FIELD ACTIVITIES PLAN
PRE-DESIGN INVESTIGATION

SARANAC LAKE GAS COMPANY
OPERABLE UNIT 01
NYSDEC SITE NO. 516008
REMEDIAL DESIGN

WORK ASSIGNMENT NO. D007619-50

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Consulting, P.C.
Portland, Maine

MACTEC: 3611191237

August 2019

FIELD ACTIVITIES PLAN
PRE-DESIGN INVESTIGATION

SARANAC LAKE GAS COMPANY
OPERABLE UNIT 01
NYSDEC Site No. 516008
REMEDIAL DESIGN

WORK ASSIGNMENT NO. D007619-50

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Consulting, P.C.
Portland, Maine

MACTEC: 3611191237

August 2019

Submitted by:	Approved by:
Jean Firth. P.G. Site Lead	Jamie Welch Project Manager

TABLE OF CONTENTS

LIST OF FIGURES

Figure

LIST OF TABLES

Table

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ACM	Asbestos Containing Material
ACOE	Army Corps of Engineers
ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene and xylene compounds
CAMP	Community Air Monitoring Plan
COC	contaminant of concern
CSM	Conceptual Site Model
cy	cubic yards
DEPH	di-2-ethylhexyl phthalate
DNAPL	dense non-aqueous phase liquid
Eurofins	Eurofins TestAmerica
°F	degrees Fahrenheit
FAP	Field Activities Plan
FDR	Field Data Records
HASP	Health and Safety Plan
ID	identification
IDW	investigation-derived wastes
ISS	in-situ solidification
LBP	lead-based paint
LNAPL	light non-aqueous phase liquid

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

MACTEC	MACTEC Engineering and Consulting, P.C.
mg/kg	milligram(s) per kilogram
µg/m^3	microgram(s) per cubic meter
MGP	Manufactured Gas Plant
NCCC	North Country Community College
New York	New York State Museum and Science Service
NOB	Non-friable Organically Bound
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
OD	outside diameter
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
PFAS	Per- and Polyfluoroalkyl Substances
PDI	Pre-Design Investigation
PID	photoionization detector
PLM	Polarizing Light Microscopy
ppm	parts per million
QAPP	Quality Assurance Program Plan
RA	remedial action
RCM	Reactive Core Mat™
RD	remedial design
RI	remedial investigation
SC	Site Characterization
SCG	Standards, Criteria and Guidance Values

SCO	Soil Cleanup Objectives
SGV	Sediment Guidance Values
Site	Saranac Lake Gas Company
SVOC	semi-volatile organic compounds
TCLP	Toxicity Characteristics Leaching Procedure
TEM	Transmission Electron Microscopy
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WA	Work Assignment

1.0 INTRODUCTION

This Field Activities Plan (FAP) has been prepared by MACTEC Engineering and Consulting, P.C. (MACTEC) in response to Work Assignment (WA) No. D007619-50 from the New York State Department of Environmental Conservation (NYSDEC) for the Saranac Lake Gas Company Site Operable Unit 01 (OU01) – NYSDEC Site (Site No 516008) (Site) in the Village of Saranac Lake, in Essex County, New York (Figure 1.1). This FAP has been prepared in response to the NYSDEC WA authorization letter for D007619-50 dated April 19, 2019, and the July 2011 Superfund Standby Contract between MACTEC and the NYSDEC.

The Site is currently listed as a Class 2 site (i.e., significant threat to the public health or environment) by the NYSDEC. This FAP presents a technical scope of work to conduct pre-design field activities in support of the Remedial Design (RD) for OU01 (on-Site). Work will be conducted in accordance with the NYSDEC DER-10 Guidance (NYSDEC, 2010).

This FAP is organized into six sections as follows:

- *Section 1.0* – Introduction, Field Investigation Objectives, and Site Background.
- *Section 2.0* –Site Physical Setting – describes the physical, geologic, and hydrogeologic setting of the Site.
- *Section 3.0* – Conceptual Site Model (CSM) – presents a working conceptual model describing how contaminants may have been released into the environment, how the chemicals may migrate, and the receptors that may be affected.
- *Section 4.0* – Scope of Work - describes the sampling and analysis that will be performed to assess contaminant distribution in groundwater, soil and soil vapor.
- *Section 5.0* – FAP References.

The FAP is supplemented by the following attached documents:

- *Appendix A* – MACTEC Short Form Site-Specific Health and Safety Plan (HASP)
- *Appendix B* – Field Data Records (FDRs)
- *Appendix C* – Field Descriptions of Samples for Former Manufactured Gas Plant (MGP) Sites

1.1 Field Investigation Objectives

The objective of this FAP is to provide the technical scope of work to conduct pre-design field activities in support of the RD at OU01. The investigation objectives are:

- Conduct a hazardous building material survey at the onsite structure
- Further delineate the extent of MGP materials
  - Complete an environmental investigation of OU01 to refine the horizontal and vertical extent of MGP waste impact and to support excavation support design
  - Delineate the extent of MGP material visually and evaluate concentrations of polyaromatic hydrocarbons (PAH) and/or benzene, toluene, ethylbenzene and xylene (BTEX) exceeding commercial clean-up criteria.
  - Visually identify extent (horizontal and vertical) of purifier box waste (as indicated by wood chips) which will be removed from the site.
- Waste characterization of material to be disposed off-site
- Support bench scale testing for solidification of waste
- Support design of potential excavation water treatment
- Evaluate contaminant migration in groundwater at the nearest receptor
- Evaluate current groundwater concentration and the presence/absence of emerging contaminants
- Evaluate remaining contamination along the railroad corridor
- Decommission monitoring wells which are not needed for long term monitoring
- Clear trees to support implementation of the remedial activities

1.2 Site Background

Information pertaining to the history of the Site is contained in previous reports and is summarized in the following subsections.

1.2.1 SITE DESCRIPTION

The Remedial Investigation (RI) Report (MACTEC, 2015) documented investigation activities completed from August 2013 through October 2014 at the Site for all OUs:

- OU01 – Site property (the former MGP property)
- OU02 – Brandy Brook (the section of brook from OU01 to Pontiac Bay in Lake Flower)
- OU03 – Pontiac Bay of Lake Flower.

The RI report incorporated the results and findings of the Site Characterization (SC) Report which documented investigation activities completed in 2007 for all OUs.

OU01 is approximately 4.5 acres in size and is located east of, and adjacent to the Adirondack Scenic Railroad. Residential properties border OU01 to the north, east, and part of the west side and North Country Community College soccer fields and facilities border OU01 to the south. An access road extends from Payeville Lane west to the former gas plant setting. The Site and surrounding area is serviced by public water; therefore, groundwater is not believed to be used as a source of drinking water. Currently, OU01 is a vacant lot with an open, unoccupied one-story brick building. Figure 1.2 shows the existing and historical MGP-related features within OU01.

OU02 is Brandy Brook which flows along the northern edge of OU01 and continues in a northerly direction for approximately 1,000 feet then turns to the west and flows for 700 feet, where it discharges to OU03. Brandy Brook is a Class A designated water body.

OU03 includes Pontiac Bay and an adjacent area within Lake Flower. Pontiac Bay (approximately 4 acres) is located along the northeast portion of Lake Flower adjacent to the intersection of Lake Flower Avenue, Brandy Brook Road, and River Street. Lake Flower is a Class A designated water body.

1.2.2 PREVIOUS INVESTIGATIONS AND REMEDIATIONS

Investigations conducted between 2007 and 2017 revealed the primary contaminants of concern (COCs) as the by-products resulting from the manufacturing of coal gas, which contain several chemical constituents that are a cause for concern when left untreated in the environment. The following COCs are a result of the coal tar producing MGP process:

- Coal-tar includes two predominant contaminant classifications, volatile organic compounds (VOCs) and semi-VOCs (SVOCs).
    - MGP-related VOCs are specifically characterized by BTEX compounds. BTEX compounds often represent a small percentage of the mass of MGP-related waste but are the most soluble and therefore are the most likely to migrate in groundwater. BTEX are also the most volatile and are thus the most likely to migrate through subsurface soils as vapors or soil gas.
    - SVOCs found in coal-tar are PAHs. Naphthalene, a PAH, is present in coal-tar in relatively high concentrations and was used during the RI as an indicator compound for detecting MGP-related waste in sampled media.

During the previous investigations visual impact from MGP waste was documented in soil throughout OU01 (Figure 1.3). Purifier box wastes (typically wood chips and/or cyanide staining [blue]) were observed in in the central portion of OU01. VOCs and SVOCs were detected in soil at concentrations exceeding Part 375 Soil Cleanup Objectives (SCOs) for Industrial, Commercial and Residential use (NYSDEC, 2006). The majority MGP impacts in soil were observed within the limits of the site fence with some impacts observed both north and south of the former MGP processing area. The volume of MGP impacted soil is estimated to be 38,500 cubic yards (cy). Although visual impacts of MGP-related wastes were not observed in soil borings advanced at several locations within OU01, olfactory indications of MGP-related waste were noted in samples below the water table suggesting that contaminants are migrating in groundwater. VOCs and SVOCs were detected in OU01 groundwater at concentrations exceeding the New York State Ambient Water Quality Class GA Standards and Guidance Values (Class GA standards) (NYS, 1999). Groundwater contamination is migrating offsite to the south.

Results from the RI indicated OU02 sediment throughout Brandy Brook showed evidence of impact from MGP-related waste. PAH concentrations in OU02 exceeded both the Class A and B Sediment Guidance Values (SGVs) and met the definition of Class C sediments, which are "considered highly contaminated and likely to pose a risk to aquatic life" as set forth in NYSDEC Guidance Document titled “Screening and Assessment on Contaminated Sediment,” issued June 24, 2014. MGP-related contamination was generally observed from the surface to approximately three feet below ground surface (bgs) in Brandy Brook and the associated wetland. Increased concentrations, volume and depth of MGP-related contamination were detected in depositional areas in Brandy Brook (i.e. areas where stream flow velocity is reduced).

OU03 sediment throughout Pontiac Bay also showed evidence of impact from MGP-related waste. PAH concentrations in OU03 exceeded both the Class A and B SGVs and met the definition of Class C sediments. The vertical extent of MGP-impacted sediment within OU03 ranged between one to seven feet bgs.

Due to the nature of MGP-related waste, RI field observations (including visual, olfactory and photoionization detector [PID] field scan responses) were used as a primary characterization tool to assess the extent of contamination in soil and sediment. For confirmation of this technique, a subset of

samples (both with and without observed impacts) were submitted for laboratory analysis. It was observed that where MGP-like product or staining was observed, analytical results exceeded Standards, Criteria, and Guidance Values (SCGs); where no observable impacts of MGP-like wastes were noted, analytical concentrations were generally below applicable SCGs (MACTEC, 2015).

A pre-design investigation (PDI) for OU02 and OU03 was conducted in 2016/2017 to:

- Complete an ecological study, bathymetric study, and wetland delineation at OU02 and OU03
- Complete a topographic and property boundary survey of OU02
- Complete a topographic survey of OU03 shoreline areas and determination of property lines at OU03
- Complete a hydrogeological investigation of OU02 and OU03 to evaluate the depth of groundwater, the potential for groundwater discharge into Pontiac Bay, and to assist with RD dewatering specifications
- Complete an environmental and geotechnical investigation of OU02 to refine the horizontal and vertical extent of MGP waste impact to sediments, to support excavation support design, and to assess the slope stability of Brandy Brook
- Complete an environmental and geotechnical investigation of OU03 to refine the horizontal and vertical extent of MGP waste impact to sediments, to support shoring design, and to identify options available to render saturated sediment suitable for off-site disposal during the remedial action (RA).

Results from this investigation were presented in the PDI Field Activities Report Operable Units OU02 and OU03 (MACTEC, 2017). The results of this investigation were used to prepare a RD for OU02 and OU03. Soil and sediment removal remedial activities were conducted at OU02 and OU03 in 2018. Remedial activities consisted of:

- excavation of approximately 5,800 cy of MGP-impacted soil and sediment along Brandy Brook up to a depth of 9.5 feet bgs;
- removal of sediment accumulated in culverted sections of Brandy Brook located under Slater Avenue and Lake Flower Avenue discharging into Pontiac Bay;
- mechanical dredging of approximately 16,900 cy of MGP-impacted lake sediment in OU03 to a depth of 7.5 feet below lake bottom;
- Treatment of approximately 1,200 cy of MGP-impacted upland soil adjacent to Lake Flower in OU03 using in-situ solidification (ISS);
- Installation of engineering controls (Reactive Core Mat™ (RCM) in OU02 and Aquablok®, an impermeable barrier at OU03) at locations where visually impacted soil or sediment remained or laboratory results indicated that SCOs were not achieved but additional soil or sediment could not be reached or remediation was logistically impractical.

Restoration activities for OU02 and OU03 were conducted in May/June 2019.

2.0 SITE PHYSICAL SETTING

The sections below describe the topography, climate, surface water and groundwater hydrology, and geology in the area surrounding the Site.

2.1 Topography

The Site is located in the Village of Saranac Lake, Essex County at approximately 1560 feet above mean sea level. The topography in the immediate vicinity of the Site is characterized by a relatively flat grade. Brandy Brook flows adjacent to the northern edge of the Site and eventually discharges to Pontiac Bay of Lake Flower which is located approximately 0.75 miles northeast of the Site.

2.2 Climate

The climate of the area is characterized by moderately warm summers and cold winters. Mean monthly temperatures range from around 14 degrees Fahrenheit (°F) in January to 65°F in July. Average annual precipitation is about 40 inches (National Climactic Data Center, 1999).

2.3 Surface Water Hydrology

Brandy Brook (OU02) flows westward along the northern edge of the former gas plant property (OU01) before turning northwest and then west and discharging into Pontiac Bay (OU03) in Lake Flower. Along the corridor of Brandy Brook, precipitation that does not infiltrate to recharge groundwater may migrate as overland flow to the brook. Storm water from the northernmost portion of the property is presumed to migrate towards Brandy Brook. There are no other surface water features present within, or immediately adjacent to OU01. The southernmost portion of OU01 slopes southward and North Country Community College (NCCC) soccer fields bordering the Site to the south are built on the location of a former gravel pit. Surface runoff from the southern portion of the OU01 property would be expected to migrate southward. However, the sandy character of the surface soils promotes infiltration and no overland surface runoff was observed during precipitation events that occurred during RI activities.

McKenzie Brook is located to the south and flows generally from east to west along a corridor with wetland and small ponds and discharges to Lake Flower.

2.4 Groundwater Hydrology

Based on the sandy character of the overburden, the flat topography at OU01, and measurements of groundwater elevation, the former gasification plant (OU01) occupies a groundwater recharge area, or an area with downward vertical gradients. Depth to groundwater at OU01 ranges generally from 5 to 10 feet bgs. MGP-related waste, where present, will clog pore space and reduce the ability of the overburden to transmit water, and therefore measured groundwater elevations in shallow wells within OU01 are inconsistent. Therefore, the groundwater flow direction is interpreted based on weight of evidence from the majority of wells, the distribution of contaminants detected in these wells and the local topography. An interpretation of generalized shallow overburden flow direction is shown on Figure 2.1. Groundwater flow direction is controlled partially by the presence of a hill to the west of OU01. Flow beneath the northernmost portion of OU01 is directed northwestward towards Pontiac Bay (OU03) in Lake Flower. However, flow beneath most of OU01 is likely directed southward towards the McKenzie Brook watercourse, associated wetlands and small feeder ponds.

The bed of Brandy Brook along the northern edge of OU01 is approximately four feet above the water elevation in nearby wells indicating that the brook is a perched stream that recharges the groundwater table. The potential discharge point for groundwater beneath the impacted reach of Brandy Brook (OU02) is likely Pontiac Bay in Lake Flower (OU03). Seasonal variation in precipitation may affect surface water features (i.e., Brandy Brook to the north and drainage ditches located south of OU01) and influence shallow groundwater flow migrating from the Site.

Data collected during monitoring well sampling was evaluated to provide a general assessment of overburden hydraulic characteristics in the vicinity of OU01. Sampling flow rates and stabilized drawdown measurements were used to calculate well specific capacities (yield per unit of stabilized drawdown) and to estimate aquifer transmissivity (the maximum rate at which groundwater can flow horizontally through a unit width of unconsolidated aquifer). Transmissivity estimated from specific capacity was also approximated using an assumed storage coefficient for unconfined aquifer conditions. A summary of the data and calculations were presented in the RI Report. Specific capacity (and estimated transmissivity) values range over two orders of magnitude.

2.5 Geology

Based on information gathered during the SC and RI investigations, the surficial geology at the Site is predominately fluvial sands, medium to fine sands with some silt. These unconsolidated deposits are collectively referred to as "overburden". Bedrock underlying the site is noted as gneiss (metamorphic rock) of uncertain origin, and varied in composition (New York, 1970). Bedrock was not encountered during the 2007 SC or 2013/2014 RI and the depth to bedrock at the Site is not known. Soils at the Site (OU01) were logged continuously in most borings to depths up to 56 feet bgs and bedrock was not encountered. A solid point was advanced to refusal with a direct push drill rig in each corner of the Site, to get a better understanding of where a lithological change may be present and/or the elevation of the bedrock surface. Refusal depths encountered within OU01 ranged from 27 feet bgs to 68 feet bgs.

3.0 CONCEPTUAL SITE MODEL

Data obtained during the SC and RI was used to formulate the CSM for the Site. Field staff collecting samples during the RI evaluated conditions encountered and assessed whether field observations were consistent with the current site understanding and, if collected, met the project objectives. The CSM was updated after each phase of work to help guide future sampling tasks, as well as formulate a current understanding of the Site conditions and potential complete exposure pathways.

Background – The former Saranac Lake Gas Company manufactured lighting gas through the coal gasification process for the Village of Saranac Lake. According to Sanborn insurance maps and photos obtained from the town library, the MGP likely operated until the 1930s or 1940s and included two above ground gas holders, a building housing the purifier and retort (heating) operations, as well as additional areas for coal storage and offices.

Based on the operational age of this MGP site, the most likely method of gas manufacturing was via the Carbureted Water Gas process. In general, this method involved:

- Coal heated in closed retorts in which the coal was prevented from combusting by limiting the oxygen.
- During the heating process steam was injected into the retort and a chemical reaction occurred that produced a flammable gas mixture.
- Liquid petroleum hydrocarbons were sprayed into the hot gas mixture creating additional methane.
- The gas was collected, cooled, and purified before being used.
- Condensed tar (coal-tar) was produced as a by-product (waste).

