: 1.86% by weight.
Nutrient Content:	Nitrogen: <1.0% by weight (fusion and qualitative test for ammonia).
	Phosphorus: 0.3% by formula.
	Sulfur: 0.6% by weight (barium chloride precipitation method).

Detection: Simple Green® has a characteristic sassafras odor that is not indicative of any hazardous situation.

XI. STABILITY AND REACTIVITY INFORMATION

Nonreactive. Simple Green® is stable, even under fire conditions, and will not react with water or oxidizers. Hazardous polymerization will not occur.

XII. TOXICOLOGICAL INFORMATION

Nonhuman Toxicity

Acute Mortality Studies:

Oral LD_{50} (rat):	>5.0 g/kg body weight
Dermal LD_{50} (rabbit):	>2.0 g/kg body weight

Dermal Irritation: Only mild, but reversible, irritation was found in a standard 72-hr test on rabbits. A value of 0.2 (non-irritating) was found on a scale of 8.

Eye Irritation: With or without rinsing with water, the irritation scores in rabbits at 24 hours did not exceed 15 (mild irritant) on a scale of 110.

Subchronic dermal effects: No adverse effects, except reversible dermal irritation, were found in rabbits exposed to Simple Green® (up to 2.0 g/kg/day for 13 weeks) applied to the skin of 25 males and 25 females. Only female body weight gain was affected. Detailed microscopic examination of all major tissues showed no adverse changes.

Fertility Assessment by Continuous Breeding: The Simple Green® formulation had no adverse effect on fertility and reproduction in CD-1 mice with continuous administration for 18 weeks, and had no adverse effect on the reproductive performance of their offspring.

XIII. BIODEGRADABILITY AND ENVIRONMENTAL TOXICITY INFORMATION

Biodegradability:
Simple Green® is readily decomposed by naturally occurring microorganisms. The biological oxygen demand (BOD), as a percentage of the chemical oxygen demand (COD), after 4, 7, and 11 days was 56%, 60%, and 70%, respectively. Per OECD Closed Bottle Test, Simple Green® meets OECD and EPA recommendations for ready biodegradability.

In a standard biodegradation test with soils from three different countries, Butyl Cellosolve reached 50% degradation in 6 to 23 days, depending upon soil type, and exceeded the rate of degradation for glucose which was used as a control for comparison.

Environmental Toxicity Information:
Simple Green® is considered practically non-toxic per EPA's aquatic toxicity scale. Simple Green® is non-lethal to any of the marine and estuarine test animals listed in the following table at concentrations below 200 mg/L (0.02%). This table shows the Simple Green® concentrations that are likely to be lethal to 50% of the exposed organisms.

	LC_{50} in mg/L (ppm)	
	48-hour	96-hour
Marine Fish:		
Mud minnow *(Fundulus heteroclitus)*	1690	1574
Whitebait *(Galaxias maculatus)*	210	210
Marine/Estuarine Invertebrates:		
Brine Shrimp *(Artemia salina)*	610	399
Grass Shrimp *(Palaemonetes pugio)*	270	220
Green-lipped Mussel *(Perna canaliculus)*	220	220
Mud Snail *(Potamopyrgus estuarinus)*	410	350

XIV. DISPOSAL CONSIDERATIONS

Simple Green® is fully water soluble and biodegradable and will not harm sewage-treatment microorganisms if disposal by sewer or drain is necessary. Dispose of in accordance with all applicable local, state, and federal laws.

XV. OTHER INFORMATION

Containers:	Simple Green® residues can be completely removed by rinsing with water; the container may be recycled or applied to other uses.
Electrical Wiring Compatibility:	Polyimide insulated wiring is not affected by exposure to Simple Green®. After immersion in Simple Green® for 14 days at 74°F, the 61 cm piece of polyimide insulated wire passed a one minute dielectric proof test at 2500 volts (ASTM D-149).
Contact Point:	Sunshine Makers, Inc., Research and Development Division: 562-795-6000.

*** NOTICE ***

All information appearing herein is based upon data obtained by the manufacturer and recognized technical sources. Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of this information, Sunshine Makers, Inc. or its distributors extends no warranties, makes no representations and assumes no responsibility as to the suitability of such information for application to purchaser's intended purposes or for consequences of its use.

1.1 MATERIAL SAFETY DATA SHEET

TOLUENE (AMOCO/TOTAL)

MSDS No. 11699000 ANSI/ENGLISH

1.1.1 1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: TOLUENE (AMOCO/TOTAL)

MANUFACTURER/SUPPLIER:

Amoco Chemical Company
200 East Randolph Drive
Chicago, Illinois 60601 U.S.A.

EMERGENCY HEALTH INFORMATION:
1 (800) 447-8735
EMERGENCY SPILL INFORMATION:
1 (800) 424-9300 CHEMTREC (USA)
OTHER PRODUCT SAFETY INFORMATION:
(312) 856-3907

1.1.2 2.0 COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS#	Range % by Wt.
Toluene	108-88-3	80
C9 Isoparaffins		9
C8 Isoparaffins		5
Benzene	71-43-2	2
Xylenes		2
Ethylbenzene	100-41-4	2

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

1.1.3 3.0 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Warning! Flammable. Causes eye irritation. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Inhalation causes headaches, dizziness, drowsiness, nausea, and respiratory irritation. If swallowed, causes headaches, dizziness, drowsiness and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs. Danger! Contains Benzene. Cancer hazard. Can cause blood disorders. Harmful when absorbed through the skin.

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: Causes mild eye irritation.

SKIN CONTACT: Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Harmful when absorbed through the skin. Cancer hazard. Can cause blood disorders.
INHALATION: Inhalation causes headaches, dizziness, drowsiness, nausea, and respiratory irritation. See "Toxicological Information" section (Section 11.0).
INGESTION: If swallowed, causes headaches, dizziness, drowsiness and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs.
HMIS CODE: (Health:2) (Flammability:3) (Reactivity:0)
NFPA CODE: (Health:2) (Flammability:3) (Reactivity:0)

1.1.4 4.0 FIRST AID MEASURES

EYE: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.
SKIN: Wash exposed skin with soap and water. Remove contaminated clothing and thoroughly clean and dry before reuse.
INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.
INGESTION: If swallowed, drink plenty of water, do NOT induce vomiting. Get immediate medical attention.

1.1.5 5.0 FIRE FIGHTING MEASURES

FLASHPOINT: 40°F(4°C)
UEL: 6.8%
LEL: 1.3%
AUTOIGNITION TEMPERATURE: 997°F (536°C)
FLAMMABILITY CLASSIFICATION: Flammable Liquid.
EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Flammable liquid. Vapor may explode if ignited in enclosed area.
FIRE-FIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.
PRECAUTIONS: Keep away from sources of ignition (e.g., heat and open flames). Use with adequate ventilation. Keep container closed.
HAZARDOUS COMBUSTION PRODUCTS: Incomplete burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

1.1.6 6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Remove mechanically or contain on an absorbent material such as dry sand or earth. Keep out of sewers and waterways.

1.1.7 7.0 HANDLING AND STORAGE

HANDLING: Do not breathe vapors. Do not get in eyes. Do not get on skin or clothing.

STORAGE: Store in flammable liquids storage area. Store away from heat, ignition sources, and open flame in accordance with applicable regulations. Keep container closed.

1.1.8 8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE: Do not get in eyes. Wear chemical goggles.
SKIN: Avoid skin contact. Wear protective clothing and gloves.
INHALATION: Do not breathe mist or vapor. Use with adequate ventilation. If ventilation is inadequate, use NIOSH certified respirator that will protect against organic vapor and dust/mist.
ENGINEERING CONTROLS: Control airborne concentrations below the exposure guidelines.
EXPOSURE GUIDELINES:

Component	CAS#	Exposure Limits
Toluene	108-88-3	OSHA PEL: 100 ppm (1989); 200 ppm (1971) OSHA STEL: 150 ppm (1989); Not established. (1971) OSHA Ceiling: 300 ppm (1971) ACGIH TLV-TWA: 50 ppm (skin)
C9 Isoparaffins		No exposure limit established
C8 Isoparaffins		No exposure limit established
Benzene	71-43-2	OSHA PEL: 1 ppm OSHA STEL: 5 ppm ACGIH TLV-TWA: 10 ppm
Xylenes		No exposure limit established
Ethylbenzene	100-41-4	OSHA PEL: 100 ppm (1989)(1971) OSHA STEL: 125 ppm(1989); Not established. (1971) ACGIH TLV-TWA: 100 ppm ACGIH TLV-STEL: 125 ppm

1.1.9 9.0 CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE AND ODOR: Liquid. Clear. Colorless. Aromatic odor.
pH: Not determined.
VAPOR PRESSURE: 26 mm Hg at 25 °C
VAPOR DENSITY: 3.2
BOILING POINT: 231°F(111°C)
MELTING POINT: Not determined.
SOLUBILITY IN WATER: Negligible, below 0.1%.
SPECIFIC GRAVITY (WATER=1): 0.87
EVAPORATION RATE:

1.1.10 10.0 STABILITY AND REACTIVITY

STABILITY: Burning can be started easily.

CONDITIONS TO AVOID: Keep away from ignition sources (e.g. heat, sparks, and open flames).
MATERIALS TO AVOID: None identified.
HAZARDOUS DECOMPOSITION: Burning can produce carbon monoxide and/or carbon dioxide and other harmful products.
HAZARDOUS POLYMERIZATION: Will not occur.

1.1.11 11.0 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA:

EYE IRRITATION: Testing not conducted. See Other Toxicity Data.
SKIN IRRITATION: Testing not conducted. See Other Toxicity Data.
DERMAL LD50: Testing not conducted. See Other Toxicity Data.
ORAL LD50: Testing not conducted. See Other Toxicity Data.
INHALATION LC50: Testing not conducted. See Other Toxicity Data.

