GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

Remedial Investigation Work Plan

Canastota Non-Owned Former MGP Site

Canastota, New York
Site #V00477

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Abbreviations and Acronyms

ASP	Analytical Services Protocol
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BTU	British Thermal Unit
CAMP	CommunityAir Monitoring Plan
COC	Constituents of Concern
CSM	Conseptual Site Model
DNAPL	Dense Non-aqueous Phase Liquid
DPW	Department of Public Works
DUSR	Data Usability Summary Report
EDR	Environmental Data Resources, Inc.
FSP	Field Sampling Plan
GEI	GEI Consultants, Inc.
GPR	Ground Penetrating Radar
Hartgen	Hartgen Archaeological Associates, Inc.
HASP	Health and Safety Plan
HSA	Hollow-Stem Auger
LNAPL	Light non-aquious phase liquid
MGP	Manufactured Gas Plant
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSL	mean sea level
MTBE	Methyl Tertiary Butyl Ether
NAPL	Non-aqueous Phase Liquid
NCP	National Contingency Plan
NGVD29	National Geodetic Vertial Datum of 1929
NYSAWQS	New York State Ambient Water Quality Standards
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSOPPRH	New York State Office of Parks, Recreation and Historic Preservation
PAH	Polycyclic Aromatic Hydrocarbon
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QHHEA	Qualitative Human Health Exposure Assessment
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RSCO	Recommended Soil Cleanup Objectives
SC	Site Characterization
SCO	Soil Cleanup Objective

SVI	Soil Vapor Intrusion
SVOC	Semivolatile Organic Compounds
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
U.S. EPA	United States Environmental Protection Agency
VCO	Voluntary Consent Order
VOC	Volatile Organic Compound

MEASUREMENTS

mg/kg	Milligrams Per Kilogram
MSL	Mean Sea Level
ppb	Parts Per Billion
µg/kg	Micrograms Per Kilogram
µg/l	Micrograms Per Liter
µg/m^3	Micrograms per cubic meter

1. Introduction

This Remedial Investigation (RI) Work Plan has been prepared for the National Grid Company (National Grid) by GEI Consultants, Inc. (GEI) for the Canastota Non-owned Former manufactured gas plant (MGP) site located in the Village of Canastota, Madison County, New York. The location of the site is shown on Figure 1.

The investigation of the site is being conducted pursuant to a Voluntary Consent Order (VCO) between National Grid and the New York State Department of Environmental Conservation (NYSDEC), Index # D0-0001-0011, which was executed on July 3, 2001, 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).

The former MGP process area is now occupied by the Village of Canastota Department of Public Works (DPW) garage building and a portion of their operations yard, with a smaller portion of the MGP on the adjacent property of the Greater Lenox Ambulance Company. During the investigation work performed in this area in 2003 and 2005, MGP-related residuals were identified in several subsurface soil borings advanced at locations in and adjacent to the former MGP process area. The NYSDEC has indicated that additional investigation work is necessary to determine the horizontal and vertical extent of the MGP-related residuals identified in this area.

This RI Work Plan presents the project objectives, summarizes the results of the previous investigation work, and outlines the strategies and methodologies that will be implemented during the investigation field activities for the site. The investigation will be conducted in accordance with the following documents:

- **Generic Field Sampling Plan (FSP) –** Field sampling methods and procedures that will be used during the investigation are described in the document prepared by Foster Wheeler Environmental Corporation entitled "*Generic Field Sampling Plan for Site Investigations at Manufactured Gas Plant Sites*", dated November 2002 [Foster Wheeler, 2002a].
- **Generic Quality Assurance Project Plan (QAPP) –** The quality assurance/quality control (QA/QC) procedures that will be implemented during the fieldwork and in the laboratory which performs the chemical analyses of the samples collected during the RI are presented in the document prepared by Foster Wheeler entitled "*Generic*

Quality Assurance Project Plan (QAPP) for Site Investigations at Manufactured Gas Plant Sites", dated November 2002 [Foster Wheeler, 2002b].

- **Site-specific Health and Safety Plan (HASP) –** The HASP outlines 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 RI fieldwork (Appendix C).
- **Community Air Monitoring Plan (CAMP) –** The CAMP provides information regarding the procedures to be used to monitor and control, if necessary, the potential release of airborne constituents of concern (COC) at the downwind perimeters of the investigation work areas. Included in the CAMP are procedures to be used as necessary to control odors that may be present as a result of the intrusive site investigation activities (Appendix D).

Although included in this Work Plan, two additional guidance documents will apply to the conduct of this investigation:

- **(Draft) Standard Operating Procedures for Soil Vapor Intrusion Evaluations at National Grid MGP Sites in New York State, September 2007 –** This document describes how soil vapor intrusion (SVI) evaluations are performed for National Grid sites [O'Brien and Gere, 2007].
- **DER-10 Technical Guidance for Site Investigation and Remediation** [NYSDEC, May 2010].

1.1 Project Objectives

The objectives of the investigation include the following:

- To collect additional data to determine the subsurface characteristics of the site;
- To more completely determine the nature and extent of MGP-related residuals that are present at the site;
- To identify the potential routes of off-site migration from sources of MGP-related residuals;
- To indentify exposure pathways to human and ecologic receptors; and
- To obtain sufficient data to facilitate the selection of remedial actions to address MGP residuals within the site.

1.2 Work Plan Organization

Following this introduction, the remainder of this Work Plan describes the proposed RI activities.

- **Section 2 –** provides a description of the site and the history of MGP operations.
- **Section 3 –** presents a summary of the site conditions found by previous investigations.
- **Section 4 –** presents the scope of work for the RI.
- **Section 5 –** describes the Community Outreach Plan to be undertaken by National Grid for this project.
- **Section 6 –** presents the general project schedule.
- **Section 7 –** provides a list of the references cited in the Work Plan.

Appendices to the Work Plan include the following:

- **Appendix A –** Historical information, including a Sanborn Fire Insurance map and historic site photographs.
- **Appendix B –** Borelogs and well construction logs for the borings previously advanced at the site.
- **Appendix C –** Site-Specific Health and Safety Plan (HASP).
- **Appendix D –** Community Air Monitoring Plan (CAMP).
- **Appendix E –** MGP Soil Logging Protocol.
- **Appendix F –** NYSDEC Fieldwork Reporting Guidelines.

2. Site Description and Background Information

2.1 Site Description

The site is located at East North Canal Street, on the east side of the Village of Canastota and immediately across the street from the Erie Canal (Figure 1)[1]. The layout of the site and the surrounding properties as they are today is shown in Figure 2. The location of the former MGP is at the southern end of a property approximately 10 acres in area. It is owned by the Village of Canastota and is in active use as the DPW garage and service yard. The site is bounded by East North Canal Street to the south, Roberts Street to the north, the Greater Lenox Ambulance Service and residential properties to the west, and residential properties to the east. Land recently purchased by the Board of Education of the Canastota Central School Board is located to the northeast, but is zoned as R-1 and is currently undeveloped.

The Village of Canastota identifies the portion of the DPW property where the former MGP was located as Section 36.47, Block 1, Lot 15 (Figure 2). Additional contiguous properties which belong to the Village and are used as part of the DPW facility are lots identified as Section 36.55, Block 1, Lot 64; and Section 36.55, Block 1, Lot 65. The site property is zoned as Residential 1 (R-1) or single family residential. It should be noted, however, that the DPW garage is not in compliance with this zoning as it has been grandfathered in the zoning regulations.

Asphalt paved areas are present adjacent to the DPW garage building. Gravel areas are located in the central portion of the property and grassed and wooded areas are located on the northern portion and perimeter of the site. A concrete sidewalk is present on the site along East North Canal Street.

2.2 Site History

A summary of the MGP's history is presented in Table 1. Gas production in Canastota is reported to have begun in 1887. No records were reviewed for this Work Plan which describe the gas operations from 1887 to 1906, and the 1902 topographic map of the site does not show a building at the site under investigation (though the railroad line is shown on this map). Documents on display at the Canastota Canal Town Museum indicated that the Canastota Gas Company began operations in 1904.

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[1] Note that the street fronting the former MGP is referred to in several different ways by different sources. The property deed for the site describes it as Northeast Canal Street. Other names include East North Canal Street, or simply Canal Street. According to the village clerk, the correct name is East North Canal Street.

In 1906 the property where the subject site is located was acquired by the Canastota Gas Light Company. Newspaper reports from 1907 described the construction of the MGP and village gas lines [Hartgen, 2010]. Production is believed to have begun in the second half of that year. One Sanborn Fire Insurance Map (Appendix A) dated 1911 depicts the MGP site. At this point, the site consisted of two circular gas holders, a tar well, a purifier building, a "hot well", and retorts as well as a repair shop, condenser, and scrubber. Two undated historic photographs are also presented in Appendix A, showing the MGP from the north and south sides. The layout of these historical features is shown on Figure 3. Based on the correlation between the photos and the Sanborn Map these photographs were taken sometime after 1911 (the photographs show the addition of a tank to the north of the MGP next to a pond, and of a two-story structure and attached shed at the east side of the gas plant building). The land north of the MGP shown on these photos appears to be undeveloped and used for agriculture.

The Browns Directory of American Gas Companies (Browns Directory) was reviewed for listings of the Canastota MGP. Listings were found for the years 1914 through 1928, with the last two years (1927 and 1928) repeats of the 1926 listing (Table 2). From 1927 onwards the listing for the Utica Gas and Electric Company cited that it supplied gas to Canastota. Based on this information it appears that site operations ceased after 1926 when the Canastota Gas and Electric Company merged with the Utica Gas and Electric Company.

The Browns Directory cited gas production by both the Lowe (water gas) process and coal process in 1914. No production method was cited in 1915, and all subsequent entries cited the coal process. BTU content for the gas (when noted) was 600 BTUs. The gas holder capacity is listed at 70,000 cubic feet for all listings.

It is unknown when the plant was demolished, but the building and the adjacent railroad line are not shown on the 1946 topographic map of the area. Aerial photographs of the site and areas north of East North Canal Street show the entire area as vacant for most of the 1950s and 1960s, with the exception of the development of houses along the north side of East North Canal Street. The vacant land appears to be mowed, with few scattered trees. The current DPW operations area appears to have some disturbed ground in the air photos, but the source and purpose of the disturbance cannot be determined.

In 1969, the site property was sold by Niagara Mohawk Power Corporation, a successor to the Central New York Power Company, to the Village of Canastota. The current DPW garage building was constructed in 1973, and the site has been developed and operated continuously as the DPW garage and storage yard since that time. Activities at the site include:

- Heavy vehicle maintenance and storage;
- Equipment cleaning;
- Fuel storage and dispensing (initially from underground storage tanks, now from above-ground tanks);
- Road salt storage (in uncovered stockpiles until approximately 2008);
- Staging of roadbed materials; and
- Staging of wood waste from tree clearing activities.

Additionally, a small portion of the DPW property has been use as a fire training facility by the local fire department. This area is located immediately to the north of the salt storage building. It is isolated by a fenced-off area 110 by 100 feet in size. Within the fence is a small metal building and junk cars used for training.

2.3 Summary of Previous Activities/Investigations

This section provides a summary of previous activities, investigations, and/or findings. The data from all previous investigations are summarized on Figure 4 and in Table 3. Test pit and soil boring logs are provided in Appendix B.

2.3.1 November 2003

In 2003, GEI began initial Site Characterization (SC) on behalf of National Grid. These investigations were based on a NYSDEC-approved Work Plan [Foster Wheeler, 2003]. GEI supervised excavation of one test pit (TP-1), drilling of 14 borings (SB-01 through SB-13, and SB-03A), and conversion of three borings to monitoring wells (SB-09/MW-1, SB-10/MW-2, and SB-12/MW-3). Soil and groundwater samples were collected for laboratory analysis.

The 2003 test pit was not located across the wall of the former gas holder, but adjacent to the exterior holder wall. Trace amounts of tar and non-aqueous phase liquid (NAPL) blebs were observed with a slight naphthalene-like odor. This test pit appears to be located within a former domestic waste pile (see test pit log in Appendix B).

Generally, one to two subsurface soil samples were collected at all borings completed (Appendix B). The samples were analyzed for benzene, toluene, ethylbenzene, xylene (BTEX) [U.S. EPA Method 8260B], polycyclic aromatic hydrocarbons (PAHs) [U.S. EPA Method 8270C], and cyanide (U.S. EPA Method 9012). The validated analytical results are presented in Table 3. Refusal was encountered at boring SB-02 at a depth of 5.6 feet below ground surface (bgs), possibly indicating the gas holder floor.

MGP residuals were observed at several locations within the former MGP process area including SB-3A(8-10’), SB-4(8-12’), SB-5(8-10’), SB-7(4-8’), SB-8(4-12’), and SB-11(6-8’ and 9-10’).

The three monitoring wells were sampled for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and cyanide. The validated analytical results are presented on Table 4. No VOCs or SVOCs were detected. Sodium and manganese were detected in all three wells and barium and magnesium were detected in MW-3. These are commonly found as natural minerals in groundwater; however, the sodium is likely to be from an uncovered salt storage pile. This storage pile has been replaced by a new covered storage building located at the same location immediately north of the DPW garage building.

Subsequent to completion of field work, GEI prepared a Data Usability Summary Report (DUSR) on behalf of National Grid. National Grid forwarded the DUSR to NYSDEC.

2.3.2 July 2005

Following communications with National Grid and the NYSDEC, GEI conducted additional field investigations in 2005. This phase of investigation was conducted to:

- Confirm the lack of the historic gas holder foundation west of the DPW building;
- More fully determine the extent of the former pond impacts;
- Refine the apparent groundwater flow direction;
- Evaluate additional groundwater samples;
- Confirm the physical characteristics and contiguous nature of the glacial till;
- Provide a qualitative assessment of potential human exposure pathways; and
- Provide a qualitative assessment of potential ecological receptors.

To accomplish this scope of work, 10 additional soil borings (SB-14 through SB-23) were completed and three additional monitoring wells (MW-4 through MW-6) were installed and sampled. As previously found, small amounts of MGP residuals were observed at borings completed within the former MGP process area: SB-14(8-9’), SB-19(5-5.5’), SB-20 (5.5-6’), SB-20A(2.7-3’ and 5.5-6’), SB-21 (7.5-8’), and SB-22(6-7’). Four cross-sections were prepared from the soil boring information, and are shown in Figures 5 through 8.

A contour map of the top of the till surface was prepared for this work plan using the existing soil boring data (Figure 9). This figure shows that the till surface slopes generally to the north and northwest, with a trough in the surface also sloping in this direction.

The groundwater flow direction was better defined by the 2005 investigation. The summary of the well constructions and water level measurements is provided in Table 5. Figure 10 shows the water table map prepared from the site data. There appears to be a small divide at the central portion of the site with flow diverted to the southeast and northwest.

The groundwater analytical results (Table 4) indicated no BTEX or PAH detections at any wells except for a small amount at MW-4 (9 parts per billion [ppb] PAHs), and at MW-6 (2,620 ppb BTEX and 1,995 ppb total PAHs).

2.3.3 2009

Four of the monitoring wells at the site (MW-1 through MW-4) were repaired in July 2009. In winter of 2009/2010, the reference elevations for all of the wells were re-surveyed, and the base map for the site was updated and expanded to provide a basis for mapping for the RI.

2.3.4 2010

During the winter of 2009/2010 Hartgen Archaeological Associates, Inc. (Hartgen) performed a Phase 1a archaeological assessment of the site [Hartgen, 2010]. This report is being submitted to the New York State Office of Parks, Recreation and Historic Preservation (NYSOPPRH) in anticipation of remedial actions at the site.

GEI performed additional investigation on the background and current conditions at the site in the spring of 2010. This work included:

- Obtaining an environmental database search for the site and surrounding area from Environmental Data Resources, Inc. (EDR).
- Contacting the Village of Canastota for information regarding the construction of the DPW facility and other background information.
- Filing a Freedom of Information Law (FOIL) request with the Canastota School District in order to review engineering and planning documents related to the proposed construction of a school bus garage on the northern DPW tax map parcel, and an elementary school on the property to the northeast owned by the School District.

The EDR report noted that a petroleum spill was reported for the property at 446 Canal Street (spill number S108765245). This property is immediately adjacent to the east side of the DPW property. The spill was reported in September 2007, due to the presence of two drums containing waste oil which had been abandoned at the property by the owner for “many years”. The drums and associated soils were removed and the spill was closed in January 2008. Due to the nature of the material and the minimal amount of oil released (estimated by the spill report at 10 gallons), it is unlikely that this spill will significantly affect the area to be investigated for the MGP. Note, however, that the spill report cited “housekeeping” issues with the property, and there may be other possible sources of impacts to soil or groundwater.

An additional petroleum spill file exists for the Canastota School bus garage, on the north side of Roberts Street (downgradient of the MGP). This file was opened in 1987 due to a tank test failure. The tank was removed and replaced; no contamination was found to be associated with the tank.

Other spills were reported between ¼-mile and ½-mile from the MGP, but these are all located cross-gradient, downgradient of the site, or are not located such that they would be expected to have any impact on the site.

The EDR report confirmed that only one Sanborn Map (the 1911 edition) is available for the site which shows the presence of the MGP. Note that a property 500 feet west of the MGP on Canal Street is shown as the Marvin Electric Drill Company on the 1895 and 1900 Sanborn maps, and as the Ideal Cut Glass Works on the 1906 and 1911 and Sanborn maps [Sanborn Map, 1911]. An underground gasoline tank and engine are shown at this property. The core of the existing commercial building currently at this location is likely to be a remnant of this previous industrial development.

A site reconnaissance and interview with the foreman for the Village of Canastota DPW (Mr. Tony Torentore) were performed in March 2010. Mr. Torentore indicated that underground storage tanks were previously found at the northeast corner of the DPW garage building. Based on his information and remnant electrical wiring it appears that fuel pump(s) were located on the north wall of the garage, with the tank(s) underground in front of the northernmost garage bay. Two floor drains were observed in the garage building, with the southern drain believed to connect to a drywell at the west side of the building, and the northern drain discharging to a low area at the northwest of the garage.

3. Site Physical and Chemical Characteristics

This section of the Work Plan describes the site physical characteristics, including surface topography and hydrology, surficial geology, and groundwater. The chemical characteristics based on previous investigations are also summarized.

3.1 Site Topography and Surface Water Hydrology

Delta Engineers, Architects and Land Surveyors developed the site base map. As part of the effort, site topography was also mapped. The site topographic contours are presented in 1-foot increments on Figure 2.

Site elevation decreases from southeast to northwest. The topographic high is 427 feet above NGVD29 (referenced in the survey as mean sea level or MSL) within the central portion of the former MGP process area at the DPW garage. The topographic low is 417 feet MSL at the northwest site corner. Surface water flow during storm events generally follows the topographic contours from high to low. However, some small ponding occurs in the gravel area along East North Canal Street, where there are small depressions in the ground surface. There is also a small drainage channel along the eastern property boundary. This ditch begins at the southeast side of the DPW property, and drains along the property line to the north. The typical depth of the ditch around the surrounding land is 3 to 4 feet below the ground surface. The ditch then drains to a culvert under Roberts Street to the north. Mr. Torentore reports that this ditch is maintained by excavating accumulated sediment as necessary.

The area to the northwest on the DPW property forms a seasonal wetland. During the November 2009 site visit flagging was observed which was placed during a wetlands delineation survey conducted for the Canastota School District. The southern and eastern limits of this low area are defined by filling from the south, with a drop in surface elevation of 3 feet at the southern end of the low area, and 6 feet at the northeast side.

3.2 Surficial Geology

3.2.1 Fill

The surface of the former MGP area and to the north is composed of fill. At the Canastota site, the fill is apparently contiguous and ranges from 3 to 6 feet in thickness. The fill consists of sand, gravel, brick fragments, asphalt, slag, and silt. Based on the history of the site, it is likely that much of the fill originated from the former railroad grade which had been constructed along the east side of the site. The remnants of what is likely to be concrete foundation material was encountered at the two former gas holder locations. Based on the depth of the concrete it is possible that the ground surface has been raised by several feet by the filling.

3.2.2 Native Sand, Silt, and Clay

Varying amounts of sand, silt and clay are found beneath the fill layer. This unit ranges in thickness from approximately 2 to 22 feet. These materials are likely to be alluvial deposits. The clay deposits are likely to be glacial lake deposits.

3.2.3 Glacial Till

The sand, silt, and clay unit is underlain by glacial till. The till is generally described as predominantly silt with lesser amounts of clay, sand, and gravel that is very dense. Based on previous geotechnical testing the till is especially dense and is highly impermeable. The depth at which till was encountered appears to increase farther north indicating a sloping surface for this contact. Figure 9 shows the elevation of the top of the till surface. Note that a trough is present in the till surface, from the former pond location and sloping to the north.

3.3 Groundwater

Groundwater at the site is shallow and was encountered within 5 feet bgs. Water table elevations were measured at the 2005 groundwater sampling event and on two subsequent site visits. Table 5 presents groundwater elevations collected to date.

Groundwater elevations have a consistent pattern. There appears to be a small divide at the central portion of the site coinciding with the highest elevation, with flow diverted to the southeast and northwest.

Figure 10 presents groundwater flow contours for August 2005. Groundwater flow direction at the site splits directions to the southeast and to the northwest. The groundwater contours from elevations taken in 2009 are similar to those generated from 2005 water table elevations. Note that the change in elevation of the water table is very slight across the area containing monitoring wells, with a total change in elevation of 1.4 feet, and a gradient in August 2005 ranging from approximately 0.009 to 0.017 feet per foot.

Standing water has been observed near MW-2 and MW-6 in gravel cover areas or where there is believed to be poor surface drainage.

3.4 Nature and Extent of MGP-Related Impacts

3.4.1 Subsurface Soil

The subsurface at soil borings SB-3A, SB-5, SB-7, SB-8, SB-11, SB-14, SB-19, SB-20A, and SB-22 (Figure 4), contains tar-coated NAPL-impacts or NAPL blebs. Sheens were also observed at SB-4, SB-20, and SB-21. Concentrations of BTEX and PAHs were also detected above the Residential Soil Cleanup Objectives (SCOs) at several locations. As shown on Figure 4, the majority of these locations are found within the former MGP process area, specifically near the small gas holder and the tar well. Impacts observed downgradient from these features at SB-8, SB-11, and SB-14 could be related to the large former gas holder.

Total cyanide with concentrations above Residential SCOs were detected at SB-2 (41 ppm) and SB-5 (32 ppm), at depths of 4 to 5.6 and 8 to 10 feet bgs, respectively. The impacts at SB-2 may be related to the gas purifier house mapped to be immediately east of the boring location, while the impacts at SB-5 may be related to the NAPL impacts at the former tar well at this location.

3.4.2 Groundwater

Groundwater at this site has been sampled twice – in December 2003 (MW-1, MW-2, and MW-3) and August 2005 (MW-1, MW-2, MW-3, MW-4, MW-5, and MW-6).

No VOCs or SVOCs have been detected in groundwater except for a trace detection of naphthalene at MW-4 and several BTEX and PAH compounds at MW-6 (see Figure 10). At MW-6, benzene, ethylbenzene, toluene, acenaphthene, naphthalene, and phenanthrene were all detected above their respective New York State Ambient Water Quality Standards (NYSAWQS). Cyanide was detected in low levels at MW-4, MW-5, and MW-6 at concentrations well below the NYSAWQS. Note that these three wells surround the DPW’s roadsalt stockpile area, which was uncovered until approximately 2008 (cyanide is a common component in anti-caking agents used to treat roadsalt).

3.5 Known Utilities Serving the Site

The site and other occupied surrounding properties are served by municipal water and sewer (Figure 2). The sewer and water conduits come into the DPW from East North Canal Street, beneath the paved apron that provides access for parking the DPW trucks. Natural gas service also comes into the building, via subsurface conduit, from East North Canal Street. The exact depths of the subsurface water, sewer, and gas conduits are uncertain.

Electricity is provided to the DPW via overhead wires along East North Canal Street. The electrical junction is on the south side of the DPW. Within the DPW yard subsurface utilities are present within the investigation area. An underground electric line extends from the garage building to a utility pole east of the building. Other underground lines connect this pole to the above-ground fuel storage tank pumps and to a sewer pump station. This pump station takes flow from the residential area to the east of the site and transfers it under the paved DPW yard to the southwest to a sewer main along the north side of Canal Street.

3.6 Conceptual Site Model

The Conceptual Site Model (CSM) provides a holistic framework for the physical, chemical, and contaminant distribution at the site that serves as a basis for future decisions regarding investigation and remediation. Typically a CSM identifies sources of contamination, migration pathways stemming from the sources, and any human or environmental receptors.

The East North Canal Street former MGP site has a relatively simple CSM. The former MGP contained only a few structures; two circular gas tanks, a tar well, purifier, a “hot well”, and retorts as well as a repair shop, condenser, and scrubber. Based on the historic site photos it appears that both gas holders were constructed with above-grade tanks. Based on the depths at which concrete was encountered at their locations it is likely that some filling over the foundations has occurred since they were removed.

Surface soil at the site consists of fill or placed topsoil. A large amount of the central area of the former MGP is covered by asphalt pavement. One soil surface soil sample, obtained from the landscaped area south of the DPW building, found low PAH concentrations which may be reflective of site background.

The fill layer across the surface of the site is likely to represent at least three generations of filling. Due to the low-lying landscape observed in this area and the shallow water table, it is likely that some build-up of the site for the MGP was required prior to construction to support the building foundation and to prevent flooding. The pond located at the north side of the gas plant was probably excavated to create a source of water for the plant. Filling was also performed, roughly 10 feet or more above grade, for the construction of the railroad line which ran along the east side of the site. Both the gas plant and the railroad line were demolished prior to 1946, and the pond was filled-in. This event was likely to have created the greatest amount of filling across the MGP site. The fill used to construct the railroad grade could have been the source for most of this material, which would have led to the incorporation of some amount of coal combustion residue into the fill from steam locomotives. It is unknown whether additional filling was performed to prepare the site for the construction of the current DPW garage and paved yard area, but it is evident that filling has been taking place to the north of the building where bulk materials are stockpiled (soil, gravel, woodchips, etc.).

The natural soils which are present below the fill (sand, silt, and clay) are likely to be post glacial alluvial deposits, with the clays deposited from glacial Lake Iroquois. The fine-grained beds within this soil unit may be acting as local aquitards and may retard or stop the movement of any dense non-aqueous phase liquid (DNAPL) to the base of the formation and the surface of the glacial till. Note that where NAPL was previously found it was in the interbedded soils and not at the till surface at most locations of the site.

The till at the site is dense and has been found to be at least 5 feet thick. Samples obtained from the top of the till did not find significant impacts. The total thickness of the till over bedrock is unknown.

Tar impacts are present at the site in an area extending from the east and north sides of the DPW building. It is unknown whether these impacts are also present under the building, but tar is not found to the west of the building. The approximate extent of NAPL is shown on Figure 4. The NAPL is located in the area of the former gas plant building, tar well, smaller gas holder, and the pond. The NAPL impacts are found generally from 5 to 12 feet bgs. Note that no indications of MGP impacts have been observed within 3 feet of the ground surface.

There is no surface water at the site. The historic Erie Canal is located approximately 80 feet south of the former MGP; however, the surface water drainage from the site is to the north, following the regional flow direction. Drainage outfall pipes or groundwater seeps were not observed to be present along the north side of the canal. It is unknown at this time if the canal is connected to the water table.

The water table at the site is relatively flat, with an apparent local divide at the DPW building. The primary flow direction is to the northwest, which corresponds to the regional northerly flow direction for surface water. A minor component of groundwater flow is to the southeast. Monitoring wells at the site which are located outside the area of soil impact show little or no impacts. MW-6, which is located within the NAPL-impacted area, shows impacts from BTEX and PAHs. The groundwater directly downgradient of this well has not be investigated, however.

Transport of contaminants from the site is limited to groundwater transport of dissolved compounds. The burial of impacted soils beneath fill prevents impact to site receptors except during excavation for placement or repair of deeper underground utility lines. Due to the shallow water table the generation and transport of soil vapors is highly limited, and the building at the site is constructed without a basement. Any soil vapor migration to the DPW garage may be difficult to distinguish from vapors generated from within the building due to vehicle storage and petroleum use.

There are no apparent potential exposure pathways to residents at the eastern side of the site. Impacted groundwater and/or soil vapor may be present on the western property, at the east side of the ambulance company buildings; however, this area is not downgradient of the tar impacts, and the soils in the vicinity of the gas holder at this location have low concentrations of VOCs.

No impacts to natural resource receptors from MGP residuals have been observed at the site, as all of the impacts are found well below the ground surface.

3.7 Data Gaps

Surface soil and soil vapor at the site have not been characterized. Surface soil investigation was not initially considered due to the use of the site for the Town DPW garage for road maintenance equipment and the likely associated impacts to site surface from petroleum hydrocarbons. While this situation is still the current site use, analytical sample collection of surface soil and soil vapor intrusion samples will follow guidelines discussed and agreed to in the September 14, 2010 conference call.

The location and condition of the soils associated with the former pond have not been fully defined. Based on the data shown on Figure 4 it appears that tar has impacted soils inside and outside of the former pond location. The areal limits of the pond and its subsurface condition should be determined to evaluate whether the sediments were impacted by the MGP.

The location, integrity, and construction of some of the former MGP features are still not fully understood. Additional soil test pits and soil boring investigation of the tar well, “hot well”, condensers, repair shop, and purifier house will also be implemented. Further delineation of the exact nature and location of the gas holder foundations will also be conducted.

Potential impacts could be migrating off site in the vicinity of MW-6. Additional delineation will be conducted downgradient of this location to attempt to encompass the MGP-related impacts observed closer to the former process area. As the wells installed to date have been water table wells, the extent of groundwater impacts at the till interface are unknown. Therefore, expanding the groundwater monitoring network to include wells screened at contact will be included. This is proposed for well locations near where MGP impacts have been observed (MW-3 and MW-6), and further downgradient where the till surface appears to be lower in elevation and creating a potential pathway for migration.

Additional sampling is needed to assess the conditions associated with the drainage ditch along the eastern side of the site. Although the bottom of the ditch is above the elevation of MGP impacts in the soil, it is possible that the ditch is a conduit for transport of impacted groundwater.

4. Scope of Work

The overall objectives for the RI are to complete the investigation of the site and lay the groundwork for the selection of a site remedy. The specific objectives for the RI 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 locations of each of the proposed RI sample points are shown on Figure 11. The rationale for each subsurface investigation point is shown in Table 6.

4.1 Health and Safety

All work performed at the site will be conducted under the terms of a site-specific HASP (Appendix C).

A CAMP will be implemented during any invasive drilling activities (Appendix D). The program will include the monitoring for VOCs and particulates. Additional information regarding the air monitoring is provided in the CAMP.

4.2 Underground Utility Clearance

The results of the utility clearance activities performed in 2003 and 2005 and the site survey are summarized on the latest survey map of the site [Delta, 2010]. Included on the figure are the locations of mapped subsurface electrical lines, water lines, communication cables, storm sewers, sanitary sewers, and gas lines. As discussed above, additional lines are present which must be mapped prior to conducting invasive subsurface exploration activities.

Additional utility clearance activities will be performed during the RI at the proposed sample locations shown on Figure 11. Dig Safely New York (Dig Safely) will be contacted to mark the location of underground utilities in the on-site and off-site investigation areas. The locations of all test pits, borings, and wells will be staked out or marked with white paint so that any utility companies with utilities present can compare these locations with the locations of the utility lines. The sample locations will then be adjusted, if necessary.

Dig Safely will typically only locate utilities in the public right-of way, and between the main lines and the utility meter at a property. Because most of the work is to be performed outside of this area, a private utility locating company will also be utilized to locate utilities in the vicinity of planned invasive activities. This task will be accomplished with ground penetrating radar (GPR) unit with a 250 MHz or 500 MHz Antenna, with a radio frequency locator, and the use of a Fischer TW-6 magnetometer at each of the sample locations shown on Figure 11. The information obtained during this task will be added to the final RI Report figures.

In addition to the utility clearance, an electromagnetic (EM) survey is proposed in the former pond area. The purpose of this survey is to attempt to identify the edges of the former pond as well as locate the tar well and “hot well” features. These locations would then focus the placement of the test pits and soil borings in these areas.

4.3 Former Pond

Soil borings will be advanced at roughly equidistant points around the former pond feature and at points within the pond to better assess and document its location and the soil conditions within the pond boundaries. The pond was shown in historical site photographs as well as partially in the 1911 Sanborn map. The northern extent of the pond is unknown (Figure 3 shows its estimated extent).

4.4 Former MGP Process Area – Test Pits and Subsurface Soil Sampling

Although soil borings have been completed during the previous investigations performed at the site, additional sampling is needed to further assess the horizontal and vertical extent of the previously observed MGP-related residuals.

The locations of the proposed test pits, soil borings, and monitoring wells are shown on Figure 4. Table 6 provides summary information regarding the proposed investigation points, including the test pit, boring, or well designation, the sampling location or rationale, the anticipated completion depth, and the laboratory analyses to be performed. It is anticipated that the borings completed in the overburden soil will be advanced to the top of the till contact. The available data indicate that the till surface slopes toward the north, therefore we anticipate that the borings completed to the south will be more shallow (approximately 15 feet below grade) than the borings completed to the north (approximately 20 feet below grade or more). As indicated on Table 6, borings will be advanced to the top of the glacial till unit to confirm non-impacted conditions. At selected locations, outside of the area of known tar impacts, soil borings will be advanced 10 feet into the till to assess its minimum thickness and to obtain materials for permeability testing.

The three test pits (TP-2, TP-3, and TP-4) will be excavated using a rubber-tired backhoe to determine the nature and condition of former MGP site features. The test pits will be excavated as deeply as possible to determine if foundations are still present and if any MGP residuals are found within the former structures. Should the shallow water table interfere with observations, it may be necessary to complete the investigation of the areas targeted for test pits by means of soil borings. During test pitting operations, excavated soils will be staged on plastic. The shallower soils, expected to contain the least potential impacts, will be used as a "bed" for deeper soils. When the test pits are back-filled, the deeper soils will be placed back in the pit first, and compacted, to ensure that all remaining soils can be returned to the pit. If the test pits are located within paved areas, the locations will be restored to their previous condition.

The subsurface borings will be advanced by a conventional hollow-stem auger (HSA) drill rig equipped with 2-inch diameter split-spoon samplers. This will allow for continuous soil samples to be taken from the ground surface to the bottom of the borehole for both field characterization (photoionization detector screening and observations) and for the collection of samples for the chemical analyses. This will also provide blow count data for future geotechnical evaluation of soil conditions.

The soil samples 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 PID readings, and visual and olfactory observations regarding the presence of hydrocarbon-like residuals. The most current soil classification protocol for MGP sites established between National Grid (Upstate sites) and the NYSDEC will be used for logging and reporting. The current protocols are provided in Appendix E.

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 PID screening and field observations. If impacts are not encountered, a sample will be collected from the 1-foot interval immediately below the water table, and below the impacted interval or the bottom of the boring to confirm "non-impacted" conditions. The number of soil samples, their analyses, and the quality control sample requirements are outlined in Table 7.

Representative samples of grossly impacted soil containing visible tar-like or oil-like NAPL will be sampled for laboratory analyses in order to verify the impacted conditions. These "MGP source" materials will be sampled at approximately 4-foot intervals, or as necessary to provide representative samples. Information regarding the vertical extent of this material will be recorded on the borelogs by the field geologist and the areal extent of this material will be surveyed during the survey task.

Representative soil samples will be obtained for laboratory geotechnical testing of each distinct soil type observed in borings at the site. Grain size and Atterberg limits will be measured for each soil type (fill, sandy unit, silty unit, clayey unit, and till).

One soil sample will be obtained from the till unit for laboratory permeability testing. This sample will be obtained from a non-impacted location, cross-gradient of the primary impacted area. The sample will be obtained using a Shelby Tube, from a depth below the upper weathered surface of the till so that a representative measurement can be obtained for the unit.

4.5 Monitoring Well Construction

Overburden monitoring wells will be installed in six of the RI soil borings (Table 6). The monitoring well locations, shown on Figure 11, were selected to have a sufficient number of wells (along with the previously installed wells) to evaluate groundwater in areas that are considered up gradient, side gradient, and down gradient of areas where MGP-related residuals have previously been identified. A well (MW-10) will also be installed within the impacted area to assess conditions at the former MGP and to help map the direction of groundwater flow.

Monitoring wells MW-7 through MW-10 will be screened across the water table to evaluate shallow groundwater conditions. Monitoring wells MW-3D and MW-6D will be installed so that the screen is positioned at the top of the till contact. Based on the findings of the deep soil borings, an additional deep monitoring well may be installed if necessary to characterize deep downgradient groundwater conditions.

The wells will be constructed using a 2-inch diameter Schedule 40 PVC well riser with a 0.02-inch slotted screen. In areas where soil impacts are observed, the wells will be constructed with a 2-foot long sump for monitoring the presence of any DNAPL. Groundwater monitoring wells will be constructed in accordance with the methods described in the FSP.

4.6 Groundwater Sampling

All site wells will be sampled for laboratory analysis. The purpose of this sampling will be to delineate the groundwater impacts at the site, and to characterize the nature of the impacts. The reference elevations of the newly installed monitoring wells will also be surveyed, and the information used to prepare an updated water table map of the site.

4.6.1 Well Development

Each of the new monitoring wells will be developed not sooner than 24 hours after their installation to evacuate fine-grained sediments that may have accumulated within the well during installation. Well development activities will be conducted in accordance with the FSP.

4.6.2 NAPL Monitoring

Approximately 2 weeks following the development of the new monitoring wells, all site wells will be gauged to determine if either light non-aqueous phase liquids (LNAPL) or DNAPL are present. To determine if LNAPL is present, all wells will be tested with an oil-water interface probe. If the probe indicates that LNAPL is present, the thickness of the layer will be confirmed with the probe and a clear bailer.

To determine if DNAPL is present, the well bottoms will also be tested with an oil-water interface probe. If the probe indicates that DNAPL is present, the thickness of the layer will be checked by lowering a weighted string to the bottom of the well, and then a measurement of the hydrocarbon-stained portion of the string will be obtained. Note that if NAPL is observed in any of the site wells, the NAPL layer will be removed by bailing or pumping.

4.6.3 Groundwater Sampling

Following completion of 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 LNAPL or 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 RI Report. Table 7 provides summary information for the groundwater samples to be collected, including the sample designations, sample rationale, and the laboratory analyses to be completed for the new and previously installed wells.

4.7 Surface Soil Sampling

One surface soil sample will be obtained from the grassy area to the northwest of the MGP, downgradient of the historic MGP operations area. Other locations at the site may be sampled if the field observations during the RI identify any locations where surface soils may be impacted by MGP residuals. The final decision regarding the number and locations for surface soil samples will be made in consultation between National Grid, the NYSDEC, and the NYSDOH near the end of the field sampling program.

4.8 Soil Vapor/Indoor Air Sampling

Soil vapor and indoor air samples will be obtained from the following locations, as shown on Figure 11:

- A soil vapor sample will be obtained from a location to the west of the larger gas holder on the west side of the former MGP (SG2). The exact location will be determined based on the findings at SB-39. If no soil, groundwater, or vapor impacts are detected in this boring then the soil vapor sample will be obtained adjacent to the east side of the office building for the Lenox Ambulance Company. If impacts are found in this boring, then a sub-slab vapor sample will be obtained from inside the building, paired with an indoor air sample and an up-wind ambient air sample.

- A sub-slab soil vapor sample will be obtained from beneath the office at the southern end of the DPW garage building (SG3), paired with an indoor air sample and an up-wind ambient air sample. Note that if indoor air samples are obtained from both the Ambulance Company office and the DPW office, a single ambient air sample will be obtained concurrent with the indoor air samples from both locations.

The final locations for these three samples will be selected at the end of the subsurface investigation.

An additional soil vapor sample may be obtained from an impacted location within the MGP site for comparison purposes. The decision as to whether this fourth soil vapor sample will be necessary will be made in consultation between National Grid, the NYSDEC, and the NYSDOH.

4.9 Site Survey

A survey of the new investigation sampling points, monitoring wells, and important site features will be conducted at the end of the fieldwork by a New York state licensed surveying contractor, under the direction of the field geologist. A reference point will be marked on each new monitoring well, and the elevation and location will be surveyed. All horizontal locations will be reported in the applicable (NAD83 NYS Zone) coordinates. All vertical measurements will be reported in NGVD29. The new information will be added to the existing basemap for the site.

4.10 Investigation-Derived Waste Management

All soil cuttings, used disposable sampling equipment, and personal protective equipment (PPE) will be containerized in drums or other suitable containers, sampled, and properly disposed of off site at a permitted disposal facility. Decontamination and well development water will be containerized in drums or a plastic bulk tank prior to sampling and off-site disposal.

4.11 Analytical Program

The laboratory samples to be collected from each type of media and the chemical analyses to be performed, including the QA/QC samples, are listed in Table 7. These analyses are summarized below.

4.11.1 Surface Soil Analyses

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

- SVOCs by U.S. EPA Method 8270C;
- Target Analyte List (TAL) Metals by U.S. EPA Method 6000-7000 Series;
- Total Cyanide by U.S. EPA Method 9012A; and
- Available Cyanide by U.S. EPA Method OIA-1677.

4.11.2 Subsurface Soil Analyses

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

- VOCs by U.S. EPA Method 8260B;
- SVOCs by U.S. EPA Method 8270C;
- TAL Metals by U.S. EPA Method 6000-7000 Series;
- Total Cyanide by U.S. EPA Method 9012A; and
- Available Cyanide by U.S. EPA Method OIA-1677.

4.11.3 Groundwater Analyses

The groundwater samples will be analyzed for the following parameters:

- VOC by U.S. EPA Method 8260B;
- SVOC by U.S. EPA Method 8270C;
- TAL Metals by U.S. EPA Method 6000-7000 Series;
- Total Cyanide by U.S. EPA Method 9012A; and
- Available Cyanide by U.S. EPA Method OIA-1677.

4.11.4 Quality Assurance/Quality Control Sampling

Field and laboratory QC 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 7, include trip blanks, field equipment blanks, field duplicates, matrix spikes, and matrix spike duplicates. The data quality level for the investigation will be consistent with procedures outlined in the NYSDEC Analytical Services Protocol (ASP) July 2005 methodologies. A full ASP Category B data package will be prepared by the laboratory for all samples. The data will be reviewed, and a DUSR will be prepared by a qualified chemist. Additional QA/QC information is provided in the QAPP.

4.12 Soil Vapor Sampling

Due to the shallow water table at the site and the use of hydrocarbons with the one site structure, soil vapor samples will not be collected during the RI. Soil boring/monitoring well

SB-39/MW-9 will be used to assess whether or not any soil or groundwater impacts are present adjacent to the Greater Lenox Ambulance Company buildings. While it is known that there is a shallow water table at the site and of the use of hydrocarbons with the one site structure, soil vapor samples will be collected as discussed and agreed to in the September 14, 2010 conference call.

4.13 Cultural Resources Evaluation

A cultural resources evaluation is required during remedial investigation, and prior to any remedial activities. Hartgen was contracted to perform the historical and cultural resources review of the site. The results of this investigation will be reported with the RI.

4.14 Human and Ecological Exposure Assessment

A Qualitative Human Health Exposure Assessment (QHHEA) will be performed to assess the current and potential human receptors and exposure pathways. The QHHEA will address the current site and area use, as well as reasonably anticipated future uses, and will be performed according to the requirements of Appendix 3B of the NYSDEC’s DER-10. Note that the site is expected to continue to be used as the DPW maintenance facility.

An ecological assessment is not necessary for this investigation. The former MGP site and area of presumed impact is highly disturbed by human occupation and use, and it contains no habitat for ecological resources. There are no MGP impacts present at or near the ground surface of the site, nor are there impacts to surface water from MGP residuals which might have an ecological effect. Future remediation of the site will be restricted to the areas which are already disturbed (the DPW property). Areas to the north of the former MGP which may have been classified as small local wetlands have not been impacted by MGP residuals, nor will they be encroached upon during future remedial actions.

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 may consist of some or all of the following:

- Preparation and maintenance of a mailing list;
- Fact sheets;
- Preparation of a Citizen Participation Plan;
- Establishment of document repositories; and
- Participation in public meetings.

The community outreach activities will be patterned to meet the needs of the community and would be modeled after other community outreach programs the NYSDEC has established on other MGP 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.

Communications with the Village of Canastota DPW and the neighboring Lenox Ambulance Service will be conducted regularly, in order to make sure that the RI is conducted with minimal interference with their operations.

6. Reporting and Schedule

6.1 Schedule

The RI fieldwork will be initiated 30 days following approval of the scope of work presented in this Work Plan by the NYSDEC. The initial target dates for the project milestones are as follows:

- **Early October 2010 –** NYSDEC approval of RI Work Plan.
- **Late October 2010 –** Mobilization and initiation of RI fieldwork (the duration of the subsurface investigation is estimated to be approximately 6 weeks, including the waiting period for monitoring well stabilization prior to sampling).
- **November 2010 –** Submittal of the end of fieldwork summary report (see Appendix F).
- **November-December 2010 –** Receipt of laboratory analyses and data processing (preparation of logs, figures, data summaries, etc.).
- **January 2011 –** Completion of DUSRs and finalization of data figures.
- **January-February 2011 –** Completion of RI Report, and submittal to National Grid for review.
- **February 2011-March 2011 –** Report revision and preparation for submittal to NYSDEC.
- **March 2011 –** Submittal of complete RI to NYSDEC for review and approval.

The milestones presented above are subject to change based on the planning and scheduling of the consulting geologist, drilling contractor, 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 Field Reporting

Routine reports will be provided to the NYSDEC project manager, according to the reporting guidelines provided in Appendix F. Per the guidelines, the following will be provided:

- A daily report will be submitted which summarizes the accomplishments and findings of each day's work in the field.
- At the end of each week, a summary of that week's activities will be provided.
- At the end of the field program, a summary of the overall RI field work will be submitted.

Each of these reports will be provided by e-mail to the NYSDEC project manager.

Notification within one business day will be made to the NYSDEC project manager when necessary to address site emergencies, environmental releases, and to provide notice of changes to the field schedule.

6.2.1 RI Report

Upon completion of the field activities, an RI 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, 2009] 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 human exposure assessment which assesses the sources of impact, on- and off-site human and ecological receptors, and exposure pathways;
- An integration of field observations and measurements with laboratory analytical data to evaluate the nature and extent of impacts;
- A set of conclusions for the investigation; and
- Recommendations.

The RI 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 feasibility study for the site. If appropriate, recommendations for additional site activities will be furnished.

7. References

Delta, 2010. Survey Map of the Village of Canastota DPW Property and Surrounding Lands. Delta Engineers, Architects & Land Surveyors, February 10, 2010.

Foster Wheeler, 2002a. Generic Field Sampling Plan for Site Investigations at Manufactured Gas Plant Sites, November 2002.

Foster Wheeler, 2002b. Generic Quality Assurance Project Plan (QAPP) for Site Investigations at Manufactured Gas Plant Sites, November 2002.

Foster Wheeler, 2003. Canastota (E. N. Canal Street) Non-owned Former MGP Site, Canastota, New York, Site-specific Work Plan for Site Characterization, October 2003.

Hartgen, 2010. Draft Phase 1A Literature Review and Archaeological Sensitivity Assessment, Canastota Non-Owned Former Manufactured as Plant, Canastota, NY. Hartgen Archaeological Associates, Inc., April, 2010.

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values, Division of Water Technical and Operational Guidance Series (TOGS 1.1.1), October, and addenda added: January, 1999, April 2000, and June 2004.

NYSDEC, 2006. Rules and Regulations, 6 NYCRR Subpart 375-6, Remedial Program Soil Cleanup Objectives, dated December 14, 2006.

NYSDEC, 2010. DER-10 Technical Guidance for Site Investigation and Remediation, May 2010.

O’Brien and Gere, 2007. Draft Standard Operating Procedures for Soil Vapor Intrusion Evaluations at National Grid MGP Sites in New York State, updated September 2007.

Sanborn Fire Insurance Maps, Village of Canastota, New York - Insurance map for the year 1911.

Tables

Table 1
Historical Information Summary
Canastota Non-Owned Former MGP Site
Canastota, NY

Year	Source of Information	Comments
1875	Warranty Deed	Five-acre parcel of land running along the north side of East North Canal Street is sold from Thomas Farr and Emma B. Farr to Frances E. Smith.
1887	National Grid	Site operations begin.
1906	Warranty Deed	Actual site parcel is sold from Frances E. Smith to Central New York Power Company.
1911	Sanborn Map	Central New York Power Co. operates Gas & Electric Plant onsite. Two circular gas tanks, tar well, purifier, a "hot well", and retorts are depicted. A repair shop, condenser, and a scrubber were also shown.
1926	National Grid	Site operations cease.
1946	Foster Wheeler 2003 Work Plan	Gas works are apparently demolished.
1969	Quit Claim Deed	The site property is sold by Niagara Mohawk Power Corporation to the Village of Canastota. The Central New York Power Company was succeeded by the Utica Gas & Electric Company (in 1926) and records indicate the the subject parcel was conveyed to Candido Penna by a deed dated April 19, 1933 and "upon information and belief never having been recorded" in the Madison County Clerk's Office.
2003	GEI Consultants, Inc.	Site Characterization tasks begun.

Table 2
Browns Directory Summary
Canastota Non-Owned Former MGP Site
Canastota, NY

Date	Annual Gas Production (cubic feet)	Annual Gas Sales (cubic feet)	Max. Day's Send-out (cubic feet)	Gas Holder Capacity (cubic feet)	Process	Byproducts Produced	Ownership	Operating Company ("Controlled By")	Comments
No listings prior to 1914									
1914	NE	8,000,000 (approx.)	NE	70,000	Lowe and coal	NE	Central New York Power Co.	Utica Gas and Electric Co.	
1915	NE	8,000,000 (approx.)	40,000	70,000		NE	Central New York Power Co.	Utica Gas and Electric Co.	
1916	12,115,000	8,722,800 (approx.)	40,000	70,000	coal	NE	Central New York Power Co.	Utica Gas and Electric Co.	
1917	12,115,000	8,722,800 (approx.)	40,000	70,000		NE	Central New York Power Co.	Utica Gas and Electric Co.	
1918	12,115,000	8,722,800 (approx.)	40,000	70,000	coal	NE	Central New York Power Co.	Utica Gas and Electric Co.	
1919	10,000,000	6,000,000 (approx.)	44,000	70,000	coal	NE	Central New York Power Co.	Utica Gas and Electric Co.	
1920	10,000,000	6,000,000 (approx.)	44,000	70,000	coal	NE	Central New York Power Co.	Utica Gas and Electric Co.	
1921	11,800,000	8,782,100 (approx.)	50,000	70,000	coal	382 tons coke, 11,127 gal. tar	Central New York Power Co.	Utica Gas and Electric Co.	
1922	11,800,000	8,782,100 (approx.)	50,000	70,000	coal	382 tons coke, 11,127 gal. tar	Central New York Power Co.	Utica Gas and Electric Co.	
1923	8,607,000	5,277,000	260,000	70,000	coal	627 tons coke, 9,019 gal. tar	Central New York Power Co.	Utica Gas and Electric Co.	
1924	8,267,000	5,388,000	260,000	70,000	coal	538 tons coke, 3,640 gal. tar	Central New York Power Co.	Utica Gas and Electric Co.	
1925	Directory not available								
1926	8,381,000	5,490,000	47,000	70,000	coal	593 tons coke, 10,980 gal. tar	Central New York Power Co.	Utica Gas and Electric Co.	
1927	States no report for Canastota - entry shown is a repeat of the 1926 data. Utica Gas and Electric Co. entry cites supply to Canastota.								
1928	Repeat of 1926 entry. Gas supplied by Utica Gas and Electric Co.								
1929	No entry for Canastota. Gas supplied by Utica Gas and Electric Co.								

NE – No Entry

Table 3
Soil Analytical Results
Canastota Non-Owned Former MGP Site
Canastota, NY

	NY Soil Cleanup Objective (TAGM 4046)	SS-01 (0-0.25) 7/14/2005	MW-04 (5.5-6) 7/13/2005	MW-05 (8.5-9.5) 7/13/2005	SB-01 (0-4) 12/2/2003	SB-01 (4-8) 12/2/2003	SB-02 (0-4) 12/2/2003	SB-02 (4-5.6) 12/2/2003	SB-03A (4-8) 12/3/2003	SB-03A (8-10) 12/2/2003	SB-03A (12-16) 12/2/2003	SB-04 (1-4) 12/2/2003	SB-04 (8-12) 12/2/2003	SB-05 (0-4) 12/1/2003	SB-05 (4-8) 12/1/2003	SB-05 (8-10) 12/1/2003	SB-06 (0-4) 12/1/2003	SB-06 (4-6) 12/3/2003	SB-06 (8-12) 12/1/2003	SB-07 (4-8) 12/1/2003	SB-07 (7-9) 12/1/2003	SB-07 (12-16) 12/1/2003	SB-08 (4-8) 12/3/2003	SB-08 (8-12) 12/3/2003	SB-08 (16-20) 12/3/2003	SB-8 (0-4) 12/3/2003	SB-09 (4-8) 12/2/2003	SB-10 (0-4) 12/1/2003	SB-10 (4-6) 12/2/2003	SB-11 (0-4) 12/3/2003	SB-11 (6-8) 12/3/2003
BTEX (mg/kg)																															
Benzene	0.06	0.0067 U	0.0068 U	0.0061 U	0.013 U	0.012 U	NA	**0.014**	NA	1.5 UJ	**0.002 J**	0.011 U	**0.17 J**	NA	**180**	**630**	NA	**0.021**	**0.025 J**	**0.73**	NA	**0.31 J**	**0.22 J**	**15 J**	0.011 U	NA	**0.001 J**	NA	0.012 U	NA	**1.9 J**
Ethylbenzene	5.5	0.0067 U	0.0068 U	0.0061 U	0.013 U	0.012 U	NA	0.014 U	NA	**11 J**	0.011 U	0.011 U	**16**	NA	**21**	**53 J**	NA	0.012 U	0.011 U	**0.23**	NA	**0.004 J**	**3.4**	**100 J**	0.011 U	NA	0.012 U	NA	0.012 U	NA	**4**
Toluene	1.5	0.0067 U	0.0068 U	0.0061 U	0.013 U	0.012 U	NA	**0.003 J**	NA	1.5 UJ	0.011 U	0.011 U	**0.36 J**	NA	**220**	**670**	NA	**0.011 J**	**0.007 J**	**0.18**	NA	**0.01 J**	**0.65 J**	**57 J**	0.011 U	NA	0.012 U	NA	0.012 U	NA	**2.8 J**
Total BTEX	NE	ND	ND	ND	ND	ND	NA	**0.017**	NA	**16.6**	**0.002**	ND	**26.53**	NA	**701**	**2163**	NA	**0.032**	**0.032**	**1.58**	NA	**0.334**	**8.57**	**282**	ND	NA	**0.001**	NA	ND	NA	**24.7**
Xylene, Total	1.2	0.0067 U	0.0068 U	0.0061 U	0.013 U	0.012 U	NA	0.014 U	NA	**5.6 J**	0.011 U	0.011 U	**10**	NA	**280**	**810**	NA	0.012 U	0.011 U	**0.44**	NA	**0.01 J**	**4.3**	**110 J**	0.011 U	NA	0.012 U	NA	0.012 U	NA	**16**
Other VOCs (mg/kg)																															
Carbon disulfide	2.7	0.0067 U	**0.0029 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16 U	NA	NA	NA	NA	0.012 U	NA	NA
Dichlorodifluoromethane	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16 U	NA	NA	NA	NA	**0.002 J**	NA	NA
Isopropyl benzene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**10 J**	NA	NA	NA	NA	0.012 U	NA	NA
Trichloroethene	0.7	**0.016**	**0.0054 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16 U	NA	NA	NA	NA	0.012 U	NA	NA
Noncarcinogenic PAHs (mg/kg)																															
Acenaphthene	50	0.43 U	0.45 U	0.39 U	**0.62 J**	**0.014 J**	NA	9.4 U	NA	**13 J**	0.37 U	**0.72 J**	**5.9**	NA	**100**	**190**	NA	3.9 U	0.36 U	**36 J**	NA	**0.18 J**	**6.1**	**450 DJ**	**0.037 J**	NA	0.37 U	NA	0.36 U	NA	**88 D**
Acenaphthylene	41	**0.27 J**	0.45 U	0.39 U	**11**	0.4 U	NA	9.4 U	NA	**1.8 J**	**0.011 J**	7.1 U	**0.42 J**	NA	**600 DJ**	**1400 DJ**	NA	3.9 U	**0.019 J**	**41 J**	NA	**0.51**	**1.6 J**	**50 J**	0.38 U	NA	0.37 U	NA	0.36 U	NA	**9.8**
Anthracene	50	**0.37 J**	0.45 U	0.39 U	**7.8**	0.4 U	NA	**0.34 J**	NA	**6.7 J**	**0.01 J**	**7 J**	**1.5 J**	NA	**230**	**580**	NA	3.9 U	0.36 U	**32 J**	NA	**0.43**	**3.3**	**240 DJ**	**0.026 J**	NA	0.37 U	NA	0.36 U	NA	**29**
Benzo[g,h,i]perylene	50	**1.1 J**	0.45 U	0.39 U	**17**	0.4 U	NA	**0.46 J**	NA	**1.2 J**	**0.01 J**	**1.7 J**	**0.59 J**	NA	**94**	**180**	NA	**0.22 J**	0.36 U	**10 J**	NA	**0.1 J**	**1.6 J**	**21 J**	0.38 U	NA	0.37 U	NA	**0.013 J**	NA	**7**
Fluoranthene	50	**2.4**	0.45 U	0.39 U	**88 D**	**0.014 J**	NA	**2.5 J**	NA	**8.8 J**	**0.046 J**	**18**	**2.7**	NA	**1200 D**	**2400 DJ**	NA	**0.29 J**	0.36 U	**66 J**	NA	**0.86**	**6.5**	**340 DJ**	**0.042 J**	NA	0.37 U	NA	**0.016 J**	NA	**88 D**
Fluorene	50	**0.1 J**	0.45 U	0.39 U	**3.2 J**	0.4 U	NA	9.4 U	NA	**9.1 J**	0.37 U	**3.1 J**	**2.3 J**	NA	**350**	**990 DJ**	NA	3.9 U	0.36 U	**48 J**	NA	**0.48**	**4**	**290 DJ**	**0.02 J**	NA	0.37 U	NA	0.36 U	NA	**58 D**
Methylnaphthalene,2-	36.4	0.43 U	0.45 U	0.39 U	**0.45 J**	**0.031 J**	NA	9.4 U	NA	**10 J**	0.37 U	**3.1 J**	**6.4**	NA	**600 DJ**	**1500 DJ**	NA	3.9 U	**0.021 J**	**62 J**	NA	**0.44**	**4.6**	**530 DJ**	**0.055 J**	NA	**0.016 J**	NA	**0.014 J**	NA	**65 D**
Naphthalene	13	**0.14 J**	0.45 U	0.39 U	7.3 U	0.4 U	NA	9.4 U	NA	**31 DJ**	**0.02 J**	7.1 U	**28 D**	NA	**3200 D**	**8000 D**	NA	3.9 U	0.36 U	**280 DJ**	NA	**1.2**	**11**	**1300 DJ**	0.38 U	NA	0.37 U	NA	0.36 U	NA	**110 D**
Phenanthrene	50	**1.5**	0.45 U	0.39 U	**34**	**0.021 J**	NA	**1.6 J**	NA	**32 DJ**	**0.032 J**	**23**	**6.2**	NA	**1800 D**	**4100 D**	NA	**0.12 J**	**0.016 J**	**200 DJ**	NA	**1.6**	**11**	**880 DJ**	**0.12 J**	NA	0.37 U	NA	**0.01 J**	NA	**170 D**
Pyrene	50	**2.7**	0.45 U	0.39 U	**43 J**	**0.013 J**	NA	**2.1 J**	NA	**12 J**	**0.042 J**	**11 J**	**3.7**	NA	**750 DJ**	**1500 DJ**	NA	**0.39 J**	0.36 U	**77 J**	NA	**0.97**	**9.6**	**380 DJ**	**0.042 J**	NA	0.37 U	NA	**0.016 J**	NA	**93 DJ**
Total Noncarcinogenic PAHs	NE	**8.58**	ND	ND	**205.07**	**0.093**	NA	**7**	NA	**125.6**	**0.171**	**67.62**	**57.71**	NA	**8924**	**20840**	NA	**1.02**	**0.056**	**852**	NA	**6.77**	**59.3**	**4481**	**0.342**	NA	**0.016**	NA	**0.069**	NA	**717.8**
Carcinogenic PAHs (mg/kg)																															
Benz[a]anthracene	0.224	**1.2**	0.45 U	0.39 U	**46**	0.4 U	NA	**1.4 J**	NA	**4.7 J**	**0.023 J**	**8.9**	**1.1 J**	NA	**310**	**850 DJ**	NA	**0.24 J**	0.36 U	**31 J**	NA	**0.35 J**	**3.9**	**130 DJ**	**0.017 J**	NA	0.37 U	NA	**0.012 J**	NA	**26**
Benzo[a]pyrene	0.061	**1.3**	0.45 U	0.39 U	**31**	0.4 U	NA	**1.1 J**	NA	**4.2 J**	**0.011 J**	**5.9 J**	**1.2 J**	NA	**260**	**500**	NA	**0.28 J**	0.36 U	**27 J**	NA	**0.31 J**	**4.1**	**97 DJ**	**0.01 J**	NA	0.37 U	NA	**0.017 J**	NA	**24**
Benzo[b]fluoranthene	1.1	**1.1**	0.45 U	0.39 U	**49**	0.4 U	NA	**1.1 J**	NA	**2.1 J**	**0.019 J**	**5 J**	**0.53 J**	NA	**260**	**530**	NA	**0.31 J**	0.36 U	**22 J**	NA	**0.22 J**	**2.2 J**	**54 DJ**	0.38 U	NA	0.37 U	NA	**0.011 J**	NA	**27 J**
Benzo[k]fluoranthene	1.1	**1**	0.45 U	0.39 U	**29**	0.4 U	NA	**0.72 J**	NA	**2.2 J**	**0.014 J**	**6.2 J**	**0.63 J**	NA	**110**	**160**	NA	**0.14 J**	0.36 U	**12 J**	NA	**0.17 J**	**2 J**	**24**	0.38 U	NA	0.37 U	NA	**0.016 J**	NA	**27 J**
Chrysene	0.4	**1.5**	0.45 U	0.39 U	**36**	0.4 U	NA	**1.2 J**	NA	**3.9 J**	**0.023 J**	**6.7 J**	**0.96 J**	NA	**200**	**460**	NA	**0.24 J**	0.36 U	**22 J**	NA	**0.27 J**	**3**	**110 DJ**	**0.013 J**	NA	0.37 U	NA	**0.013 J**	NA	**21**
Dibenz[a,h]anthracene	0.014	**0.46 J**	0.45 U	0.39 U	**8.5**	0.4 U	NA	9.4 U	NA	**0.57 J**	0.37 U	**1.1 J**	**0.12 J**	NA	**51**	**94**	NA	3.9 U	0.36 U	**4.7 J**	NA	**0.036 J**	**0.63 J**	**9.7**	0.38 U	NA	0.37 U	NA	0.36 U	NA	**3.1 J**
Indeno[1,2,3-cd]pyrene	3.2	**1 J**	0.45 U	0.39 U	**19**	0.4 U	NA	**0.44 J**	NA	**1.1 J**	0.37 U	**2 J**	**0.45 J**	NA	**110**	**210**	NA	**0.18 J**	0.36 U	**11 J**	NA	**0.1 J**	**1.5 J**	**20 J**	0.38 U	NA	0.37 U	NA	**0.011 J**	NA	**6.7**
Total Carcinogenic PAHs	NE	**7.56**	ND	ND	**218.5**	ND	NA	**5.96**	NA	**18.77**	**0.09**	**35.8**	**4.99**	NA	**1301**	**2804**	NA	**1.39**	ND	**129.7**	NA	**1.456**	**17.33**	**444.7**	**0.04**	NA	ND	NA	**0.08**	NA	**134.8**
Total PAHs (mg/kg)																															
Total PAHs	NE	**16.14**	ND	ND	**423.57**	**0.093**	NA	**12.96**	NA	**144.37**	**0.261**	**103.42**	**62.7**	NA	**10225**	**23644**	NA	**2.41**	**0.056**	**981.7**	NA	**8.226**	**76.63**	**4925.7**	**0.382**	NA	**0.016**	NA	**0.149**	NA	**852.6**
Other SVOCs (mg/kg)																															
Biphenyl,1,1-	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**94 DJ**	NA	NA	NA	NA	0.36 U	NA	NA
Bis(2-ethylhexyl)phthalate	50	0.43 U	0.45 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.6 U	NA	NA	NA	NA	**0.011 J**	NA	NA
Carbazole	NE	**0.18 J**	0.45 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**18**	NA	NA	NA	NA	0.36 U	NA	NA
Dibenzofuran	6.2	**0.083 J**	0.45 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**39**	NA	NA	NA	NA	0.36 U	NA	NA
Di-n-butyl phthalate	8.1	0.43 U	0.45 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.6 U	NA	NA	NA	NA	**0.034 J**	NA	NA
PCBs (mg/kg)																															
PCBs	Not Compared*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA	NA	ND	NA	NA
Pesticides (mg/kg)																															
Pesticides	Not Compared*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	R	NA	NA	NA	NA	ND	NA	NA
Metals (mg/kg)																															
Aluminum	SB	**8690**	**7020**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**3470**	NA	NA	NA	NA	**8910**	NA	NA
Arsenic	7.5 or SB	**7.5**	**2.1 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**2.1**	NA	NA	NA	NA	**3.0**	NA	NA
Barium	300 or SB	**84.8**	**42.8 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**46.3**	NA	NA	NA	NA	**46.1**	NA	NA
Beryllium	0.16 or SB	2.2 U	3.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.19 UJ	NA	NA	NA	NA	**0.39 J**	NA	NA
Calcium	SB	**56900**	**19500**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**41900 J**	NA	NA	NA	NA	**2400 J**	NA	NA
Chromium	10 or SB	**15.1**	**11.3**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**5.8 J**	NA	NA	NA	NA	**11.9 J**	NA	NA
Cobalt	30 or SB	**8.1 J**	**4.9 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**3.6**	NA	NA	NA	NA	**8.0**	NA	NA
Copper	25 or SB	**41.9**	**8.6**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**16.5**	NA	NA	NA	NA	**15.4**	NA	NA
Iron	2000 or SB	**16100**	**12900**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**7860**	NA	NA	NA	NA	**16600**	NA	NA
Lead	SB	**46**	**5.2**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**4.1 J**	NA	NA	NA	NA	**7.8 J**	NA	NA
Magnesium	SB	**23800 J**	**3480 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**13900**	NA	NA	NA	NA	**3970**	NA	NA
Manganese	SB	**407**	**124**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**203**	NA	NA	NA	NA	**229**	NA	NA
Mercury	0.1	**0.23**	**0.022**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0053 U	NA	NA	NA	NA	**0.009**	NA	NA
Nickel	13 or SB	**18.1**	**13.7**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**8.4**	NA	NA	NA	NA	**17.3**	NA	NA
Potassium	SB	**1430 J**	**995 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**873**	NA	NA	NA	NA	**1610**	NA	NA
Selenium	2 or SB	17.4 U	25.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.64 J**	NA	NA	NA	NA	**0.66 J**	NA	NA
Sodium	SB	**109 J**	**818 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**250**	NA	NA	NA	NA	**186**	NA	NA
Thallium	SB	10.9 U	**5.7 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.49 UJ	NA	NA	NA	NA	0.45 UJ	NA	NA
Vanadium	150 or SB	**18.2**	**13.2 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**8.7**	NA	NA	NA	NA	**14.4**	NA	NA
Zinc	20 or SB	**67.4**	**29.6**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**19.1 J**	NA	NA	NA	NA	**30.2 J**	NA	NA
Total Cyanide (mg/kg)																															
Cyanide, Total	NE	0.667 U	0.679 U	0.604 U	**11.3**	4.6 U	NA	**41.4**	NA	4.5 U	4.3 U	4.4 U	6.2 U	NA	4.9 U	**31.6**	NA	**5.9**	4.2 U	13.4 UJ	NA	4.3 U	**4.1**	NA	4.5 U	NA	4.4 U	NA	NA	NA	4.7 U
Other (%)																															
Total Organic Carbon	NE	NA	NA	NA	NA	NA	**28.0**	NA	**1.3**	NA	NA	NA	NA	**2.2**	NA	NA	**3.1**	NA	NA	NA	**2.1**	NA	NA	NA	NA	**8.0**	**0.40**	**2.0**	NA	**1.8**	NA