Waste materials and by-products may have been disposed through a variety of methods. Historically, coal-tar was collected for sale or reuse. If a market for the coal tar did not exist, the waste may have been disposed in an onsite/near site landfill or waste was often discharged to nearby water bodies. Wastes may also have entered the environment through leaks from storage and, or processing. Coal tar disposal at this site was most likely disposed through a direct discharge to Brandy Brook; coal tar in onsite soil is likely the result of spills and leaks. Some box waste and ash materials were landfilled at the Site.

Investigations conducted between 2007 and 2017 revealed the presence of MGP-related contamination within OU01 soil and groundwater; OU02 sediment in Brandy Brook east and to a much lesser extent to the west of the Adirondack Scenic Railroad; and OU03 sediment within Pontiac Bay and extending further into Lake Flower.

3.1 CONTAMINANTS OF CONCERN AND ENTRY POINTS/SOURCE AREAS

COCs resulting from the MGP process (as described in Section 1.3 above) found at the Site property, Brandy Brook and Lake Flower include:

- Coal tar - Visual and olfactory evidence of coal tar related to the Site have been documented in soil, groundwater and sediment. PAHs have been detected at concentrations exceeding SCGs in soil and groundwater at OU01 and in sediment at OU02 and OU03. Naphthalene and/or BTEX compounds were detected in groundwater at concentrations above their SCGs in 10 of the 19 monitoring wells sampled as part of the RI.
- Light oil - Petroleum-related VOCs were detected at concentrations exceeding SCGs in soil and groundwater at (OU01) and downgradient from the Site (OU02).
- Phenols - Low concentrations of phenol were detected in groundwater collected from the Site (OU01) during the 2007 SC; however, they were not detected during the RI.
- Purifier box waste - OU01 Purifier box waste-like material was observed in 13 soil borings advanced within OU01 during the RI. In general, the purifier waste material was present adjacent to the footprint of the existing gas holder pad and extending southwards to the fenced perimeter of the Site (Figure 1.3). Cyanide likely associated with the box waste was detected at the Site (OU01) in soils at a concentration of 423 milligrams per kilogram (mg/kg) and sulfide was detected at the Site in soils at a concentration of 27 mg/kg during the 2007 SC.
- Metals - Metals have been detected at concentrations above SCOs in soil at the Site (OU01 and OU03).

In general, coal-tar can exist as a dense non-aqueous phase liquid (DNAPL), and the associated light oil as a light non-aqueous phase liquid (LNAPL). The VOCs and phenols tend to dissolve in groundwater or volatilize in the soil (vadose zone). Metals and cyanide may be mobilized from the purifier waste and coal ash, depending on pH (perhaps affected by the presence of sulfur); the metals may be either insoluble or soluble.

Potential Sources of MGP-related waste at the Site (OU01) include:

- Gas holders – within and around the footprint of the former gas holders;
- Former purifier and retort building;
- Former coal storage area.

Points of Entry - Waste from the MGP process may have been released to the environment through a variety of processes. Coal-tar, one of the byproducts from the coal gasification process, is a dense, oily liquid able to condense out of the gas at various stages during its production, purification and distribution. Historically, coal-tar may have been collected for sale or reuse; however, disposal often occurred on and near the site if markets were not available. Also, MGP plants often had tar/water separators, which may not have fully separate the two liquids. The resulting tar/water emulsion was often discharged to a nearby surface water body.

Based on the vertical distribution of MGP-impacted soil, it appears that the onsite gas holders, condensers and/or tar separators may be the source of coal-tar and light oil in the soil. Both tar and light oil tend to sink in the vadose zone. However, once the water table is encountered, coal-tar will continue to sink but the light oil will float. The VOCs associated with the light-oil tend to migrate in groundwater in a dissolved phase. Measurable quantities of DNAPL and LNAPL were detected in OU01 monitoring wells during the RI.

Wastes from the purifier box, ash and coal slag from the retort have been found on the Site (OU01). During the RI, purifier box waste material (described in the field as stained wood chips with strong olfactory odor) was encountered on the central and southern portion of OU01 (as shown on Figure 1.3). Purifier waste material was observed ranging in depths from three to seven feet bgs and varying in thickness from one to four feet. The estimated area of purifier box waste material present in OU01 soils is 19,000 square feet. Using an interpretive average thickness over that area of three feet, approximately 2,100 cy of purifier box waste is present within OU01.

Additionally, ash, coal and slag are present on the ground surface on the Site. COCs associated with these wastes (inorganics and cyanide) were not found at concentrations that pose a concern from surface soil at the Site.

The distribution of MGP-related waste in shallow sediment (ranging generally from 0 to 3.5 feet bgs) along Brandy Brook and Pontiac Bay suggests that coal-tar waste was likely directly discharged to Brandy Brook, either via a drainage swale or a discharge pipe (not confirmed). MGP-related waste (coal-tar DNAPL) was also observed in deeper sediment (from 7.5 to 9 feet bgs) beneath Brandy Brook; therefore, the vertical distribution of contamination appears to be discontinuous (i.e. clean sediment was observed between contaminated sediment within Brandy Brook). Coal tar observed to

be present in deeper sediment in OU02 located closer to the Site (OU01) may have been a result of lateral migration from DNAPL directly discharged to Brandy Brook.

3.2 HYDROGEOLOGY AND CONTAMINANT DISTRIBUTION

The soil underlying the site consists of fluvial sands, medium to fine grain size with some silt. Soils at OU01 were logged continuously to depths up to 56 feet bgs (F-9A) and soil cores did not encounter indications of bedrock (e.g. dense basal till or hard refusal on rock). At each corner of the OU01, an attempt was made to get additional information on depth to bedrock or a change in lithology by advancing a solid point to refusal using a direct push rig. These probes encountered refusal at depths ranging from 27 feet bgs (southeast corner) to 68 feet bgs (center of the Site); however, these did not confirm the presence of bedrock.

DNAPL migration within overburden is primarily controlled by gravity and this denser-than-water product will seek to migrate downward but may also flow laterally along the top of soil horizons with lower transmissivity (i.e., clay or silt layers). In contrast, migration of lighter phase contaminants associated with coal-tar tends to follow the hydraulic gradient once the water table is encountered.

VOCs and PAHs associated with MGP-waste have been detected in OU01 and OU02 groundwater at concentrations exceeding Class GA standards. Contaminant plumes generally follow the interpreted groundwater flow directions; south of OU01 toward the wetland network and northwest and west beneath Brandy Brook (OU02).

Natural attenuation processes, (the reduction of contaminant concentrations by natural physical and chemical processes such a biologic degradation), act on dissolved aromatic hydrocarbons, petroleum-related VOCs and fuel-hydrocarbons as they migrate in groundwater. Analytical data collected as part of the RI shows contaminant concentrations decreasing with distance from the OU01 which supports the theory of limited migration of MGP-impacted contamination in groundwater.

Measurable quantities of DNAPL (0.5-feet) and LNAPL (0.45-feet) were observed in groundwater in the central portion of OU01 at MW-109 and DNAPL (0.4-feet) was also observed in nearby MW-101. Following the interpreted groundwater flow direction to the south, naphthalene concentrations decrease an order of magnitude approximately 300-feet downgradient from where DNAPL was measured to 2,200 micrograms per liter (µg/L) at MW-205D from 29,000 µg/L at MW-109.

Naphthalene was detected in shallow groundwater (15 feet bgs) from the same location (MW-205S) but at a concentration below the Class GA Standard (2.9 μg/L) which would be explained based on the downward vertical gradients.

Naphthalene concentrations 200-feet to the northwest of MW-109 were 9,700 μg/L at MW-102 and 890 μg/L at MW-106 (350-feet northwest). Extending another 300-feet to the northwest (into OU02), naphthalene concentrations decrease to 290 μg/L at MW-201. Based on the contaminant distribution detected in the south flowing groundwater plume (naphthalene concentrations decreasing approximately an order of magnitude 300-feet downgradient), naphthalene concentrations detected northwest of the Site suggest that MGP-impacted sediment from the wetland associated with Brandy Brook were contributing to the observed groundwater impacts.

PAHs (including naphthalene) have a high total organic carbon (TOC) Koc (partitioning coefficient) and therefore tend to adhere to readily available natural carbon. TOC was detected at a concentration of up to 40,000 mg/kg from sediment collected in Brandy Brook during the 2007 SC, suggesting that PAHs may less readily migrate from sediment to groundwater from shallow sources along the brook corridor. At MW-203, located approximately 200-feet downgradient and west from the Brandy Brook corridor, naphthalene was detected in shallow groundwater at 0.94 μg/L, below the Class GA Standard (10 μg/L).

3.3 SURFACE WATER MIGRATION PATHWAYS

Based on data collected to date, MGP-related waste appeared either to have been discharged via a drainage swale or a discharge pipe to the Brandy Brook located to the northeast of the Site. The contamination appeared to have migrated with surface water in Brandy Brook and discharged to Pontiac Bay of Lake Flower. Based on groundwater and surface water elevations measured in 2014, Brandy Brook appears to be a "losing stream" (a stream that recharges to groundwater). However, seasonal variation in groundwater elevation along the brook has not been studied.

3.4 EXPOSURE POINTS

MGP-related contamination above SCGs was documented during the SC and the RI in groundwater and soil at OU01, in sediment and soil from Brandy Brook (OU02), and sediment from Pontiac Bay/Lake Flower (OU03). Exposure to contaminated soils at OU01 is limited by a locked chain link fence surrounding a portion of the property. Contamination is persistent within shallow soils inside the

fenced-in perimeter of OU01 (present at depths less than one foot bgs), however it is unlikely that the Site is accessed by the public or that surface/subsurface is being disturbed. Residents and students attending the local college, NCCC, utilize the areas surrounding the Site (outside the fenced perimeter of OU01) as walking trails.

Public water is available in the vicinity of the Site, therefore, it is unlikely that contaminated groundwater near the Site is being used for drinking purposes.

Brandy Brook (OU02) extends from the northern portion of the Site and discharges into Pontiac Bay of Lake Flower (OU03) approximately 2,000 feet downgradient from the Site. Pontiac Bay/Lake Flower serves as a recreational area, as well as an alternate drinking water supply for the Village of Saranac Lake. Contaminated sediments were removed from OU02 and OU03 as part of the 2018 RA to limit potential exposure pathways to humans and the environment.

4.0 SCOPE OF WORK

The following subsections describe the activities planned for the pre-design field investigation. The field investigations are focused primarily on the following activities to support the design of the chosen remedy identified in the Record of Decision for OU01:

- Hazardous building materials survey of an existing site building;
- Vertical and horizontal delineation of coal tar and purifier waste at OU01;
- Groundwater studies to better understand existing hydrology, dewatering requirements and potential impacts from ISS implementation;
- Collection of soil samples for ISS bench tests;
- Porewater sampling to evaluate potential impacts to surface water south of the site;

Other activities proposed in this FAP, not related to the PDI for OU01 include:

- Removal and temporary on-site storage of approximately 1,200 feet of railroad tracks adjacent to OU01 and OU02.
- Delineation of remaining sediment and/or soil impacts adjacent to Brandy Brook that were not removed during the 2018 remedial activities due to the presence of the Adirondack Scenic Railroad.
- Decommissioning of piezometers at OU03 that are not required for long-term monitoring.
- Conducting an inventory of monitoring wells and piezometers at OU02 for potential future monitoring or decommissioning.
- Clearing of trees at OU01 between November 1 and March 31, in accordance with the Army Corps of Engineers' (ACOE) permit, to facilitate implementation of the remedial activities at OU01, which are anticipated to take place in 2020.

The field investigation will be conducted in accordance with the specifications presented in the Quality Assurance Program Plan (QAPP) (MACTEC, 2011a). Health and Safety procedures for onsite activities are presented in the Program HASP (MACTEC, 2011b) and the Site-specific HASP, included as Appendix A to this FAP.

4.1 General Field Operations

This FAP provides necessary details for the implementation of the PDI. A summary of the field methodologies, rationale, sample identifications (ID), and analytical program are described in more detail in Tables 4.1 and 4.2, as well as in the following subsections. The types and locations of the investigation areas described in Table 4.2 are shown on Figures 4.1 through 4.5.

4.1.1 HEALTH AND SAFETY

The Site-specific HASP is provided as Appendix A. MACTEC anticipates that the fieldwork will be conducted in Level D personal protection. Specific investigation activities, utility clearance procedures, and required level of personal protection are set forth in the Site-specific HASP. Criteria for upgrading or downgrading the specified level of protection are also provided in the Site-specific HASP. Additional health and safety requirements are set forth in the Program HASP (MACTEC, 2011b). Should site conditions pose a threat to those present on site, and/or should Site conditions warrant an upgrade from Level D, as defined by the HASP, work will stop and the situation will be reevaluated by the NYSDEC and MACTEC.

4.1.2 ACCESS AND CLEARANCE

Proposed exploration locations will be placed, to the extent practical, on a limited number of properties to facilitate access. Current proposed explorations are located on:

- the Site property
- the New York State Department of Transportation's (NYSDOT) Right of way (former Adirondack Scenic Railroad property)

The NYSDEC will coordinate access with MACTEC assistance.

For clearing exploration locations of utilities, the drilling and test pitting contractors will be responsible for marking locations in the field and coordinating utility clearance with Dig Safely – New York. In addition, there is a known sewer force main located adjacent to the railroad tracks that will need to be located by private utility locators to ensure that it is not impacted during drilling activities. MACTEC will confirm investigation locations and utility clearance prior to conducting drilling activities.

4.1.3 COMMUNITY AIR MONITORING PLAN

4.1.3.1 PURPOSE

The purpose of the Community Air Monitoring Plan (CAMP) is to provide a measure of protection for the downwind community from potential airborne contaminant releases as a result of remedial work activities performed at the Site. Site-specific procedures described below are consistent with

the New York State Department of Health generic CAMP (NYSDEC, 2010). Several of the proposed borings are in wooded areas, and many are located relatively close to residential dwellings.

4.1.3.2 Particulate Air Monitoring

Particulate monitoring will be conducted continuously during ground intrusive activities (e.g., installation soil borings and test pitting). Dust/particulate monitoring will be conducted up wind of the intrusive activities and at the property boundary. Dust monitoring may be suspended during periods of precipitation.

Particulate air monitoring will be conducted with a DataRAM-4 (or a similar device). This instrument is equipped with an audible alarm (indication of exceedance) and can measure particulate matter less than 10 micrometers in size (PM-10). The DataRAM-4 will continually record emissions (calculating 15-minute running average concentrations) generated during field activities. The dust monitoring device will be checked periodically throughout each day of intrusive activities to assess emissions and the need for corrective action.

Weather conditions, including the prevailing wind direction, will be observed and recorded for each day of site activities. As work and weather conditions change throughout the day, the locations where the dust monitoring devices are set up may be adjusted accordingly.

Particulate monitoring response and action levels include:

- If the PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques, provided that the PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above background level and provided that no visible dust is migrating from the work area.
- If after implementation of dust suppression techniques, the PM-10 particulate levels are greater than 150 $\mu g/m^3$ above background, work will be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the PM-10 particulate concentration to within 150 $\mu g/m^3$ of the background level and in preventing visible dust migration.

4.1.3.3 VOC AIR MONITORING

VOC air monitoring will be conducted in conjunction with the dust monitoring program. VOC air monitoring will be conducted using a RAE Systems MiniRAE 2000 VOC instrument (or a similar PID device). This will provide real-time recordable air monitoring data.

VOC monitoring will be conducted for ground intrusive (continuous monitoring) and non-intrusive activities (periodic monitoring).

VOCs will be continuously monitored in the vicinity of the drilling and test pitting operations. Upwind/background concentrations will be measured before field activities commence and periodically throughout the day to confirm background conditions. The drilling area VOC monitoring device will also be checked periodically throughout the day to assess emissions and the need for corrective action.

VOC monitoring response and action levels include:

- If the ambient air concentration of total organic vapors at the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the work area persist at levels greater than 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. Work activities can resume provided the total organic vapor level 200 feet downwind of the work area or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, below 5 ppm over background for the 15-minute average.
- If the organic vapor level exceeds 25 ppm at the perimeter of the work area, activities will be shutdown.

Weather conditions, including the prevailing wind direction, will be observed and recorded for each day of site activities. As work and weather conditions change throughout the day, the locations of the VOC monitoring devices may be adjusted accordingly.

4.1.4 MOBILIZATION

Mobilization will include obtaining utility clearances for proposed locations, procurement of subcontractors, and the acquisition and coordination of supplies. The NYSDEC will be responsible for obtaining access to the Site as well as off-site locations.

4.1.5 DECONTAMINATION

Sampling methods and equipment for this field program have been chosen to minimize decontamination requirements reducing the potential for cross contamination. Disposable sampling equipment will be used as much as practical to minimize decontamination time and water disposal. Non-disposable sampling equipment will be decontaminated before and after the collection of each sample. Decontamination methods and materials are described in detail in Subsection 4.3 of the QAPP.

Non-disposable sampling equipment will be decontaminated by 1) washing the sample collection equipment with potable water and Liquinox, rinsing with potable water, rinsing with deionized water, and then allowing the equipment to air dry, or 2) steam cleaning the equipment and then allowing the equipment to air dry. Drilling equipment (i.e. drill rods and casing) will be decontaminated by steam cleaning with potable water prior to each boring and before leaving the Site on a temporary decontamination pad constructed at the Site. Decontamination water will be collected, containerized, and stored on site in labeled containers awaiting treatment and/or proper disposal based on investigation-derived wastes (IDWs) characterization sampling results.

4.1.6 INVESTIGATION DERIVED WASTES

Soil IDW. Test pits will be excavated such that the clean cover soils will be segregated from contaminated materials. Once the test pit is completed the excavation contaminated soil will be replaced in a test pit first and covered with non-contaminated soil. Soil IDW generated outside of the soil remediation area which shows visual, olfactory or PID indications of potential contamination will be consolidated in test pits located within the soil remediation area. Soils from borings which do not appear to be contaminated will be placed back in the hole.

Decontamination Fluids and Well Purge Water IDW. Decontamination fluids and purge water generated during groundwater sampling will be temporarily containerized and then treated on-site with

a granular activated carbon filtration unit. The purge water will be discharged to the ground surface at the Site in a location and at a rate which allows infiltration.