OTHER TOXICITY DATA: Specific toxicity tests have not been conducted on this product. Our hazard evaluation is based on information from similar products, the ingredients, technical literature, and/or professional experience.

This stream contains benzene, toluene, xylene and ethylbenzene.

Toluene: Toluene is readily absorbed via inhalation, ingestion, and somewhat through skin contact. In the liquid form, it causes mild skin irritation with a single exposure (PDIS: 4.8/8.0) and dermatitis following repeated exposures. Toluene also produces mild eye irritation (Draise score at 1.0 hour 13.7/110.0) which includes reversible corneal opacity and iritis. It is not a dermal sensitizer. Inhalation in humans has caused mild respiratory irritation (200 ppm), mild eye irritation (400 ppm), and lassitude and slight nausea (600 ppm). Drowsiness occurs at 800 ppm. Very high concentrations may result in paresthesia, dizziness, disturbances of vision, nausea, narcosis, and collapse. It does not induce the hematopoietic effects seen with benzene exposure. Rat oral LD50: 5000 mg/kg; rat inhalation LC50: 4000 ppm (4 hours).

Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC) and OSHA consider benzene to be a human carcinogen. Chronic exposures to benzene at levels of 100 ppm and below have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.

Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to the higher dosage levels (greater than 100 ppm) resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level.

This product contains xylene. Xylene is readily absorbed through the skin. It is also absorbed when inhaled or ingested. Overexposure to xylene can cause eye and respiratory irritation, drowsiness, headache, fatigue, irritability, and gastrointestinal disturbances. Some liver damage and lung inflammation were seen in chronic studies in guinea pigs but not in rats. In rat reproduction studies, xylenes did not produce birth defects but were toxic to the embryo when

toxicity to the mother was produced. In a mouse study, xylenes caused birth defects at doses that threatened the life of the mother. The doses which produced these effects were greatly in excess of the TLV. Rat oral LD50: 4300 mg/kg; rat inhalation LC50: 5000 ppm/4 hours.
Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

1.1.12 12.0 ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this product.

1.1.13 13.0 DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations. Residues and spilled material are hazardous waste due to ignitability. Incineration at an EPA-permitted hazardous waste management facility as required by law. Do not landfill.

1.1.14 14.0 TRANSPORTATION INFORMATION

U.S. DEPT OF TRANSPORTATION

Shipping Name	Toluene
Hazard Class	3
Identification Number	UN1294
Packing Group	II
RQ	RQ

INTERNATIONAL INFORMATION:
Sea (IMO/IMDG)

Shipping Name Not determined.

Air (ICAO/IATA)

Shipping Name Not determined.

European Road/Rail (ADR/RID)

Shipping Name Not determined.

Canadian Transportation of Dangerous Goods

Shipping Name Not determined.

1.1.15 15.0 REGULATORY INFORMATION

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR Part 302.4): This product is reportable under 40 CFR Part 302.4 because it contains the following substance(s):

Component/CAS Number	Weight %	Component Reportable Quantity (RQ)
Benzene 71-43-2	2	10 lbs.
Ethylbenzene 100-41-4	2	1,000 lbs.

Xylenes	2	100 lbs.
Toluene 108-88-3	80	1,000 lbs.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR Part 355): This product is not regulated under Section 302 of SARA and 40 CFR Part 355.
SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR Part 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).
SARA TITLE III SECTION 313 (40 CFR Part 372): This product contains the following substance(s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
Benzene 71-43-2	2
Ethylbenzene 100-41-4	2
Xylenes	2
Toluene 108-88-3	80

U.S. INVENTORY (TSCA): Listed on inventory.
OSHA HAZARD COMMUNICATION STANDARD: Flammable liquid. CNS Effects.
EC INVENTORY (EINECS/ELINCS): In compliance.
JAPAN INVENTORY (MITI): Not determined.
AUSTRALIA INVENTORY (AICS): Not determined.
KOREA INVENTORY (ECL): Not determined.
CANADA INVENTORY (DSL): Not determined.
PHILIPPINE INVENTORY (PICCS): Not determined.

1.1.16 16.0 OTHER INFORMATION

Prepared by:

Environment, Health and Safety Department
Issued: April 14, 1997
Supersedes: April 10, 1997

This material Safety Data Sheet conforms to the requirements of ANSI Z400.1.
This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.

MSDS *Material Safety Data Sheet*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

1.1 M-XYLENE

MSDS Number: X2400 --- *Effective Date: 11/02/01*

1.2 1. Product Identification

Synonyms: m-Dimethylbenzene; 1,3 dimethylbenzene; 1,3-xylene; m-xylol
CAS No.: 108-38-3
Molecular Weight: 106.18
Chemical Formula: C6H4(CH3)2
X523

1.3 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
m-Xylene	108-38-3	90 - 100%	Yes

1.4 3. Hazards Identification

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER.
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors may be irritating to the nose and throat. Inhalation of high concentrations may result in nausea, vomiting, headache, ringing in the ears, and severe breathing difficulties which may be delayed in onset. Substernal pain, cough, and hoarseness are also reported. High vapor concentrations are anesthetic and central nervous system depressants.
Ingestion:
Ingestion causes burning sensation in mouth and stomach, nausea, vomiting and salivation. Minute amounts aspirated into the lungs can produce a severe hemorrhagic pneumonitis with severe pulmonary injury or death.
Skin Contact:
Skin contact results in loss of natural oils and often results in a characteristic dermatitis. May be absorbed through the skin.
Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Chronic Exposure:
Chronic inhalation can cause headache, loss of appetite, nervousness and pale skin. Repeated or prolonged skin contact may cause a skin rash. Repeated exposure of the eyes to high concentrations of vapor may cause reversible eye damage. Repeated exposure can damage bone marrow, causing low blood cell count. May damage the liver and kidneys.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, blood, or respiratory function may be more susceptible to the effects of the substance.

1.5 4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to

prevent aspiration into lungs.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

1.6 5. Fire Fighting Measures

Fire:
Flash point: 25C (77F) CC
Autoignition temperature: 527C (981F)
Flammable limits in air % by volume:
lel: 1.1; uel: 7.0
Flammable Liquid and Vapor!
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

1.7 6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

1.8 7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

1.9 8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit
100 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):
100 ppm (TWA) 150 ppm (STEL) m-xylene

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

1.109. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Characteristic odor.
Solubility:
Insoluble in water.
Specific Gravity:
0.86 @15C / 4C
pH:
Not applicable.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
138C (280F)
Melting Point:
-48C (-54F)
Vapor Density (Air=1):
3.7
Vapor Pressure (mm Hg):
9 @ 20C (68F)
Evaporation Rate (BuAc=1):
0.7

1.1110. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Involvement in a fire causes formation of carbon monoxide and unidentified organic components.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents and strong acids.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

1.1211. Toxicological Information

Toxicological Data:
Oral rat LD50: 5000 mg/Kg; skin rabbit LD50: 14,100 mg/Kg; irritation eye rabbit: 5 mg / 24 Hrs severe (Std. Draize); irritation skin rabbit 20 mg / 24 Hrs moderate (Std. Draize); investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\--

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
m-Xylene (108-38-3)	No	No	3

1.1312. Ecological Information

Environmental Fate:
Following data for xylene: When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. (mixed xylenes: octanol / water partition coefficient 3.1 - 3.2; bioconcentration factor = 1.3, eels)
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 1 and 10 mg/l.

1.1413. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

1.1514. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 500ML

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 500ML

International (Air, I.C.A.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 500ML

1.1615. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------
-

Ingredient	TSCA	EC	Japan	Australia
m-Xylene (108-38-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
-

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
m-Xylene (108-38-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\---------------
-

	-SARA 302-		------SARA 313-----	
Ingredient	RQ	TPQ	List	Chemical Catg.
m-Xylene (108-38-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\---------------
-

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
m-Xylene (108-38-3)	1000	No	No

```
Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes     Chronic: Yes  Fire: Yes Pressure: No
Reactivity: No          (Pure / Liquid)
```

Australian Hazchem Code: 3[Y]
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

1.1716. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.
Label Precautions:
Keep away from heat, sparks and flame.
Avoid contact with eyes, skin and clothing.
Keep container closed.
Use only with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly after handling.
Label First Aid:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS *Material Safety Data Sheet*

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

1.1 O-XYLENE

MSDS Number: X2200 --- *Effective Date: 12/08/96*

1.2 1. Product Identification

Synonyms: o-Dimethyl benzene; 1,2 dimethyl benzene; 1,2 xylene; o-xylol
CAS No.: 95-47-6
Molecular Weight: 106.18
Chemical Formula: C6H4(CH3)2
Product Codes: X518

1.3 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
o-Xylene	95-47-6	90 - 100%	Yes

1.4 3. Hazards Identification

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors may be irritating to the nose and throat. Inhalation of high concentrations may result in nausea, vomiting, headache, ringing in the ears, and severe breathing difficulties which may be delayed in onset. Substernal pain, cough, and hoarseness are also reported. High vapor concentrations are anesthetic and central nervous system depressants.

Ingestion:
Ingestion causes burning sensation in mouth and stomach, nausea, vomiting and salivation. Minute amounts aspirated into the lungs can produce a severe hemorrhagic pneumonitis with severe pulmonary injury or death.

Skin Contact:
Skin contact results in loss of natural oils and often results in a characteristic dermatitis. May be absorbed through the skin.

Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

Chronic Exposure:
Chronic inhalation can cause headache, loss of appetite, nervousness and pale skin. Repeated or prolonged skin contact may cause a skin rash. Repeated exposure of the eyes to high concentrations of vapor may cause reversible eye damage. Repeated exposure can damage bone marrow, causing low blood cell count. May damage the liver and kidneys.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, blood, or respiratory function may be more susceptible to the effects of the substance.

1.5 4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.

Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

1.6 5. Fire Fighting Measures

Fire:
Flash point: 32C (90F) CC Autoignition temperature: ca. 463C (ca. 865F)
Flammable limits in air % by volume: lel: 1.0; uel: 7.0 Flammable.

Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. Sensitive to static discharge.

Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

1.7 6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. J. T. Baker SOLUSORB(tm) solvent adsorbent is recommended for spills of this product.

1.8 7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

1.9 8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limits (Xylene) 100 ppm (TWA) -ACGIH Threshold Limit Value (TLV): 100 ppm (TWA), 150 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

1.109. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Characteristic odor.

Solubility:
Insoluble in water.

Specific Gravity:
0.88 @ 20C / 4 C

pH:
Not applicable.

% Volatiles by volume @ 21C (70F):
100

Boiling Point:
144C (291F)

Melting Point:
-25C (-13F)

Vapor Density (Air=1):
3.7

Vapor Pressure (mm Hg):
7 @ 20C (68F)

Evaporation Rate (BuAc=1):
1

1.1110. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
Involvement in a fire causes formation of carbon monoxide and unidentified organic components.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Strong oxidizing agents and strong acids.

Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

1.1211. Toxicological Information

Toxicological Data:
O-Xylene:investigated as a reproductive effector. Mixed Xylenes: Oral rat LD50: 4300 mg/kg; Inhalation rat LC50: 5000 ppm/4H; Skin Rabbit LD50: > 1700 mg/kg; Irritation, skin rabbit: 500 mg/24-hour, moderate (Standard Draize); Irritation, eye rabbit 87 mg, mild (Standard Draize). Investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\--------

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
o-Xylene (95-47-6)	No	No	3

1.1312. Ecological Information

Environmental Fate:
Following data for xylene: When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. (mixed xylenes: octanol / water partition coefficient 3.1 - 3.2; bioconcentration factor = 1.3, eels)

Environmental Toxicity:
For xylene: This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

1.1413. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

1.1514. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: II
Information reported for product/size: 20L

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3.2
UN/NA: UN1307
Packing Group: II

Information reported for product/size: 20L

International (Air, I.C.A.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3.2
UN/NA: UN1307
Packing Group: II
Information reported for product/size: 20L

1.1615. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
o-Xylene (95-47-6)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	--Canada-- NDSL	Phil.
o-Xylene (95-47-6)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	-SARA 302- TPQ	------SARA 313----- List	------SARA 313----- Chemical Catg.
o-Xylene (95-47-6)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
o-Xylene (95-47-6)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 3[Y]
Poison Schedule: S6

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

1.1716. Other Information

NFPA Ratings: Health: 2 Flammability: 3 Reactivity: 0

Label Hazard Warning:
DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

Label Precautions:
Keep away from heat, sparks and flame. Avoid contact with eyes, skin and clothing. Keep container closed. Use only with adequate ventilation. Avoid breathing vapor. Wash thoroughly after handling.

Label First Aid:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Product Use:
Laboratory Reagent.

Revision Information:
Pure. New 16 section MSDS format, all sections have been revised.

Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF

****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

MSDS *Material Safety Data Sheet*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS
J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

1.1 P-XYLENE

MSDS Number: X2600 — *Effective Date: 01/18/01*

1.2 1. Product Identification

Synonyms: p-Dimethylbenzene; 1,4 dimethylbenzene; 1,4 xylene; p-xylol
CAS No.: 106-42-3
Molecular Weight: 106.18
Chemical Formula: C6H4(CH3)2
Product Codes:
J.T. Baker: 9498, X528
Mallinckrodt: 1949, 5450

1.3 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
p-Xylene	106-42-3	90 - 100%	Yes

1.4 3. Hazards Identification

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER.
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors may be irritating to the nose and throat. Inhalation of high concentrations may result in nausea, vomiting, headache, ringing in the ears, and severe breathing difficulties which may be delayed in onset. Substernal pain, cough, and hoarseness are also reported. High vapor concentrations are anesthetic and central nervous system depressants.

Ingestion:
Ingestion causes burning sensation in mouth and stomach, nausea, vomiting and salivation. Minute amounts aspirated into the lungs can produce a severe hemorrhagic pneumonitis with severe pulmonary injury or death.

Skin Contact:
Skin contact results in loss of natural oils and often results in a characteristic dermatitis. May be absorbed through the skin.

Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

Chronic Exposure:
Chronic inhalation can cause headache, loss of appetite, nervousness and pale skin. Repeated or prolonged skin contact may cause a skin rash. Repeated exposure of the eyes to high concentrations of vapor may cause reversible eye damage. Repeated exposure can damage bone marrow, causing low blood cell count. May damage the liver and kidneys.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, blood, or respiratory function may be more susceptible to the effects of the substance.

1.5 4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large

quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

1.6 5. Fire Fighting Measures

Fire:

Flash point: 27.2C (81F) CC
Autoignition temperature: ca. 528C (ca. 982F)
Flammable limits in air % by volume:
lel: 1.1; uel: 7.0
Flammable.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

1.7 6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

1.8 7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

1.9 8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limits (Xylene)
100 ppm (TWA)
-ACGIH Threshold Limit Value (TLV):
100 ppm (TWA), 150 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

1.109. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Characteristic odor.
Solubility:
Insoluble in water.
Specific Gravity:
0.86 @ 20C/ 4C
pH:
Not applicable.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
138C (280F)
Melting Point:
12 - 15C (54 - 59F)
Vapor Density (Air=1):
3.7
Vapor Pressure (mm Hg):
9 @ 20C (68F)
Evaporation Rate (BuAc=1):
0.7

1.1110. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Involvement in a fire causes formation of carbon monoxide and unidentified organic components.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents and strong acids.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

1.1211. Toxicological Information

Toxicological Data:
P-Xylene: oral rat LD50: 5000 mg/kg; inhalation rat LC50: 4550 ppm/4H; investigated as a reproductive effector.
Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\--

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
p-Xylene (106-42-3)	No	No	3

1.1312. Ecological Information

Environmental Fate:
Following data for xylene: When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. (mixed xylenes: octanol / water partition coefficient 3.1 - 3.2; bioconcentration factor = 1.3, eels)
Environmental Toxicity:
This material may be toxic to aquatic life. The LC50/96-hour values for fish are between 1 and 10 mg/l. The LC50/96-hour values for fish are between 10 and 100 mg/l.

1.1413. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

1.1514. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: XYLENES

Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 4L

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 4L

1.1615. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------------------------------
-

Ingredient	TSCA	EC	Japan	Australia
p-Xylene (106-42-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------------------------------
-

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
p-Xylene (106-42-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\---------------
-

	-SARA 302-		------SARA 313-----	
Ingredient	RQ	TPQ	List	Chemical Catg.
p-Xylene (106-42-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\---------------
-

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
p-Xylene (106-42-3)	100	No	Yes

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 3[Y]
Poison Schedule: S6

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

1.1716. Other Information

NFPA Ratings: Health: 2 Flammability: 3 Reactivity: 0
Label Hazard Warning:
DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.
Label Precautions:
Keep away from heat, sparks and flame.
Avoid contact with eyes, skin and clothing.
Keep container closed.
Use only with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly after handling.
Label First Aid:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Call a physician.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 9.
Disclaimer:

****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE

RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Appendix H

EHS Field Forms

H-1 Air Quality Monitoring Record

Air Quality Monitoring Record

Client:____________________________ **Project No.**:_______________________
Location:_________________________ **Site Eng.**:__________________________
Project Mgr.:______________________ **Site H&S Officer**:___________________

Date	Initial	Time	Location	PID/FID PPM	O$_2$%	LEL%	Dräeger Tubes			Other
							_____ _____	_____ _____	_____ _____	

H-2 Field Equipment Calibration/Maintenance Log

Field Equipment Calibration/Maintenance Log

Client:___________________________ **Project No.**:_______________________
Location:_________________________ **Site Eng.**:_________________________
Project Mgr.:______________________ **Site EHS Officer**:___________________

Date	Type of Equipment[1]	Equipment ID Number	Procedure[2]	Reference Standards[3]	Initials of Individual	Company	Calibration OK Yes/No

Maintenance Required/Procedures:____
____
____
____
____
____

[1] Certifications or statements of manufacturer calibration can be obtained from RETEC office files.

[2] Use space below if necessary

[3] Type of calibration gas used and concentration; buffer solutions, etc.

H-3 Confined Space Entry Permit

Confined Space Entry Permit

Client:	**Project Number:**
Location:	**Date:**
Project Manger:	**Site Engineer:**
Site EHS Officer:	
Location and Description of Confined Space:	
Purpose of Entry:	
Date of Entry:	**Termination Date:**
Description of Hazards of the Permit Space:	
Authorized Entrants:	
Authorized Attendants:	
Rescue Team Personnel/Outside Agency (Name and Address):	

Special Requirements	**Yes**	**No**
Lockout/Tagout		
Lines Broken-Capped or Blanked		
Purge-Flush or Vent		
Ventilation		
Secure Area		
SCBA or APRs		
Escape Harness		
Tripod Emergency Escape Harness		
Lifelines		
Fire Extinguishers		
Lighting		
PPE		
• **Level A, B, C, or D**		
• **Modifications**		
• **Communication System**		

Required Air Monitoring	PEL	Yes	No	Frequency (times/day)
% Oxygen	19.5 to 21%			
% LEL	0 to 10%			
Benzene	1 ppm			
Carbon Monoxide	50 ppm			
Aromatic Hydrocarbon	10 ppm			
Other:				
Note: If any reading exceeds the PEL designated, appropriate actions must be implemented before allowing anyone to enter the confined space.				
Name of Person Conducting Monitoring:				

***Note**: Continuous/periodic tests shall be established prior to initiation of site activities. Any questions pertaining to testing, contact Jim Colbert, Corp. EHS Manager (970) 493-3700.*

Instruments Used	Type	Yes	No	Calibration Date
PID	Photoionization			
Portable GC	Flame ionization			
LEL	Explosimeter			
Oxygen	% Oxygen			
Combustible Gas Indicator	LEL/O_2/H_2S/CO			
Sampling Tubes	Dräeger or equivalent			NA

Immediately prior to entry, conduct these tests three times at five-minute intervals at all levels of the confined space:			
	Test 1 Time	**Test 2 Time**	**Test 3 Time**
Oxygen Content (%)			
Flammability (% LEL)			
Toxic Gases (ppm)			

Describe in detail any ventilation systems to be used:____

____

____

On-site individual responsible for authorizing entry:
Name (please type):
Signature:

Confined Space Entry Permit Approval:
Name (please type):
Signature:
Date of Approval:
Duration of Permit Validity:

H-4 EHS Incident Report

EHS Incident Report

Section One: Background Information

Your Name ______________________

Today's Date ______________________

Project Name ______________________

Site Name ______________________

Project Manager ______________________

Project Number ______________________

Were there any witnesses to the incident? ☐Yes ☐No

If yes, list name(s)/office locations (including subcontractors):

____

____

Was weather a factor? ☐Yes ☐No

If yes, please describe weather conditions:

____

____

____

Section Two: Injury, Illness and Exposure

Was there an injury, illness or exposure associated with this incident?