Table 3
Soil Analytical Results
Canastota Non-Owned Former MGP Site
Canastota, NY

	NY Soil Cleanup Objective (TAGM 4046)	SB-11 (9-10) 12/3/2003	SB-11 (16-20) 12/3/2003	SB-12 (0-4) 12/3/2003	SB-12 (4-8) 12/2/2003	SB-13 (6.5-7.5) 7/12/2005	SB-14 (8-9) 7/11/2005	SB-15 (14-15) 7/11/2005	SB-16 (13-13.5) 7/11/2005	SB-17 (7-8) 7/11/2005	SB-18 (6-7) 7/11/2005	SB-19 (7-8) 7/13/2005	SB-20 (5.5-6) 7/12/2005	SB-20A (5.5-6) 7/13/2005	SB-21 (7.5-8) 7/12/2005	SB-22 (6-7) 7/13/2005	SB-23 (13.5-14) 7/12/2005
BTEX (mg/kg)																	
Benzene	0.06	**7.3**	**0.002 J**	NA	0.012 U	**0.0021 J**	**51**	0.0057 U	0.0056 U	**0.0019 J**	**0.047 J**	**31**	**0.57 J**	**8.9 J**	**0.027**	**0.035**	0.0061 U
Ethylbenzene	5.5	**23**	0.011 U	NA	0.012 U	0.006 U	**150**	0.0057 U	0.0056 U	0.0064 U	**0.077 J**	**40**	**0.28 J**	**10 J**	**0.17**	**0.76**	0.0061 U
Toluene	1.5	**5.2 J**	0.011 U	NA	0.012 U	0.006 U	**100**	0.0057 U	0.0056 U	0.0064 U	**0.028 J**	**44**	**0.51 J**	**17 J**	**0.017**	**0.13**	0.0061 U
Total BTEX	NE	**70.5**	**0.002**	NA	ND	**0.0021**	**451**	ND	ND	**0.0019**	**0.272**	**187**	**3.96**	**122.9**	**0.374**	**2.225**	ND
Xylene, Total	1.2	**35**	0.011 U	NA	0.012 U	0.006 U	**150**	0.0057 U	0.0056 U	0.0064 U	**0.12 J**	**72**	**2.6**	**87 J**	**0.16**	**1.3**	0.0061 U
Other VOCs (mg/kg)																	
Carbon disulfide	2.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropyl benzene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Noncarcinogenic PAHs (mg/kg)																	
Acenaphthene	50	**130 DJ**	**0.01 J**	NA	3.8 U	**0.22 J**	**1400**	0.37 U	0.37 U	0.41 U	**1.7**	**63**	**160**	**73 J**	**2 J**	**46**	0.39 U
Acenaphthylene	41	**93 DJ**	0.41 U	NA	3.8 U	0.38 U	**180 J**	0.37 U	0.37 U	0.41 U	**2.8**	**67**	**260**	**130 J**	**0.1 J**	**4.3**	0.39 U
Anthracene	50	**140 DJ**	0.41 U	NA	3.8 U	0.38 U	**660**	0.37 U	0.37 U	0.41 U	**11**	**79**	**480**	**250 J**	**0.26 J**	**25**	0.39 U
Benzo[g,h,i]perylene	50	**19**	0.41 U	NA	3.8 U	0.38 U	**160 J**	0.37 U	0.37 U	0.41 U	**6.9**	**23**	**430**	**89 J**	0.38 UJ	**4.8**	0.39 U
Fluoranthene	50	**220 DJ**	0.41 U	NA	**0.099 J**	0.38 U	**1000**	0.37 U	0.37 U	0.41 U	**31**	**170**	**1800**	**650 J**	**0.54 J**	**34**	0.39 U
Fluorene	50	**160 DJ**	0.41 U	NA	3.8 U	0.38 U	**720**	0.37 U	0.37 U	0.41 U	**8.3**	**79**	**350**	**190 J**	**0.85 J**	**28**	0.39 U
Methylnaphthalene,2-	36.4	**320 DJ**	**0.019 J**	NA	3.8 U	0.38 U	**1700**	0.37 U	0.37 U	0.41 U	**2.2**	**110**	**160**	**170 J**	0.38 U	**55**	0.39 U
Naphthalene	13	**810 D**	0.41 U	NA	3.8 U	0.38 U	**4800**	0.37 U	0.37 U	0.41 U	**5.8**	**390**	**490**	**590 J**	**1.8 J**	**93**	0.39 U
Phenanthrene	50	**580 D**	**0.02 J**	NA	3.8 U	0.38 U	**2700**	**0.091 J**	0.37 U	0.41 U	**34**	**310**	**1600**	**620 J**	**1.9 J**	**95**	0.39 U
Pyrene	50	**230 DJ**	0.41 UJ	NA	3.8 UJ	0.38 U	**1500**	0.37 U	0.37 U	0.41 U	**30**	**170**	**1900**	**370 J**	**0.55 J**	**47**	0.39 U
Total Noncarcinogenic PAHs	NE	**2702**	**0.049**	NA	**0.099**	**0.22**	**14820**	**0.091**	ND	ND	**133.7**	**1461**	**7630**	**3132**	**8**	**432.1**	ND
Carcinogenic PAHs (mg/kg)																	
Benz[a]anthracene	0.224	**58**	0.41 U	NA	3.8 U	0.38 U	**410**	0.37 U	0.37 U	0.41 U	**15**	**57**	**720**	**190 J**	**0.16 J**	**14**	0.39 U
Benzo[a]pyrene	0.061	**48**	0.41 U	NA	3.8 U	0.38 U	**330**	0.37 U	0.37 U	0.41 U	**13**	**50**	**770**	**180 J**	**0.17 J**	**12**	0.39 U
Benzo[b]fluoranthene	1.1	**34**	0.41 U	NA	3.8 U	0.38 U	**260 J**	0.37 U	0.37 U	0.41 U	**16**	**44**	**760**	**160 J**	**0.12 J**	**9.9**	0.39 U
Benzo[k]fluoranthene	1.1	**16**	0.41 U	NA	3.8 U	0.38 U	**120 J**	0.37 U	0.37 U	0.41 U	**7.2**	**30**	**340**	**95 J**	**0.12 J**	**5.2**	0.39 U
Chrysene	0.4	**46**	0.41 U	NA	3.8 U	0.38 U	**400**	0.37 U	0.37 U	0.41 U	**14**	**54**	**720**	**170 J**	**0.17 J**	**14**	0.39 U
Dibenz[a,h]anthracene	0.014	**7.2 J**	0.41 U	NA	3.8 U	0.38 U	310 U	0.37 U	0.37 U	0.41 U	**2**	**4.2 J**	**79 J**	**15 J**	0.38 U	4.1 U	0.39 U
Indeno[1,2,3-cd]pyrene	3.2	**18**	0.41 U	NA	3.8 U	0.38 U	**130 J**	0.37 U	0.37 U	0.41 U	**6.5**	**20**	**370**	**86 J**	0.38 UJ	**3.9 J**	0.39 U
Total Carcinogenic PAHs	NE	**227.2**	ND	NA	ND	ND	**1650**	ND	ND	ND	**73.7**	**259.2**	**3759**	**896**	**0.74**	**59**	ND
Total PAHs (mg/kg)																	
Total PAHs	NE	**2929.2**	**0.049**	NA	**0.099**	**0.22**	**16470**	**0.091**	ND	ND	**207.4**	**1720.2**	**11389**	**4028**	**8.74**	**491.1**	ND
Other SVOCs (mg/kg)																	
Biphenyl,1,1-	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	6.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	8.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (mg/kg)																	
PCBs	Not Compared*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides (mg/kg)																	
Pesticides	Not Compared*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)																	
Aluminum	SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7.5 or SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	300 or SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.16 or SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	10 or SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	30 or SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	25 or SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	2000 or SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	13 or SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	2 or SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	150 or SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	20 or SB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide (mg/kg)																	
Cyanide, Total	NE	4.3 U	4.6 U	NA	4.6 U	0.56 U	0.581 U	0.54 U	0.561 U	**0.154 J**	**1.01**	**1.11**	**6.8**	**6.33**	0.571 U	0.612 U	0.601 U
Other (%)																	
Total Organic Carbon	NE	NA	NA	**0.58**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
- Only detected analytes are shown on the table.
- Other VOCs includes all VOCs except BTEX.
- Other SVOCs includes all SVOCs except PAHs
- NE - not established
- NA - not analyzed
- ND - not detected
- J - estimated value
- U - indicates not detected at or above the reporting limit shown
- UJ - estimated detection limit
- D - indicates that compound concentration was obtained from a diluted sample
- R - rejected value
- Shading/bolding indicates an exceedance of established New York State Recommended Soil Cleanup Objectives for residential soils.
- SB - site background (* - Background levels for lead vary widely)
- Not Compared* - Pesticides and PCBs were analyzed for in 2 samples only, and there were no detected results to campare to criteria
- mg/kg - milligrams/kilogram or parts per million (ppm)

Table 4
Groundwater Analytical Results
Canastota Non-Owned Former MGP Site
Canastota. NY

	NYS AGWQS	MW-1 12/30/2003	MW-1 8/3/2005	MW-2 12/29/2003	MW-2 (DUP) 12/29/2003	MW-2 8/3/2005	MW-3 12/30/2003	MW-3 8/3/2005	MW-4 8/3/2005	MW-5 8/4/2005	MW-6 8/4/2005	MW-6 (DUP) 8/4/2005
BTEX (ug/L)												
Ethylbenzene	5	10 U	5 U	10 U	10 U	5 U	10 U	5 U	5 U	5 U	**440**	**340**
Toluene	5	10 U	5 U	10 U	10 U	5 U	10 U	5 U	5 U	5 U	**780**	**600**
Xylene, Total	NE	10 U	5 U	10 U	10 U	5 U	10 U	5 U	5 U	5 U	**420**	**330**
Benzene	1	10 U	5 U	10 U	10 U	5 U	10 U	5 U	5 U	5 U	**980**	**800**
Total BTEX	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	**2620**	**2070**
Noncarcinogenic PAHs (ug/L)												
Anthracene	50*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Pyrene	50*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Benzo[g,h,i]perylene	NE	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Fluoranthene	50*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Acenaphthylene	NE	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Acenaphthene	20*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	**120 J**	**120 J**
Phenanthrene	50*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	**66 J**	**70 J**
Fluorene	50*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	**39 J**	**42 J**
Naphthalene	10*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	9 J	11 U	**1600**	**1700**
Methylnaphthalene,2-	NE	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	**170 J**	**180 J**
Total Noncarcinogenic PAHs	NE	ND	ND	ND	ND	ND	ND	ND	**9**	ND	**1995**	**2112**
Carcinogenic PAHs (ug/L)												
Indeno[1,2,3-cd]pyrene	0.002*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Benzo[b]fluoranthene	0.002*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Benzo[k]fluoranthene	0.002*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Chrysene	0.002*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Benzo[a]pyrene	NE	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Dibenz[a,h]anthracene	NE	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Benz[a]anthracene	0.002*	10 U	13 U	10 U	10 U	11 U	10 U	12 U	11 U	11 U	440 U	440 U
Total Carcinogenic PAHs	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PAHs (ug/L)												
Total PAHs	NE	ND	ND	ND	ND	ND	ND	ND	**9**	ND	**1995**	**2112**
Total Cyanide (ug/L)												
Cyanide, Total	200	--	10 U	--	--	10 U	--	10 U	**16.7**	**14.6**	**17**	**14.4**

Notes-
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
NYS AGWQS – New York State Ambient Groundwater Quality Standards
* - Indicates a value that is a guidance value and not a standard
NE - not established
J - estimated value
U - not detected at or above the reporting limit shown
Bolding indicates the value was detected above the method detection limit.
Shading indicates an exceedance of established NY AGWQS
ND - not detected; total concentration is listed as ND because no compounds were detected in the group
ug/l - micrograms per liter; also expressed as parts per billion
-- = Not Analyzed

Table 5
Monitoring Well Construction Summary and Groundwater Elevations
Canasota Non-Owned Former MGP Site
Canastota, NY

Location	Northing	Easting	Ground Elevation	Top of Inner Well Casing Elevation	Top of Inner Well Casing Elevation (as of 2/10/10)	Top of Screen (ft, bgs)	Bottom of Screen Depth (ft, bgs)	Elevation of Screen Top	Elevation of Screen Bottom	Depth to Water 8/3/05	Groundwater Elevation 8/3/05	Depth to Water 6/10/09	Groundwater Elevation 6/10/09	Depth to Water 11/20/09	Groundwater Elevation 11/20/09
MW-01	1123234.32	1044600.05	426.91	426.58	426.45	4	9	422.91	417.91	5.41	421.17	5.07	421.51	4.79	421.66
MW-02	1123245.29	1044768.27	427.02	426.58	426.54	4	9	423.02	418.02	6.75	419.83	5.7	420.88	6.26	420.28
MW-03	1123682.53	1044575.59	424.86	424.62	424.41	4	14	420.86	410.86	4.85	419.77	4.12	420.5	3.12	421.29
MW-04	1123577.13	1044749.53	425.84	425.39	425.33	3	8	422.84	417.84	3.93	421.46	3.27	422.12	3.29	422.04
MW-05	1123426.06	1044812.71	426.13	425.62	425.65	3	8	423.13	418.13	4.18	421.44	3.51	422.11	3.29	422.36
MW-06	1123528.56	1044538.48	425.29	424.79	424.76	3	13	422.29	412.29	4.12	420.67	3.25	421.54	2.97	421.79

[1] Survey performed 2/10/10; Vertical Datum NAVD88; Horizontal Datum NAD83

NA = Not Available.

NM = Not Measured.

Table 6
Remedial Investigation Sample Summary and Rationale
Canastota Non-Owned Former MGP Site
Canastota, NY

Investigation Point	Location	Rationale	Soil Samples	Target Completion Depth	Laboratory Analyses
Test Pit TP-2	Former condensers	Evaluate magnitude of impacts and generate additional soil data near former condensers	1	10-12 feet bgs	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Test Pits TP-3	Former tar well and "hot well"	Confirm presence of tar well and evaluate the feature labeled as a "hot well"	1	10-12 feet bgs	BTEX PAH TAL Metals Total Cyanide
Test Pit TP-4	Large gas holder	Confirm the location of the gas holder foundation and evaluate potential soil impacts	1	10-12 feet bgs	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-24	West of MW-6	Evaluate groundwater west (off-site) of MW-6	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-25/ Monitoring Well MW-7	Northwest of MW-6	Evaluate groundwater northwest (off-site) and downgradient of MW-6	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-26	Former pond	Evaluate magnitude of impacts and generate additional soil data at center of former pond	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-27	Former large gas holder	Evaluate extent of impacts at center of former large gas holder	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-28	South end of drainage ditch	Evaluate potential impacts of contemporary surface water drainage heading offsite	2	TBD - limits of hand sampling	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide

Table 6
Remedial Investigation Sample Summary and Rationale
Canastota Non-Owned Former MGP Site
Canastota, NY

Investigation Point	Location	Rationale	Soil Samples	Target Completion Depth	Laboratory Analyses
Boring SB-29 / Monitoring Well MW-8	Southeast side of site	Evaluate potential impacts between condensers, retorts, and eastern site boundary	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-30	Southwest side of site	Evaluate potential impacts up/sidegradient of MW-1/SB-9 at southwest property boundary	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-31	Former MGP repair shop	Identify potential impacts from former repair shop and in former foundation (if present)	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-32	Former small gas holder	Evaluate extent of impacts at center of former small gas holder	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-33	North of fenced area from SB-12	Evaluate potential impacts on till contact to north (downgradient)	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-34	North of SB-11, east of SB-12	Evaluate potential impacts on till contact to north, on north side of former pond	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-35	Center of drainage ditch	Identify potential impacts of contemporary surface water drainage to north of former MGP process area	2	TBD - limits of hand sampling	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-36	North of SB-34	Step out location, if necessary, for evaluation of deeper till contact to north	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide

Table 6
Remedial Investigation Sample Summary and Rationale
Canastota Non-Owned Former MGP Site
Canastota, NY

Investigation Point	Location	Rationale	Soil Samples	Target Completion Depth	Laboratory Analyses
Boring SB-37	West of SB-12	Evaluate downgradient conditions	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-38	Former purifier house	Identify potential impacts from former purifier house	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-39/MW-9	Between former large gas holder and ambulance building	Evaluate potential impacts sidegradient from large gas holder	2	Boring to top of glacial till - well to screen water table	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-40	South end of drainage ditch	Evaluate potential impacts of contemporary surface water drainage	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-41	West side of garage and small gas holder	Evaluate conditions downgradient of small gas holder	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-42	East side of garage	Evaluate conditions downgradient of the gas plant building and scrubber	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-43	Between the garage and the salt storage building	Locate edge of former pond	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-44	North of salt storage building	Locate edge of former pond	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-45	Northeast of salt storage building	Locate edge of former pond	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide

Table 6
Remedial Investigation Sample Summary and Rationale
Canastota Non-Owned Former MGP Site
Canastota, NY

Investigation Point	Location	Rationale	Soil Samples	Target Completion Depth	Laboratory Analyses
Boring SB-46	East of salt storage building	Evaluate central area of former pond	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Boring SB-47	East side of site	Locate edge of former pond	2	TBD - Top of glacial till	TCL VOCs / SVOCs TAL Metals Total and Available Cyanide
Monitoring Well MW-3D	Adjacent to MW-3	Screen top of till adjacent to shallow well	0	TBD - Top of glacial till	NA
Monitoring Well MW-6D	Adjacent to MW-6	Screen top of till adjacent to shallow well	0	TBD - Top of glacial till	NA
Monitoring Well MW-10	Downgradient of former tar well	Characterize groundwater conditions at the central portion of the site	0	Well to screen water table	NA
SG-1	Eastern property line area, near SB-29	Assess soil vapor conditions between the site and the closest residential property to the MGP	1	1 foot above water table	TO-15 VOCs + MGP indicators
SG-2	Between western gas holder and the ambulance company office	Assess soil vapor conditions between the large gas holder and the ambulance company buildings	1	1 foot above water table	TO-15 VOCs + MGP indicators
SG-3	DPW office - south end of DPW building	Assess sub-slab soil vapor beneath the DPW garage office	1	1 foot above water table	TO-15 VOCs + MGP indicators
IA-3	DPW office - south end of DPW building	Assess indoor air in the DPW garage office space	1	Breathing zone in office	TO-15 VOCs + MGP indicators
AA-3	Upwind of DPW office	Upwind ambient air take during indoor air and soil vapor sampling	1	Breathing zone, upwind of office	TO-15 VOCs + MGP indicators
TBD	TBD	Representative sample of each soil unit present at the site	5	TBD	Grain size and Atterberg limits
TBD	TBD (cross-gradient from impacted area)	Till unit	1	Till unit (obtained below weathered upper surface)	Laboratory permeability test

NOTES:

NA - Not Applicable

TBD - To be determined

Table 7
RI Laboratory Analyses Summary
Canastota Non-Owned Former MGP Site
Canastota, NY

Sample Designation		Soil Analyses							Groundwater Analyses					Soil Vapor
Analyses Method QA/QC	Anticipated Completion or Sample Depth	VOC 8260B ASP B	SVOC 8270C ASP B	TAL Metals 6000-7000 ASP B	Total CN 9012A ASP B	Available CN OIA-1677 ASP B	Grain size and Atterberg Limits (Note 1)	Laboratory Permeability (Note 2)	VOC 8260B ASP B	SVOC 8270C ASP B	TAL Metals 6000-7000 ASP B	Total CN 9012A ASP B	Available CN OIA-1677 ASP B	VOCs + MGP Indicators TO-15 ASP B
Test Pits														
TP-2	10 feet bgs	1	1	1	1	1								
TP-3	10 feet bgs	1	1	1	1	1								
TP-4	10 feet bgs	1	1	1	1	1								
Subsurface Soil Borings														
SB-24	TBD - top of glacial till	2	2	2	2	2								
SB-25 / MW-7	TBD - top of glacial till	2	2	2	2	2								
SB-26	TBD - top of glacial till	2	2	2	2	2								
SB-27	TBD - top of glacial till	2	2	2	2	2								
SB-28	TBD - top of glacial till	2	2	2	2	2								
SB-29 / MW-8	TBD - top of glacial till	2	2	2	2	2								
SB-30	TBD - top of glacial till	2	2	2	2	2								
SB-31	TBD - top of glacial till	2	2	2	2	2								
SB-32	TBD - top of glacial till	2	2	2	2	2								
SB-33	TBD - top of glacial till	2	2	2	2	2								
SB-34	TBD - top of glacial till	2	2	2	2	2								
SB-35	TBD - top of glacial till	2	2	2	2	2								
SB-36	TBD - top of glacial till	2	2	2	2	2								
SB-37	TBD - top of glacial till	2	2	2	2	2								
SB-38	TBD - top of glacial till	2	2	2	2	2								
SB-39 / MW-9	TBD - top of glacial till	2	2	2	2	2								
SB-40	TBD - top of glacial till	2	2	2	2	2								
SB-41	TBD - top of glacial till	2	2	2	2	2								
SB-42	TBD - top of glacial till	2	2	2	2	2								
SB-43	TBD - top of glacial till	2	2	2	2	2								
SB-44	TBD - top of glacial till	2	2	2	2	2								
SB-45	TBD - top of glacial till	2	2	2	2	2								
SB-46	TBD - top of glacial till	2	2	2	2	2								
SB-47	TBD - top of glacial till	2	2	2	2	2								
Subsurface Soil Borings for Monitoring Well Installation														
MW-3D	TBD - screened at top of glacial till	1	1	1	1	1								
MW-6D	TBD - screened at top of glacial till	1	1	1	1	1								
MW-10	TBD	0	0	0	0	0								
Soil QA/QC														
Duplicates	NA	3	3	3	3	3								
MS (Matrix Spike Samples)	NA	3	3	3	3	3								
MSD (Matrix Spike Duplicate Samples)	NA	3	3	3	3	3								
Equipment Blank	NA								2	2	2	2		
Trip Blank	NA								10					

Table 7
RI Laboratory Analyses Summary
Canastota Non-Owned Former MGP Site
Canastota, NY

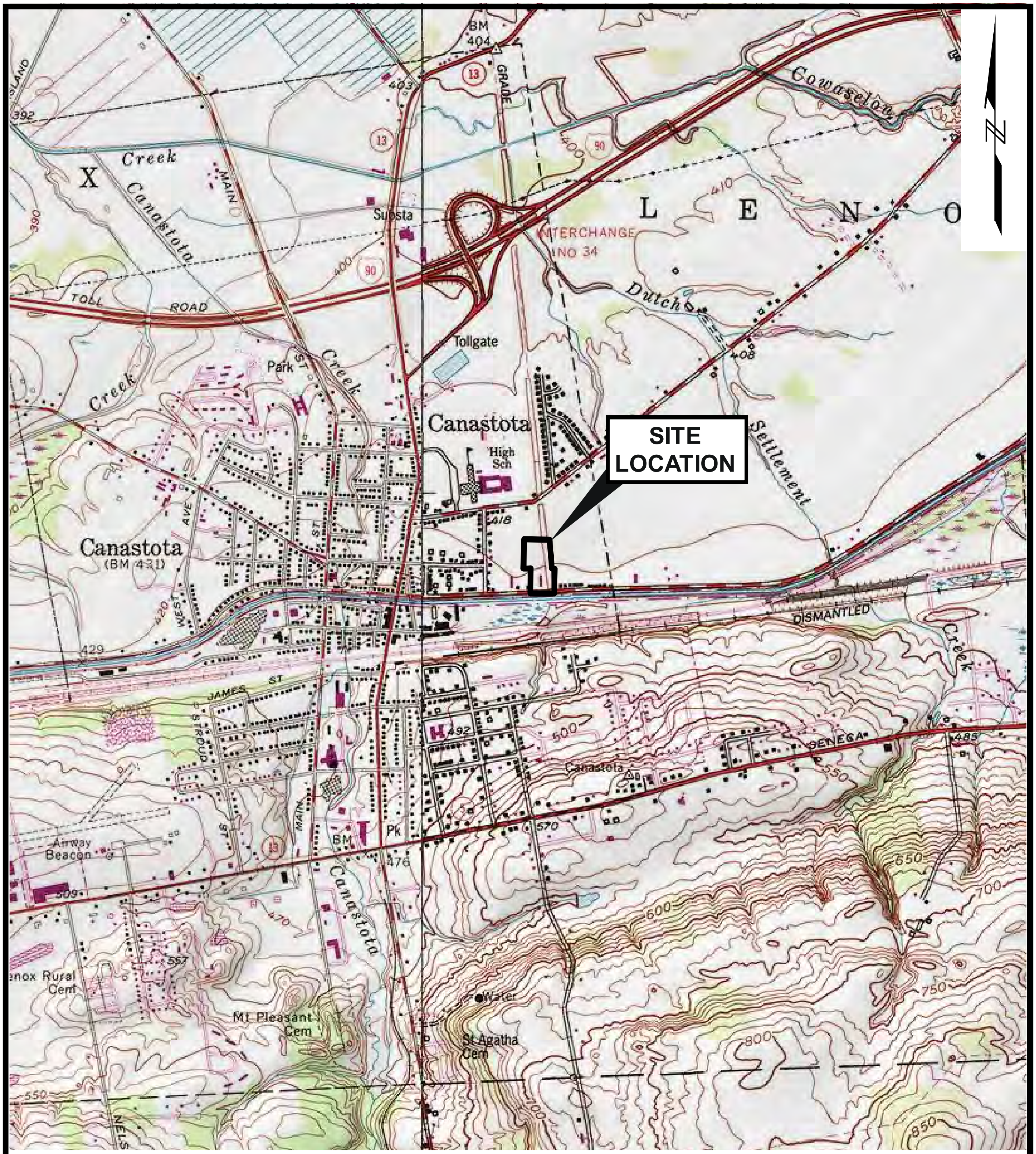
Sample Designation		Soil Analyses							Groundwater Analyses					Soil Vapor
Analyses Method QA/QC	Anticipated Completion or Sample Depth	VOC 8260B ASP B	SVOC 8270C ASP B	TAL Metals 6000-7000 ASP B	Total CN 9012A ASP B	Available CN OIA-1677 ASP B	Grain size and Atterberg Limits (Note 1)	Laboratory Permeability (Note 2)	VOC 8260B ASP B	SVOC 8270C ASP B	TAL Metals 6000-7000 ASP B	Total CN 9012A ASP B	Available CN OIA-1677 ASP B	VOCs + MGP Indicators TO-15 ASP B
Groundwater														
MW-1	water table well								1	1	1	1	1	
MW-2	water table well								1	1	1	1	1	
MW-3	water table well								1	1	1	1	1	
MW-3D	top of till								1	1	1	1	1	
MW-4	water table well								1	1	1	1	1	
MW-5	water table well								1	1	1	1	1	
MW-6	water table well								1	1	1	1	1	
MW-6D	top of till								1	1	1	1	1	
MW-7	water table well								1	1	1	1	1	
MW-8	water table well								1	1	1	1	1	
MW-9	water table well								1	1	1	1	1	
MW-10	water table well								1	1	1	1	1	
Groundwater QA/QC														
Duplicate	NA								1	1	1	1	1	
MS (Matrix Spike Sample)	NA								1	1	1	1	1	
MSD (Matrix Spike Duplicate Sample)	NA								1	1	1	1	1	
Equipment Blank	NA								1	1	1	1	1	
Trip Blank	NA								2					
Soil Vapor/Indoor Air/Ambient Air														
SG-1	one foot above water table													1
SG-2	one foot above water table													1
SG-3	one foot above water table													1
IA-3	Indoor air breathing zone													1
AA-3	Upwind ambient air at breathing zone													1
Total		**62**	**62**	**62**	**62**				**30**	**18**	**18**	**18**	**16**	**5**

TBD - To Be Determined
NA - Not applicable

Note 1 - The number and locations for these analyses will be determined in the field. The objective will be to obtain one sample from each soil unit (estimated at 5 samples).
Note 2 - One sample will be obtained from a boring into the till unit. The sample will be obtained from below the weathered till surface for permeability testing.

REMEDIAL INVESTIGATION WORK PLAN
NATIONAL GRID
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK
OCTOBER 2010

Figures



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)

0 2000 4000

SCALE, FEET

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

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SITE LOCATION MAP

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Figure 1

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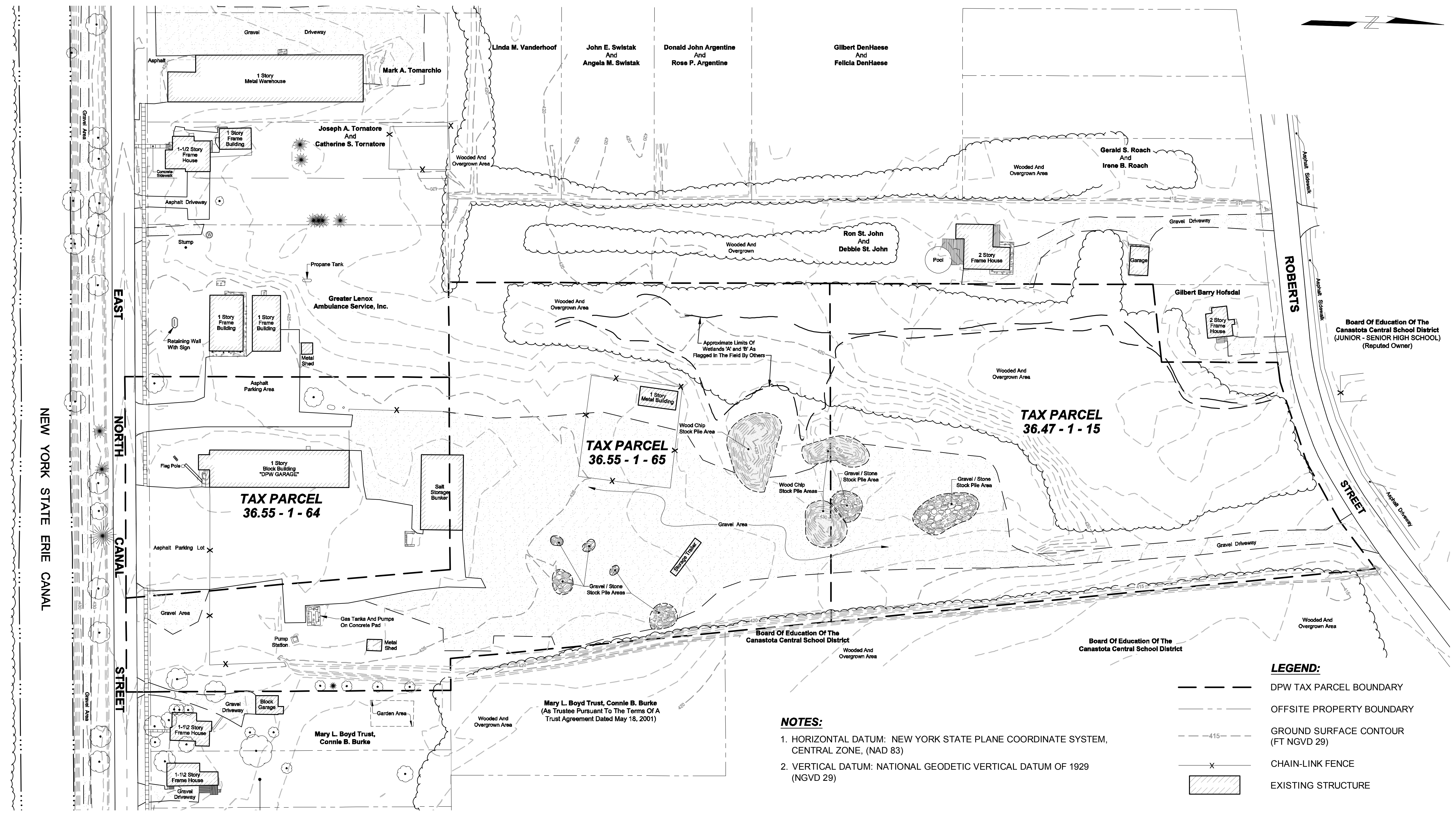

NOTES:

1. HORIZONTAL DATUM: NEW YORK STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, (NAD 83)
2. VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29)

LEGEND:

— — —	DPW TAX PARCEL BOUNDARY
— - —	OFFSITE PROPERTY BOUNDARY
-415-	GROUND SURFACE CONTOUR (FT NGVD 29)
—x—	CHAIN-LINK FENCE
▨	EXISTING STRUCTURE

SOURCES:

1. PLAN BASED ON SURVEY MAPS SHEETS 1 AND 2: *LANDS OF VILLAGE OF CANASTOTA, NORTHEAST CANAL STREET AND ROBERTS STREET, BEING PART OF LOT # 86 OF THE CANASTOTA TRACT, VILLAGE OF CANASTOTA - MADISON COUNTY, STATE OF NEW YORK,* PREPARED BY DELTA ENGINEERS, ARCHITECTS & LAND SURVEYORS, 4873 NEW YORK STATE ROUTE #5, VERNON, NY, DATE: 2/10/2010, SCALE: 1" = 30.
2. FIGURE 1: *CURRENT SITE CONDITIONS AND SAMPLE LOCATION MAP,* PREPARED BY GEI CONSULTANTS, INC., DATE: OCTOBER 2007, SCALE: 1" = 60'

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

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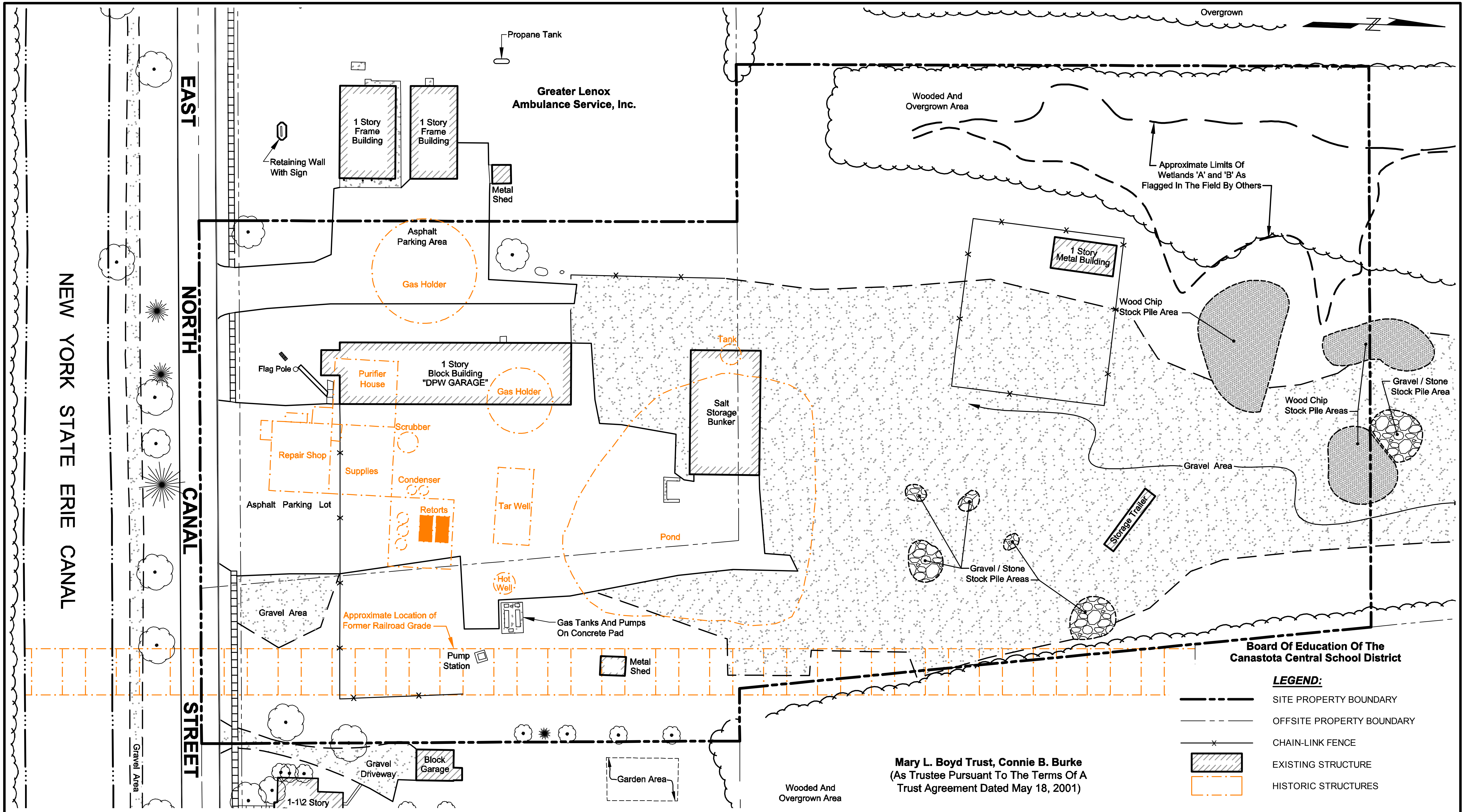
CURRENT SITE LAYOUT

Project 034390-1-1014 | October 2010 | Figure 2

I:\Project\National Grid_formerly NIMO\CANASTOTA\RI - 2010\CADD DWGS\Figures\October 2010\Canastota-RIWP Figures.dwg



SOURCES:

1. PLAN BASED ON SURVEY MAPS SHEETS 1 AND 2: *LANDS OF VILLAGE OF CANASTOTA, NORTHEAST CANAL STREET AND ROBERTS STREET, BEING PART OF LOT # 86 OF THE CANASTOTA TRACT, VILLAGE OF CANASTOTA - MADISON COUNTY, STATE OF NEW YORK,* PREPARED BY DELTA ENGINEERS, ARCHITECTS & LAND SURVEYORS, 4873 NEW YORK STATE ROUTE #5, VERNON, NY, DATE: 2/10/2010, SCALE: 1" = 30.
2. FIGURE 1: *CURRENT SITE CONDITIONS AND SAMPLE LOCATION MAP,* PREPARED BY GEI CONSULTANTS, INC., DATE: OCTOBER 2007, SCALE: 1" = 60'

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

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HISTORICAL SITE FEATURES

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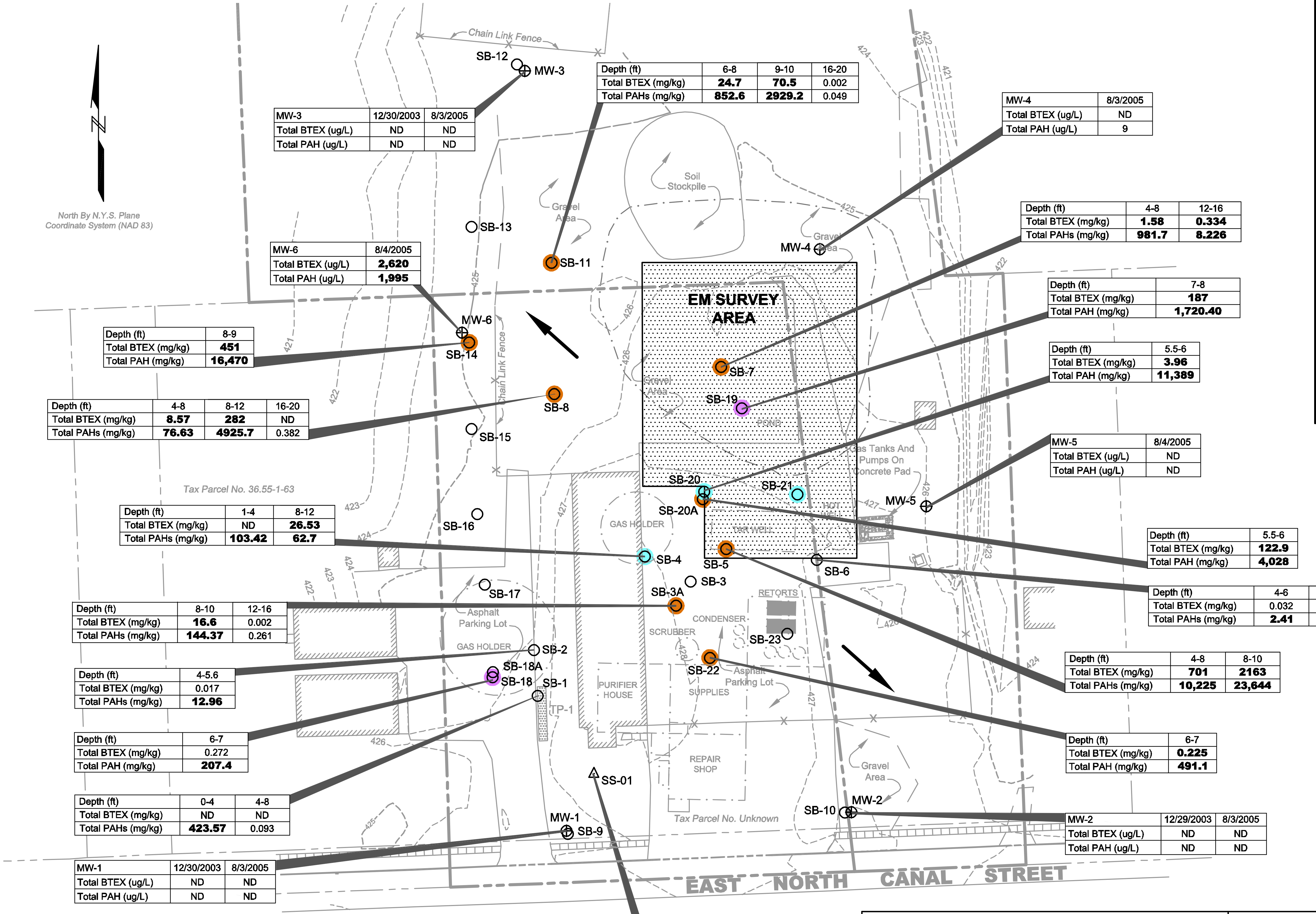
Figure 3

I:\Project\National Grid_formerly NIMO\CANASTOTA\RI - 2010\CADD DWGS\Figures\October 2010\Canastota-RIWP Figures.dwg



MW-3	12/30/2003	8/3/2005
Total BTEX (ug/L)	ND	ND
Total PAH (ug/L)	ND	ND

Depth (ft)	6-8	9-10	16-20
Total BTEX (mg/kg)	**24.7**	**70.5**	0.002
Total PAHs (mg/kg)	**852.6**	**2929.2**	0.049

MW-4	8/3/2005
Total BTEX (ug/L)	ND
Total PAH (ug/L)	9

Depth (ft)	4-8	12-16
Total BTEX (mg/kg)	**1.58**	**0.334**
Total PAHs (mg/kg)	**981.7**	**8.226**

MW-6	8/4/2005
Total BTEX (ug/L)	**2,620**
Total PAH (ug/L)	**1,995**

Depth (ft)	7-8
Total BTEX (mg/kg)	**187**
Total PAH (mg/kg)	**1,720.40**

Depth (ft)	8-9
Total BTEX (mg/kg)	**451**
Total PAH (mg/kg)	**16,470**

Depth (ft)	5.5-6
Total BTEX (mg/kg)	**3.96**
Total PAH (mg/kg)	**11,389**

Depth (ft)	4-8	8-12	16-20
Total BTEX (mg/kg)	**8.57**	**282**	ND
Total PAHs (mg/kg)	**76.63**	**4925.7**	0.382

MW-5	8/4/2005
Total BTEX (ug/L)	ND
Total PAH (ug/L)	ND

Depth (ft)	1-4	8-12
Total BTEX (mg/kg)	ND	**26.53**
Total PAHs (mg/kg)	**103.42**	**62.7**

Depth (ft)	5.5-6
Total BTEX (mg/kg)	**122.9**
Total PAH (mg/kg)	**4,028**

Depth (ft)	4-6	8-12
Total BTEX (mg/kg)	0.032	0.032
Total PAHs (mg/kg)	**2.41**	0.056

Depth (ft)	8-10	12-16
Total BTEX (mg/kg)	**16.6**	0.002
Total PAHs (mg/kg)	**144.37**	0.261

Depth (ft)	4-8	8-10
Total BTEX (mg/kg)	**701**	**2163**
Total PAHs (mg/kg)	**10,225**	**23,644**

Depth (ft)	4-5.6
Total BTEX (mg/kg)	0.017
Total PAHs (mg/kg)	**12.96**

Depth (ft)	6-7
Total BTEX (mg/kg)	0.272
Total PAH (mg/kg)	**207.4**

Depth (ft)	6-7
Total BTEX (mg/kg)	**0.225**
Total PAH (mg/kg)	**491.1**

Depth (ft)	0-4	4-8
Total BTEX (mg/kg)	ND	ND
Total PAHs (mg/kg)	**423.57**	0.093

MW-2	12/29/2003	8/3/2005
Total BTEX (ug/L)	ND	ND
Total PAH (ug/L)	ND	ND

MW-1	12/30/2003	8/3/2005
Total BTEX (ug/L)	ND	ND
Total PAH (ug/L)	ND	ND

Depth (ft)	0-0.25
Total BTEX (mg/kg)	ND
Total PAH (mg/kg)	**16.14**

LEGEND:

— - —	VILLAGE OF CANASTOTA PROPERTY BOUNDARY
▨	BUILDING
⬚	APPROXIMATE HISTORIC STRUCTURE LOCATION
----425----	SURFACE CONTOUR (ft)
⊕ MW-1	FORMER MONITORING WELL LOCATION
○ SB-1	FORMER SOIL BORING LOCATION
▒	TEST PIT LOCATION
(BOLD) **2.41**	ONE OR MORE COMPOUNDS EXCEEDS NEW YORK STATE SOIL CLEANUP OBJECTIVE
NA	NOT ANALYZED
ND	NOT DETECTED
→	GROUNDWATER FLOW DIRECTION

PHYSICAL OBSERVATIONS

●	MGP/NAPHTHALENE ODOR
●	SHEEN, STAINED
●	TAR COATED/BLEBS

0 60 120

SCALE, FEET

NOTE:

SB-07 LOCATION IS APPROXIMATE.

SOURCE:

SURVEY MAP TITLED "PORTION OF THE LANDS OF VILLAGE OF CANASTOTA NORTHEAST CANAL STREET, VILLAGE OF CANASTOTA - MADISON COUNTY, STATE OF NEW YORK; PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP, 214 CEDAR STREET, ONEIDA, NEW YORK 13421; DATED 11/20/2003; SCALE: 1" = 30'.

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

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SOIL AND GROUNDWATER ANALYTICAL RESULTS

October 2010

Figure 4

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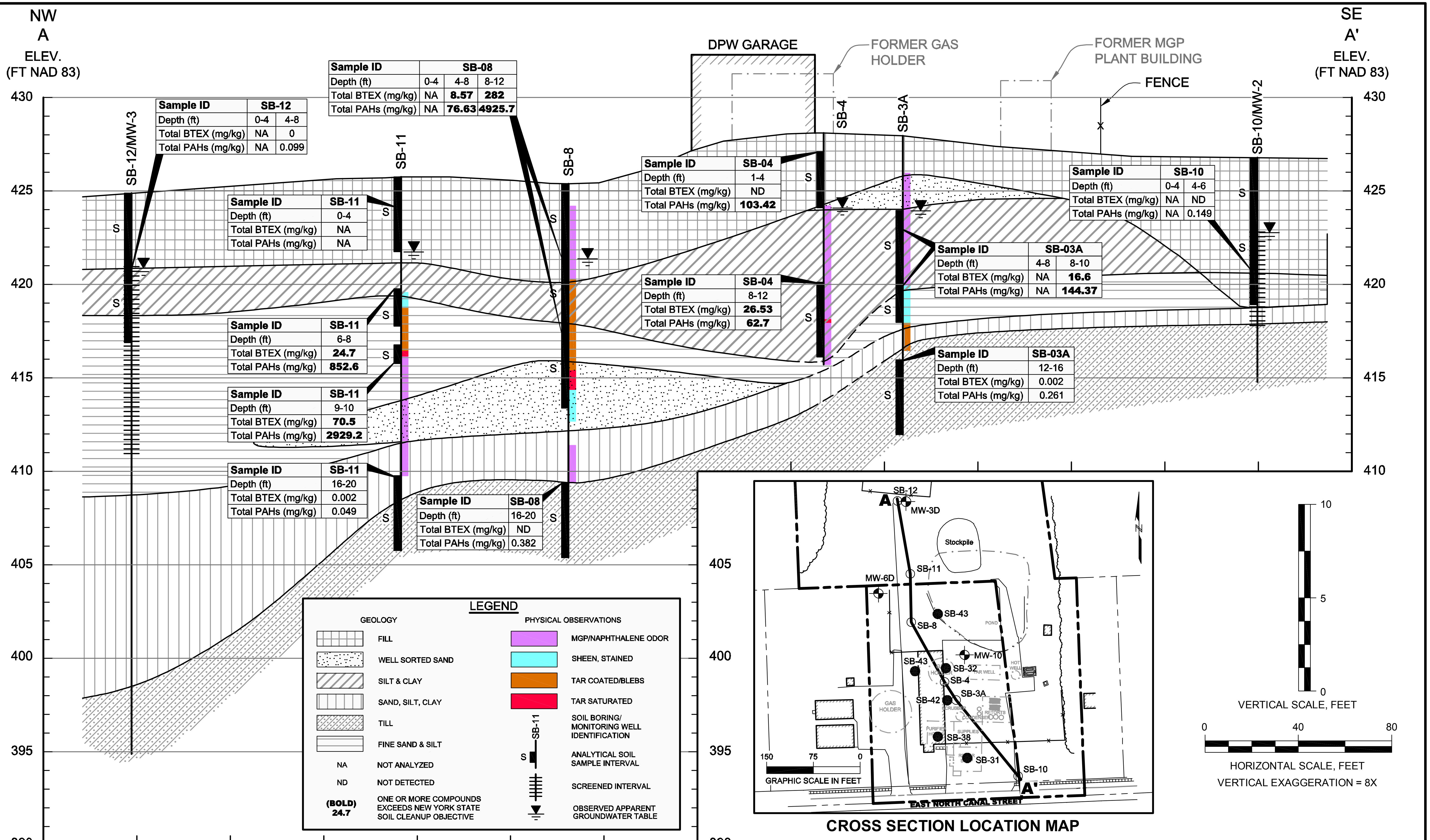

Sample ID	SB-12	
Depth (ft)	0-4	4-8
Total BTEX (mg/kg)	NA	0
Total PAHs (mg/kg)	NA	0.099

Sample ID	SB-08		
Depth (ft)	0-4	4-8	8-12
Total BTEX (mg/kg)	NA	**8.57**	**282**
Total PAHs (mg/kg)	NA	**76.63**	**4925.7**

Sample ID	SB-11
Depth (ft)	0-4
Total BTEX (mg/kg)	NA
Total PAHs (mg/kg)	NA

Sample ID	SB-04
Depth (ft)	1-4
Total BTEX (mg/kg)	ND
Total PAHs (mg/kg)	**103.42**

Sample ID	SB-10	
Depth (ft)	0-4	4-6
Total BTEX (mg/kg)	NA	ND
Total PAHs (mg/kg)	NA	0.149

Sample ID	SB-03A	
Depth (ft)	4-8	8-10
Total BTEX (mg/kg)	NA	**16.6**
Total PAHs (mg/kg)	NA	**144.37**

Sample ID	SB-04
Depth (ft)	8-12
Total BTEX (mg/kg)	**26.53**
Total PAHs (mg/kg)	**62.7**

Sample ID	SB-11
Depth (ft)	6-8
Total BTEX (mg/kg)	**24.7**
Total PAHs (mg/kg)	**852.6**

Sample ID	SB-03A
Depth (ft)	12-16
Total BTEX (mg/kg)	0.002
Total PAHs (mg/kg)	0.261

Sample ID	SB-11
Depth (ft)	9-10
Total BTEX (mg/kg)	**70.5**
Total PAHs (mg/kg)	**2929.2**

Sample ID	SB-11
Depth (ft)	16-20
Total BTEX (mg/kg)	0.002
Total PAHs (mg/kg)	0.049

Sample ID	SB-08
Depth (ft)	16-20
Total BTEX (mg/kg)	ND
Total PAHs (mg/kg)	0.382

LEGEND

GEOLOGY		PHYSICAL OBSERVATIONS	
▦	FILL	🟪	MGP/NAPHTHALENE ODOR
▒	WELL SORTED SAND	🟦	SHEEN, STAINED
▨	SILT & CLAY	🟧	TAR COATED/BLEBS
▥	SAND, SILT, CLAY	🟥	TAR SATURATED
▧	TILL	SB-11	SOIL BORING/ MONITORING WELL IDENTIFICATION
▤	FINE SAND & SILT	S ▮	ANALYTICAL SOIL SAMPLE INTERVAL
NA	NOT ANALYZED	╪	SCREENED INTERVAL
ND	NOT DETECTED	▼	OBSERVED APPARENT GROUNDWATER TABLE
(BOLD) **24.7**	ONE OR MORE COMPOUNDS EXCEEDS NEW YORK STATE SOIL CLEANUP OBJECTIVE		

CROSS SECTION LOCATION MAP

NOTE: ALL SAMPLE LOCATIONS SHOWN AS "S",
HOWEVER, NOT ALL ANALYZED FOR BTEX OR PAH.

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CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

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GEOLOGIC CROSS SECTION
A-A'

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Figure 5

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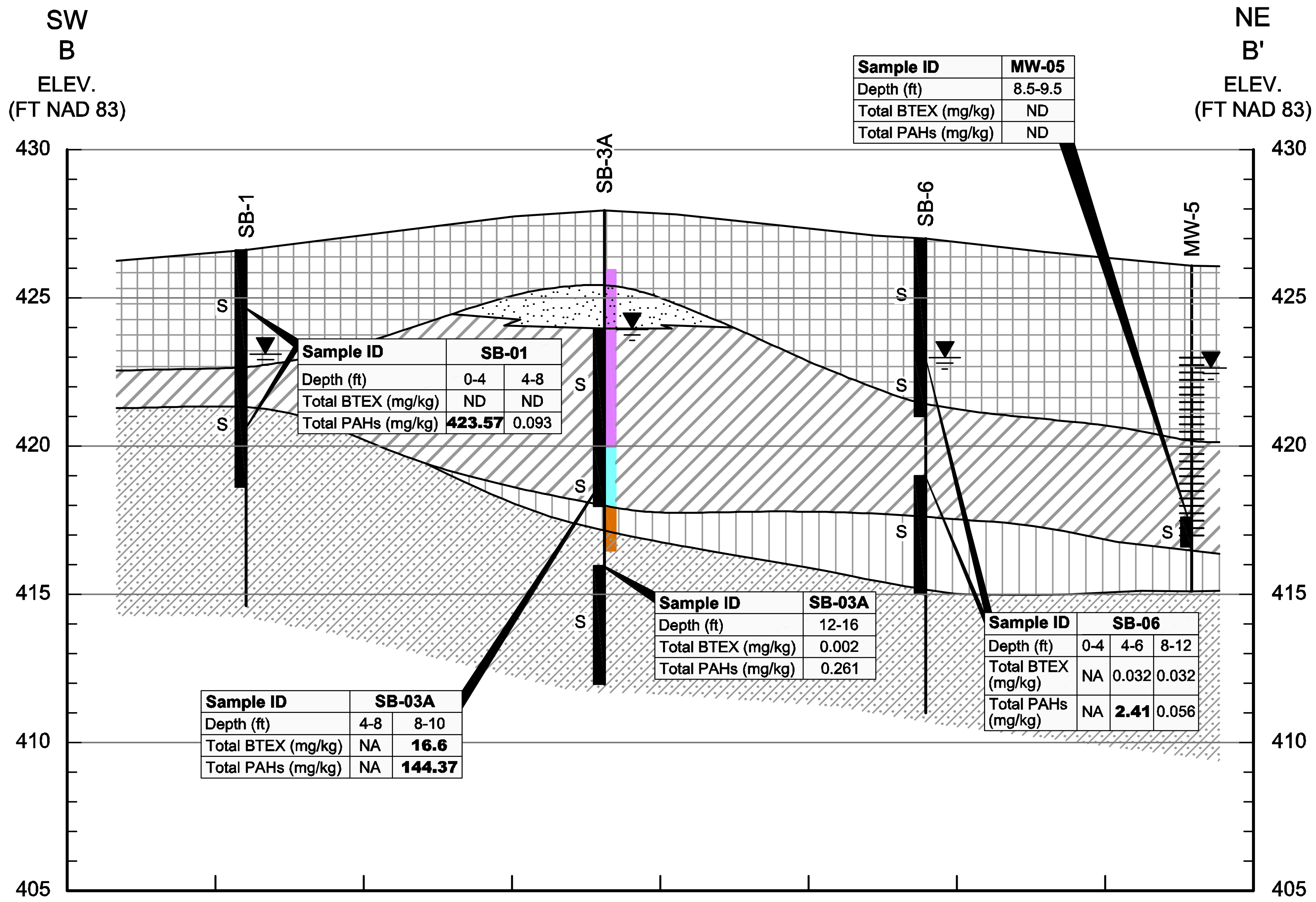


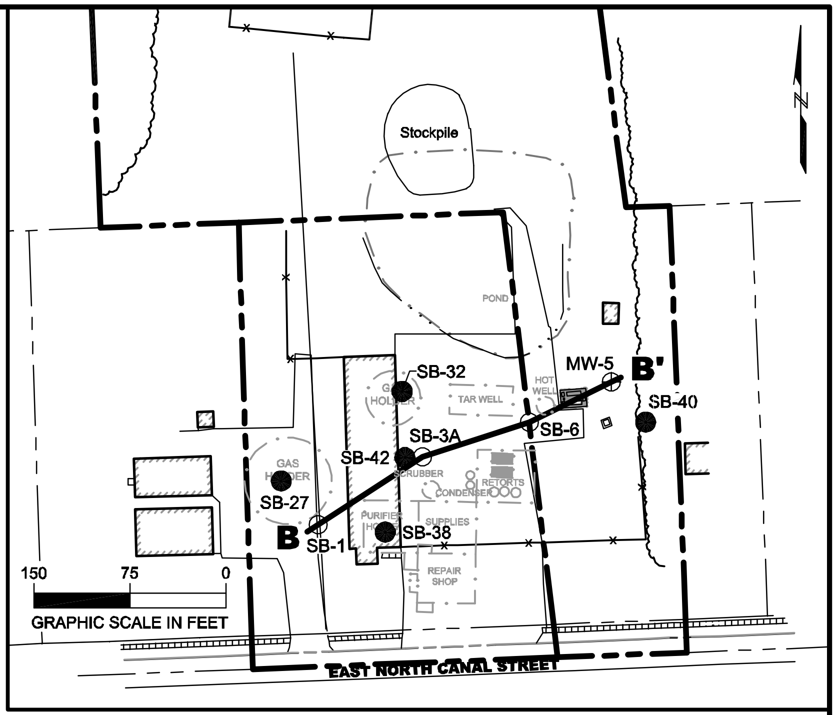
Sample ID	MW-05
Depth (ft)	8.5-9.5
Total BTEX (mg/kg)	ND
Total PAHs (mg/kg)	ND

Sample ID	SB-01	
Depth (ft)	0-4	4-8
Total BTEX (mg/kg)	ND	ND
Total PAHs (mg/kg)	**423.57**	0.093

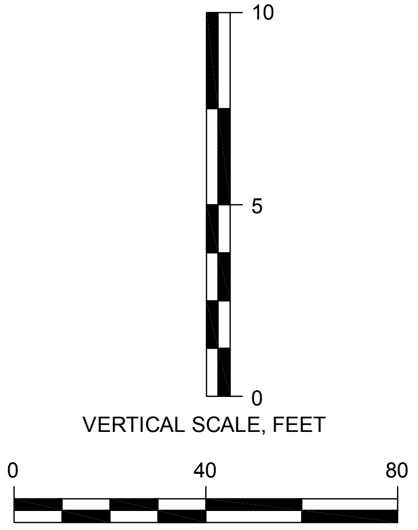
Sample ID	SB-03A
Depth (ft)	12-16
Total BTEX (mg/kg)	0.002
Total PAHs (mg/kg)	0.261

Sample ID	SB-06		
Depth (ft)	0-4	4-6	8-12
Total BTEX (mg/kg)	NA	0.032	0.032
Total PAHs (mg/kg)	NA	**2.41**	0.056

Sample ID	SB-03A	
Depth (ft)	4-8	8-10
Total BTEX (mg/kg)	NA	**16.6**
Total PAHs (mg/kg)	NA	**144.37**



CROSS SECTION LOCATION MAP



VERTICAL SCALE, FEET

HORIZONTAL SCALE, FEET

VERTICAL EXAGGERATION = 8X

LEGEND

GEOLOGY		PHYSICAL OBSERVATIONS	
▦	FILL	🟪	MGP/NAPHTHALENE ODOR
⠿	WELL SORTED SAND	🟦	SHEEN, STAINED
▨	SILT & CLAY	🟧	TAR COATED/BLEBS
▥	SAND, SILT, CLAY	🟥	TAR SATURATED
▩	TILL	SB-11	SOIL BORING/ MONITORING WELL IDENTIFICATION
▤	FINE SAND & SILT	S ▌	ANALYTICAL SOIL SAMPLE INTERVAL
NA	NOT ANALYZED	▼	OBSERVED APPARENT GROUNDWATER TABLE
ND	NOT DETECTED		
(BOLD) 24.7	ONE OR MORE COMPOUNDS EXCEEDS NEW YORK STATE SOIL CLEANUP OBJECTIVE		

NOTE: ALL SAMPLE LOCATIONS SHOWN AS "S", HOWEVER, NOT ALL ANALYZED FOR BTEX OR PAH.