4.1.7 LABORATORY ANALYSIS

Groundwater and soils: Groundwater and soil samples will be analyzed at Eurofins TestAmerica (Eurofins) of Buffalo, New York (as a NYSDEC call-out contractor) by one or more of the following analysis:

- VOCs by Unites States Environmental Protection Agency (USEPA) method 8260;
- SVOCs by USEPA method 8270;
- 1,4-dioxane and by Method USEPA method 8260 selective ion monitoring to obtain low detection limits (groundwater only)
- Per- and Polyfluoroalkyl Substances (PFAS) by modified USEPA method 537 (groundwater only)

Laboratory results will be reported in a Category B deliverable. A summary of target analytes and reporting limits for these methods is presented in Appendix D. Quality assurance /quality control samples will be collected at a frequency of 5 percent (1 for every 20) for the above parameters for each sample media (soil and groundwater).

Groundwater samples will be compared to the Class GA groundwater standards and guidance values in the Technical and Operational Guidance Series 1.1.1 (NYS, 1999). Soil samples will be compared to 6 New York Codes, Rules and Regulations Part 375 Soil Cleanup Objectives for unrestricted and commercial use (NYSDEC, 2006). PFAS and 1,4-dioxane will be compared to the NYS Department of Health Drinking Water Quality Council proposed maximum contaminant levels (NYSDOH, 2018).

Specific analysis for each site media is described in Section 4.2 and is presented on Table 4.2.

Building Materials: Building materials will be analyzed at Eurofins for the following analyses:

- Lead by USEPA method 6010
- Polychlorinated biphenyls (PCBs) by USEPA method 8082

Asbestos Containing Material (ACM): Suspect ACM will be analyzed by Lozier Environmental Consulting, Inc. of Rochester, New York for one or more of the following analyses:

- Polarizing Light Microscopy (PLM);

- Transmission Electron Microscopy (TEM); and
- PLM/TEM for Non-friable Organically Bound (NOB) material.

Waste Characterization, ISS support, and Water Treatment: Soil and water samples collected for waste characterization, ISS support, or on-site treatment will be analyzed by Eurofins for one or more of the following:

- VOCs by USEPA method 8260;
- SVOCs by USEPA method 8270;
- Toxicity Characteristic Leachate Procedure (TCLP) for VOCs, SVOCs, and metals;
- Target analyte list metals plus mercury by USEPA methods 6010 and 7471;
- PCBs by USEPA method 8082;
- pH by USEPA method 150.1 (soil) or USEPA method 9040 (water);
- Total suspended solids by SM2540D;
- Total dissolved solids by USEPA method 160.1;
- Total organic content by Lloyd Kahn method (soils) or USEPA method 415.1 (water);
- Biological oxygen demand by SM5210B;
- Oil and grease by USEPA method 1664A;
- Pesticides by USEPA method 8081;
- Salinity by American Society for Testing and Materials (ASTM) D2937;
- Sulfide by SM4500-S;
- Free chlorine by SM4500-Cl;
- Reactive cyanide by USEPA method 9012;
- Reactive sulfide by USEPA method 9034; and
- Ignitability by USEPA method 1030.

Geotechnical Testing: Geotechnical testing will be conducted by RSA Geolab, LLC. of Union, New Jersey. Testing will consist of a bench scale test for the in-situ solidification as described in Appendix E. The following tests methods are included in the bench scale test:

- Grain-Size with Hydrometer, ASTM D6913/D7928;
- Moisture Content, ASTM D2216;
- Atterberg Limits, ASTM D4318;
- Hydraulic Conductivity, ASTM D5084;
- Unconfined Compression, ASTM D1633, with stress-strain plots;

- Specific Gravity, ASTM D854;
- Marsh Funnel Viscosity, API RP 13B-1; and
- Mud Balance, ASTM D4380 or API RP 13B-1.

4.2 Field Activities

Fieldwork is anticipated to be conducted as described in the following subsections. The fieldwork will be conducted in accordance with the specifications presented in the QAPP (MACTEC, 2011a). A summary of the field methodologies, rationale, sample IDs, and analytical program are described in more detail in Tables 4.1 and 4.2, as well as in the following subsections. Proposed investigation areas are shown on Figure 4.1. Proposed boring and well locations are shown on Figures 4.2 and 4.3. Wells and piezometers in OU02 and OU3 are shown on Figures 4.4a and 4.4b. Proposed tree clearing areas are shown on Figure 4.5.

4.2.1 BUILDING MATERIALS SURVEY

ACM - A NYS Licensed Asbestos Inspector will complete a pre-demolition asbestos survey of the onsite shed structure (Figure 4.1). The survey will consist of the inspection and sampling of building materials for suspect ACM. Roofing samples will be collected if feasible without climbing on the roof. Otherwise, MACTEC will presume suspect ACM observed is ACM.

An estimated 10 bulk asbestos samples will be collected and analyzed for PLM analysis, up to six bulk samples for PLM/NOB analysis and up to three bulk samples for TEM analysis.

Lead Paint. A limited screening of painted surfaces will be conducted to identify the presence of lead in the subject building. The lead-based paint (LBP) survey will include the representative testing of accessible interior and exterior surfaces through paint chip sampling. Surface types to be analyzed include paint, varnishes, stains, and primers. The goals of the LBP survey is not to assess lead content throughout the building, but rather to document lead content in the building to provide to abatement contractors prior to demolition. This documentation will be used to support compliance with Occupational Safety and Health Administration 29 CFR 1926.62 (Lead in Construction Standard). MACTEC assumes up to three paint chip samples from these surfaces will be analyzed. In addition, MACTEC will analyze one composite waste stream by TCLP for lead to determine if the material is a hazardous waste.

PCBs. Up to two bulk samples will be collected of building substrates, such as caulking and glazing for PCB analysis.

Other Materials. Other hazardous materials observed while conducting survey activities will be inventoried. Other hazardous material may include: PCB and di-2-ethylhexyl phthalate (DEPH, a.k.a. bis-2ethylhexyl phthalate) containing light ballast, mercury containing lamps, mercury containing thermostatic controls, chlorofluorocarbons, and chemical containers and storage tanks.

MACTEC will prepare a hazardous materials summary report for the subject site building. The report will describe the findings of the ACM, LBP, PCB containing materials, and other hazardous materials survey. The report will include: procedures for the inventory and building inspection, sampling strategy and methodology, and laboratory analysis; an inspection summary that describes the materials sampled, their condition and locations, and hazardous material content and quantities; and a map showing the sample locations.

4.2.2 RAILROAD TRACK REMOVAL

During the OU02 RA some areas of soil or sediments, where visual MGP impacts or laboratory results indicated that SCOs were not achieved, were left in place along the railroad tracks on the western boundary of the Site due to logistical unpracticality of excavation (Figure 4.3). Therefore, engineering controls (RCM in OU02) were installed. The impacts observed at these locations may extend beneath the railroad tracks.

To prepare the site for evaluation of the remaining residual material in OU02, the railroad tracks are proposed to be removed between Brandy Brook Rd and the southern Site boundary (Figure 4.3) The rails will be staged on-site for future restoration of the railroad line if needed. The removal work will be conducted by a NYSDEC callout subcontractor with MACTEC oversight. MACTEC will identify an area on-site that the materials can be staged to avoid interfering with OU01 investigation and remedial activities. The rails and/or rail ties will be evaluated for general condition with regards to re-use in the event the railroad tracks will be replaced in the future.

4.2.3 DELINEATION OF MGP MATERIALS

The extent of waste materials at the site will be further delineated by collecting surface soil samples, excavating test pits, and advancing soil borings to meet the following objectives:

- to evaluate presence/absence of surficial contamination outside the area proposed for ISS remediation which may need to be covered;
- to refine the horizontal and vertical extent of MGP waste impacted materials visually and to collect samples to evaluate concentrations of PAH and BTEX exceeding commercial clean-up criteria; and
- visually identify extent (horizontal and vertical) of purifier box waste (as indicated by wood chips) which will be removed from the site for disposal.

4.2.3.1 SURFACE SOIL SAMPLES

Surficial soil samples will be collected from outside the area proposed for ISS remediation to evaluate the extent of cover soils needed as part of the remedy. Soils will be logged for physical analysis and will be recorded on the provided field data record (Appendix B) in accordance with Subsection 4.4.3 of the QAPP (MACTEC, 2011a). Samples will be collected and composited from the top 1-ft of soils and submitted for analysis as outlined in Tables 4.1 and 4.2. Surface soil sample locations are shown on Figure 4.2.

4.2.3.2 TEST PITS

Test pits will be excavated on the Site to further delineate the extent of MGP and purifier box waste materials. Purifier wastes will be characterized visually by the presence of wood chips. Samples from select test pits will be collected for laboratory analysis of environmental parameters, waste characterization and for ISS bench scale testing to support the ISS design (Table 4.1).

Soil samples for waste characterization will be collected as composite samples from multiple test pits:

- from 0-6 ft bgs across the north central investigation area;
- from 0-6 ft bgs across the central investigation area; and
- from identified purifier box waste.

Soil samples to support the ISS bench scale testing will be collected as composite samples from multiple test pits to represent 3 soil types:

- Soil type 1 - Below the purifier box waste where viscous product (aka DNAPL) exists and PAHs, cyanide and arsenic are present.
- Soil type 2 - Within the light oil area where product (aka LNAPL) exists and where BTEX are present (primarily located north of the purifier waste and adjacent to Brandy Brook);
- Soil type 3 - The remainder of the Site where MGP waste has been identified.

If present, samples of DNAPL and LNAPL will collected from the test pits for environmental parameters and to support the ISS bench scale testing (Table 4.2).

In addition to the waste evaluation, explorations will be conducted in locations of former Site buildings to evaluate the presence, construction, and size of subsurface foundations. Figure 4.2 shows locations of the test pits. Figure 4.1 shows former building locations and the areas of interest on the Site. Table 4.1 presents the objective and rationale for each test pit. Additional test pits will be advanced in an iterative manner to meet the objectives of delineating MGP and purifier box wastes at the Site.

Test pits will be logged for physical analysis and will be recorded on the provided field data record (Appendix B) in accordance with Subsection 4.4.3 of the QAPP (MACTEC, 2011a) and the NYSDEC Field Descriptions of Samples for Former MGP Sites (Appendix C).

4.2.3.3 SOIL BORINGS

OU01 On-Site Investigation

Approximately 36 soil borings will be advanced onsite to further delineate the vertical and horizontal extent of soil contamination. Borings will be advanced until the vertical extent of contamination is delineated (estimated to be between 20 and 30 ft bgs) using a 7000/8000 series Geoprobe direct push drill rig or equivalent. Borings across the interpreted ISS area will typically be co-located with test pits to complete the vertical delineation of soil contamination in these areas. Borings will primarily be evaluated for visual, olfactory and PID evidence of MGP materials only. Figure 4.2 shows locations of the on-Site borings and Table 4.1 presents objective and rationale for each investigation area. Samples from select borings in each investigation area will be collected for laboratory analysis of environmental parameters and for bench scale testing to support the ISS design (Table 4.2). Additional borings will be added as necessary based on field observation to meet the data quality objectives of delineating the horizontal and vertical extent of MGP material at the Site. In order to meet the soil type objectives for the ISS bench scale study deep soil samples from the direct push borings will be collected and composited with the test pits samples as necessary.

Soil borings will be logged for physical analysis and will be recorded on the provided field data record (Appendix B) in accordance with Subsection 4.4.3 of the QAPP (MACTEC, 2011a) and the NYSDEC Field Descriptions of Samples for Former MGP Sites (Appendix C).

Railroad Investigation

Approximately 25 soil borings will be advanced along the railroad tracks located on the western boundary of OU01 and OU02. Proposed railroad track borings are shown on Figures 4.2 and 4.3. These borings will be advanced through or adjacent to the railroad bed to evaluate the presence/absence of and, if present, extent of MGP materials. These borings include areas that could not be remediated during the previous RA for OU02 (MACTEC, 2019). Borings will be evaluated for the visual, olfactory and PID evidence of MGP materials that may require remediation. No samples for laboratory analysis of environmental parameters are proposed to be collected from the railroad investigation borings.

Soil borings will be logged for physical analysis and will be recorded on the provided field data record (Appendix B) in accordance with Subsection 4.4.3 of the QAPP (MACTEC, 2011a) and the NYSDEC Field Descriptions of Samples for Former MGP Sites (Appendix C).

4.2.4 GROUNDWATER ACTIVITIES

Groundwater activities will be conducted for the following objectives:

- To evaluate the current contaminant concentrations in existing monitoring wells located on and downgradient of OU01
- To evaluate the presence/absence of emerging contaminants at the site (PFAS and 1,4-dioxane)
- To support the RD
    - Slug testing for post RA groundwater modelling
    - ISS bench testing
    - Groundwater characterization for treatment during excavation dewatering
- To decommission piezometers within OU03 which are not needed for long term monitoring
- To conduct a well inventory of piezometers and monitoring wells within OU02 to assess current conditions for potential future monitoring

4.2.4.1 TEMPORARY WELL INSTALLATION

Two temporary wells will be installed at the Site following procedures described in Section 4.4.4 of the QAPP. One temporary monitoring well (TW-702) will be installed in the southcentral area of the site within the purifier box waste near former monitoring well MW-101 to evaluate the

presence/absence of emerging contaminants (Figure 4.2). The monitoring well will be installed with a 10-foot screen that crosses the water table.

The second temporary well (TW-701) will be installed on the eastern boundary of the site for evaluation of hydraulic conductivity as described in Section 4.2.4.3 below.

The temporary wells will be removed and the boreholes sealed with bentonite upon completion of all testing. Well materials will be removed from Site for disposal by the drilling subcontractor.

4.2.4.2 ENVIRONMENTAL GROUNDWATER SAMPLING

A round of groundwater sampling will be conducted from select existing monitoring wells to evaluate current contaminant concentrations at the Site (Figure 4.2). A synoptic round of groundwater levels will be measured prior to collecting groundwater samples. Measurements will be recorded on an FDR which is included in Appendix B.

Groundwater samples will be collected from three existing wells (MW-108, MW-204, and MW-205D) for VOC and SVOC analysis (Table 4.2). Existing downgradient monitoring wells (MW-204 and MW-205D), the newly installed temporary monitoring well in the south-central portion of the Site, and one upgradient monitoring well (MW-108) will be sampled for emerging contaminants (PFAS and 1,4-dioxane) (Table 4.2).

4.2.4.3 HYDRAULIC CONDUCTIVITY TESTING

Hydraulic conductivity tests will be performed on two wells (one existing [MW-108] and one newly installed [TW-702]) on the eastern side of the site. This information will be used to build a hydrogeologic model to evaluate post remediation groundwater flow conditions that may adversely affect nearby structures (e.g. groundwater mounding flooding basements). The procedures for conducting the tests are presented in Subsection 4.7.2 of the QAPP (MACTEC, 2011a). Hydraulic conductivity test data will be analyzed by the methods of Hvorslev (1951) and Bouwer and Rice (1976).

4.2.4.4 DESIGN SUPPORT SAMPLING

On-site groundwater samples from test pits will be collected for use in the RD for excavation water treatment and ISS bench test which is described in Section 4.2.6 below. Samples will be collected by lowering a pump into the excavation. Grab samples will be collected for environmental characterization to support groundwater treatment during excavation dewatering. Samples collected to support the bench scale testing will be containerized in sealed buckets for transport to the geotechnical laboratory. Water samples will be collected from a fire hydrant near OU01 to support the bench scale testing as mix water for ISS. Laboratory analyses for the bench scale testing and excavation water treatment are presented in Table 4.2.

4.2.5 WETLANDS POREWATER SAMPLING

Porewater samples will be collected from the marshes to the southwest of the Site and north of where McKenzie Brook enters Lake Flower (Figure 4.1). This is a discharge area for groundwater originating from OU01 and represents the closest receptor to Site. Porewater samples will be collected from up to six locations using the procedures outlined in Section 4.5.4.2 of the QAPP (MACTEC, 2011a). Porewater samples will be submitted for analytical testing of naphthalene only, as this compound was identified during the RI as the primary indicator compound for off-Site migration of COCs in groundwater (Table 4.2).

4.2.6 IN-SITU SOLIDIFICATION BENCH TESTING

Samples of site media (soil, groundwater, DNAPL and LNAPL) will be collected from OU01 for the bench scale study to identify possible reagent additions and mixing ratios to support the ISS activities. A summary of the bench scale study tests and methodology is presented in Appendix E. Samples will be collected for environmental parameters in accordance with Table 4.2. MACTEC will correspond with RSA Geolab, LLC throughout the bench test process to provide guidance with each test phase.

4.2.7 PIEZOMETER DECOMMISSIONING AND WELL INVENTORY

Fourteen piezometers were installed for PDI purposes for OU02 and OU03 to evaluate hydrogeologic conditions and excavation dewatering in the remedy areas along Brandy Brook and Pontiac Bay. As the remedy has been implemented the piezometers in OU03 these are no longer needed and will be decommissioned in accordance with NYSDEC Commissioner's Policy 43 (CP-43) (NYSDEC, 2009). Six piezometers are proposed for decommissioning in OU03 (shown on Figure 4.4a). The eight

piezometers installed in OU02 will be located and assessed for use as long-term monitoring locations. The piezometers and monitoring wells in OU02 are shown on Figure 4.4b. The construction details of the fourteen piezometers and existing monitoring wells are presented in Table 4.3. Boring logs and well construction field data records are presented in Appendix D.

4.2.8 TREE CLEARING

To provide access and staging areas implement the proposed remedy for OU01, trees will be cleared from the majority of the Site. Proposed tree clearing areas are shown on Figure 4.5. Tree clearing is proposed to be conducted between November 1, 2019 and March 31, 2020 to minimize impacts to the threatened Northern Long-eared Bat (*Myotis septentrionalis*) in accordance with the ACOE Permit issued for the Site in 2018 (ACOE, 2018). Felled trees will be processed through a chipper and staged on-site for future use and/or removal. The tree removal will be conducted by a NYSDEC callout contractor or their subcontractor with oversight by MACTEC.

4.3 Data Deliverable

A PDI Report will summarize findings of the PDI field activities. Boring logs and environmental sampling data will be included as appendices to the report. Data obtained under this FAP, including analytical laboratory data, will be reviewed and incorporated into the RD.