☐ Yes ☐ No

If yes, please complete this section.
If no, please proceed to Section Three.

Name of Injured:	______	Job Title:	______
Male/Female:	______	Date of Hire:	______
Date of Birth:	______	SSN:	______
Date/Time of Injury/Exposure:	______	Time Employee Began Work:	______
Supervisor:	______	H&S Coordinator:	______
Log Number:	______	SSN:	______

Employee's Home Address: ______

NOTE: The Occupational Safety and Health Administration requires the above information for regulatory reporting.

Where did the incident occur (place name, address)?

Please describe the incident:

Was injured person/persons using required PPE? ☐Yes ☐No

Were there any unsafe conditions at the time of the incident? ☐Yes ☐No

If yes, please describe:

Please describe what the employee was doing just before the incident (was there an unsafe act involved?):

____

____

____

____

____

What was the severity of the injury / exposure:

☐First Aid Only ☐Medical Treatment Only ☐Fatality ☐Non-Occupational

What was the nature of the injury / exposure (please check):

☐Fractures
☐Respiratory Allergy
☐Heat Burns
☐Chemical Burns
☐Radiation Burns
☐Bruises
☐Bites
☐Blisters
☐Toxic Respiratory
☐Toxic Ingestion
☐Cold Exposure
☐Frostbite
☐Heatstroke
☐Other:
☐Heat Exhaustion
☐Exposure
☐Faint/Dizziness
☐Toxic Respiratory
☐Dermal Allergy
☐Ergonomic
☐Dislocations
☐Concussion
☐Abrasions
☐Lacerations
☐Punctures
☐Sprains

Parts of Body Affected (Specify Right/Left): ______________________________

Date medical care was received: ______________________________

Was employee taken to the emergency room? ☐Yes ☐ No

Was employee hospitalized overnight as an in-patient? ☐Yes ☐ No

Facility Where Medical Care Was Received:

Clinic/Hospital Name: ______________________________
Name of Attending Physician: ______________________________
Clinic/Hospital Address: ______________________________
Clinic/Hospital Telephone Number: ______________________________

Section Three: Environmental Incident

Did one of the following occur: a spill to land over one quart, any spill to surface water, a significant release to the air, a violation of permit conditions, receipt of Notice of Violation, or an event that causes potentially significant damage to the environment?

☐ Yes ☐ No

Did a RETEC employee directly contribute to the incident?

☐ Yes ☐ No

If yes to both, please complete this section. If no to either, the incident is not required to be reported to the RETEC EHS Department. Continue to Section Four.

What type of environmental incident occurred?

☐Spill to Land ☐Spill to Water ☐Release to Air ☐Permit Violation ☐Notice of Violation ☐Other

If other, specify:

Please describe the incident in detail:

If the incident was a spill or release, what material was involved and what amount?

Was there a violation of permit limits associated with the incident? ☐Yes ☐No

If yes, list permits and issuing agencies:

Were the required regulatory agencies notified? ☐Yes ☐No

If yes, which agencies were notified?

Section Four: Property Damage / Loss

Did the damage exceed $500.00?
☐ Yes ☐ No

If yes, please complete this section.
If no, the incident is not required to be reported to the RETEC EHS Department. Continue to Section Five.

What type of loss and/or property damage occurred?

☐Equipment Failure ☐Collision ☐Contamination ☐Weather ☐Fire ☐Vandalism/Theft ☐Other

If other, specify:

Describe the incident of loss or damaged property in detail (RETEC):

Describe the incident of loss or damage of property in detail (3rd Party):

Was a RETEC insurance representative contacted? ☐Yes ☐No

If yes, list name of agent and time

What was the approximate cost of the loss / property damage?

Section Five: Analysis and Corrective Action

Were there any behavioral factors that contributed to the incident? ☐Yes ☐No

If yes, please describe (describe any unsafe acts or conditions):

What can be done to prevent a recurrence of this type of incident?

List corrective actions that were taken to prevent this type of incident in the future:

Person Responsible for taking corrective action:

Forward this form within 24 hours to the following:

☐Environmental Health and Safety Department - Monroeville
☐Regional Manager - Local
☐Operations Manager - Local
☐Health and Safety Coordinator - Local

Employee's Signature Date

Employee's Supervisor Signature Date

PROJECT MANAGERS ARE REQUIRED TO SUBMIT A ROOT CAUSE ANALYSIS FOR ALL INCIDENTS.

H-5 Near-Miss Incident Report

RETEC

EHS Opportunity or Near Miss Report

Reported by: ______________________ Incident Date/Time: __________________________

Date Reported: ______________________ Site Location: __________________________

Report Type (please check one):

☐ EHS Opportunity (*suggestion for improvement, good EHS idea to share, or EHS observation*)
☐ EHS Near-Miss (*event that could have resulted in an incident under different circumstances)*

Event Description:

Describe key aspects such as the operation in progress, worker experience, potential outcome of event, and any contributing conditions. Use additional sheets as necessary.

____
____
____
____
____
____

Hazard Category (check all that apply):

☐ Slip/trip/fall
☐ Chemical
☐ Weather
☐ Improper PPE
☐ Other: ____
☐ Traffic/vehicle
☐ Electrical
☐ Not following procedures
☐ Improper body position/tool use
☐ Plant/Animal
☐ Faulty equipment
☐ Fire

Possible Outcome (check all that apply):

☐ Injury/illness ☐ Property damage ☐ Environmental release

Were you able to correct the problem?

☐ Yes ☐ No If no, whom did you inform:____________ ☐ N/A

Potential Outcome if Circumstances Occurred:

____
____
____

Corrective Action Taken:

____
____
____

Submit to: ☐ **EHS Coordinator – Local** ☐ **Corporate EHS – Monroeville**

H-6 Hot Work Permit

Hot Work Permit

Permit Valid
For 1 Work Day

Site Name:______________________________ **Project Number**:_________________________

EHS Officer:_____________________________ **Client**:__________________________________

Hot Work Description:____

____

____

Workers/Welders Conducting Hot Work:____

Permits MUST be completed in its Entirety Before Hot Work Begins

	Yes	**No**
Has project supervisor been notified of intended Hot Work?		
Does client representative need to be notified of the intended Hot Work?		
Will Hot Work impact the general public, clients, or operation employees?		
Will the intended Hot Work need to be coordinated with other contractors who may be working on the site to make them aware of any hazards and the scope of work to be performed?		
Have hazardous energy sources been identified, isolated, and locked out/tagged out before the start of the project?		
Will Hot Work be conducted within a confined space?		
All testing equipment (*i.e.,* CGI, oxygen meter, etc.) and firefighting equipment (*i.e.*, extinguisher, etc.) have been checked to ensure proper operation and calibration before the start of this project?		
Has a fire watch been designated and on station?		
Have coatings on metal surfaces been tested for ignitability and flame spread?		
Has the area been cleared of all flammable materials?		
Have all fuel sources been identified and protected?		
Has the area been restricted with proper barriers and signs?		
Has the area been tested to be certain that atmosphere is 0% LEL before starting Hot Work?		
Have flame sensitive areas and equipment (including cylinders and gas delivery lines) exposed to slag and sparks been protected by flame resistant blankets or removed from the area?		
Have all equipment and hoses been protected from falling metal structures and debris?		
Have escape routes been identified before starting work?		
Is ventilation equipment needed? Type needed:		

The Following Protective Equipment Will be Required:

	Yes	No		Yes	No
Welding Goggles/Shield Tint			Supplied Air Respirator		
Safety Boots			Head Protection		
Leather gloves			Safety Harness		
Hearing Protection			Welding Leathers – Top		
APR Cartridge			Welding Leathers - Bottom		

Permit Valid for 1 Work Day

The following procedures will be applicable prior to Hot Work on tanks or other types of enclosed structures. (Check all that apply and fill in appropriate information)

☐ Ventilate to 0% LEL

☐ Confined Space Entry Permit

☐ Mechanical Ventilation Required

☐ Cold Cut Only Method Allowed:____

☐ Hot Cutting Permitted Method Allowed:____

Inert to <____________% Oxygen

Approvals:

____
Date

____
Client Representative

____
RETEC Site Safety Officer

____
Fire Watch

____
Performed Hot Work Employee

File Permit in Project Work File and Environmental Health and Safety Department

H-7 Drill Rig Inspection Log

Drill Rig Inspection Log

Project Name:____________________________ **Project Number**:__________________________

Date:_____________________________________ **Subcontractor Audited**:____________________