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

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GEOLOGIC CROSS SECTION
B-B'

October 2010

Figure 6

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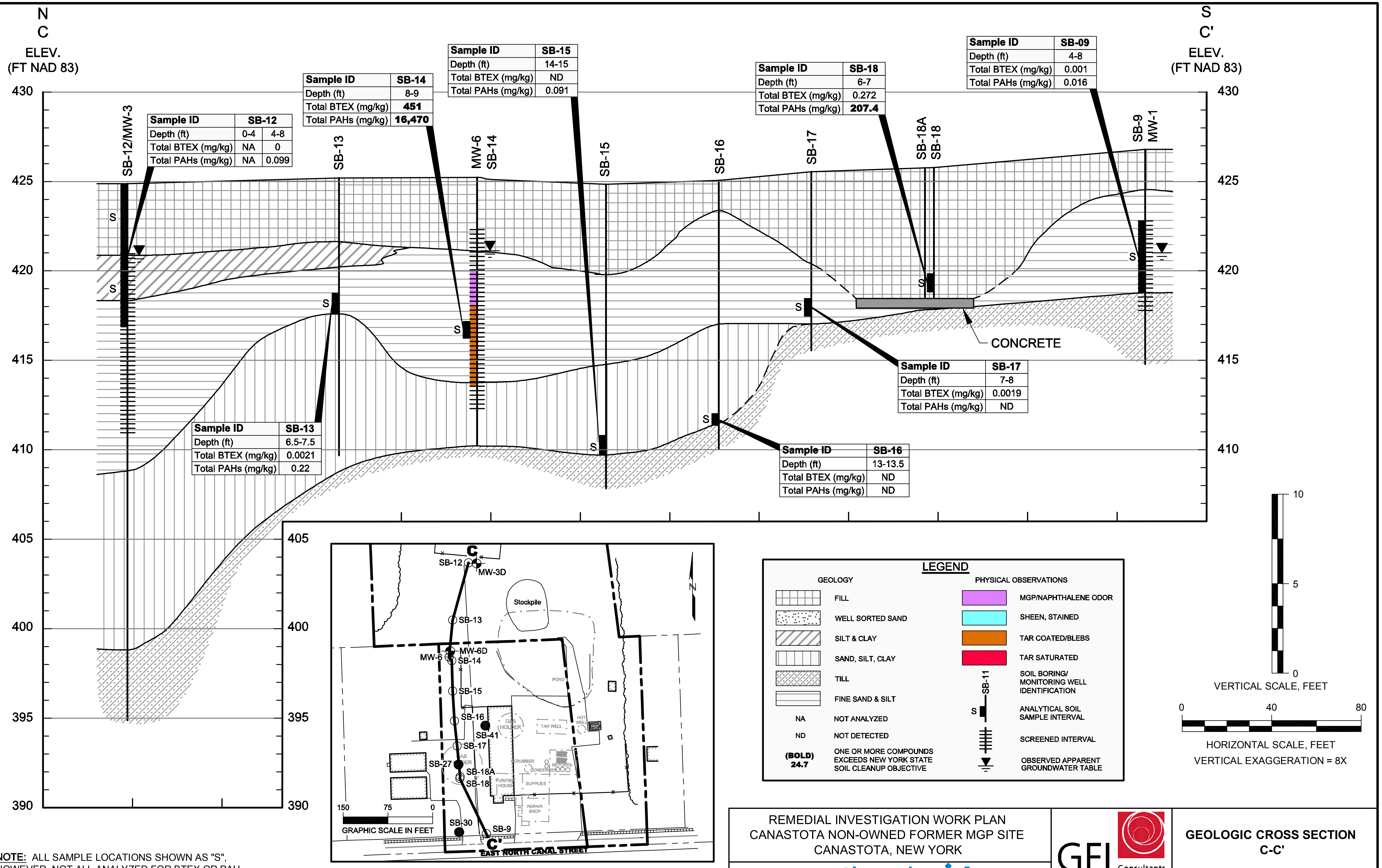

Sample ID	SB-12	
Depth (ft)	0-4	4-8
Total BTEX (mg/kg)	NA	0
Total PAHs (mg/kg)	NA	0.099

Sample ID	SB-13
Depth (ft)	6.5-7.5
Total BTEX (mg/kg)	0.0021
Total PAHs (mg/kg)	0.22

Sample ID	SB-14
Depth (ft)	8-9
Total BTEX (mg/kg)	**451**
Total PAHs (mg/kg)	**16,470**

Sample ID	SB-15
Depth (ft)	14-15
Total BTEX (mg/kg)	ND
Total PAHs (mg/kg)	0.091

Sample ID	SB-16
Depth (ft)	13-13.5
Total BTEX (mg/kg)	ND
Total PAHs (mg/kg)	ND

Sample ID	SB-17
Depth (ft)	7-8
Total BTEX (mg/kg)	0.0019
Total PAHs (mg/kg)	ND

Sample ID	SB-18
Depth (ft)	6-7
Total BTEX (mg/kg)	0.272
Total PAHs (mg/kg)	**207.4**

Sample ID	SB-09
Depth (ft)	4-8
Total BTEX (mg/kg)	0.001
Total PAHs (mg/kg)	0.016

CROSS SECTION LOCATION MAP

NOTE: ALL SAMPLE LOCATIONS SHOWN AS "S", HOWEVER, NOT ALL ANALYZED FOR BTEX OR PAH.

LEGEND

GEOLOGY

▦	FILL
░	WELL SORTED SAND
▨	SILT & CLAY
▥	SAND, SILT, CLAY
▩	TILL
▤	FINE SAND & SILT
NA	NOT ANALYZED
ND	NOT DETECTED
(BOLD) **24.7**	ONE OR MORE COMPOUNDS EXCEEDS NEW YORK STATE SOIL CLEANUP OBJECTIVE

PHYSICAL OBSERVATIONS

🟪	MGP/NAPHTHALENE ODOR
🟦	SHEEN, STAINED
🟧	TAR COATED/BLEBS
🟥	TAR SATURATED
SB-11	SOIL BORING/ MONITORING WELL IDENTIFICATION
S	ANALYTICAL SOIL SAMPLE INTERVAL
≡	SCREENED INTERVAL
▼	OBSERVED APPARENT GROUNDWATER TABLE

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

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GEOLOGIC CROSS SECTION
C-C'

October 2010

Figure 7

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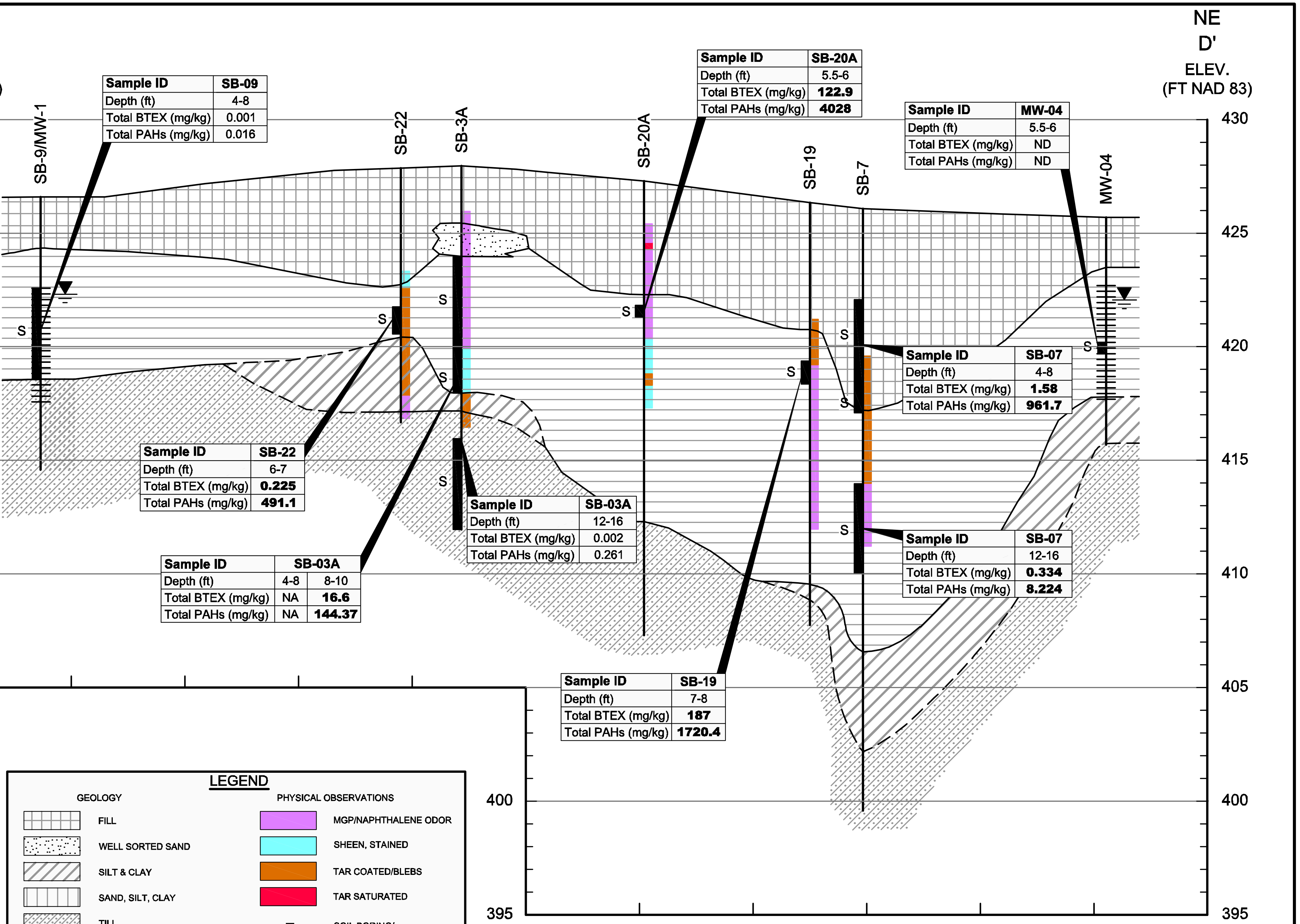
SW
D
ELEV.
(FT NAD 83)



Sample ID	SB-09
Depth (ft)	4-8
Total BTEX (mg/kg)	0.001
Total PAHs (mg/kg)	0.016

Sample ID	SB-20A
Depth (ft)	5.5-6
Total BTEX (mg/kg)	**122.9**
Total PAHs (mg/kg)	**4028**

Sample ID	MW-04
Depth (ft)	5.5-6
Total BTEX (mg/kg)	ND
Total PAHs (mg/kg)	ND

Sample ID	SB-07
Depth (ft)	4-8
Total BTEX (mg/kg)	**1.58**
Total PAHs (mg/kg)	**961.7**

Sample ID	SB-22
Depth (ft)	6-7
Total BTEX (mg/kg)	**0.225**
Total PAHs (mg/kg)	**491.1**

Sample ID	SB-03A
Depth (ft)	12-16
Total BTEX (mg/kg)	0.002
Total PAHs (mg/kg)	0.261

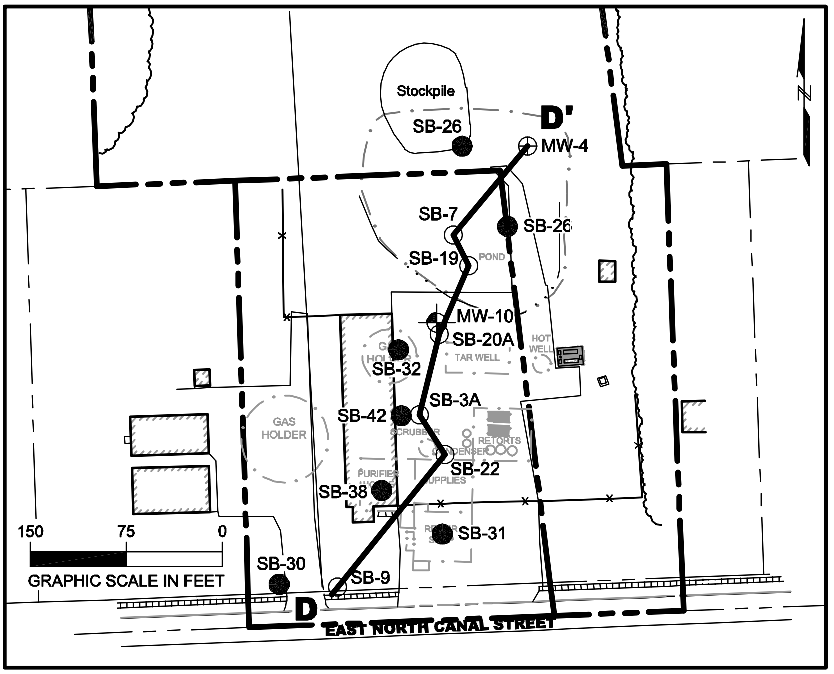
Sample ID	SB-07
Depth (ft)	12-16
Total BTEX (mg/kg)	**0.334**
Total PAHs (mg/kg)	**8.224**

Sample ID	SB-03A	
Depth (ft)	4-8	8-10
Total BTEX (mg/kg)	NA	**16.6**
Total PAHs (mg/kg)	NA	**144.37**

Sample ID	SB-19
Depth (ft)	7-8
Total BTEX (mg/kg)	**187**
Total PAHs (mg/kg)	**1720.4**

10
5
0
VERTICAL SCALE, FEET

0 40 80
HORIZONTAL SCALE, FEET
VERTICAL EXAGGERATION = 8X



CROSS SECTION LOCATION MAP

LEGEND

GEOLOGY		PHYSICAL OBSERVATIONS	
▦	FILL	🟪	MGP/NAPHTHALENE ODOR
⁘	WELL SORTED SAND	🟦	SHEEN, STAINED
▨	SILT & CLAY	🟧	TAR COATED/BLEBS
▥	SAND, SILT, CLAY	🟥	TAR SATURATED
▩	TILL	SB-11	SOIL BORING/ MONITORING WELL IDENTIFICATION
▤	FINE SAND & SILT	S ▮	ANALYTICAL SOIL SAMPLE INTERVAL
NA	NOT ANALYZED		
ND	NOT DETECTED		
(BOLD) **24.7**	ONE OR MORE COMPOUNDS EXCEEDS NEW YORK STATE SOIL CLEANUP OBJECTIVE	▼	OBSERVED APPARENT GROUNDWATER TABLE

NOTE: ALL SAMPLE LOCATIONS SHOWN AS "S", HOWEVER, NOT ALL ANALYZED FOR BTEX OR PAH.

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

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GEOLOGIC CROSS SECTION
D-D'

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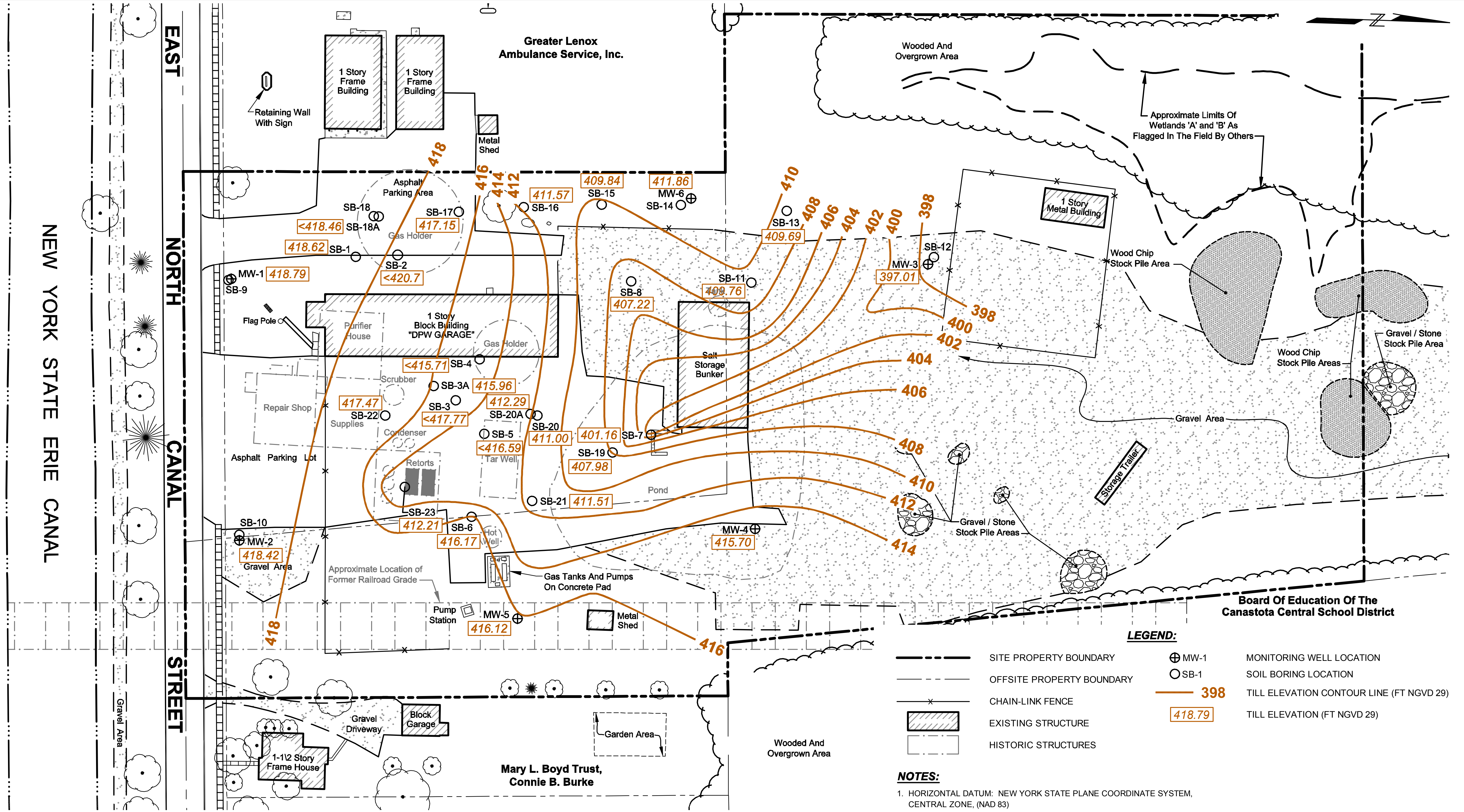
Figure 8

I:\Project\National Grid_formerly NIMO\CANASTOTA\RI - 2010\CADD DWGS\Figures\October 2010\Canastota-XSections.dwg



NOTES:

1. HORIZONTAL DATUM: NEW YORK STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, (NAD 83)
2. VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29)

SOURCES:

1. PLAN BASED ON SURVEY MAPS SHEETS 1 AND 2: *LANDS OF VILLAGE OF CANASTOTA, NORTHEAST CANAL STREET AND ROBERTS STREET, BEING PART OF LOT # 86 OF THE CANASTOTA TRACT, VILLAGE OF CANASTOTA - MADISON COUNTY, STATE OF NEW YORK,* PREPARED BY DELTA ENGINEERS, ARCHITECTS & LAND SURVEYORS, 4873 NEW YORK STATE ROUTE #5, VERNON, NY, DATE: 2/10/2010, SCALE: 1" = 30.
2. FIGURE 1: *CURRENT SITE CONDITIONS AND SAMPLE LOCATION MAP,* PREPARED BY GEI CONSULTANTS, INC., DATE: OCTOBER 2007, SCALE: 1" = 60'

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

nationalgrid

GEI Consultants

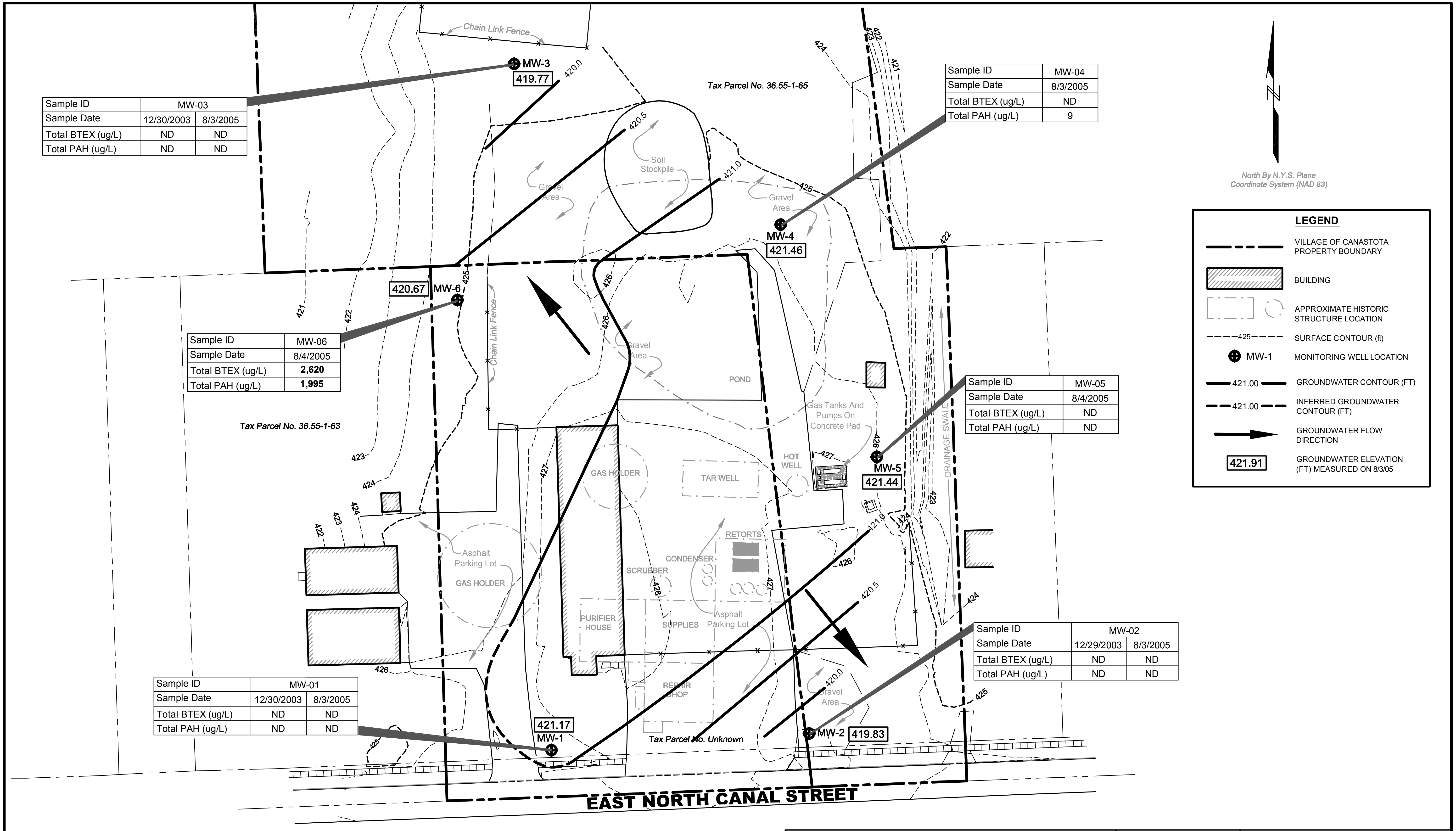
Project 034390-1-1014

TOP OF TILL SURFACE

October 2010

Figure 9

I:\Project\National Grid_formerly NIMO\CANASTOTA\RI - 2010\CADD DWGS\Figures\October 2010\Canastota-RIWP Figures.dwg



Sample ID	MW-03	
Sample Date	12/30/2003	8/3/2005
Total BTEX (ug/L)	ND	ND
Total PAH (ug/L)	ND	ND

Sample ID	MW-04
Sample Date	8/3/2005
Total BTEX (ug/L)	ND
Total PAH (ug/L)	9

Sample ID	MW-06
Sample Date	8/4/2005
Total BTEX (ug/L)	**2,620**
Total PAH (ug/L)	**1,995**

Sample ID	MW-05
Sample Date	8/4/2005
Total BTEX (ug/L)	ND
Total PAH (ug/L)	ND

Sample ID	MW-02	
Sample Date	12/29/2003	8/3/2005
Total BTEX (ug/L)	ND	ND
Total PAH (ug/L)	ND	ND

Sample ID	MW-01	
Sample Date	12/30/2003	8/3/2005
Total BTEX (ug/L)	ND	ND
Total PAH (ug/L)	ND	ND

LEGEND

▬ ▪ ▬	VILLAGE OF CANASTOTA PROPERTY BOUNDARY
▨	BUILDING
⬚	APPROXIMATE HISTORIC STRUCTURE LOCATION
---425---	SURFACE CONTOUR (ft)
⊕ MW-1	MONITORING WELL LOCATION
—421.00—	GROUNDWATER CONTOUR (FT)
--421.00--	INFERRED GROUNDWATER CONTOUR (FT)
→	GROUNDWATER FLOW DIRECTION
421.91	GROUNDWATER ELEVATION (FT) MEASURED ON 8/3/05

SOURCE:
SURVEY MAP TITLED "PORTION OF THE LANDS OF VILLAGE OF CANASTOTA NORTHEAST CANAL STREET, VILLAGE OF CANASTOTA - MADISON COUNTY, STATE OF NEW YORK; PREPARED BY SNYDER ENGINEERING & LAND SURVEYING, LLP, 214 CEDAR STREET, ONEIDA, NEW YORK 13421; DATED 11/20/2003; SCALE: 1" = 30'.

0 60 120
SCALE, FEET

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

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GROUNDWATER CONTOUR MAP AND GROUNDWATER ANALYTICAL RESULTS

October 2010

Figure 10

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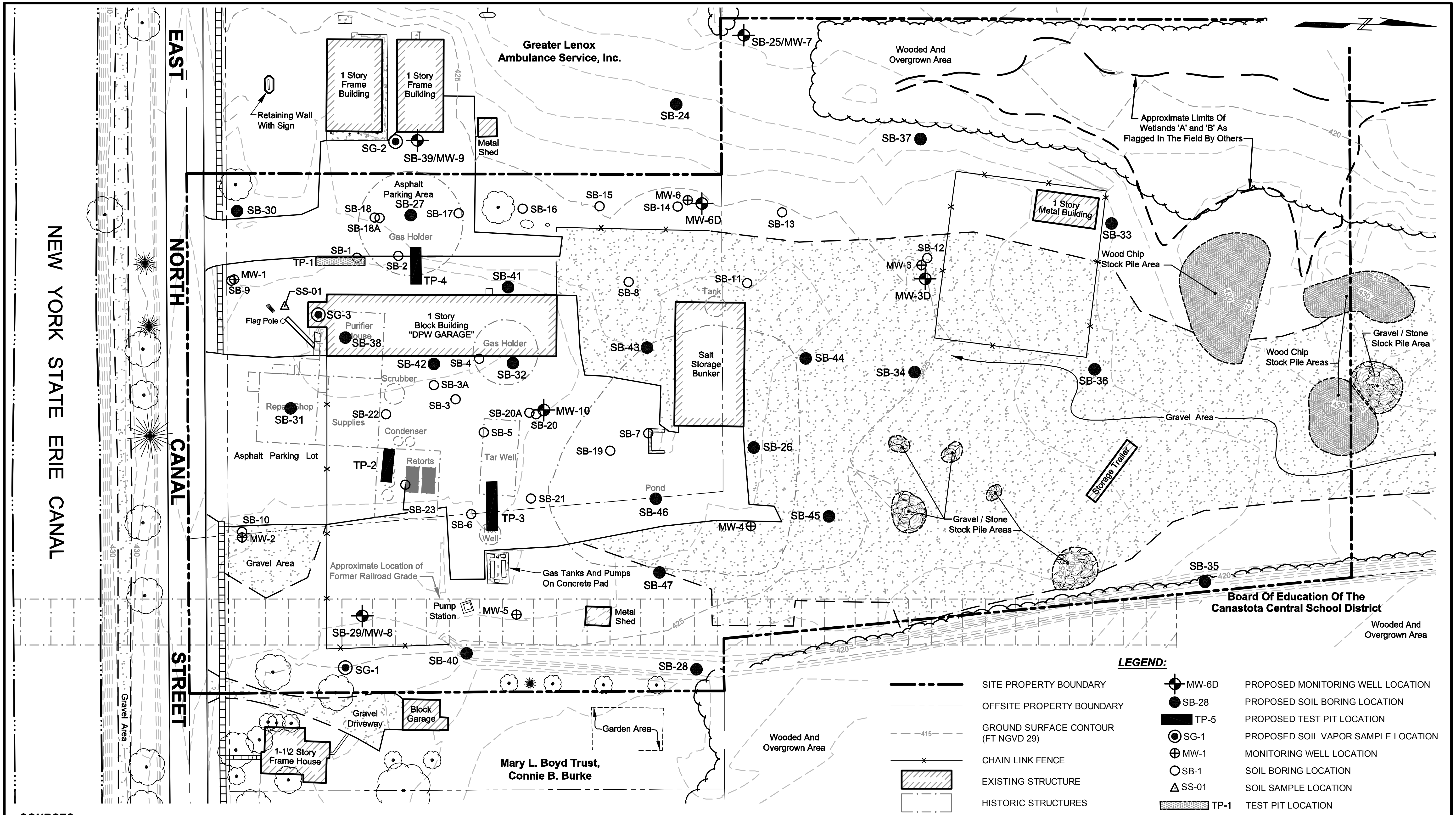

SOURCES:

1. PLAN BASED ON SURVEY MAPS SHEETS 1 AND 2: *LANDS OF VILLAGE OF CANASTOTA, NORTHEAST CANAL STREET AND ROBERTS STREET, BEING PART OF LOT # 86 OF THE CANASTOTA TRACT, VILLAGE OF CANASTOTA - MADISON COUNTY, STATE OF NEW YORK,* PREPARED BY DELTA ENGINEERS, ARCHITECTS & LAND SURVEYORS, 4873 NEW YORK STATE ROUTE #5, VERNON, NY, DATE: 2/10/2010, SCALE: 1" = 30.
2. FIGURE 1: *CURRENT SITE CONDITIONS AND SAMPLE LOCATION MAP,* PREPARED BY GEI CONSULTANTS, INC., DATE: OCTOBER 2007, SCALE: 1" = 60'

0 60 120
SCALE, FEET

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

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PREVIOUS AND PROPOSED SUBSURFACE INVESTIGATION POINTS

October 2010

Figure 11

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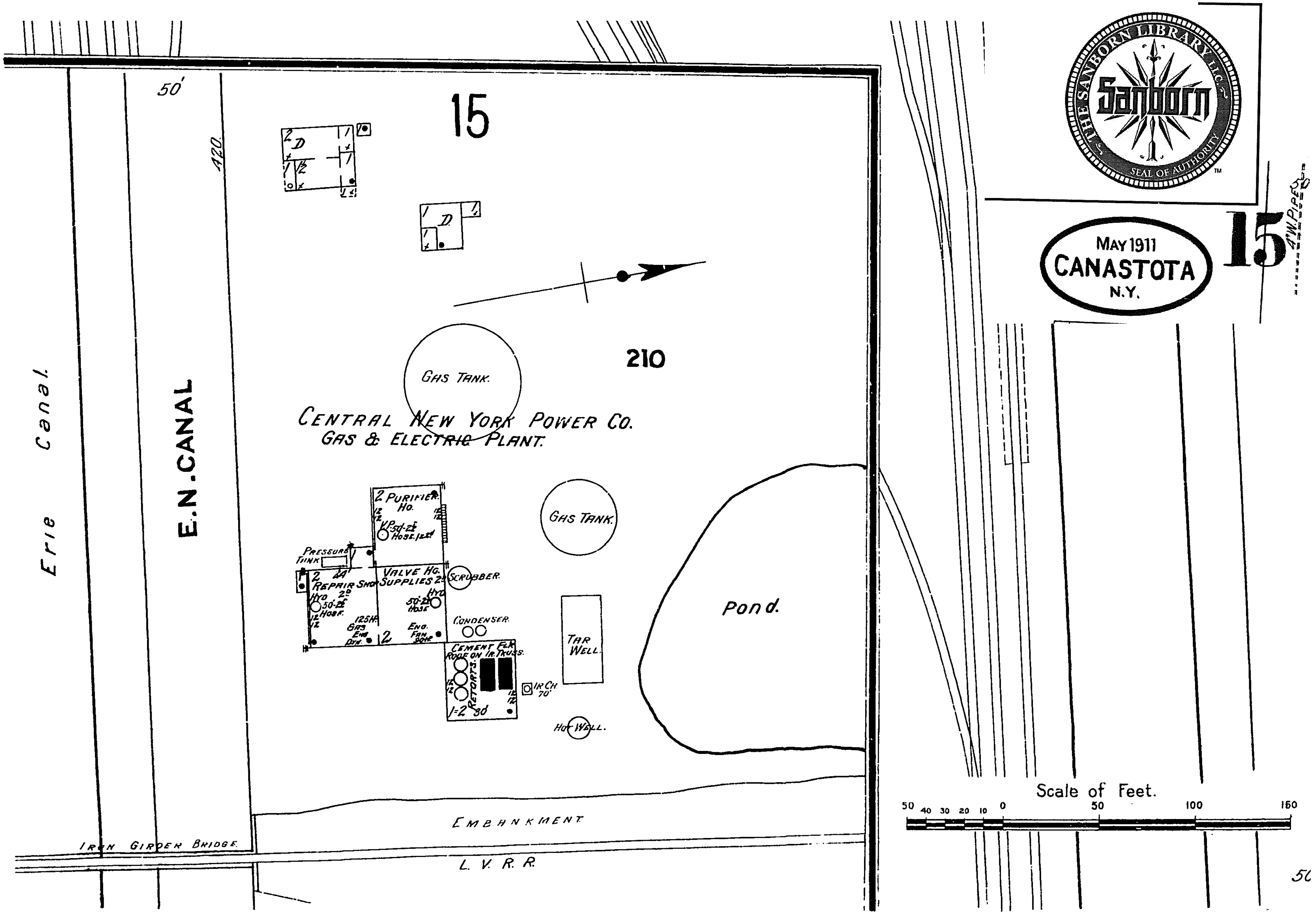
REMEDIAL INVESTIGATION WORK PLAN
NATIONAL GRID
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK
OCTOBER 2010

Appendix A

Historical Documentation

GEI Consultants

15
May 1911
CANASTOTA
N.Y.
15
50'
420.
Erie Canal.
E.N.CANAL
2 D
1
1½
1
D
1
1
210
Gas Tank.
Central New York Power Co.
Gas & Electric Plant.
2 Purifier. Ho.
V.P. 50-2½
Hose 12½
Pressure Tank
2 4A
Repair Shop
Hyd 2½
50-2½
Hose
125H.P. Gas Eng Dyn.
2
Valve Ho. Supplies 2½
Hyd
50-2½
Hose
Eng. Fan Boil.
Scrubber.
Condenser.
Cement Flr. Roof on Ir. Truss.
Retorts.
1-2 3d
Ir. Ch. 70'
Hot Well.
Gas Tank.
Tar Well.
Pond.
Embankment
Iron Girder Bridge
L. V. R. R.
4"W. Pipe
Scale of Feet.
50 40 30 20 10 0 50 100 150
50

Appendix B

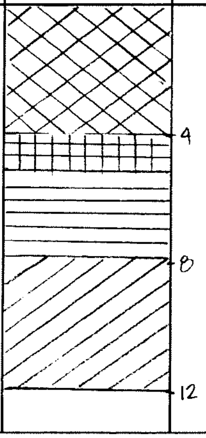
Test Pit and Soil Boring Logs

GEI Consultants, Inc.

SOIL BORING LOG (SB-01)

Boring/Well ID:	**SB-01**	**Client:**	**Niagara Mohawk/National Grid**
Project Number:	**034390**	**Project Name:**	**Canastota Non-owned MGP Site**
Logged By:	**Lynn Willey**	**Location:**	**See map**
Date Started:	**12/02/03**	**Contractor:**	**North Star Drilling**
Date Completed:	**12/02/03**	**Driller:**	**Scott Breeds**
Total Depth:	**12 feet**	**Drilling Method:**	**Geoprobe®**

Ground Surface Elevation: **Measuring Point Elevation:**	**426.62'** **NA**	**Well Construction:** **Not Applicable**	**Notes: Headspace readings are indicated below.**

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
0 - 4	NA	2.5	3.1	0 – 4.0': Brown, silt and fine sand with trace fill (clinker, ash, wood fragments) and trace rootlets. Slightly cohesive. Non-plastic. No odors or visual impacts. Wet at 3.5'. (FI)		
4 - 8	NA	2.8	0.9	4.0' – 5.14': Brown/light brown, clay and silt. Cohesive. Plastic. Moderately stiff. Moist. No odors or visual impacts. (CL) 5.14' – 8.0': Red brown, silt, little clay and trace gravel. Cohesive. Stiff. Damp. No odor or visual impacts. (ML)		
8 – 12	NA	4.0	1.1	8.0' – 12': Red brown, till, silt, little fine-coarse gravel, trace clay, trace fine-coarse sand. Cohesive. Very dense. Dry. No odors or visual impacts. (ML)		

GEI Consultants, Inc.

SOIL BORING LOG (SB-02)

Boring/Well ID:	**SB-02**	**Client:**	**Niagara Mohawk/National Grid**
Project Number:	**034390**	**Project Name:**	**Canastota Non-owned MGP Site**
Logged By:	**Lynn Willey**	**Location:**	**See map**
Date Started:	**12/02/03**	**Contractor:**	**North Star Drilling**
Date Completed:	**12/02/03**	**Driller:**	**Scott Breeds**
Total Depth:	**5.6 feet**	**Drilling Method:**	**Geoprobe®**

Ground Surface Elevation: **Measuring Point Elevation:**	**426.30'** **NA**	**Well Construction:** **Not Applicable**	**Notes: Headspace readings are indicated below.**

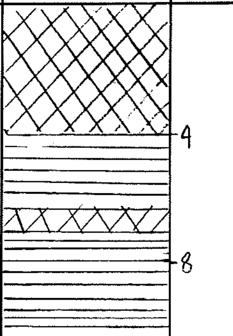
Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
0 - 4	NA	3.2	0.8	0 – 4.0': Brown, fill (fine sand, silt, ash, porcelan, glass, root lets). No odors or visual impacts. Wet at 4'. (FI)	▨	
4 – 5.6	NA	1.0	0.7	4.0' – 5.6': Brown, fill (silt and little fine gravel and root lets). Progresses to fine sand with silt and trace gravel. Wet. Trace sheen and naphthalene like odor. (FI) Refusal at 5.6'	▨	-4

GEI Consultants, Inc.

SOIL BORING LOG (SB-03)

Boring/Well ID:	SB-03	**Client:**	Niagara Mohawk/National Grid
Project Number:	034390	**Project Name:**	Canastota Non-owned MGP Site
Logged By:	Lynn Willey	**Location:**	See map
Date Started:	12/02/03	**Contractor:**	North Star Drilling
Date Completed:	12/02/03	**Driller:**	Scott Breeds
Total Depth:	10 feet	**Drilling Method:**	Geoprobe®

Ground Surface Elevation: **Measuring Point Elevation:**	427.77' NA	**Well Construction:** **Not Applicable**	**Notes: Headspace readings are indicated below.**

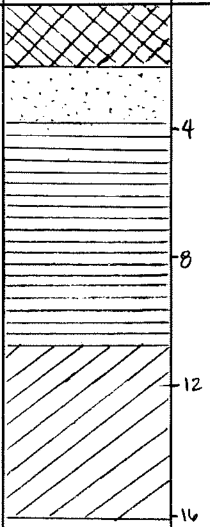
Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
0 - 4	NA	3.7	2.5	0 – 1.08': Crushed asphalt and concrete. Non-cohesive. Loose. Dry. No odors or visual impacts. (FI) 1.08' – 4.0': Brown to black, fill (silt and clay with layers of concrete dust, red brick and slag). Moist/damp. No odors or visual impacts. (FI)		
4 - 8	NA	3.3	25	4.0' – 6.42': Brown, silt and clay. Cohesive. Dense/stiff. Moist. Naphthalene like odor. No visual impact. (ML) 6.42' – 7.03': Black, fill (silt and wood). Wet. Trace blob. Trace sheen. Trace naphthalene like odor. (FI) 7.03' – 8.0': Black, silt and clay. Cohesive. Soft. Naphthalene like odor. No visual impacts. (ML)		
8 – 10	NA	2.0	**NA**	8.0' – 9.0': Brown, silt with trace clay. Cohesive. Wet. Slight sheen. Slight naphthalene like odor. (MH) 9.0' – 10.0': Red brown, silt with little clay, trace fine sand and fine gravel. Moist. Vein of tar coated grains in middle of sample. (ML) Refusal at 10.0', due to concrete, possibly bottom of holder.		

GEI Consultants, Inc.

SOIL BORING LOG (SB-03A)

Boring/Well ID:	**SB-03A**	**Client:**	**Niagara Mohawk/National Grid**
Project Number:	**034390**	**Project Name:**	**Canastota Non-owned MGP Site**
Logged By:	**Lynn Willey**	**Location:**	**See map**
Date Started:	**12/02/03**	**Contractor:**	**North Star Drilling**
Date Completed:	**12/02/03**	**Driller:**	**Scott Breeds**
Total Depth:	**16 feet**	**Drilling Method:**	**Geoprobe®**

Ground Surface Elevation: **Measuring Point Elevation:**	**427.96'** **NA**	**Well Construction:** **Not Applicable**	**Notes: Headspace readings are indicated below.**

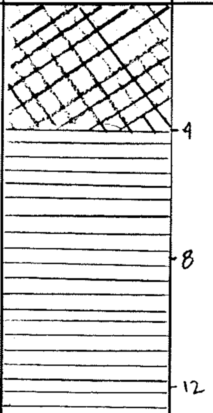
Depth (feet)	**Blow Counts**	**Recovery (feet)**	**PID (ppm)**	**Soil Description**	**Lithology (not to scale)**	**Well Construction**
0 - 4	NA	4.0	NA	0 – 2.0': Fill with crushed asphalt, concrete dust, silt and coarse sand. Non-cohesive. Dry. (FI) 2.0' – 3.8': Black, coarse sand, little fine sand and slag. Non-cohesive. Loose. Black stained. Moderate naphthalene like odor. (SP) 3.8' – 4.0': Brown, silt and clay. Cohesive. Moist to wet. Moderate naphthalene like odor. (ML)		
4 - 8	NA	2.8	2.1	4.0' – 5.57': Brown, silt and clay, trace rootlets. Cohesive. Plastic. Wet. Trace naphthalene odor. No visual impacts. (ML) 5.57' – 8.0': Black, silt with little clay, trace gravel and trace rootlets. Trace naphthalene like odor.		
8 – 12	NA	4.0	50	8.0' – 10.0': Brown, black-stained, silt, trace clay and trace fine gravel. Cohesive. Slightly plastic. Wet. Sheen on water. Vein of tar-coated grains. Black stain on silt. Moderate tar odor. (MH) 10.0' – 10.7': Brown, silt, some fine-coarse sand and trace clay. Cohesive. Slightly plastic. Wet. Trace tar coated grains. Moderate tar odor. (MH) 10.7' – 12.0': Red brown, silt and clay, little gravel and coarse sand. Dense. Dry. Tar in vertical veins until 11.5'. (ML)		
12 – 16	NA	2.1	1.8	Red brown, silt and clay, trace gravel. Cohesive. Very stiff. Trace tar odor. No visual impacts. (ML)		

GEI Consultants, Inc.

SOIL BORING LOG (SB-04)

Boring/Well ID:	SB-04	**Client:**	Niagara Mohawk/National Grid
Project Number:	034390	**Project Name:**	Canastota Non-owned MGP Site
Logged By:	Lynn Willey	**Location:**	See map
Date Started:	12/02/03	**Contractor:**	North Star Drilling
Date Completed:	12/02/03	**Driller:**	Scott Breeds
Total Depth:	12.4 feet	**Drilling Method:**	Geoprobe®

Ground Surface Elevation: **Measuring Point Elevation:**	428.11' NA	**Well Construction:** **Not Applicable**	**Notes: Headspace readings are indicated below.**

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
0 - 4	NA	2.9	1.4	0 – 1.38': Crushed asphalt and concrete dust. Non-cohesive. Loose. Dry. No odors or visual impacts. (FI) 1.38' – 3.86': Brown, fill (medium-coarse sand, little silt and limestone dust). Non-cohesive. Loose. Damp. No odors or visual impacts. (FI) 3.86' – 4.0': Black, silt and medium sand. Non-cohesive. Loose. Faint naphthalene like odor. (ML)		
4 - 8	NA	1.1	1.3	4.0' – 8.0': Gray brown, silt, little clay and trace fine sand. Cohesive. Slightly plastic. Wet. Slight naphthalene like odor. No visual impacts. (ML)		
8 – 12	NA	1.1	13.7	8.0' – 12.0': Gray brown, silt-clay, little fine sand. Cohesive. Plastic. Trace naphthalene like odor. Spotty sheen on wet areas around sleeve, trace grain coatings in micro layer <1/8". (ML)		
12 – 12.4	NA	~0.2	28.0	12.0' – 12.4': Gray black, silt-clay, trace fine sand. Cohesive. Plastic. Soft. Wet. Tar coated. Naphthalene like odor. (ML) (Concrete in bottom of shoe due to suspected bottom of holder. Recovery is approximate)		

GEI Consultants, Inc.

SOIL BORING LOG (SB-05)

Boring/Well ID:	SB-05	**Client:**	Niagara Mohawk/National Grid
Project Number:	034390	**Project Name:**	Canastota Non-owned MGP Site
Logged By:	Lynn Willey	**Location:**	See map
Date Started:	12/01/03	**Contractor:**	North Star Drilling
Date Completed:	12/01/03	**Driller:**	Joe Menzel
Total Depth:	10.8 feet	**Drilling Method:**	Geoprobe®

Ground Surface Elevation: **Measuring Point Elevation:**	427.39' NA	**Well Construction:** **Not Applicable**	**Notes: Headspace readings are indicated below.**

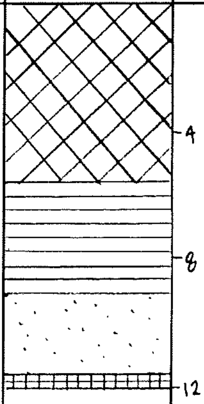
Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
0 - 4	NA	3.2	1.0	0 – 2.5': Dark gray fill (road base gravel with some silt). Dry. No odor or visual impacts. (FI) 2.5-3.25: Concrete dust. Dry. No odor or visual impacts. (FI) 3.25-4.0: Red brick, coarse gravel size. Dry. No odor or visual impacts. (FI)	▨	-4
4 - 8	NA	1.5	79.0	4.0' – 8.0': Red brick and concrete fill. Noncohesive. Wet. Spotty sheen, blebs, heavily coated tar, viscous black. Naphthalene like odor. Moderate tar odor. (FI)	▨	-8
8 – 10.8	NA	2.8	454.0	8.0' – 10.8': Red brick, gravel sized. Noncohesive. Loose. Black viscous tar within brick. Moderate tar odor. (FI)	▨	

Φ **GEI Consultants, Inc.**

SOIL BORING LOG (SB-06)

Boring/Well ID:	SB-06	**Client:**	Niagara Mohawk/National Grid
Project Number:	034390	**Project Name:**	Canastota Non-owned MGP Site
Logged By:	Lynn Willey	**Location:**	See map
Date Started:	12/01/03	**Contractor:**	North Star Drilling
Date Completed:	12/01/03	**Driller:**	Joe Menzel
Total Depth:	16 feet	**Drilling Method:**	Geoprobe®

Ground Surface Elevation: **Measuring Point Elevation:**	427.80' NA	**Well Construction:** **Not Applicable**	**Notes: Headspace readings are indicated below.**

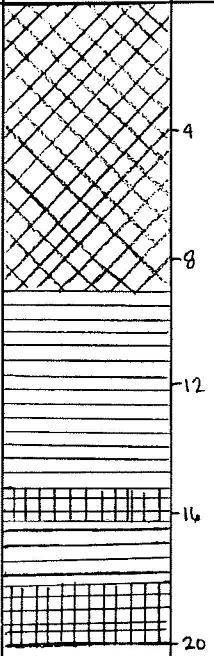
Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
0 - 4	NA	3.3	2.7	0 – 0.24': Asphalt fragments. (FI) 0.24' - 1.45': Crushed limestone. Non-cohesive. Loose. Damp. (FI) 1.45' - 2.06': Brown, fine sand. Non-cohesive. Well-sorted. No odors of visual impacts. (FI) 2.06' - 4.0': Black fill (fine to medium sand, little coal dust, red brick and trace silt). Non-cohesive. Loose. No odors or visual impacts. (FI)		
4 - 8	NA	2.5	1.2	4.0' – 5.6': Black to red/brown, fill (ash, coal dust and brick fragments). Non-cohesive. Loose. Wet. No odors or visual impacts. (FI) 5.6' – 8.0': Brown to gray brown, silt, little clay. Cohesive. Slightly plastic. Medium stiff. No odors or visual impacts. (ML)		
8 – 12	NA	3.2	2.0	8.0' – 9.13': Same as above. Brown. Cohesive. Medium stiff. Wet. No odors or visual impacts. (ML) 9.13' – 11.63': Red brown, fine sand, little silt and clay. Cohesive. Slightly plastic. Medium stiff. Moist. No odors or visual impacts. (SM) 11.63' – 12.0': Red brown/gray, clay and silt. Cohesive. Plastic. Stiff. Damp. No odor or visual impacts. (CL)		

GEI Consultants, Inc.

SOIL BORING LOG (SB-07)

Boring/Well ID:	**SB-07**	**Client:**	**Niagara Mohawk/National Grid**
Project Number:	**034390**	**Project Name:**	**Canastota Non-owned MGP Site**
Logged By:	**Lynn Willey**	**Location:**	**See Map**
Date Started:	**12/01/03**	**Contractor:**	**North Star Drilling**
Date Completed:	**12/01/03**	**Driller:**	**Joe Menzel**
Total Depth:	**26.5 feet**	**Drilling Method:**	**Geoprobe®**

Ground Surface Elevation: **Measuring Point Elevation:**	**425.60' (approximate)** **NA**	**Well Construction:** **Not Applicable**	**Notes: Headspace readings are indicated below.**

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
0-4	NA	3.0	1.4	0 – 1.33': Black/dark brown, loose fill (medium to coarse sand, little silt). Non-cohesive. Dry. No odors. (FI) 1.33' - 2.33': Crushed Concrete. Non-cohesive. Dry. No odors. (FI) 2.33' - 4': Brown, fine sandy fill (little silt, coal fragments, ash and brick). No odors or impacts. (FI)		
4-8	NA	2.0	15	4' - 5.2': As above, light brown, with ash (gray) concrete powder. Non-cohesive. Loose. No odors. (FI) 5.2' – 6.4': As above with fragments of gray. Wet. (FI) 6.4' – 8.0': As above. Black-stained, fine sand with fill containing wood fragments/ash/glass. Wet. Sheen, tar coated, and stained. Moderate tar odor. (FI)		
8-12	NA	3.6	35 35	8.0' – 8.9': As above. Fill (silt, glass, gravel and ash). Non-cohesive. Wet. Tar coated. Tar odor. (FI) 8.89' - 11.0': Brown, till-like, silt, little clay, ash and fine sand. Cohesive. Blobs of tar. Slight tar odor. (ML) 11.0' - 12.0': Brown silt and fine sand, trace gravel. Slightly cohesive. Moist. Sheen. (ML)		
12-16	NA	2.0	2.8	12.0' – 15.0': Red brown/brown, silt, little fine clay and trace sand and gravel. Moderately dense. Cohesive. Plastic. Moist. Trace naphthalene like odor. No visual impacts. (ML) 15' - 16': Red brown, clay and silt. Stiff. Cohesive. Plastic. Dry. No odors. (CL)		
16-20	NA	1.5	1.1	16.0' – 18.0': Red brown/brown, silt, little clay and trace sand and fine gravel. Cohesive. Slightly plastic. No odors or visual impacts. (ML) 18.0' – 20.0': Red brown/brown, clay, little silt. Very dense. Moist. No odors of visual impacts. (CL)		

SOIL BORING LOG (SB-07)

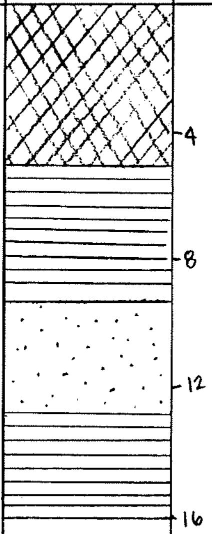
Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
20-24	NA	~2	0.8	20.0' - 24.0': Red brown, silt and clay. Very Stiff. Cohesive. Dry. No odors or visual impacts. (ML)	▤	
24-26.5	NA	1.5	3.8	24.0' - 26.5': Red brown, till, silt, little clay and trace fine sand and fine gravel. Very dense. Cohesive. Slightly Plastic. No odors or visual impacts. (ML) (Macro core liner bound with core barrel. Recovery is approximate)	▤	- 24

GEI Consultants, Inc.

SOIL BORING LOG (SB-08)

Boring/Well ID:	**SB-08**	**Client:**	**Niagara Mohawk/National Grid**
Project Number:	**034390**	**Project Name:**	**Canastota Non-owned MGP Site**
Logged By:	**Lynn Willey**	**Location:**	**See map**
Date Started:	**12/03/03**	**Contractor:**	**North Star Drilling**
Date Completed:	**12/03/03**	**Driller:**	**Scott Breeds**
Total Depth:	**20 feet**	**Drilling Method:**	**Geoprobe®**

Ground Surface Elevation: **Measuring Point Elevation:**	**425.39'** **NA**	**Well Construction:** **Not Applicable**	**Notes: Headspace readings are indicated below.**

Depth (feet)	**Blow Counts**	**Recovery (feet)**	**PID (ppm)**	**Soil Description**	**Lithology (not to scale)**	**Well Construction**
0 - 4	NA	3.4	NA	0 – 1.18': Medium coarse concrete and limestone dust, little silt. Non-cohesive. Loose. Dry. No odors or visual impacts. (FI) 1.18' – 4.0': Dark brown, silt, little fill (ash, glass and coal fragments). Non-cohesive. Damp to wet at 4'. Trace naphthalene like odor. (FI)		
4 - 8	NA	4.0	32	4.0' – 5.1': Same as above. Saturated water with spotty sheen. Trace naphthalene like odor. (FI) 5.1' – 7.4': Brown, silt and clay. Cohesive. Plastic. Medium stiff. 2 (1/8") stringers of tar coated grains with viscous black tar, black stain. Coal tar odor. (ML) 7.4' – 8.0': Brown, silt and sand. Non-cohesive. Wet. Sheen. Trace to moderately tar coated grains. Moderate tar odor. (ML)		
8 – 12	NA	2.8	171	8.0' – 9.29': Same as above. Wet. Coated tar in veins. Moderate tar odor. 9.29' – 10.0': Brown, fine sand, trace little silt. Non-cohesive. Wet. Sheen. Tar blobs. Moderate tar odor. (SW) 10.0' – 11.14': Same as above. Tar coated. Saturated with liquid tar in pore spaces. Strong tar odor. (SW) 11.14' – 12.0': Brown, fine well-sorted sand. Moderately dense. Sheen. Moderate tar odor. (SW)		
12 – 16	NA	3.0	2.4	12.0' – 12.67': Brown, fine well-sorted sand. Non-cohesive. Loose. Wet. Spotty sheen. Naphthalene like odor. (SW) 12.67' – 14.0': Brown, silt, fine sand and little clay. Cohesive. Wet. (MH) 14.0' – 16.0': Red brown, silt, little clay, trace fine-coarse sand and trace gravel. Soft. Naphthalene like odor. (MH)		

SOIL BORING LOG (SB-08)

16 - 20	NA	~2.4	3.0	16' – 18.17': Red brown, silt and clay. Cohesive. Plastic. Very stiff. Damp. No odor or visual impacts. (ML) 18.17 – 20': Red brown, till containing silt and clay, little to some coarse sand and gravel. Cohesive. Dry. No odors or visual impacts.	▨	20

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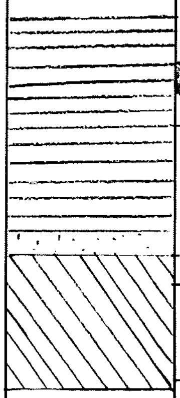
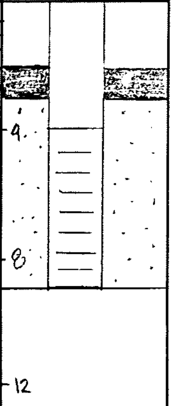
SOIL BORING LOG (SB-09/MW-01)

Boring/Well ID:	**SB-09/MW-01**	**Client:**	**Niagara Mohawk/National Grid**
Project Number:	**034390**	**Project Name:**	**Canastota Non-owned MGP Site**
Logged By:	**Lynn Willey**	**Location:**	**See map**
Date Started:	**12/02/03**	**Contractor:**	**North Star Drilling**
Date Completed:	**12/02/03**	**Driller:**	**Scott Breeds**
Total Depth:	**12 feet**	**Drilling Method:**	**Geoprobe®**

Ground Surface Elevation: **Measuring Point Elevation:**	**SB-09: 426.79'** **MW-01: 426.82'** **MW-01: 426.57'**	**Well Construction:** **Riser 0 – 4'** **Screen 4' – 9'** **Manhole 0 – 1'** **Concrete 0 – 2'** **Bentonite Chips 2' – 3'** **Filter Sand 3' – 9'**	**Notes: Headspace readings are indicated below. Monitoring Well MW-01 was installed adjacent to SB-09.**

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
0 - 4	NA	3.0	1.0	0 – 3.33': Brown, silt, little fine sand and trace coarse gravel. Non-cohesive. Dry. No odors or visual impacts. (ML) 3.33' – 4.0': Light brown, silt, little clay. Cohesive. Slightly plastic. Moist. No odors or visual impacts. (ML)		
4 - 8	NA	3.2	0.9	4.0' – 7.5': Same as above. Brown. Fine sand layer wet within the clay. Moderately stiff to very dense. Moist to wet at ~5.5'. No odors or visual impacts. (ML) 7.5' – 8.0': Red brown to gray brown, fine sand and silt. Non-cohesive. Damp. (SM)		
8 – 12	NA	~2	0.9	8.0' – 12.0': Red brown, till. Cohesive. Non-plastic. Very dense. Brittle. Dry. No odors or visual impacts. (ML) (Macro core liner bound with core barrel. Recovery is approximate)		

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SOIL BORING LOG (SB-10/MW-02)

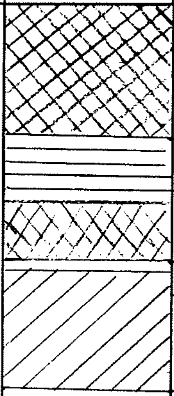
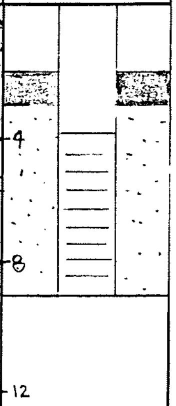
Boring/Well ID: SB-10/MW-02
Project Number: 034390
Logged By: Lynn Willey
Date Started: 12/02/03
Date Completed: 12/02/03
Total Depth: 12 feet

Client: Niagara Mohawk/National Grid
Project Name: Canastota Non-owned MGP Site
Location: See map
Contractor: North Star Drilling
Driller: Scott Breeds
Drilling Method: Geoprobe®

Ground Surface Elevation: SB-10: 426.78'
MW-02: 426.88'
Measuring Point Elevation: MW-02: 426.57'

Well Construction:
Riser 0 – 4'
Screen 4' – 9'
Manhole 0 – 1'
Concrete 0 – 2'
Bentonite Chips 2' – 3'
Filter Sand 3' – 9'

Notes: Headspace readings are indicated below.
Monitoring Well MW-02 was installed adjacent to SB-10.