The report will be submitted in draft to the NYSDEC for review and comment. Upon receipt of NYSDEC comments, MACTEC will address the comments and submit a final report in portable document format (PDF) format. Analytical data will be uploaded to EQuIS and laboratory deliverables will also be submitted electronically (PDF and electronic data deliverable) with the report at the completion of the PDI.

5.0 REFERENCES

Army Corps of Engineers (ACOE), 2018. Permit Application No. NAN-2017-00440-UDE, by New York State Department of Environmental Conservation, Village of Saranac Lake, Essex County, NY. January, 2017.

Bouwer, H. and R.C. Rice, 1976. "A Slug Test Method for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells"; *Water Resource Research*, Vol. 12, No. 3; pp.423-428.

Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Ground-Water Observations, Bull. No. 36, Waterways Exper. Sta. Corps of Engrs, U.S. Army, Vicksburg, Mississippi, pp. 1-50.

MACTEC Engineering and Consulting, P.C. (MACTEC), 2019. Draft Interim Site Management Plan, OU02 & OU03 Saranac Lake Gas Company, Inc., Site #516008. Prepared for New York State Department of Environmental Conservation, Albany, New York. June 2019.

MACTEC, 2017. Pre-Design Investigation Field Activities Report, Operable Units OU02 and OU03, Saranac Lake Gas Company, Inc. Prepared for New York State Department of Environmental Conservation, Albany, New York. August 2017.

MACTEC, 2015. Remedial Investigation – Saranac Lake Gas Company Site. Prepared for New York State Department of Environmental Conservation, Albany, New York. January, 2015.

MACTEC, 2011a. Program Quality Assurance Program Plan. Prepared for the New York State Department of Environmental Conservation, Albany, New York. June 2011.

MACTEC, 2011b. Program Health and Safety Plan. Prepared for New York State Department of Environmental Conservation, Albany, New York. June 2011.

National Climactic Data Center (NCDC), 1999. Comparative Climactic Data for the United States through 1998. June 22, 1999.

New York State (NYS), 1999. New York Codes, Rules, and Regulations, Title 6, Part 700-705 Water Quality Regulations Surface Water and Groundwater Classifications and Standards. Amended August 1999.

NYSDEC, 2010. DER-10, Technical Guidance for Site Investigation and Remediation. May 3, 2010.

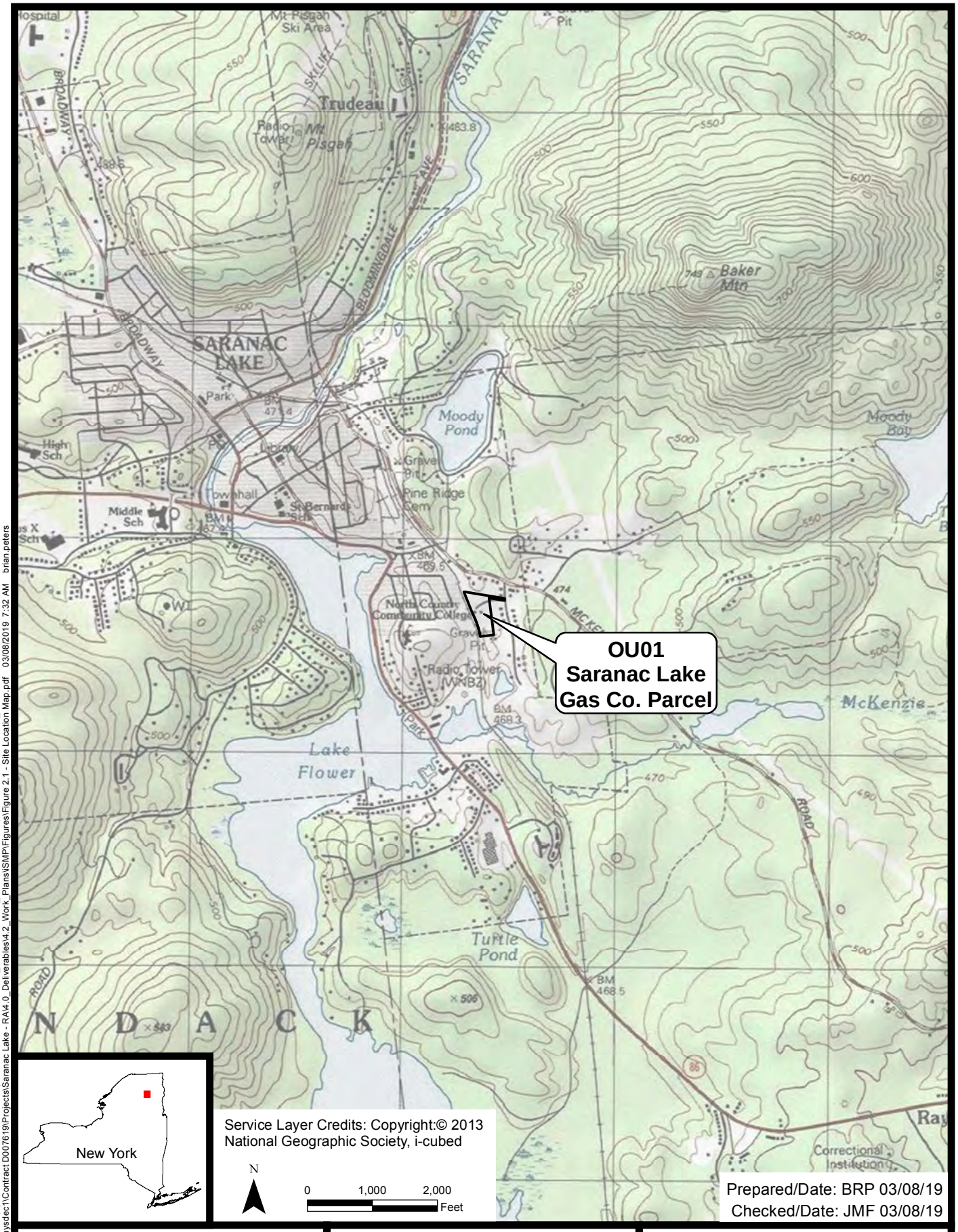
NYSDEC, 2009. CP-43: Groundwater Monitoring Well Decommissioning Policy. Division of Environmental Remediation. November 2009.

NYSDEC, 2006. New York Codes, Rules and Regulations, Title 6, Part 375 – Environmental Remedial Programs. Amended December 2006.

New York State Department of Health (NYSDOH), 2018. Press Release: Drinking Water Quality Council Recommends Nation's Most Protective Maximum Contaminant Levels for Three Unregulated Contaminants in Drinking Water. December 2018. https://www.health.ny.gov/press/releases/2018/2018-12-18_drinking_water_quality_council_recommendations.htm

New York State Museum and Science Service (New York), 1970. Geologic Map of New York, Adirondack Sheet. Map and Chart Series No. 15.

FIGURES

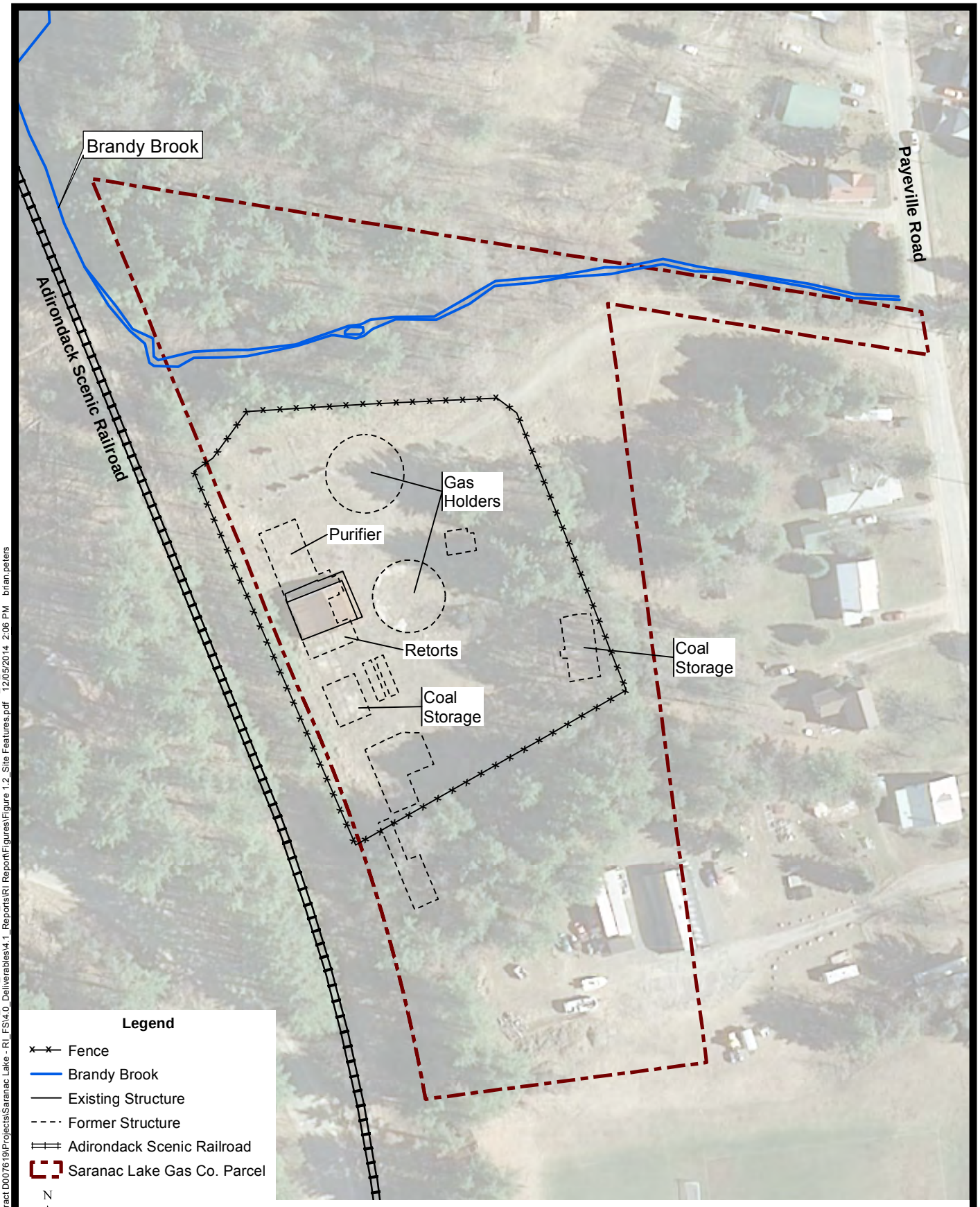


NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Site Location Map

Project 3611191237 Figure 1.1



Essex County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 12/05/14
Checked/Date: BAS 12/05/14

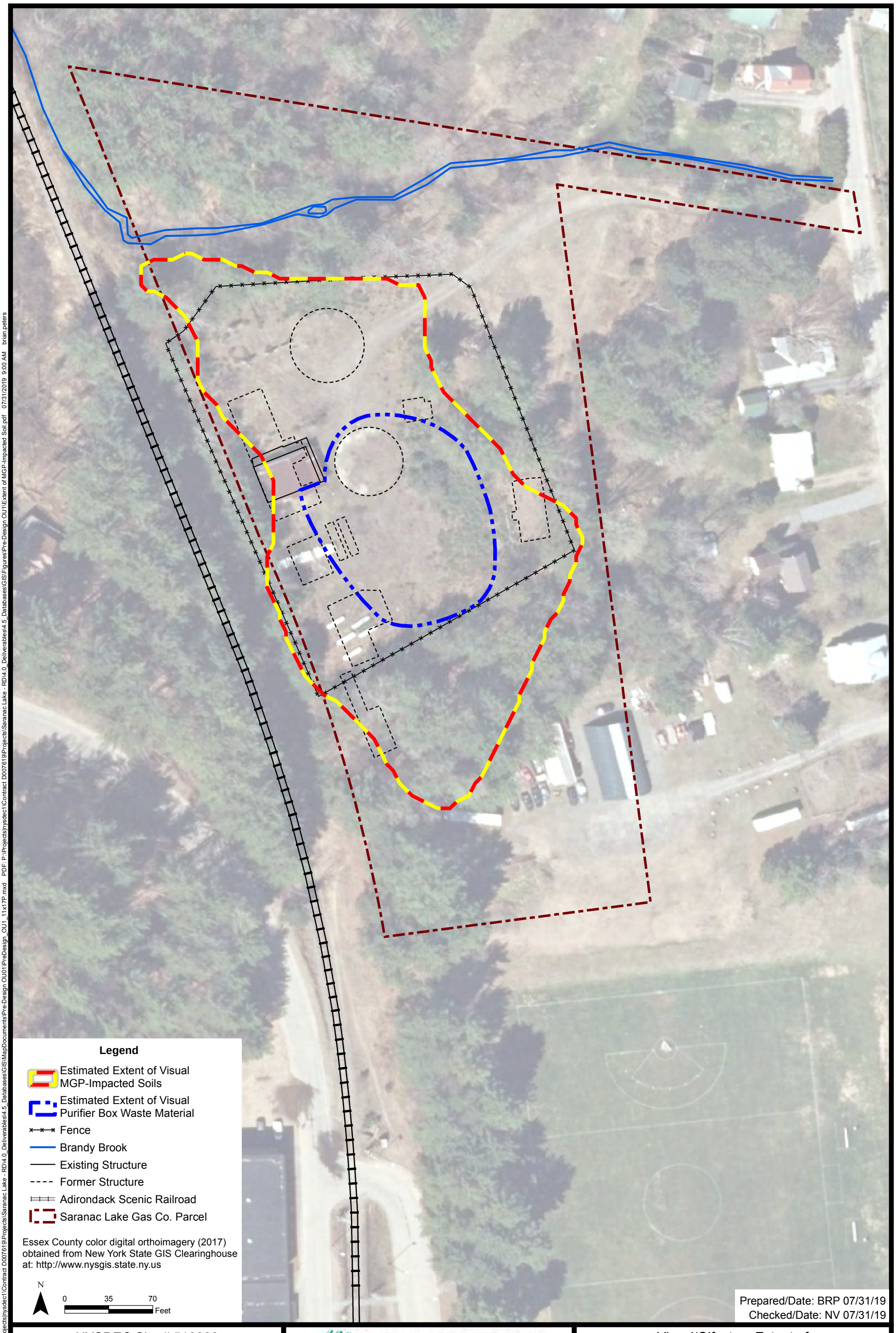
NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Site Features

Project 3611191237 Figure 1.2

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RI_FS\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Phase II RI\PhaseII_RI_8.5x11P.mxd
PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RI_FS\4.0_Deliverables\4.1_Reports\RI Report\Figures\Figure 1.2_Site Features.pdf 12/05/2014 2:06 PM brian.peters

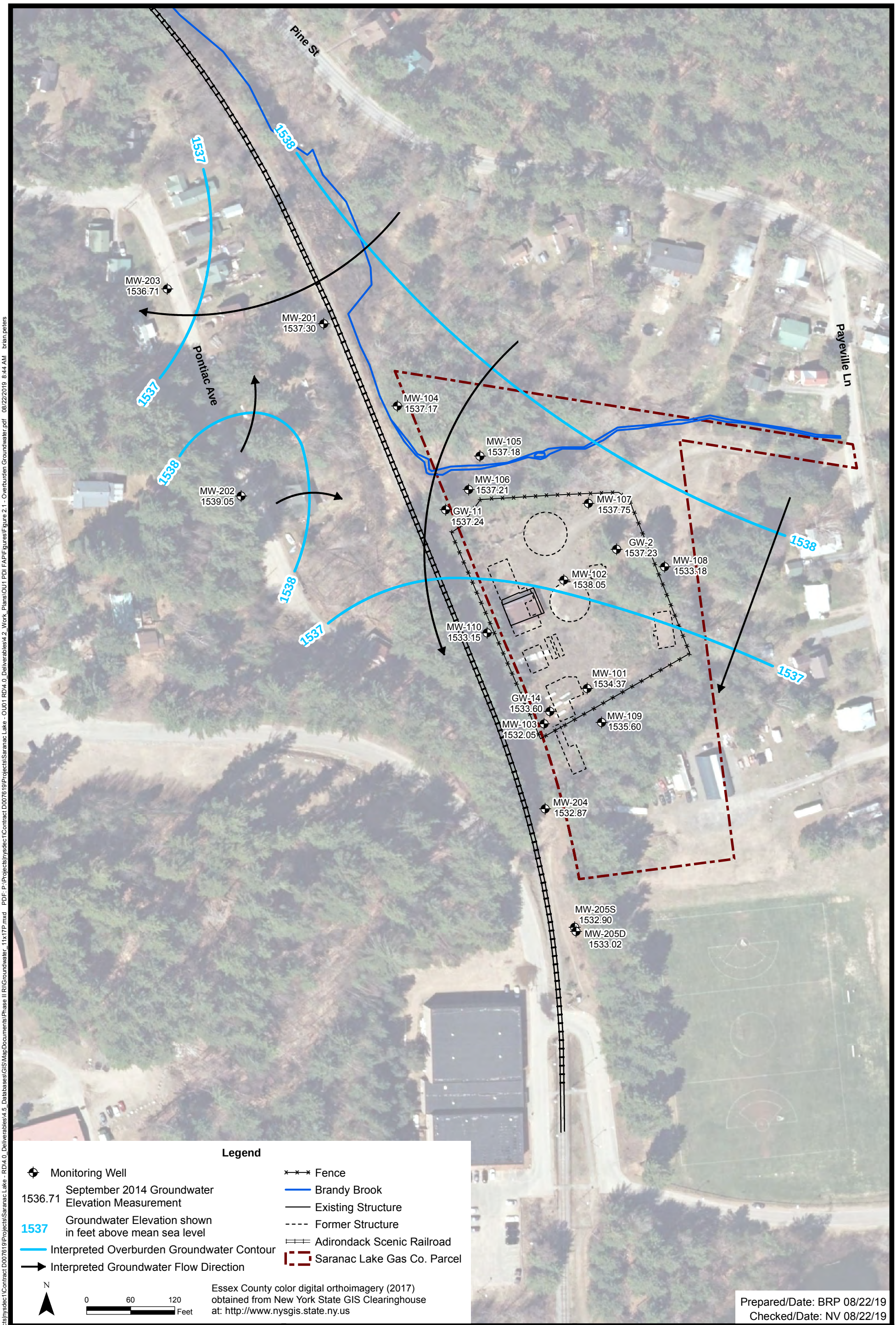


NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Visual/Olfactory Extent of MGP-Impacted Soil
Project 3611191237 Figure 1.3