Auditor:____

General Safety		
Safety Officer Designated for Job:	☐ Yes	☐ No
Name:		
Safety Meeting Performed (Daily)	☐ Yes	☐ No
Personal Protective Equipment (PPE)		
Hard Hats	☐ Yes	☐ No
Safety Glasses	☐ Yes	☐ No
Steel Toed Boots	☐ Yes	☐ No
Hearing Protection	☐ Yes	☐ No
Work Gloves	☐ Yes	☐ No
Orange Work Vests	☐ Yes	☐ No
Traffic Cones and Signs	☐ Yes	☐ No
Other	☐ Yes	☐ No
Disposal of PPE in Proper Waste Containers (if applicable)	☐ Yes	☐ No
Comments:		
Daily Inspections of Drill Rig:		
Structural Damage, Loose Bolts	☐ Yes	☐ No
Proper Tension in Chain Drives	☐ Yes	☐ No
Loose or Missing Guards, Fluid Leaks	☐ Yes	☐ No
Damaged Hoses and/or Damaged Pressure	☐ Yes	☐ No
Gages and Pressure Relief Valves	☐ Yes	☐ No
Comments:		

Check and test all safety devices such as:		
Emergency shutdown switches, at least daily	☐ Yes	☐ No
All gages and warning lights and ensure control levers are functioning properly	☐ Yes	☐ No
First Aid and fire extinguishers on drill rig	☐ Yes	☐ No
Back up alarm functioning properly	☐ Yes	☐ No
Comments:		

Drill Crew Training Requirements:		
40-hour OSHA Training	☐ Yes	☐ No
8-hour Annual Refresher Training	☐ Yes	☐ No
Drill Rig Training/Safe Operating Practices	☐ Yes	☐ No
First Aid/CPR	☐ Yes	☐ No
Emergency Procedures	☐ Yes	☐ No
Emergency Phone Numbers Posted	☐ Yes	☐ No
Site Orientation	☐ Yes	☐ No
Health and Safety Plan Review	☐ Yes	☐ No
Comments:		

Housekeeping:		
Suitable storage for tools, materials, and supplies	☐ Yes	☐ No
Pipes, drill rods, casing, and augers stacked on racks to prevent rolling and sliding	☐ Yes	☐ No
Platforms and other work areas free of debris materials and obstructions	☐ Yes	☐ No
Comments:		

Hand Tools:		
Tools in good condition	☐ Yes	☐ No
Broken tools discarded and replaced	☐ Yes	☐ No
Right tool used for the right job	☐ Yes	☐ No
Comments:		
Drilling Operations:		
Mast or derrick down when moving rig	☐ Yes	☐ No
Overhead obstructions identified before mast is raised	☐ Yes	☐ No
Drill rig stabilized using leveling jacks or solid cribbing	☐ Yes	☐ No
Secure and lock derrick	☐ Yes	☐ No
Comments:		
Overhead and Buried Utilities:		
Buried utilities identified and marked	☐ Yes	☐ No
Safe distance of drill rig from overhead power lines	☐ Yes	☐ No
Comments:		
Wire Line Hoists Wire Rope and Hardware:		
Inspection for broken wires where reduction in rope diameter, wire diameter, fatigue, corrosion, damage from gear jamming, crushing, bird caging, kinking	☐ Yes	☐ No
Inspect and lubricate parts daily	☐ Yes	☐ No
Comments:		

Auger Operations - What to look for:

- A system of responsibility between the operator and the tool handler when connecting and disconnecting auger sections and inserting and removing auger fork.
- During connecting and disconnecting auger sections and inserting auger for the tool, handler should position himself away from the auger column while it is rotating.
- When securing the auger to the power coupling, pin should be inserted and tapped into place using a hammer or other similar device.
- Tool hoist should be used to lower second section of auger into place.
- Both operators should be clear of auger as it is being lifted into place.
- Long-handled shovel should be used to move dirt away from auger.

Overall Summary:

H-8 Safety Task Analysis Review (STAR) Form

Identify Potential Hazards

☐ Abrasions
☐ Biological Hazards (Plants, Animals, Insects)
☐ Cave-in (Trench/Excavation Work)
☐ Chemical/Thermal Burn
☐ Cuts
☐ Dermatitis
☐ Dropping Materials/Tools to Lower Level
☐ Drowning/Flowing Water
☐ Dust
☐ Electrical Shock
☐ Elevated/Overhead Work
☐ Energized Equipment
☐ Fire
☐ Flammability
☐ Foreign Body in Eye
☐ Hazardous Materials (Exposure or Release)
☐ Heat or Cold Stress
☐ Heavy Equipment Operation
☐ Heavy Lifting
☐ High Noise Levels
☐ Impact Noise
☐ Inability to Maintain Communication
☐ Inclement Weather
☐ Overhead Work
☐ Overhead Utilities
☐Underground Utilities
☐ Pinch Points
☐ Pressurized Lines
☐ Slips, Trips, Falls
☐ Sprains/Strains
☐ Traffic
☐ Underground Utilities
☐ Confined Space
☐ New or Rental Equipment
☐ Surface Water Run-On/Run-Off
☐ Odor/VOC Emissions
☐ Compressed Gas Cylinders
☐ Generated Wastes (Solids/Liquids)
☐ Known/Unknown Visitors
☐ Visibility
☐ New Personnel
☐ Hoists/Rigging/Slings/Wire Rope
☐ Special Operations/Instructions (Attach)
☐ Ergonomics

Identify Controls

☐ Air Monitoring
☐ Barricades/Fencing/Silt Fencing
☐ Buddy System
☐ Appropriate Clothing/Monitoring of Weather
☐ Confined Space Procedures
☐ Decontamination
☐ Drinking Water/Fluids
☐ Dust abatement Measures
☐ Equipment Inspection
☐ Exclusion Zones
☐ Exhaust Ventilation
☐ Fall Protection
☐ Fire Extinguisher/Fire Watch
☐ Flotation Devices/Lifelines
☐ Grounds on Equipment/Tanks
☐ Ground Fault Interrupter
☐ Ground Hydraulic Attachments
☐ Hand Signal Communication
☐ Hazardous/Flammable Material Storage
☐ Hazardous Plant/Animal Training
☐ Hearing Protection (Specify)
☐ Hoses, Access to Water
☐ Hot Work Procedures
☐ Insect Repellent or Precautions
☐ Isolation of Equipment or Process (LO/TO)
☐ Stormwater Control Procedures/Methods
☐ Machine/Equipment Guarding
☐ Manual Lifting Equipment (Chain Falls)
☐ Protective Equipment (Specify)
☐ Proper Lifting Techniques
☐ Proper Tool for Job
☐ Radio Communication
☐ Respirator, (Specify Type)
☐ Safety Harness/Lanyard/Scaffold
☐ Sloping, Shoring, Trench Box
☐ Vehicle Inspection
☐ Spill Prevention Measures/Spill Kits
☐ Equipment Manuals/Training
☐ Emergency Procedures/Incident Management Plan
☐ Appropriate Labels/Signage
☐ Derived Waste Management Plan
☐ Visitor Escort/Orientation/Security
☐ Window Cleaning/Defrost
☐ Proper Work Position/Tools

Pre-Task Review (Yes/No/NA)

1. Has Job Hazard Analysis been completed and reviewed? _____
2. Is Job Scope understood by all Personnel? _____
3. Proper Safety Equipment on job site? ___
4. Permit Issued?
   What type? ☐ Hot Work
   ☐ Confined Space ☐ Excavation
   ☐ Other:___________________________
5. Proper Tools for Job on site? ______
6. Oxygen/Flammability checked? ________
7. Reviewed MSDSs for any hazardous substance that might be present? ______
8. Proper training for all personnel? ________
9. Are there any planned deviations from set procedures for equipment modifications? __ If so, contact supervisor to check applicability of MOC procedures.
10. Is there any work planned that could cause activation of emergency procedures? ___ If so, have these procedures been discussed and communicated?

Post-Task Review

1. Work area cleaned up?_________
2. All locks and tags removed and signed off by individuals?______________
3. Have Permits been turned in? ______
4. STAR submitted to EHS Department? ____________
5. Were there any unplanned deviations from set procedures or equipment modifications? _______________
   If so, contact supervisor to check applicability of MOC procedures.

The RETEC Group, Inc. Safety Task Analysis Review

(STAR)

Task Description:___________________

____

List Tasks:

____

____

____

____

____

____

____

____

____

____

____

____

____

Company: ___________________________

Completed By: ________________________

Date: _______________________________

Job Location:_____________________

____

List Additional Hazards (Hazards Not Shown with Check Box)

____

____

____

____

____

____

____

____

____

____

____

____

____

____

____

List Additional Controls (Controls Not Shown with Check Box)

____

____

____

Tailgate Meeting Topic

____

____

____

____

Signatures of Personnel on Task Analysis Review/Tailgate Meeting:

____

____

____

____

____

Mentor Assigned to Work

____

____

____

Lessons Learned (Based on changes in conditions, EHS Near- Incidents/ Observations, Potential Emergencies)

Is there a better/safer way to perform the work/task?