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
0 - 4	NA	3.2	1.4	0 – 1.7': Crushed gray limestone with fine gravel and silt. Non-cohesive. Loose. Dry. (FI) 1.7' – 4.0': Black to light brown, fill (coal ash, glass fragments). Silt and fine sand inter bedded with gray silt. (FI)		
4 - 8	NA	4.0	0.9	4.0' – 6.1': Brown, silt and clay. Cohesive. Plastic. Very stiff. Damp. No odors or visual impacts. (MH) 6.1' – 8.0': Crumbling cobble fragments, red brick, red brown sandstone, and gray coarse gravel. Non-cohesive. Brittle. Dry. (FI) Piece of gray clay with trace fine gravel. Cohesive. Dry. (CL)		
8 – 12	NA	2.2	1.1	8.0' – 8.36': Gray, silt and coarse sand. Saturated with water. (MH) 8.36' – 12.0': Red brown, till with silt, little clay and little fine gravel. Cohesive. Very dense. No odors or visual impacts. (ML)		

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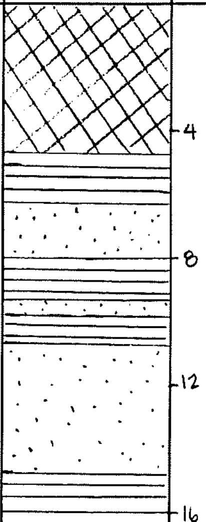
SOIL BORING LOG (SB-11)

Boring/Well ID:	**SB-11**	**Client:**	**Niagara Mohawk/National Grid**
Project Number:	**034390**	**Project Name:**	**Canastota Non-owned MGP Site**
Logged By:	**Lynn Willey**	**Location:**	**See map**
Date Started:	**12/03/03**	**Contractor:**	**North Star Drilling**
Date Completed:	**12/03/03**	**Driller:**	**Scott Breeds**
Total Depth:	**20 feet**	**Drilling Method:**	**Geoprobe®**

Ground Surface Elevation: **Measuring Point Elevation:**	**425.76'** **NA**	**Well Construction:** **Not Applicable**	**Notes: Headspace readings are indicated below.**

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
0 - 4	NA	4.0	1.9	0 – 4.0': Brown, fill (silt, little fine sand, trace coarse sand and gravel and brick fragments). Non-cohesive. Loose. Moist at bottom. No odor or visual impacts. (FI)		
4 - 8	NA	3.9	4.3	4.0' – 4.51': Same as above. Moist to wet. No odor or visual impacts. (FI)		
			32	4.51' – 6.26': Brown, silt, little clay that progresses to sandy silt, trace to some sand at 6.26' and trace rootlets. Cohesive. Moist. (ML)		
				6.26' – 8.0': Brown, fine sand, little silt. Well-sorted. Non-cohesive. Loose. Trace sheen progresses to moderately tar coated grains with blebs in water. Strong tar odor. (SP)		
8 – 12	NA	4.0	246	8.0' – 9.3': Gray/green to red, silt, little clay, trace fine-coarse sand and trace gravel. Cohesive. Plastic. Wet. Vertical veins of tar coated grains around coarse gravel. Moderate tar odor. (ML)		
				9.3' – 9.6': Black-stained, fine well-sorted sand. Loose. Tar saturated and black stained sand. Tar stains glove. Strong tar odor. (SW)		
				9.6' – 10.5': Brown, silt and clay. Cohesive. Very stiff. Damp. Moderate naphthalene like odor. No visual impacts. (ML)		
				10.5' – 12.0': Light brown, fine sand with intermittent layers of brown clay. Damp. Slight naphthalene like odor. No visual impacts. (SP)		
12 – 16	NA	3.1	4.8	12.0' – 14.06': Brown, fine/very fine well-sorted sand. Dense. Damp. Trace naphthalene like odor. No visual impacts. (SW)		
				14.06' – 16.0': Inter bedded silt, very fine sand and clay. Dense. Cohesive. Damp. Trace naphthalene like odor. No visual impacts. (ML)		

SOIL BORING LOG (SB-11)

16 - 20	NA	~2.5	2.9	16' – 20': Brown, silt and clay. Cohesive. Very stiff and brittle. Dry. No odors or visual impacts. (ML)	▤	20

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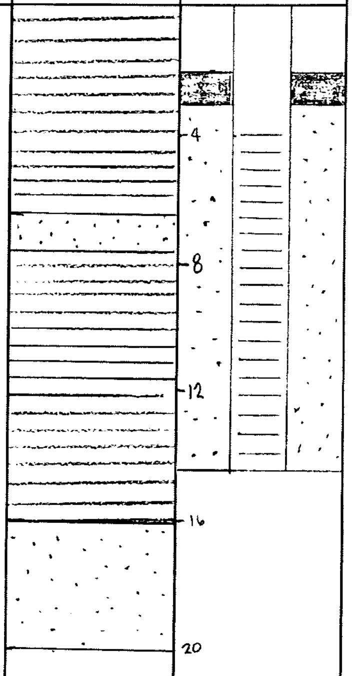
SOIL BORING LOG (SB-12/MW-03)

Boring/Well ID:	SB-12/MW-03	**Client:**	Niagara Mohawk/National Grid
Project Number:	034390	**Project Name:**	Canastota Non-owned MGP Site
Logged By:	Lynn Willey	**Location:**	See Map
Date Started:	12/01/03	**Contractor:**	North Star Drilling
Date Completed:	12/01/03	**Driller:**	Scott Breeds
Total Depth:	30 feet	**Drilling Method:**	Geoprobe® and Hollow Stem Auger

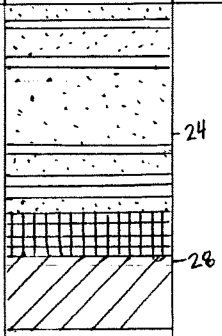
Ground Surface Elevation: **Measuring Point Elevation:**	SB-12: 424.88' MW-03: 424.87' MW-03: 424.61'	**Well Construction:** Riser 0 – 4' Screen 4' – 14' Manhole 0 – 1' Concrete 0 – 2' Bentonite Chips 2' – 3' Filter Sand 4' – 14'	Notes: Headspace readings are indicated below. Monitoring Well MW-03 was installed adjacent to SB-12, approximately 5 feet to the east. Hollow stem auger used from 20' – 30'.

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description
0 - 4	NA	3.8	4.6	0 – 4.0': Brown, silt, trace fine sand, trace gravel, trace fill (asphalt and brick). Dry to moist at 4'. No odor or visual impacts. (ML)
4 - 8	NA	3.25	2.4	4' - 6.46': Brown, silt, little to some clay. Cohesive. Wet. No odors or visual impacts. (ML) 6.46' – 7.82': Brown, fine sand, little silt. Non-cohesive. Wet. No odors or visual impacts. (SP) 7.82' – 8.0': Brown, silt. Cohesive. Dense. No odors or visual impacts. (ML)
8 - 12	NA	3.9	3.0	8.0' – 12.0': Alternating layers. Fine well-sorted sand, little silt. Non-cohesive. No odors or visual impacts. (SW) Brown, silt and clay. Cohesive. Very dense. No odors or visual impacts. (ML)
12 - 16	NA	2.9	2.5	12.0' – 16.0': Same as above. Alternating layers. Fine sand, little silt. Non-cohesive. Loose. (SP) 3" - 6" of silt and clay. Cohesive. Dense. Dry. No odors or visual impacts. (ML)
16 - 20	NA	3.4	2.6	16.0' – 18.35': Brown, fine sand, little silt with stringers of silt and clay. Non-cohesive. Non-plastic. Wet. No odors or visual impacts. (SP) 18.35' – 20.0': Alternate layers as above of fine sand and silt-clay. No odors or visual impacts. (SP)

Lithology (not to scale) | **Well Construction**



SOIL BORING LOG (SB-12/MW-03)

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description	Lithology (not to scale)	Well Construction
20 - 22	8 18 20 26	1.8	NA	20.0' - 20.44': Red/brown to brown, fine sand, little silt. Non-cohesive. Loose. Wet. No odors or visual impacts. (SP) 20.44' – 20.67': Brown, silt and clay. Dense. No odors or visual impacts. (ML) 20.67' – 21.67': Red/brown to brown, fine sand, little silt. Non-cohesive. Loose. Wet. No odors or visual impacts. (SP) 21.67' – 22.0': Brown, silt and clay interbedded with lenses of fine sand and little silt. Noncohesive. Dense. No odors or visual impacts. (ML)		
22 - 24	11 17 19 34	1.9	NA	22.0' – 24.0': Same as above with more lenses of fine sand <1/8". Dense. Damp. No odors or visual impacts. (SP)		
24 – 26	12 28 24 34	1.9	NA	24.0' – 24.42': Fine sand, little silt. Non-cohesive. Medium stiff. Wet. No odors or visual impacts. (SP) 24.42' – 24.63': Brown, silt and clay. Cohesive. Plastic. Dense/stiff. Damp. No odors or visual impacts. (ML) 24.63' – 25.26': Fine sand, little silt. Non-cohesive. Medium stiff. Wet. No odors or visual impacts. (SP) 25.26' – 26.0': Brown, silt and clay. Cohesive. Plastic. Dense/stiff. Damp. No odors or visual impacts. (ML)		
26 - 28	24 34 18 29	1.5	NA	26.0' – 26.67': Brown, fine sand, little to some silt. Non-cohesive. Dense. Wet. No odors or visual impacts. (SP) 26.67' – 27.87': Brown, clay. Plastic. Dense. Dry. No odors or visual impacts. (CL) 27.87' – 28.0': Red brown. Till, silt, trace little fine sand and fine gravel. Cohesive. Dense. Dry. No odors or visual impacts.		
28 - 30	15 24 21 35	1.5	NA	28.0' – 30.0': Red brown, till, silt, little fine sand, trace coarse sand and trace fine gravel. Cohesive. Dense. Dry. (ML)		

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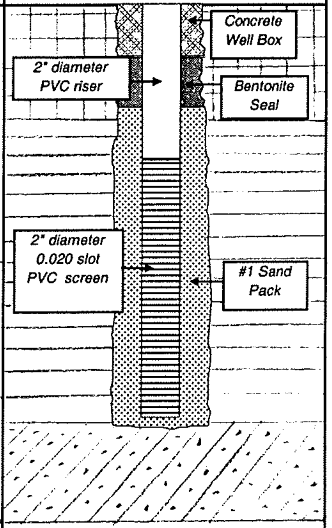
SOIL BORING/WELL LOG (MW-04)

Boring/Well ID:	MW-04	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/13/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	10.0'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	425.70'	**Drilling Method:**	Geoprobe/Hollow Stem Auger
Elevation (top of riser):	425.39'		
Well Construction:			
Riser (from - to):	0.0' - 3.0'	**Bentonite Seal (from - to):**	1.0' - 2.0'
Screen (from - to):	3.0' - 8.0'	**Annular Fill Type/Depth:**	Concrete / 0.0' -1.0'
Screen Type/Size:	PVC / 0.020 Slot	**Cement Grout (from - to):**	NA
Sand Pack (from - to):	2.0' - 8.0'	**Well Cover Type:**	Flush Mount Road Box

Notes: Proportions Used: Trace - 1-10% Some - 20-30%
bgs - below ground surface Little - 10-20% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	WELL DIAGRAM
1 2 3 4 5	0-5	0.0-0.5	5/4.2	0.0' - 2.2': Brown, dry, FINE SAND, some fine to medium gravel, asphalt, and brick fragments, dense, well sorted, non-cohesive. No odor. No visual contamination. (FILL) 2.2' - 4.0': Brown, moist-wet, FINE SAND, dense, poorly sorted, semi-cohesive. No odor. No visual contamination. 4.0' - 4.2': Brown, wet, SILT, some clay, trace fine gravel, dense, poorly sorted, cohesive. No odor. No visual contamination.	
6 7 8 9 10	5-10	0.0	5/5	0.0' - 0.1': Same as above. 0.1' - 2.9': Brown, moist, SILT and FINE SAND, some clay, dense, poorly sorted, cohesive. No odor. No visual contamination. ***Analytical samle MW-04 (5.5-6) collected*** 2.9' - 5.0': Red-brown, moist, SILT and CLAY, dense, poorly sorted, cohesive. No odor. No visual contamination.	
11 12 13 14 15				End of Boring at 10.0' bgs.	
16 17 18 19 20					

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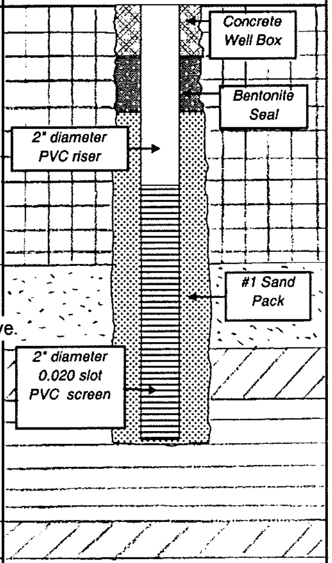
SOIL BORING/WELL LOG (MW-05)

Boring/Well ID:	MW-05	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/13/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	10.5'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	426.12'	**Drilling Method:**	Geoprobe/Hollow Stem Auger
Elevation (top of riser):	425.62'		
Well Construction:			
Riser (from - to):	0.0' - 3.0'	**Bentonite Seal (from - to):**	1.0' - 2.0'
Screen (from - to):	3.0' - 8.0'	**Annular Fill Type/Depth:**	Concrete / 0.0' -1.0'
Screen Type/Size:	PVC / 0.020 Slotted	**Cement Grout (from - to):**	NA
Sand Pack (from - to):	2.0' - 8.0'	**Well Cover Type:**	Flush Mount Road Box

Notes: Proportions Used: Trace - 1-10% Some - 20-30%
bgs - below ground surface Little - 10-20% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	**WELL DIAGRAM**
1 2 3 4 5	0-5	0.0-0.1	5/3.4	0.0' - 1.7': Brown, dry, FINE SAND, some brick fragments and fine gravel, trace asphalt, well sorted, non-cohesive. No odor. No visual contamination. (FILL) 1.7' - 3.4': Brown, moist, FINE SAND, loose, poorly sorted, non-cohesive. No odor. No visual contamination. (FILL)	 Concrete Well Box Bentonite Seal 2" diameter PVC riser #1 Sand Pack 2" diameter 0.020 slot PVC screen
6 7 8 9 10	5-10	0.0	5/4.4	0.0'- 1.1': Brown, wet, FINE SAND, loose, semi-cohesive. No odor. No visual contamination. 1.1' - 1.5': Brown, wet, FINE to COARSE SAND, well sorted, semi-cohesive. 1.5' - 1.9': Brown-black, moist, SILT and CLAY, dense. 1.9' - 2.3': Red-brown, CLAY and SILT, dense. 2.3' - 3.9': Brown, wet, FINE SAND, dense, semi-cohesive. No odor. No visual contamination. 3.9' - 4.4': Brown, wet, SILT, some clay, dense, cohesive. No odor. *No visual contamination.* ***Analytical sample MW-05 (8.5-9.5) collected***	
11 12 13 14 15	10-15	0.0	5/0.8	*Liner bound up in core barrel.* 0.0' - 0.8': Red-brown, moist, CLAY and SILT, very dense, poorly sorted, cohesive. No odor. No visual contamination. End of boring at 10.8' bgs.	
16 17 18 19 20					

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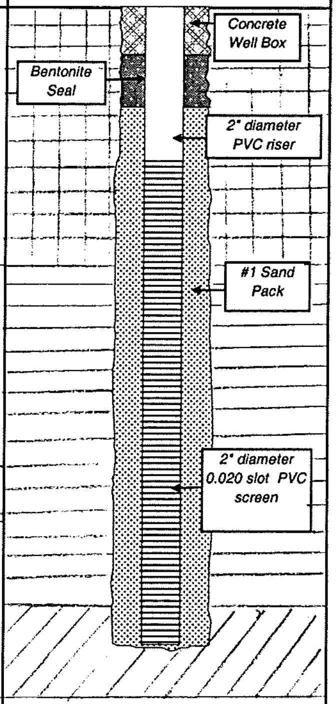
SOIL BORING/WELL LOG (SB-14/MW-06)

Boring/Well ID:	SB-14 / MW-06	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/13/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	13.3'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	425.17'	**Drilling Method:**	Geoprobe/Hollow Stem Auger
Elevation (top of riser):	424.79'		
Well Construction:			
Riser (from - to):	0.0' - 3.0'	**Bentonite Seal (from - to):**	1.0' - 2.0'
Screen (from - to):	3.0' - 13.0'	**Annular Fill Type/Depth:**	Concrete / 0.0' - 1.0'
Screen Type/Size:	PVC / 0.020 Slotted	**Cement Grout (from - to):**	NA
Sand Pack (from - to):	2.0' - 13.0'	**Well Cover Type:**	Flush Mount Road Box

Notes:
bgs - below ground surface

Proportions Used:		
	Trace - 1-10%	Some - 20-30%
	Little - 10-20%	And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	WELL DIAGRAM
1 2 3 4 5	0-5	0.0	5/3.9	0.0' - 2.0': Brown, dry, FINE SAND and SILT, little fine gravel, medium dense, non-cohesive. No odor. No visual contamination. (FILL) 2.0' - 2.7': Brown, moist, SILT and CLAY, some fine sand, poorly sorted, cohesive. No odor. No visual contamination. (FILL) 2.7' - 3.9': Brown, moist, FINE SAND and SILT, little fine gravel, trace wood fragment, medium dense, non-cohesive.No odor. No visual contamination. (FILL)	
6 7 8 9 10	5-10	7.3-335	5/3.8	0.0' - 2.0': Brown, wet, FINE SAND and SILT, dense, semi-cohesive. Slight naphthalene-like odor. No visual contamination. 2.0' - 3.8': Brown, wet, FINE SAND, medium dense, poorly sorted, semi-cohesive. Moderate naphthalene-like odor. Tar coated grains and sheen. ***Analytical sample SB-14 (8-9) colleced***	
11 12 13 14 15	10-15	1.2-186	5/3.3	0.0' - 1.7': Brown, saturated, FINE SAND and SILT, loose, poorly sorted. Moderate naphthalene-like odor. Tar coated grains and sheen. 1.7' - 3.2': Red-brown, moist, CLAY and SILT, dense, poorly sorted, cohesive. No odor. No visual contamination. 3.2' - 3.3': Red brown, dry, SILT, CLAY, and GRAVEL, very dense, cohesive. No odor. No visual contamination. (TILL)	
16 17 18 19 20				End of Boring at 13.3' bgs.	

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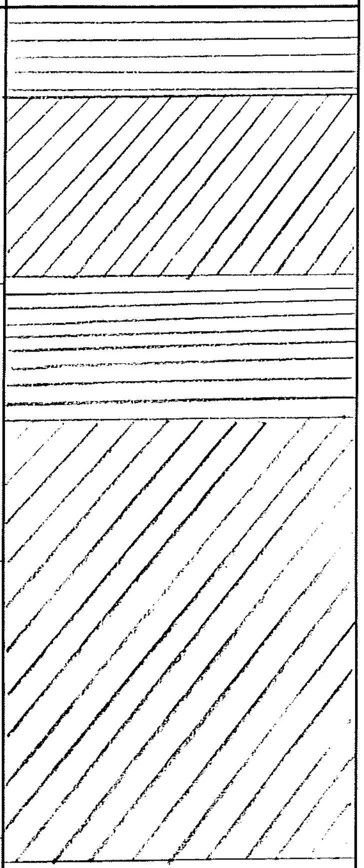
SOIL BORING (SB-13)

Boring/Well ID:	SB-13	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/12/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	15.5'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	425.19'	**Drilling Method:**	Geoprobe

Notes:
bgs - below ground surface

Proportions Used: Trace - 1-10%
Little - 10-20%
Some - 20-30%
And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	Geologic Strata
1 2 3 4 5	0-5	0.0	5/4.8	0.0' - 1.4': Brown, dry, FINE SAND, some gravel, trace organic material, loose, well sorted, non-cohesive. No odor. No visual contamination. 1.4' - 3.4': Brown, dry, SILT and CLAY, some fine sand, dense, cohesive. 3.4' - 4.8': Dark brown, moist, SILT and CLAY, organic layers throughout, trace fine gravel, dense, poorly sorted, semi-cohesive. No odor. No visual contamination.	
6 7 8 9 10	5-10	0.0	5/4.6	0.0' - 2.4': Brown, wet, FINE SAND, dense, poorly sorted, semi-cohesive. No odor. No visual contamination. 2.4' - 2.6': Red-brown, moist, SILT and CLAY, dense, poorly sorted, cohesive. No odor. No visual contamination. ***Analytical sample SB-13 (6.5-7.5) collected***	
11 12 13 14 15	10-15	0.0	5/3.5	0.0' - 3.5': Red-brown, moist, SILT and CLAY, dense-very dense, poorly-sorted, cohesive. No odor. No visual contamination.	
16 17 18 19 20	15-20	0.0	5/0.5	*Liner bound up in core sampler.* 0.0' - 0.5': Red-brown, dry-moist, SILT and CLAY, very dense, cohesive. No odor. No visual contamination. End of Boring at 15.5' bgs.	

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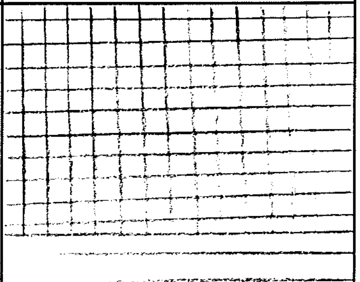
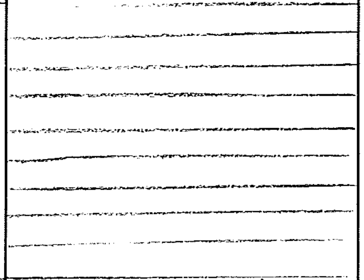
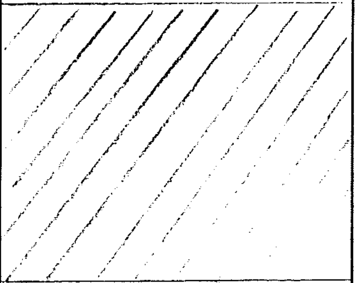
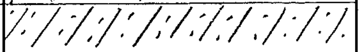
SOIL BORING (SB-15)

Boring/Well ID:	SB-15	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/11/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	17.0'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	424.84'	**Drilling Method:**	Geoprobe

Notes: Proportions Used: Trace - 1-10% Some - 20-30%
bgs - below ground surface Little - 10-20% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	Geologic Strata
1 2 3 4 5	0-5	0.0	5/3.8	0.0' - 1.7': Brown, dry, FINE SAND and GRAVEL, some organic material, brick fragments, loose, well sorted, non-cohesive. No odor. No visual contamination. (FILL) 1.7' - 2.3': Grey, moist, ROCK FRAGMENTS, some sand and silt.(FILL) 2.3' - 3.8': Dark brown, moist, SILT and FINE SAND, trace clay, dense, semi-cohesive. No odor. No visual contamination. (FILL)	
6 7 8 9 10	5-10	0.0	5/4.1	0.0' - 4.1': Brown, wet, FINE SAND, some silt, poorly sorted, dense, semi-cohesive. No odor. No visual contamination.	
11 12 13 14 15	10-15	0.0	5/2.1	0.0' - 2.1': Brown-red-brown, wet, SILT and CLAY, trace fine sand, dense-very dense, cohesive. No odor. No visual contamination. ***Analytical sample SB-15 (14-15) collected***	
16 17 18 19 20	15-17	0.0	2/0.2	0.0' - 0.2': Rock imbedded in red-brown, dry, SILT, CLAY, and GRAVEL, very dense, cohesive. No odor. No visual contamination. (TILL) End of Boring at 17.0' bgs.	

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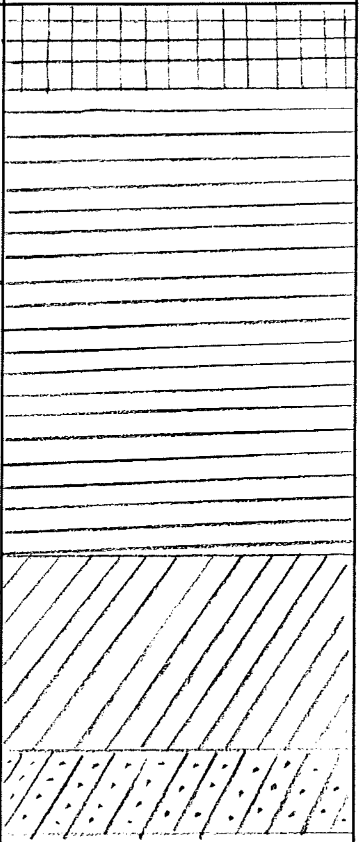
SOIL BORING (SB-16)

Boring/Well ID:	SB-16	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/11/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	15.0'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	425.07'	**Drilling Method:**	Geoprobe

Notes: Proportions Used: Trace - 1-10% Some - 20-30%

bgs - below ground surface Little - 10-20% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	Geologic Strata
1 2 3 4 5	0-5	0.0	5/3.3	0.0' - 1.5': Brown, dry, FINE SAND, some fine gravel, loose, non-cohesive. No odor. No visual contamination. (FILL) 1.5' - 3.3': Brown, moist to wet, FINE SAND and SILT, some fine to medium gravel with layers of silt and clay, medium dense, non-cohesive. No odor. No visual contamination.	
6 7 8 9 10	5-10	0.0	5/3.5	0.0' - 3.5': Brown, wet, FINE SAND, some silt, well sorted, medium dense, semi-cohesive. No odor. No visual contamination.	
11 12 13 14 15	10-15	0.0	5/5	0.0' - 3.5': Brown to grey, moist, SILT and CLAY, trace fine gravel, poorly sorted, dense, cohesive. No odor. No visual contamination. ***Analytical sample SB-16 (13-13.5) collected*** 3.5' - 5.0': Red-brown, dry, SILT, CLAY, and GRAVEL, very dense, cohesive. No odor. No visual contamination. (TILL)	
16 17 18 19 20				End of Boring at 15.0' bgs.	

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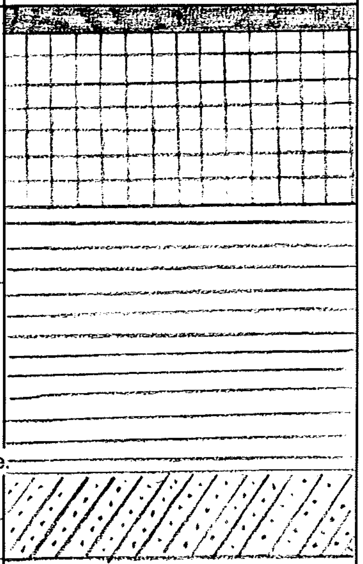
SOIL BORING (SB-17)

Boring/Well ID:	SB-17	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/11/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	10.0'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	425.55'	**Drilling Method:**	Geoprobe

Notes: Proportions Used: Trace - 1-10% Some - 20-30%

bgs - below ground surface Little - 10-20% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	Geologic Strata
1 2 3 4 5	0-5	0.0	5/3.5	0.0' - 0.5': ASPHALT. 0.5' - 2.3': Brown, moist, FINE SAND and SILT, some fine to medium gravel, dense, well-sorted, semi-cohesive. No odor. No visual contamination. (FILL) 2.3' - 2.6': Red, moist, BRICK FRAGMENTS. (FILL) 2.6' - 3.5': Brown, moist, FINE SAND and SILT, some fine gravel, dense, well sorted, semi-cohesive. No odor. No visual contamination. (FILL)	
6 7 8 9 10	5-10	0.0	5/5	0.0' - 1.3': Brown, wet, FINE SAND, trace fine gravel, medium dense, poorly sorted, semi-cohesive. No odor. No visual contamination. 1.3' - 2.6': Brown, saturated, FINE SAND and SILT, dense, semi-cohesive. No odor. No visual contamination. 2.6' - 3.4': Grey-brown, moist, SILT and FINE SAND, some clay and fine gravel, very dense. No odor. No visual contamination. 3.4' - 5.0': Red-brown, dry, SILT, CLAY, and GRAVEL, very dense, cohesive. No odor. No visual contamination.(TILL) ***Analytical sample SB-17 (7-8) collected***	
11 12 13 14 15				End of Boring at 10.0' bgs.	
16 17 18 19 20					

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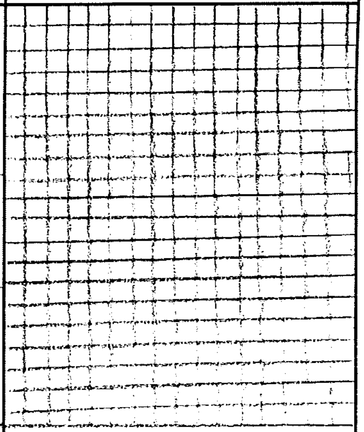
SOIL BORING (SB-18)

Boring/Well ID:	SB-13	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/11/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	7.3'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	425.76'	**Drilling Method:**	Geoprobe

Notes: NA - Not Available
bgs - below ground surface

Proportions Used: Trace - 1-10% Some - 20-30%
Little - 10-20% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	Geologic Strata
1 2 3	0-3	0.1	NA	*Hand augered to 3.0' bgs.* 0.0' - 0.5': ASPHALT. 0.5' - 3.0': Brown, dry, SAND and GRAVEL, trace silt, loose, non-cohesive. Slight organic-like odor. No visual contamination. (FILL)	
4 5	3-5	0.1	2/1.2	0.0' - 2.0': Brown, moist, FINE SAND, some silt and organic material (rootlets), trace glass fragments, loose, non-cohesive. Slight organic-like odor. No visual contamination. (FILL)	
6 7 8 9 10	5-10	2.1-2.6	2.3/1	0.0' - 0.8': Black, wet, FINE SAND and SILT, some organic material, medium dense, non-cohesive. Slight organic-like odor. No visual contamination. ***Analytical sample SB-18 (6-7) collected*** 0.8' - 1.0': Grey, dry, CONCRETE FRAGMENTS. (FILL)	
11 12 13 14 15				Refusal at 7.3' bgs. End of Boring.	
16 17 18 19 20					

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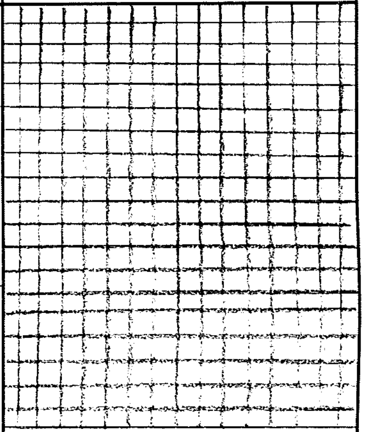
SOIL BORING (SB-18A)

Boring/Well ID:	SB-18A	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/11/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	7.3'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	425.76'	**Drilling Method:**	Geoprobe

Notes:
bgs - below ground surface

Proportions Used: Trace - 1-10% Some - 20-30%
Little - 10-20% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	Geologic Strata
1 2 3 4 5	0-5	0.0-0.1	5/3.7	0.0' - 0.5': ASPHALT. 0.5' - 3.7': Brown, dry to moist, FINE SAND, some silt and fine gravel, trace organic material, medium dense, semi-cohesive. Slight organic-like odor. No visual contamination.	
6 7 8 9 10	5-10	0.0-2.0	2.3/1.6	0.0' - 1.3': Dark brown, wet, FINE SAND, some silt and fine gravel, trace brick and glass fragments, medium dense, semi-cohesive. Slight organic-like odor. No visual contamination. 1.3' - 1.6': Grey, dry, CONCRETE FRAGMENTS. (FILL)	
11 12 13 14 15				Refusal at 7.3' bgs. End of Boring.	
16 17 18 19 20					

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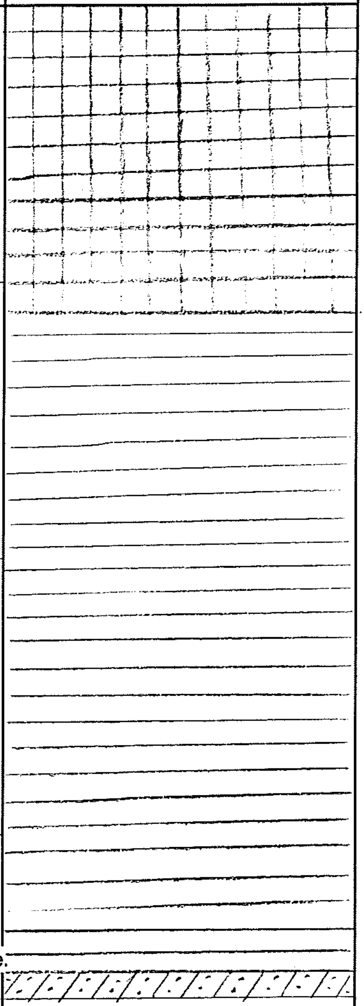
SOIL BORING (SB-19)

Boring/Well ID:	SB-19	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/13/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	18.6'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	426.38'	**Drilling Method:**	Geoprobe

Notes: Proportions Used: Trace - 1-10% Some - 20-30%
bgs - below ground surface Little - 10-20% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	Geologic Strata
1 2 3 4 5	0-5	0.0-12.5	5/3.1	0.0' - 2.0': Light brown, dry, FINE SAND, loose, well sorted, non-cohesive. No odor. No visual contamination. (FILL) 2.0' - 3.1': Dark brown, dry-moist, FINE SAND, some organic material and glass fragments, well sorted, non-cohesive. Slight fuel oil-like odor. Trace sheen in tip of liner. (FILL)	
6 7 8 9 10	5-10	30-115	5/2.7	0.0' - 0.6': Brown, wet, FINE SAND and GRAVEL, trace organic material and glass, loose. Strong naphthalene-like odor. Tar coated soil grains and sheen. (FILL) 0.6' - 2.2': Brown, wet, FINE SAND, medium dense, poorly sorted, non-cohesive. Moderate naphthalene-like odor. No visual contamination. 2.2' -2.7': Brown, wet, FINE SAND and SILT, dense, poorly sorted, semi-cohesive. Very slight naphthalene-like odor. No visual contamination. ***Analytical sample SB-19 (7-8) collected***	
11 12 13 14 15	10-15	NA	5/3.3	0.0' - 3.3': Brown, wet, FINE SAND, some silt, dense, poorly sorted, semi-cohesive. Slight naphthalene-like odor. Sheen.	
16 17 18 19 20	15-20	0.0-0.1	5/3.6	0.0' - 2.6': Brown, wet, FINE SAND, some silt, dense, poorly sorted, semi-cohesive. No odor. No visual contamination. 2.6' - 3.4': Red-brown, moist, SILT and CLAY, dense, cohesive. No odor. No visual contamination. 3.4' - 3.6': Red-brown, dry, SILT, CLAY, and GRAVEL, very dense, cohesive. No odor. No visual contamination. (TILL) End of Boring at 18.6' bgs.	

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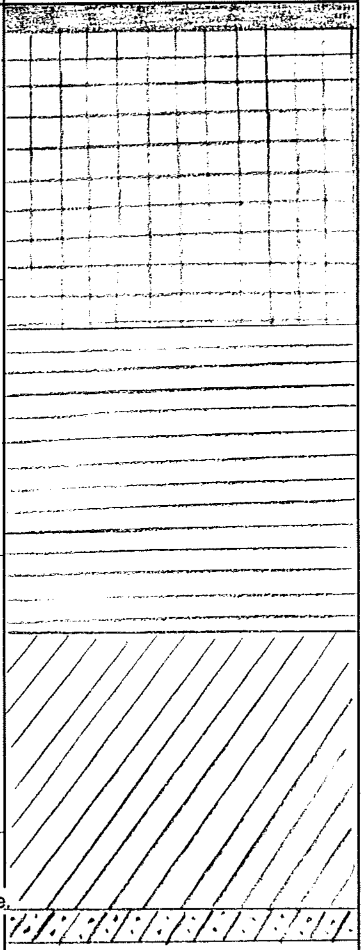
SOIL BORING (SB-20)

Boring/Well ID:	SB-20	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/12/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	16.8'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	427.20'	**Drilling Method:**	Geoprobe

Notes: Proportions Used: Trace - 1-10% Some - 20-30%
bgs - below ground surface Little - 10-20% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	Geologic Strata
1 2 3 4 5	0-5	0.0	5/2.7	0.0' - 0.5': ASPHALT. 0.5' - 2.7': CLINKER, ASH, and BRICK FRAGMENTS, some fine to coarse sand and silt, loose, well sorted. No odor. No visual contamination. (FILL)	
6 7 8 9 10	5-10	3.1-137	5/3.7	0.0' - 0.9': Same as above. Moderate naphthalene-like odor. Tar coated. (FILL) 0.9' - 1.5': Brown, moist, SILT and FINE SAND, dense, semi-cohesive. Slight naphthalene-like odor. Sheen. 1.5' - 3.7': Brown, moist-wet, FINE SAND and SILT, dense, poorly sorted, semi-cohesive. Moderate naphthalene-like odor. Sheen. ***Analytical sample SB-20 (5.5-6) collected***	
11 12 13 14 15	10-15	1.3-5.3	5/1.8	0.0' - 1.2': Brown, wet, FINE SAND, some silt, dense, poorly sorted, semi-cohesive. Very slight naphthalene-like odor. No visual contamination. 1.2' - 1.8': Red-brown, moist, SILT and CLAY, dense, cohesive. No odor. No visual contamination.	
16 17 18 19 20	15-20	0.0	5/1.8	0.0' - 1.2': Red-brown, moist, SILT and CLAY, trace fine gravel, dense, cohesive. No odor. No visual contamination. 1.2' - 1.8': Red-brown, dry, SILT, CLAY, and GRAVEL, very dense, cohesive. No odor. No visual contamination. (TILL) Refusal - Rock in tip of sampler. End of Boring at 16.8' bgs.	

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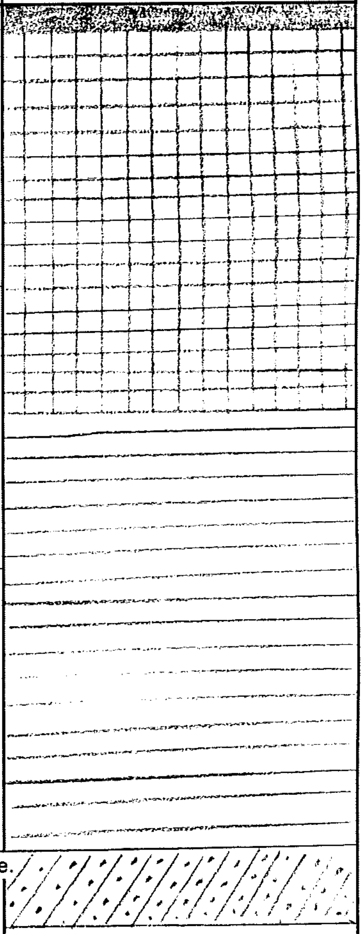
SOIL BORING (SB-20A)

Boring/Well ID:	SB-20A	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/13/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	20.0'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	427.20'	**Drilling Method:**	Geoprobe

Notes: NA - Not Available
bgs - below ground surface

Proportions Used: Trace - 1-10% Little - 10-20% Some - 20-30% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	Geologic Strata
1 2 3 4 5	0-5	5.4-158	5/3.8	0.0' - 0.05': ASPHALT 0.5' - 3.8': Brown, dry, FINE to COARSE SAND, some gravel and cobbles, loose, well sorted, non-cohesive. Slight naphthalene-like odor. Tar saturated between 2.7' - 3.0'. (FILL)	
6 7 8 9 10	5-10	36.1-138	5/4.4	0.0' - 2.3': Black, moist, FINE SAND and SILT, some organic material, very dense, cohesive. Strong naphthalene-like odor. (FILL) 2.3' - 4.4': Brown, wet, FINE SAND, trace silt, dense, poorly sorted, semi-cohesive. Moderate naphthalene-like odor. Tar blebs at 3.5' and sheen throughout. ***Analytical sample SB-20A (5.5-6) collected***	
11 12 13 14 15	10-15	NA	NA	No Recovery - sample ran out of liner: loose, wet sand.	
16 17 18 19 20	15-20	0.0	5/1.2	0.0' - 1.2': Red-brown, dry, SILT, CLAY, and GRAVEL, very dense, cohesive. No odor. No visual contamination. End of Boring at 20' bgs.	

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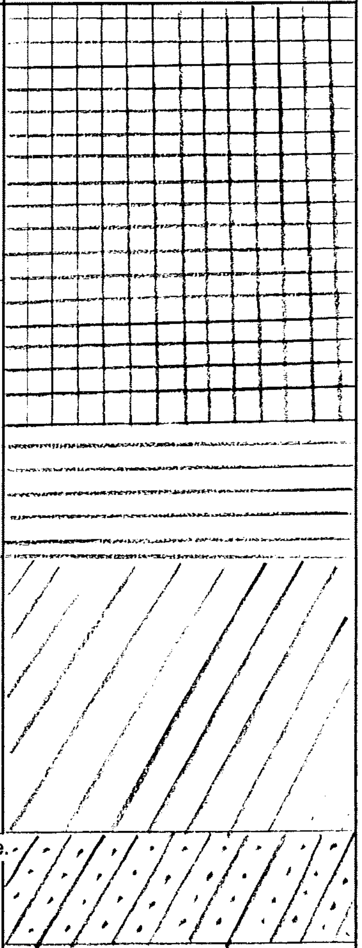
SOIL BORING (SB-21)

Boring/Well ID:	SB-21	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/12/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	17.0'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	426.51'	**Drilling Method:**	Geoprobe

Notes: NA - Not Available
bgs - below ground surface

Proportions Used: Trace - 1-10% Some - 20-30%
Little - 10-20% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	Geologic Strata
1 2 3 4 5	0-5	NA	NA	*Hand augered to 5' bgs.* 0.0' - 0.5': Brown to black, dry, FINE SAND, some brick fragments, loose, well sorted. No odor. No visual contamination. (FILL)	
6 7 8 9 10	5-10	0.0-11.6	5/2.9	0.0' - 1.1': Brown, moist, FINE SAND, some clinker/ash, loose, well sorted. Moderate naphthalene-like odor. No visual contamination. (FILL) 1.1' - 2.3': Brown, moist, SILT and FINE SAND, 1" gravel vein, well sorted, medium dense, cohesive. Moderate naphthalene-like odor. Gravel vein tar coated. (FILL) 2.3' - 2.9': Brown, wet, FINE SAND, poorly sorted, dense, semi-cohesive. Moderate naphthalene-like odor. Sheen. ***Analytical sample SB-21 (7.5-8) collected***	
11 12 13 14 15	10-15	0.0	5/2.1	0.0' - 2.1': Brown-red-brown, wet-moist, SILT and CLAY, poorly sorted, dense-very dense, cohesive. No odor. No visual contamination.	
16 17 18 19 20	15-20	0.0	5/2	0.0' - 2.0': Red-brown, dry, SILT, CLAY, and GRAVEL, very dense, cohesive. No odor. No visual contamination. (TILL)	

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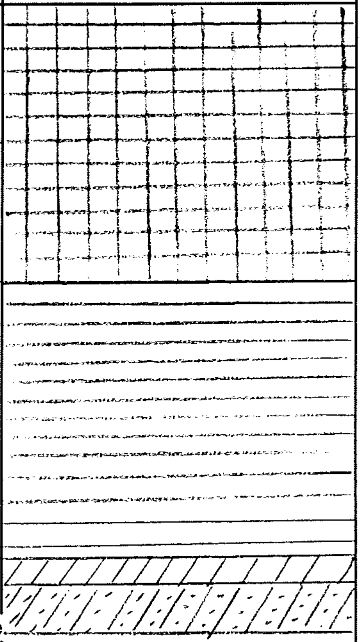
SOIL BORING (SB-22)

Boring/Well ID:	SB-22	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/13/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	15.0'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	427.87'	**Drilling Method:**	Geoprobe

Notes: NA- Not Available
bgs - below ground surface

Proportions Used: Trace - 1-10% Little - 10-20% Some - 20-30% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description	Geologic Strata
1 2	0-2.5	NA	NA	*Hand augered to 2.5' bgs.*	
3 4 5	2.5-5	0.0-4.5	2.5/1.8	0.0' - 1.8': Brown, moist, FINE SAND and SILT, dense, poorly sorted, semi-cohesive. Slight naphthalene-like odor. Trace sheen in bottom 0.2' (FILL)	
6 7 8 9 10	5-10	14.3-63	5/4.4	0.0' - 2.1': Brown, wet, FINE SAND and SILT, loose to medium dense, poorly sorted. Moderate naphthalene-like odor. Some tar coated grains and sheen. 2.1' - 4.4': Red-brown, moist, SILT, some clay, dense, poorly sorted. Slight naphthalene-like odor. Blebs of tar at 4.0'. ***Analytical sample SB-22 (6-7) collected***	
11 12 13 14 15	10-15	0.0-0.3	5/1.2	0.0' - 0.4': Red-brown, moist, SILT and CLAY, dense, poorly sorted. Slight naphthalene-like odor. No visual contamination. 0.4' - 1.2': Red-brown, dry, SILT, CLAY, and GRAVEL, very dense, cohesive. No odor. No visual contamination. (TILL) End of Boring at 11.2' bgs.	
16 17 18 19 20					

GEI Consultants

SOIL BORING (SB-23)

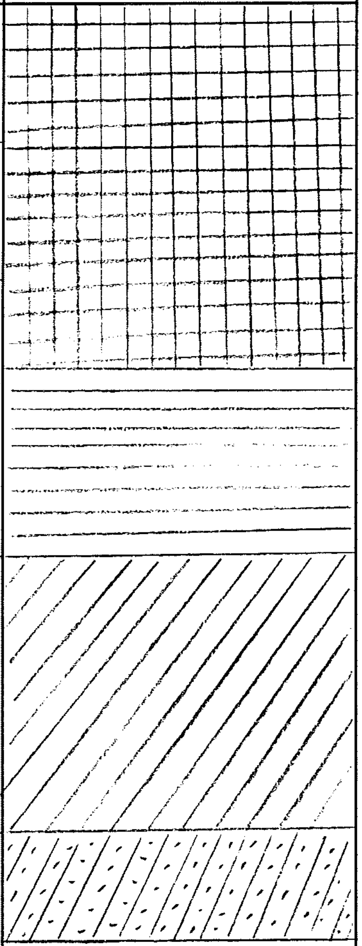
Boring/Well ID:	SB-23	**Client:**	Niagara-Mohawk
Project Number:	034390	**Project Name:**	Canastota Non-Owned Fmr. MGP Site
Logged By:	Dan Burke	**Site Address:**	E.N. Canal Street, Canastota, NY
Date:	7/12/2005	**Contractor:**	Aquifer Drilling and Testing
Total Depth:	17.0'	**Driller:**	Roger Buley, Brian Urick
Elevation (ground):	427.21'	**Drilling Method:**	Geoprobe

Notes: NA- Not Available
bgs - below ground surface

Proportions Used: Trace - 1-10% Some - 20-30%
Little - 10-20% And - 30-50%

Depth (ft.)	Sample Interval (feet)	PID Screening (ppm)	Penetration / Recovery (feet)	Soil/Geologic Description
1 2	0-2.5	0.0	NA	*Hand augered to 2.5' bgs.* 0.0' - 1.5': Brown, dry, FINE SAND, some silt, loose, well sorted, cohesive. No odor. No visual contamination. (FILL) 1.5' - 2.5': Dark brown, moist, SILT, some clay and fine sand, dense, poorly sorted, semi-cohesive. No odor. No visual contamation. (FILL)
3 4 5	2.5-5	0.0	2/1.3	0.0' - 1.3': Brown, moist, SILT, some fine sand and clinker/ash, poorly sorted, semi-cohesive. No odor. No visual contamination. (FILL)
6 7 8 9 10	5-10	0.0	5/5	0.0' - 0.7': Brown, wet, SILT and FINE SAND, poorly sorted, semi-cohesive. 0.7' - 1.2': Dark brown, FINE SAND, some organic material. Organic-like odor. No visual contamination. (FILL) 1.2' - 5.0': Brown-red-brown, moist, SILT, some fine sand, trace clay, dense, poorly sorted, cohesive. No odor. No visual contamination.
11 12 13 14 15	10-15	0.0	5/2	0.0' - 2.0': Red-brown, moist, SILT and CLAY, very dense, cohesive. No odor. No visual contamination. ***Analytical sample SB-23 (13.5-14) collected***
16 17 18 19 20	15-20	0.0	5/2	0.0' - 2.0': Red-brown, dry, SILT, CLAY, and GRAVEL, very dense, cohesive. No odor. No visual contamination. (TILL)

Geologic Strata



Φ GEI Consultants, Inc.

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P.O. Box 297
Colchester, CT 06415

Ph: (860) 537-0751
Fax: (860) 537-6347

TEST PIT DESCRIPTION SHEET

PROJECT NUMBER: 034390
TEST PIT NUMBER: TP-1
GENERAL LOCATION AND/OR PURPOSE: PARALLEL AND WEST OF MAIN BUILDING
DATE: DECEMBER 1, 2003
TIME OPENED: 1005 **TIME CLOSED:** 1430

CALL BEFORE YOU DIG CASE NO.: 11253-076-060
OBSERVER: JERRY ZAK
ASSISTANT:
OTHERS: PETE MOREAU (NIMO), SCOTT DEYETTE (NYSDEC)
CONTRACTOR: NORTH STAR DRILLERS
EQUIPMENT: BACKHOE EXCAVATOR

0.0-0.3
GRASS, LOAM, ROOTS. NO ODORS.

0.3 TO 1.2
BROWN SILTY LOAM, DRY. NO ODORS.

1.2 TO 2.5
MIX OF CINDERS ASH, GRAVEL, BROWN SILT. TRACE NAPHTHALENE ODOR.

TRACE TAR AND BLEBS

OLD BOTTLES

2.5 TO 5.0
BROWN SILT, CONCRETE RUBBLE AT 2.7'. WET AT 4.0 FEET.

VIDEO DOCUMENTED: YES ____ NO X
PHOTOGRAPHED: YES X NO ____
DEPTH TO WATER: 4.0 FT BGS

ANALYTICAL SAMPLES: NONE
NAPL SEEPAGE: YES X NO ____

REMEDIAL INVESTIGATION WORK PLAN
NATIONAL GRID
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK
OCTOBER 2010

Appendix C

Site-Specific Health and Safety Plan

HEALTH AND SAFETY PLAN (HASP)

Site:	**CANASTOTA NON-OWNED FORMER MANUFACTURED GAS PLANT**
Location:	**CANASTOTA, NEW YORK**
Date Prepared:	**OCTOBER 2010**
Revision:	**0**
Project Description:	**REMEDIAL INVESTIGATION. SOIL BORING AND MONITORING WELL INSTALLATION AND SAMPLING**
Potential Waste types:	Dense non-aqueous phase liquid (DNAPL) tar, non-aqueous phase liquid (NAPL) petroleum (diesel), tar-impacted and petroleum-impacts soil and groundwater, solvents, metals, and cyanide
Characteristics:	Volatile Compounds, Toxic
Unusual Site Features:	The Canastota Non-Owned Former Manufactured Gas Plant site is developed with a commercial building.
Status:	Commercial and Industrial land use. Utilities are located within the street right-of-ways and on privately-owned parcels.
Background Review:	Site Records Review, Initial Site Characterization
Overall Hazard:	Low

NATIONAL GRID, NATIONAL GRID CONTRACTORS AND SUBCONTRACTORS DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS THAT MAY BE ENCOUNTERED. STRICT ADHERENCE TO THE HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDANCE IN THIS PLAN WAS PREPARED TO SERVE AS AN EXAMPLE TO POTENTIAL CONTRACTORS AND SUBCONTRACTORS THAT MAY WORK AT THIS SITE AND SHOULD NOT BE USED ON ANY SPECIFIC PROJECT WITHOUT PRIOR RESEARCH AND EVALUATION BY TRAINED HEALTH AND SAFETY SPECIALISTS.

CONTRACTOR CERTIFICATIONS

By their signature, the undersigned hereby certify that this HASP has been reviewed and approved for use at the National Grid (National Grid) Canastota Non-Owned Former Manufactured Gas Plant Site located in Canastota, New York.

11/5/10

PROJECT MANAGER DATE

11/5/10

SITE SAFETY OFFICER DATE

Rollin B. DeHate 11/5/10

CORPORATE HEALTH AND SAFETY OFFICER DATE

Health and Safety Plan
Canastota Non-Owned Former MGP
Remedial Investigation
Canastota, New York

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1.0 INTRODUCTION

1.1 Purpose

This Health and Safety Plan (HASP) addresses the health and safety practices that will be employed by workers participating in investigation activities at the Canastota Non-Owned Former Manufactured Gas Plant (MGP) Site (Site) in Canastota, New York. The investigations are being performed on behalf of National Grid (National Grid) at the Site.

This HASP takes into account the specific potential hazards at the Site, and provides procedures to be followed by the Consultant (GEI Consultants, Inc.) and all site visitors in order to avoid and if necessary, protect against health and/or safety hazards.

Activities performed under this HASP will comply with applicable parts of OSHA Regulations, primarily 29 CFR Parts 1910 and 1926 and attached National Grid policies and procedures. A copy this HASP will be maintained at the Site for the duration of work.

All workers who participate in activities at the Site are required to comply with the provisions specified in this HASP. All site visitors who enter designated work zones must also comply with this HASP. Failure to comply with the HASP may result in immediate removal from the Site following consultation with the GEI Consultants.

1.2 Scope of Work

This HASP addresses all general activities listed below:

Mobilization/Demobilization

- Mobilization/demobilization of equipment and supplies
- Establishment of site security, work zones, and staging areas

Pre-Investigation Activities

- Location of all utilities to and from the Site
- Location and protection of all active utility lines on the Site

Investigation Activities

- Test pit excavation and sample collection
- Subsurface soil boring installation and sample collection
- Monitoring well installation and sample collection
- Investigation-derived waste handling and storage activities

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section includes the project organization and structure, and establishes the specific chain-of-command for responsibilities and communications. The organizational structure shall be reviewed and updated as necessary to reflect the current status of project operations.

2.1 National Grid

National Grid will have final responsibility and authority for all aspects of the project, and is also responsible for approving all changes to this HASP.

A National Grid project-specific organization chart with contact information is included in Appendix A.

2.2 Consultant

GEI provides general health and safety oversight as National Grid's Agent. GEI will also conduct perimeter air monitoring and work zone monitoring for Consultant employees. GEI will monitor daily operations and will serve as the primary point of contact with National Grid and regulatory agencies for health-and-safety related matters. GEI's health-and-safety roles for this project include:

- Project Manager
- Site Safety Officer
- Corporate Health and Safety Officer

Task	**Consultant**
Site Remedial Investigation of The Canastota Non-Owned Former MGP	GEI Consultants, Inc. 1301 Trumansburg Road, Suite N Ithaca, New York 14850 Project Manager: Bruce Coulombe

GEI's project-specific organization chart with contact information is included in Appendix A.

GEI is responsible for all work detailed in the project work plan and/or Statement of Work. GEI's specific health and safety roles include:

Project Manager – responsibilities include the following:

- Ensures implementation of this program

- Conducts periodic inspections
- Participates in incident investigations
- Ensures the HASP has all of the required approvals before any site work is conducted
- Ensures that the Site Safety Officer is informed of project changes which require modifications of the site health and safety plan
- Has overall project responsibility for project Health and Safety

Site Safety Officer (SSO) - responsibilities include the following:

- Ensures that the HASP is implemented and that all health-and-safety activities identified in site safety plans are conducted and/or implemented
- Ensures that field work is conducted safely and enforces site health and safety rules
- Ensures that adequate communication between field crews and emergency response personnel is maintained
- Ensures that field site personnel are medically cleared and adequately trained and qualified to work at the Site and that proper personal protective equipment is utilized by field teams
- Investigate and report all accidents/incidents to the PM and to the Corporate Health and Safety Officer (CHSO)
- Conducts and documents daily safety briefings
- Stops work if necessary
- Identifies operational changes which require modifications to health-and-safety procedures and site safety plans, and ensures that the procedure modifications are implemented and documented through changes to the HASP, with CHSO approval
- Directs and coordinates health-and-safety monitoring activities
- Evaluates air monitoring data relative to site and activity-specific action levels
- Ensures that monitoring instruments are calibrated
- Reports to the PM to provide summaries of field operations and progress
- Conducts routine safety inspections of their work areas
- Consults with the CHSO with incident investigations and together with the CHSO, prepares appropriate reports (i.e., Accident Report form)
- Maintains files in the field on all personal monitoring results, laboratory reports, calculations, and air sampling data sheets
- Ensure that all necessary information including emergency phone numbers, hospital directions, and warning signs are kept posted in an area accessible to all site employees
- Maintain a daily list of workers and visitors present on the Site.

Corporate Health and Safety Officer (CHSO) - responsibilities include the following:

- Provides for the development and approval of the HASP

- Serves as the primary contact to review health and safety matters that may arise
- Approves revised or new safety protocols for field operations
- Coordinates revisions of this HASP with field personnel
- Coordinates upgrading or downgrading of personal protective equipment with the SSO and PM
- Maintains a copy of fit test certification, documents of medical clearance, and exposure reports from site activities
- Conducts in the investigation of all accidents/incidents

Site Personnel - responsibilities include the following:

- Reports any unsafe or potentially hazardous conditions to the SSO
- Maintains knowledge of the information, instructions and emergency response actions contained in the HASP
- Complies with rules, regulations and procedures as set forth in the HASP and any revisions
- Prevents admittance to work sites by unauthorized personnel
- Inspect all tools and equipment, including personal protective equipment (PPE), prior to use.

3.0 SITE HISTORY AND PROJECT DESCRIPTION

3.1 Location

The property is located on E. North Canal Street in Canastota, New York. The property is owned by the Village of Canastota and is approximately 2 acres in size. The site is bounded by E. North Canal Street to the south, private residential property to the east, and the Greater Lenox Ambulance Company to the west. The portion of the DPW property north of the investigation area is used as a training area for the local fire department, and as a storage yard for gravel, soil, mulch, and other materials. The location is presented on Figure 1.

3.2 Site History and Current Site Conditions

The former MGP property was a manufacturer of coal gas, operating from 1907 until approximately 1926. The gas works was apparently demolished by 1946. The Village of Canastota Department of Public Works garage currently occupies the property. The current site conditions are presented on Figure 2.

3.3 Project Description

National Grid has retained GEI to perform a Remedial Investigation (RI) program at the Canastota Non-Owned Former MGP Site in Canastota, New York. This RI is being conducted to evaluate the nature and extent of impacts at the Site.

The RI scope of work is intended to generate sufficient data to evaluate the nature and extent of compounds within soils and groundwater that may be associated with the Canastota Non-Owned Former MGP site.

The RI will evaluate whether potential pathways exist through which people, flora, or fauna could be exposed to site-related contaminants. The scope of work is presented in the Canastota Non-Owned Former MGP Remedial Investigation Work Plan dated October 2010 (GEI, 2010). A summary of the RI activities follows:

- Pre-Investigation Tasks
- Site Utility Survey
- Test Pit Excavation
- Subsurface Soil Boring Installation and Soil Sample Collection
- Monitoring Well Installation and Groundwater Sample Collection
- Survey
- Investigation derived waste (IDW) management

4.0 POTENTIAL SITE HAZARDS

This section presents an assessment of potential chemical, physical, and biological hazards that may be encountered during the project work. This section also includes an activity hazard analysis (AHA) to assess and control potential site hazards for each general project task. A more detailed Contractor Project specific AHA is included in Appendix C, which addresses the health and safety hazards of each specific project task or operation and includes requirements and procedures for worker protection. The following appendices include information on additional programs, which will be used to mitigate potential hazards:

Appendix D – Cold Stress Guidelines
Appendix E – Heat Stress Guidelines
Appendix F – National Grid Control of Hazardous Energy Program “Lock Out/Tag Out”
Appendix G – Incident Reporting
Appendix H – Addendum (Material Safety Data Sheets, previous analytical results)

4.1 Chemical Hazards

Chemical characteristics and potential exposure information for the compounds that may be encountered during site activities are presented in Table 4-1 below. Material Safety Data Sheets (MSDS) for commonly used substances are located in Appendix H. Adherence to the safety and health guidelines in this HASP should reduce the potential for exposure to these compounds

4.1.1 Volatile Organic Compounds (VOCs)

Volatile organic chemicals (VOCs), such as benzene, toluene, ethyl benzene, and xylenes (BTEX) are present within subsurface soils and groundwater at the Site because they are common constituents in coal tar and petroleum products. In some cases, the chemical components are present in non-aqueous phase liquids (NAPLs) such as fuels, oils, or coal tar within subsurface soils. Copies of analytical data generated by GEI during previous investigations are located in Appendix H.

At high concentrations these compounds generally have a depressant effect on the central nervous system (CNS), may cause chronic liver and kidney damage, and some are suspected human carcinogens. Benzene is a known human carcinogen. Acute exposure may include headache, dizziness, nausea, and skin and eye irritation. The primary route of exposure to VOCs is through inhalation and therefore air monitoring and respiratory protection is the primary control against exposure to VOCs. Air monitoring will be completed as specified in Section 8.0 to minimize airborne exposures. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the RI Work Plan and Community Air Monitoring Plan (CAMP) (GEI, 2010). Exposure through direct contact is possible and will be minimized through the use of PPE as prescribed in Section 6.0.

4.1.2 Coal Tar and Oil Products

Coal tar and petroleum products contain semi-volatile organic compounds (SVOCs). SVOCs consist of a mixture of acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(e)pyrene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methyl naphthalene, naphthalene, phenanthrene, phenols, pyrene and other compounds.

Coal tar products, petroleum products, and other SVOCs are potentially present within subsurface soils and groundwater at the site. Petroleum products within subsurface soils could be associated with the former MGP or modern site operations.

Coal tar products such as those listed above may cause contact dermatitis. Direct contact can be irritating to the skin and produce itching, burning, swelling and redness. Direct contact or exposure to the vapors may be irritating to the eyes. Conjunctivitis may result from prolonged exposure. Coal tar may be toxic, if ingested. High levels of exposure to coal tar (not anticipated during field activities), may increase the risk of cancer including lung, kidney, and skin cancer. Naphthalene is also an eye and skin irritant and can cause nausea, headache, fever anemia, liver damage, vomiting convulsions, and coma. Poisoning may occur by ingestion, inhalation, or direct contact with large amounts of coal tar.

The major route of exposure to SVOCs is through direct contact. Exposure is most likely when handling soil and groundwater samples. Exposure through direct contact will be minimized through the use of PPE as prescribed in Section 6.0. Inhalation of SVOCs may occur when impacted soil is disturbed. Air monitoring will be conducted as specified in Section 8.0 to minimize airborne exposures. Community air monitoring of the area immediately surrounding the work zone will be conducted in accordance with the RI Work Plan and the CAMP.

4.1.3 Heavy Metals

The subsurface soil may contain elevated levels of metals including arsenic, lead, mercury, selenium and other metals based upon the historic filling of the area and subsequent land use.

As with SVOCs, the primary route of metal exposure is through inhalation of dust particles when subsurface soils are disturbed and become airborne. Air monitoring will be completed as specified in Section 8.0 to minimize airborne exposures during subsurface soil investigations. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the RI Work Plan and the CAMP.

4.1.4 Polychlorinated Biphenyls

Based on the history of the site, it is not expected that polychlorinated biphenyls (PCBs) will be of potential concern based on previous land uses at the Site. PCBs have historically been used from a number of sources including, but not limited to electrical systems, hydraulic oils, lubricants, cutting oils, printer's ink, and asphalt. Exposure to PCBs can occur through dermal contact without immediate pain or irritation. Acute affects of PCB exposure can include eye, skin, nose, and throat irritation. Chronic effects of PCB exposure can include skin swelling and redness, gastro-intestinal disturbances, and neurological effects such as headache, dizziness, nervousness and numbness of extremities. PCBs are suspected human carcinogens. PCBs can accumulate in fatty tissues and result in health effects after the initial exposure has occurred. The primary route of exposure for PCBs is inhalation, dermal contact, and ingestion.

4.1.5 Cyanide

Cyanide compounds are common by-products of manufactured gas production but are also used in rat poisons, silver and metal polish, photographic solutions, fumigating solutions, and electroplating solutions. Hydrogen cyanide is toxic because it is a chemical asphyxiant. It replaces the oxygen in the blood and thereby suffocates the cells. Ferrocyanides (which are associated with purifier waste from gas manufacture) are not considered toxic because the hydrogen cyanide ion is bound tightly to the iron and cannot therefore replace the oxygen. It takes a great amount of heat and/or acid to release hydrogen cyanide gas from the ferrocyanide molecule, therefore hydrogen cyanide is not a concern at this site.

4.1.7 Evaluation of Organic Vapor Exposure

Air monitoring reduces the risk of overexposure by indicating when action levels have been exceeded and when PPE must be upgraded or changed. Action levels for volatile organic compounds and associated contingency plans for the work zone are discussed within Section 8.0 of this Health and Safety Plan. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the RI Work Plan and the CAMP.

Exposure to organic vapors shall be evaluated and/or controlled by:

- Monitoring air concentrations for organic vapors in the breathing zone with a photoionization detector (PID) or a flame ionizing detector (FID).
- When possible, engineering control measures will be utilized to suppress the volatile organic vapors. Engineering methods can include utilizing a fan to promote air circulation, utilizing volatile suppressant foam, providing artificial ground cover, or covering up the impacted material with a tarp to mitigate volatile odors.
- When volatile suppression engineering controls are not effective and organic vapor meters indicate concentrations above the action levels, then appropriate respiratory protection (i.e. air purifying respirator with organic vapor cartridge) will be employed.