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RD\4.0_Deliverables\4.5_Databases\GIS\Figures\Pre-Design OU1\Extent of MGP-Impacted Soil.pdf 07/31/2019 9:00 AM brian.peters
Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RD\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Pre-Design OU01\PreDesign_OU1_11x17P.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RD\4.0_Deliverables\4.5_Databases\GIS\Figures\Pre-Design OU1\Extent of MGP-Impacted Soil.pdf 07/31/2019 9:00 AM brian.peters



NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Interpreted Overburden
Groundwater Flow
Project 3611191237 Figure 2.1

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RD\4.0_Deliverables\4.2_Work_Plans\OU1 PDI FAP\Figures\Figure 2.1 - Overburden Groundwater_11x17P.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - OU01 RD\4.0_Deliverables\4.2_Work_Plans\OU1 PDI FAP\Figures\Figure 2.1 - Overburden Groundwater.pdf 08/22/2019 8:44 AM brian.peters

INSET AREA

Railroad Borings

North Central

East

Central

Building Materials Survey

West/Southwest

South Central

Wetlands Investigation

INSET

Railroad Borings

Inset Scale:
0 75 150
Feet

Legend

- Investigation Areas
- Fence
- Brandy Brook
- Adirondack Scenic Railroad
- Saranac Lake Gas Co. Parcel

Essex County color digital orthoimagery (2017) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

N
0 60 120
Feet

Prepared/Date: BRP 08/22/19
Checked/Date: NV 08/22/19

NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

OU01 Pre-Design
Investigation Areas
Project 3611191237 Figure 4.1

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RDI4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Pre-Design OU01\PreDesign_OU1_11x17P_Inset.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - OU01 RDI\4.0_Deliverables\4.2_Work_Plans\OU1 PDI FAP\Figures\Figure 4.1 - OU01 Pre-Design Investigation Areas.pdf 08/22/2019 8:19 AM brian.peters

TB-24 TB-25 TB-22 TB-21 TB-20 TB-19 SD-102B SW-102A SD-102A TB-17 TB-16 TB-15 TB-14 TB-11 TB-12 TB-13

A-1 MW-104 A-2 B-2 C-2 MW-105 GS-15 (0/6) GW-15 SD-04 SD-03 E-2 F-2 SD-02 BB-1 SW-101A SD-01 SD-101A

E-3 (0/16) F-3 (0/16) GS-01 (0/4)

C-3 (9/16) MW-106 GS-10 (8/8) GW-10 B-3 (5/16) GW-09 GS-09 (0/8) E-4 (8/16) F-4 (8/16) MW-107 GS-11 (0/11) GW-11 C-4 (9/16) D-4 (8/16)

B-4 (0/16) GS-08 (12/12) GW-08 TP-01 (6/8) E-5 (4/16) D-5 (19/20) C-5 (16/16) GS-02 (0/11) GW-02

GS-12 (0/8) GW-12 TP-03 (0/9) F-5 (12/16) MW-108 H-6 (0/16) E-6 (16/20) MW-102 F-6 (7/16) D-6 (12/12) GS-03 (0/8) TP-02 (1/4)

GS-07 (8/8) GW-07 F-7 (13/16) G-7 (8/16) H-7 (0/16) D-7 (12/16) E-7 (12/16)

C-7 (0/20) MW-110 TP-04 (0/10) GS-06 (8/8) GW-06 E-7A (16/49) GS-04 (0/8)

GS-13 (0/12) GW-13 F-8 (12/16) G-8 (3/16) H-8 (0/16) TW-701

D-8 (0/16) E-8 (16/16) TW-702 GS-05 (4/8) GW-05

G-9 (10/16) TP-05 (2.5/4) F-9 (14/16) MW-101 E-9 (10/16) D-9 (13/16) GS-16 (0/12)

F-9A (0/56) GS-14 (0/8) GW-14 G-10 (9/16) E-10 (0/20) MW-103 F-10 (20/20) MW-109

E-11 (20/20) F-11A (5/24) F-11 (0/16)

F-12A (0/28) F-12 (0/20) G-12 (0/8) MW-204 E-12 (0/36)

H-13 (0/15) J-14 (0/16) H-15 (0/28) MW-205S MW-205D E-16 (0/40)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

A B C D E F G H I J K L M N

Legend

- Proposed Temporary Well
- Proposed Visual Evaluation
- Proposed Analytical Evaluation
- Purifier Box Waste
- MGP Materials
- E-16 - Location has No MGP Waste
- H6 - Location has no analytical results
- MW-108 - Location has analytical results
- (0/20) - Bottom of Waste/Bottom of Boring
- 25 Foot Grid
- 50 Foot Grid
- Saranac Lake Gas Co. Parcel

2007 Site Characterization Locations:
- Direct Push Boring
- Direct Push Boring/Groundwater Grab
- Direct Push Boring/Monitoring Well
- Sediment Sample Location
- Test Pit
- Access Road
- Fence
- Brandy Brook
- Adirondack Scenic Railroad

2013/2014 Remedial Investigation Locations:
- Direct Push Boring
- Direct Push Boring/Groundwater Grab
- Direct Push Boring/Monitoring Well
- Monitoring Well
- Sediment Sample
- Surface Water Sample
- Test Boring
- Benchmark

N

0 20 40 Feet

Essex County color digital orthoimagery (2017) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 08/23/19
Checked/Date: NV 08/23/19

NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Extent of Waste and Proposed OU1 Sample Locations
Project 3611191237 Figure 4.2

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RD\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Pre-Design OU001\Grid_25ft_22x34P.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - OU01 RD\4.0_Deliverables\4.2_Work_Plans\OU1 PDI FAP\Figures\Figure 4.2 - Extent of Waste and Proposed Sample Locations.pdf 08/23/2019 12:41 PM brian.peters

Brandy Brook Rd

Pine St

Pontiac St

SB-825
SB-824
SB-823
SB-822
SB-821
SB-820
SB-819
SB-818
SB-817
SB-816
SB-815
SB-814
SB-813
SB-812
SB-811
SB-810
SB-809
SB-808
SB-807
SB-806
SB-805
GS-12 (0/8)
SB-804
GS-13 (0/12)
SB-803
SB-802
SB-801

Legend

- Proposed Soil Boring
- 2007 Direct Push Boring (0/8 - Bottom of Waste/Bottom of Boring)
- Section of tracks to be temporarily removed in support of remediation activities
- Approximate Location of Sewer Main to be Located
- Location of Residual MGP Impacts Covered with RCM or AquaBlok™
- Fence
- Brandy Brook
- Adirondack Scenic Railroad
- Saranac Lake Gas Co. Parcel

Essex County color digital orthoimagery (2017) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

N

0 55 110 Feet

Prepared/Date: BRP 08/22/19
Checked/Date: NV 08/22/19

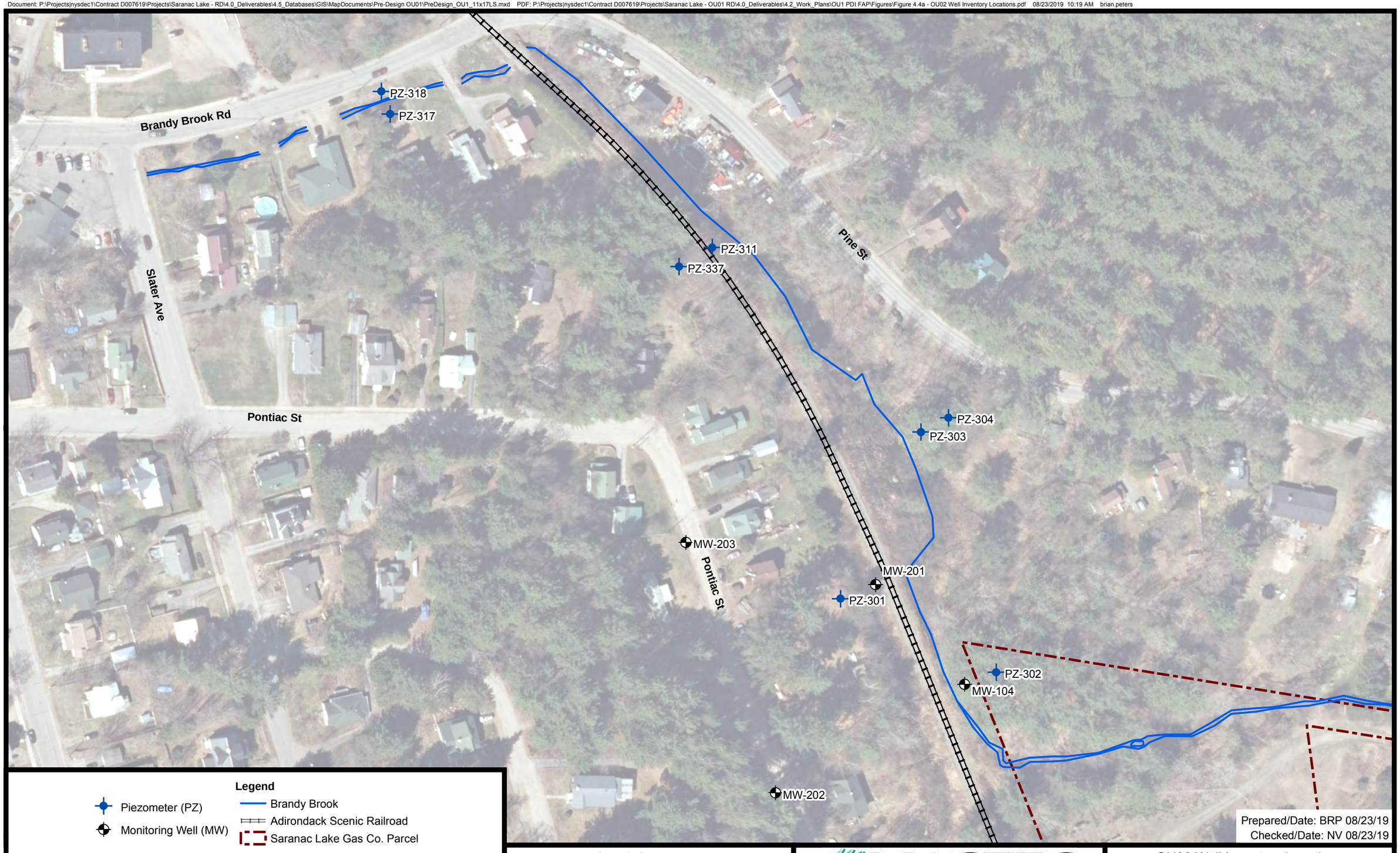
NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Proposed Railroad Track
Sample Locations
Project 3611191237 Figure 4.3

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RD\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Pre-Design OU01\PreDesign_OU1_11x17P.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - OU01 RD\4.0_Deliverables\4.2_Work_Plans\OU1 PDI FAP\Figures\Figure 4.3 - Proposed RR Delineation Locations.pdf 08/22/2019 9:42 AM brian.peters

Document: P:\Projects|nysdec1\Contract D007619\Projects\Saranac Lake - RD\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Pre-Design OU01\PreDesign_OU1_11x17LS.mxd PDF: P:\Projects|nysdec1\Contract D007619\Projects\Saranac Lake - OU01 RD\4.0_Deliverables\4.2_Work_Plans\OU1 PDI FAP\Figures\Figure 4.4a - OU02 Well Inventory Locations.pdf 08/23/2019 10:19 AM brian.peters



NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

OU02 Well Inventory Locations

Project 3611191237 Figure 4.4a

Document: P:\Projects|nysdec1\Contract D007619\Projects\Saranac Lake - RD\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Pre-Design OU01\PreDesign_OU1_11x17LS.mxd PDF: P:\Projects|nysdec1\Contract D007619\Projects\Saranac Lake - OU01 RD\4.0_Deliverables\4.2_Work_Plans\OU1 PDI FAP\Figures\Figure 4.4b - PZs Proposed to be Decomm.pdf 08/23/2019 10:23 AM brian.peters

Legend

Piezometer (PZ)

Brandy Brook

N

0 40 80 Feet

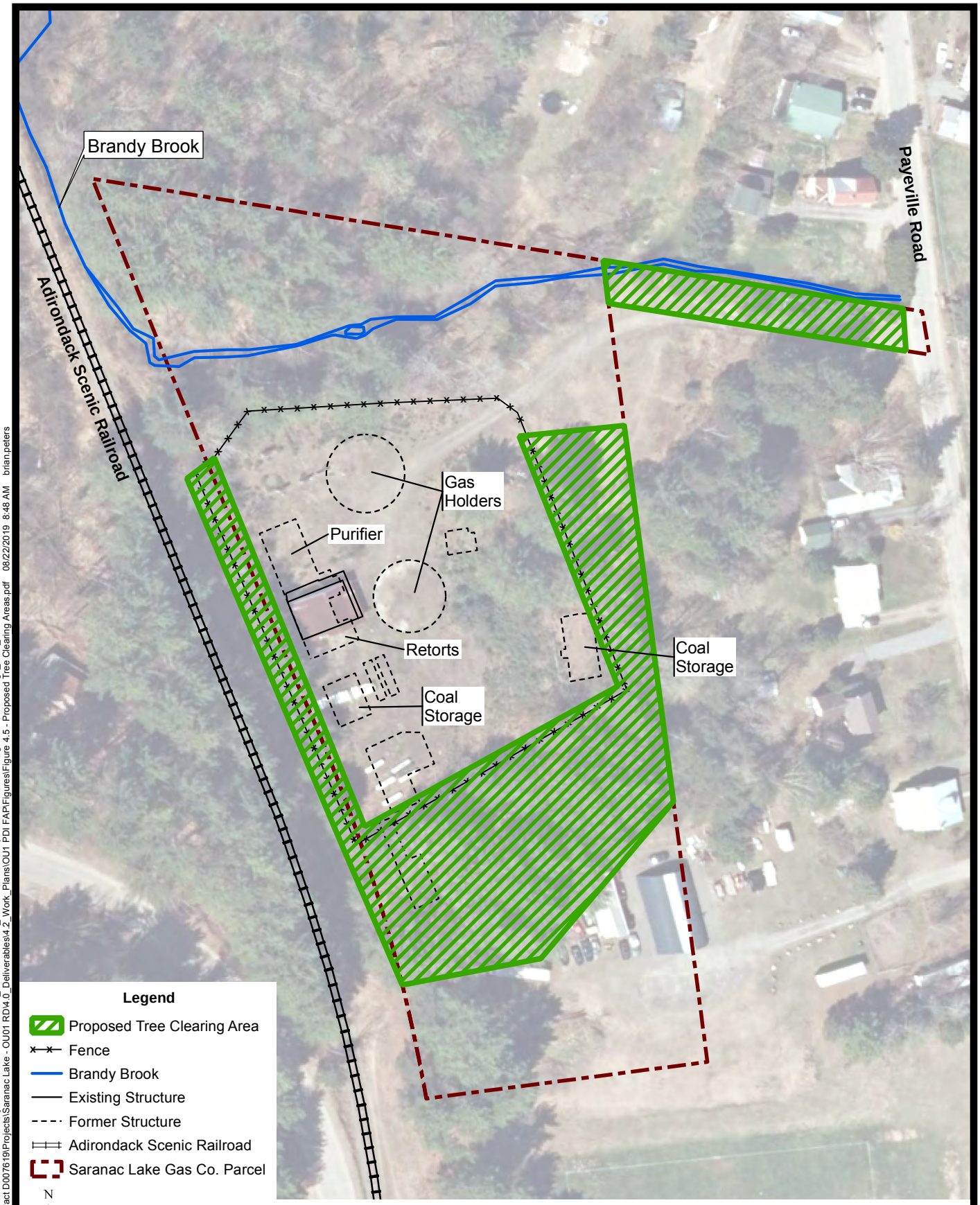
Essex County color digital orthoimagery (2017) obtained from New York State GIS Clearinghouse at: gis.ny.gov

NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Piezometers Proposed to be Decommissioned
Project 3611191237 Figure 4.4b

Prepared/Date: BRP 08/23/19
Checked/Date: NV 08/23/19



Essex County color digital orthoimagery (2017) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 08/22/19
Checked/Date: NV 08/22/19

NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Proposed Tree Clearing Areas

Project 3611191237 Figure 4.5

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RD\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Pre-Design OU01\PreDesign_OU1_8.5x11P.mxd
PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - OU01 RD\4.0_Deliverables\4.2_Work_Plans\OU1 PDI FAP\Figures\Figure 4.5 - Proposed Tree Clearing Areas.pdf 08/22/2019 8:48 AM brian.peters

TABLES

TABLE 4.1
Summary of Pre-Design Investigation Rationale for Saranac Lake OU01

Investigation Area	Data Quality Objective	Collection Method	Number of Locations	Depth (ft. bgs)	Type	Parameters	# of Sample Locations	Sample objective	Rationale
North Central Between Brandy Brook and purifier box waste area	Horizontal delineation	Test pit	10	0-10	Visual	None	10 - Visual ID of MGP material, clean edge, clean bottom	Delineate the extent of MGP material visually and evaluate concentrations of PAHs and BTEX exceeding commercial clean-up criteria	BTEX and PAHs not delineated towards the Brook near sample location C-4 and GS-10. This is an area of the site with no samples. Confirm clean edge of contamination previously identified visually.
					Soil Grab	Total PAH Total BTEX	2 - Two ft below water table or areas of observed MGP impacts from 0-6 ft bgs (whichever is deeper)		
	Vertical delineation	Direct push	10	0-20	Visual	None	10 - Visual ID of MGP and clean bottom		Waste extent not vertically bounded, minimal analytical results. Waste not adequately bounded vertically near GS-09.
					Soil grab	Total PAH Total BTEX	2 - Two ft below water table or areas of observed MGP impacts from 0-6 ft bgs (whichever is deeper)		
	ISS design support	Test Pit / Direct Push	1	0-20	Soil composite	Bench Test	1 composite of test pits	Support bench scale testing for solidification of waste.	Information needed for preparing the remedial design.
					Free Product (if present)	Total PAH Total BTEX	2 (1 floating and 1 sinking product)		
	Waste characterization	Test Pit	1	0-6	Soil composite	Waste characterization*	1 composite of test pits	Waste characterization if material needs to be disposed off-site	The top 6 feet will be excavated for ISS. If this material contains visual MGP material it will need to be disposed off-site.
	Groundwater treatment support	Test pit	1	NA	Water grab	Water chemistry	1 grab of water in test pit	Support design of potential excavation water treatment.	Information needed for preparing the remedial design.
East Along property boundary adjacent to residences	Vertical and horizontal delineation	Direct push / Hand Auger	4	0-20	Visual	None	Visual ID of MGP material, clean edge, clean bottom	Delineate the extent of MGP material visually	There is limited visual data (especially on the northern extent) and no analytical data. Information needed for preparing the remedial design.
					Soil grab	Total PAH Total BTEX	4 - Surface soil samples (0-1 ft bgs) 2 - Two ft below water table or zones of observed MGP impacts (whichever is deeper)	Evaluate concentrations of PAH and BTEX exceeding commercial clean-up criteria outside of the proposed remedy area	