____

____

____

Supervisor Review (date/Time): ____________

EHS Review (date/time):_________________

Comments:

H-9 Job Hazard Analysis (JHA) Form

Job Hazard Analysis (JHA) Form

Job/Operation	JHA No.	JHA Status	Page______ of _____	☐ New Revision No.:___________

Analysis by:	Reviewed & Approved by:	Process/Machine Equipment:
Employee Position Title:	Approval Date:	Recommended/Required PPE:
Department/Division:	Annual Review Date:	Special Hazards:

Sequence of Basic Job Steps		**Potential Hazards/Accidents**		**Recommended Safe Job Procedures**	
Step #		Step #		Step #	

H-10 Field Equipment/Tool Inspection Checklist

Field Equipment/Tool Inspection Checklist

Equipment/Tool Inspected: ______________________________

Site: ______________________ **Inspected by:** ______________________

Date: ______________________ **Title:** ______________________

Item #	Item Inspected	Description	Pass	Fail	N/A
1	Equipment Operator	Equipment operator has had proper training and is familiar with equipment and operational features.			
2	Hydraulic Lines	Hydraulic lines are secure and no leaks. Hoses are in good condition with no cracks or breaks.			
3	Pipe, Hoses, and Fittings	Discharge hoses and pipes are secure and no leaks. Fittings are tight, secure, and not leaking.			
4	Power/Extension Cords	Power/extension cords are in one piece with no frays or breaks. Plug ends are in good working order.			
5	GFI and Grounding	A ground fault interrupter is in place for electrical equipment and is in good working order. Grounding cable in place and operable for drilling or liquids transfer.			
6	Safety Guards	All equipment/tool safety guards are in place and in operation. Rotating and thermal guards.			
7	Windows and Mirrors	Equipment windows and mirrors are in good condition to ensure operator visibility.			
8	Wheels and Tires	Equipment wheels and tires are in good working order. Proper inflation.			
9	Engine Oil Fluids	Engines or motors are properly lubricated and cooled. No leaks are present. Oil and coolant levels full.			
10	Tool Handles	Tool handles are secure and not broken. Grips are not worn or missing.			
11	Blades	Cutting blades are sharp and securely fastened			

Item #	Item Inspected	Description	Pass	Fail	N/A
		to the equipment or tool.			
12	**Fall Protection**	**Harnesses and lifelines are secure and in good condition. Buckles and fasteners in good condition.**			
13	**Ingress and Egress to Equipment**	**Steps, handrails, etc. are secured and functioning properly. Steps are free of ice and mud.**			
14	**Lights and Signals, Alarms**	**Lights and signals operate properly. Backup alarm working properly.**			
15	**Lockout/Tagout**	**Battery disconnect switch in place to prevent unauthorized use. Lockout/tagout system in place to prevent energizing.**			
16	**Fire Extinguishers**	**Fire extinguisher in place, or available close by, for emergency fire protection.**			
17	**Ignition and Controls**	**Ignition and controls intact with no loose wiring.**			

Notes (Reference Item#)

Appendix I
Completed Site-Specific Job Hazard Analysis (JHA)

RETEC Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☒ New ☐ Revised	**Date:** 8/1/06

Work Activity: Well installation and sediment sampling.

Personal Protective Equipment (PPE): Modified Level D PPE, including personal floatation devices (PFDs) and Tyveks as necessary, Level C PPE including a half- or full-face respirator as necessary.

Development Team	Position/Title	Reviewed By	Position/Title	Date
Scott Hauswirth/Jesse Lloyd	Geologist	Jennifer Koch	Environmental Scientist/ EHS Coordinator	8/1/06

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]

1 – Target number of job steps: six to ten

2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

1. Equipment mobilization/ jobsite setup	• New personnel (RETEC staff new to process, contractor staff new to site) • Physical Site Hazards as listed below: 1. Heat Stress/Cold stress 2. Heavy equipment operation 3. Heavy lifting of equipment parts and supplies 4. Impact noise from setup/assembly of equipment 5. Slips/trips/falls 6. Third party vehicle and pedestrian traffic 7. Pinch points/hand injuries 8. Poisonous plants (Poison Ivy) 9. Hazards posed by trespassers at the site 10. Water safety • Emergency Scenarios	• Project kickoff meeting with contractors, daily EH&S meetings o Review HASP, including MSDS sheets for BTEX, coal tar, Portland cement, and bentonite; o Daily completion of STAR forms with input from entire field team • Control measures for physical hazards as listed below: 1. Appropriate clothing for weather/personnel monitoring/breaks/hydration. 2. Inspect vehicles and equipment prior to use. Establish and control traffic patterns, backup alarms, eye contact with operators prior to approaching equipment. 3. Proper lifting techniques. Use mechanical methods when possible (drum dolly, hydraulic equipment, etc.) Use two or more people to lift heavy or awkward objects. 4. Hearing protection during work involving elevated noise levels. 5. Proper house keeping and site layout. 6. Vehicle traffic control signage, cones and barricades. Prohibit access to any unknown visitors. 7. Identify all pinch points, proper use of tools for intended purposes, protective leather gloves during physical work, general hand safety 8. Be aware of surroundings, site conditions. Be familiar with identification of poisonous plants. 9. Use of the buddy system at all times. 10. Use of PFD's within 10' of the water and in the boat. • Easy access to cellular telephones, emergency phone numbers, hospital route maps, eye wash, fire extinguishers, MSDS. Clearly identify roles/responsibilities in emergencies.

1 – Target number of job steps: six to ten

2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

2. Drilling/Well installation (Including direct-push drilling), test trench excavation.	1. Pinch points/hand injuries 2. Noise 3. Struck by equipment 4. Slip/trip/fall same level 5. Contact with overhead and underground utilities 6. Contact with and exposure to potential hazardous material 7. Inhalation of dust or chemical vapors 8. Slip/trip/fall below 9. Exposure to decon. materials.	1. Identify all pinch points, proper use of tools for intended purposes, protective leather gloves during physical work, general hand safety 2. Wear hearing protection during drilling operations. 3. Eye contact with operator prior to approaching equipment. Inspect equipment prior to use. 4. Proper housekeeping and site layout. Awareness of site conditions. 5. Locate utilities prior to beginning work. Contact local utility companies. Use utility maps for utility location along with markouts. 6. Proper PPE, including gloves, safety glasses/goggles, Tyvek (if necessary), and splash shields during air rotary drilling (if necessary). Level D PPE as identified in HASP. 7. Air monitoring for dust and VOCs with appropriate responses to elevated levels as listed in HASP. Respirators readily available on site. Personnel fit tested. Familiarize staff with MSDS for all chemicals on site. 8. Awareness of trench edge. Personnel not digging, needs to stay 2' from edge. 9. Proper PPE, follow MSDS and Level D PPE identified in HASP.
3. Material Handling	1. Contact with solids/liquids. 2. Spillage of material with subsequent migration via stormwater/wind	1. Wear proper PPE. Have portable eye wash stations readily available. Use caution when working with potentially hazardous materials. Be familiar with MSDS for materials brought to site (cement, bentonite, etc.). Prohibit eating, drinking or tobacco use in/near exclusion zone. Proper decon procedures. 2. Spill response equipment available and discussion of spill response during project kickoff meeting.

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

4.) Sediment sampling	1. Slip/trip/fall to same level and/or below (Drowning/ Person Overboard) and SB tools/equipment o Contacted by/caught in pinch point while using hand tools. 2. Contact with electrical energy 3. Contact with Hazardous Plants, Insects, and Animals	1. When working in river, wear appropriate footwear (waders), gloves, and PFD. o Wear PFD at all times while on the deck of the vessel. o Use Emergency response procedure with person overboard and have a throw ring PFD available. o Hold handrails when getting on and off boat. o Do not perform tight maneuvers at high speed. o Orient boat perpendicular to waves to prevent excess rocking. o Housekeeping. Be aware of your location at all times. Be aware of trip hazards. o Conduct a safety briefing on boat hazards prior to sampling activities. o Be aware of the presence/potential of underwater debris (sharp edges, rebar, concrete, etc.) o Care should be taken while collecting samples using a spade or similar sample. Use heavy duty work gloves when applicable. o Maintain eye contact with boat operator and other boat drivers (if present). o Employ buddy system. o Stay in communication (cell phone) with co-workers. 2. Use operable GFCIs for any hand tool (remember to use it between the energy source and the extension cord – not the cord and the tool). o Keep any electrical equipment/tool away from wet surfaces and pond water body 3. Wear Level D PPE as specified in the HASP, be aware of surroundings with animals.
5.) Work on shore near bank (steep slope to water)	1. Slip/trip/fall to same level and/or below.	1. Where appropriate footwear (steel-toe boots with heel, good soles). Use of PFD's within 10' of the water and in the boat. Wear life jacket when working very close to top of bank. - Be aware of terrain, including groundhog holes, debris, etc. - Use buddy system.

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP
Page 4 of 5

6.) Sample handling, packaging, and processing	1. Boat Capsizing/Use of Boats 2. Exposure to toxic substances 3. Dermal contact with contaminated media 4. Ingestion of contaminated media 5. SB sampling equipment aboard the vessel 6. Slip, Trip, and FS on wet or oily surfaces and over equipment 7. Caught in/Contact with tools	1. Do not perform tight maneuvers at high speed. o Distribute weight in boat uniformly and avoid sudden shifts to one side of boat. o Be aware of changing weather conditions. o Ensure that personnel working from or in boats are familiar and competent with boat operation and boating safety. o Operator to complete Boating Safety Operator's Checklist prior to launching boat. o Boating Safety Maintenance Checklist and Health and Safety Representative's Checklist to be completed at a minimum of once a week 2. Be alert during sampling to avoid splashing. o Wear proper PPE including protective gloves, protective coveralls, and safety glasses. o On exposure, rinse immediately with fresh water o Compliance with SOIs/SOPs regarding the collection of samples 3. Wear a hard hat at all times on the vessel. o Obey the instructions of the vessel captain. o Keep proper clearance from equipment. o Never approach equipment without establishing eye contact with operator. o Establish protocol for hand and arm signals. 4. Wear appropriate slip-resistant boots with a steel toe. 5. Only the necessary personnel should be in the area of operation. 6. Always return equipment to proper storage location on the vessel. 7. Store coolers out of the walkway o Coil up anchor ropes when not in use. o Use heavy duty work gloves when applicable to prevent hand injuries.
7. Jobsite cleanup/demobilization	1. Overexertion when picking up equipment. 2. See Activity 1 above for Physical Hazards and Emergency Scenarios 3. See Activities 4 and 5 above for Exposure Hazards, High Pressure Hoses, and Spillage.	1. Use proper lifting techniques when moving packed coolers, packing equipment, etc. o Have two personnel carry heavy or awkward items.