Table 4-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
Arsenic	7440-38-2	0.01 mg/m^3	0.01 mg/m^3 A.L. 0.5mg/m3	Inhalation Skin Absorption Ingestion Skin Contact	Ulceration of nasal septum, dermatitis, GI disturbances, peripheral neuropathy, respiratory irritation, hyper pigmentation of skin, potential carcinogen	Liver, kidneys, skin, lungs, lymphatic system	Metal: Silver-gray or tin-white, brittle, odorless solid FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Benzene	71-43-2	0.5 ppm (Skin)	1 ppm TWA 5 ppm STEL	Inhalation Skin Absorption Ingestion Skin Contact	Irritation of eyes, skin, nose, respiratory system, giddiness, headache, nausea; staggering gait, fatigue, anorexia, weakness, dermatitis, bone marrow depression, potential carcinogen	Eyes, skin, CNS, bone marrow, blood	FP: 12^o F IP: 9.24 eve LEL: 1.2% UEL:7.8% VP: 75 mm
Ethyl benzene	100-41-4	100 ppm	100 ppm	Inhalation Ingestion Skin Contact	Eye, skin, mucous membrane irritation; headache; dermatitis, narcosis; coma	Eyes, skin, respiratory system, CNS	FP: 55^o F IP: 8.76 eV LEL: 0.8% UEL:6.7% VP: 7 mm
Lead	7439-92-1	0.050 mg/m^3	0.05 mg/m^3 A.L. 0.03 mg/m3	Inhalation Ingestion Skin Contact	Weakness, insomnia; facial pallor; pal eye, anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis of wrist and ankles; irritates eyes, hypo tension	Eyes, GI tract, CNS, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid. FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Naphthalene	91-20-3		10 ppm (50 mg/m^3) TWA	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system	FP: 174 F IP: 8.12 eV, LEL: 0.8% UEL:6.7%, VP: 0.08 mm
Mercury	7439-97-6	0.025 mg/m^3	0.10 mg/m3	Inhalation Ingestion	Irritates eyes and skin, chest pain, cough, difficulty breathing,	Eyes, skin, respiratory tract,	Silver-white, heavy odorless liquid

Table 4-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
				Skin Contact Skin Absorption	bronchitis, pneumonitis, tremor, insomnia, irritability, indecision, headache, fatigue, weakness, stomatitis, salivation, Gastrointestinal disturbance, weight loss, proteinuria	central nervous system	FP: NA IP: unknown LEL: NA UEL:NA VP: 0.0012 mm
PAH's as Coal tar pitch Volatiles (CTPV)	65996-93-2	0.2 mg/m3	0.2 mg/m3	Inhalation Skin contact Ingestion	Irritant to eyes, swelling, acne contact dermatitis, chronic bronchitis	Respiratory system, CNS, liver, kidneys, skin, bladder, carc	Black or dark brown amorphous residue.
PCBs	11097-69-1	0.5 mg/m^3 (Skin)	0.5 mg/m^3 (Skin)	Inhalation Skin Absorption Ingestion Skin Contact	Irritate eyes; chloracne; liver damage;	Skin, eyes, liver, reproductive system	Colorless liquid or solid with a mild, hydro-carbon odor VP = 0.00006 mm
Phenol	108-95-2	10 ppm (skin)	5 ppm (19 mg/m^3) [skin]	Inhalation Skin Absorption Ingestion Skin Contact	Irritates eyes, nose, throat, anorexia, weight loss, weakness, muscle ache, pain, dark urine, cyanosis, liver and kidney damage, skin burns, dermatitis, tremors, convulsions, twitching,	Eyes, skin, respiratory system, liver, kidneys	Colorless to light pink crystalline solid with sweet, acrid odor. FP:175 ^{o}F IP:8.5 LEL:1.8% UEL: 8.6% VP: 0.4 mm
Selenium	7782-49-2	0.2 mg/m^3	0.2 mg/m^3	Inhalation Ingestion Skin Contact	Irritant to eyes, skin, nose and throat, visual disturbance, headache, chills, fever, breathing difficulty, bronchitis, metallic taste, garlic breath, GI disturbance, dermatitis, eye and skin burns,	Eyes, skin, respiratory system, liver, kidneys, blood spleen	Amphorous or crystalline, red to gray solid FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Toluene	108-88-3	50 ppm	200 ppm	Inhalation Skin Absorption Ingestion Skin Contact	Eye, nose irritation; fatigue, weakness, confusion, euphoria, dizziness, headache; dilated pupils, tearing of eyes; nervousness, muscle fatigue, insomnia, tingling in limbs; dermatitis	Eyes, skin, respiratory system, CNS, liver, kidneys	FP: 40^{o}F IP: 8.82 eV LEL: 1.1% UEL:7.1% VP: 21 mm

Table 4-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
Xylenes	1330-20-7	100 ppm	100 ppm	Inhalation Skin Absorption Ingestion Skin Contact	Eye, skin, nose, throat irritation; dizziness, excitement, drowsiness; incoordination, staggering gait; corneal damage; appetite loss, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, CNS, GI tract, blood, liver, kidneys	FP: 90^{o} F IP: 8.56 eV LEL: 0.9% UEL: 6.7% VP: 9 mm

Abbreviations

C = ceiling limit, not to be exceeded
CNS = Central Nervous System
CVS = Cardiovascular System
eV = electron volt
FP = Flash point
IP = Ionization Potential
GI = Gastro-intestinal
A.L. = Action Level

LEL = Lower explosive limit
mm = millimeter
ppm = parts per million
Skin = significant route of exposure
STEL = Short-term exposure limit (15 minutes)
TWA = Time-weighted average (8 hours)
UEL = Upper explosive limit
VP = vapor pressure approximately 68° F in mm Hg (mercury)

4.1.8 Evaluation of Respirable Dust Inhalation

Inhalation of respirable dust containing metals, asbestos, and SVOCs is possible when surrounding ground cover is disturbed by heavy equipment, or using power tools on surfaces that contain these materials. Contaminated particulate matter (soil, pavement, insulation, etc.) becomes suspended in air due to a combination of factors including lack of vegetative cover and/or dry or dusty conditions. Air monitoring reduces the risk of overexposure to respirable dust inhalation by indicating when action levels have been exceeded and when PPE must be upgraded or changed. Action levels for respirable dust and associated contingency plans for the work zone and perimeter of the Site are discussed within Section 8.0 of this HASP. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the RI Work Plan and the CAMP.

Control of respirable dust shall be conducted at this Site as follows:

- When possible, wetting down the area, providing artificial ground cover, or covering up the material with a tarp.
- Modifying work practices to minimize ground disturbance or deferring work to times with calmer wind conditions.
- When dust suppression is not possible and respirable dust concentrations are above the action levels, a HEPA Filter must be used to prevent inhalation of contaminated dusts.

4.1.9 Evaluation of Skin Contact and Absorption

Skin contact with contaminants may be controlled by use of proper hygiene practices, PPE, and good housekeeping procedures. The proper PPE (e.g., Tyvek®, gloves, safety glasses) as described in Section 6.0 will be worn for all activities where contact with potential contaminated media or materials is expected.

4.1.10 Other Chemical Hazards

If chemicals not identified in this HASP need to be used during the RI activities, each, Subcontractor shall provide MSDS's to the SSO for each of the chemicals to be used, prior to their use. The MSDS's will be maintained at the Site by the SSO and all site workers and visitors who may potentially be exposed to the chemicals will be made aware of these hazards and the location of the on-site MSDS's during a hazard briefing session by the SSO. MSDS of commonly used compounds are located in Appendix H.

4.2 Physical Hazards

4.2.1 High Loss Potential Physical Hazards

Activities to be conducted at the Site may involve operations that have the potential for a serious injury to occur, and can include the following:

- Lockout/Tag out
- Heavy Equipment Operation
- Excavation and Trenching

Subsurface utilities will be marked out and boring locations hand cleared before mechanized intrusive work begins.

4.2.1.1 Lockout-Tag out

Site personnel will assume that all nearby electrical equipment at surface, subsurface, and overhead locations is energized, until the equipment has been designated as de-energized by a National Grid representative. If the equipment cannot de-energized, then work will stop and the SSO will consult with the PM and CHSO. GEI will notify National Grid prior to working adjacent to this equipment, and will verify that the equipment is energized or de-energized in the vicinity of the excavation location. The Control of Hazardous Energy Program “Lock Out/Tag Out” is included in Appendix F.

All power lines, which have been indicated by National Grid to be de-energized, must be locked out, such that the lines cannot be energized when personnel are working near them. The lines shall not be unlocked and re-energized until GEI notifies National Grid that they have completed work in the area and that all personnel are clear of the area. National Grid representatives will thoroughly familiarize GEI personnel with site-specific lockout/tagout procedures during the site orientation. The lockout procedures must be equivalent in effectiveness to those found in Appendix F.

If power lines cannot be de-energized, the SSO will consult with the local utility provider safety personnel to determine the safe working distance from the energized line. Work tasks will only commence after determination that a safe working distance can be maintained and all personnel working in the area have been informed of the limitation.

Mechanized drilling equipment will maintain a minimum safe distance of 15 feet from energized overhead electric lines. If this safe distance is maintained, no Lockout-Tag Out of energized lines will be required.

4.2.1.2 Heavy Equipment Operation

Heavy equipment will be operated under the following conditions:

- The operation of heavy equipment will be limited to authorized personnel specifically trained in its operation. Subcontractor site supervisors must provide this information to the SSO.
- Equipment shall be inspected daily to ensure that there are no exposed belts, fans, pulleys, or other rotating parts..
- When not in use, hydraulic and pneumatic components shall be left in down or "dead" position.
- Roll-over protection shall be provided on hilly terrain.
- Maintain all emergency shut-offs in sound working condition.
- The operator will use the safety devices provided with the equipment, including seat belts. Backup warning indicators and horns will be operable at all times.
- While in operation, all personnel not directly required in the area will keep a safe distance from the equipment.
- Personnel directly involved in activity will avoid moving in the path of operating equipment or any portion thereof. Areas blinded from the operator's vision will be avoided. Spotters will be used when personnel may be in areas where the operator's view is obstructed.
- Additional riders will not be allowed on equipment unless it is specifically designed for that purpose.

4.2.1.3 Excavation and Trenching

Test pit excavation or trenching is planned for this portion of RI investigation. The safety measures outlined below will be implemented.

The safety requirements for each excavation must be determined by the sub-contractor's competent person who is capable of identifying existing and predictable hazards and work conditions that are unsanitary, hazardous, or dangerous to employees. The competent person must also have the authorization to take prompt corrective measures to eliminate unsatisfactory conditions.

Subsurface utilities will likely be located in the vicinity of the RI sampling points.

The following are general requirements for work activities in and around excavations:

- Prior to initiation of any excavation activity (or ground intrusive activity, such as drilling), the location of underground installations will be determined. The New York State one-call center will be contacted by the GEI/Subcontractor a minimum of 72 hours prior to excavation activities, but no sooner than 10 days prior to excavation activities. It may also be necessary to temporarily support underground utilities during excavation. When excavations approach the estimated location of underground installations, the exact location of the underground installations shall be determined by means that are safe to workers, i.e., hand dig, test pits, etc.

- All excavations will be inspected daily by the sub-contractor’s competent person prior to commencement of work activities. Evidence of cave-ins, slides, sloughing, or surface cracks or excavations will be cause for work to cease until necessary precautions are taken to safeguard employees.
- Excavated and other materials or equipment that could fall or roll into the excavation shall be placed at least 5 feet from the edge of the excavation.
- Vehicular traffic and heavy equipment shall remain at least four feet from the face of the excavation.
- All excavation operations will cease immediately during hazardous weather conditions such as high winds, heavy rain, lightning and heavy snow.

4.2.1.4 Excavation Entry Safety

Personnel entering a trench or excavation that is greater than 4-feet deep shall implement the following procedures:

- The sides of all excavations in which personnel will be exposed to the danger of moving ground or potential cave-in will be adequately sloped, shored or contained within a trench box, or similar support structure designed and sealed by a professional engineer.
- The air in the excavation will be tested for oxygen deficiency, explosivity, organic vapors, carbon monoxide and hydrogen sulfide. The bottom, middle, top and corners of the excavation will be tested prior to entry and continuously during excavation entry.
- Ramps or ladders will be used to provide access and sufficient egress to the excavation. Ladders must be supplied for every 25 feet of lateral travel. Ladders must be securely anchored at the top or bottom and must extend at least 3 feet above the ground surface. A competent person is required to design ramps (those used exclusively for employee access/egress). Such ramps are constructed of wood, steel or earth. Structural ramps, used for vehicle/equipment access (steel or wood) must be designed by a competent person qualified in structural design. Vehicle ramps built of earth are not considered “structural ramps.”
- Employees shall not work in excavations where there is an accumulation of water or in excavations where water is accumulating unless adequate precautions have been taken to protect employees against the hazard s posed by water accumulation.
- Emergency rescue equipment such as breathing apparatus, a safety harness and line, or a basket stretcher shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation.

4.2.2 Fire and Explosion

Subsurface utilities including gas lines and electrical lines may be located in the vicinity of the subsurface soil borings.

When conducting excavating activities, the possibility of encountering fire and explosion hazards also exists from contamination in the soils and the possibility of free product in the underground structures and pipelines. Additionally, the use of diesel–powered excavating equipment could present the possibility of creating fire and explosion hazards. Prevention and management of fire and explosion potential is addressed in the GEI Project Specific AHA included in Appendix C of this HASP. All GEI and Subcontractor activities shall conform with all applicable state, federal, and local regulations pertaining to fire and explosion prevention procedures.

4.2.3 Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia as well as slippery surfaces, brittle equipment, and impaired judgment. The procedures to be followed are found in Appendix D, the Cold Stress Guidelines.

4.2.4 Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. A heat stress prevention program will be implemented when ambient temperatures exceed 70ºF for personnel wearing chemical protective clothing. The procedures to be followed are found in Appendix E, the Heat Stress Guidelines.

4.2.5 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Site workers who will perform high noise tasks and operations for short durations (less than 1 hour) shall wear earplugs. If deemed necessary by the SSO, the CHSO will be consulted on the need for additional hearing protection and the need to monitor sound levels for site activities. Workers who are not involved in the noisy activity should distance themselves from the equipment generating the noise.

4.2.6 Hand and Power Tools

In order to complete the various tasks for the project, personnel may use hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Work gloves, safety glasses, and hard hats will be worn by the operating personnel at all times when utilizing hand and power tools and Ground Fault Circuit Interrupter GFCI-equipped circuits will be used for all power tools.

4.2.7 Slips, Trips, and Falls

Working in and around the Site will pose slip, trip, and fall hazards due to uneven or slippery surfaces. GEI and it's sub-contractors will employ good work practice and housekeeping procedures to minimize the potential for slip, trip, and fall hazards.

4.2.8 Manual Lifting

Manual lifting of heavy objects such as sections of pipe may be required. Failure to follow proper lifting technique can result in back injuries and strains. Site workers should use power equipment to lift heavy loads whenever possible and should evaluate loads before trying to lift them (i.e., they should be able to easily tip the load and then return it to its original position). Carrying heavy loads with a buddy and proper lifting techniques include: 1) make sure footing is solid, 2) make back straight with no curving or slouching, 3) center body over feet, 4) grasp the object firmly and as close to your body as possible, 5) lift with legs, and 6) turn with your feet, don't twist.

4.2.9 Steam, Heat, Splashing

Exposure to steam/heat/splashing hazards can occur during steam cleaning activities. Exposure to steam/heat/splashing can result in scalding/burns, eye injury, and puncture wounds. Proper PPE will be worn during all steam cleaning activities including rain gear or Tyvek®, hardhat equipped with splashguard, and water resistant gloves and boots.

4.3 Biological Hazards

During the course of the project, there is a potential for workers to come into contact with biological hazards such as animals, insects, plants, and sewage. Workers should be aware of these potential hazards that are discussed below.

4.3.1 Animals

During the conduct of site operations, wild animals such as stray dogs or cats, raccoons, and rats may be encountered. Workers shall use discretion and avoid all contact with wild animals. If these animals present a problem, efforts will be made to remove these animals from the Site by contacting a licensed animal control technician.

4.3.2 Insects

Insects, including bees, wasps, hornets, mosquitoes, ticks, and spiders, may be present at the Site making the chance of a bite possible. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition. Some insect bites can transmit diseases such as Lyme Disease or a virus such as West Nile; any individuals who have been bitten or stung by an insect should notify the SSO. The following is a list of preventive measures:

- Apply insect repellent prior to performing any field work and as often as needed throughout the work shift
- Wear proper protective clothing (work boots, socks and light colored pants)
- When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible
- Field personnel who may have insect allergies shall have bee sting allergy medication on site and should provide this information to the SSO prior to commencing work.

4.3.2.1 Lyme Disease

Lyme disease is caused by infection from a deer tick that carries a spirochete. During the painless tick bite, the spirochete may be transmitted into the bloodstream often after feeding on the host for 12 to 24 hours. The ticks that cause the disease are often no bigger than a poppy seed or a comma in newsprint. The peak months for human infection are from May to September.

Symptoms appear in three stages. First symptoms usually appear from 2 days to a few weeks after a person is bitten by an infected tick. Symptoms usually consist of a ring-like red rash on the skin where the tick was attached. The rash is often bulls-eye like with red on the outside and clear in the center. The rash may be warm, itchy, tender, and/or "doughy." Unfortunately, this rash appears in only 60 to 80% of infected persons. An infected person also has flu-like symptoms of a stiff neck, chills, fever, sore throat, headache, fatigue and joint pain. These symptoms often disappear after a few weeks. The second stage symptoms, which occur weeks to months later include meningitis, severe headache, drooping of the muscles on the face, called Bell's Pals, encephalitis, numbness, withdrawal and lethargy. These symptoms may last for several weeks to several months. Third stage symptoms, which occur months or years later include arthritis, heart problems, and loss of memory. The third stage symptoms may mimic multiple sclerosis and Alzheimer's disease.

It is recommended that personnel check themselves when in areas that could harbor deer ticks, wear light color clothing and visually check themselves and their buddy when coming from wooded or vegetated areas. If a tick is found biting an individual, the SSO should be contacted immediately. The tick can be removed by pulling gently at the head with tweezers. If tweezers are not available, cover your fingers (e.g., tissue paper) and use to grasp the tick. It is important to grasp the tick as close to the site of attachment and use a firm steady pull to remove it. Wash hands immediately after with soap and water. The affected area should then be disinfected with an antiseptic wipe. All mouth parts must be removed from the skin. If the tick is removed with breaking off the mouth parts, an irritation or infection may occur. Also, the organism that is causing the disease can still enter the body through the skin. The employee will be offered the option for medical treatment by a physician, which typically involves antibiotics. If personnel feel sick or have signs similar to those above, they should notify the SSO immediately.

Treatment with antibiotics is effective and recovery is usually complete. In the first stage antibiotics are usually given orally. Second and third stage treatment, however is prolonged and recovery may take longer. Antibiotic treatment is usually provided intravenously for second and third stage Lyme disease.

4.3.2.2 West Nile Virus

West Nile Virus (WNV) is a mosquito-borne infection transmitted through the bite of an infected mosquito. The symptoms of WNV can be asymptomatic (no symptoms) or in more serious cases can lead to West Nile fever. West Nile Fever can include fever, headache, tiredness, body ache, an occasional rash on the trunk of the body, and swollen lymph glands. In severe cases, people have developed West Nile encephalitis or meningitis which symptoms include fever, headache, neck stiffness, tremors, coma and in some cases death. The incubation period for the disease is usually 2 to 15 days. The symptoms can range from a few days to several weeks.

Since the initial outbreak in 1999, the virus has spread rapidly throughout New York State. There are about 65 different species of mosquitoes in New York State, but only a small percentage has been associated with the WNV. Most mosquitoes are not infected and the chance of infection from a mosquito bite of an on-site worker is very small. All residents of areas where virus activity has been identified are at risk of getting WNV, but those of the highest risk for becoming seriously ill from WNV are people are over 50 and individuals with some immunocompromised person (transplant patients).

The following precautions will be used to help reduce the risk of mosquito bites:

- Reduce mosquito-breeding areas by making sure wheelbarrows, buckets, and other containers are turned upside down when not used so that they do not collect standing water.
- Wear shoes, long pants with bottoms tucked into boots or socks, and a long-sleeved shirt when outdoors for long periods of time, or when many mosquitoes are most active (between dawn and dusk).
- Use mosquito repellant according to the manufacturer’s directions when outdoors for long periods of time and when mosquitoes are most active.

4.3.3 Plants

The potential for contact with poisonous plants exists when performing fieldwork in undeveloped and wooded areas. Poison ivy, sumac, and oak may be present on site. Poison ivy can be found as vines on tree trunks or as upright bushes. Poison ivy consists of three leaflets with notched edges. Two leaflets form a pair on opposite sides of the stalk, and the third leaflet stands by itself at the tip. Poison ivy is red in the early spring and turns shiny green later in the spring. Poison sumac can be present in the form of a flat-topped shrub or tree. It has fern-like leaves, which are velvet "down." Poison sumac has white, "hairy" berry clusters. Poison oak can be present as a sparingly branched shrub. Poison oak is similar to poison ivy in that it has the same leaflet configuration; however, the leaves have slightly deeper notches. Prophylactic application of Tecnu® may prevent the occurrence of exposure symptoms. Post exposure over the counter products are available and should be identified at the local pharmacist. Susceptible individuals should identify themselves to the SSO.

Contact with poison ivy, sumac, or oak may lead to a skin rash, characterized by reddened, itchy, blistering skin which needs first aid treatment. If you believe you have contacted one of these plants, immediately wash skin thoroughly with soap and water, taking care not to touch your face or other body parts.

4.3.4 Blood Poisoning

Blood poisoning is a term used to indicate a large number of bacteria present in the circulating blood. The most common symptom of blood poisoning is the reddening of skin which advances toward the heart. For example, if the point of contact is the hand, then a red line will appear at the hand and extend up the arm towards the heart.

Signs and symptoms include swelling, stiffness and tenderness in the affect area, fatigue chills and fever, pustules, and/or abscesses. If allowed to progress without treatment, the bacteria may multiply and cause an overwhelming infection which can lead to death.

Personal protective equipment shall be worn to prevent direct contact with equipment that may be contaminated with bacteria such as well caps and soil.

4.4 Hazard Analysis

This section includes an AHA to assess and control potential site hazards for each general project task. A more detailed GEI Project-specific AHA is included in Appendix C, which addresses the health and safety hazards of each specific project task or operation and includes requirements and procedures for worker protection.

Area crime reports are available for select municipalities. These reports are available to field staff so that they are aware of potential crime hazards in the area of the project site. Web-based reports used include the following:

www.crimereports.com
www.cityrating.com/crimestatistics.asp

According to the above web reports, the Canastota area is considered fairly safe. Although detailed crime reports were unavailable, the following information was retrieved from these sites:

- There are four registered sex offenders living within approximately one mile of the project site.
- The highest number of crime incidents in the greater Oneida area include burglary and larceny/theft. Burglary involves breaking into a structure with the intent of committing a crime. Larceny is similar to burglary but the perpetrator did not illegally enter a structure. Theft involves taking something from someone else with the intent of not returning the item.

Control measures to be implemented for these hazards include:

- Limiting contact with individuals not directly involved with the site or project.
- Storing field equipment within a secure location such as a locked building or vehicle that is kept within the site area or under surveillance from field personnel.
- Maintain awareness of your surroundings and what is going on.

The following AHAs have been prepared for the site investigation activities at the former Canastota MGP:

WORK TASK	POTENTIAL HAZARDS	CONTROLS
Activity: Pre-Investigation and Utility Clearance		
Site Mobilization/Activity	Biological Hazards.	Proper clothes, body inspections, insect repellant.
	Slip, Trip, Fall Hazards	Identify and repair potential tripping hazards. Maintain safe and orderly work areas.
	Traffic Hazards	Use traffic cones, signage, and traffic safety vests in accordance with Canastota Traffic Regulations. Communication and planning with the DPW foreman. Use a traffic spotter.
	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Noise	Distancing from noise; use of hearing protection
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
Activity: Test Pit Advancement and Sample Collection		
Test Pit Advancement and Sample Collection	Heavy Equipment / Proximity to Heavy Equipment	Distancing, safe work practices, inspections, wear hearing protection. Maintain eye contact with equipment operator.
	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
	Slip/Trip/Fall	Maintain safe and orderly work areas. Unloading areas should be on even terrain. Identify and repair potential tripping hazards.
	Noise	Distancing form noise, hearing protection
	Traffic Hazards	Use traffic cones, signage, and traffic safety vests. Use a traffic spotter.
	Tool Use	Use proper guarding, inspections, wear safety glasses with side shields, hearing protection.
	Excavation	Maintain proper distance from edge of excavation; be alert for unstable soil conditions/wall collapse.
	Contaminant Contact	Wear protective coveralls (e.g., Tyvek®) (if needed) with shoe covers, nitrile gloves, and safety glasses when handling samples. Dispose of gloves after sampling. Personal protective equipment will be decontaminated and disposed of in general accordance with Section 13 of this HASP.

WORK TASK	POTENTIAL HAZARDS	CONTROLS
	Exposure to vapors from contaminated soils	Use work zone air monitoring equipment including photoionization detector and multiple gas meter (that monitors % oxygen, lower explosive limit, hydrogen sulfide and hydrogen cyanide), and dust monitor to monitor the workzone as specified in Section 9 of the HASP. If air monitoring action levels are exceeded, then engineering controls will be implemented. If excursions of the action levels persist, then upgrade to half or full face respirator with HEPA/organic vapor cartridge as indicated in Section 14 of the HASP. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the RI Work Plan and the CAMP.
Activity: Subsurface Borings, Monitoring Well Installation, and Soil Sample Collection		
Subsurface Borings, Monitoring Well Installation, and Soil Sample Collection	Heavy Equipment / Proximity to Heavy Equipment	Distancing, safe work practices, inspections, wear hearing protection. Maintain eye contact with equipment operator.
	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
	Slip/Trip/Fall	Maintain safe and orderly work areas. Unloading areas should be on even terrain. Identify and repair potential tripping hazards.
	Noise	Distancing form noise, hearing protection
	Traffic Hazards	Use traffic cones, signage, and traffic safety vests in accordance with Canastota Traffic Regulations. Use a traffic spotter.
	Tool Use	Use proper guarding, inspections, wear safety glasses with side shields, hearing protection.
	Contaminant Contact	Wear protective coveralls (e.g., Tyvek®) (if needed) with shoe covers, nitrile gloves, and safety glasses when handling samples. Dispose of gloves after sampling. Personal protective equipment will be decontaminated and disposed of in general accordance with Section 10 of this HASP.
	Exposure to vapors from contaminated soils	Use work zone air monitoring equipment including photoionization detector and dust monitor to monitor the workzone as specified in Section 8.0 of the HASP. If air monitoring action levels are exceeded, then engineering controls will be implemented. If excursions of the action levels persist, then upgrade to full face respirator with HEPA/organic vapor cartridge as indicated in Section 6.0 of the HASP. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the RI Work Plan and the CAMP.

WORK TASK	POTENTIAL HAZARDS	CONTROLS
Activity: Groundwater Sampling		
Groundwater Sampling	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
	Slip/Trip/Fall	Maintain safe and orderly work areas. Unloading areas should be on even terrain. Identify and repair potential tripping hazards.
	Contaminant Contact	Wear nitrile gloves when sampling points. Dispose of gloves after installation. Personal protective equipment will be decontaminated and disposed of in general accordance with Section 10 of this HASP.
	Exposure to vapors from contaminated groundwater	Use work zone air monitoring equipment including photo-ionization detector. If air monitoring action levels are exceeded, then engineering controls will be implemented.
	Traffic Hazards	Use traffic cones, signage, and traffic safety vests as needed. Coordinate activities with DPW foreman.
Activity: Survey		
Survey	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
	Slip/Trip/Fall	Maintain safe and orderly work areas. Unloading areas should be on even terrain. Identify and repair potential tripping hazards.
	Traffic Hazards	Use traffic cones, signage, and traffic safety vests as needed. Coordinate activities with DPW foreman.

5.0 TRAINING

5.1 General Health and Safety Training

In accordance with 29 CFR 1910.120, hazardous waste site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations unless otherwise noted in the above reference. At a minimum, the training shall have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training shall not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical). Proof of training shall be submitted to the SSO prior to the start of field activities.

5.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualifications for fieldwork. The training will cover a review of 29 CFR 1910.120 requirements and related company programs and procedures. Proof of current 8-hour refresher training shall be submitted to the SSO prior to the start of field activities.

5.3 Site Safety Officer (SSO)

The SSO shall have completed the following training and work experience prior to the commencement of site activities:

- One year of construction experience
- 40-Hour Hazardous Materials training course
- Training specific to work activities (i.e., excavation and trenching activities, lock out/tag out, etc.)

5.4 Site-Specific Training

Prior to commencement of field activities, the SSO will ensure all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include site and facility layout, hazards and emergency services at the Site and will highlight all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. Personnel that have not received site-specific training will not be allowed on site.

5.5 On-Site Safety Briefings

Project personnel and visitors will be given health and safety briefings daily by the SSO to assist site personnel in safely conducting work activities. The briefings will include information on new operations to be conducted, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity to periodically update the crews on monitoring results. Documentation of these briefings will be recorded in the GEI field book or on a separate form.

5.6 First Aid and CPR

The SSO will identify individuals certified in first aid and CPR, or identify individuals for such training in order to ensure that emergency medical treatment is available during field activities. The training will be consistent with the requirements of the American Red Cross Association and will include training on blood borne pathogens.

5.7 Hazard Communication

Hazard communication training will be provided in accordance with the requirements contained in GEI’s Hazard Communication Program.

6.0 PERSONAL PROTECTIVE EQUIPMENT

The PPE specified in Table 6-1 represents PPE selection required by 29 CFR 1910.132, and is based on the AHA of Section 4.

The PPE program addresses elements, such as PPE selection based on site hazards, use and limitations, donning and doffing procedures, maintenance and storage, decontamination and disposal, training and proper fitting, inspection procedures prior to/during/and after use, evaluation of the effectiveness of the PPE program, and limitations during temperature extremes, heat stress, and other appropriate medical considerations.

A summary of PPE for each level of protection is as follows:

Safety Equipment	Level A	Level B	Level C	Level D
Tyvek® suit or work overalls				•
Hard hats with splash shields and/or safety glasses			•	•
Steel-toe boots with over boots			•	•
Chemical-resistant gloves as appropriate for work being performed and materials handled			•	•
Disposable Respirator/ Half- or full-face respirators as approved by the CHSO/SSO			•	
Tyvek® splash-resistant suit or chemical resistant clothing appropriate for the work being performed or materials handled			•	
Chemical-resistant clothing		•		
Pressure-demand, full-face SCBA or pressure-demand supplied air respirator with escape SCBA	•	•		
Inner and outer chemical-resistant gloves	•	•		
Chemical-resistant safety boots or shoes	•	•		
Two-way radio	•	•		
Fully encapsulating chemical-resistant suit	•			

Table 6-1 describes the anticipated task-specific PPE. For activities not covered by Table 6-1, the SSO/CHSO will revise the hazard assessment and select the PPE.

6.1 PPE Abbreviations and Selection

HEAD PROTECTION HH = Hard Hat HEARING PROTECTION EP = ear plugs or ear muffs	EYE/FACE PROTECTION PFS =Plastic Face shield SG = ANSI approved safety glasses with side shields	RESPIRATORY PROTECTION Level D = No respiratory protection required Level C = Half face or full face air purifying respirator with approved cartridges (HEPA filter/organic vapor cartridge) Level B = Full face air supplied respirator with escape bottle
HAND PROTECTION LWG = Leather Work Gloves Nit = Nitrile Gloves	BODY PROTECTION Poly = Polyethylene coated Tyvek® coveralls or apron WC = Work clothes	FOOT PROTECTION OB = Over boot STB = Leather work boots with steel toe

Table 6.1-PERSONAL PROTECTIVE EQUIPMENT SELECTION

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
Mobilization/Demobilization							
Mobilization/ demobilization of equipment and supplies	HH as needed	SG as needed	STB	LWG as needed	WC	EP as needed	Level D
Establishment of site security, work zones and staging area	HH as needed	SG as needed	STB	LWG as needed	WC	EP as needed	Level D
Locate all utilities to and from the site	HH as needed	SG as needed	STB	LWG as needed	WC	EP as needed	Level D
Locate all active utility lines on site	HH as needed	SG as needed	STB	LWG as needed	WC	EP as needed	Level D
Remedial Investigation Activities							
Test Pits, Subsurface Soil Boring and Monitoring Well Installation and Sampling	HH	SG	STB, OB as needed	Nit	WC, Poly as needed	EP	Level D initially, Level C-If action levels exceeded (see Section 8.0 of HASP)
Survey	HH as needed	SG as needed	STB	LWG as needed	WC	EP as needed	Level D
Monitoring Well Development	HH as needed	SG as needed	STB	Nit	WC	EP as needed	Level D
Groundwater Sampling	HH as needed	SG	STB, OB as needed	Nit	WC, Poly as needed	EP as needed	Level D
Waste Handling	HH	SG	STB, OB as needed	LWG and Nit as needed	WC, Poly as needed	EP as needed	Level D initially, Level C-If action levels exceeded (see Section 8.0 of HASP)

7.0 MEDICAL SURVEILLANCE

All personnel performing field work where potential exposure to contaminants exists at the Site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f) and, where applicable, expanded health standards.

7.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the SSO before a worker can enter the exclusion zone. The examination will be taken annually at a minimum and upon termination of hazardous waste site work if the last examination was not taken within the previous six months. Additional medical testing may be required by the CHSO in consultation with the SSO if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other site conditions warrant further medical surveillance.

8.0 AIR MONITORING

Air monitoring shall be performed to identify and quantify airborne levels of hazardous substances and safety and health hazards in order to determine the appropriate level of worker protection needed on site.

GEI will conduct perimeter and work zone air monitoring, and work zone monitoring for employees and will monitor and document daily site conditions and operations on National Grid's behalf.

GEI will provide the following equipment for health and safety monitoring of its personnel:

- Photoionization Detector (PID), or Flame Ionization Detector (FID),
- Particulate Meter (PM-10 capable)

GEI will adopt the air monitoring action levels and contingency plan presented within the Table 8-1 below. The perimeter air monitoring will be conducted during test pit excavations and subsurface soil boring installations to conform to the community air monitoring plan (CAMP) guidelines presented by the New York State Department of Health in Appendix 1A of the New York State Department of Conservation DER-10 Technical Guidance for Site Investigation and Remediation. The CAMP is located as a separate deliverable, as part of the RI Work Plan.

Total volatile organic compounds (VOCs), respirable particulate matter, and odor will be monitored during all intrusive subsurface soil activities in accordance with the CAMP.

Table 8-1 provides a summary of real time air monitoring action levels and contingency plans for work zone activities.

Table 8.1-REAL TIME AIR MONITORING ACTION LEVELS – WORK ZONE ACTIVITIES

Air Monitoring Instrument	Monitoring Location	Action Level	Site Action
PID/FID	Breathing Zone	0.5 ppm	Use detector tube for benzene or Znose™ to verify if concentration is benzene.
PID/FID	Breathing Zone	0.5 - 10 ppm	No respiratory protection is required if benzene is not detected.
		10 - 250 ppm	Stop work, withdrawal from work area, institute engineering controls, if levels persist Upgrade to Level C
		> 250 ppm	Stop work, withdraw from work area; notify SSO & CHSO
Particulate Meter	Excavation/ Work Zone	150 ug/m^3	Implement work practices to reduce/minimize airborne dust generation, e.g., spray/misting of soil with water

9.0 SITE CONTROL MEASURES

9.1 Site Zones

Site zones are intended to control the potential spread of contamination and to assure that only authorized individuals are permitted into potentially hazardous areas. A three-zone approach will be utilized. It shall include an Exclusion Zone (EZ), Contamination Reduction Zone (CRZ), and a Support Zone (SZ). Specific zones shall be established on the work site when operations begin for each task requiring such delineation (i.e. drilling, construction, excavation, trenching in impacted areas of the Site). Carry cellular telephones for communication in a designated area away from subsurface investigation and sampling activities. Cellular phone use will not be permitted in the Exclusion Zone while work is being conducted in Level C PPE.

This project is being conducted under the requirements of 29 CFR 1910.120, and any personnel working in an area where the potential for exposure to site contaminants exists, will only be allowed access after proper training and medical documentation as required by National Grid. These records are maintained by the CHSO, and copies are provided to the SSO prior to mobilization for project activities.

The following shall be used for guidance in revising these preliminary zone designations, if necessary.

Support Zone - The SZ is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for medical emergency. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples. The SZ should be established up-wind of the work area if possible.

Contamination Reduction Zone - The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides an area for decontamination of personnel and portable hand-held equipment, tools and heavy equipment. A personnel decontamination area will be prepared at each exclusion zone. The CRZ will be used for Exclusion Zone entry and egress in addition to access for heavy equipment and emergency support services.

Exclusion Zone - All activities which may involve exposure to site contaminants, hazardous materials and/or conditions should be considered an exclusion zone. This zone will be clearly delineated by cones, tapes or other means. The SSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the site SSO allowing adequate space for the activity to be completed, field members and emergency equipment.

9.2 Communications

The following communications equipment shall be specified as appropriate:

- Telephones - A cellular telephone will be located in the SZ for communication with emergency support services/facilities and the field office. Personnel in the EZ can carry cellular telephones for communication in a designated area away from subsurface investigation and sampling activities.
- Hand Signals - Hand signals shall be used by field teams along with the buddy system. They shall be known by the entire field team before operations commence and their use covered during site-specific training. Typical hand signals are the following:

Signal	Meaning
Thumbs up	Okay, I’m all right, I understand.
Thumbs down	No, negative.

10.0 DECONTAMINATION

PPE helps prevent the wearer from becoming contaminated or inhaling contaminants, and good work practices help reduce contamination on protective clothing, instruments, and equipment. Even with these safeguards, contamination may occur. Harmful materials can be transferred to clean areas, exposing unprotected personnel. To prevent such occurrences, the following contamination reduction and decontamination procedures have been developed.

10.1 Minimization of Contact with Contaminants

During completion of all site activities, personnel should attempt to minimize the degree of contact with contaminated materials. This involves a conscientious effort to keep "clean" during site activities. All personnel should minimize kneeling, splash generation, and other physical contact with contamination. This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

10.2 Personnel Decontamination

Personnel hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure. Consideration will be given to prevailing wind directions so that the decontamination line, the support zone, and contamination reduction zone exit is upwind from the exclusion zone and the first station of the decontamination line. Decontamination will be performed by removing all PPE used in the EZ and placing in drums/trash cans at the CRZ. Disinfecting hand wipes shall be available for wiping hands and face. For Level D decontamination, personnel should wash and rinse gloves, and wash and rinse hands and face with potable water.

10.3 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination; wrap injured personnel with clean garments/blankets to avoid contaminating other personnel or transporting equipment. If the injured person can be moved, he/she will be moved to the exclusion zone boundary and decontaminated by site personnel as described above before emergency responders handle the victim. If the person cannot be moved because of the extent of the injury (a back or neck injury) provisions shall be made to ensure that emergency response personnel will be able to respond to victim without being exposed to potentially hazardous atmospheric conditions. The only time an injured person should be removed is if the worker’s life is threatened to a greater degree than if he/she is left in the spot where the accident occurred. If emergency response personnel have to enter hazardous conditions to respond to victim this should be communicated when the emergency call is made and responders can come prepared in appropriate PPE. If the potential for inhalation hazards exist, such as with an open excavation, this area will be covered with plastic sheeting, or similar controls, to eliminate any potential inhalation hazards. All emergency personnel are to be immediately informed of the injured person's condition, potential contaminants, and provided with all pertinent chemical data.

10.4 Hand Held Equipment Decontamination

Hand held equipment includes all monitoring instruments, samples, hand tools, and notebooks. The hand held equipment is dropped at the first decontamination station to be decontaminated by one of the decontamination team members. These items must be decontaminated or discarded as waste prior to removal from the exclusion zone.

To aid in decontamination, monitoring instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants. The instruments will be wiped clean using a cleaning solution and paper towels if contamination is visually evident.

Decontamination procedures for sampling equipment, hand tools, etc., shall include the use of steam cleaning or a detergent wash, as appropriate for the site conditions. The standard decontamination procedures will be used as presented in the Canastota Non-Owned Former MGP Remedial Investigation Work Plan. All liquids generated in the decontamination will be stored at the Site in drums or a poly tank and then disposed of at an approved facility in accordance with federal, state and local regulations. Personnel performing this task will wear the proper PPE as prescribed in Table 6-1.

10.5 Heavy Equipment Decontamination

Decontamination of chemically contaminated heavy equipment will be accomplished using high-pressure steam or hot-water power wash or dry decontaminated with brushes and shovels. Decontamination shall take place on a decontamination pad and all liquids used in the decontamination procedure will be collected. Vehicles or equipment brought into an exclusion zone will be treated as contaminated, and will be decontaminated prior to removal. All solids and liquids collected in the decontamination procedure will be stored in the Site drums (or other approved containers) and then disposed of at an approved facility in accordance with federal, state and local regulations. Personnel performing this task will wear the proper PPE as prescribed in Table 6-1.

11.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff are essential. Specific elements of emergency support procedures which are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on-site, record keeping, and emergency site evacuation procedures.

11.1 Pre-emergency Planning

Before the field activities begin, the local emergency response personnel may be notified by National Grid of the schedule for field activities and about the materials that are thought to exist on the Site so that they will be able to respond quickly and effectively in the event of a fire, explosion, or other emergency.

In order to be able to deal with any emergency that might occur during remedial activities at the Site, emergency telephone numbers will be readily available in the SSO vehicle or field office. These telephone numbers are presented in Appendix A. A hospital route map will also be readily available at the Site, and is in Appendix B as Figure 2.

11.2 Roles and Responsibilities

11.2.1 Corporate Health and Safety Officer (CHSO)

The CHSO oversees and approves the Emergency Response Plan and may perform audits to determine that the plan is in effect and that all pre-emergency requirements are met. The CHSO acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

11.2.2 Site Safety Officer (SSO)

The SSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The SSO is required to immediately notify the Consultant and National Grid Project Managers, and the CHSO of any fatalities or injuries requiring more than basic first aid treatment. The CHSO will notify OSHA within the required time frame if a reportable incident has occurred. The CHSO will be notified of all OSHA recordable injuries, fires, spills, releases or equipment damage in excess of $500 within 24 hours.

The SSO also serves as the Emergency Coordinator. In the event of an emergency, the Emergency Coordinator, with National Grid representatives, shall make contact with Local Emergency Response personnel. In these contacts, the Emergency Coordinator will inform response personnel about the nature of work on the Site, the type of contaminants and associated health or safety effects, and the nature of the emergency, particularly if it is related to exposure to contaminants.

The Emergency Coordinator shall review this plan and verify emergency phone numbers, identify hospital routes, and shall ensure the appropriate emergency equipment is available and in working order prior to beginning work on site.

The Emergency Coordinator shall implement the Emergency Response Plan whenever conditions at the Site warrant such action.

11.2.3 Site Personnel

Site personnel are responsible for knowing the Emergency Response Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency.

11.3 Evacuation Routes and Procedures

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs at the work area, including but not limited to fire, explosion, or significant release of toxic gas into the atmosphere, immediate evacuation of all personnel is necessary due to an immediate or impending danger. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at a pre-determined location.

11.4 Contingency Plans

11.4.1 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the work area. The Emergency Coordinator will immediately notify the local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials
- Storage of flammable liquids and gases away from oxidizers
- No smoking in the exclusion zone or any work area
- No hot work without a properly executed hot work permit
- Shutting off engines to refuel
- Grounding and bonding metal containers during transfer of flammable liquids
- Use of UL approved flammable storage cans
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities
- Monthly inspections of all fire extinguishers.

The SSO is responsible for the maintenance of fire prevention and/or control equipment. The SSO is responsible for the control of fuel source hazards.

11.4.2 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet will be followed as necessary. If first aid or emergency medical treatment is necessary the Emergency Coordinator will contact the appropriate emergency facilities.

SKIN AND EYE CONTACT:	Use copious amounts of soap and water. Wash/rinse affected areas thoroughly, then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination. Skin should also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs. Transport to hospital or local medical provider.
INHALATION:	Move to fresh air. Decontaminate. Transport to hospital or local medical provider.
INGESTION:	Decontaminate and transport to emergency medical facility.
PUNCTURE WOUND OR LACERATION:	Decontaminate and transport to emergency medical facility.

11.4.3 Decontamination during Medical Emergencies

If emergency life-saving first aid and/or medical treatment are required, normal decontamination procedures may need to be abbreviated or postponed. The SSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on site, a plastic barrier between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

11.4.4 Adverse Weather Conditions

In the event of adverse weather conditions, the SSO will determine if work can continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries

- Potential for cold stress and cold-related injuries
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds)
- Limited visibility (fog)
- Potential for electrical storms
- Earthquakes
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The SSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions. If work is stopped due to lightening in the area, work may resume 30 minutes after the last observed lightning or thunder.

When severe weather has passed, the SSO will direct all contractors to inspect project equipment to ensure its readiness for operation prior to commencing field activities.

11.4.5 Spill Control and Response

All small hazardous spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, absorbent materials such as sand, sawdust, or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid or caustic spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size and type of the spill.

Refueling of sampling equipment will be done with UL-approved safety cans. Fuel will be stored in containers meeting applicable fuel storage safety regulations.

The Emergency Coordinator should take the following steps:

1. Determine the nature, identity and amounts of major spill components
2. Make sure all unnecessary persons are removed from the spill area
3. Notify appropriate response teams and authorities
4. Use proper PPE in consultation with the SSO and information provided on the MSDS for the spilled material
5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc.)
6. If possible, try to stop the leak with appropriate material
7. Remove all surrounding materials that can react or compound with the spill
8. Notify the PM and National Grid Project Managers.

11.5 Emergency Contact Information

Emergency Phone List
Canastota Non-Owned Former MGP Site

Medical Emergencies	
Emergency Medical Services (Ambulance)	
Emergency	911
Nearest Emergency Room (Oneida Healthcare Center) **321 Genesee Street, Oneida, NY**	(315) 363-6000
Fire and Rescue Emergencies	
Emergency	911
Non-Emergency	(315) 697-8888
Police Emergencies	
Canastota Police	
Emergency	911
Non-Emergency	(315) 697-2240
Utility Emergencies	
Electric and Natural Gas (National Grid)	(800) 892-2345
Water (Department of Public Works)	(315) 697-7042
National Grid Site Contacts Steven Stucker	(315) 428-5652 (office) (315) 247-6490 (cell)
Underground Utilities (DigSafely NY One Call Center)	811 or (800) 962-7962
Spill Incident	
New York State Department of Environmental Conservation	(800) 457-7362
National Response Center	(800) 424-8802
National Information Centers	
Chemtrec	(800) 424-9300
Poison Control Center	(800) 222-1222

11.6 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained at the Site.

- Industrial first aid kit
- Portable eye washes
- ABC-rated fire extinguishers (one per vehicle and heavy equipment [drill rig and sample vessel])

- Absorbent material [Sorbent pads and booms]

In case of minor injuries, on-site care shall be administered with the Site first aid kit. The first aid kit will include at a minimum the items specified in Appendix G of this HASP. A first aid kit will be kept in a waterproof container at the Site. In addition, eye wash, antibacterial wipes/gel, soap, and potable water will be kept at the Site.

For serious injuries that cannot be treated with the first aid kit, call 911 and request emergency medical assistance. Seriously injured persons should not be moved, unless they are in immediate danger.

11.7 Postings

The following information shall be posted or be readily visible and available at the Site:

- Emergency telephone numbers
- Hospital Route Map

The expected travel time from the Site to the nearest hospital is approximately 6 minutes, depending on local traffic conditions.

11.8 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers
- Refilling medical supplies
- Recharging eyewashes and/or showers
- Replenishing spill control supplies
- Replacing used air horns

12.0 LOGS, REPORTS, AND RECORD KEEPING

The following is a summary of required health and safety logs, reports, and record keeping. The SSO will maintain an on-site file for all the following logs, reports, and records. The CHSO or designee will maintain a parallel file off-site.

12.1 Medical and Training Records

Copies or verification of training (40 hour, 8 hour, supervisor, and site-specific training) and medical clearance for hazardous waste site work and respirator use will be maintained by the CHSO and copies provided to the SSO prior to the initiation of work on site.

12.2 On-Site Log

A log of personnel on site each day will be kept by the SSO in a field logbook.

12.3 Exposure Records

All personal monitoring results, laboratory reports, calculations, and air sampling data sheets will be maintained by the SSO during site work. At the end of the project they may be maintained in employee files if deemed necessary by the CHSO.

12.4 Accident/Incident Reports

The incident reporting and investigation during site work will follow the Incident Reporting Program in Appendix G.

12.5 OSHA Form 300

An OSHA Form 300 will be maintained by the CHSO. All recordable injuries or illnesses will be recorded on this form. The incident report form referenced in Appendix J meets the requirements of the OSHA Form 101 (supplemental record) and must be maintained with the OSHA Form 300 for all recordable injuries or illnesses.

12.6 Hazard Communication Program/MSDS

Material Safety Data Sheets (MSDS's) will be obtained for applicable substances and included in the site hazard communication file and provided in Appendix H. The hazard communication program will be maintained on site in accordance with 29 CFR 1910.1200.

12.7 Work Permits

All work permits, including confined space entry, hot work, lockout/tagout, and line-breaking permits will be maintained in the project files. Copies of the work permits shall also be provided to the SSO, and the National Grid Project Manager.

13.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of this HASP for the Canastota Non-Owned Former MGP site. It is maintained on site by the SSO as a project record. Each field team member shall sign this section after training on the contents of this HASP has been completed. Site workers must sign this form after site-specific training is completed and before being permitted to work on site.

I have read, or have been informed of, the Health and Safety Plan and understand the information presented. I have also completed site-specific training for the work detailed in the project Work Plan. I will comply with the provisions contained therein.

PRINT NAME	SIGNATURE	DATE

PRINT NAME	SIGNATURE	DATE

PRINT NAME	**SIGNATURE**	**DATE**

[1]**DATE:**______________________

GEI Consultants

Daily Site Safety Briefing Log and Visitor List

Project Number:

Project Name:

Briefing Conducted by:

Signature:

This sign-in log documents the tailgate safety briefing conducted in accordance with the HASP. Personnel who perform work operations on site are required to attend each briefing and to acknowledge receipt of each briefing, daily. Site visitors will also sign-in and be briefed on site safety.

TOPICS COVERED (check all those covered):

- ☐ General PPE Usage
- ☐ Hearing Conservation
- ☐ Respiratory Protection
- ☐ Personal Hygiene
- ☐ Exposure Guidelines
- ☐ Decon Procedures
- ☐ Emergency Procedures (include route to hospital)
- ☐ Confined Space
- ☐ Slips, Trips, Falls
- ☐ Heat Stress
- ☐ Cold Stresses
- ☐ Site Control
- ☐ Work Zones
- ☐ Lockout/Tagout
- ☐ Excavation Safety
- ☐ Confined Space
- ☐ Traffic Safety
- ☐ Changes to the HASP
- ☐ Initial Review of Hazard Evaluation
- ☐ Other (Specify):
- ☐ Other (Specify):

Personnel Sign-in List

Printed Name	Signature	Company Name	Check-In Time

---

[1] This form is applicable for <u>only</u> 1 day of site activity.

APPENDIX A

ORGANIZATIONAL STRUCTURE/ CONTACT INFORMATION

National Grid
Contact Information

Name	**Title**	**Contact Information**
Steven Stucker	Project Manager	Office: (315) 428-5652 Mobile: (315) 247-6490 E-mail: Steven.Stucker@us.ngrid.com

GEI Consultants
Project Team Contact Information

Name	**Title**	**Contact Information**
Bruce Coulombe, PG	Project Manager	Office: (607) 216-8959 Mobile: (607) 793-3426 E-mail: bcoulombe@geiconsultants.com
Jennifer Belonsoff, PG	Field Team Leader/Site Safety Officer (SSO)	Office: (607) 216-8963 Mobile: (607) 229-4678 E-mail: jbelonsoff@geiconsultants.com
Garrett Schmidt	Air Monitoring and Investigation Support	Office: (607) 216-8968 Mobile: (607) 793-3463 E-mail: gschmidt@geiconsultants.com
Robin DeHate	Corporate Health and Safety Officer (CHSO)	Office: (813) 774-6564 Mobile: (813) 323-6220 E-mail: RDeHate@geiconsultants.com
Jerry Zak	Technical Expert	Office: (860) 368-5404 Mobile: (860) 558-3866 E-mail: jzak@geiconsultants.com

Driller's
Contact Information

Name	Title	Contact Information
	Project Manager	Office: Mobile: E-mail:
	Field Team Leader/Site Safety Officer (SSO)	Office: Mobile: E-mail:
	Corporate Environmental Safety Manager (CESM)	Office: Mobile: E-mail:
		Office: Mobile: E-mail:
		Office: Mobile: E-mail:

APPENDIX B

SITE-SPECIFIC INFORMATION

MAPQUEST.

Notes

Trip to Oneida Health Care Center

321 Genesee St, Oneida, NY 13421 - (315) 363-6000
5.65 miles - about 8 minutes

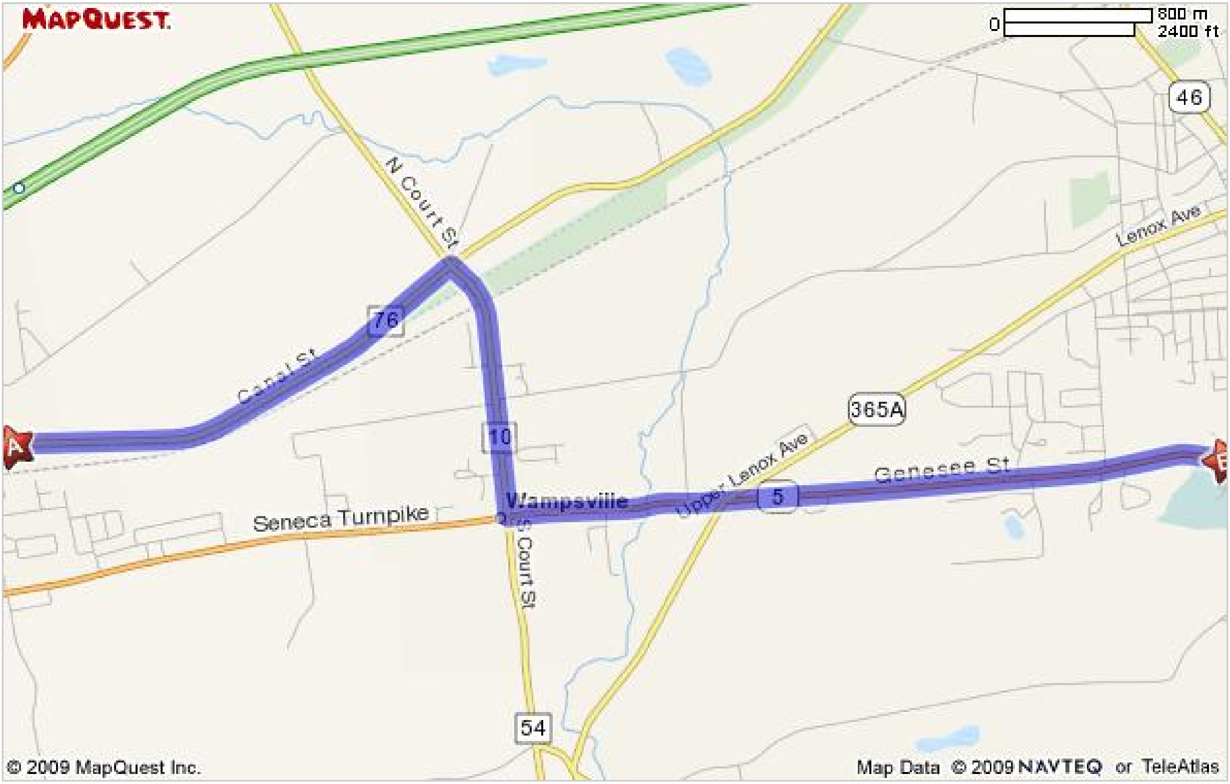
A 424 E North Canal St, Canastota, NY 13032-1319

START	1. Start out going **NORTHEAST** on **E N CANAL ST / CR-76** toward **N COURT ST / CR-10**. Continue to follow **CR-76**.	go 1.9 mi
↱	2. Turn **RIGHT** onto **N COURT ST / CR-10**.	go 1.1 mi
↰ 5	3. Turn **LEFT** onto **GENESEE ST / NY-5**.	go 2.7 mi
END	4. **321 GENESEE ST**.	go 0.0 mi

B Oneida Health Care Center - (315) 363-6000
321 Genesee St, Oneida, NY 13421

Total Travel Estimate : 5.65 miles - about 8 minutes

Route Map Hide


MAPQUEST
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Wampsville
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Seneca Turnpike
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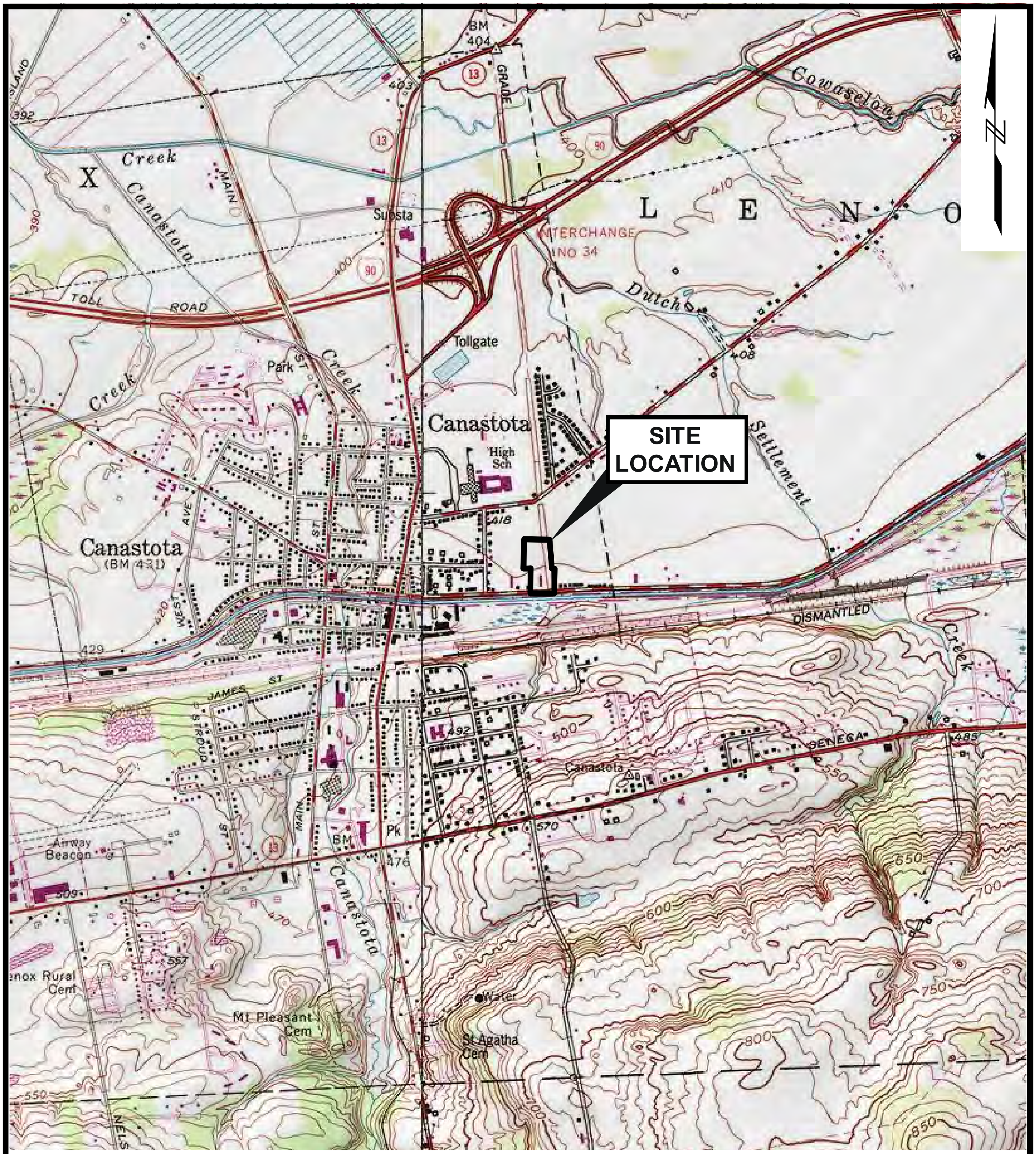
© 2009 MapQuest Inc.
Map Data © 2009 NAVTEQ or TeleAtlas



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)

0 2000 4000
SCALE, FEET

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

nationalgrid

GEI Consultants

SITE LOCATION MAP

Project 034390-1-1014 | October 2010 | Figure 1

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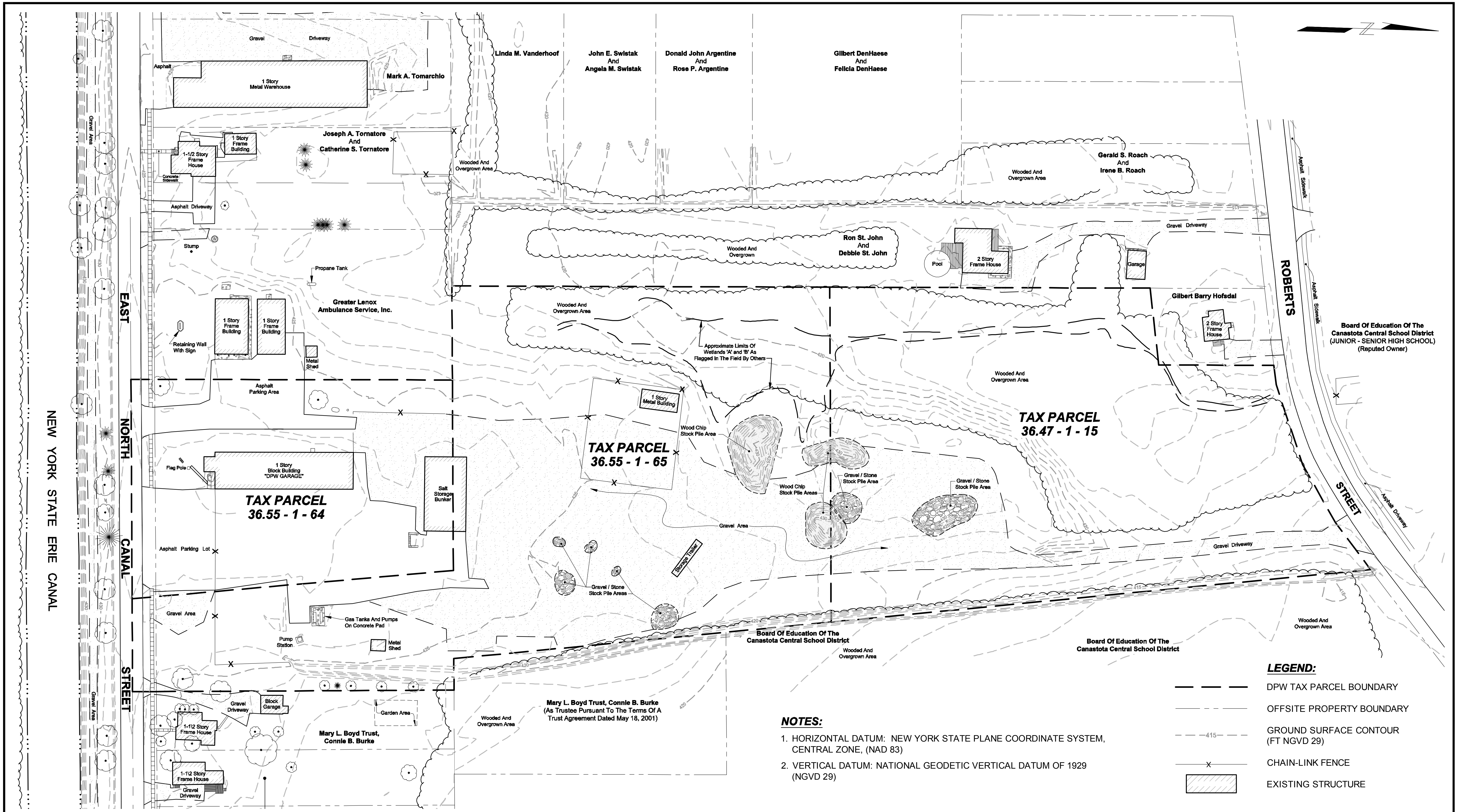


LEGEND:

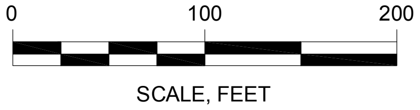
▬ ▬ ▬	DPW TAX PARCEL BOUNDARY
— - —	OFFSITE PROPERTY BOUNDARY
—415—	GROUND SURFACE CONTOUR (FT NGVD 29)
—x—	CHAIN-LINK FENCE
▨	EXISTING STRUCTURE

NOTES:

1. HORIZONTAL DATUM: NEW YORK STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, (NAD 83)
2. VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29)

SOURCES:

1. PLAN BASED ON SURVEY MAPS SHEETS 1 AND 2: *LANDS OF VILLAGE OF CANASTOTA, NORTHEAST CANAL STREET AND ROBERTS STREET, BEING PART OF LOT # 86 OF THE CANASTOTA TRACT, VILLAGE OF CANASTOTA - MADISON COUNTY, STATE OF NEW YORK,* PREPARED BY DELTA ENGINEERS, ARCHITECTS & LAND SURVEYORS, 4873 NEW YORK STATE ROUTE #5, VERNON, NY, DATE: 2/10/2010, SCALE: 1" = 30.
2. FIGURE 1: *CURRENT SITE CONDITIONS AND SAMPLE LOCATION MAP,* PREPARED BY GEI CONSULTANTS, INC., DATE: OCTOBER 2007, SCALE: 1" = 60'



REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

nationalgrid

GEI Consultants

Project 034390-1-1014

CURRENT SITE LAYOUT

October 2010

Figure 2

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APPENDIX C

PROJECT SPECIFIC ACTIVITY HAZARD ANALYSIS

WORK TASK	POTENTIAL HAZARD	CONTROL
Activity: Pre-Investigation and Utility Clearance		
Site Mobilization/Activity	Biological Hazards.	Proper clothes, body inspections, insect repellant.
	Slip, Trip, Fall Hazards	Identify and repair potential tripping hazards. Maintain safe and orderly work areas.
	Traffic Hazards	Use traffic cones, signage, and traffic safety vests in accordance with New York City Traffic Regulations. Use a traffic spotter.
	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Noise	Distancing form noise, hearing protection
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
Activity: Subsurface Boring/ Monitoring Well Installation and Sample Collection		
Subsurface Boring/ Monitoring Well Installation and Sample Collection	Heavy Equipment / Proximity to Heavy Equipment	Distancing, safe work practices, inspections, wear hearing protection.
	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
	Slip/Trip/Fall	Maintain safe and orderly work areas. Unloading areas should be on even terrain. Identify and repair potential tripping hazards.
	Noise	Distancing form noise, hearing protection
	Traffic Hazards	Use traffic cones, signage, and traffic safety vests in accordance with New York City Traffic Regulations. Use a traffic spotter.
	Tool Use	Use proper guarding, inspections, wear safety glasses with side shields, hearing protection.
	Contaminant Contact	Wear protective coveralls (e.g., Tyvek®) (if needed) with shoe covers, nitrile gloves, and safety glasses when handling samples. Dispose of gloves after sampling. Personal protective equipment will be decontaminated and disposed of in general accordance with Section 10 of this HASP.
	Exposure to vapors from contaminated soils	Use work zone air monitoring equipment including photoionization detector and multiple gas meter (that monitors % oxygen, lower explosive limit, hydrogen sulfide and hydrogen cyanide), and dust monitor to monitor the workzone as specified in Section 8.0 of the HASP. If air monitoring action levels are exceeded, then engineering controls will be implemented. If excursions of the action levels persist, then upgrade to full face respirator with HEPA/organic vapor cartridge as indicated in Section 6.0 of the HASP. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the RI Work Plan and Appendix K of this HASP.