TABLE 4.1
Summary of Pre-Design Investigation Rationale for Saranac Lake OU01

Investigation Area	Data Quality Objective	Collection Method	Number of Locations	Depth (ft. bgs)	Type	Parameters	# of Sample Locations	Sample objective	Rationale
Central Within and immediately adjacent to the purifier box waste area	Horizontal delineation	Test pit	13	0-10	Visual	None	Visual ID of wood chips	Visually identify extent (horizontal and vertical) of purifier box waste (as indicated by wood chips) which will be removed from the site.	Define the limit of excavation which will be used in the remedial design.
	Vertical delineation	Direct push	13	0-30	Visual	None	Visual ID of MGP material	Delineate the extent of MGP material visually.	Previous borings did not identify the vertical extent.
	ISS design support	Test Pit / Direct Push	1	0-30	Soil composite	Bench Test	1 composite from below purifier waste material 1 composite from above purifier waste material	Support bench scale testing for solidification of waste.	Information needed for preparing the remedial design.
					Free Product (if present)	Viscosity	2 - (1 floating and 1 sinking product)		
	Waste characterization	Test Pit	1	0-10	Soil composite	Waste characterization*	2-7 samples from locations that represent the purifier box waste to be removed from the site	Waste characterization of materials which will be disposed off-site.	Information needed for preparing the remedial design.
	Groundwater treatment support	Test Pit	1	NA	Water grab	Water chemistry	1 grab of water in test pit	Support design of potential excavation water treatment.	Information needed for preparing the remedial design.
West/Southwest Between Site and railroad tracks	Vertical and horizontal delineation	Direct push	5	0-20	Visual	None	Visual ID of MGP material, clean bottom and edge	Delineate the extent of MGP material visually and evaluate concentrations of PAH and BTEX exceeding commercial clean-up criteria.	This is an area of the site with limited samples. Confirm clean edge of contamination previously identified visually.
					Soil Grab	Total PAH Total BTEX	2 - Surface soil samples (0-1 ft bgs)		
South Central Outside the site fence	Vertical and horizontal delineation	Direct push	5	0-30	Visual	None	Visual ID of MGP material, clean bottom, and edge	Delineate the extent of MGP material visually and evaluate concentrations of PAH and BTEX exceeding commercial clean-up criteria.	This is an area of the site with no analytical samples. Confirm clean edge of contamination that was previously identified visually.
					Soil grab	Total PAH Total BTEX	3 - surface soil samples (0-1 ft bgs) 3 - Two ft below water table or zones of observed MGP impacts (whichever is deeper)		
	Debris evaluation	Hand Probe	NA	0-2	Visual	None	Visual ID of surficial and buried debris thickness and areal extent	Estimate type and volume of debris material observed in the wooded area south of Site to be disposed of off-site.	Information needed for preparing the remedial design.

TABLE 4.1
Summary of Pre-Design Investigation Rationale for Saranac Lake OU01

Investigation Area	Data Quality Objective	Collection Method	Number of Locations	Depth (ft. bgs)	Type	Parameters	# of Sample Locations	Sample objective	Rationale
Railroad Tracks OU01 and OU02	Vertical and horizontal delineation	Direct push	25	0-30	Visual	None	Visual ID of MGP material	Evaluate if contamination is present under the railroad tracks to the west of OU01 and delineate residual impacts under the tracks in OU02.	Information needed for evaluating future remediation activities.
Former On-site Structures	Concrete debris evaluation	Test Pit	NA	0-5	Visual	None	Visual ID of surficial and buried concrete thickness and areal extent	Debris material estimates which will be disposed off-site.	Information needed for preparing the remedial design.
Wetlands Investigation South of Site	Groundwater discharge area	Push point	6	0.5-1.5	Water grab	Naphthalene	6 porewater from nearest groundwater discharge areas south of OU01.	Evaluate contaminant migration in groundwater at the nearest receptor.	The extent of groundwater contamination has not been delineated.
Groundwater Samples	Evaluate for Emerging Contaminants	Existing monitoring wells	4	5-15	Low flow purging	PFAS 1,4-Dioxane	3 wells in impacted areas 1 upgradient well	Evaluate presence of emerging contaminants	Information needed for evaluating future remediation activities.
	Evaluate Current Conditions		3	5-15		VOCs SVOCs	2 downgradient wells 1 upgradient wells	Evaluate current contaminant concentrations in groundwater at the Site	Establish a baseline for evaluating the ISS remediation at the Site

Notes:

ft bgs	feet below ground surface
ppm	parts per million
	*TCLP Metals; TCLP VOC; Total SVOC; PCB/Pesticides; Reactivity; Ignitability; pH
BTEX	benzene, toluene, ethylbenzene, xylene
ID	identification
MGP	manufactured gas plant
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyls
PFAS	per- and polyfluoroalkyl substances
SVOC	semi-volatile organic compounds
TCLP	toxicity characteristic leaching protocol
VOC	volatile organic compounds

Table 4.2: Proposed Sample Identification and Analyses

						Visual/Olfactory Analysis	Environmental Characterization			Design Support		
Investigation Area	Grid ID	Location ID	Method	Depth bgs (ft)	Sample ID	Document Sample Using NYSDEC Field Descriptions of Samples for Former MGP Sites	T(34) PAHs	Total BTEX	Emerging Contaminants	Waste Disposal Parameters-Soil	Excavation Water Treatment Samples	ISS Bench Test Sample Media
North Central	B3C	TP-B3C	Test Pit	10	no analytical	x						
	B3C	DP-B3C	Direct Push	20	no analytical	x						
	C3D	TP-C3D	Test Pit	10	TP-C3D___	x	1	1				
	C3D	TP-C3D	Test Pit	10	TP-C3D___MS	x	1	1				
	C3D	TP-C3D	Test Pit	10	TP-C3D___MD	x	1	1				
	C3D	DP-C3D	Direct Push	20	no analytical	x						
	C5D	TP-C5D	Test Pit	10	no analytical	x						
	C5D	DP-C5D	Direct Push	20	no analytical	x						
	C7B	TP-C7B	Test Pit	10	no analytical	x						
	C7B	DP-C7B	Direct Push	20	no analytical	x						
	D3C	TP-D3C	Test Pit	10	no analytical	x						
	D3C	DP-D3C	Direct Push	20	no analytical	x						
	D3D	TP-D3D	Test Pit	10	TP-D3D___	x	1	1				
	D3D	TP-D3D	Test Pit	10	TP-D3D___D	x	1	1				
	D3D	TP-D3D	Test Pit	10	TP-D3D___D	x	1	1				
	D3D	DP-D3D	Direct Push	20	no analytical	x						
	D5A	TP-D5A	Test Pit	10	no analytical	x						
	D5A	DP-D5A	Direct Push	20	no analytical	x						
	E4C	TP-E4C	Test Pit	10	no analytical	x						
	E4C	DP-E4C	Direct Push	20	no analytical	x						
	F5B	TP-F5B	Test Pit	10	no analytical	x						
	F5B	DP-F5B	Direct Push	20	no analytical	x						
	Multiple	NA	Composite	6	516008-OU01 North					1		1
East	G3A	DP-G3A	Direct Push	20	no analytical	x						
	G4A	DP-G4A	Direct Push	20	DP-G4A___	x	1	1				
	G5B	DP-G5B	Direct Push	20	DP-G5B010	x	1	1				
	H3D	HA-H3B	Hand Auger	1	HA-H3B010	x	1	1				
	H6D	DP-H6D	Direct Push	20	DP-H6D___	x	1	1				
	I8A	DP-I8A	Direct Push	20	DP-I8A010	x	1	1				
	J2C	HA-J2C	Hand Auger	1	HA-J2C0101	x	1	1				
Central	D8C	TP-D8C	Test Pit	10	no analytical	x						
	D8C	DP-D8C	Direct Push	30	no analytical	x						
	E6D	TP-E6D	Test Pit	10	no analytical	x						
	E6D	DP-E6D	Direct Push	30	no analytical	x						
	E7D	TP-E7D	Test Pit	10	no analytical	x						
	E7D	DP-E7D	Direct Push	30	no analytical	x						
	E8C	TP-E8C	Test Pit	10	no analytical	x						
	E8C	DP-E8C	Direct Push	30	no analytical	x						
	F6A	TP-F6A	Test Pit	10	no analytical	x						
	F6A	DP-F6A	Direct Push	30	no analytical	x						
	F7D	TP-F7D	Test Pit	10	no analytical	x						

Table 4.2: Proposed Sample Identification and Analyses

						Visual/Olfactory Analysis	Environmental Characterization			Design Support		
Investigation Area	Grid ID	Location ID	Method	Depth bgs (ft)	Sample ID	Document Sample Using NYSDEC Field Descriptions of Samples for Former MGP Sites	T(34) PAHs	Total BTEX	Emerging Contaminants	Waste Disposal Parameters-Soil	Excavation Water Treatment Samples	ISS Bench Test Sample Media
Central	F7D	DP-F7D	Direct Push	30	no analytical	x						
	F9D	TP-F9D	Test Pit	10	no analytical	x						
	F9D	DP-F9D	Direct Push	30	no analytical	x						
	G7D	TP-G7D	Test Pit	10	no analytical	x						
	G7D	DP-G7D	Direct Push	30	no analytical	x						
	G8D	TP-G8D	Test Pit	10	no analytical	x						
	G8D	DP-G8D	Direct Push	30	no analytical	x						
	G9D	TP-G9D	Test Pit	10	no analytical	x						
	G9D	DP-G9D	Direct Push	30	no analytical	x						
	H7A	TP-H7A	Test Pit	10	no analytical	x						
	H7A	DP-H7A	Direct Push	30	no analytical	x						
	H8A	TP-H8A	Test Pit	10	no analytical	x						
	H8A	DP-H8A	Direct Push	30	no analytical	x						
	H9B	TP-H9B	Test Pit	10	no analytical	x						
	H9B	DP-H9B	Direct Push	30	no analytical	x						
	Multiple	NA	Composite	4-10	519008-Purifier WC					1		
	Multiple	NA	Composite	6	516008-OU01 Central					1		
	Multiple	NA	Composite	Above Purifier Waste	519008-LNAPL							1
	Multiple	NA	Composite	Below Purifier Waste	516008-DNAPL							1
West / Southwest	A4B	DP-A4B	Direct Push	20	no analytical*	x						
	B5A	DP-B5A	Direct Push	20	no analytical*	x						
	B5A	DP-B5A	Direct Push	20	DP-B5A010	x	1	1				
	D9A	DP-D9A	Direct Push	20	no analytical*	x						
	D10A	DP-D10A	Direct Push	20	DP-D10A010	x	1	1				
	D11B	DP-D11B	Direct Push	20	no analytical*	x						
South Central	E11D	DP-E11D	Direct Push	30	DP-E11D010	x	1	1				
	E11D	DP-E11D	Direct Push	30	DP-E11D___	x	1	1				
	F11C	DP-F11C	Direct Push	30	no analytical	x						
	G10C	DP-G10C	Direct Push	30	no analytical	x						
	G11C	DP-G11C	Direct Push	30	DP-G11C010	x	1	1				
	G11C	DP-G11C	Direct Push	30	DP-G11C___	x	1	1				
	H10C	DP-H10C	Direct Push	30	DP-H10C010	x	1	1				
	H10C	DP-H10C	Direct Push	30	DP-H10C___	x	1	1				

Table 4.2: Proposed Sample Identification and Analyses

						Visual/Olfactory Analysis	Environmental Characterization			Design Support		
Investigation Area	Grid ID	Location ID	Method	Depth bgs (ft)	Sample ID	Document Sample Using NYSDEC Field Descriptions of Samples for Former MGP Sites	T(34) PAHs	Total BTEX	Emerging Contaminants	Waste Disposal Parameters-Soil	Excavation Water Treatment Samples	ISS Bench Test Sample Media
Water Sampling	NA	MW-108	Low flow	14	510068-MW108019		1	1	1			
	NA	MW-204	Low flow	17	516008-MW204023		1	1	1			
	NA	MW-204	Low flow	17	516008-MW204023MS		1	1				
	NA	MW-204	Low flow	17	516008-MW204023MD		1	1				
	NA	MW-205D	Low flow	25	510068-MW205D025		1	1	1			
	NA	MW-205D	Low flow	25	510068-MW205D025D		1	1	1			
	F8C	TW-702	Low flow	15	510068-TW702015				1			
	NA	Test Pit Water	Grab	NA	516008-OU01 Water						1	
	NA	Site Hydrant	Grab	NA	516008-Hydrant							1
	NA	PP-701	Push point	0.5-1.5	PP-701___		1[#]					
	NA	PP-702	Push point	0.5-1.5	PP-702___		1[#]					
	NA	PP-703	Push point	0.5-1.5	PP-703___		1[#]					
	NA	PP-704	Push point	0.5-1.5	PP-704___		1[#]					
	NA	PP-705	Push point	0.5-1.5	PP-705___		1[#]					
	NA	PP-706	Push point	0.5-1.5	PP-706___		1[#]					
Total Soil							19	19	0	3	0	3
Total Water							12	6	5	0	1	3
TOTAL SAMPLES							31	25	5	3	1	6

NOTES:

Sample ID Based on Site Number (516008) - Location ID - Sample depth (last three digits represent sample depth in feet below ground surface with the third digit in tenths of feet [010 = 1 ft bgs])

QA/QC Field duplicate (Sample IDs end in D), Matrix Spike (MS) and Matrix Spike Duplicate (MD) collected for every 20 samples. 1 each for soil and groundwater

no analytical* Analytical samples will be collected from select borings if visual observations of MGP waste are identified

T(34) PAHs Alkylated PAHs EPA34 Compounds - USEPA Method 8270 SIM

Total BTEX Benzene, toluene, ethylbenzene, total toluene - USEPA Method 8260B

Emerging Contaminants Per- and polyfluoroalkyl substances (PFAS) by Modified USEPA Method 537 and 1,4-Dioxane by USEPA Method 8270 SIM

Soil Waste Disposal Parameters TCLP VOCs by USEPA Methods 1311/8260C; TCLP SVOCs - USEPA 1311/8270D; Total PCBs - USEPA 8082A; TCLP Pesticides - USEPA 1311/8081B; TCLP Metals - USEPA 1311/6010C/7470A; Cyanide, Reactive - 9012; Sulfide, Reactive - 9034; Ignitability 1030; 9045D - pH - Corrosivity

Excavation Water Treatment TCL VOCs - USEPA 8260; SVOCs - USEPA 8270; TAL Metals - USEPA 6010; Mercury - USEPA 7471; Total PCBs - USEPA 8082; Pesticides/Herbicides - USEPA 8081; Total suspended solids - SM2540D; Total dissolved solids - USEPA 160.1; Bacterial oxygen demand - SM5210B; free chlorine - SM4500-Cl; salinity - ASTM D2937; oil and grease - USEPA 1664A; Total organic content - USEPA 415.1; pH - USEPA 9040

Bench test sample media Soil - Total BTEX; T(34) PAHs; pH by Method 9040; sulfide by SM4500-S; total organic carbon by Lloyd Kahn method
Hydrant water - Total suspended solids - SM2540D; salinity - ASTM D2937; Total organic content - USEPA 415.1; pH - USEPA 9040; Free chlorine - SM4500-Cl
LNAPL/DNAPL - Total BTEX; T(34) PAHs; pH by Method 150.1; total organic carbon - USEPA 415.1; salinity - ASTM D2937; Total suspended solids - SM2540D

1[#] Porewater samples to be analyzed for naphthalene only
bgs below ground surface
ISS In situ stabilization
DP Direct push boring
HA Hand auger
TP Test pit
PP Push point sample
MW Monitoring well
TW Temporary well

Table 4.3: Monitoring Well and Piezometer Construction Details

Location ID	Northing	Easting	Casing Elevation (ft amsl)	Riser Elevation (ft amsl)	Ground Surface Elevation (ft amsl)	TOC (ft ags)	TOC - TOR (ft)	Bottom of Well (ft BTOR)	Screening Interval (ft bgs)
MW-101	1999449.36	592312.95	1543.18	1542.93	1543.2	0	0.25	13.0	3 - 13
MW-102	1999596.97	592281.02	1543.51	1543.22	1543.5	0	0.29	14.9	4.9 - 14.9
MW-103	1999401.39	592254.05	1542.45	1542.07	1542.4	0	0.38	19.7	9.7 - 19.7
MW-104	1999833.87	592054.19	1545.27	1544.85	1542.3	3.0	0.42	19.4	6.4 - 16.4
MW-105	1999766.01	592166.86	1545.98	1545.83	1543.0	3.0	0.15	18.3	5.3 - 15.3
MW-106	1999720.04	592151.21	1543.23	1543.17	1540.4	2.8	0.06	16.9	4.1 - 14.1
MW-107	1999701.42	592314.39	1542.21	1541.91	1542.2	0	0.30	14.6	4.6 - 14.6
MW-108	1999615.19	592418.34	1546.75	1546.69	1543.6	3.1	0.06	22.1	9.0 - 19.0
MW-109	1999403.28	592332.38	1546.10	1545.85	1543.0	3.1	0.25	18.8	5.7 - 15.7
MW-110	1999524.97	592176.70	1543.33	1543.08	1543.3	0	0.25	19.6	9.6 - 19.6
MW-201	1999945.73	591954.15	1543.81	1543.58	1540.6	3.2	0.23	18.6	5.4 - 15.4
MW-202	1999711.88	591841.61	1554.19	1553.97	1554.2	0	0.22	22.4	12.4 - 22.4
MW-203	1999993.61	591740.99	1548.05	1547.83	1548.1	0	0.22	17.3	7.3 - 17.3
MW-204	1999285.76	592255.49	1546.53	1546.29	1543.5	3.0	0.24	28.3	10.3 - 25.3
MW-205S	1999119.02	592297.69	1545.44	1545.24	1542.5	2.9	0.20	19.6	9.6 - 19.6
MW-205D	1999124.30	592295.88	1545.52	1545.37	1542.4	3.1	0.15	33.5	20.4 - 30.4
PZ-301	1999930.00	591915.00	NA	NA	1540.0	NA	NA	12.0	2.0 - 12.0
PZ-302	1999848.00	592090.00	NA	1553.90	1550.0	3.9	NA	19.9	3.0 - 16.0
PZ-303	2000117.00	592005.00	NA	1540.90	1539.0	1.9	NA	9.9	3.0 - 8.0
PZ-304	2000133.00	592036.00	NA	1546.90	1544.0	2.9	NA	14.9	1.0 - 11.0