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Appendix J

Schedule E

Safety Rules for Contractors

SCHEDULE E

SAFETY RULES AND REGULATIONS FOR CONTRACTORS
(CONTRACT ATTACHMENT)

SAFETY RULES AND REGULATIONS FOR COMPANY AND IT'S AFFILIATES CONTRACTORS
8/19/05

COMPANY and it's affiliates's intent in issuing this document is to provide the Contractor with minimum safety requirements. when working on COMPANY Projects. All work performed shall be in accordance with COMPANY contract specifications.

Contractors shall comply with all applicable federal, state, local and COMPANY standards, ordinances, regulations and the rules and regulations of any agency having jurisdiction on the premises. In the case of conflicting requirements, the most stringent shall prevail. Each Contractor shall have a current written safety program. The document will be made available upon request by COMPANY. The Contractor shall immediately correct any conditions deemed unsafe by COMPANY.

All contractors and subcontractors shall be properly trained. These records shall be made available upon request.

Contractors shall communicate the required safety rules and regulations to their employees in a documented tailboard meeting prior to the start of the job. Contractors are responsible for interpreting these rules for non-English speaking and reading-impaired employees.

Contractors are responsible for informing all subcontractors of the safety rules and regulations set forth here and in the contract terms and conditions.

All questions pertaining to this document shall be directed to the local COMPANY Project Monitor or COMPANY's Health and Safety Representative.

A. <u>ACCIDENTS</u>

1. The COMPANY Project Monitor shall be notified immediately of any accidents involving personal injury or property damage. Appropriate reports shall be completed in 1 working day.
2. All work must be done in a manner which minimizes the possibility of a spill of hazardous or non-hazardous substance to the environment. Equipment may not be fueled, greased or oiled within 100' of any water source. Storage of fuels, oils, chemicals and sanitary facilities shall be confined to at least 500 ft from water sources, wells, or other ecological sensitive sites. Any spill must be immediately reported to the COMPANY Project Monitor and the appropriate authorities. Contractor is responsible for all associated clean-up costs, penalties, etc.

B. <u>ASBESTOS</u> (ref: 29 CFR 1926.1101 and 1910.1001)

Contractors shall not disturb known or suspected asbestos-containing materials. When these materials are encountered and could potentially be disturbed by the work being performed, work should immediately be stopped. The Contractor shall immediately notify the COMPANY project monitor.

C. COMPRESSED AIR / AIR TOOLS (ref: 29 CFR 1926.302 and 1910.243)

The contractor will comply with the standards for compressed air equipment used in providing compressed air for performing operations such as cleaning, drilling, hoisting and chipping.
Pneumatic power tools shall be secured to the hose in a positive manner to prevent accidental disconnection.
Safety clips or retainers shall be securely installed and maintained on pneumatic impact tools to prevent attachments from accidentally expelled.
The manufacture's safe operating pressure for all fittings shall not be exceeded.
All hoses exceeding ½ -inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of failure.

D. CONFINED AND ENCLOSED SPACES (ref: 29 CFR 1926.21,1910.269(e) and 1910.146)

The Contractor is responsible for complying with all applicable confined-space and enclosed space work practices and standards. Contractor employees working in confined/enclosed space conditions must have demonstrated competency in proper work practices and rescue techniques (achieved by training and experience). The Contractor shall have a means of emergency rescue arranged prior to start of work and must check with the local fire department or agency expected to provide rescue assistance as to their availability prior to entering space.

E. CRANES (ref: 29 CFR 1926.550,1910.179,and1910.180)

The Contractor shall not use COMPANY cranes. Specific exceptions to this rule shall be written and made part of the contract. Qualified employees, with licenses when required, will operate Cranes. If a license is required, the operator will have the license with them when operating subject cranes. Lift plans may be necessary before work begins. Documentation will be submitted to the COMPANY project monitor upon request.

F. DRUGS AND ALCOHOL (ref: 49 CFR 382)

1. Possession or use of controlled substances or alcohol is strictly prohibited on COMPANY premises or while working for COMPANY. Reporting to work on COMPANY property under the influence of unauthorized drugs or alcohol is strictly prohibited; any person under the influence of unauthorized drugs or alcohol shall not be permitted on the premises of a COMPANY project.
2. When applicable, Contractors must comply with U.S. Department of Transportation regulations. The contractors written program and demonstratable random sampling program for Drugs and/or Alcohol shall be made available upon request.

G. ELECTRICAL (ref: 29 CFR 1926.402-408, 416, 417; 29 CFR 1926, subpart V, and 1910.269)

1. Only authorized and qualified personnel shall work on installation and maintenance of electrical equipment. The project monitor may request documentation of employee qualification.
2. All equipment used shall have required approvals and be free from known defects.
3. The Contractor will utilize a lockout/tagout procedure or recognized isolation/tagging procedure, as specified by COMPANY. GFCI's (ground fault circuit interrupters) shall be used for all electrical tools and equipment.
4. All non-qualified Contractor employees and equipment shall stay a minimum of 10 feet away from overhead, energized lines. Non-qualified Contractor employees are not permitted to enter an energized substation unless qualified personnel accompany them.

5. Mobile radio antennas shall be lowered prior to taking any vehicles inside a substation.
6. No metal measuring tapes or tapes containing a metal wrap shall be used near energized circuits, equipment, poles or substation structures. Metal tapes may be used at the project monitor's discretion for making critical measurements at ground level or on dead and grounded portions of the structure.
7. Metal tools utilizing cable slings, winch cable, chains, loose sections and ends of conductors, or other similar objects, shall be kept under control by the worker to prevent contact with energized conductors or equipment and the worker's body.

H. EXCAVATIONS (ref: 29 CFR 1926.650-652, 1926.800, and 1926.956)

1. The general requirements of the OSHA 1926.650, 651, 652 excavation standard, including the provision for a competent person, shall be understood and followed by all Contractor employees.
2. All excavations that workers may enter that are 5 feet or more in depth, or a depth where there is danger of cave-in shall be protected by a shoring or shielding system, or by a benching or sloping system.
3. Materials shall not be stored closer than two (2) feet from the edge of a trench or excavation and mobile equipment shall not be operated in close proximity to the edge unless extra precautions are taken to shore or slope the walls back to a stable slope.

Requirements include but are not limited to the following items:

- contractor shall provide adequate barriers/barricades (special considerations for excavations left overnight)
- air monitoring where indicated
- advance notification to Underground Facilities Protective Organization (e.g. Dig Safe)
- providing adequate access and egress
- hand dig when within two feet of any underground facility

4. The Contractor shall promptly notify appropriate utilities of any damage done, prior to closing the trench.

I. FIRE REGULATIONS (ref: 29 CFR 1926.150, 152, 1910.38, 1910.39, 1910.157)

1. Contractors shall provide fire extinguishers, sealed, fire service ready, inspected and in good working order and properly maintained at all times when live gas work is being done. At least one 20-pound dry chemical fire extinguisher shall be on the ground near the edge of the excavation.
2. Contractors shall provide a trained fire watch as dictated by the job hazard assessment.
3. When required, hot work permits shall be obtained from the COMPANY project monitor for such activities as welding, cutting, burning, anything that causes a spark, uses an open flame, or involves temperatures high enough to ignite combustible materials.
4. All acetylene and oxygen cylinders shall be stored and used in accordance with OSHA regulations (ref: 29 CFR 1926.350), and transported per DOT specifications. Flashback arresters shall be installed at the welding tip and at the regulator.
5. Open flames, sparks or smoking shall be prohibited in areas so marked or designated, and where a recognized combustible/flammable hazard exists.
6. Fire detection and/or suppression systems shall not be disabled or blocked without notifying the COMPANY project monitor and obtaining his/her consent.
7. Flammable/combustible material shall be stored in approved containers and locations. Quantities in excess of one day's use shall be reported to the COMPANY project monitor.

J. <u>HAZARD COMMUNICATION</u> (ref: 29 CFR 1926.59 and 1910.1200)

1. The Contractor must have a written program that complies with OSHA's Hazard Communication standard.
2. Contractors shall provide to the COMPANY project monitor a list of chemicals and Material Safety Data Sheets (MSDS) for each chemical that they will bring on COMPANY property or use on a COMPANY project.
3. Contractor chemical containers will be properly labeled.
4. All unused chemicals, which Contractors have brought onto COMPANY property or used for a project, shall be the responsibility of the contractor to properly dispose of and/or remove.
5. The COMPANY project monitor shall make Contractors aware of COMPANY's Hazard Communication Program, notify them of any chemicals that they may be exposed to while working on COMPANY property, and provide access to the applicable MSDS.

K. <u>PCB FLUIDS (POLYCHLORINATED BIPHENYL FLUIDS)</u> (40 CFR 761)

PCB fluids were used as an electrical insulating fluid (transformers, regulators, capacitors, PTs, CTs) and in addition can be found in the gas distribution system in gas pipe, distribution equipment, (filters, separators, drips, meters, and regulators) and gas condensate/pipeline liquids. When these materials are encountered and could potentially be disturbed by the work being performed, work shall immediately be stopped. The Contractor shall immediately notify the COMPANY project monitor.

L. <u>HAZARDOUS WASTE (ref: 40CFR 260)</u>

Contractor is responsible for the removal and proper disposal of all hazardous waste they generate.

M. <u>HOUSEKEEPING</u> (ref: 29 CFR 1926.25)

1. Good housekeeping practices shall be strictly adhered to daily. The work site shall be kept clean and orderly.
2. Trash shall be promptly removed from the work site and from the customer's property.
3. Boards with protruding nails shall not be left lying around. All nails shall be withdrawn or hammered down.
4. Contractors shall not block means of access or egress, or safety equipment.

N. <u>LADDERS AND SCAFFOLDING</u> (ref: 29 CFR 1926.451, 1050-1053, 1060, 1910.27)

1. Contractors shall not use COMPANY ladders without permission from the COMPANY project monitor.
2. Contractors are required to furnish their own ladders and equipment free of defects. Specific exceptions to this rule shall be written and made part of the contract.
3. All straight and extension ladders shall be properly maintained and equipped with approved safety feet.
4. Ladders made of conductive materials shall not be used while working in proximity to energized electrical facilities.
5. All scaffolding erection and use shall be in compliance with OSHA standards. A professional engineered approval of scaffolding plan(s) shall be submitted as required.