Activity: Groundwater Sampling		
Groundwater Sampling	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
	Slip/Trip/Fall	Maintain safe and orderly work areas. Unloading areas should be on even terrain. Identify and repair potential tripping hazards.
	Contaminant Contact	Wear nitrile gloves when sampling points. Dispose of gloves after installation. Personal protective equipment will be decontaminated and disposed of in general accordance with Section 10 of this HASP.
	Exposure to vapors from contaminated groundwater	Use work zone air monitoring equipment including photo-ionization detector. If air monitoring action levels are exceeded, then engineering controls will be implemented.
Activity: Survey		
Survey	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
	Slip/Trip/Fall	Maintain safe and orderly work areas. Unloading areas should be on even terrain. Identify and repair potential tripping hazards.
	Traffic Hazards	Use traffic cones, signage, and traffic safety vests as needed.

APPENDIX D

COLD STRESS GUIDELINES

Cold Stress Guidelines

	Symptoms	What to do
Mild Hypothermia	• Body Temp 98-90°F • Shivering • Lack of coordination, stumbling, fumbling hands • Slurred speech • Memory loss • Pale, cold skin	• Move to warm area • Stay active • Remove we clothes and replace with dry clothes of blankets • Cover the head • Drink warm (not hot) sugary drink
Moderate Hypothermia	• Body temp 90-86°F • Shivering stops • Unable to walk of stand • Confused irrational	• All of the above, plus: • Call 911 • Cover all extremities complexly • Place very warm objects, such as hot packs on the victim's head, neck, chest and groin
Severe Hypothermia	• Body temp 86-78°F • Severe muscle stiffness • Very sleepy or unconscious • Ice cold skin • Death	• Call 911 • Treat victim very gently • Do not attempt to re-warm
Frostbite	• Cold, tingling, stinging or aching feeling in the frostbitten area, followed by numbness • Skin color turns red, then purple, then white or very pale skin • Cold to the touch • Blisters in severe cases	• Call 911 • Don not rub the area • Wrap in soft cloth • If help is delayed, immerse in warm, not hot, water
Trench Foot	• Tingling, itching or burning sensation • Blisters	• Soak feet in warm water, then wrap with dry cloth bandages • Drink a warm sugary drink

APPENDIX E

HEAT STRESS GUIDELINES

HEAT STRESS GUIDELINES

Form	Signs & Symptoms	Care	Prevention[3]
Heat Rash	Tiny red vesicles in affected skin area. If the area is extensive, sweating can be impaired.	Apply mild lotions and cleanse the affected area.	Cool resting and sleeping areas to permit skin to dry between heat exposures
Heat Cramps	Spasm, muscular pain (cramps) in stomach area and extremities (arms and legs).	Provide replacement fluids with minerals (salt) such as Gatorade.	Adequate salt intake with meals[1] ACCLIMATIZATION[2]
Heat Exhaustion	Profuse sweating, cool (clammy) moist skin, dizziness, confusion, pale skin color, faint, rapid shallow breathing, headache, weakness, muscle cramps.	Remove from heat, sit or lie down, rest, replace lost water with electrolyte replacement fluids (water, Gatorade) take frequent sips of liquids in amounts greater than required to satisfy thirst.	ACCLIMATIZATION[2] Adequate salt intake with meals [1] only during early part of heat season. Ample water intake, frequently during the day
Heat Stroke	HOT Dry Skin. Sweating has stopped. Mental confusion, dizziness, nausea, severe headache, collapse, delirium, coma.	HEAT STROKE IS A MEDICAL EMERGENCY - Remove from heat. - COOL THE BODY AS RAPIDLY AS POSSIBLE by immersing in cold (or cool) water, or splash with water and fan. Call for Emergency Assistance. Observe for signs of shock.	ACCLIMATIZATION[2] Initially moderate workload in heat (8 to 14 days). Monitor worker’s activities.

Footnotes:

1.) American diets are normally high in salt, sufficient to aid acclimatization. However, during the early part of the heat season, (May, June), one extra shake of salt during one to two meals per day may help, so long as this is permitted by your physician. Check with your personal physician.

2.) ACCLIMATIZATION - The process of adapting to heat is indicated by worker's ability to perform hot jobs less fluid loss, lower concentrations of salt loss in sweat, and a reduced core (body) temperature and heart rate.

3.) Method to Achieve Acclimatization - Moderate work or exercise in hot temperatures during early part of heat season. Adequate salt (mineral) and water intake. Gradually increasing work time in hot temperatures. Avoid alcohol. Normally takes 8 to 14 days to achieve acclimatization. Lost rapidly, if removed from strenuous work (or exercise) in hot temperature for more than approximately five days.

APPENDIX F

NATIONAL GRID
CONTROL OF HAZARDOUS ENERGY PROGRAM "LOCK OUT/TAG OUT"

1.0 INTRODUCTION

The Lock Out/Tag Out Standard, 29 CFR 1910.147, is prevents approximately 120 deaths and 60,000 injuries per year. Under this standard, **CONTRACTOR** is required to establish a program that utilizes procedures for locking out and/or tagging to isolate and disable the equipment to prevent accidental start-up or release of stored energy. **CONTRACTOR** employees will identify, locate and control these energy sources, as necessary.

DEFINITIONS

Affected Employee: An employee whose job requires operation/use of equipment or machines on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed. All **CONTRACTOR** personnel or subcontractors working in these circumstances are "affected employees."

Authorized Employee: A person who locks out or implements a tagout system procedure on machines or equipment in connection with the servicing or maintenance on that machine or equipment. An authorized person and an affected employee may be the same person when the affected employee's duties also include performing a lock out or tag out on a machine or equipment.

Capable of being Locked Out: An energy isolating device will be considered to be capable of being locked out either if it designed with a hasp or other attachment or integral part to which, or through which, a lock can be affixed, or if it has a locking mechanism built into it. Other energy isolating devices will also be considered to be capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized: Connected to an energy source or containing residual or stored energy.

Energy Isolating Device: A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a slide gate; a slip blind; a line valve; a block; and, any similar device used to block or isolate energy. The term does not include a push button, selector switch, and other control circuit type devices.

Energy Source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Lockout: The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout Device: A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment.

Tagout: The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout Device: A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

2.0 PURPOSE

To establish procedures for locking out and/or tagging to isolate and disable equipment to prevent accidental startup or release of stored energy, and possible injury to employees.

3.0 SCOPE

This procedure applies to all field/facility operations that require all operative energy sources, including line breaking, in the work area to be shut down, locked out and tagged, so that **CONTRACTOR** employees may safely perform their job. Contractors and subcontractors performing work on **CONTRACTOR** projects will be required to comply with these requirements if their employer does not have a comparable lock out/tag out program already in place.

4.0 PROCEDURE

1. The authorized employee will evaluate the scope of work and all equipment, machines or industrial processes in the area that require the use of stored energy. Energized equipment that may cause a safety hazard will be shut down to eliminate the potential for injury.

2. Prior to beginning the work, the authorized employee will be sure that appropriate lock out/tag out equipment is available to isolate the energy source.

3. The authorized employee will ensure that all affected employees have been trained on the following topics:

    a. Scope of Work.

    b. Energy sources.

    c. Energy isolation devices.

    d. Lock out devices.

    e. Tags.

    f. Test procedures.

    g. Authorized personnel. Those individuals charged with the responsibility for deenergizing and reenergizing energy sources).

4. A safety meeting will take place immediately prior to work, and will be documented and placed in the job folder for future reference. All employees will sign the Lockout Worksheet prior to starting the work. See Attachment A for a copy of the Lockout Worksheet.

5. All energized equipment will be shut down before **CONTRACTOR** personnel or its contractors/subcontractors begin work on site. Shut down will take place in the following manner:

   a. The authorized employee will inform the client's representative of the need to shut down the equipment.

   b. The authorized employee, with assistance from the client's representative, will locate all power sources on the process or equipment.

   c. All power sources will be shut down and verified as such by the authorized employee.

   d. A National Grid standardized lockout device must be applied by all parties entering the energized area. Each authorized employee shall affix a personal lockout or tagout device to the group lockout device. Locks and tags shall identify the identity of the employee applying the device.

   e. Any necessary testing of equipment will be conducted to ensure that the process or equipment is free of energy.

   f. The authorized employee will attempt to operate the machine to be sure that it remains inoperative. All activation controls will be returned to the "off" position after testing.

   g. The authorized employee will apply a tag that bears the following warning, “DANGER - EQUIPMENT LOCKOUT” along with the authorized employee’s name, the date, and the time of the lockout.

   h. The authorized employee will complete the Lockout Worksheet.

   i. Equipment may now be released for work by the authorized employee. No release will be given until all required inspections and testing are performed.

6. Residual energy, i.e., pneumatic/hydraulic power, spring compression, and residual electrical energy in transformers are examples of residual energy that, when unsuspected, may present a greater hazard to the employee. These sources of energy will be identified, located and controlled in the following manner:

   a. Residual electrical energy can be controlled through grounding.

   b. Pneumatic/hydraulic line pressure can be released, allowing the weight to come to a rest.

   c. Spring tensions can be relieved.

   d. Product lines will be double blocked (panned) and bled to prevent product from being released.

   e. A lockout device and tag will be applied and secured by the authorized employee for the duration of the job to prevent residual energy from reaccumulating and creating a hazard to employees.

   f. The lockout/tagout will be documented by the authorized employee on the Lockout Worksheet.

7. After all work is completed, the authorized employee will perform the following:

   a. The authorized employee will inform everyone that the job is complete.

   b. The Lockout Worksheet will be reviewed by the authorized employee with all employees to make sure that all employees are accounted for before re-energizing the equipment.

   c. The authorized employee will be sure that all tools, debris or other material that could be placed into motion are removed before the equipment or process is re-energized. All employees will be instructed to stay clear of movable parts of the equipment or process.

   d. All residual energy controls will be removed by the authorized employee, as well as all energy isolation lockouts and tags.

   e. In the presence of the client's representative, energy will be restored to the equipment or process.

   f. All lockout equipment removal will be documented on the Lockout Worksheet by the authorized employee. The Lockout Sheet will be placed in the job file at the end of the shift.

8. All employees must be accounted for before re-energizing equipment. When employees that have worked on the job are absent from the final inspection before re-energizing the equipment, the authorized employee will initiate the following:

   a. The lockout sheet will be checked to account for all employees.

   b. The authorized employee will obtain a Lockout/Tagout Absent Employee form (See Attachment B).

   c. The authorized employee will appoint employees to look for the individual, paying special attention to high hazard areas where physical harm could result from the start-up of the equipment or process.

   d. After a complete search of the equipment or process, and it has been determined by the authorized employee that the employee is not present, all outlying areas surrounding the site will be searched.

e. The area surrounding the site will be guarded to prevent the absent employee from inadvertently entering a hazardous situation.

f. The employer must make all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed.

g. The equipment or process will be cleared for re-energizing only by the authorized employee once all of the above conditions are met.

h. A copy of the completed Absent Employee form will be posted conspicuously in the work area, and not removed until the employee has been located. The client's representative will be notified of the situation so that the absent employee does not endanger himself/herself by entering an energized process or equipment.

9. When appropriate, contractors and subcontractors working under **CONTRACTOR**’s direction will be informed of their responsibilities, under the Lockout/Tagout Standard, to provide protection against hazardous energy.

   a. When necessary within the scope of work, contractors and subcontractors without such a program, at the discretion of **CONTRACTOR**, will be disqualified from bidding on these projects.

   b. Contractors and subcontractors with such a program will submit their program to the CHSO for review. The contractor or subcontractor program must be comparable or more strict than **CONTRACTOR**'s program.

      - Programs found to be insufficient in some areas will be returned, with the requested changes to be made before the program is acceptable for implementation.

      - The copy of the program will be returned to the contractor or subcontractor, and will not be duplicated by CONTRACTOR or any of its employees.

10. All affected employees will be given training in these procedures prior to performing any lockout/tagout work. This training will be documented and maintained in the employees' training file with the CHSO.

11. This procedure will be reviewed annually by the CHSO to ensure that it is relevant to **CONTRACTOR** operations.

ATTACHMENT A

LOCKOUT WORKSHEET

LOCKOUT WORKSHEET

Job Location: ___________________ Project Manager: ______________________________________

Date: _______________________ Time: ____ a.m./p.m.

Equipment Description to be locked out: ____

Equipment No:_______

Energy Source(s): ____

Pre-Work Safety Meeting Minutes: ____

Lockout Hardware Used: ____
No of locks required: ___________________________

HAZARDOUS ENERGY		ISOLATING DEVICES			CONTROL DEVICES			
Type	Magnitude	Type	Location	I.D. No.	Lock	Tag	Both	Additional Measures

Methods use to verify isolation:
___Design of machine reviewed
___Circuitry tested
___Are valves or hydraulic system attached to electrical sources?
___Does the electrical cabinet have any live wire circuits?
___Based on the energy sources listed above, indicate all energy isolating verification procedures required to ensure lockout
____
____
____

Energy Restoration (Check each as you Progress):	Time Completed
___ All personnel accounted for and in the clear.	____________________
___ Point(s) of operation free of tools and debris.	____________________
___ Points of operation restraints removed.	____________________
___ Lockout hardware removed.	____________________
___ Personnel clear of points of operation.	____________________

Energy Restoration (Check each as you Progress): Time Completed

___ Energy restored. ____________________

___ Equipment operation verified, client's rep on site. ____________________

___ Lockout terminated. ____________________

Employees’ Signatures: ____
Date: _

ATTACHMENT B

LOCKOUT/TAGOUT ABSENT EMPLOYEE FORM

LOCKOUT/TAGOUT ABSENT EMPLOYEE FORM

NOTICE

Upon completion of work performed under lockout/tagout conditions, the following employee(s) listed below could not be located or accounted for:

____

____

____

All attempts have been made to locate this employee at the jobsite. It has been verified that this employee is not in the vicinity of the hazardous energy source and will not be affected by the startup of equipment which was under lockout conditions.

____ __________________________________
Signature of Authorized Employee Date

Signature of Employer ___________________________ Date________________

APPENDIX G

INCIDENT REPORTING

1.0 ACCIDENT AND INCIDENT REPORTING

It is important that all accidents and incidents that result in injury, illness, or medical treatment be reported within 24 hours. If an accident occurs, the Contractor will call their Human Resources Director and Corporate Environmental Safety Manager (CHSO) to provide information on the injury. The CHSO will complete the first report of injury and file it accordingly. Copies will be sent to the Project Manager (PM) and Site Safety Officer (SSO). Supervisors are required to complete the Supervisor's Report of Accident included in this section. It is **CONTRACTOR'S** responsibility to investigate each incident, file appropriate paperwork, and conduct a follow-up analysis of each incident to develop information about the cause of the accident.

2.0 REPORTING PHONE NUMBERS

Consultant Accident/Incident Contact Information (For Consultant Employees)
Corporate Environmental Safety Manager: Robin DeHate (813) 774-6564
Human Resources Director: To be determined

3.0 FIRST AID AND MEDICAL TREATMENT

The **CONTRACTOR** provides a First Aid Kit on each site and in each Company vehicle. It is there for use in the treatment of minor scratches, burns, headaches, nausea, etc. Each employee should verify the location of the nearest first aid kit and should make use of it whenever needed. Each kit is fully stocked and restocked monthly by an outside vendor. The kit includes bandages, over the counter medications, disinfecting supplies and topical ointments. The user of each kit is responsible for contacting the vendor to replace items used or submitting the kit to **CONTRACTOR** for replacement. Kits are to be inventoried by the Project Manager before being sent in the field. Only completely stocked kits are to be brought into the field. The kits are maintained in a weatherproof container and in accordance with ANSI Standard Z308.1-1998. The first aid supplies in each kit are included in Attachment A.

Any work related injury or illnesses that require professional medical assistance should be reported immediately. Failure to promptly notify of a work related injury could make the claim questionable and subject to stricter review. The nearest medical center or hospital will be identified for each project. The phone number and location for this center will be determined before commencing field activities and be included in the Health and Safety Plan. The phone numbers will be posted by Site Safety Officer (SSO) or the Project Manager (PM) and available to all employees in order to provide prompt response to all injuries. The SSO or the PM will contact the nearest medical facility to determine the facility's capabilities and verify that the facility is willing to provide emergency medical services. The following actions for medical treatment scenarios are presented below:

1. Minor First Aid Treatment

   First aid kits are stored in each company vehicle. If an injury is sustained or results in minor first aid treatment:

   a. Inform your supervisor.
   b. Administer first aid treatment to the injury or wound.
   c. If a first aid kit is used, indicate usage on the accident investigation report.
   d. Access to a first aid kit is not intended to be a substitute for medical attention.

e. Provide details for the completion of the accident investigation report.

2. Non-Emergency Medical Treatment

For non-emergency work-related injuries requiring professional medical assistance, management must first authorize treatment. If you sustain an injury requiring treatment other than first aid:

a. Inform your supervisor.

b. Proceed to the posted medical facility. Your supervisor will assist with transportation, if necessary.

c. Provide details for the completion of the accident investigation report.

3. Emergency Medical Treatment

If you sustain a severe injury requiring emergency treatment:

a. Call for help and seek assistance from a co-worker.

b. Use the emergency telephone numbers and instructions posted next to the telephone in your work area to request assistance and transportation to the local hospital emergency room.

c. Provide details for the completion of the accident investigation report.

d. The Project Manager will identify an ER provider for each long-term project for emergency medical services. The phone number will be posted at each job site.

4. First Aid Training

Each employee will receive training and instructions from his or her supervisor on our first aid procedures.

5. Wounds

a. Minor - Cuts, lacerations, abrasions, or punctures

- Wash the wound using soap and water; rinse it well.
- Cover the wound using clean dressing.

b. Major - Large, deep and bleeding

- Stop the bleeding by pressing directly on the wound, using a bandage or cloth.
- Keep pressure on the wound until medical help arrives.

1. Broken Bones

    a. Do not move the victim unless it is absolutely necessary.

    b. If the victim must be moved, “splint” the injured area. Use a board, cardboard, or rolled newspaper as a splint.

7. Burns

    a. Thermal (Heat)

        - Rinse the burned area, without scrubbing it, and immerse it in cold water; do not use ice water.

        - Blot dry the area and cover it using sterile gauze or a clean cloth.

    c. Chemical

        - Flush the exposed area with cool water immediately for 15 to 20 minutes.

8. Eye Injury

    a. Small particles

        - Do not rub your eyes.

        - Use the corner of a soft clean cloth to draw particles out, or hold the eyelids open and flush the eyes continuously with water.

    b. Large or stuck particles

        - If a particle is stuck in the eye, do not attempt to remove it.
        - Cover both eyes with bandage.

    c. Chemical

        - Immediately irrigate the eyes and under the eyelids, with water, for 30 minutes.

9. Neck and Spine Injury

    If the victim appears to have injured his or her neck or spine, or is unable to move his or her arm or leg, do not attempt to move the victim unless it is absolutely necessary.

10. Heat Exhaustion

    a. Loosen the victim’s tight clothing.
    b. Give the victim “sips” of cool water.

Make the victim lie down in a cooler place with the feet raised.

4.0 FIRST AID/CPR Certification

Each **CONTRACTOR** project will identify individuals that are certified CPR/first aid. First aid training sponsored by the American Red Cross is acceptable and must be renewed every three years. CPR training must be renewed annually. Other first aid training will be reviewed to see if it is comparable to the Red Cross training.

5.0 SAFETY RESPONSIBILITIES

The Contractor and Subcontractor employees also have some important responsibilities concerning safety. They are:

a. The responsibility of reporting all injuries and illnesses to your supervisor, no matter how small.

b. The responsibility of always following the safety rules for every task performed.

c. The responsibility of reporting any hazards seen.

d. The responsibility of helping co-workers recognize unsafe actions or conditions.

e. The responsibility of asking about the safety rules.

It is impossible to list or include all safety rules for all the possible tasks. But the following rules have been prepared to help the employee avoid hazards, which may cause injury while doing some of the more common tasks. Failure to follow safety rules and/or safe practices will result in disciplinary action, up to and including termination.

Supervisor’s Report of Accident

Supervisor's Name: ____

Basic Rules for Accident Investigation

- Find the cause to prevent future accidents - Use an unbiased approach during investigation.
- Interview witnesses & injured employees at the scene - conduct a walkthrough of the accident.
- Conduct interviews in private - Interview one witness at a time.
- Get signed statements from all involved.
- Take photos or make a sketch of the accident scene.
- What hazards are present - what unsafe acts contributed to accident
- Ensure hazardous conditions are corrected immediately.

Date & Time		**Location**	
Tasks performed		**Witnesses**	
Resulted in	**__ Injury __ Fatality** **__Property Damage**	**Property Damage**	
Injured		**Injured**	
Describe Accident Facts & Events			

Supervisor's Root Cause Analysis		*Check ALL that apply to this accident*	
Unsafe Acts		**Unsafe Conditions**	
Improper work technique		Poor Workstation design	
Safety rule violation		Unsafe Operation Method	
Improper PPE or PPE not used		Improper Maintenance	
Operating without authority		Lack of direct supervision	
Failure to warn or secure		Insufficient Training	
Operating at improper speeds		Lack of experience	
By-passing safety devices		Insufficient knowledge of job	
Protective equipment not in use		Slippery conditions	
Improper loading or placement		Excessive noise	
Improper lifting		Inadequate guarding of hazards	
Servicing machinery in motion		Defective tools/equipment	
Horseplay		Poor housekeeping	
Drug or alcohol use		Insufficient lighting	
Unsafe Acts require a written warning and re-training <u>before</u> the Employee resumes work			

Date		**Date**	
Re-Training Assigned		Unsafe Condition Guarded	
Re-Training Completed		Unsafe Condition Corrected	
Supervisor Signature		**Supervisor Signature**	

Accident Report Review

Supervisor ____ Date _______________

Department Superintendent _________________________ Date _______________

Safety Manager ____________________________________ Date _______________

Plant Manager _____________________________________ Date _______________

ATTACHMENT A

First Aid Kits

Each first aid kit is in a weather proof container and contains the following:

Item	Amount
Ear Plugs	2 pair
Band-aids	2 boxes
Sterile pads	5 2”x2”
Oval eye pads	2
Tylenol	10
Burn cream	1 tube
Tweezers	1 each
Scissors	1 each
Triangular bandage	1
Antiseptic wipes	1 box
Ammonia inhalants	1 box
Flexible gauze	1 roll
First aid guide	
Latex gloves	2 pair

APPENDIX H

Addendum (Material Safety Data Sheets, previous analytical results)

Material Safety Data Sheet

from Genium's Reference Collection

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 300

ACETONE

(Revision E)
Issued: September 1985
Revised: November 1988

SECTION 1. MATERIAL IDENTIFICATION

Material Name: ACETONE

Description (Origin/Uses): Used as a solvent for fats, oils, waxes, resins, rubber, plastics, varnishes, and rubber cements; also used in the manufacture of methyl isobutyl ketone, mesityl oxide, acetic acid, diacetone alcohol, chloroform, iodoform, bromoform, explosives, rayon, photographic films, and isoprene. Used to store acetylene gas. Widely used in the chemical process industry (CPI).

Other Designations: Dimethylformaldehyde; Dimethylketal; Dimethyl Ketone; Ketone Propane; Pyroacetic Acid; Pyroacetic Ether; C_3H_6O; CAS No. 0067-64-1

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

NFPA: 3 (top), 1 (left), 0 (right), - (bottom)

HMIS
H 1
F 3
R 0
PPG*
*See sect. 8

R 1
I 1
S 2
K 4

SECTION 2. INGREDIENTS AND HAZARDS

INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Acetone, CAS No. 0067-64-1 *See NIOSH, *RTECS* (AL3150000), for additional data with references to reproductive, mutagenic, and irritative effects.	Ca 100	**OSHA PELs** 8-Hr TWA: 750 ppm, 1800 mg/m³ STEL: 1000 ppm, 2400 mg/m³ **ACGIH TLVs, 1988-89** TLV-TWA: 750 ppm, 1780 mg/m³ TVL-STEL: 1000 ppm, 2375 mg/m³ **Toxicity Data*** Man, Inhalation, TD_{Lo}: 440 µg/m³ (6 Mins) Man, Inhalation, TD_{Lo}: 10 mg/m³ (6 Hrs)

SECTION 3. PHYSICAL DATA

Boiling Point: 134°F (56°C)
Melting Point: -137°F (-94°C)
Vapor Density (Air = 1): 2
Vapor Pressure: 180 Torrs at 68°F (20°C)
Evaporation Rate: Faster than That of *n*-Butyl Acetate

Molecular Weight: 58 Grams/Mole
Solubility in Water (%): Complete
Specific Gravity (H_2O = 1): 0.778 at 77°F (25°C)
% Volatile by Volume: 100

Appearance and Odor: A clear, colorless, highly flammable, volatile liquid with a characteristic, pleasant, sweetish odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point: 1.4°F (-17°C) CC	Autoignition Temperature: 869°F (465°C)	LEL: 2.9% v/v	UEL: 12.8% v/v

Extinguishing Media: Use "alcohol" foam, dry chemical, or carbon dioxide. Use a blanketing effect to smother flames. Use water spray to reduce the rate of burning and to cool containers. Water will probably not be effective in directly extinguishing an acetone fire.

Unusual Fire or Explosion Hazards: Acetone vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Acetone is stable in closed containers during routine operations. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Acetone can react dangerously with strong oxidizing agents such as nitrates, perchlorates, permanganates, and concentrated sulfuric acid; chromic anhydride; chromyl chloride; hydrogen peroxide; hexachloromelamine; nitrosyl chloride; permonosulfuric acid; mixtures of sulfuric acid and nitric acid; mixtures of nitric acid and acetic acid; and potassium *tert*-butoxide.

Conditions to Avoid: Do not expose acetone to sources of ignition and incompatible chemicals.

Hazardous Products of Decomposition: Carbon monoxide and carbon dioxide can be produced during acetone fires.

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Acetone is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: Inhalation of high concentrations of acetone vapor can cause dryness of the mouth and throat; dizziness, nausea, incoordination, slurred speech, drowsiness, and, in severe exposures, coma. Inhalation of small quantities of acetone vapor for an extended period causes irritation of the respiratory tract, coughing, and headache. Prolonged or repeated skin contact with acetone has a defatting effect causing dryness, irritation, and mild dermatitis. Under routine operating conditions the amount of acetone absorbed through the skin is small. Ingestion of acetone may cause irritation of the gastrointestinal tract and narcosis. Acetone acts primarily as a depressant to the central nervous system (CNS) when exposures are severe or prolonged. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** Skin, eyes, respiratory system, and CNS. **Primary Entry:** Inhalation, skin contact. **Acute Effects:** See Summary of Risks, above. **Chronic Effects:** None reported. **FIRST AID:** **Eyes.** Immediately flush eyes, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 minutes. **Skin.** Rinse the affected area with flooding amounts of water, then wash it with soap and water. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have qualified medical personnel administer oxygen as required. Monitor the exposed person for symptoms of depression of the CNS such as incoordination and drowsiness. **Ingestion.** Unlikely.* If a small amount is ingested, dilute it slowly with 1 to 2 glasses of water or milk. **Get medical help (in plant, paramedic, community) for all exposures.** Seek prompt medical assistance for further treatment, observation, and support after first aid. ***Note to Physician:** Treatment for accidental ingestion of a small amount of acetone is unnecessary. If a large amount has been ingested, administer a charcoal slurry, either aqueous or mixed with a saline cathartic or sorbital.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately, and provide adequate ventilation. Cleanup personnel need protection against this liquid's contact with skin or eyes as well as inhalation of its vapor (see sect. 8). Contain large spills and collect waste or absorb it with an inert material such as sand, earth, or vermiculite. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.
Waste Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations. Consider saving the waste hydrochloric acid for use as a neutralizing agent during cleanup operations of basic materials.

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z).
EPA Designations (40 CFR 302.4)
RCRA Hazardous Waste, No. U002
CERCLA Hazardous Substance, Reportable Quantity: 5000 lbs (2270 kg), per the Resource Conservation and Recovery Act, § 3001.

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Use a NIOSH-approved respirator per Genium reference 88 r the maximum-use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious butyl or natural rubber gloves, boots, aprons, and gauntlets, etc., to prevent prolonged or repeated contact with this material. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of acetone below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from your shoes and equipment. **Other:** Automatic sprinkler systems for fire protection are desirable in work areas. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Keep it off your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Do not inhale acetone vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store acetone in closed containers (carbon steel is recommended) in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage. **Engineering Controls:** Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. Electrically ground and bond all containers and pipelines, etc., used in shipping, transferring, reacting, production, and sampling operations to prevent generating static sparks. **Other Precautions:** Use labeled safety cans when handling small amounts of acetone. Acetone presents a dangerous fire hazard; perform all work operations involving it carefully and in a way that will prevent exposing the liquid or its vapor to sources of ignition.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Acetone
DOT Hazard Class: Flammable Liquid
ID No. UN1090
DOT Label: Flammable Liquid

IMO Hazard Class: 3.1
IMO Label: Flammable Liquid
IMDG Packaging Group: II

ferences: 1, 26, 38, 84-94, 100, 116, 117, 120, 122.

Prepared by PJ Igoe, BS
Industrial Hygiene Review: DJ Wilson, CIH
Medical Review: MJ Hardies, MD

Genium Publishing Corporation
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Material Safety Data Sheets Collection:

Sheet No. 420
Acetone Solvent Blend

Issued: 4/79 Revision: A, 9/91

Section 1. Material Identification

35

Acetone Solvent Blend Description: A mixture of acetone and isopropanol. Used as a solvent for fats, oils, waxes, rubber, plastics, varnishes, gums, resins and rubber cements.
Other Designations: Acetone, CAS No. 0067-64-1; isopropyl alcohol, CAS No. 0067-63-0.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemical Week Buyers' Guide*(TM) for a suppliers list.

R 1
I 1
S 2
K 3

NFPA
3
1 0
-

HMIS
H 1
F 3
R 0
PPG†
† Sec. 8

Cautions: Acetone solvent blend is a skin, eye, and mucous membrane irritant. It may be narcotic in high concentrations.

Section 2. Ingredients and Occupational Exposure Limits

Acetone, >60%
Isopropanol, 10 to 30%

1990 OSHA PELs
Acetone: 8-hr TWA: 750 ppm, 1800 mg/m^3
15-min STEL: 1000 ppm, 2400 mg/m^3
Isopropyl alcohol: 8-hr TWA: 400 ppm, 980 mg/m^3
15-min STEL: 500 ppm, 1225 mg/m^3

1990-91 ACGIH TLVs
Acetone: TWA: 750 ppm, 1,780 mg/m^3
STEL: 1000 ppm, 2400 mg/m^3
Isopropyl alcohol: TWA: 400 ppm, 985 mg/m^3
STEL: 500 ppm, 1,230 mg/m^3

1990 NIOSH RELs
Acetone: TWA: 250 ppm, 590 mg/m^3
Isopropyl alcohol: 400 ppm, 980 mg/m^3

1985-86 Toxicity Data*
Acetone: Man, oral, TD$_{Lo}$: 2857 mg/kg
Man, inhalation, TD$_{Lo}$: 440 μg/m^3/6 min
Isopropyl alcohol: Man, oral, LD$_{Lo}$: 5272 mg/kg
Human, oral, LD$_{Lo}$: 3570 mg/kg; toxic effects include central nervous system, pulmonary, and gastrointestinal

Calculated TLV for Acetone (70%) Isopropanol (30%) Mixture: 596 ppm

* See NIOSH, *RTECS* (AL3150000, NT8050000) for additional toxicity data on acetone and isopropyl alcohol, respectively.

Section 3. Physical Data

Boiling Point: 133 to 181 °F (56 to 83 °C) at 1 atm
Vapor Pressure: ca 225 mm Hg at 77 °F (25 °C)
Vapor Density (air = 1): ca 2
Density/Specific Gravity (20 °C/20 °C): 0.79
Water Solubility: Completely soluble
% Volatile by Volume: ca 100*

Appearance and Odor: A clear, colorless liquid with an acetone odor.

* Acetone solvent blend is a very volatile liquid that increases fire/explosion risk, especially at elevated temperatures.

Section 4. Fire and Explosion Data

Flash Point: 0 to 53 °F (-17.8 to 11.7 °C), CC	**Autoignition Temperature:** >750 °F (399 °C)*	**LEL:** 2.0% v/v	**UEL:** 12.0% v/v

Extinguishing Media: Alcohol foam, dry chemical, or carbon dioxide (CO$_2$). Use smothering effect to extinguish fire. Waterspray may be ineffective for extinguishing, but it is useful in cooling fire-exposed containers, in reducing fire intensity, and for diluting and flushing solvent.
Unusual Fire or Explosion Hazards: Acetone solvent blend is an OSHA Class 1B liquid. Fire and explosion hazards exist when this material is exposed to heat or ignition sources. Vapors may travel to an ignition source and flash back.
Special Fire-fighting Procedures: Isolate hazard area and deny entry. Stay upwind. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode, and full protective equipment. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

* An estimated value.

Section 5. Reactivity Data

Stability/Polymerization: Acetone solvent blend is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Acetone solvent blend is incompatible with strong oxidizing agents, strong acids, and strong alkalies.
Conditions to Avoid: Avoid heat and ignition sources.
Hazardous Products of Decomposition: Thermal oxidative decomposition of acetone solvent blend can produce carbon monoxide.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA do not list acetone solvent blend as a carcinogen.
Summary of Risks: Excessive vapor inhalation can cause mucous membrane and respiratory tract irritation. Eye contact can cause severe irritation. Prolonged or repeated skin contact can defat skin. It may be narcotic in high concentrations.
lical Conditions Aggravated by Long-Term Exposure: None reported.
get Organs: Skin, eyes, respiratory system, and central nervous system (CNS).
Primary Entry Routes: Inhalation, skin contact.
Acute Effects: Symptoms include respiratory tract irritation, nasal irritation, conjunctiva irritation, cough, headache, fatigue, dizziness, narcosis, and even asphyxiation. Skin contact causes dryness, irritation, and mild dermatitis. Ingestion produces gastrointestinal (GI) tract irritation and nausea. Injury to the kidneys is associated with ingestion of isopropyl alcohol and could potentially occur with significant ingestions of acetone solvent blend. Aspiration of vomitus into the lungs is a hazard and can result in severe illness or even death.
Chronic Effects: None reported.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If a small amount is ingested, have that *conscious and alert* person drink 1 to 2 glasses of water. Consult a physician.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Accidental or intentional ingestion may result in a state of intoxication difficult to distinguish from ethanol ingestion. Serum acetone and alcohol levels may be necessary to diagnose and monitor such a patient's status. In severe intoxication, arterial blood gases and pH, blood electrolytes, liver function studies, a baseline creatinine, blood counts, and urinalysis may be indicated. Watch for deteriorating CNS and respiratory function.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel of large spills, evacuate all unnecessary personnel, remove all heat and ignition sources, and provide maximum, explosion-proof ventilation. Cleanup personnel should protect against inhalation and skin or eye contact. For small spills, 1) absorb liquid with a noncombustible, absorbent material, and dispose; or 2) absorb on paper and burn. For large spills, dike far ahead to contain and collect for recycle or disposal. Use nonsparking tools to place waste liquid or absorbent in closable containers for disposal. Keep waste out of sewers, watersheds, or waterways. Follow applicable OSHA regulations (29 CFR 1910.120).
Environmental Degradation: When released on soil, acetone solvent blend probably both volatilizes and leaches into the ground and probably biodegrades. If released into water, it probably also biodegrades.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

A Designations

d as a RCRA Hazardous Waste (40 CFR 261.21): Ignitable Waste
A tone is listed as a RCRA Hazardous Waste (40 CFR 261.33)
Acetone is listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 5000 lb (2270 kg) [* per RCRA, Sec. 3001]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Acetone and isopropyl alcohol are listed as SARA Toxic Chemicals (40 CFR 372.65)

OSHA Designations

Acetone and isopropyl alcohol are listed as Air Contaminants (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles where necessary, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious natural rubber gloves, boots, aprons, and gauntlets to prevent skin contact.
Ventilation: Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

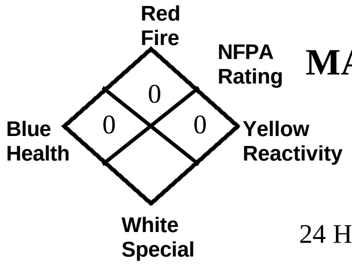
Storage Requirements: Store in a clean, cool, well-ventilated area away from heat and ignition sources, oxidizing agents, strong acids, and bases. Protect containers from physical damage. Emptied containers may still be hazardous from residual liquid or vapors. Store and handle as an OSHA Class 1B flammable liquid.
Engineering Controls: Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Make sure all engineering systems are of maximum explosion-proof design. Acetone solvent blend presents a dangerous fire and explosion hazard; form all work operations involving it carefully and in a way that prevents exposing liquid or its vapor to ignition sources. To prevent static s, electrically ground and bond all containers and pipelines used in shipping, transferring, reacting, production, and sampling operations. ider automatic sprinkler systems for fire protection in work areas.

Transportation Data (49 CFR 172.101, .102): See acetone and isopropyl alcohol (*MSDS Collection*, Nos. 300 and 324)

MSDS Collection References: 1, 2, 26, 38, 73, 84-94, 100, 101, 103, 116, 117, 120, 122, 124, 126, 132, 136, 138, 143, 146, 148, 159
Prepared by: M Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD ; **Edited by:** JR Stuart, MS

ALCONOX MSDS - ALCONOX MSDS - ALCONOX MSDS - ALCONOX MSDS - ALCONOX MSDS

Alconox ®



MATERIAL SAFETY DATA SHEET

Alconox, Inc.
30 Glenn Street
White Plains, NY 10603

24 Hour Emergency Number – Chem-Tel (800) 255-3924

I. IDENTIFICATION

Product Name (as appears on label)	ALCONOX
CAS Registry Number:	Not Applicable
Effective Date:	January 1, 2001
Chemical Family:	Anionic Powdered Detergent
Manufacturer Catalog Numbers for sizes	1104, 1125, 1150, 1101, 1103 and 1112

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
Melting Point:	Not Applicable
Evaporation Rate (Butyl Acetate=1):	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, CO_2, 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 CO_2 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.

VIII. 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

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Material Safety Data Sheets Collection:

Sheet No. 316
Benzene

Issued: 11/78 Revision: E, 8/90

Section 1. Material Identification

32

Benzene (C_6H_6) Description: Derived by fractional distillation of coal tar, hydrodealkylation of toluene or pyrolysis of gasoline, catalytic reforming of petroleum, and transalkylation of toluene by disproportionation reaction. Used as a fuel; a chemical reagent; a solvent for a large number of materials such as paints, plastics, rubber, inks, oils, and fats; in manufacturing phenol, ethylbenzene (for styrene monomer), nitrobenzene (for aniline), dodecylbenzene (for detergents), cyclohexane (for nylon), chlorobenzene, diphenyl, benzene hexachloride, maleic anhydride, benzene-sulfonic acid, artificial leather, linoleum, oil cloth, varnishes, and lacquers; for printing and lithography; in dry cleaning; in adhesives and coatings; for extraction and rectification; as a degreasing agent; in the tire industry; and in shoe factories. Benzene has been banned as an ingredient in products intended for household use and is no longer used in pesticides.

Other Designations: CAS No. 0071-43-2, benzol, carbon oil, coal naphtha, cyclohexatriene, mineral naphtha, nitration benzene, phene, phenyl hydride, pyrobenzol.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*(73) for a suppliers list.

R 1
I 4
S 2*
K 4
*Skin absorption

NFPA
3
2 0
-

HMIS
H 3
F 3
R 0
PPG†
† Sec. 8

Cautions: Benzene is a confirmed *human carcinogen* by the IARC. *Chronic low-level exposure may cause cancer (leukemia) and bone marrow damage, with injury to blood-forming tissue.* It is also a dangerous fire hazard when exposed to heat or flame.

Section 2. Ingredients and Occupational Exposure Limits

Benzene, ca 100%*

1989 OSHA PELs
(29 CFR 1910.1000, Table Z-1-A)
8-hr TWA: 1 ppm, 3 mg/m³
15-min STEL: 5 ppm, 15 mg/m³

(29 CFR 1910.1000, Table Z-2)
8-hr TWA: 10 ppm
Acceptable Ceiling Concentration: 25 ppm
Acceptable Maximum Peak: 50 ppm (10 min)†

1989-90 ACGIH
TLV-TWA: 10 ppm, 32 mg/m³

1988 NIOSH RELs
TWA: 0.1 ppm, 0.3 mg/m³
Ceiling: 1 ppm, 3 mg/m³

1985-86 Toxicity Data‡
Man, oral, LD_{Lo}: 50 mg/kg; no toxic effect noted
Man, inhalation, TC_{Lo}: 150 ppm inhaled intermittently over 1 yr in a number of discrete, separate doses affects the blood (other changes) and nutritional and gross metabolism (body temperature increase)
Rabbit, eye: 2 mg administered over 24 hr produces severe irritation

* OSHA 29 CFR 1910.1000, Subpart Z, states that the final benzene standard in 29 CFR 1910.1028 applies to all occupational exposures to benzene except in some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, il and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.

† Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift.

‡ See NIOSH, *RTECS* (CY1400000), for additional irritative, mutative, reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 176 °F (80 °C)
Melting Point: 42 °F (5.5 °C)
Vapor Pressure: 100 mm Hg at 79 °F (26.1 °C)
Vapor Density (Air = 1): 2.7
Evaporation Rate (Ether = 1): 2.8

Molecular Weight: 78.11
Specific Gravity (15 °C/4 °C): 0.8787
Water Solubility: Slightly (0.180 g/100 g of H_2O at 25 °C)
% Volatile by Volume: 100
Viscosity: 0.6468 mPa at 20 °C

Appearance and Odor: A colorless liquid with a characteristic sweet, aromatic odor. The odor recognition threshold (100% of panel) is approximately 5 ppm (unfatigued) in air. Odor *is not* an adequate warning of hazard.

Section 4. Fire and Explosion Data

Flash Point: 12 °F (-11.1 °C), CC	**Autoignition Temperature:** 928 °F (498 °C)	**LEL:** 1.3% v/v	**UEL:** 7.1% v/v

Extinguishing Media: Use dry chemical, foam, or carbon dioxide to extinguish benzene fires. Water may be ineffective as an extinguishing agent since it can scatter and spread the fire. Use water spray to cool fire-exposed containers, flush spills away from exposures, disperse benzene vapor, and protect personnel attempting to stop an unignited benzene leak.

Unusual Fire or Explosion Hazards: Benzene is a Class 1B flammable liquid. A concentration exceeding 3250 ppm is considered a potential fire explosion hazard. Benzene vapor is heavier than air and can collect in low lying areas or travel to an ignition source and flash back. Explosive and flammable benzene vapor-air mixtures can easily form at room temperature. Eliminate all ignition sources where benzene is used, handled, or stored.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Structural firefighter's protective clothing provides limited protection. Stay out of low areas. Be aware of runoff from fire control methods. Do not release to sewers or waterways. Runoff to sewer can create pollution, fire, and explosion hazard.

Section 5. Reactivity Data

Stability/Polymerization: Benzene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Benzene explodes on contact with diborane, permanganic acid, bromine pentafluoride, peroxodisulfuric acid, and roxomonosulfuric acid. It ignites on contact with dioxygen difluoride, dioxygenyl tetrafluoroborate, iodine heptafluoride, and sodium peroxide water. Benzene forms sensitive, explosive mixture with iodine pentafluoride, ozone, liquid oxygen, silver perchlorate, nitryl perchlorate, nitric id, and arsenic pentafluoride + potassium methoxide (explodes above 30 °C). A vigorous or incandescent reaction occurs with bromine rifluoride, uranium hexafluoride, and hydrogen + Raney nickel [above 410 °F (210 °C)]. Benzene is incompatible with oxidizing materials.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of benzene can produce toxic gases and vapors such as carbon monoxide.

Section 6. Health Hazard Data

Carcinogenicity: The ACGIH, OSHA, and IARC list benzene as, respectively, a supected human carcinogen, a cancer hazard, and, based on sufficient human and animal evidence, a human carcinogen (Group 1).

Summary of Risks: Prolonged skin contact or excessive inhalation of benzene vapor may cause headache, weakness, appetite loss, and fatigue. e most important health hazards are cancer (leukemia) and bone marrow damage with injury to blood-forming tissue from chronic low-level osure. Higher level exposures may irritate the respiratory tract and cause central nervous system (CNS) depression.

edical Conditions Aggravated by Long-Term Exposure: Exposure may worsen ailments of the heart, lungs, liver, kidneys, blood, and CNS.

Target Organs: Blood, central nervous system, bone marrow, eyes, upper respiratory tract, and skin.

Primary Entry Routes: Inhalation, skin contact.

Acute Effects: Symptoms of acute overexposure include irritation of the eyes, nose, and respiratory tract, breathlessness, euphoria, nausea, drowsiness, headache, dizziness, and intoxication. Severe exposure may lead to convulsions and unconsciousness. Skin contact may cause a drying rash (dermatitis).

Chronic Effects: Long-term chronic exposure may result in many blood disorders ranging from aplastic anemia (an inability to form blood cells) to leukemia.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin: *Quickly* remove contaminated clothing. Immediately rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.

Inhalation: Remove exposed person to fresh air. Emergency personnel should protect against inhalation exposure. Provide CPR to support breathing or circulation as necessary. Keep awake and transport to a medical facility.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* since aspiration may be fatal. Call a physician immediately.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Physician's Note: Evaluate chronic exposure with a CBC, peripheral smear, and reticulocyte count for signs of myelotoxicity. Follow up any early indicators of leukemia with a bone marrow biopsy. Urinary phenol conjugates may be used for biological monitoring of recent exposure. Acute management is primarily supportive for CNS depression.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: *Design and practice a benzene spill control and countermeasure plan (SCCP).* Notify safety personnel, evacuate all unnecessary personnel, eliminate all heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against vapor inhalation, eye contact, and skin absorption. Absorb as much benzene as possible with an inert, noncombustible material. For large spills, dike far ahead of spill and contain liquid. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of confined spaces such as sewers, watersheds, and waterways because of explosion danger. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.33), Hazardous Waste No. U019

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1000 lb (454 kg) [* per Clean Water Act, Sec. 307 (a), 311 (b)(4), 112; and per RCRA, Sec. 3001]

ARA Extremely Hazardous Substance (40 CFR 355): Not listed

d as SARA Toxic Chemical (40 CFR 372.65)

IA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Tables Z-1-A and Z-2)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations at least below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.(103)

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a cool, dry, well-ventilated area away from all heat and ignition sources and incompatible materials. *Caution! Benzene vapor may form explosive mixtures in air.* To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. When opening or closing benzene containers, use nonsparking tools. Keep fire extinguishers readily available.

Engineering Controls: Because OSHA specifically regulates benzene (29 CFR 1910.1028), educate workers about its potential hazards and dangers. Minimize all possible exposures to carcinogens. If possible, substitute less toxic solvents for benzene; use this material with extreme caution and only if absolutely essential. Avoid vapor inhalation and skin and eye contact. Use only with adequate ventilation and appropriate personal protective gear. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Designate regulated areas of benzene use (see legend in the box below) and label benzene containers with "DANGER, CONTAINS BENZENE, CANCER HAZARD."

Other Precautions: Provide preplacement and periodic medical examinations with emphasis on a history of blood disease or previous exposure.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Benzene (*benzol*)
DOT Hazard Class: Flammable liquid
No.: UN1114
Label: Flammable liquid
Packaging Exceptions: 173.118
DOT Packaging Requirements: 173.119

IMO Shipping Name: Benzene
IMO Hazard Class: 3.2
ID No.: UN1114
IMO Label: Flammable liquid
IMDG Packaging Group: II

DANGER
BENZENE
CANCER HAZARD
FLAMMABLE–NO SMOKING
AUTHORIZED PERSONNEL ONLY
RESPIRATOR REQUIRED

MSDS Collection **References:** 1, 2, 12, 26, 73, 84-94, 100, 101, 103, 109, 124, 126, 127, 132, 134, 136, 138, 139, 143

Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** MJ Upfal, MD, MPH; **Edited by:** JR Stuart, MS

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Material Safety Data Sheets Collection:

Sheet No. 757
Coal Tar Creosote

Issued: 7/91

Section 1. Material Identification

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Coal Tar Creosote (molecular formula varies with purity) Description: Three main derivations: by distillation of coal tar produced by high-temperature carbonization of bituminous coal; by mixing strained naphthalene oil, wash oil, and strained or light anthracene oil; as a by-product of conventional coal coking. It typically contains up to 160 chemicals, mainly aromatic compounds such as phenol, pyrol and pyridine. Used mainly as a wood preservative for railroad ties, poles, fence posts, marine pilings, and other lumber for outdoor use; as a water-proofing agent, fuel oil constituent, frothing agent for mineral separation, hop defoliant, and lubricant for die molds; in manufacturing chemicals; and in medicine as an antiseptic, disinfectant, antipyretic, astringent, germicide, and styptic.
Other Designations: CAS No. 8001-58-9, Awpa,® brick oil, Caswell No. 225,® coal tar oil, creosote, creosote oil, creosotum, cresylic creosote, heavy oil, liquid pitch oil, naphthalene oil, Preserv-o-sote,® Sakresote,® tar oil, wash oil.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*⁽⁷³⁾ for a suppliers list.
Cautions: Flammable, liquid coal tar creosote is toxic by inhalation, ingestion, and skin contact. The IARC and NTP classify it as *a human carcinogen.*

R 1
I 4
S 4*
K 2
* Skin absorption

NFPA
2
2 0
-

HMIS
H 2
F 2
R 0
PPG†
† Sec. 8

* Skin absorption can occur with phenol, a major component of coal tar creosote.

Section 2. Ingredients and Occupational Exposure Limits

Coal tar creosote, ca 100%

1990 OSHA PEL
8-hr TWA: 0.2 mg/m³*

1987 IDLH Level
700 mg/m³

1990-91 ACGIH TLV
TWA: 0.2 mg/m³*

1990 NIOSH REL
0.1 mg/m³ (cyclohexane extractable portion)

1985-86 Toxicity Data†
Rat, oral, LD_{50}: 725 mg/kg; toxic effects not yet reviewed
Dog, oral, LD_{Lo}: 600 mg/kg; toxic effects not yet reviewed
Rat, TD_{Lo}: 52,416 mg/kg administered during 91 days prior to mating produces reproductive effects on fallopian tubes and ovaries
Mouse, skin, TD_{Lo}: 99 g/kg produces tumors in skin and appendages

* As coal tar pitch volatiles.
† See NIOSH, *RTECS* (GF8615000), for additional mutation, reproductive, tumorigenic, and other toxicity data.

Section 3. Physical Data

Boiling Point: 381 to 752 °F (194 to 400 °C)
Distillation Range: 446 to 554 °F (230 to 290 °C)
Heat of Combustion: -12,500 Btu/lb
Heat of Vaporization: 107 Btu/lb
Molecular Weight: Varies with purity
Density/Specific Gravity: 1.07 to 1.08 at 68 °F (20 °C)
Water Solubility: Slightly soluble

Appearance and Odor: Pure coal tar creosote is colorless, but the industrial product is a yellow to black oily liquid with an aromatic smoky smell and a burning caustic taste.

Section 4. Fire and Explosion Data

Flash Point: 165.2 °F (74 °C), CC	**Autoignition Temperature:** 637 °F (336 °C)	**LEL:** None reported	**UEL:** None reported

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO_2), or regular foam. For large fires, use fog or regular foam. Since water is least effective, use it as an extinguishing agent only when the preferred measures are unavailable. However, use water spray to cool fire-exposed containers.
Unusual Fire or Explosion Hazards: Vapors may travel to an ignition source and flash back. Containers may explode in heat of fire. Coal tar creosote presents a vapor explosion hazard indoors, outdoors, and in sewers.
Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear full protective clothing. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. Immediately leave area if you hear a rising sound from venting safety device or notice any fire-caused tank discoloration. Isolate area for 1/2 mile in all directions if fire involves tank, rail car or tank truck. Be aware of runoff from fire control methods. Do not release to sewers or waterways. Fully decontaminate or properly dispose of personal protective clothing.

Section 5. Reactivity Data

Stability/Polymerization: Coal tar creosote is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Creosote oil mixed with chlorosulfonic acid in a closed container causes an increase in temperature and pressure.
Conditions to Avoid: Avoid excessive heat and contact with chlorosulfonic acid.
Hazardous Products of Decomposition: Thermal oxidative decomposition of coal tar creosote can produce oxides of carbon and thick, black, acrid smoke.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA list coal tar creosote as a carcinogen.
Summary of Risks: Coal tar creosote is toxic by inhalation, ingestion, and skin contact. It contains a variety of hydrocarbons such as phenol and polycyclic aromatic hydrocarbons such as benzo[a]pyrene, benzanthracene, and phenol derivatives. The range of toxicity depends on the exposure ration, amount, and duration. Effects may include irritation, burns, and several forms of cancer.
l Conditions Aggravated by Long-Term Exposure: Chronic respiratory or skin diseases.
Ta Organs: Eyes, skin, bladder, kidneys, and respiratory system.
Primary Entry Routes: Inhalation, ingestion, and skin contact.
Acute Effects: Skin contact may cause irritation, burning, itching, redness, pigment changes, dermatitis (a rash of redness and small bumps), or ourns. Photosensitization (worsening of rash with exposure to sunlight) may occur. Inhalation may be irritating to the respiratory tract. Eye contact may cause conjunctivitis (inflammation of the eye's lining), keratitis (corneal inflammation), or corneal burns with scarring. Ingestion may result in nausea, vomiting, abdominal pain, rapid pulse, respiratory distress, and shock. Systemic absorption by any route (including skin absorption) may cause trouble breathing, thready (continuous or drawn out) pulse, dizziness, headache, nausea, vomiting, salivation, and convulsions. Exposure to large doses (particularly by ingestion) may be fatal.
Chronic Effects: Dermatitis, skin cancer, and lung cancer.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. *Do not* let victim rub eyes or keep them tightly closed. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Wash affected area with soap and flooding amounts of water for at least 15 min. For reddened or olistered skin, consult a physician.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
ngestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious* person drink 1 to 2 glasses of nilk or water. *Do not induce vomiting!*
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Cresol may be detected in urine.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel. Isolate hazard area, deny entry, and stay upwind of spills. Shut off all ignition sources–no flares, smoking, or lames in hazard area. Cleanup personnel should protect against vapor inhalation and skin or eye contact. If possible with no risk, stop leak. Water spray may be used to reduce vapor but it may not prevent ignition in closed spaces. For small spills, take up with earth, sand, vermiculite, or other ibsorbent, noncombustible material and place in suitable containers for later disposal. For large spills, dike far ahead of liquid spill for later lisposal. Follow applicable OSHA regulations (29 CFR 1910.120).
Environmental Degradation: Coal tar creosote is fouling to shoreline. Ecotoxicity values are: TL_{m}, goldfish (*Carassius auratus*), 3.51 ppm/24 hr 60:40) mixture of creosote and coal tar; LD_{50}, bob white quail (*Colinus virginianus*), 1,260 ppm/8 days (60:40) mixture of creosote and coal tar.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33), Hazardous Material No. U051
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1 lb (0.454 kg) [* per RCRA, Sec. 3001]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
a SARA Toxic Chemical (40 CFR 372.65)
esignations
Liste as coal tar pitch volatiles) as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since ontact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if ecessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an CBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent all skin contact. Applying a layer of petroleum jelly or lanolin castor oil intment to the face reduces vapor contact and penetration through skin. Frequent change of protective garments is an additional protective easure.
entilation: Provide general and local exhaust ventilation systems equipped with high-efficiency particulate filters to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by ontrolling it at its source.(103)
afety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
ontaminated Equipment: Take particular care to avoid any contamination of drains or ventilation ducts. Remove this material from your shoes d equipment. Launder contaminated clothing before wearing.
omments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, noking, using the toilet, or applying cosmetics.

ection 9. Special Precautions and Comments

torage Requirements: Avoid physical damage to containers. Store in a cool, dry, well-ventilated area. Store coal tar creosote as close to area of e as possible to minimize transporting distance.
ngineering Controls: Use engineering controls to keep airborne concentrations below the OSHA PEL. Institute a respiratory protection ogram that includes regular training, maintenance, inspection, and evaluation. Always perform synthesis and purification procedures under a rtical ventilation hood and make regular operational safety checks. Label doors to rooms where coal tar creosote is produced, used, or stored as ntaining a carcinogen. Locate emergency equipment at well-marked and clearly identified stations in case emergency escape is necessary.
ther Precautions: Preplacement and periodic medical examinations of exposed workers emphasizing respiratory, skin, liver, and kidney sorders, including comprehensive work and medical history, physical examination, CXR, PFTs, urinalysis, LFT, and sputum cytology as the ending physician considers appropriate. Educate workers about coal tar creosote's carcinogenicity and proper handling procedures to avoid posure.
ther Comments: Caution is in order when handling or sawing old creosote-treated lumber since it retains a considerable portion of creosote for to 25 to 30 years.
ransportation Data (49 CFR 172.101)
pping Name: Creosote
ard Class: Flammable liquid
No.: UN1136
OT Label: Flammable liquid

SDS Collection **References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 138, 139, 140, 142, 143, 146, 148, 153, 159
epared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** Mark Upfal, MD, MPH; **Edited by:** JR Stuart, MS

Occupational Health Guideline for Coal Tar Pitch Volatiles

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

Anthracene

- Formula: $C_{14}H_{10}$
- Synonyms: None
- Appearance and odor: Pale green solid with a faint aromatic odor.

Phenanthrene

- Formula: $C_{14}H_{10}$
- Synonyms: None
- Appearance and odor: Colorless solid with a faint aromatic odor.

Pyrene

- Formula: $C_{16}H_{10}$
- Synonyms: None
- Appearance: Bright yellow solid

Carbazole

- Formula: $C_{12}H_9N$
- Synonyms: None
- Appearance and odor: Colorless solid with a faint aromatic odor.

Benzo(a)pyrene

- Formula: $C_{20}H_{12}$
- Synonyms: BaP, 3,4-benzopyrene
- Appearance and odor: Colorless solid with a faint aromatic odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for coal tar pitch volatiles is 0.2 milligram of coal tar pitch volatiles per cubic meter of air (mg/m^3) averaged over an eight-hour work shift. NIOSH has recommended that the permissible exposure limit for coal tar products be reduced to 0.1 mg/m^3 (cyclohexane-extractable fraction) averaged over a work shift of up to 10 hours per day, 40 hours per week, and that coal tar products be regulated as occupational carcinogens. The NIOSH Criteria Document for Coal Tar Products and NIOSH Criteria Document for Coke Oven Emissions should be consulted for more detailed information.

HEALTH HAZARD INFORMATION

- **Routes of exposure**

Coal tar pitch volatiles can affect the body if they are inhaled or if they come in contact with the eyes or skin.

- **Effects of overexposure**

Repeated exposure to coal tar pitch volatiles has been associated with an increased risk of developing bronchitis and cancer of the lungs, skin, bladder, and kidneys. Pregnant women may be especially susceptible to exposure effects associated with coal tar pitch volatiles. Repeated exposure to these materials may also cause sunlight to have a more severe effect on a person's skin. In addition, this type of exposure may cause an allergic skin rash.

- **Reporting signs and symptoms**

A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to coal tar pitch volatiles.

- **Recommended medical surveillance**

The following medical procedures should be made available to each employee who is exposed to coal tar pitch volatiles at potentially hazardous levels:

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

1. *Initial Medical Examination:*

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the oral cavity, respiratory tract, bladder, and kidneys should be stressed. The skin should be examined for evidence of chronic disorders, for premalignant and malignant lesions, and evidence of hyperpigmentation or photosensitivity.

—Urinalysis: Coal tar pitch volatiles are associated with an excess of kidney and bladder cancer. A urinalysis should be obtained to include at a minimum specific gravity, albumin, glucose, and a microscopic on centrifuged sediment, as well as a test for red blood cells.

—Urinary cytology: Coal tar pitch volatiles are associated with an excess of kidney and bladder cancer. Employees having 5 or more years of exposure or who are 45 years of age or older should have a urinary cytology examination.

—Sputum cytology: Coal tar pitch volatiles are associated with an excess of lung cancer. Employees having 10 or more years of exposure or who are 45 years of age or older should have a sputum cytology examination.