Table 4.3: Monitoring Well and Piezometer Construction Details

Location ID	Northing	Easting	Casing Elevation (ft amsl)	Riser Elevation (ft amsl)	Ground Surface Elevation (ft amsl)	TOC (ft ags)	TOC - TOR (ft)	Bottom of Well (ft BTOR)	Screening Interval (ft bgs)
PZ-311	2000325.00	591770.00	NA	NA	1542.0	NA	NA	12.0	2.0 - 12.0
PZ-317	2000475.00	591409.00	NA	NA	1536.0	NA	NA	8.0	3.0 - 8.0
PZ-318	2000500.00	591399.00	NA	NA	1535.0	NA	NA	8.0	3.0 - 8.0
PZ-337	2000303.00	591733.00	NA	NA	1549.0	NA	NA	17.0	7.0 - 17.0
PZ-328	2000416.00	590853.00	NA	NA	1531.0	NA	NA	8.0	3.0 - 8.0
PZ-331	2000308.00	590667.00	NA	NA	1533.0	NA	NA	25.0	15.0 - 25.0
PZ-332	2000173.00	590565.00	NA	NA	1529.0	NA	NA	9.0	4.0 - 9.0
PZ-333	2000391.00	590880.00	NA	NA	1532.0	NA	NA	NA	NA
PZ-335	2000463.00	590668.00	NA	NA	1532.0	NA	NA	26.0	16.0 - 26.0
PZ-336	2000495.00	590419.00	NA	NA	1533.0	NA	NA	20.0	10.0 - 20.0

Notes:

MW = monitoring well PZ = Piezometer
TOC = top of casing TOR = top of riser BTOR = below top of riser NA = not available
ft = feet ags = above ground surface bgs = below ground surface amsl = above mean sea level
Wells Surveyed by Prudent Engineering
Northing/Easting = North American Datum 83/96 - NYSPCS EAST (US survey ft); Elevations = North American Vertical Datum 88 (US survey ft)
Water levels collected by MACTEC Engineering and Consulting

APPENDIX A

MACTEC SHORT FORM SITE-SPECIFIC HEALTH AND SAFETY PLAN (HASP)

MACTEC, Inc.

MACTEC Short Form HASP

Site: Saranac Lake Gas Company Site Job Number: 3612132271
Street Address: 24 Payeville Road, Village of Saranac Lake, New York
Proposed Date(s) of Investigation: August 2013
Prepared by: Rebecca Gabryszewski Date: 7/03/2013
*Approved by: Kendra Bavor, CSP Date: 7-1-13
Site Description: Closed propane distribution company. Previously the site of the Saranac Lake Gas Company former manufactured gas plant used for manufacture of lighting gas. (See attached Site Location Map)

*Approval also serves as certification of a Hazard Assessment as required by 29 CFR 1910.132

MACTEC	Other contractor	Task Description
☒	☐	Mobilization/demobilizing
☒	☐	Overall inspection of the site
☒	☐	General Field Work/Oversight
☐	☒	Direct Push Boring Installation (on and off site)
☐	☒	Micro-Well Installation
☒	☐	Sediment sampling
☒	☐	Groundwater Sampling
☒	☐	Surface Water Sampling
☒	☐	Hand Borings
☒	☒	Sediment Coring in Lake Flowers
☐	☒	Survey
☐	☐	
☐	☐	

Dates of Required Training and Medical Surveillance:

		Names of Field Team*			
		Brandon Shaw	Charles Lyman	Charles Lyman	
	Req?	Dates	Dates	Dates	Dates
Medical Surveillance	YES	12/06/2012	5/16/2013		
Site Specific Medical Testing:_____					
40-Hour Initial	YES	5/13/2005	8/1993		
8-Hour Supervisor [1,3]			6/12/2001		
8-Hour Refresher	YES	8/17/2012	4/30/2013		
First Aid/CPR [1,2]			3/20/2012		
Respirator Fit Test [1]					
Respirator Brand [1]					
Hazard Communication [1]	YES	6/9/2013	6/9/2013		
Fall Protection [1]					
Confined Space Entry [1]					
Lead Awareness					

[1] If Applicable
[2] At least one worker must be trained in First Aid/CPR and should received Bloodborne Pathogen Training
[3] Required for Field Lead and Site Health and Safety Officer
*Field Team to be determined at time field work is assigned.

Known or Suspected Contaminants (include PELs/TLVs):

Contaminants of Concern	Historical Highest Sample Data (pre-cleanup)	PEL/TLV	Fact Sheet Included
Benzene	67 ppm (soil)	0.5 ppm	X
Toluene	160 ppm (soil)	20 ppm	X
Ethyl Benzene	100 ppm (soil)	100 ppm	X
Xylene	140 ppm (soil)	100 ppm	X
PAHs (Naphthalene)	3300 ppm (soil)		X
Cyanide	423 ppm (soil)	5 mg/m3	X

Air Monitoring Action Levels:

PID/FID Reading [1]	Detector Tube [1]	Dust Meter [1]	LEL[2]/O_2 [1]	Action	Level of PPE
Above Background				Stop work, back away from work area, evaluate potential source of contamination	

[1] Sustained readings measured in the breathing zone
[2] Readings at measured at the source (borehole, well, etc.)

AHAs: Check and attach all that apply (add applicable AHAs not already listed):
Activity and Hazard Specific AHAs:

☒	Mobilization/Demobilization and Site Preparation	☒	Soil Sampling
☒	Field Work – General	☒	Working near water
☒	Decontamination	☐	
☒	Groundwater Sampling	☐	
☒	Sampling with a hand auger	☐	
☒	Field Oversight	☐	
☒	Geoprobe (MACTEC oversight)	☐	
☒	Stream/Wetlands Work	☐	
☒	Insect Stings and Bites	☐	
☒	Working with Preservatives (Acids)	☐	
☒	Boating - Surface Water and Sediment Collection	☐	

Chemicals Brought to the Site:
List all chemicals brought to the site (e.g., preservatives, decontamination solutions, gasoline, etc.). Attach MSDS

Chemicals	MSDS Attached?
HYDROGEN CHLORIDE (HCL) (RESERVATIVE)	☒
NITRIC ACID (PRESERVATIVE)	☒
LIQUINOX/ ALCONOX	☒
ISOBUTYLENE	☒
CALIBRATION SOLUTIONS (YSI)-PH4, PH7, DO, ORP, 1413 SPECIFIC COND.	☒
METHANOL	☒
SULFURIC ACID	☒

Chemicals will be kept in their original containers. If transferred to another container, aside from days use by one individual, the new container will be labeled with the name of the chemical and the hazard warnings.

HAZARD IDENTIFICATION SUMMARY

Complete the checklist for summarizing the hazards identified in the AHAs

Standard Hazards			
☒ Falling Objects	☒ Slips and trips	☒ Pinch points	☒ Rotating equipment
☒ Falls	☒ Power equipment/tools	☐ Elevated work surfaces	☐ _____
Eye Hazards			
☒ Particulates	☒ Liquid splashes	☐ Welding Arc	☐ _____
Hearing Hazards			
☐ None	☒ Impact noise	☐ High frequency noise	☒ High ambient noise

Respiratory Hazards						
☐ None	☒ Dust/aerosols/particulates	☐ Organic Vapors	☐ Acid Gases	☐ O_2 deficient	☐ Metals	☐ Asbestos

Chemical Hazards			
☐ None	☒ Organic solvents	☐ Reactive metals	☐ PCBs
☒ Acids / bases	☐ Oxidizers	☒ Volatiles/Semi-volatiles	☐ _____

Environmental Hazards			
☐ None	☒ Temperature extremes: ☒ Cold ☒ Heat	☒ Wet location	☒ Bio hazards (snakes, insects, spiders, poisonous plants, etc.)
☐ Explosive vapors	☐ Confined space	☐ Engulfment Hazard	☐ _____

Electrical Hazards				
☐ None	☒ Energized equipment or circuits	☒ Overhead utilities	☒ Underground utilities	☐ Wet location

Fire Hazards			
☒ None	☐ Cutting, welding, or grinding generated sparks or heat sources	☐ Flammable materials present	☐ Oxygen enriched location

Ergonomic Hazards					
☒ Lifting	☒ Bending	☐ Twisting	☒ Pulling/tugging	☐ Repetitive motion	☒ Carrying
Computer Use in the: ☐ Office ☐ Field			☐ _____		

Radiological Hazards						
☒ None	☐ Alpha	☐ Beta	☐ Gamma/X-rays	☐ Neutron	☐ Radon	☐ Non-Ionizing

Other Hazards
☐

PPE and Monitoring Instruments

Initial Level of PPE *			
☒ Level D	☐ Modified Level D	☐ Level C	* Cannot use Short Form HASP for Level B or A work

Standard PPE					
☒ Hard Hat	☒ Safety boots	☒ Safety glasses	☐ Chem. Resistant Boots	☒ High visibility vest	☐ Other:_____

Eye and Face Protection			
☐ Face shield	☐ Vented goggles	☐ Unvented goggles	☐ Indirect vented goggles

Hearing Protection					
☒ Ear plugs	☐ Ear Muffs	☐ Ear plugs and muffs	☐ Other _____		
Respiratory Protection					
☒ None	☐ Dust mask	☐ Full Face APR	☐☐ Half Face APR	Cartridge Type: _____	Change Cartridges: _____
Protective Clothing					
☒ Work uniform	☐ White uncoated Tyvek®	☐ Poly-coated Tyvek®	☐ Saranex®		
☐ Boot covers	☒ Reflective vest	☐ Chaps or Snake Legs	☒ Other Optional Coveralls		
Hand Protection					
☐ None	☐ Cotton gloves	☐ Leather gloves	☐ Glove liners	☐ Cut-resistant gloves	☒ Other –Nitrile Gloves
☐ Outer Gloves: List Type _____		☐ Inner Gloves: List Type_____			
Monitoring Instruments Required*					
Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen over permissible exposure limits or published exposure levels since prior monitoring. Situations where it shall be considered whether the possibility that exposures have risen are as follows: ▪ When work begins on a different portion of the site. ▪ When contaminants other than those previously identified are being handled. ▪ When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling.) ▪ When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon.)					
☐ LEL/O2 Meter	☐ PID: 10.0-10.6 eV Lamp ☐ 11.7 eV Lamp	☐ FID	☐ Hydrogen Sulfide/Carbon Monoxide		
☐ Dräger Pump (or equivalent) List Tubes_____	☐ Dust Meter: ☐ Respirable dust ☐ Total dust	☐ Other _____			

*Monitoring instruments will be calibrated daily in accordance with manufacturer's instructions.

PPE Selection Guidelines

When selecting the appropriate PPE for the job, consider the following:

- **Safety glasses** – general eye protection – source of hazard, typically coming from straight on, required at most sites
- **Tinted Safety Glasses** – same as above, but when working in direct sunlight. May need two both tinted and untinted if working in both sunlight and shade/overcast skys.
- **Safety goggles** – needed for splash hazard, more severe eye exposures coming from all directions. Non-vented or indirect venting for chemical splash, non-vented for hazardous gases or very fine dust, vented for larger particulates coming from all directions.
- **Face shield** – needed to protect face from cuts, burns, chemicals (corrosives or chemicals with skin notation), etc.
- **Safety boots** – needed if danger of items being dropped on foot that could injure foot
- **Hard hat** – danger from items falling on head – any overhead work, tools, equipment, etc that is above the head and could fall on head of item fails, or falls off work platform. Typically required at most sites as a general PPE
- **Thin, chemical protective inner gloves** (e.g., thin Nitrile, PVC – do not use latex – many people are allergic to latex) –needed to protect hands from incidental contact with low risk contamination at very low concentrations (ppb or low ppm concentrations in groundwater or soil) or used in combination with outer gloves as a last defense against contamination. Need to specify type
- **Outer gloves** – thicker gloves (e.g., Nitrile, Butyl, Viton, etc.) – used when potential for high concentrations of contaminants (e.g., floating product, percent ranges of contaminant, opening drums, handling pure undiluted chemicals, etc.). Need to specify type.
- **Leather gloves, leather palm, cotton** – good in protecting hands against cuts – no protection from chemicals. May be used in combination with chemical protective gloves.
- **Boot Covers –** when there is contamination in surface soils or waking surface in general. When safety boots need protection from contact with contaminants.
- **White (uncoated) Tyveks** – protect clothing from getting dirty, good for protection against solid, non-volatile chemicals (e.g., asbestos, metals) – no chemical protection.
- **Polycoated Tyveks** – least protective of chemical protective clothing. Used when some risk of contamination getting on skin or clothing. Usually, lower ppm ranges of contaminants.
- **Saranex** – Greater protection against contamination than Polycoated Tyveks. Used to protect against PCBs or higher concentrations of contaminants in the soil or groundwater.
- **Other Chemical protective clothing** – if significant risk of dermal exposure, contact H&S to determine best kind.
- **Long sleeved shirts, long pants** – if working in areas with poison ivy/oak/sumac, poisonous insects, etc. and no chemicals exposure. May want to use uncoated Tyveks for work in areas where poisonous plants are known to occur to protect clothing.
- **Cartridge Respirator (Level C PPE)** – Need to calculate change schedule (contact Division EH&S Manager for this) to determine length of use. To be able to use cartridge respirators, need to know contaminants, estimate levels to be encountered in the breathing zone, need to ensure that cartridge will be effective against COCs, and need to be able to monitor for COCs using PID, FID, Dräger tubes, etc.. If can't do any of these, then Level B PPE is probably going to be needed.
- **High Visibility Vest** – needed for any road work (with in 15 feet of a road) or when working on a site with vehicular traffic or working around heavy equipment. Needed if work tasks would take employee concentration away from movement of vehicles and workers would have to rely on the other driver's ability to see the employee in order not to hit them. This includes heavy equipment as well as cars and trucks, on public roads or the jobsite. Not needed if wearing Polycoated Tyveks – as they are already high visibility.
- **Reflective Vest** – see above, but for use at night.
- **Hearing Protection** – needed if working at noise levels above 85 dBA on a time weighted average. If noise measurements are not available, use around noisy equipment, or in general, if you have to raise your voice to be heard when talking to someone standing two feet away.
- **Protective Chaps –** required when using a machete or chain saw or any other cut hazard to legs.

Work Zones:
The work zones will be defined relative to the location of the work activity. The Exclusion Zone is considered the area within a 10-foot diameter of the sampling location. The Contamination Reduction Zone is considered to be the area with in a 20-foot diameter of the sampling location. The decontamination zone being located upwind of the work area. Work zones will be maintained through the use of:

- ☐ Warning Tape
- ☒ Visual Observations
- ☒ Cones and Barriers

Decontamination Procedures and Equipment:
Note: See Decontamination JHA for further information

Level D Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Boots, and Gloves Wash and Rinse (if worn)	Scrub outer boots, and outer gloves decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal (if worn)	Remove outer boots and gloves. Deposit in plastic bag.
Station 4: Inner glove removal	Remove inner gloves and place in plastic bag.
Station 5: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Modified Level D and Level C PPE Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4: Canister or Mask (Level C only) Change	If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty.
Station 5: Boot, Gloves and Outer Garment Removal	Boots, chemical resistant splash suit, and inner gloves are removed and deposited in separate containers lined with plastic.
Station 6: Face Piece Removal (Level C only)	Facepiece is removed. Avoid touching face with fingers. Facepiece is deposited on plastic sheet.
Station 7: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Site Communication:

- ☒ Verbal
- ☒ Two-way radio
- ☒ Cellular telephone
- ☒ Hand signals
  - Hand gripping throat ---------- Out of air, can't breathe
  - Grip partner's wrist or both hands around waist ---------- Leave area immediately
  - Hands on top of head ---------- Need assistance
  - Thumbs up ---------- OK, I am all right, I understand
  - Thumbs down ---------- No, negative
- ☐ Horn
- ☐ Siren
- ☐ Other:

EMERGENCY CONTACTS

NAME	TELEPHONE NUMBERS		DATE OF PRE-EMERGENCY NOTIFICATION (if applicable)
Fire Department:	911		
Hospital:			
Police Department:	911		
Site Health And Safety Officer: Charles Lyman	Office: (207) 828-3280	Cell: (207) 461-0001	
MACTEC Project Manager: Jayme Connolly	Office: (207) 775-5401	Cell: (207) 205-3155	
Division EH&S Manager: Cindy Sundquist	Office: (207) 828-3309 Cell: (207) 650-7593	Home: (207) 892-4402	
NYSDEC Project Manager: Mike McLean	Office: (518) 897-1254		
OTHER: Ambulance	911		

Emergency Equipment:

The following emergency response equipment is required for this project and shall be readily available:

- ☒ Field First Aid Kit
- ☐ Fire Extinguisher (ABC type)
- ☐ Eyewash (Note: 15 minutes of free-flowing fresh water)
- ☐ Other: _____

EMERGENCY PROCEDURES

- The HSO (or alternate) should be immediately notified via the on-site communication system. The HSO assumes control of the emergency response.
- The HSO notifies the Project Manager and client contact of the emergency. The HSO shall then contact the Division ES&H Manager who will then contact the Corporate EH&S Manager.
- If applicable, the HSO shall notify off-site emergency responders (e.g. fire department, hospital, police department, etc.) and shall inform the response team as to the nature and location of the emergency on-site.
- If applicable, the HSO evacuates the site. Site workers should move to the predetermined evacuation point (See Site Map).
- For small fires, flames should be extinguished using the fire extinguisher. Large fires should be handled by the local fire department.
- In an unknown situation or if responding to toxic gas emergencies, appropriate PPE, including SCBAs (if available), should be donned. If appropriate PPE is unavailable, site workers should evacuate and call in emergency personnel.
- For chemical spills, follow the job specific JHA for spill containment
- If chemicals are accidentally spilled or splashed into eyes or on skin, use eyewash and wash affected area. Site worker should shower as soon as possible after incident.
- If a worker is injured, first aid shall be administered by certified first aid provider.
- If the emergency involves toxic gases, workers will back off and reassess. Prior to re-entering the work zone, the area must be determined to be safe. Entry will be using Level B PPE and utilize appropriate monitoring equipment to verify that the site is safe.
- An injured worker shall be decontaminated appropriately.
- After the response, the SHSO shall follow-up with the required company reporting procedures, including the completing the MACTEC Incident Analysis Report.