O. <u>LEAD</u> (ref: 29 CFR 1926.62 and 1910.1025)

Contractors shall not disturb known or suspected lead-containing materials. When these materials are encountered and could potentially be disturbed by the work being performed, work shall be stopped immediately. The Contractor shall immediately notify the COMPANY project monitor.

P. **MEDICAL SERVICES** (ref: 29 CFR 1926.50)

1. When a medical facility is not reasonably accessible for the treatment of injured employees, personnel trained to render first aid and CPR shall be available at the worksite. The personnel designated to provide CPR and first aid must have current certifications and must carry evidence of their training while on site.
2. First aid supplies approved by a consulting physician shall be readily available at the worksite.

Q. **MOTOR VEHICLES** (ref: 29 CFR 1926.600-02)

1. Contractors shall not use COMPANY vehicles without permission. Contractors shall transport employees in a safe manner (e.g., riding in the back of a pick-up and in places other than the operator's seat, (i.e., a backhoe bucket or fender) is prohibited).
2. Contractor employees shall possess the necessary license classification for vehicle(s) being driven.

R. **OVERHEAD WORK** (ref: 29 CFR 1926.500-503)

1. Personnel shall be protected from falling tools, equipment and material.
2. All girders, beams and overhead surfaces shall be kept free of loose material.

S. **PERSONAL SAFETY EQUIPMENT** (ref: 29 CFR 1926.28,52,95,100-103,353,500-503, 1910 Subpart I)

1. Eye and Face Protection - Approved and appropriate eye and/or face protection shall be worn at the worksite. Personnel involved in welding operations shall wear eye protection with filter lenses or plates of the proper shade number. The eye and face protection must meet the requirements of ANSI Z87.1-2003.
2. Head Protection - OSHA approved hard hats shall be worn at the work site. Bump caps, metal hard hats, and metal hard caps are prohibited.
3. Clothing - Contractors employees shall be properly clothed at all times. Natural fabric clothing or flame retardant clothing is required while working on energized gas pipelines, energized electrical equipment and whenever a flame hazard exists.
4. Gloves - Suitable gloves will be worn when there is a potential for hand injury.
5. Foot Protection – Safety shoes and boots that meet the guidelines of ANSI Z41-1991 must be worn whenever exposed to crushing hazards.
6. Hearing Protection - All personnel subjected to sound exceeding OSHA permissible noise exposures shall have available and wear appropriate hearing protection.
7. Respirators - The contractor shall provide respirators based on the hazard encountered. Contractor respirator use will be in compliance with OSHA requirements.
8. Fall protection - Whenever work site conditions involve a potential for a fall hazard of 4 feet or more, the contractor shall use appropriate fall protection.

T. **RADIATION** (ref: 29 CFR 1926.53, 1910.96, 1910.97, 1910.1096, 10 CFR 19,20,32-36,39)

1. The Contractor shall inform the COMPANY project monitor whenever an ionizing radiation source is used.
2. The COMPANY project monitor will inform the Contractor when work is necessary near a COMPANY ionizing radiation source.
3. If work is required in the proximity of an ionizing radiation source, the Contractor shall comply with all applicable regulations.

U. **TOOLS** (ref: 29 CFR 1926.300-305, 1910.242)

1. Contractors shall not use COMPANY tools without permission.
2. Tools shall be kept defect free and if defects are found, immediately taken out of service.
3. Tools shall be maintained as per manufacturer's specifications and governing regulations.
4. Tools shall not be retrofitted or changed.

V. **WATER** (ref: 29 CFR 1926.106)

When Contractors work over or near water and where the danger of drowning exists, the contractor must comply with all provisions of OSHA (i.e., training, Coast Guard approved life jackets, ring buoys, skiffs, fall protection etc.).

W. **WORK AREA PROTECTION** (Flagging) (1926.201)

1. Contractors shall use adequate work area protection. All work area protection shall be in accordance with the Manual of Uniform Traffic Control Devices.
2. All contractors working in the road right-of-way:

   a. Must wear high visibility clothing or reflective vests.
   b. Shall use reflective vests for flagging and night work.

X. **MISCELLANEOUS REQUIREMENTS** (ref: 29 CFR 1926.20-21)

1. Contractor employees shall not enter any building or area where their work does not require their presence.
2. Firearms and weapons are forbidden on COMPANY work sites or property.
3. Unauthorized explosives or explosive materials are forbidden on COMPANY work sites or property.
4. The Contractor shall maintain current safety and health signs and erect new ones if the hazard changes. The contractor shall also remove signs from the work site when there is no longer a hazard present.
5. The Contractor shall have a program to provide for frequent and regular inspections of the job site, materials, and equipment by designated competent persons.
6. The Contractor shall instruct each employee in the recognition and avoidance of unsafe conditions and in the regulations applicable to his/her work environment to control or eliminate any hazards or other exposure to illness or injury.
7. The Contractor shall permit only those employees qualified by training or experience to operate equipment and machinery.

SPECIFIC REQUIREMENTS BY COMPANY AND IT'S AFFILIATES AND THE TYPE OF WORK BEING PERFORMED

S.A.1. **ELECTRIC POWER GENERATION, TRANSMISSION AND DISTRIBUTION WORK** (ref: 29 CFR 1910.269)

1. Contractor shall comply with the operation and maintenance of electric power generation, control, transformation, transmission and distribution lines and equipment including;

   - Job briefing requirements
   - Line clearance tree- trimming operations including brush chippers and chain saw use.
   - Specific training including Skills and Techniques necessary to perform this work
   - Hazardous energy control (lockout/ tag out) procedures
   - Enclosed spaces
   - Fall protection
   - Tools and equipment including Live-line tools
   - Working on or near exposed energized parts

- Minimum approach distance
- Grounding for the protection of employees
- Work involving overhead lines including installing and removing lines
- Substation work activities including entry and Job Briefings

Line workers contracted to work on COMPANY's transmission and distribution lines are required to also work in accordance with the safety rules outlined in the transmission and distribution section of COMPANY's Accident Prevention Manual. This does not apply to companies covered by separate mutual aid agreements.

Tree contractors working for COMPANY will be required to work in accordance with the latest American National Standard Institute (ANSI) safety requirements for tree care operations involving pruning, trimming, repairing, maintaining and removing trees and cutting brush.

S.B.2. <u>HELICOPTER REGULATIONS</u> (ref: 29 CFR 1926.551, 1910.183)

1. Contracted Helicopter's shall be expected to comply with any applicable regulations of the Federal Aviation Administration.

- Briefing: Prior to each day's operation a briefing shall be conducted. This briefing shall set forth the plan of operation for the pilot and ground personnel.
- Personal protective equipment for employees shall consist of complete eye protection and hard hats secured by chinstraps.
- Loose fitting clothing likely to flap in the downwash, shall not be worn.
- Every practical precaution shall be taken to provide for the protection of the employees from flying objects in the rotor downwash. All loose material within 100 feet shall be secured or removed.
- No unauthorized person shall be allowed to approach within 50 feet of the helicopter when the rotor blades are turning.
- Whenever approaching or leaving a helicopter with blades rotating, all personnel shall remain in full view of the pilot and keep in a crouched position. Personnel shall avoid the area from the cockpit or cabin rearward unless authorized by the helicopter operator to work there.
- There shall be constant reliable communication between the pilot, and a designated person of the ground crew who acts as a signalman. This signalman shall be distinctly recognizable from other ground personnel.

S.C.3. <u>GAS OPERATIONS/ PERSONAL PROTECTIVE EQUIPMENT IN POTENTIALLY HAZARDOUS ATMOSPHERES</u>

- A copy of the COMPANY procedures will be provided if the work involves encountering a potentially hazardous atmosphere requiring the use of personal protective equipment. This will include a copy of the Personal Protective Equipment Matrix.
- This procedure describes specific requirements for working in an atmosphere, which may be hazardous due to the presence of natural gas or oxygen deficiency (asphyxiation hazard). This procedure is applicable to all phases of operation, maintenance and construction of the gas system.
- The provisions of other programs or procedures may apply to situations that are covered by this procedure. These may include but are not limited to Excavation Safety, Respiratory Protection, Confined Space Entry, and Chemical Safety.
- All equipment shall be utilized in accordance with this procedure and in good condition, properly maintained and present at the work site.

COMPANY AND IT'S AFFILIATES

CONTRACTOR'S SIGN-OFF SHEET

NOTE: The Working Rules for Contractors shall be read and understood and the sign-off sheet completed before arrival on the job site.

NAME OF CONTRACTED CO.:	
DATE THE WORK STARTED:	
DESCRIPTION OF THE WORK:	
NAME OF THE COMPANY SUPERVISOR WHO IS RESPONSIBLE FOR THIS JOB:	
NAME OF THE CONTRACTOR SUPERVISOR RESPONSIBLE FOR THIS JOB:	

DATE	NAME (please print)	SIGNATURE

SCHEDULE F

Notices

Along with all other correspondence requirements included in this Agreement, any notice, request, approval or other document required or permitted to be given under this Agreement shall be in writing and shall be deemed to have been sufficiently given when delivered in person or deposited in the U.S. Mail, postage prepaid, addressed as specified herein or to such other address or addresses as may be specified from time to time in a written notice given by such party. The parties shall acknowledge in writing the receipt of any such notice delivered in person.

All communications to COMPANY shall be directed to:

Utility Shared Services Corporation
89 East Avenue
Rochester, New York 14649

All communications to CONTRACTOR shall be directed to:

The Retec Group, Inc.
1001 W. Seneca Street, Suite 204
Ithaca, New York 14850