—14" x 17" chest roentgenogram: Coal tar pitch volatiles are associated with an excess of lung cancer. Surveillance of the lungs is indicated.

—FVC and FEV (1 sec): Coal tar pitch volatiles are reported to cause an excess of bronchitis. Periodic surveillance is indicated.

—A complete blood count: Due to the possibility of benzene exposure associated with coal tar pitch volatiles, a complete blood count is considered necessary to search for leukemia and aplastic anemia.

—Skin disease: Coal tar pitch volatiles are defatting agents and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of these agents.

2. *Periodic Medical Examination:* The aforementioned medical examinations should be repeated on an annual basis, and semi-annually for employees 45 years of age or older or with 10 or more years' exposure to coal tar pitch volatiles.

- **Summary of toxicology**

Coal tar pitch volatiles (CTPV) are products of the destructive distillation of bituminous coal and contain polynuclear aromatic hydrocarbons (PNA's). These hydrocarbons sublime readily, thereby increasing the amounts of carcinogenic compounds in working areas. Epidemiologic evidence suggests that workers intimately exposed to the products of combustion or distillation of bituminous coal are at increased risk of cancer at many sites. These include cancer of the respiratory tract, kidney, bladder, and skin. In a study of coke oven workers, the level of exposure to CTPV and the length of time exposed were related to the development of cancer. Coke oven workers with the highest risk of cancer were those employed exclusively at topside jobs for 5 or more years, for whom the increased risk of dying from lung cancer was 10-fold; all coke oven workers had a 7-½-fold increase in risk of dying from kidney cancer. Although the causative agent or agents of the cancer in coke oven workers is unidentified, it is suspected that several PNA's in the CTPV generated during the coking process are involved. Certain industrial populations exposed to coal tar products have a demonstrated risk of skin cancer. Substances containing PNA's which may produce skin cancer also produce contact dermatitis; examples are coal tar, pitch, and cutting oils. Although allergic dermatitis is readily induced by PNA's in guinea pigs, it is only rarely reported in humans from occupational contact with PNA's; these have resulted largely from the therapeutic use of coal tar preparations. Components of pitch and coal tar produce cutaneous photosensitization; skin eruptions are usually limited to areas exposed to the sun or ultraviolet light. Most of the phototoxic agents will induce hypermelanosis of the skin; if chronic photodermatitis is severe and prolonged, leukoderma may occur. Some oils containing PNA's have been associated with changes of follicular and sebaceous glands which commonly take the form of acne. There is evidence that exposures to emissions at coke ovens and gas retorts may be associated with an increased occurrence of chronic bronchitis. Coal tar pitch volatiles may be associated with benzene, an agent suspected of causing leukemia and known to cause aplastic anemia.

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data—Anthracene**

1. Molecular weight: 178.2
2. Boiling point (760 mm Hg): 340 C (644 F)
3. Specific gravity (water = 1): 1.24
4. Vapor density (air = 1 at boiling point of anthracene): 6.15
5. Melting point: 217 C (423 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

- **Physical data—Phenanthrene**

1. Molecular weight: 178.2
2. Boiling point (760 mm Hg): 340 C (644 F)
3. Specific gravity (water = 1): 1.18
4. Vapor density (air = 1 at boiling point of phenanthrene): 6.15
5. Melting point: 100.5 C (213 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

- **Physical data—Pyrene**

1. Molecular weight: 202.3
2. Boiling point (760 mm Hg): Greater than 360 C (greater than 680 F)

3. Specific gravity (water = 1): 1.28
4. Vapor density (air = 1 at boiling point of pyrene): 6.9
5. Melting point: 150.4 C (303 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

- **Physical data—Carbazole**

1. Molecular weight: 167.2
2. Boiling point (760 mm Hg): 355 C (671 F)
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of carbazole): 5.8
5. Melting point: 246 C (475 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

- **Physical data—Benzo(a)pyrene**

1. Molecular weight: 252.3
2. Boiling point (760 mm Hg): Greater than 360 C (greater than 680 F)
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of benzo(a)pyrene): 8.7
5. Melting point: 179 C (354 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

- **Reactivity**

1. Conditions contributing to instability: None hazardous
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: None
4. Special precautions: None

- **Flammability**

1. Flash point: Anthracene: 121 C (250 F) (closed cup); Others: Data not available
2. Autoignition temperature: Anthracene: 540 C (1004 F); Others: Data not available
3. Flammable limits in air, % by volume: Anthracene: Lower: 0.6; Others: Data not available
4. Extinguishant: Foam, dry chemical, and carbon dioxide

- **Warning properties**

Grant states that "coal tar and its various crude fractions appear principally to cause reddening and squamous eczema of the lid margins, with only small erosions of the corneal epithelium and superficial changes in the stroma, which disappear in a month following exposure. Chronic exposure of workmen to tar fumes and dust has been reported to cause conjunctivitis and discoloration of the cornea in the palpebral fissure, either near the limbus or, in extreme cases, across the whole cornea. Occasionally, epithelioma of the lid margin has been attributed to contact with coal tar."

MONITORING AND MEASUREMENT PROCEDURES

- **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

- **Method**

Coal tar products may be sampled by collection on a glass fiber filter with subsequent ultrasonic extraction and weighing. An analytical method for coal tar pitch volatiles is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 1, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00267-3).

RESPIRATORS

- Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.
- In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent skin contact with condensed coal tar pitch volatiles, where skin contact may occur.
- If employees' clothing may have become contaminated with coal tar pitch volatiles, employees should change into uncontaminated clothing before leaving the work premises.
- Clothing contaminated with coal tar pitch volatiles

should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of coal tar pitch volatiles from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the coal tar pitch volatiles, the person performing the operation should be informed of coal tar pitch volatiles's hazardous properties.

- Employees should be provided with and required to use splash-proof safety goggles where condensed coal tar pitch volatiles may contact the eyes.

SANITATION

- Workers subject to skin contact with coal tar pitch volatiles should wash with soap or mild detergent and water any areas of the body which may have contacted coal tar pitch volatiles at the end of each work day.
- Employees who handle coal tar pitch volatiles should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.
- Areas in which exposure to coal tar pitch volatiles may occur should be identified by signs or other appropriate means, and access to these areas should be limited to authorized persons.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in hich exposure to coal tar pitch volatiles may occur and control methods which may be effective in each case:

Operation	Controls
Liberation from extraction and packaging from coal tar fraction of coking	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use as a binding agent in manufacture of coal briquettes used for fuel; use as a dielectric in the manufacture of battery electrodes, electric-arc furnace electrodes, and electrodes for alumina reduction	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in manufacture of roofing felts and papers and roofing	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use for protective coatings for pipes for underground conduits and drainage; use as a coating on concrete as waterproofing and corrosion-resistant material; use in road paving and sealing	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in manufacture and repair of refractory brick; use in production of foundry cores; use in manufacture of carbon ceramic items	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

- **Eye Exposure**

If condensed coal tar pitch volatiles get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with these chemicals.

- **Skin Exposure**

If condensed coal tar pitch volatiles get on the skin, wash the contaminated skin using soap or mild detergent and water. Be sure to wash the hands before eating or smoking and to wash thoroughly at the close of work.

- **Breathing**

If a person breathes in large amounts of coal tar pitch volatiles, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

- **Rescue**

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of releases until cleanup has been completed.
- If coal tar pitch volatiles are released in hazardous concentrations, the following steps should be taken:

1. Ventilate area of spill.

2. Collect released material in the most convenient and safe manner for reclamation or for disposal in sealed containers in a secured sanitary landfill.

- Waste disposal method:

Coal tar pitch volatiles may be disposed of in sealed containers in a secured sanitary landfill.

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RESPIRATORY PROTECTION FOR COAL TAR PITCH VOLATILES

Condition	Minimum Respiratory Protection* Required Above 0.2 mg/m³
Particulate and Vapor Concentration	
2 mg/m³ or less	A chemical cartridge respirator with an organic vapor cartridge(s) and with a fume or high-efficiency filter. Any supplied-air respirator. Any self-contained breathing apparatus.
10 mg/m³ or less	A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s) and with a fume or high-efficiency filter. A gas mask with a chin-style or a front- or back-mounted organic vapor canister and with a full facepiece and a fume or high-efficiency filter. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
200 mg/m³ or less	A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode. A powered air-purifying respirator with an organic vapor cartridge and a high-efficiency particulate filter.
400 mg/m³ or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 400 mg/m³ or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors and particulates, including pesticide respirators which meet the requirements of this class. Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.

Occupational Health Guideline for Cyanide

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

APPLICABILITY

The general guidelines contained in this document apply to all cyanides. Physical and chemical properties of two specific compounds are provided for illustrative purposes.

SUBSTANCE IDENTIFICATION

Potassium cyanide

- Formula: KCN
- Synonyms: None
- Appearance and odor: White solid with a faint almond odor.

Sodium cyanide

- Formula: NaCN
- Synonyms: None
- Appearance and odor: White solid with a faint almond odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for cyanide is 5 milligrams of cyanide per cubic meter of air (mg/m^3) averaged over an eight-hour work shift. NIOSH has recommended that the permissible exposure limit be changed to a ceiling of 5 milligrams cyanide per cubic meter of air averaged over a 10-minute period. The NIOSH Criteria Document for Hydrogen Cyanide and Cyanide Salts should be consulted for more detailed information.

HEALTH HAZARD INFORMATION

- Routes of exposure

Cyanide can affect the body if it is inhaled, if it comes in contact with the eyes or skin, or if it is swallowed. Sufficient cyanide may be absorbed through the skin, especially if there are cuts to cause fatal poisoning.

- Effects of overexposure

1. Short-term Exposure: Inhalation or ingestion of cyanide salts may be rapidly fatal. Larger doses by inhalation or swallowing may cause the person to rapidly lose consciousness, stop breathing, and die. In some cases, there are convulsions. At lower levels of exposure, the earlier symptoms include weakness, headache, confusion, nausea, and vomiting. These symptoms may be followed by unconsciousness and death. Occasionally, convulsions occur. Milder forms of intoxication may result only in weakness, dizziness, headache, and nausea. The dust of cyanide salts is irritating to the eyes. In the presence of tears, it may cause the symptoms of poisoning described above. The dust of cyanide salts may produce irritation of the nose and skin. Strong solutions of cyanide salts are corrosive and may produce ulcers.

2. Long-term Exposure: Effects from chronic exposure to cyanide are non-specific and rare.

3. Reporting Signs and Symptoms: A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to cyanide.

- Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to cyanide at potentially hazardous levels:

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Persons with a history of fainting spells, such as occur in various types of cardiovascular and nervous disorders,

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These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
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Occupational Safety and Health Administration

and those unusually susceptible to effects of anoxia or with anemia would be expected to be at increased risk from exposure. Examination of the cardiovascular, nervous, and upper respiratory systems, and thyroid should be stressed. The skin should be examined for evidence of chronic disorders.

—Skin disease: Cyanide is a defatting agent and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

—14" x 17" chest roentgenogram: Cyanide causes human lung damage. Surveillance of the lungs is indicated.

—FVC and FEV (1 sec): Cyanide is a respiratory irritant. Persons with impaired pulmonary function may be at increased risk from exposure. Periodic surveillance is indicated.

2. *Periodic Medical Examination:* The aforementioned medical examinations should be repeated on an annual basis.

3. *First Aid Kits:* First aid kits should be readily available in workplaces where there is a potential for the release of cyanide. These kits should contain a minimum of 48 ampules, each of 0.3 ml amyl nitrate, and complete instructions for use. In addition, 2 physician's kits should be immediately available to trained medical personnel. These kits should contain the above quantity of amyl nitrate as well as sterile sodium nitrite solution (3%) and sterile sodium thiosulfate solution (25%). All of the above drugs should be replaced at least biannually to ensure their potency.

- Summary of toxicology

The dust of cyanide salts, a source of cyanide ion, is an asphyxiant due to an inhibitory action on metabolic enzyme systems and can be rapidly fatal. Cyanide exerts this effect because it inactivates certain enzymes by forming very stable complexes with the metal in them. Cytochrome oxidase is probably the most important of these, since it occupies a fundamental position in the respiratory process and is involved in the ultimate electron transfer to molecular oxygen. Since cytochrome oxidase is present in practically all cells that function under aerobic conditions, and since the cyanide ion diffuses easily to all parts of the body, it is capable of suddenly bringing to a halt practically all cellular respiration. In the presence of even weak acids, hydrocyanic acid (HCN) gas is liberated from cyanide salts; a few inhalations of higher concentrations of HCN may be followed by almost instantaneous collapse and cessation of respiration; 270 ppm HCN is immediately fatal to humans, 181 ppm is fatal after 10 minutes, 135 ppm after 30 minutes, and 110 ppm may be fatal in 1 hour. The ingestion by humans of 50 to 100 mg of sodium or potassium cyanide may also be fatal. At lower levels of exposure to HCN, the earliest symptoms of intoxication may include weakness, headache, confusion, and occasionally nausea and vomiting; respiratory rate and depth is usually increased initially and at later stages becomes slow and gasping; if cyanosis is present, it usually indicates that respiration has either ceased or has been very inadequate for a few minutes. Humans tolerate 45 to 54 ppm for ½ to 1 hour without immediate or delayed effects, while 18 to 36 ppm may result in some symptoms after an exposure of several hours. Sodium cyanide dust is irritating to the eyes; in the presence of tears it may liberate HCN, which can be absorbed and cause systemic intoxication. Skin contact with dust may be irritating; strong solutions on the skin produce ulcers which are slow in healing. Cyanide is one of the few toxic materials for which an antidote exists; it functions as follows: First, amyl nitrite (inhalation) and sodium nitrite (intravenously) are administered to form methemoglobin, which binds firmly with free cyanide ions. This traps any circulating cyanide ions. The formation of 10 to 20% methemoglobin usually does not involve appreciable risk, yet provides a large amount of cyanide-binding substance. Second, sodium thiosulfate is administered intravenously to increase the rate of conversion of cyanide to the less toxic thiocyanate. Methylene blue should not be administered, because it is a poor methemoglobin former and, moreover, promotes the conversion of methemoglobin back to hemoglobin.

CHEMICAL AND PHYSICAL PROPERTIES

- Physical data—Potassium cyanide

1. Molecular weight: 65.1
2. Boiling point (760 mm Hg): Data not available
3. Specific gravity (water = 1): 1.55
4. Vapor density (air = 1 at boiling point of potassium cyanide): Not applicable
5. Melting point: 635 C (1175 F)
6. Vapor pressure at 20 C (68 F): Essentially zero
7. Solubility in water, g/100 g water at 20 C (68 F): 71.6
8. Evaporation rate (butyl acetate = 1): Not applicable

- Physical data—Sodium cyanide

1. Molecular weight: 49
2. Boiling point (760 mm Hg): 1500 C (2732 F) (extrapolated)
3. Specific gravity (water = 1): 1.6
4. Vapor density (air = 1 at boiling point of sodium cyanide): Not applicable
5. Melting point: 560 C (1040 F)
6. Vapor pressure at 20 C (68 F): Essentially zero
7. Solubility in water, g/100 g water at 20 C (68 F): 58
8. Evaporation rate (butyl acetate = 1): Not applicable

- Reactivity

1. Conditions contributing to instability: None. Hazardous if kept in closed containers. It may form toxic concentrations of hydrogen cyanide gas when in prolonged contact with air in a closed area.
2. Incompatibilities: Contact with strong oxidizers such as nitrates and chlorates may cause fires and

explosions. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas.

3. Hazardous decomposition products: Toxic gases and vapors (such as hydrogen cyanide and carbon monoxide) may be released when cyanide decomposes.

4. Special precautions: Cyanide may react with carbon dioxide in ordinary air to form toxic hydrogen cyanide gas.

- Flammability

1. Not combustible

- Warning properties

1. Odor Threshold: No quantitative information is available concerning the odor threshold of sodium or potassium cyanide. HCN, however, is evolved from these substances in the presence of moisture. The Manufacturing Chemists Association states that "although HCN has a characteristic odor, its toxic action at hazardous concentrations is so rapid that it is of no value as a warning property."

2. Eye Irritation Level: Cyanide (as CN) is not known to be an eye irritant. However, according to Grant, HCN can produce eye irritation after chronic exposures.

3. Evaluation of Warning Properties: Although cyanide (as CN) has a negligible vapor pressure, in the presence of moisture HCN can be given off. HCN does not have adequate warning properties.

MONITORING AND MEASUREMENT PROCEDURES

- Eight-Hour Exposure Evaluation

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

- Ceiling Evaluation

Measurements to determine employee ceiling exposure are best taken during periods of maximum expected airborne concentrations of cyanide. Each measurement should consist of a ten (10) minute sample or series of consecutive samples totalling ten (10) minutes in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). A minimum of three (3) measurements should be taken on one work shift and the highest of all measurements taken is an estimate of the employee's exposure.

- Method

Sampling and analyses may be performed by collection of cyanide with a cellulose membrane filter and an impinger containing sodium hydroxide, followed by analysis by direct potentiometry. An analytical method for cyanide is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 3, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00261-4).

RESPIRATORS

- Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.
- In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent any possibility of skin contact with cyanide or liquids containing cyanide.
- If employees' clothing has had any possibility of being contaminated with cyanide, employees should change into uncontaminated clothing before leaving the work premises.
- Clothing which has had any possibility of being contaminated with cyanide should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of cyanide from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the cyanide, the person performing the operation should be informed of cyanide's hazardous properties.
- Where there is any possibility of exposure of an employee's body to cyanide or liquids containing cyanide, facilities for quick drenching of the body should be provided within the immediate work area for emergency use.
- Non-impervious clothing which becomes contaminated with cyanide should be removed immediately and not reworn until the cyanide is removed from the clothing.
- Employees should be provided with and required to use dust- and splash-proof safety goggles where there is any possibility of cyanide or liquids containing cyanide contacting the eyes.

- Where there is any possibility that employees' eyes may be exposed to cyanide or liquids containing cyanide, an eye-wash fountain should be provided within the immediate work area for emergency use.

SANITATION

- Skin that becomes contaminated with cyanide should be immediately washed or showered with soap or mild detergent and water to remove any cyanide.
- Workers subject to skin contact with cyanide should wash with soap or mild detergent and water any areas of the body which may have contacted cyanide at the end of each work day.
- Eating and smoking should not be permitted in areas where cyanide or liquids containing cyanide are handled, processed, or stored.
- Employees who handle cyanide or liquids containing cyanide should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to cyanide may occur and control methods which may be effective in each case:

Operation	Controls
Use as fumigants and pesticides in greenhouses, ships, mills, and warehouses; use of cyanogen chloride as a warning agent in fumigant gases	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in metal treatment in nitriding, tempering, and case hardening steel; coloring of metals by chemical or electrolytic process; cleaning and coating metals; welding and cutting of heat-resistant metals; liberation during ore extraction and metal purification	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use of calcium cyanamid in fertilizer on soil; during chemical synthesis for manufacture of intermediates in pharmaceuticals, dyes, vitamins, plastics, and sequestering agents; preparation of nitriles, carbylamines, cyano fatty acids, and inorganic cyanides	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in cellulose technology; paper manufacture; in dyeing; as cement stabilizers; use in photography as fixatives, and in blueprinting and process engraving; liberation in blast furance gases or in handling of illuminating gas	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

- Eye Exposure

If cyanide gets into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention immediately. Contact lenses should not be worn when working with cyanides.

- Skin Exposure

If cyanide gets on the skin, immediately wash the contaminated skin using soap or mild detergent and water. If cyanide penetrates through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Get medical attention immediately.

- Breathing

If a person breathes in large amounts of cyanide, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

- Swallowing

When cyanide has been swallowed and the person is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

- Rescue

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of spills until cleanup has been completed.
- If cyanide is spilled, the following steps should be taken:

1. Ventilate area of spill.
2. Collect spilled material in the most convenient and safe manner for reclamation, or for treatment in a cyanide disposal system.

- Waste disposal method:

After treatment as in above, cyanide may be disposed of in a secured sanitary landfill.

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RESPIRATORY PROTECTION FOR CYANIDE

Condition	Minimum Respiratory Protection* Required Above 5 mg/m³
Particulate Concentration	
50 mg/m³ or less	Any supplied-air respirator. Any self-contained breathing apparatus.
Greater than 50 mg/m³ or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against hydrogen cyanide and particulates. Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.

Material Safety Data Sheet
from Genium's Reference Collection

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GENIUM PUBLISHING CORP.

No. 385

ETHYL BENZENE
(Revision A)
Issued: August 1978
Revised: November 1988

SECTION 1. MATERIAL IDENTIFICATION

27

Material Name: ETHYL BENZENE

Description (Origin/Uses): Used as a solvent and as an intermediate in the production of styrene monomer.

Other Designations: Phenylethane; Ethylbenzol; $C_2H_5C_6H_5$; CAS No. 0100-41-4

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

NFPA

HMIS			
H	2	R	1
F	3	I	3
R	0	S	2
PPG*		K	4

*See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Ethyl Benzene, CAS No. 0100-41-4 *See NIOSH, *RTECS* (DA0700000), for additional data with references to reproductive, irritative, and mutagenic effects.	Ca 100	**OSHA PELs** 8-Hr TWA: 100 ppm, 435 mg/m³ 15- Min STEL: 125 ppm, 545 mg/m³ **ACGIH TLVs, 1988-89** TLV-TWA: 100 ppm, 435 mg/m³ TLV-STEL: 125 ppm, 545 mg/m³ **Toxicity Data*** Human, Inhalation, TC_{Lo}: 100 ppm (8 Hrs) Rat, Oral, LD_{50}: 3500 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 277°F (136°C)
Melting Point: -139°F (-95°C)
Vapor Pressure: 7.1 Torrs at 68°F (20°C)
Vapor Density (Air = 1): 3.7
% Volatile by Volume: Ca 100

Molecular Weight: 106 Grams/Mole
Solubility in Water (%): Slight
Specific Gravity (H_2O = 1): 0.86258 at 77°F (25°C)

Appearance and Odor: A clear, colorless, flammable liquid; characteristic aromatic hydrocarbon odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method: 64°F (18°C) CC	Autoignition Temperature: 810°F (432.22°C)	LEL: 1% v/v	UEL: 6.7% v/v

Extinguishing Media: Use foam, dry chemical, or carbon dioxide to put out ethyl benzene fires. A water spray may be ineffective in extinguishing the fire, because it can scatter and spread the burning liquid. Use water spray to cool fire-exposed containers of ethyl benzene, to disperse ethyl benzene vapor, and to protect personnel attempting to stop an ethyl benzene leak. **Unusual Fire or Explosion Hazards:** This liquid can readily form explosive vapor-air mixtures, especially when heated. Ethyl benzene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back to its origin. **Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Ethyl benzene is stable in closed containers during routine operations. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Hazardous chemical reactions can occur between ethyl benzene and strong oxidizing agents, acids, ammonia, and bases. **Conditions to Avoid:** Avoid any exposure to sources of ignition such as heat, sparks, open flame, and lighted tobacco products, etc., and to incompatible chemicals. Use caution when entering confined spaces, particularly low-lying areas where explosive concentrations of ethyl benzene vapor may be present. Provide good ventilation to such areas to prevent the concentration of this vapor. **Hazardous Products of Decomposition:** Thermal-oxidative degradation can include toxic gases such as carbon monoxide and/or aromatic hydrocarbon gases.

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Ethyl benzene is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: Ethyl benzene vapor is severely irritating to the eyes and to the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the central nervous system (CNS) characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid ethyl benzene causes irritation; dermatitis and defatting can also develop. The acute oral toxicity of ethyl benzene is low; however, ingestion of it presents a serious aspiration hazard. Aspirating even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are expected at the levels that produce pronounced, unignorable, disagreeable skin and eye irritation. The TLVs cited in section 2 are set to prevent this intolerable irritation. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** Skin, eyes, respiratory system, and CNS. **Primary Entry:** Inhalation, skin contact **Acute Effects:** Irritation of the skin, eyes, and respiratory system. Also, cardiac-rhythm disturbance due to sensitization; acute bronchitis, bronchospasm, pulmonary and laryngeal edema; euphoria; headache; giddiness; dizziness; and incoordination, as well as possible depression; confusion; and coma. **Chronic Effects:** None reported. **First Aid:** Eyes. Immediately

SECTION 6. HEALTH HAZARD INFORMATION, cont.

flush eyes, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 minutes. **Skin.** Rinse the affected area with plenty of water, then wash it with soap and water. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have qualified medical personnel administer oxygen as required. **Ingestion.** Unlikely. Should this type of exposure occur, the aspiration hazard must be considered. Do not induce vomiting unless directed to do so by a physician. To prevent aspiration by spontaneous vomiting, keep the victim's head low (between his or her knees). **Get medical help (in plant, paramedic, community) for all exposures.** Seek prompt medical assistance for further treatment, observation, and support after first aid. **Note to Physician:** Professional judgment is required as to whether or not to induce vomiting because of the possibility of aspiration. A gastric lavage may be administered, followed by saline catharsis, if this procedure is appropriate to the specific incident. Monitor cardiac and pulmonary functions.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately, and provide adequate explosion-proof ventilation. Cleanup personnel need protection against skin or eye contact with this liquid as well as inhalation of its vapor (see sect. 8). Contain large spills and collect waste or absorb it with an inert material such as sand, earth, or vermiculite. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways. Waste **Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z).

EPA Designations (40 CFR 302.4)

CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per the Clean Water Act (CWA), §§ 311 (b) (4) and 307 (a).

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Wear a NIOSH-approved respirator per Genium reference 88 for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, and gauntlets, etc., to prevent prolonged or repeated skin contact with this material. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of this material below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. Keep it off your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Do not inhale ethyl benzene vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store ethyl benzene in closed containers in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage. **Special Handling/Storage:** Outside, isolated, detached, or remote storage is recommended for large quantities of ethyl benzene. Isolate bulk storage areas from acute fire hazards. **Engineering Controls:** Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. To prevent static sparks, electrically ground and bond all containers, pipelines, etc., used in shipping, transferring, reacting, production, and sampling operations. **Other:** Use safety cans for transferring small amounts of ethyl benzene.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Ethyl Benzene
DOT Hazard Class: Flammable Liquid
ID No. UN1175
DOT Label: Flammable Liquid
DOT Packaging Exceptions: 49 CFR 173.118
DOT Packaging Requirements: 49 CFR 173.119

IMO Shipping Name: Ethylbenzene
IMO Hazard Class: 3.2
IMO Label: Flammable Liquid
IMDG Packaging Group: II

References: 1, 26, 38, 84-94, 100, 116, 117, 120, 122.

Prepared by PJ Igoe; BS

Industrial Hygiene Review: DJ Wilson, CIH

Medical Review: W Silverman, MD

Material Safety Data Sheet

from Genium's Reference Collection
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GENIUM PUBLISHING CORP.

No. 30A

HYDROCHLORIC ACID
(Revision B)
Issued: October 1977
Revised: November 1988

SECTION 1. MATERIAL IDENTIFICATION

27

Material Name: HYDROCHLORIC ACID

Description (Origin/Uses): Used in the production of chlorides; in refining ore in the production of tin and tantalum; for the neutralization of bases; for pickling and cleaning metal products; for oil- and gas-well treatments; and in removing scale from boilers and heat-exchange equipment.

0
3 0
-
NFPA

Other Designations: Aqueous Hydrogen Chloride; Muriatic Acid; HCl/H_2O; CAS No. 7647-01-0

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

HMIS			
H	3	R	1
F	0	I	4
R	0	S	4
PPG*		K	0

*See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Hydrogen Chloride, CAS No. 7647-01-0	38 or Less	**OSHA PEL** Ceiling: 5 ppm, 7 mg/m³
Water	Balance*	**ACGIH TLV, 1988-89** TLV-Ceiling: 5 ppm, 7 mg/m³
*Impurities such as iron, chlorine, and traces of organic matter may be present in small amounts, depending on the grade of acid. **See NIOSH, *RTECS* (MW4025000), for additional data with references to reproductive and mutagenic effects. Continue to monitor NIOSH, *RTECS* (MW40300000), for toxicity data on hydrochloric acid itself.		**Toxicity Data**** Human, Inhalation, LC_{Lo}: 1300 ppm (30 Mins) Rat, Inhalation, LC_{50}: 3124 ppm (1 Hr) Rabbit, Oral, LD_{50}: 900 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 227°F (109°C) (20.22%)
Melting Point: -85°F (-65°C) (20.69%)
Vapor Density (Air = 1): 1.268
pH: Strong Mineral Acid

Molecular Weight: Not Applicable
Solubility in Water (%): Complete
Specific Gravity (H_2O = 1): >1
% Volatile by Volume: Ca 100

Appearance and Odor: A clear, colorless-to-lightly yellowed, fuming liquid; sharp, pungent, characteristic, irritating odor of hydrogen chloride gas. This odor is detectable at 1 to 5 ppm and becomes unpleasant and irritating at 5 to 10 ppm; however, the odor serves as a good warning property.

Comments: The specific physical properties of aqueous hydrochloric acid solutions vary with the amount of dissolved hydrogen chloride gas. Hydrochloric acid forms a constant boiling azeotrope (a mixture of hydrochloric acid and water that behaves like a single substance in that its vapor has the same composition as the mixture itself) with water (at 227°F or 109°C) that contains 20.22% hydrogen chloride and has a density of 1.096. Boiling weaker or stronger aqueous solutions results in the loss of either component until the constant boiling acid is produced.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	LEL	UEL
*	*	*	*

Extinguishing Media: *Hydrochloric acid solutions do not burn. Use extinguishing agents that will put out the surrounding fire. **Unusual Fire or Explosion Hazards:** Use a water spray to cool fire-exposed containers of hydrochloric acid to prevent ruptures. Explosive hydrogen gas can be produced by the reaction of hydrochloric acid with metals such as iron. Neutralize spilled hydrochloric acid with limestone, slaked lime, or soda ash to minimize the possible generation of hydrogen gas. **Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Special neutralization procedures, if applicable, include the application of chemically basic substances such as soda ash or slaked lime.

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Hydrochloric acid is stable in closed containers during routine operations at room temperature. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Hydrochloric acid reacts dangerously with acetic anhydride, 2-aminoethanol, ammonium hydroxide, calcium phosphide, chlorosulfonic acid, ethylene diamine, ethylenimine, oleum, perchloric acid, ß-propiolactone, propylene oxide, silver perchlorate and carbon tetrachloride, sodium hydroxide, sulfuric acid, uranium phosphide, vinyl acetate, sodium, and many carbide compounds (Genium ref. 84). This material is a strong mineral acid that is very reactive with bases. **Conditions to Avoid:** Avoid exposure to incompatible chemicals and to any other material whose compatibility with hydrochloric acid or its vapor has not yet been established. The corrosive action of hydrochloric acid on most metals can liberate extremely flammable/explosive hydrogen gas (H_2); piping stems and containment systems must be chosen carefully. **Hazardous Products of Decomposition:** During fires hydrochloric acid may ecompose by reacting with certain metals to produce very flammable and explosive hydrogen gas (H_2). Significant amounts of hydrogen chloride gas (HCl) are given off at room temperature; the rate of this generation increases as the temperature and the strength (1%) by weight of HCl in H_2O increase. **Comments:** Reactions between hydrochloric acid and cyanides, sulfides, and formaldehyde, will produce extremely toxic hydrogen cyanide (HCN), hydrogen sulfide (H_2S), sulfur dioxide (SO_2), and *bis*chloromethylether, respectively.

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Hydrochloric acid is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: See Genium Industrial MSDS 30 for details of the health effects of hydrogen chloride gas. Hydrochloric acid solutions will generate hydrogen chloride gas with all its health effects. These are irritating to the skin, eyes, and mucous membranes of the upper respiratory tract (URT). The severity of eye injury from splashes depends upon quantity, concentration/strength, and duration of the contact. ermanent visual damage has been reported. Ingestion of hydrochloric acid causes corrosion of the mucous membranes, esophagus, and omach, as well as nausea, vomiting, intense thirst, and diarrhea. Erosion of exposed teeth may occur. Circulatory collapse and death are possible. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** Skin, eyes, URT. **Primary Entry:** Inhalation, skin contact. **Acute Effects:** Corrosive skin and eye burns, tissue damage, and severe irritation of the URT. **Chronic Effects:** None reported. **FIRST AID:** **Eyes.** Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. **Skin.** Rinse the affected area with flooding amounts of water and then wash it with soap and water. Remove contaminated clothing under a safety shower. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have qualified medical personnel administer oxygen as required. **Ingestion.** Not likely. Should this type of exposure occur, and the exposed person is responsive, give him or her 2 to 3 glasses of water, then milk of magnesia or limewater to drink. Do not induce vomiting. Spontaneous laryngeal spasms can occur. Never give anything by mouth to someone who is unconscious or convulsing. **Get medical help (in plant, paramedic, community) for all exposures.** Seek prompt medical assistance for further treatment, observation, and support after first aid. **Note to physician:** Treatment for respiratory effects following inhalation of hydrogen chloride gas includes using a 5% sodium bicarbonate solution as an aerosol; maintaining a proper fluid balance (diuretics may be useful); and decreasing the inflammatory response of the lungs by administering steroids on a short-term basis (2 to 4 days). Severe inhalation exposure requires hospitalization and observation (72-hour minimum) for the delayed onset of pulmonary edema. Serial chest X rays and respiratory support, including intubation, may be required as an early intervention.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately (hydrogen gas may be generated), and provide adequate ventilation. Cleanup personnel need a full set of protective clothing, including a self-contained breathing apparatus (SCBA). Small spills and residue can be covered with an excess of a mixture of soda ash and slaked lime. After neutralization, do not flush waste directly to a sewer or into lakes, ponds, or streams. **Waste Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. The allowable concentration of neutral salt in the effluent discharge is apt to be regulated; study and follow Federal, state, and local regulations. Consider saving the waste hydrochloric acid for use as a neutralizing agent during cleanup operations of basic materials.

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z).
EPA Designations (40 CFR 302.4)
CERCLA Hazardous Substance, Reportable Quantity: 5000 lbs (2270 kg), per the Clean Water Act (CWA), §311 (b) (4)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Wear a NIOSH-approved respirator per Genium reference 88 r the maximum-use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). or emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks), wear an SCBA. All respirators must be acid resistant. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, gauntlets, etc., to prevent any contact with this material. All clothing must be acid resistant. **Ventilation:** Install and operate general and local maximum-explosion-proof ventilation systems powerful enough to maintain airborne levels of hydrogen chloride below the OSHA PEL cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. Make ventilation system ductwork and exposed fan components acid resistant. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from your shoes and equipment. **Other:** Design all engineering systems to be acid resistant and explosion proof (hydrogen gas may be accidentally generated). **Comments:** Practice good personal hygiene; always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. Keep it off your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Do not inhale hydrochloric acid vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store hydrochloric acid in closed containers in a cool, dry, well-ventilated area away from sources of ignition, strong oxidizers, strong bases, out of direct sunlight, and away from incompatible chemicals (see sect. 5). Protect containers from physical damage. **Special Handling/Storage:** Storage areas should have acid-resistant floors and approved drainage facilities. Use nonsparking tools in areas around tanks and pipes where hydrogen gas may be generated. **Engineering Controls:** Make sure all engineering systems (production, transportation) are of maximum-explosion-proof design. Ground and bond all containers and pipelines, etc., used in shipping, transferring, reacting, production, and sampling operations to prevent static sparks. Hydrogen gas may become concentrated inside metal equipment; perform operations to search out possible hidden areas of hydrogen gas carefully. **Other Precautions:** Carefully follow your supplier's recommendations concerning the proper handling and storage procedures for hydrochloric acid. Provide emergency neutralization materials (soda ash, limestone, or slaked lime) and equipment near storage and use areas.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Hydrochloric Acid
DOT Hazard Class: Corrosive Material
ID No. UN1789
DOT Label: Corrosive
DOT Packaging Requirements, DOT Packaging Exceptions: 49 CFR 173.263

IMO Shipping Name: Hydrochloric Acid, Solution
IMO Hazard Class: 8
IMO Label: Corrosive
IMDG Packaging Group: II

eferences: 1, 26, 38, 84-94, 100, 116, 117, 120, 122.

Prepared by PJ Igoe, BS

Industrial Hygiene Review: DJ Wilson, CIH

Medical Review: W Silverman, MD

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Material Safety Data Sheets Collection:

Sheet No. 354
Methyl Alcohol

Issued: 11/77 Revision: D, 11/91

Section 1. Material Identification

36

Methyl alcohol (CH_3OH) Description: Derived from destructive distillation of wood, oxidation of hydrocarbons, or high-pressure catalytic synthesis from hydrogen and carbon dioxide or carbon monoxide. Used as a solvent in manufacturing industrial chemicals and chemical pharmaceuticals, a raw material for making formaldehyde and methyl esters, a softening agent for pyroxylin plastics, a dehydrator for natural gas, a feedstock for manufacturing synthetic proteins by continuous fermentation, an octane booster in gasoline, an extractant for animal and vegetable oils; in antifreeze for automotive radiators, air brakes, gasoline, and diesel oil; and in denaturing ethanol.
Other Designations: CAS No. 67-56-1, carbinol, Columbian spirits, methanol, methyl hydroxide, methylol, monohydroxymethane, pyroxylic spirit, wood alcohol, wood naphtha, wood spirit.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(TM) for a suppliers list.

R	1
I	2
S	1[a]
K	4

[a] Skin absorption

NFPA

HMIS

H	2
F	3
R	0
PPG†	

† Sec. 8

Cautions: Methyl alcohol is moderately toxic by ingestion and mildly toxic by inhalation and skin absorption. It is flammable, volatile, and a dangerous fire hazard.

Section 2. Ingredients and Occupational Exposure Limits

Methyl alcohol, ca 100%

1990 OSHA PELs (Skin)
8-hr TWA: 200 ppm (260 mg/m³)
15-min STEL: 250 ppm (310 mg/m³)

1990 IDLH Level
25,000 ppm

1991-92 ACGIH TLVs (Skin)
TWA: 200 ppm (262 mg/m³)
STEL: 250 ppm (328 mg/m³)

1990 DFG (Germany) MAK
200 ppm (260 mg/m³)

1990 NIOSH RELs (Skin)
TWA: 200 ppm (260 mg/m³)
Ceiling: 250 ppm (325 mg/m³)

1985-86 Toxicity Data[a]
Human, inhalation, TC_{Lo}: 300 ppm caused eye (visual field change), CNS (headache), and pulmonary effects
Human, oral, LD_{Lo}: 428 mg/kg causes CNS (headache) and pulmonary (respiratory change) effects
Rat, oral, TD_{Lo}: 7500 mg/kg administered continuously to the female during the 17th to 19th day of gestation produced behavioral effects on newborns
Rat, inhalation, TC_{Lo}: 20,000 ppm/7 hr administered continuously to the female during the 1st to 22nd day of gestation produced specific developmental abnormalities

[a] See NIOSH, *RTECS* (PC1400000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: 148 °F (64.5 °C)
Freezing Point: -144.04 °F (-97.8 °C)
Vapor Pressure: 29 mm Hg at 68 °F (20 °C)
Vapor Density (air = 1): 1.11
Viscosity: 0.00593 P at 68 °F (20 °C)
Molecular Weight: 32.05
Density: 0.7924 at 68 °F (20 °C)
Water Solubility: Soluble
Other Solubilities: Soluble in ethanol, ether, benzene, ketones, and most organic solvents

Appearance and Odor: Clear, colorless, volatile liquid with a slight alcohol odor when pure, a disagreeably pungent odor when crude, and a low 10-ppm odor threshold.

Section 4. Fire and Explosion Data

Flash Point: 54 °F (12 °C), CC	**Autoignition Temperature:** 878 °F (470 °C)	**LEL:** 6% v/v	**UEL:** 36.5% v/v

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO_2), water spray, or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Do not scatter material with any more water than needed to extinguish fire.
Unusual Fire or Explosion Hazards: Methyl alcohol is a dangerous fire hazard when exposed to heat, flame, or oxidizers. It is explosive in its vapor form when exposed to heat or flame. Vapors may travel to an ignition source and flash back.
Special Fire-fighting Procedures: Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear full protective clothing. Structural firefighters' protective clothing is *ineffective* for fires involving methyl alcohol. If possible without risk, remove container from fire area. Apply cooling water to sides of fire-exposed container until fire is well out. Stay away from ends of tanks. Leave area immediately if you hear a rising sound from venting safety device or see any tank discoloration due to fire. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Methyl alcohol is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Methyl alcohol is incompatible with beryllium dihydride, metals (such as potassium or magnesium), oxidants (such as barium perchlorate, bromine, chlorine, hydrogen peroxide, and sodium hypochlorite), potassium tertbutoxide, carbon tetrachloride + metals; reacts explosively with chloroform + heat, and diethyl zinc; and reacts violently with alkyl aluminum salts, acetyl bromide, chloroform + sodium hydroxide, cyanuric chloride, and nitric acid.
Conditions to Avoid: Avoid vapor inhalation and contact with oxidizers and other incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of methyl alcohol can produce carbon oxides (CO and CO_2), possible formaldehyde (HCHO) and acrid smoke, and irritating fumes.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA do not list methyl alcohol as a carcinogen.
Summary of Risks: Methyl alcohol is toxic mainly to the nervous system, particularly optic nerves, where damage can progress to permanent blindness. Poisoning may also result in metabolic acidosis. Methyl alcohol oxidizes in the body to form formaldehyde and formic acid. These ivatives are believed responsible for many of methyl alcohol's poisonous and toxic effects. Since it is eliminated slowly from the body, methyl hol is considered a cumulative poison. The fatal ingestion dose is 100 to 250 ml, although death is reported from less than 33 ml.
Medical Conditions Aggravated by Long-Term Exposure: None reported
Target Organs: Eyes, central nervous system, skin, and digestive tract.
Primary Entry Routes: Inhalation, ingestion, skin absorption.
Acute effects: Inhalation can cause irritation of eyes and nose, headache, fatigue, nausea, visual impairment (optic nerve neuropathy or visual field changes) or complete and possibly permanent blindness, acidosis, convulsions, circulatory collapse, respiratory failure, and death. Ingestion can cause gastrointestinal (GI) irritation followed by the symptoms described for inhalation and possible kidney impairment. Skin contact results in a feeling of coldness, dryness, and cracking possibly leading to dermatitis. Methyl alcohol can absorb through skin and may cause headache, fatigue, and visual disturbances. Eye contact causes irritation and watering of eyes, inflamed lids, and painful sensitization to light.
Chronic Effects: Chronic inhalation or skin absorption may produce visual impairment or complete blindness.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Do not let victim rub or keep eyes tightly shut. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Since methyl alcohol is volatile and flammable, carefully dispose of contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Consider administering 10% ethanol in D5W intravenously to maintain ethyl alcohol blood level at 100 mg/dl. Check formic acid in urine and measure blood pH and plasma bicarbonate. After ingestion, there is typically an 18- to 48-hr latency period before clinical toxicity

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate area, deny entry, and stay upwind. Shut off all ignition sources—no flares, smoking, or flames in hazard area. Cleanup personnel should wear fully encapsulating, vapor-protective clothing for spills or leaks with no fire. Water spray may reduce vapor, but not prevent ignition in closed spaces. For small spills, use nonsparking tools to take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for later disposal. For large spills, dike far ahead of spill and await disposal. Follow applicable OSHA regulations (29 CFR 1910.120).
Environmental Degradation: Aquatic toxicity rating: TLm 96, over 1000 ppm.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33): Hazardous Waste No. U154
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
Extremely Hazardous Substance (40 CFR 355): Not listed
Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select the respirator based on its suitability to provide adequate worker protection for the given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent all skin contact.
Ventilation: Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in cool, dry, well-ventilated flammables storage area, away from strong oxidizers and other incompatibles. To prevent static sparks, electrically ground all equipment used in methyl alcohol storage, manufacture, and ransportation. Use nonsparking tools.
Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control hazardous airborne ontaminants and to maintain concentrations at the lowest practical level.
ther Precautions: Consider preplacement and periodic medical examinations of exposed workers emphasizing neurological, kidney, liver, and isual function. Practice good personal hygiene and housekeeping procedures. If respirators are used, institute a respiratory protection program hat includes regular training, maintenance, inspection, and evaluation.

Transportation Data (49 CFR 172.101, .102)

OT Shipping Name: Methyl alcohol
OT Hazard Class: Flammable liquid
D No.: UN1230
abel: Flammable liquid
ackaging Exceptions: 173.118
OT Packaging Requirements: 173.119

IMO Shipping Name: Methanol
IMO Hazard Class: 3.2
ID No.: UN1230
IMO Label: Flammable Liquid, Poison
IMDG Packaging Group: II

SDS Collection References: 26, 38, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 140, 143, 146, 148, 149, 153, 159, 163
repared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MD, MPH; **Edited by:** JR Stuart, MS

Material Safety Data Sheet

From Genium's Reference Collection
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GENIUM PUBLISHING CORP.

No. 624

NAPHTHALENE

Issued: November 1987

SECTION 1. MATERIAL IDENTIFICATION

Material Name: NAPHTHALENE

Description (Origin/Uses): Used as a moth repellant and in many industrial processes.

Other Designations: Naphthalin; Naphthene; Tar Camphor; $C_{10}H_8$; NIOSH *RTECS* No. QJ0525000; CAS No. 0091-20-3

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyer's Guide* (Genium ref. 73) for a list of suppliers.

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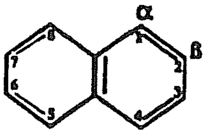
HMIS			
H	2		
F	2	R	1
R	0	I	4
PPG*		S	1
*See sect. 8		K	2

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Naphthalene, CAS No. 0091-20-3  *Immediately dangerous to life and health **See NIOSH *RTECS* for additional data with references to irritative, mutagenic, reproductive, and tumorigenic effects.	ca 100	IDLH* Level: 500 ppm **ACGIH TLVs, 1987-88** TLV-TWA: 10 ppm, 50 mg/m³ **OSHA PEL** 8-Hr TWA: 10 ppm, 50 mg/m³ **Toxicity Data**** Child, Oral, LD_{Lo}: 100 mg/kg Man, Unknown, LD_{Lo}: 74 mg/kg Rat, Oral, LD_{50}: 1250 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 424°F (218°C)
Vapor Density (Air = 1): 4.4
Vapor Pressure: 0.087 Torr at 77°F (25°C)
Water Solubility: Insoluble

Specific Gravity (H_2O = 1): 1.162 at 68°F (20°C)
Melting Point: 176°F (80°C)
Molecular Weight: 128 Grams/Mole
% Volatile by Volume: ca 100

Appearance and Odor: White crystalline flakes; strong coal tar odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
174°F (79°C) OC; 190°F (88°C) CC	979°F (526°C)	% by Volume	0.9	5.9

Extinguishing Media: Use water spray, dry chemical, or carbon dioxide to fight fires involving naphthalene. **Caution:** Foam or direct water spray applied to molten naphthalene may cause extensive foaming.

Unusual Fire or Explosion Hazards: Naphthalene is a volatile solid that gives off flammable vapor when heated (as in fire situations). This vapor is much denser than air and will collect in enclosed or low-lying areas like sumps. In these areas an explosive air-vapor mixture may form, and extra caution is required to prevent any ignition sources from starting an explosion or fire.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Naphthalene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.

Chemical Incompatibilities: Naphthalene is incompatible with strong oxidizing agents, chromic anhydride, and mixtures of aluminum trichloride and benzoyl chloride.

Conditions to Avoid: Ignition sources like open flame, unprotected heaters, excessive heat, lighted tobacco products, and electric sparks must not occur in work areas where naphthalene vapor may become concentrated.

Hazardous Products of Decomposition: Toxic gases like carbon monoxide are produced during fire conditions. Irritating, flammable vapor forms below the melting point because even solid naphthalene has a significant vapor pressure.

SECTION 6. HEALTH HAZARD INFORMATION

Naphthalene is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: Renal shutdown (kidney failure), hemolytic effects (breakdown of red blood cells), hematuria (blood in the urine), oliguria (low volume of urine), jaundice, eye damage, and depression of the central nervous system (CNS) are the primary health concerns associated with exposure to naphthalene. The ACGIH TLVs in section 2 are set to prevent eye damage. These recommended exposure limits may not be low enough to prevent blood changes in genetically hypersensitive individuals.
Medical Conditions Aggravated by Long-Term Exposure: Diseases of the blood, liver, and kidneys. Administer medical exams emphasizing these organs. **Target Organs:** Eyes, skin, kidneys, liver, blood (red blood cell effects), and CNS.
Primary Entry: Inhalation, skin contact. **Acute Effects:** Inhalation of naphthalene vapor causes excitement, confusion, headache, nausea, and loss of appetite. **Chronic Effects:** Increased incidence of cataracts.
FIRST AID
Eye Contact: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes to remove particles.
Skin Contact: Immediately wash the affected area with soap and water.
Inhalation: Remove victim to fresh air; restore and/or support his breathing as needed.
Ingestion: Call a poison control center. Never give anything by mouth to someone who is unconscious or convulsing. Administer a gastric lavage followed by saline catharsis. Monitor blood and electrolytic balance. Other sources recommend giving the victim several glasses of water to drink.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all ignition sources immediately. Cleanup personnel need protection against contact and inhalation of vapor (see sect. 8). Contain large spills and collect waste. Use nonsparking tools to place naphthalene into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.
Waste Disposal: Consider reclamation, recycling, or destruction rather than disposal in a landfill. Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations
Air Contaminant (29 CFR 1910.1000, Subpart Z)
EPA Designations (40 CFR 302.4)
RCRA Hazardous Waste, No. U165
CERCLA Hazardous Substance, Reportable Quantity: 100 lbs (45.4 kg)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Follow the eye- and face-protection guidelines of 29 CFR 1910.133. **Respirator:** Use a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* (Genium ref. 88) for the maximum-use concentrations and/or the exposure limits cited in section 2. Respirator usage must be in accordance with the OSHA regulations of 29 CFR 1910.134. IDLH or unknown concentrations require an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres.
Other Equipment: Wear impervious gloves, boots, aprons, gauntlets, etc., as required by the specific work environment to prevent skin contact. **Ventilation:** Install and operate general and local maximum explosion-proof ventilation systems of sufficient power to maintain airborne levels of naphthalene below the OSHA PEL standard cited in section 2. **Safety Stations:** Make eyewash stations, washing facilities, and safety showers available in areas of use and handling. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove and launder contaminated clothing before wearing it again; clean this material from shoes and equipment.
Comments: Practice good personal hygiene; always wash thoroughly after using this material. Keep this material off of your clothing and equipment. Avoid transferring this material from hands to mouth while eating, drinking, or smoking. Do *not* smoke, eat, or drink in any immediate work area. Avoid inhalation of vapor!

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage Segregation: Store naphthalene in a cool, dry, well-ventilated area away from chemical incompatibles (see sect. 5).
Special Handling/Storage: Protect containers from physical damage. All bulk storage facilities must be built with an explosion-proof design. All containers used in shipping/transferring operations must be electrically grounded to prevent static sparks. Use monitoring equipment to measure the extent of vapor present in any storage facility containing naphthalene because of potential fire and explosion hazards.
Comments: All operations with naphthalene must be done carefully to prevent accidental ignition of its flammable/explosive vapor. If the weather is warm, more naphthalene vapor forms and the potential for explosion increases. Do *not* smoke in any use or storage area!
Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Naphthalene
DOT Hazard Class: ORM-A
IMO Class: 4.1

DOT ID No. UN1334
IMO Label: Flammable Solid
DOT Label: None

References: 1, 2, 12, 71, 84-94, 103 PH

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Approvals
Indust. Hygiene/Safety
Medical Review

Material Safety Data Sheet

From Genium's Reference Collection
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GENIUM PUBLISHING CORP.

No. 7

NITRIC ACID
(Revision C)
Issued: October 1980
Revised: August 1988

SECTION 1. MATERIAL IDENTIFICATION

26

Material Name: NITRIC ACID

Description (Origin/Uses): Used to dissolve noble metals, for etching and cleaning metals, to make organic nitrates and nitrocompounds, to destroy residues of organic matter, and in explosives.

Other Designations: Red Fuming Nitric Acid; HNO_3; CAS No. 7697-37-2

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

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oxy
NFPA

HMIS
H 3
F 0
R 1
PPG*
*See sect. 8

R 1
I 4
S 4
K 0

SECTION 2. INGREDIENTS AND HAZARDS

	%
Nitric Acid, CAS No. 7697-37-2	*

*Contact your supplier to determine the percent by weight of nitric acid in the purchased product. Water is the other component of the product.
**See NIOSH, *RTECS* (QU5775000, QU5900000), for additional data with references to reproductive effects.

EXPOSURE LIMITS

OSHA PEL
8-Hr TWA: 2 ppm, 5 mg/m³

ACGIH TLVs, 1987-88
TLV-TWA: 2 ppm, 5 mg/m³
TLV-STEL: 4 ppm, 10 mg/m³

Toxicity Data**
Mouse, Inhalation, LC_{50}: 67 ppm/4 Hrs

SECTION 3. PHYSICAL DATA

Boiling Point: Ca 251°F (122°C)*
Specific Gravity (H_2O = 1): 1.4*
pH: Very Acidic

Water Solubility (%): Complete
Molecular Weight: 63 Grams/Mole
Melting Point: Ca -30°F (-34°C)*

Appearance and Odor: A water white to slightly yellow liquid that darkens to a brownish color on aging and exposure to light; characteristic nitrogen dioxide (NO_2) odor.

*These properties are for the approximately 68%-by-weight nitric acid that is commercially available.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air % by Volume	LOWER	UPPER
*	*		*	*

Extinguishing Media: *Nitric acid does not burn. Use extinguishing agents that will put out the surrounding fire. Use a water spray to dilute nitric acid during fires and to absorb liberated oxides of nitrogen.

Unusual Fire or Explosion Hazards: Although nitric acid does not burn, it is a strong oxidizing agent that can react with combustible materials to cause fires. Also, it can react with metals to liberate extremely flammable hydrogen gas. If this happens, direct fire-fighting procedures at this evolved hydrogen gas.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Choose protective equipment carefully (see sect. 5, Conditions to Avoid).

SECTION 5. REACTIVITY DATA

Nitric acid is stable in closed containers at room temperature under normal storage and handling conditions. It cannot undergo hazardous polymerization.

Chemical Incompatibilities: Nitric acid reacts explosively with metallic powders, carbides, hydrogen sulfide, and turpentine. Contact with organic materials such as wood, paper, sawdust, or alcohol, etc., may cause fires. Combustible materials can attain an increased mability after being exposed to nitric acid even if they do not immediately catch fire.

ditions to Avoid: Avoid any contact with incompatible chemicals. Because it is so reactive, always establish another material's ompatibility with nitric acid before mixing the two materials. This applies to the selection of safety and handling equipment, because nitric acid can attack some forms of coatings, plastics, and rubber.

Hazardous Products of Decomposition: Various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO_2), nitrous oxide (N_2O), as well as nitric acid mist or vapor, can be produced by the decomposition reactions that can affect the nitric acid during fires.

SECTION 6. HEALTH HAZARD INFORMATION

Nitric acid is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: This material is corrosive to any body tissue it contacts. Dental erosion is also reported.
Medical Conditions Aggravated by Long-Term Exposure: None reported. **Target Organs:** Skin, eyes, mucous membranes of the respiratory tract, teeth. **Primary Entry:** Inhalation, skin contact. **Acute Effects:** Irritation and/or corrosive burns of skin, eyes, and upper respiratory tract (URT), delayed pulmonary edema, pneumonitis, bronchitis, and dental erosion. **Chronic Effects:** None reported.

FIRST AID: **Eyes.** Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. Treat for eye burns. **Skin.** Immediately wash the affected area with soap and water. Watch for chemical skin burns and treat them accordingly. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. If the exposure is severe, hospitilization with careful monitoring by trained medical personnel to detect the delayed onset of severe pulmonary edema (lungs filled with fluid) is recommended for at least 72 hours. **Ingestion.** Call a poison control center. Never give anything by mouth to someone who is unconscious or convulsing. Do not induce vomiting. If the exposed person is responsive, give him or her one or two glasses of milk or water to drink as quickly as possible after exposure.
GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid. **NOTE TO PHYSICIAN:** Wash affected skin areas with a 5% solution of sodium bicarbonate ($NaHCO_3$). If ingested, the risk versus the benefit of the passage of a naso-gastric tube is debatable. Activated charcoal is of *no* value. Do *not* give the exposed person bicarbonate to neutralize the material.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all sources of ignition immediately in case contact with metals should produce highly flammable hydrogen gas. Cleanup personnel need protection against contact with and inhalation of nitric acid (see sect. 8). Contain large spills and collect waste. Use water sprays to direct nitric acid away from incompatible chemicals (see sect. 5). Neutralize the spilled nitric acid with soda ash or sodium bicarbonate. Use an absorbent such as sand, earth, or vermiculite on the resulting slurry and place the neutralized nitric acid material into containers suitable for eventual disposal, reclamation, or destruction.
Waste Disposal: Consider reclamation, recycling, or destruction rather than disposal in a landfill. Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.
OSHA Designations
Air Contaminant (29 CFR 1910.1000 Subpart Z)
EPA Designations (40 CFR 302.4)
CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per Clean Water Act (CWA), Section 311 (b) (4)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing of nitric acid solution is possible, wear a full face shield as a supplementary protective measure. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Consult the *NIOSH Pocket Guide to Chemical Hazards* (Genium ref. 88) for general recommendations on proper respiratory procedures. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine use (leaks or cleaning reactor vessels and storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, gauntlets, etc., to prevent skin contact with nitric acid. Choose protective equipment carefully (see sect. 5, Conditions to Avoid).
Ventilation: Install and operate both general and local exhaust-ventilation systems powerful enough to maintain airborne concentrations of nitric acid below the OSHA PEL standard cited in section 2. Construct exhaust ducts and systems with material such as fiberglass, which resists attack by nitric acid. **Safety Stations:** Make emergency eyewash stations, washing facilities, and safety/quickdrench showers available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean nitric acid from shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Keep it off of your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Provide preplacement and annual medical exams with emphasis on skin irritation to workers who are regularly exposed to nitric acid. Workers must receive training before handling this material in the workplace; even experienced workers should undergo refresher training periodically.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store nitric acid in a cool, dry, well-ventilated area away from incompatible chemicals (see sect. 5). Consider outside, isolated, or detached storage. Protect containers from direct sunlight.
Special Handling/Storage: Build all storage facilities of nonflammable materials that are resistant to chemical attack by nitric acid. Protect containers from physical damage. Preplan for routine use and emergency response.
Engineering Controls: Proper ventilation is essential in bulk storage areas; consider installing an automatic monitoring system to detect hazardous levels of nitrogen oxides that can develop from this material.
Comments: Separate nitric acid from hydrazine, diethylenetriamine, fluorides, and all other corrosives except sulfuric acid and sulfur trioxide when shipping or transferring it.
Transportation Data (49 CFR 172.101-2)
DOT Shipping Name: (I) Nitric Acid, Fuming or (II) Nitric Acid, Over 40% or (III) Nitric Acid, 40% or Less
DOT Label: (I) Oxidizer and Poison or (II) Oxidizer and Corrosive or (III) Corrosive
DOT Hazard Class: (I) and (II) Oxidizer or (III) Corrosive Material
DOT ID Nos. (I) UN2032; (II) UN2031; (III) NA1760
IMO Class: 8 (All Types of Nitric Acid)
IMO Label: (I) Corrosive, Oxidizer, Poison; or (II) and (III) Corrosive
References: 1, 2, 26, 38, 84-94, 100, 112, 113, 114.

Prepared by PJ Igoe, BS
Industrial Hygiene Review: DJ Wilson, CIH
Medical Review: MJ Hardies, MD

Material Safety Data Sheet

from Genium's Reference Collection
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GENIUM PUBLISHING CORP.

No. 683

POLYCHLORINATED BIPHENYLS
(PCBs)

Issued: November 1988

SECTION 1. MATERIAL IDENTIFICATION

Material Name: POLYCHLORINATED BIPHENYLS (PCBs)

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Genium

Description (Origin/Uses): Commercial PCBs are mixtures that were once widely manufactured by combining chlorine gas, iron filings, and biphenyls. Their high stability contributes to their intended commercial applications and their accidental, long-term adverse environmental and health effects. PCBs are useful as insulators in electrical equipment because they are electrically nonconductive. Their distribution has been limited since 1976. The Aroclor PCB codes identify PCBs by type. The first two digits of a code indicate whether the PCB contains chlorinated biphenyls (12), chlorinated terphenyls, (54), or both (25, 44); the last two digits indicate the approximate percentage of chlorine. Found in insulating liquid, synthetic rubber, plasticizers, flame retardants, floor tile, printer's ink, paper and fabric coatings, brake linings, paints, automobile body sealants, asphalt, adhesives, electrical capacitors, electrical transformers, vacuum pumps, gas-transmission turbines, heat-transfer fluids, hydraulic fluids, lubricating and cutting oil, copying paper, carbonless copying paper, and fluorescent light ballasts.

Synonym: Chlorodiphenyls

Other Designations (Producer, Trade Name, Nation): Monsanto, Aroclor® (USA, Great Britain); Bayer, Clophen® (German Democratic Republic); Prodelec, Phenoclor®, Pyralene® (France); Kanegafuchi, Kanechlor®; Mitsubishi, Santotherm® (Japan); Caffaro, Fenclor® (Italy).

Trade Name	CAS No.	*RTECS* No.	Trade Name	CAS No.	*RTECS* No.
Aroclors	01336-36-3	TQ1350000	Aroclor 1242	53469-21-9	TQ1356000
Aroclor 1016	12674-11-2	TQ1351000	Aroclor 1248	12672-29-6	TQ1358000
Aroclor 1221	11104-28-2	TQ1352000	Aroclor 1254	11097-69-1	TQ1360000
Aroclor 1232	11141-16-5	TQ1354000	Aroclor 1260	11096-82-5	TQ1362000

HMIS			
H	1	R	1
F	1	I	3
R	0	S	1
PPG*		K	1

SECTION 2. INGREDIENTS AND HAZARDS/EXPOSURE LIMITS

PCB-42% Chlorine/Aroclor 1242
CAS No. 53469-21-9
OSHA PEL (Skin*)
8-Hr TWA: 1 mg/m^3
ACGIH TLV (Skin*), 1988-89
TLV-TWA: 1 mg/m^3

PCB-54% Chlorine/Aroclor 1254
CAS No. 11097-69-1
OSHA PEL (Skin*)
8-Hr TWA: 0.5 mg/m^3
ACGIH TLV (Skin*), 1988-89
TLV-TWA: 0.5 mg/m^3

All PCBs/Aroclors
CAS No. 1336-36-3
NIOSH REL 1977
10-Hour TWA: 0.001mg/m^3
Toxicity Data**
Mouse, Oral, LD$_{50}$: 1900 mg/kg

*This material can be absorbed through intact skin, which contributes to overall exposure.
**See NIOSH, *RTECS* (Genium ref. 90), at the locations specified in section 1 for additional data with references to tumorigenic, reproductive, mutagenic, and irritative effects.

SECTION 3. PHYSICAL DATA

Boiling Point: Ranges from 527°F (275°C) to 725°F (385°C)
Solubility in Water (%): Insoluble
Pour Point: Ranges from -31°F (-35°C) to 87.8°F (31°C)
% Volatile by Volume: Ranges from 1.2 to 1.6
Molecular Weight (Average): Aroclor 1242: 258 Grams/Mole
Aroclor 1254: 326 Grams/Mole

Appearance and Odor: Clear to light yellow mobile oil to a sticky resin; a sweet "aromatic" odor. As the percentage of chlorine increases, the PCB becomes thicker and heavier; e.g., Aroclor 1254 is more viscous than Aroclor 1242.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point*	**Autoignition Temperature:** Not Found	**LEL:** Not Found	**UEL:** Not Found

Extinguishing Media: Use water spray/fog, carbon dioxide (CO_2), dry chemical, or "alcohol" foam to extinguish fires that involve polychlorinated biphenyls. Although it is very difficult to ignite PCBs, they are often mixed with more flammable materials (oils, solvents, etc.) **Unusual Fire or Explosion Hazards:** If a transformer containing PCBs is involved in a fire, its owner may be required to report the incident to appropriate authorities. Consult and follow all pertinent Federal, state, and local regulations. **Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode; fire fighters must also wear a complete set of protective clothing. **Comments:** The hazards of PCB fires are associated with the possibility of their being released into the environment where they and their products of degeneration can pose serious long-term health risks. These potential problems are heightened by the PCBs' resistance to biological and chemical degradation and by the possibility that they will contaminate underground water systems (see sect. 5)

*Ranges from 284°F (140°C) to 392°F (200°C).

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Polychlorinated biphenyls are very stable materials. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** PCBs can react dangerously with sodium or potassium. These reactions are part of an industrial process used to destroy PCBs; however, people have been killed by explosions at PCB treatment, storage, and disposal sites. **Conditions to Avoid:** Limit human exposure to PCBs to the lowest possible level; especially avoid contact with skin. **Hazardous Products of Decomposition:** Thermal-oxidative degradation of PCBs can produce toxic gases such as carbon monoxide, chlorine, chlorinated aromatic fragments, phenolics, aldehydes, and hydrogen chloride. Incomplete combustion of PCBs produces toxic compounds such as polychlorinated dibenzofuran (PCDF, the major product of combustion), and polychlorinated dibenzo-*p*-dioxin (PCDD or dioxin).

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: The EPA lists PCBs as carcinogens, and the IARC classifies them as probable human carcinogens (group 2B). **Summary of Risks:** Effects of accidental exposure to PCBs include acneform eruptions; eye discharge; swelling of the upper eyelids and hyperemia of the conjunctiva; hyperpigmentation of skin, nails, and mucous membrane; chloroacne; distinctive hair follicles; fever; hearing ifficulties; limb spasms; headache; vomiting; and diarrhea. PCBs are potent liver toxins that can be absorbed through unbroken skin in azardous amounts without immediately discernible pain or discomfort. Severe health effects can develop later. In experimental animals, prolonged or repeated exposure to PCBs by any route results in liver damage at levels that are less than those reported to have caused cancer in rodents. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** Skin, eyes, eyelids, blood, liver. **Primary Entry:** Inhalation, skin contact/absorption. **Acute Effects:** Skin and eye irritation, acneform dermatitis, nausea, vomiting, abdominal pain, jaundice, liver damage. **Chronic Effects:** Possible cancer (evidence of this is inconclusive); reproductive effects (jaundice, excessive secretion of tears, dermal chromopexy); and hepatitis. **FIRST AID:** **Eyes.** Immediately flush eyes, including under the eyelids, gently but thoroughly with flooding amounts of running water for 15 minutes. **Skin.** Rinse exposed skin with flooding amounts of water; wash with soap and water. **Inhalation.** Remove the exposed person to fresh air; restore and/or support breathing as needed. Have qualified medical personnel administer oxygen as required. **Ingestion.** Induce vomiting by sticking your finger to the back of the exposed person's throat. Have him or her drink 1 to 2 glasses of milk or water. **Get medical help (in plant, paramedic, community) for all exposures.** Seek prompt medical assistance for further treatment, observation, and support after first aid. **Note to Physician:** PCBs are poorly metabolized, soluble in lipids, and they accumulate in tissues or organs rich in lipids. Liver function tests can help to determine the extent of body damage in exposed persons. If electrical equipment containing PCBs arcs over, the PCBs or other hydrocarbon dielectric fluids may decompose and give off hydrochloric acid (HCl), a potent respiratory irritant.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: *Treat any accidental release of PCBs as an emergency. An SPCCP (spill-prevention control and countermeasure plan) must be formulated before spills or leaks occur.* PCBs are resistant to biodegradation, soluble in lipids, and chemically stable; as such they have become significant contaminants of global ecosystems. Releases of PCBs require immediate, competent, professional response from trained personnel. *Each release situation is unique and requires a specifically designed cleanup response.* General recommendations include adhering to Federal regulations (40 CFR Part 761). Notify safety personnel, evacuate nonessential personnel, ventilate the spill area, and contain the PCBs. All wastes, residues, and contaminated cleanup equipment from the incident are subject to EPA requirements (40 CFR 761). Consult your attorney or appropriate regulatory officials for information about reporting requirements and disposal procedures. **Waste Disposal:** Contact your hazardous waste disposal firm or a licensed contractor for detailed recommendations, especially when PCBs are unexpectedly discovered. Follow Federal, state, and local regulations. PCBs are biomagnified in the food chain; i.e., their concentration increases at each link. The disposal of PCBs or of PCB-contaminated materials is strictly regulated; violations of applicable laws can result in fines, lawsuits, and negative publicity. **Warning:** Accidental spills of PCBs that may affect water supplies must be reported to Coast Guard personnel at the National Response Center, telephone (202) 426-2675.

OSHA Designations

isted as an Air Contaminant (29 CFR 1910.1000 Subpart Z).

A Designations (40 CFR 302.4)

CERCLA Hazardous Substance, Reportable Quantity: 10 lbs (4.54 kg), per the Clean Water Act (CWA), §§ 311 (b) (4) and 307 (a).

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing of PCBs is possible, wear a full face shield. Follow OSHA eye- and face-protections regulations (29 CFR 1910.133). **Respirator:** Wear a NIOSH-approved respirator per Genium reference 88 for the maximum-use concentrations and/or exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (leaks or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, and gauntlets, etc., to prevent any contact of PCBs with your skin. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of this material below the OSHA PEL standards cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contamination into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do not wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from your shoes and equipment. Heavily soiled clothing must be properly discarded in a manner consistent with applicable regulations. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. Keep it off your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in work areas.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage Segregation: Store PCBs in closed containers in a cool, dry, well-ventilated area. Protect containers from physical damage. **Special Handling/Storage:** All storage facilities must have adequate containment systems (dikes; elevated, nonporous holding platforms; retaining walls) to prevent any major release of PCBs into the environment. Carefully design and implement these extra precautions now; do not wait until you have to respond to an accidental release of this material.

Transportation Data (49 CFR 172.101-2; PCBs were the first materials to be directly regulated by Congress by way of TSCA in 1976.)

DOT Shipping Name: Polychlorinated Biphenyls
DOT Hazard Class: ORM-E
No. UN 23115
T Packaging Requirements: 49 CFR 173.510

IMO Shipping Name: Polychlorinated Biphenyls
IMO Hazard Class: 9
IMDG Packaging Group: II

References: 1, 6, 26, 38, 84-94, 100, 101, 116, 117, 120, 122.

Prepared by PJ Igoe, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: W Silverman, MD

Technical Review: Northeast Analytical, Inc. (PCB and VOC Specialists), Schenectady, New York, Telephone: (518) 346-4592

MATERIAL SAFETY DATA SHEET: SIMPLE GREEN®

I. PRODUCT & COMPANY INFORMATION

PRODUCT NAME: **SIMPLE GREEN® CLEANER / DEGREASER / DEODORIZER**

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. 1008
Issue Date: January, 2003

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.

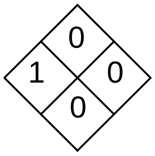
All components of Simple Green® are listed on the TSCA Chemical Substance Inventory.

III. HAZARDS IDENTIFICATION

UN Number:	Not required
Dangerous Goods Class:	Nonhazardous

Hazard Rating (NFPA/HMIS)

Health = 1*
Fire = 0
Reactivity = 0
Special = 0



Rating Scale

0 = minimal
2 = moderate
4 = severe
1 = slight
3 = serious

*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:	Non-hazardous

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 4 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.

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Material Safety Data Sheets Collection:

Sheet No. 3A
Sodium Hydroxide, 50% Liquid

Issued: 10/77 Revision: B, 11/91

Section 1. Material Identification

36

Sodium Hydroxide, 50% Liquid (NaOH), Description: Derived by electrolysis of sodium chloride brines, by reacting calcium chloride with sodium carbonate, or by electrolytic production using the diaphragm cell. Sodium hydroxide often contains minimal amounts of sodium chloride, sodium carbonate, sodium sulfate, sodium chlorate, iron, or nickel. Used in making plastics to dissolve casein; in treating cellulose in making rayon and cellophane; in explosives, dyestuffs, electrolytic extraction of zinc, reclaiming rubber, tin plating, oxide coating, etching and electroplating, laundering and bleaching, pulp and paper manufacture; in vegetable oil refining; in peeling fruits and vegetables in the food industry; to hydrolyze fats and form soaps; and in veterinary medicine as a disinfectant.

R	0
I	2
S	4
K	0

NFPA

Other Designations: CAS No. 1310-73-2; Aetznatron; Collo-Grillrein; Collo-Tapette; Feurs Rohp; Lewis-Red Devil Lye; soda lye; soda, lye solution; sodium hydrate solution; sodium hydroxide solution; white caustic solution.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(TM) for a suppliers list.

HMIS

H	3
F	0
R	1
PPG*	

* Sec. 8

Cautions: Sodium hydroxide is moderately toxic by ingestion and inhalation and can be seriously corrosive to eyes, skin, and mucous membranes.

Section 2. Ingredients and Occupational Exposure Limits

Sodium hydroxide, ca 50% water solution

1990 OSHA PEL
Ceiling: 2 mg/m³

1991-92 ACGIH TLV
Ceiling: 2 mg/m³

1990 DFG (Germany) MAK
2 mg/m³

1990 IDLH Level
250 ppm

1990 NIOSH REL
Ceiling: 2 mg/m³

1985-86 Toxicity Data*
Monkey, eye: 1% solution applied over 24 hr produced severe irritation
Rabbit, eye: 1% solution applied to the eye caused severe irritation
Grasshopper, parenteral: 20 µl produced cytogenic mutations

* See NIOSH, *RTECS* (WB4905000), for additional irritation, mutation and toxicity data.

Section 3. Physical Data

Boiling Point: 284 °F (140 °C)
Freezing Point: 53.6 °F (12 °C)
Viscosity: 50 cP at 68 °F (20 °C)
pH (0.5 % solution): 13
Molecular Weight: 40.01
Specific Gravity: 1.53 at 77 °F (25 °C)
Water Solubility: Completely soluble in water
Other Solubilities: Soluble in alcohol, methanol and glycerol; insoluble in acetone and ether

Appearance and Odor: An odorless, clear liquid.

Section 4. Fire and Explosion Data

Flash Point: None reported	**Autoignition Temperature:** None reported	**LEL:** None reported	**UEL:** None reported

Extinguishing Media: Although noncombustible, when in contact with moisture or water sodium hydroxide, 50% liquid, can generate enough heat to ignite surrounding combustibles. If possible without risk, remove containers from area. Use extinguishing agents suitable for surrounding fire. For small fire, use dry chemical, carbon dioxide (CO_2), or regular foam. Avoid using water spray since water reacts with sodium hydroxide to generate substantial heat. If you must use water, be sure it is as cold as possible. For large fires, use fog or regular foam.
Unusual Fire or Explosion Hazards: Sodium hydroxide solution can become very hot when in contact with water.
Special Fire-fighting Procedures: Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear fully protective clothing. Structural firefighters' protective clothing provides limited protection. Apply cooling water to sides of fire-exposed containers until fire is well out. *Do not* splatter or splash this material. Stay away from ends of tanks. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Sodium hydroxide solution is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Violent polymerization can occur when in contact with acrolein or acrylonitrile. Since sodium hydroxide readily absorbs water and carbon dioxide from air, keep containers tightly closed.
Chemical Incompatibilities: Since it generates large amounts of heat when in contact with water, sodium hydroxide may steam and splatter. It reacts with mineral acids to form corresponding salts, and with weak-acid gases like hydrogen sulfide, sulfur dioxide and carbon dioxide. Sodium hydroxide can be very corrosive to metals such as aluminum, tin, and zinc, as well as alloys such as steel, and may cause formation of flammable hydrogen gas. An increase in temperature and pressure occurs in closed containers when sodium hydroxide is mixed with acetic anhydride, glacial acetic acid, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, oleum, 36% hydrochloric acid, 48.7% hydrofluoric acid, 70% nitric acid, or 96% sulfuric acid.
Conditions to Avoid: Avoid generation of sodium hydroxide mists, and contact with water, metals, and the chemicals listed above.
Hazardous Products of Decomposition: Thermal oxidative decomposition of sodium hydroxide can produce toxic sodium oxide (Na_2O) and peroxide (Na_2O_2) fumes.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA do not list sodium hydroxide as a carcinogen (see Chronic Effects).
Summary of Risks: Sodium hydroxide solution is toxic by mist inhalation, ingestion, or direct skin or eye contact. Damage is immediate and without prompt medical attention can become permanent. This strong, corrosive alkaline solution dissolves any living tissue it contacts.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Eyes, digestive tract, respiratory system, and skin.
Primary Entry Routes: Ingestion, inhalation, and skin and eye contact.
Acute Effects: Ingestion causes immediate burning of mouth, esophagus, and stomach; painful swallowing; excessive salivation; edematous (excess fluid in surrounding tissue) lips, chin, tongue, and pharynx covered with exudate (fluid oozed from swollen tissue); esophageal edema (swelling from fluid buildup in esophagus walls that can prevent swallowing within hours); edematous, gelatinous, and necrotic (localized tissue

Continue on next page

Section 6. Health Hazard Data, *continued*

death) mucous membranes; vomiting (sometimes coffee grounds-like material due to digestive hemorrhage); rapid, faint pulse; and cold, clammy skin. Death commonly occurs due to shock, asphyxia (oxygen loss due to interrupted breathing), or pneumonia by the second or third day after ingestion. Mist inhalation can cause many burns, temporary hair loss (in nasal passages since sodium hydroxide breaks down keratin), and sibly pulmonary edema (fluid in lungs). Skin contact causes slippery, soapy feeling that is usually not painful for 3 min after contact—even gh skin damage begins immediately. It causes burns, keratin (hair and nails) destruction, and intracellular edema (excess fluid in skin cells), with damage progressing to severe burns, tissue corrosion, deep ulcerations, and permanent scarring if not washed off immediately. The cornea begins to corrode on contact. Disintegration and sloughing of conjunctival and corneal epithelium may progress to temporary or permanent corneal opacification (cloudiness, becoming impervious to light) or symblepharon (adhesion of lid to eyeball).

Chronic Effects: Dermatitis may result after repeated exposure to dilute solutions. Cases of squamous cell carcinoma (malignant tumors of epithelial origin) of the esophagus are reported 12 to 42 years after ingestion, although it is unclear whether the cancer resulted from scar formation caused by tissue destruction or directly from the chemical's possible carcinogenicity.

FIRST AID: Emergency personnel should protect against contamination.

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. *Do not* allow victim to keep his eyes tightly shut. *Warning!* Although splashed in only one eye, sodium hydroxide may affect the other eye's sight if prompt medical attention is not received. Consult a physician immediately.

Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of cold water for at least 15 min. *Be aware* that this substance can become very hot when in contact with water. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious and alert* person drink 1 to 2 glasses of water followed by vinegar or fruit juice to neutralize the poison. *Do not* induce vomiting.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Perform endoscopy in all suspected cases of sodium hydroxide ingestion. Perform blood analysis to determine if dehydration, acidosis, or other electrolyte imbalances have occurred.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate hazard area, deny entry, and stay upwind of spills. Cleanup personnel should protect against vapor inhalation and skin or eye contact. Use water spray to disperse vapors but do not spray directly on spills. Absorb small liquid spills with fly ash or cement powder. Neutralize spill with vinegar or dilute acid. Perlite and Cellosolve WP 3H (hydroxyethyl cellulose) are recommended for vapor suppression and containment of 50% sodium hydroxide solutions. Place material in suitable container (sodium hydroxide corrodes steel at temperatures above 60 °C) for later disposal. For large wet spills, dike flow using soil, sand bags, foamed polyurethane, or foamed concrete to contain for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120).

Environmental Transport: In solid form, sodium hydroxide is not mobile, although it very easily absorbs moisture. Once liquid, sodium hydroxide rapidly leaches into the soil, possibly contaminating water sources.

Environmental Degradation: Ecotoxicity values (as 100% NaOH): TLm, mosquito fish, 125 ppm/96 hr (fresh water); TLm, bluegill, 99 mg/48 hr (tap water).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.22): Characteristic of corrosivity

ed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1000 lb (454 kg) [* per Clean Water Act, Sec. 311 (b)(4)]

\ Extremely Hazardous Substance (40 CFR 355): Not listed

S. A Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations

Sodium hydroxide is listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select the respirator based on its suitability to provide adequate worker protection for the given working conditions, level of ariborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent any skin contact.

Ventilation: Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL and IDLH values (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.(103)

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in dry, well-ventilated area away from water, acids, metals, flammable liquids and organic halogens. Keep containers tightly closed since sodium hydroxide can decompose to sodium carbonate and carbon dioxide upon exposure to air. Since corrosion occurs easily above 140 °F (60 °C), do not store or transport in aluminum or steel containers when temperatures are near this level. Store containers in rooms equipped with trapped floor drains, curbs, or gutters.

Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control hazardous airborne contaminants and to maintain concentrations at the lowest practical level.

Other Precautions: Institute preplacement and periodic medical exams of exposed workers emphasizing the eyes, skin and respiratory tract. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Educate employees to the possible hazards in using sodium hydroxide.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Sodium hydroxide, liquid *or* solution
D Hazard Class: Corrosive material
UN1824
abel: Corrosive
OT Packaging Exceptions: 173.244
OT Packaging Requirements: 173.249

IMO Shipping Name: Sodium hydroxide, solution
IMO Hazard Class: 8
ID No.: UN1824
IMO Label: Corrosive
IMDG Packaging Group: II

SDS Collection **References:** 26, 38, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 143, 146, 148, 149, 153, 159, 161, 163

repared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** JR Stuart, MS

Material Safety Data Sheet

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GENIUM PUBLISHING CORP.

No. 9
SULFURIC ACID, CONCENTRATED
Revision C
Issued: October 1980
Revised: February 1986

SECTION 1. MATERIAL IDENTIFICATION

19

MATERIAL NAME: SULFURIC ACID, CONCENTRATED

OTHER DESIGNATIONS: Oil of Vitriol, Hydrogen Sulfate; H_2SO_4; CAS #7664-93-9

MANUFACTURER/SUPPLIER: Available from many suppliers, including:
Allied Corporation, PO Box 2064R, Morristown, NJ 07960; Telephone: 800 631-8050

0
3 2
W

HMIS
H:3
F: 0
R: 2
PPE: *
* See Sect. 8

R 1
I 3
S 4
K 0

SECTION 2. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
Hydrogen Sulfate (H_2SO_4)	93-98	8-hr TWA: 1 mg/m^3
Water	Balance*	

* Material is obtained by the reaction of SO_3 and water. Can contain low impurity levels, such as 0.02% max of iron as Fe. Properties vary with H_2SO_4 content.

Current OSHA standard and ACGIH (1985-86) TLV. NIOSH has a 10-hr TWA, 40-hr. work week, of 1 mg/m^3.

Human, Mist Inhalation, TCLo: 3 mg/m^3, 24 wk. (Toxic Mouth Effects)

Rat, Oral, LD_{50}: 2140 mg/kg

SECTION 3. PHYSICAL DATA

	93.19% H_2SO_4	98.33% H_2SO_4	100% H_2SO_4
Boiling Point, 1 atm, deg C	ca 281	ca 338	ca 330 (dc)
Specific Gravity (60/60°F)	1.8354	1.84	1.84
Volatiles, % @ 340°C	ca 100	ca 100	ca 100
Melting Point, deg C	ca -34	ca 3	10.4

Water Solubility ... Complete Miscible
Vapor Pressure, mm Hg @ 100°F ... <1 (93.19% H_2SO_4); Deg. Baume ... 66 (93.19% H_2SO_4) - Density of H_2SO_4 is often reported in degrees Baume Be). Formula is Be=145 [145/sp gr for liquids heavier than water].

Appearance and odor: Clear, colorless, hygroscopic, oily liquid with no odor. Mists greater than 1 mg/m^3 are easily recognizable. Those at 5 mg/m^3 are distinctly objectionable.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
None - Nonflammable	NA	NA	NA	NA

Sulfuric acid is nonflammable; however, it is a strong oxidizing agent and may cause ignition by contact with combustible materials. Small fires may be smothered with suitable dry chemical. Cool exterior of storage tanks of H_2SO_4 with water to avoid rupture if exposed to fire. Do not add water or other liquid to the acid! The acid, especially when diluted with water, can react with metals to liberate flammable hydrogen gas.
Sulfuric acid mists and vapors from a fire area are corrosive (see sect. 5).
Fire fighters must wear self-contained breathing equipment and fully protective clothing.

SECTION 5. REACTIVITY DATA

Sulfuric acid is stable under normal conditions of use and storage. It does not undergo hazardous polymerization. It is a strong mineral acid reacting with bases and metals. The concentrated acid is also a dehydrating agent, picking up moisture readily from the air or other materials. Hydrogen gas may be generated within a H_2SO_4 container. Vent drums cautiously.

This material reacts exothermically with water. (Acid should always be added slowly to water. Water added to acid can cause boiling and uncontrolled splashing of the acid.) Sulfur oxides can result from decomposition and from oxidizing reactions of sulfuric acid.

SECTION 6. HEALTH HAZARD INFORMATION | TLV

Concentrated sulfuric acid is a strong mineral acid, an oxidizing agent, and a dehydrating agent that is rapidly damaging to all human tissue with which it comes in contact. Ingestion may cause severe injury or death. Eye contact produces severe or permanent injury. Inhalation of mists can damage both the upper respiratory tract and the lungs. Sulfuric acid is not listed as a carcinogen by the NTP, IARC, or OSHA.

FIRST AID: EYE CONTACT: Immediately flush eyes (including under eyelids) with plenty of running water for at least 15 minutes. Speed in diluting and rinsing out acid with water is extremely important if permanent eye damage is to be avoided. Obtain medical help as soon as possible.* SKIN CONTACT: Immediately flush affected areas with water, removing contaminated clothing while under the safety shower. Continue washing with water and get medical attention.* INHALATION: Remove to fresh air. Restore breathing. Call a physician immediately. INGESTION: Dilute acid immediately with large amounts of milk or water, then give milk of magnesia to neutralize. Never give anything by mouth to an unconscious person. Do not induce vomiting; if it occurs spontaneously, continue to administer fluid. Obtain medical attention as soon as possible.*

Maintain observation of patient for possible delayed onset of pulmonary edema.

* GET MEDICAL HELP = In plant, paramedic, community.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Handle major spills by a predetermined plan. Contact supplier for assistance in this planning, in meeting local regulations, and for disposing of large amounts. Notify safety personnel. Provide optimum ventilation; vapors are extremely irritating. Stop leak if you can do so without risk.

Cleanup personnel need protection against inhalation or contact. Keep upwind. Contain spill. Minor leaks or spills can be diluted with much water and neutralized with soda ash or lime. If water is not available, cover contaminated area with sand, ashes, or gravel and neutralize cautiously with soda ash or lime.

DISPOSAL: Follow Federal, state, and local regulations. Runoff to sewer may create hydrogen gas, which is a fire or explosion hazard. EPA (CWA) RQ 1000 lbs. (40 CFR 117).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general ventilation to meet current TLV requirements in the workplace. Where mists are up to 50 mg/m^3, a high-efficiency particulate respirator with full facepiece is warranted; a type-C supplier-air respirator with full facepiece operated in pressure-demand mode is used to 100 mg/m^3.

Avoid eye contact by use of chemical safety goggles or face shield where splashing may occur. Acid-resistant protective clothing, such as rubber gloves, aprons, boots, and suits, is recommended to avoid body contact.

Eyewash fountain and safety showers with deluge type of heads should be readily available where this material is handled or stored.

Contact lenses pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.

Comprehensive preplacement and annual medical examinations with emphasis on dental erosion, cardiopulmonary system, and mucous membrane irritation and cough are indicated.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Sulfuric acid in carboys or drums should be stored in clean, ventilated storage areas having acid-resistant floors with good drainage. Keep out of direct sunlight, do not store above 89.6°F (32°C). Storage facilities are to be separate from organic materials, metallic powders, chromates, chlorates, nitrates, carbides, oxidizables, etc. Soda ash, sand, or lime should be kept in general storage or work areas for emergency use. Protect containers against physical damage. Glass bottles need extra protection. Sulfuric acid is highly corrosive to most metals, especially below 77% H_2SO_4. Avoid breathing mist or vapors. Avoid contact with skin or eyes. Do not ingest. Do not add water to concentrated acid. Drums may contain hydrogen gas, so open cautiously. Use nonsparking tools free of oil, dirt, and grit and vapor-proof electrical fixtures

DOT Classification: Corrosive Material. ID No.: UN1830 Label: Corrosive

Data Source(s) Code: 1-12, 19, 20, 24, 26, 31, 37-39, 42, 82. CK

Approvals [illegible], 6/86.

Indust. Hygiene/Safety 6/86

Medical Review July 86

Material Safety Data Sheet

Genium Publishing Corporation
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GENIUM PUBLISHING CORP.

No. 317
TOLUENE
(Revision D)

Issued: August 1979
Revised: April 1986

SECTION 1. MATERIAL IDENTIFICATION

20

MATERIAL NAME: TOLUENE

OTHER DESIGNATIONS: Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol, C_7H_8, CAS #0108-88-3

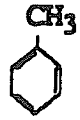
MANUFACTURER/SUPPLIER: Available from many suppliers, including:
Allied Corp., PO Box 2064R, Morristown, NJ 07960; Telephone: (201) 455-4400
Ashland Chemical Co., Industrial Chemicals & Solvents Div., PO Box 2219, Columbus, OH; Telephone: (614) 889-3844

HMIS
H: 2
F: 3
R: 0
PPE*
*See sect. 8

R 1
I 3
S 2
K 4

SECTION 2. INGREDIENTS AND HAZARDS

SECTION 2. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Toluene	ca 100	8-hr TLV: 100 ppm, or 375 mg/m^3* (Skin)** Man, Inhalation, TCLo: 100 ppm: Psychotropic*** Rat, Oral, LD_{50}: 5000 mg/kg Rat, Inhalation, LCLo: 4000 ppm/4 hrs. Rabbit, Skin, LD_{50}: 14 gm/kg Human, Eye: 300 ppm



* Current (1985-86) ACGIH TLV. The OSHA PEL is 200 ppm with an acceptable ceiling concentration of 300 ppm and an acceptable maximum peak of 500 ppm/10 minutes.
** Skin designation indicates that toluene can be absorbed through intact skin and contribute to overall exposure.
*** Affects the mind.

SECTION 3. PHYSICAL DATA

Boiling Point ... 231°F (111°C)
Vapor Pressure @ 20°C, mm Hg ... 22
Water Solubility @ 20°C, wt. % ... 0.05
Vapor Density (Air = 1) ... 3.14

Evaporation Rate (BuAc = 1) ... 2.24
Specific Gravity (H_2O = 1) ... 0.866
Melting Point ... -139°F (-95°C)
Percent Volatile by Volume ... ca 100
Molecular Weight ... 92.15

Appearance and odor: Clear, colorless liquid with a characteristic aromatic odor. The odor is detectable to most individuals in the range of 10 to 15 ppm. Because olfactory fatigue occurs rapidly upon exposure to toluene, odor is not a good warning property.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air % by Volume	LOWER	UPPER
40°F (4°C) CC	896°F (480°C)		1.27	7.1

EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, alcohol foam. Do not use a solid stream of water because the stream will scatter and spread the fire. Use water spray to cool tanks/containers that are exposed to fire and to disperse vapors.
UNUSUAL FIRE/EXPLOSION HAZARDS: This OSHA class IB flammable liquid is a dangerous fire hazard. It is a moderate fire hazard when exposed to oxidizers, heat, sparks, or open flame. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.
SPECIAL FIRE-FIGHTING PROCEDURES: Fire fighters should wear self-contained breathing apparatus with full facepiece operated in a positive-pressure mode when fighting fires involving toluene.

SECTION 5. REACTIVITY DATA

CHEMICAL INCOMPATIBILITIES: Toluene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This material is incompatible with strong oxidizing agents, dinitrogen tetraoxide, silver perchlorate, tetranitromethane, and uranium hexafluoride. Contact with these materials may cause fire or explosion. Nitric acid and toluene, especially in the presence of sulfuric acid, will produce nitrated compounds that are dangerously explosive.

CONDITIONS TO AVOID: Avoid exposure to sparks, open flame, hot surfaces, and all sources of heat and ignition. Toluene will attack some forms of plastics, rubber, and coatings. Thermal decomposition or burning produces carbon dioxide and/or carbon monoxide.

SECTION 6. HEALTH HAZARD INFORMATION | TLV

Toluene is not considered a carcinogen by the NTP, IARC, or OSHA. SUMMARY OF RISKS: Vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, lacrimation (tearing) and paresthesia (a sensation of prickling, tingling, or creeping on the skin that s no objective cause). Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and horia, and, in severe cases, may cause unconsciousness and death. The liquid is irritating to the eyes and skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated and/or prolonged contact with the skin may cause drying and cracking. It may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause reversible kidney and liver injury. FIRST AID: EYE CONTACT: Immediately flush eyes, including under eyelids, with running water for at least 15 minutes. Get medical attention if irritation persists.* SKIN CONTACT: Immediately flush skin (for at least 15 minutes) while removing contaminated shoes and clothing. Wash exposed area with soap and water. Get medical attention if irritation persists or if a large area has been exposed.* INHALATION: Remove victim to fresh air. Restore and/or support breathing as required. Keep victim warm and quiet. Get medical help.* INGESTION: Give victim 1 to 2 glasses of water or milk. Contact a poison control center. Do not induce vomiting unless directed to do so. Transport victim to a medical facility. Never give anything by mouth to a person who is unconscious or convulsing. * GET MEDICAL ASSISTANCE = In plant, paramedic, community. Get medical help for further treatment, observation, and support after first aid, if indicated.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: Notify safety personnel of large spills or leaks. Remove all sources of heat and ignition. Provide maximum explosion-proof ventilation. Limit access to spill area to necessary personnel only. Remove leaking containers to safe place if feasible. Cleanup personnel need protection against contact with liquid and inhalation of vapor (see sect. 8). WASTE DISPOSAL: Absorb small spills with paper towel or vermiculite. Contain large spills and collect if feasible, or absorb with vermiculite or sand. Place waste solvent or absorbent into closed containers for disposal using nonsparking tools. Liquid can be flushed with water to an open holding area for handling. Do not flush to sewer, watershed, or waterway. COMMENTS: Place in suitable container for disposal by a licensed contractor or burn in an approved incinerator. Consider reclaiming by distillation. Contaminated absorbent can be buried in a sanitary landfill. Follow all Federal, state, and local regulations. TLm 96: 100-10 ppm. Toluene is designated as a hazardous waste by the EPA. The EPA (RCRA) HW No. is U220 (40 CFR 261). The reportable quantity (RQ) is 1000 lbs/454 kg (40 CFR 117).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation to meet TLV requirements. Ventilation fans and other electrical service must be sparking and have an explosion-proof design. Exhaust hoods should have a face velocity of at least 100 lfm (linear feet inute) and be designed to capture heavy vapor. For emergency or nonroutine exposures where the TLV may be exceeded, u an organic chemical cartridge respirator if concentration is less than 200 ppm and an approved canister gas mask or self-contained breathing apparatus with full facepiece if concentration is greater than 200 ppm. Safety glasses or splash goggles should be worn in all work areas. Neoprene gloves, apron, face shield, boots, and other appropriate protective clothing and equipment should be available and worn as necessary to prevent skin and eye contact. Remove contaminated clothing immediately and do not wear it until it has been properly laundered.

Eyewash stations and safety showers should be readily available in use and handling areas.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION: Store in a cool, dry, well-ventilated area away from oxidizing agents, heat, sparks, or open flame. Storage areas must meet OSHA requirements for class IB flammable liquids. Use metal safety cans for handling small amounts. Protect containers from physical damage. Use only with adequate ventilation. Avoid contact with eyes, skin, or clothing. Do not inhale or ingest. Use caution when handling this compound because it can be absorbed through intact skin in toxic amounts. SPECIAL HANDLING/STORAGE: Ground and bond metal containers and equipment to prevent static sparks when making transfers. Do not smoke in use or storage areas. Use nonsparking tools. ENGINEERING CONTROLS: Preplacement and periodic medical exams emphasizing the liver, kidneys, nervous system, lungs, heart, and blood should be provided. Workers exposed to concentrations greater than the action level (50 ppm) should be examined at least once a year. Use of alcohol can aggravate the toxic effects of toluene.

COMMENTS: Emptied containers contain product residues. Handle accordingly!

Toluene is designated as a hazardous substance by the EPA (40 CFR 116). DOT Classification: Flammable liquid. UN1294.

Data Source(s) Code: 1-9, 12, 16, 20, 21, 24, 26, 34, 81, 82. CR

4

Approvals 11/86.

Indust. Hygiene/Safety 10-86

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Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
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GENIUM PUBLISHING CORP.

No. 318

XYLENE (Mixed Isomers)
(Revision D)
Issued: November 1980
Revised: August 1988

SECTION 1. MATERIAL IDENTIFICATION

26

Material Name: XYLENE (Mixed Isomers)

Description (Origin/Uses): Used as a raw material for the production of benzoic acid, phthalic anhydride, isophthalic and terephthalic acids and their dimethyl esters in the manufacture of polyester fibers; in sterilizing catgut; with Canadian balsam as oil-immersion in microscopy; and as a cleaning agent in microscopic techniques.

Other Designations: Dimethylbenzene; Xylol; C_8H_{10}; CAS No. 1330-20-7

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

Comments: Although there are three different isomers of xylene (*ortho*, *meta*, and *para*), the health and physical hazards of all three isomers are very similar. This MSDS is written for a xylene mixture of all three isomers, which is usually commercial xylene.

3
2 0
-
NFPA

HMIS			
H	2		
F	3	R	1
R	0	I	3
PPG*		S	2
*See sect. 8		K	3

SECTION 2. INGREDIENTS AND HAZARDS

	%
Xylene (Mixed Isomers), CAS No. 1330-20-7*	**

*o-Xylene, CAS No. 0095-47-6
m-Xylene, CAS No. 0108-38-3
p-Xylene, CAS No. 0106-42-3

**Check with your supplier to determine if there are additions, contaminants, or impurities (such as benzene) that are present in reportable quantities per 29 CFR 1910.

***Immediately dangerous to life and health.

**** See NIOSH, *RTECS* (No. ZE2100000), for additional data with references to reproductive, irritative, and mutagenic effects.

EXPOSURE LIMITS

IDLH*** Level: 1000 ppm

OSHA PEL
8-Hr TWA: 100 ppm, 435 mg/m³

ACGIH TLVs, 1987-88
TLV-TWA: 100 ppm, 435 mg/m³
TLV-STEL: 150 ppm, 655 mg/m³

Toxicity Data****
Human, Inhalation, TC_{Lo}: 200 ppm
Man, Inhalation, LC_{Lo}: 10000 ppm/6 Hrs
Rat, Oral, LD_{50}: 4300 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 275°F to 293°F (135°C to 145°C)*
Melting Point: -13°F (-25°C)
Evaporation Rate: 0.6 Relative to BuAc = 1
Specific Gravity (H_2O = 1): 0.86

Water Solubility (%): Insoluble
Molecular Weight: 106 Grams/Mole
% Volatile by Volume: Ca 100
Vapor Pressure: 7 to 9 Torrs at 68°F (20°C)
Vapor Density (Air = 1): 3.7

Appearance and Odor: A clear liquid; aromatic hydrocarbon odor.

*Materials with wider and narrower boiling ranges are commercially available.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air % by Volume	LOWER	UPPER
81°F to 90°F (27°C to 32°C)	867°F (464°C)		1%	7%

Extinguishing Media: Use foam, dry chemical, or carbon dioxide. Use water sprays to reduce the rate of burning and to cool containers.

Unusual Fire or Explosion Hazards: Xylene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Xylene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

Chemical Incompatibilities: This material may react dangerously with strong oxidizers.

Conditions to Avoid: Avoid any exposure to sources of ignition and to strong oxidizers.

azardous Products of Decomposition: Carbon monoxide (CO) may be evolved during xylene fires.

SECTION 6. HEALTH HAZARD INFORMATION

Xylene is not listed as a carcinogen by the IARC, NTP, or OSHA.
Summary of Risks: Liquid xylene is a skin irritant and causes erythema, dryness, and defatting; prolonged contact may cause blistering. Inhaling xylene can depress the central nervous system (CNS), and ingesting it can result in gastrointestinal disturbance; and possibly hematemesis (vomiting blood). Effects on the eyes, kidneys, liver, lungs, and the CNS are also reported. **Medical Conditions Aggravated by Long-Term Exposure:** Problems with eyes, skin, central nervous system, kidneys, and liver may be worsened by sure to xylene. **Target Organs:** CNS, eyes, gastrointestinal tract, blood, liver, kidneys, skin. **Primary Entry:** Inhalation, . contact/absorption. **Acute Effects:** Dizziness; excitement; drowsiness; incoordination; staggering gait; irritation of eyes, nose, and throat; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; and dermatitis. **Chronic Effects:** Reversible eye damage, headache, loss of appetite, nervousness, pale skin, and skin rash.
FIRST AID: Eyes. Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. **Skin.** Immediately wash the affected area with soap and water. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have a trained person administer oxygen. **Ingestion.** Never give anything by mouth to someone who is unconscious or convulsing. Vomiting may occur spontaneously, but do not induce it. If vomiting should occur, keep exposed person's head below his or her hips to prevent aspiration (breathing the liquid xylene into the lungs). Severe hemorrhagic pneumonitis with grave, possibly fatal, pulmonary injury can occur from aspiring very small quantities of xylene.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid. If exposure is severe, hospitilization for at least 72 hours with careful monitoring for delayed onset of pulmonary edema is recommended.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all sources of ignition immediately. Cleanup personnel need protection against contact with and inhalation of xylene vapor (see sect. 8). Contain large spills and collect waste or absorb it with an inert material such as sand, earth, or vermiculite. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.
Waste Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.
OSHA Designations
Air Contaminant (29 CFR 1910.1000 Subpart Z)
EPA Designations (40 CFR 302.4)
RCRA Hazardous Waste, No. U239
CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per the Clean Water Act (CWA), section 311 (b) (9)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield as a supplementary protective measure. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Use a NIOSH- ved respirator per the *NIOSH Pocket Guide to Chemical Hazards* for the maximum-use concentrations and/or the exposure limits n section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine use (leaks or cleaning reactor vessels and storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, gauntlets, etc., as required by the specifics of the work operation to prevent prolonged or repeated skin contact with xylene. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of xylene below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of xylene into general work areas by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations.
Safety Stations: Make eyewash stations, safety/quick-drench showers, and washing facilities available in areas of use and handling.
Contaminated Equipment: Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean xylene from shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Keep it off of your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Do not inhale xylene vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store xylene in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage.

Special Handling/Storage: Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. Ground and bond all containers, pipelines, etc., used in shipping, transferring, reacting, producing, and sampling operations.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Xylene	**DOT Label:** Flammable Liquid	**IMO Label:** Flammable Liquid
DOT ID No. UN1307	**DOT Hazard Class:** Flammable Liquid	**IMO Class:** 3.2 or 3.3

References: 1, 2, 12, 73, 84-94, 100, 103.

Prepared by PJ Igoe, BS
Industrial Hygiene Review: DJ Wilson, CIH
Medical Review: MJ Hardies, MD

REMEDIAL INVESTIGATION WORK PLAN
NATIONAL GRID
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK
OCTOBER 2010

Appendix D

Community Air Monitoring Plan

Appendix D

Community Air Monitoring Plan

Canastota Non-Owned Former MGP Site
Canastota, New York
NYSDEC Site # V00477
Index #: D0-0001-0011

Submitted To:

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October 2010
Project #034390-1-1014

Bruce Coulombe

Bruce Coulombe, P.G.
Project Manager

Table of Contents

Tables

Attachments

A Community Air Monitoring Daily Data Sheet

Abbreviations and Acronyms

CAMP	Community Air Monitoring Plan
COC	Constituents of Concern
DPW	Department of Public Works
GEI	GEI Consultants, Inc.
HASP	Health and Safety Plan
MGP	Manufactured Gas Plant
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PAH	Polycyclic Aromatic Hydrocarbons
PID	Photo-ionization Detector
ppm	Parts per Million
RI	Remedial Investigation
SVOC	Semi-Volatile Organic Compounds
VOC	Volatile Organic Compounds
$\mu g/m^3$	Micrograms per cubic meter

1. Introduction

This document presents the Community Air Monitoring Plan (CAMP) that will be implemented during the Remedial Investigation (RI) of the National Grid Non-Owned Former manufactured gas plant (MGP) site, located in the Village of Canastota, New York. A CAMP is required by the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH) at sites where ground-intrusive activities may result in airborne release of contaminants. Towards that end, community air monitoring will be performed for total volatile organic vapors (VOCs), and for particulates (dust).

The Canastota Non-Owned Former MGP site is located on East North Canal Street in the Village of Canastota, New York. The former MGP operations were conducted within a parcel of land that is currently owned by the Village of Canastota (site). This parcel is currently used by the Village of Canastota Department of Public Works (DPW) for its garage and equipment facility, and is covered by the garage building, a parking lot, and gravel- or grass-covered areas. A perimeter fence surrounds a portion of the parcel and access to the parcel is limited to DPW employees.

This CAMP specifically applies to the RI phase of work for the Canastota Non-Owned Former MGP site. The RI fieldwork is scheduled to be performed in late 2010, as described in the document "*RI Work Plan, Canastota Non-Owned Former MGP Site, Canastota, New York*," dated October 2010 (attached). The RI fieldwork involves the excavation of test pits, the advancement of subsurface soil borings, the installation of monitoring wells, and the collection of soil, groundwater, and soil vapor samples. Community air monitoring will be performed during the excavation and backfilling of the test pits, and during the drilling of soil borings and monitoring wells.

The objectives of this CAMP are to:

- Ensure that the airborne concentrations of constituents of concern (COC) are minimized to protect the community;
- 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 the specified limits.

This CAMP is a companion document to GEI'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. Air Monitoring Equipment, Methods, and Action Levels

This section provides instructions for conducting the CAMP. Discussed are the COC to be monitored, the equipment to be used, where sampling is to be performed, and the action limits. For the Canastota MGP site, community air monitoring will be performed for total VOCs and particulates (dust) during the excavation and backfilling of test pits, and during the drilling of soil borings and monitoring wells.

In addition to the community air monitoring, work/exclusion zone monitoring will be performed during work activities where impacted soil or groundwater may be encountered. The exclusion zone air monitoring requirements, equipment, and action levels are described in the site-specific HASP for this project. Note, however, that the work zone air monitoring and the community air monitoring are conducted as part of the overall site control program. When work zone VOC or particulate readings are found to exceed the downwind CAMP limits, the field staff will check the upwind and downwind air monitoring instruments to assess whether control measures will be required.

2.1 Monitoring Locations

Two community air monitoring locations will be established at the start of each workday – one upwind of the work area, and one downwind of the work area/exclusion zone. The purpose of the upwind station will be to determine the background concentration of VOCs and particulates at the worksite. The downwind monitoring station will be used to assess compliance with the NYSDEC/NYSDOH specified action limits for VOCs and particulates. The upwind VOC and dust measurements will be subtracted from the downwind measurements in order to compare the downwind instrument readings to the CAMP action levels.

The location of the each monitoring station will be noted on the ***Community Air Monitoring Daily Data Sheet*** (Daily Data Sheet) [Attachment A]. The locations of the instruments may be changed during the day to adapt to changing wind directions. Each location will be noted on the Data Sheet, along with the start and stop time at each location. Field personnel will be prepared to move the equipment to multiple locations in the event that there is little wind, if the wind direction changes frequently, or if there is a change to the location of the most sensitive downwind receptor location.

Where the work area is less than 20 feet from the nearest occupied building, the downwind air monitoring station will be positioned at the air intake for the building or at the most sensitive exposure point for the downwind receptors. Background measurements inside the building will be made prior to the start of work. If exceedances of the action levels are measured at the outside wall of the building, additional measurements will be made inside the building using portable meters.

If necessary, precautions to minimize the release of VOCs and particulates will be taken at the work zone, and engineering or work controls used to protect the downwind receptor. These controls for minimizing releases from the work zone are discussed in Section 3.

2.2 Air Monitoring Equipment

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. The time and method of calibration will be noted on the Daily Data Sheet. Both the photo-ionization detectors (PIDs) and particulate meters will be mounted on a tripod in a vented protective case, and programmed to record 15 minute averages. A monitoring technician will check the instrumentation at each of these locations regularly during the work-day to ensure that they are operating properly.

2.2.1 VOC Monitoring Equipment

VOC monitoring will be performed using PIDs (RAE Systems MiniRAE™ or equivalent) equipped with a 10.2 or 10.6 eV bulb. The instruments will be set to record 15-minute running average concentrations. The PIDs will be equipped with an audible alarm to indicate an exceedance of the action level of 5 ppm total VOCs.

2.2.2 Particulate (Dust) Monitoring Equipment

Particulate monitoring will be performed using meters set to measure 10 micron and finer particulates (PM-10). Particulates will be monitored using an MIE DataRAM DR-2000l, TSI DustTrak™, or equivalent, which is capable of measuring PM-10. The equipment used will be set to record 15-minute running average concentrations, for comparison to the action levels.

In addition to the instrument readings, fugitive dust migration will be visually assessed during all work activities, and the observations recorded. Per NYSDEC requirements, visible dust migration will not be allowed. If visible dust is observed to be migrating from the work zone, the work will be stopped and dust control measures implemented.

2.3 Monitoring Action Levels and Responses

The action levels and responses for VOCs and particulates are presented in Table 1.

Table 1. Air Monitoring Response Levels and Actions

VOCs	
Response Level	**Actions**
>1 ppm at the wall of an occupied structure or at an air intake	▪ Check the indoor air concentration and compare with background measurements taken previously
>5 ppm above background for 15-minute average	▪ Temporarily halt work activities ▪ Continue monitoring, especially inside of occupied structures ▪ If VOC levels decrease (per instantaneous readings) below 5 ppm over background, work activities can resume
Persistent levels >5 ppm over background but <25 ppm	▪ Halt work activities ▪ Identify source of vapors ▪ Corrective action to abate emissions ▪ Continue monitoring ▪ Resume work activities if VOC levels 200 feet downwind of the property boundary or half the distance to the nearest potential receptor is <5 ppm for a 15-minute average
>25 ppm at the perimeter of the work area	▪ Shut down work

Particulates	
Response Level	**Actions**
>100 µg/m^3 above background for 15-minute average or visual dust observed leaving the site	▪ Apply dust suppression ▪ Continue monitoring ▪ Continue work if downwind PM-10 particulate levels are <150 µg/m^3 above upwind levels and no visual dust leaving site
>150 µg/m^3 above background for 15-minute average	▪ Stop work ▪ Re-evaluate activities ▪ Continue monitoring ▪ Continue work if downwind PM-10 particulate levels are <150 µg/m^3 above upwind levels and no visual dust leaving site

Sources:

- NYSDOH Community Air Monitoring Plan, December 2009, as published in NYSDEC DER-10, Appendix 1A, 2010.
- Fugitive Dust and Particulate Monitoring, NYSDEC DER-10, Appendix 1B, 2010.
- Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures, NYSDOH.

All data will be downloaded to a computer on a daily basis and saved for review. The data will be provided to the NYSDEC and/or the NYSDOH upon request at any stage of the project.

If VOC or particulate action levels are observed to be exceeded during the work day, the event, the source and corrective actions taken will be recorded on the Daily Data Sheet and reported to the on-site NYSDEC representative. If an on-site representative is not present, exceedances will be noted in the daily report to the NYSDEC project manager within one business day.

Table 2. Emergency Contacts and Telephone Numbers

Fire, Police, Ambulance		911
NYSDEC Contact	Bernie Franklin – Project Manager	(518) 402-9662 (office) (518) 461-3094 (cell)
GEI Contacts	Bruce Coulombe – Project Manager Jennifer Belonsoff – Field Team Leader	(607) 793-3426 (cell) (607) 229-4678 (cell)
National Grid Contact	Steven Stucker – Project Manager	(315) 428-5652 (office) (315) 247-6490 (cell)

2.4 Odor Monitoring

The field investigation personnel will record observations of odors generated during the implementation of the Work Plan. When odors attributable to the exposing 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 downwind limit of the MGP site. The observations will be made to assess the potential for significant odors reaching onsite receptors or being transmitted off site. The downwind 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 Section 3 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 on-site receptors property line, site controls will be implemented proactively when odors are detected in the breathing zone at any work area.

There are no action levels specified for odors. In the event that odors persist at the downwind receptors or property line after control measures are carried-out, the odor conditions will be discussed with the National Grid and NYSDEC project managers. If necessary, the odor conditions and significance will be discussed with the DPW site staff or neighbors.

3. Control Procedures

This section outlines the procedures to be used to control VOCs, odors, and particulates that may be generated during the RI field activities. The investigation program will be conducted using two principal RI 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 NYSDEC 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 are presented in the following sections.

3.1 Potential Sources of Odors and VOCs

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, polycyclic 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 backhoe test pits and soil borings. When this occurs, VOCs and light-end semi-volatile organic compounds (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. It is important to note that the CAMP will provide for continual monitoring of VOCs and particulates during the fieldwork to monitor for any potential release of constituents which may exceed the exposure limits for downwind receptors.

3.2 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 VOCs and 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.

3.3 Secondary Site Controls

If substantial VOCs or 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 National Grid 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, VOCs, and dust.
- Water may be sprayed onto dry soils to minimize the generation of dust.
- 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.
    - Hydromulch - Although it is unlikely that it will be necessary, modified hydromulch slurry may be used to cover inactive sources for extended periods of time (up to several days). The hydromulch, typically cellulose fibers (HydroSeal®), 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.

3.4 Building Controls

Controls for minimizing the impacts to occupied buildings include temporary shut-down and/or closure of air intakes within the downwind zone, or deferral of work to times when building occupants are not present or at a minimum.

4. Documentation and Reporting

The attached Daily Data Sheet will be filled-out each day to record all of the details of the CAMP work. The form will be used to record the following information:

- Date and weather, with significant changes noted which may affect the positioning of the meters or recording of the data;
- Calibration results for the instruments;
- Locations of the upwind and downwind monitoring stations, and any changes made to the locations during the day to adjust for changing work locations or wind directions; and
- Any significant readings made during the day, such as exceedances which occur and their causes.

Additional information will be noted in the project fieldbook(s), as necessary.

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, or reported within one business day to the NYSDEC project manager (if on-site NYSDEC oversight is not provided). The results of the daily CAMP monitoring will also be discussed in the daily written report to the NYSDEC project manager. Summaries of all air monitoring data will be provided to the NYSDEC or the NYSDOH upon request.

CAMP odor monitoring results will be recorded in the field log book and/or the Daily Data Sheet, and will also be available for review by the state agencies.

ATTACHMENT A

Community Air Monitoring Daily Data Sheet

Community Air Monitoring Daily Data Sheet

Date:

Site:

Project Number:

Weather:

Monitoring Start Time:

End Time:

Monitoring Station Location	Time (24 hour)	CAMP PID (ppm)	CAMP Particulate (mg/m3)	Wind Direction	Work Zone PID (ppm)	Work Zone Particulate (mg/m3)	Activity	Comments

Notes:

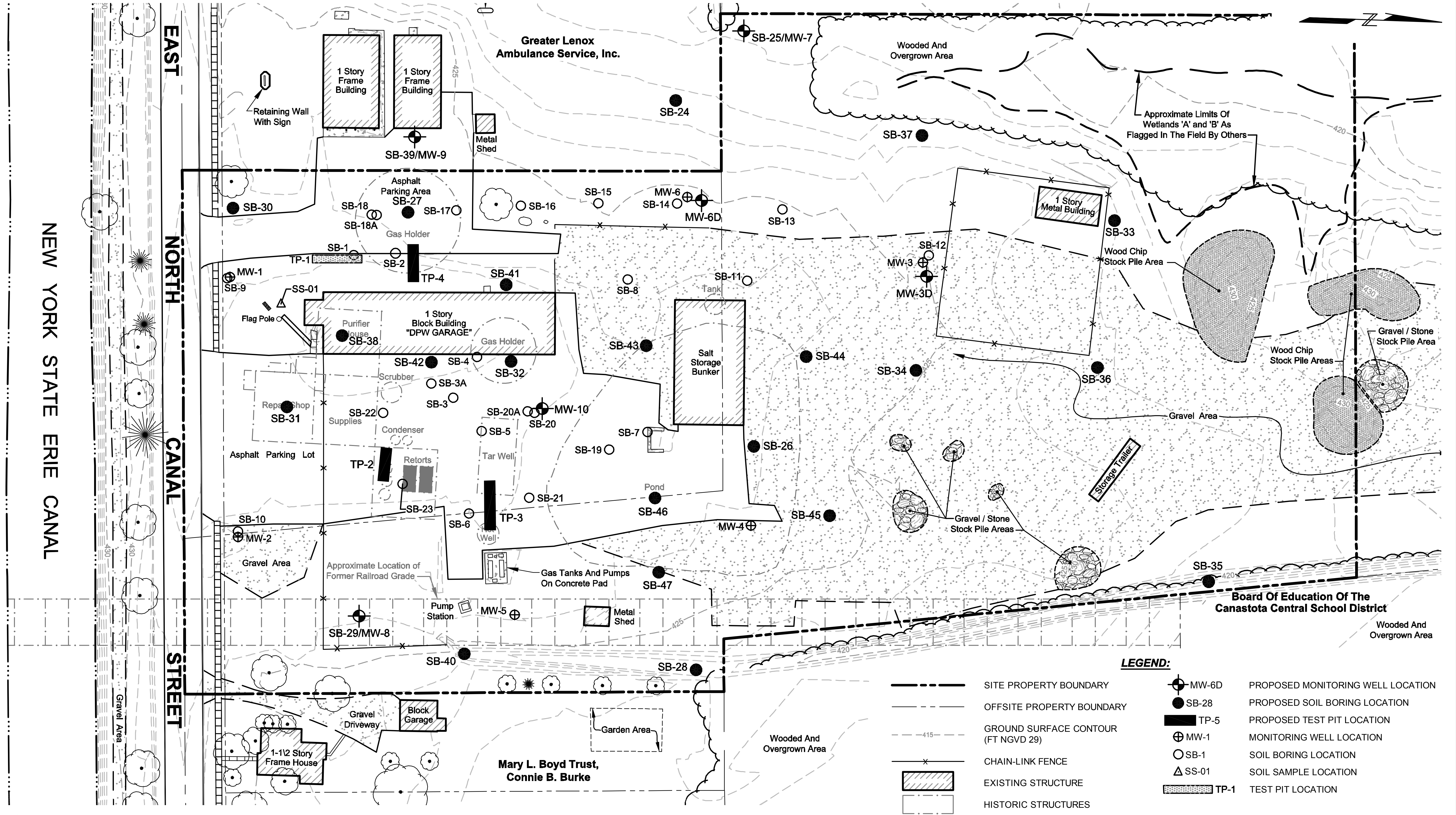
INSTRUMENT INFORMATION			**Time**	**Span and Agent**
PID Model:	**Serial Number:**	**Calibration:**		
PID Model:	**Serial Number:**	**Calibration:**		
Dust meter model:	**Serial Number:**	**Calibration:**		
Dust meter model:	**Serial Number:**	**Calibration:**		

Notes for Map on Reverse Side:

Circle Work Area. Show start and end times if there are multiple work areas.

➚ wind direction	**U** Upwind Station	**D** Downwind Station

Monitoring Completed By (print and sign): ______________________________



SOURCES:

1. PLAN BASED ON SURVEY MAPS SHEETS 1 AND 2: *LANDS OF VILLAGE OF CANASTOTA, NORTHEAST CANAL STREET AND ROBERTS STREET, BEING PART OF LOT # 86 OF THE CANASTOTA TRACT, VILLAGE OF CANASTOTA - MADISON COUNTY, STATE OF NEW YORK,* PREPARED BY DELTA ENGINEERS, ARCHITECTS & LAND SURVEYORS, 4873 NEW YORK STATE ROUTE #5, VERNON, NY, DATE: 2/10/2010, SCALE: 1" = 30.
2. FIGURE 1: *CURRENT SITE CONDITIONS AND SAMPLE LOCATION MAP,* PREPARED BY GEI CONSULTANTS, INC., DATE: OCTOBER 2007, SCALE: 1" = 60'

0 60 120

SCALE, FEET

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

nationalgrid

GEI Consultants

Project 034390-1-1014

PREVIOUS AND PROPOSED SUBSURFACE INVESTIGATION POINTS

May 2010

Figure 11

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REMEDIAL INVESTIGATION WORK PLAN
NATIONAL GRID
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK
OCTOBER 2010

Appendix E

MGP Soil Logging Protocols

🟥	TAR SATURATED
🟪	COATED MATERIAL, LENSES
🟧	BLEBS, GLOBS, SHEEN
🟨	STAINING, ODORS
🟦	PETROLEUM IMPACTS, SHEEN, STAINING, ODORS
🟦	PURIFIER WASTE OR ODORS
🟩	NO PHYSICAL IMPACTS OBSERVED

NOTES:

1. USE ONLY THE COLOR KEYS FOR THE CONDITIONS THAT ARE ENCOUNTERED AT A GIVEN SITE. IF CONDITIONS DESCRIBED ABOVE DO NOT EXIST, DO NOT USE IN LEGEND.
2. THE COLOR DESCRIPTORS ABOVE ARE TO BE USED IN CONJUNCTION WITH THE "ENVIRONMENTAL TERMINOLOGY FOR SOIL DESCRIPTIONS" BY M. PASTER OF GEI CONSULTANTS, INC.

REMEDIAL INVESTIGATION WORK PLAN
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK

nationalgrid

GEI Consultants

Project 034390-1-1014

COLORS FOR
NATIONAL GRID IMPACTS

October 2010

Figure 1

I:\Project\National Grid_formerly NIMO\CANASTOTA\RI - 2010\CADD DWGS\Figures\October 2010\ Canastota-Impacts.dwg \Oct 05, 2010

ENV'L TERMINOLOGY FOR SOIL DESCRIPTIONS

- **Ash** - Typically silt-size to medium sand-size.

- Do not use the term "cinders." This is not a technical term. Instead, use "ash," "burnt wood," "burnt material," or a similar term.

- **Coal-like material** - If it looks like coal but you aren't sure.

- **Clinker** - Vitrified (glass-like) or heat-fused material. Often burned impurities in coal. Often looks like pumice.

- **Slag** - Similar to clinker, but normally refers to residue from metal ore processing.

- **Sheen** - Iridescent petroleum-like sheen. Not to be used for a "bacterial sheen," which can be distinguished by its tendency to break up on the water surface at angles. Petroleum sheen will be continuous and will not break up.

- **Stained** - Use with a color ("brown-stained") to indicate that the soil is stained a color other than its natural (unimpacted) color.

- **Coated** - Soil grains are coated with NAPL (oil, tar, etc.). There is not enough NAPL to saturate the pore spaces. ("Split spoon sampler coated with brown oil." "Soil grains coated with gray oil-like substance.")

- **Saturated** - The entire sample pore space is saturated with NAPL. If you use this term, be sure it is not water saturating the pore spaces. Depending on viscosity, the NAPL may drain from a soil sample. ("Sample saturated with green, sticky substance.")

- **Blebs** - Discrete sphericals of NAPL in a soil matrix that was not visibly coated or saturated. ("Contained blebs of reddish-brown tar.")

- **Oil** - Exhibits a petroleum odor, different than MGP odors.

- **Tar** - Exhibits an MGP odor (e.g. naphthalene-like odor).

- **Solid Tar** - Tar that is solid or semi-solid phase. Describe what you observe (e.g., "discrete granules" or "solid layer").

- **Purifier Material** - Commonly brown/rust or blue/green wood chips or granular material. Often has a distinctive sulfur-like odor. Other colors may be present.

- **Odors** - Use terms such as "naphthalene-like odor" or "petroleum-like odor." Use modifiers (strong, moderate, slight) to indicate odor intensity.

REMEDIAL INVESTIGATION WORK PLAN
NATIONAL GRID
CANASTOTA NON-OWNED FORMER MGP SITE
CANASTOTA, NEW YORK
OCTOBER 2010

Appendix F

NYSDEC Fieldwork Reporting Guidelines

Reporting Guidelines for RI/PDI Fieldwork

To optimize the Department's oversight of field investigations at former MGP sites, we have developed reporting guidelines for certain field activities that are performed without the presence of Department personnel or Department-contracted inspectors. The purpose of these reports is to provide the Department PM with timely information of field activities on a routine schedule. The Department recognizes that these updates will require a minor degree of additional effort and the use of communication technologies from the field on the part of the utilities and their consultants. However, this information will used by the Department in responding to requested changes to work plans and will allow for more cost-effective use of Department staff in performing field oversight.

Immediate Notification – On certain occasions the Department should be informed at the earliest possible convenience of the responsible party, or their representative, of issues that require the Department's immediate attention. These notifications should be made to the Department PM by telephone, or if unavailable, via email. Examples of the immediate notifications include;

- Whenever the CAMP limits are exceeded or public health concerns (Department and DOH to be notified),
- Emergency work stoppages,
- Scheduling deviations that affect the current or next day's schedules,
- Other reasons identified in the site specific Work Plan or emergencies.

Daily Reports – The utility, or their representatives, should submit to the Department a brief daily report summarizing the RI or PDI work performed during day. Daily reports should be submitted by 8:30 am the following work day. The report will summarize work completed and scheduling information for the next three work days. The report should include the following information:

- Daily work completed,
- Sample locations,
- qualitative presence/absence of: odor, staining, NAPL,
- Significant findings, including stratigraphic information (presence or absence of confining unit, peat layer, poor sample recovery, etc.), especially if the results are contrary to previous results or the site's conceptual model,
- Media sampled,
- Sample shipments made,
- CAMP issues and operational report,
- Citizen concerns, media requests, if any,
- Select photo documentation of key features,
- Deviation from work plan, if any,
- Scheduling/sampling locations for the next three work days including any contingency locations.

The daily report should not require more than 10 minutes to prepare, and should be less than a page in length.

Weekly Reports – The daily report for the last day of the work week should also include the following information:

- Recap of the work that had been scheduled, the work completed and deviations from the schedule,
- Weekly CAMP monitoring synopsis reports to DOH,
- Scheduling for the next week, including contingencies and the anticipated de-mobilization date.

End of Fieldwork Report – At the completion of the field effort work the responsible party should report to the Department that the field efforts have been completed. The Department anticipates that this notification report would be less than one page and would include:

- The overall scope of work performed (number of borings, wells, test pits, etc.

- Major deviations from the Work Plan (locations not drilled, contingencies employed, etc.),
- Tasks not completed or omitted.

Notes:

1) The transmittal of these reports will be at the discretion of the Department PM and the RP will receive written approval to discontinue these reports where appropriate.
2) The utility (or their representatives) should consult with the Department PM to determine what activities require photo documentation and the amount of photo documentation required on a daily/weekly basis.
3) Complete photo logs will be required for each sample location and should be included in the RI.

DAILY ACTIVITY REPORT

Page 1 of 1

Date:	Consultant Personnel:
Project/Site:	Other Personnel:
Project #:	NYSDEC Personnel:
	Site Visitors:
Weather:	

Summary of Work Performed:

Significant Findings:

CAMP Results:

Citizen Activities:

Deviations from the Work Plan:

List of Attached Photos (file name and subject)

Schedule for the next three days:

Date	Planned Investigation Locations / Activities

Drilling Summary

Completed Boring ID	Completed Well ID	Total Depth of Soil Sampling	Well Screen Bottom Depth	Well Screen Top Depth	Isolation Casing Depths		

Summary of Soil Samples Submitted for Laboratory Analyses

Soil Sample ID	Boring ID	Depth Interval	Time Collected	Analyses Requested	Duplicate Sample ID	MS/MSD (yes/no)

Summary of Groundwater Samples Submitted for Laboratory Analyses

Groundwater Sample ID	Well ID	Time Collected	Analyses Requested	Sample Tube Intake Depth	Purge/Sample Flow Rate	Duplicate Sample ID