AMEC Early Injury Case Management Program

<table>
<tr><th>NON-EMERGENCY INCIDENT</th><th>EMERGENCY INCIDENT</th></tr>
<tr><td>Steps 1 & 2 must be completed before seeking medical attention other than local first aid.
1. Provide first-aid as necessary. Report the situation to your immediate supervisor AND HSE coordinator (all incidents with the apparent starting event should be reported within 1 hour of occurrence).
2. Injured employee:</td><td>1. Provide emergency first aid. Supervisor on duty must immediately call 911 or local emergency number; no employee may respond to outside queries without prior authorization. Any outside media calls concerning this incident must be referred immediately to Lauren Gallagher at 602-757-3211.
2. Once medical attention is sought and provided, the supervisor must:</td></tr>
<tr><td colspan="2">Call WorkCare 24/7 Hotline*
(888) II-XPRTS or (888) 449-7787</td></tr>
<tr><td>WorkCare will assess the situation and determine whether the incident requires further medical attention. During this process, WorkCare will perform the following:
• Explain the process to the caller.
• Determine the nature of the concern.
• Provide appropriate medical advice to the caller.
• Determine appropriate path forward with the caller.
• Maintain appropriate medical confidentiality.
• Help caller to execute path forward, including referral to the appropriate local medical facility.
• Send an email notification to the Corporate HSE Department.</td><td>WorkCare will be responsible for performing the following:
• Contact the treating physician.
• Request copies of all medical records from clinic.
• Send an email update to the Corporate HSE Department.</td></tr>
<tr><td colspan="2">3. IMMEDIATELY after contacting WorkCare send a brief email notification AND inform verbally (direct contact is required) ONE of HSE corporate representatives See Figure 11.3.
4. Make all other local notifications and client notifications.
5. Local Supervisor, HSE Coordinator, SSHO and any applicable safety committees to complete preliminary investigation, along with the initial Incident Report within 24 hours.
6. Corporate Loss Prevention Manager to complete Worker’s Compensation Insurance notifications as needed.
7. Corporate HSE to conduct further incident notifications, investigation, include in statistics, classify, and develop lessons learned materials.
* - NOTE: Step 2 is only applicable to the North-American operations and to incidents involving AMEC personnel. High potential near misses, subcontractors’ incidents, regulatory inspections, spills and property damages above $1,000 should be reported immediately, following directions from Step 3.</td></tr>
</table>

Site Specific Procedures are as follows:

FOLLOW THE “CAMP” in the FAP for dust and perimeter volatile monitoring.

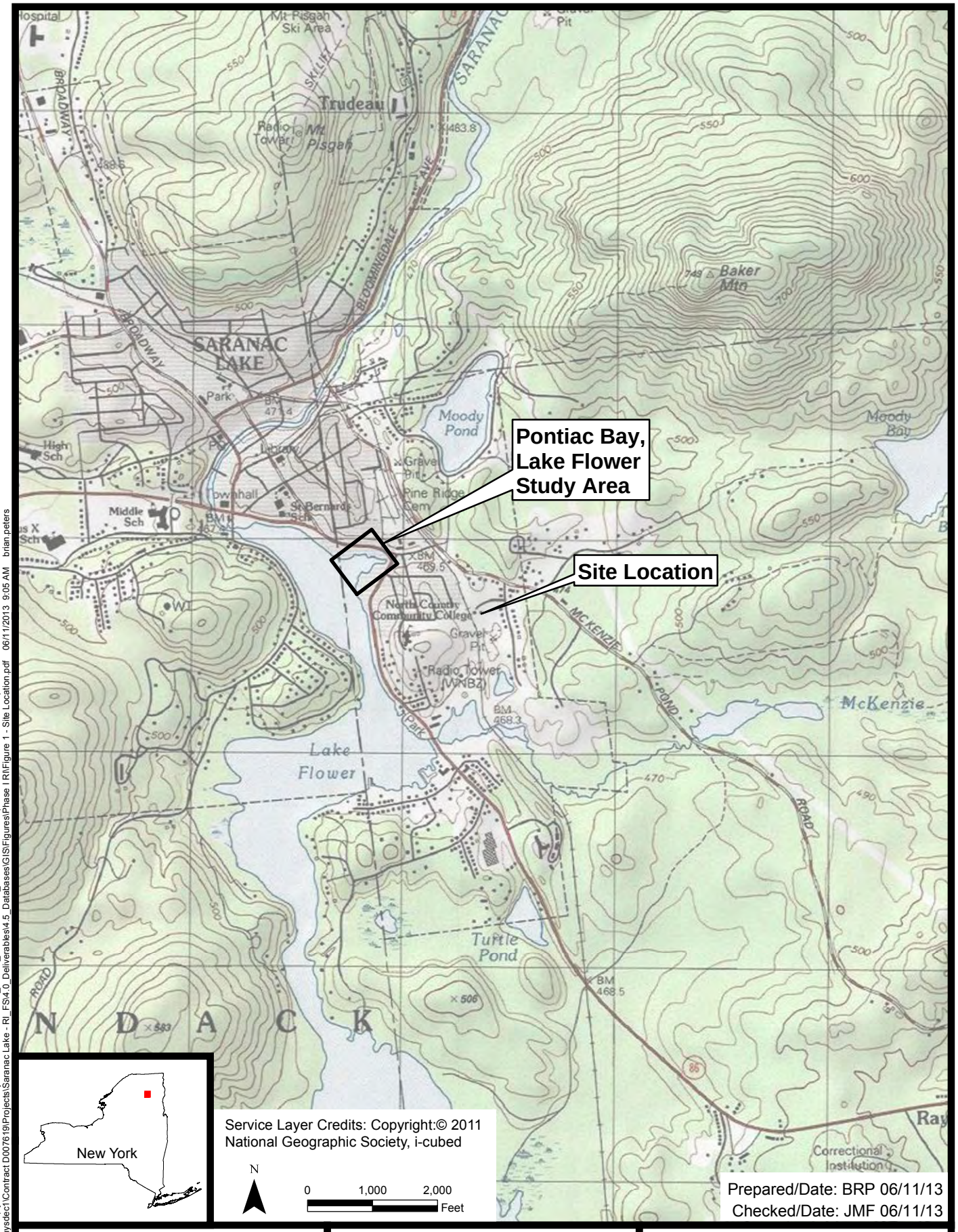
FIELD TEAM REVIEW: I acknowledge that I understand the requirements of this HASP, and agree to abide by the procedures and limitations specified herein. I also acknowledge that I have been given an opportunity to have my questions regarding the HASP and its requirements answered prior to performing field activities. Health and safety training and medical surveillance requirements applicable to my field activities at this site are current and will not expire during on-site activities.

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____



NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
North Elba, New York

MACTEC

Site Location Map

Project 3612132271 Figure 1

Routes to Emergency Medical Facilities

PRIMARY HOSPITAL:

Facility Name: Mountain Medical Urgent Care
Address: 345 Broadway, Saranac Lake New York 12983
Telephone Number: (518) 897-1000

DIRECTIONS TO PRIMARY HOSPITAL (attach map): SEE ATTACHED

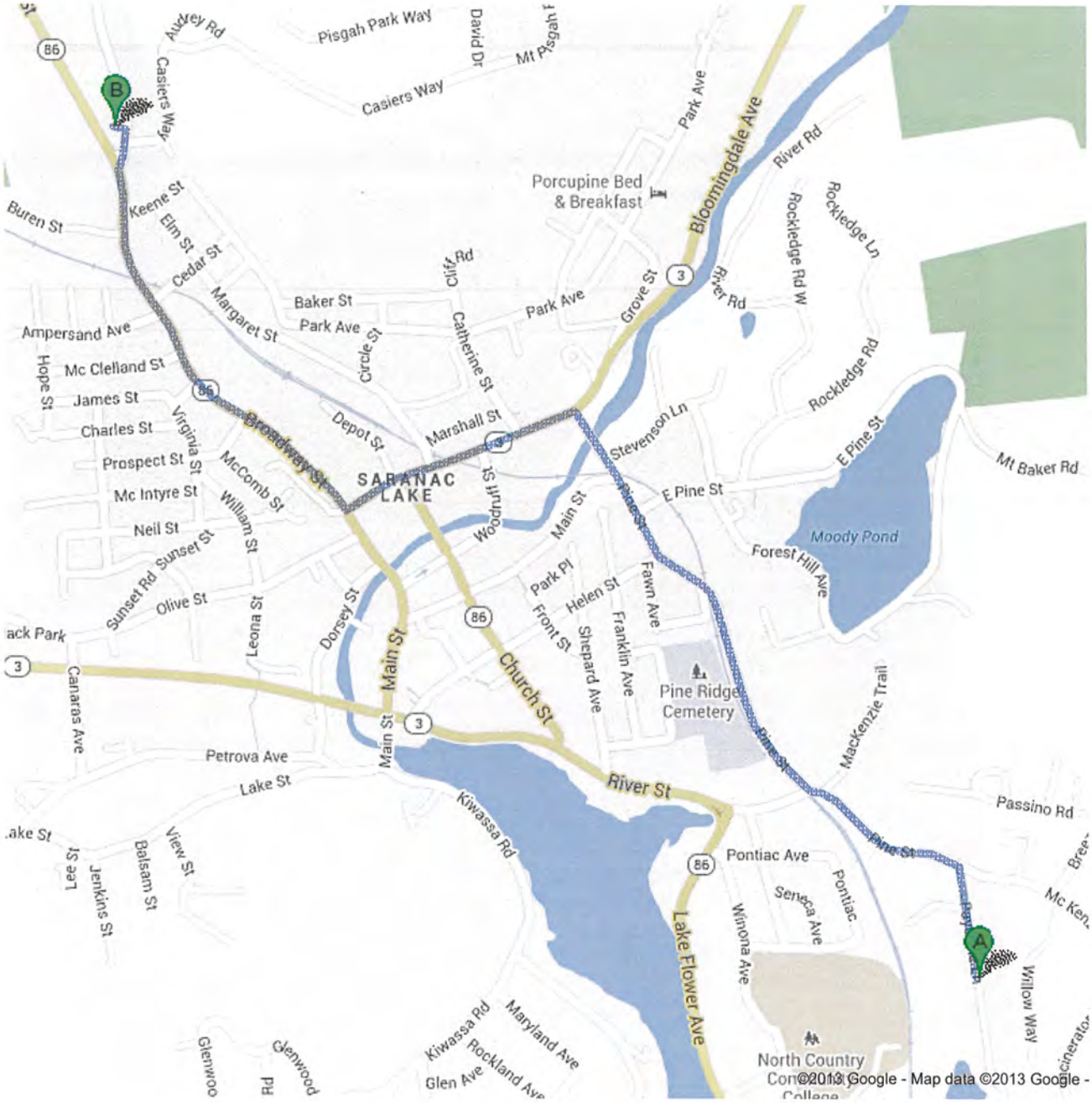
ALTERNATE HOSPITAL:

Facility Name: Adirondack Medical Center
Address: 2233 New York 86, Saranac Lake, New York 12983
Telephone Number: (518) 891-4141

DIRECTIONS TO ALTERNATE HOSPITAL (attach map): SEE ATTACHED

Google

Directions to 354 Broadway, Saranac Lake, NY 12983
2.0 mi – about **7 mins**



Mountain Medical
Urgent Care
354 Broadway
Tel (518)-897-1000

open M-F 8am - 8pm
Sat/Sun 10am - 6pm

24 Payeville Ln, Saranac Lake, NY 12983

1. Head **north** on **Payville Ln** toward **Adirondack Park Preserve**

go 0.2 mi
total 0.2 mi

2. Turn left onto **Pine St**
About 2 mins

go 0.9 mi
total 1.0 mi

3. Turn left onto **Bloomingdale Ave**
About 2 mins

go 0.3 mi
total 1.4 mi

4. Turn right onto **Broadway St**
About 1 min

go 0.6 mi
total 1.9 mi

5. Slight right onto **Old Lake Colby Rd**

go 305 ft
total 2.0 mi

6. Turn left
Destination will be on the right

go 92 ft
total 2.0 mi

354 Broadway, Saranac Lake, NY 12983

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2013 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

Google

Directions to Adirondack Medical Center
2233 New York 86, Saranac Lake, NY 12983
2.7 mi – about **8 mins**

Payeville Ln, Saranac Lake, NY 12983

1.	Head **north** on **Payeville Ln** toward **Adirondack Park Preserve**	go 0.2 mi total 0.2 mi
2.	Turn left onto **Pine St** About 2 mins	go 0.9 mi total 1.0 mi
3.	Turn left onto **Bloomingdale Ave** About 2 mins	go 0.3 mi total 1.4 mi
4.	Turn right onto **Broadway St** About 2 mins	go 1.0 mi total 2.4 mi
5.	Continue onto **NY-86 W/Lake Colby Dr** Continue to follow NY-86 W	go 0.2 mi total 2.6 mi
6.	Turn right onto **Adirondack Park** Destination will be on the right	go 0.1 mi total 2.7 mi

Adirondack Medical Center
2233 New York 86, Saranac Lake, NY 12983

Google

Directions to Adirondack Medical Center
2233 New York 86, Saranac Lake, NY 12983
2.7 mi – about **8 mins**


LAKE COLBY
Trudeau Rd
Beechwood Dr
Cherry Tree Ln
Vista Dr
Trudeau Rd
86
B
Adirondack Medical Center
Mt Pisgah Ski Area
3
Lake Colby
Grace St
86
Bloomingdale Ave
Little Colby Pond
Broadway St
3
St Bernards Cemetery
SARANAC LAKE
Moody Pond
Pine Ridge Cemetery
Church St
Main St
3
River St
Breezy Acre Way
Lake Flower Ave
A
North Country Community College
Algonquin Ave
George H Lapan Memorial Hwy
3
86
Lake Flower
©2013 Google - Map data ©2013 Google -

Payeville Ln, Saranac Lake, NY 12983

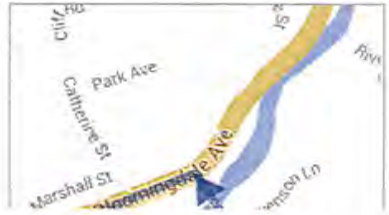
1. Head **north** on **Payeville Ln** toward **Adirondack Park Preserve**

go 0.2 mi
total 0.2 mi

2. Turn left onto **Pine St**
About 2 mins

go 0.9 mi
total 1.0 mi

3. Turn left onto **Bloomingdale Ave**
About 2 mins



go 0.3 mi
total 1.4 mi

4. Turn right onto **Broadway St**
About 2 mins

go 1.0 mi
total 2.4 mi

86 5. Continue onto **NY-86 W/Lake Colby Dr**
Continue to follow NY-86 W

go 0.2 mi
total 2.6 mi

6. Turn right onto **Adirondack Park**
Destination will be on the right

go 0.1 mi
total 2.7 mi

B **Adirondack Medical Center**
2233 New York 86, Saranac Lake, NY 12983

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may [illegible] results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2013 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

DAILY TAILGATE SAFETY MEETING CHECKLIST

Project: _____ Site: _____

Date: Location:

To be reviewed on the first day of site activities and when new workers arrive on site:

Agenda:

During the project, one or more of the agenda items could be selected for the required daily site training.

Check-off: Date

		___	___	___	___	___
1.	Planned work for this day (discuss)	☐	☐	☐	☐	☐
2.	Physical hazards and controls (discuss/review)	☐	☐	☐	☐	☐
3.	Chemical hazards and controls (discuss/review)	☐	☐	☐	☐	☐
4.	Biological hazards and controls (discuss/review)	☐	☐	☐	☐	☐
5.	Level of personal protective equipment: _____	☐	☐	☐	☐	☐
6.	Personal protective equipment required per the hazard assessment:	☐	☐	☐	☐	☐

SPECIFY TYPE	
Protective coveralls	
Safety glasses/goggles	ANSI approved
Hard hat	ANSI approved
Foot protection	Safety toe boots
Work gloves	
Chemical gloves	Nitrile outer/vinyl inner
Hearing protection	
Other	

7.	Review inspection and maintenance procedures and the limitations of the PPE to be used.	☐	☐	☐	☐	☐
8.	Decontamination procedure (discuss/review)	☐	☐	☐	☐	☐
9.	Exclusion zone maintained	☐	☐	☐	☐	☐
10.	Site emergency response plan (discuss/review)	☐	☐	☐	☐	☐
11.	Signs and symptoms of overexposure to chemicals anticipated on site	☐	☐	☐	☐	☐
12.	General health and safety rules	☐	☐	☐	☐	☐
13.	Specific health and safety requirements relating to site activities including: (discuss/review)	☐	☐	☐	☐	☐
14.	Drilling/boring	☐	☐	☐	☐	☐
15.	UST	☐	☐	☐	☐	☐
16.	Excavations (including UG utility locations)	☐	☐	☐	☐	☐
17.	Heavy equipment	☐	☐	☐	☐	☐
18.	Slips, trips, and falls	☐	☐	☐	☐	☐
19.	Lockout/tagout	☐	☐	☐	☐	☐
20.	Working in temperature extremes	☐	☐	☐	☐	☐
21.	Rain or other weather advisories	☐	☐	☐	☐	☐
22.	Other health & safety issues (discuss/note)	☐	☐	☐	☐	☐

I have participated in the daily safety meeting discussing the topics indicated and fully understand my responsibility for complying with all health and safety requirements. I have had the opportunity to have my questions on site health and safety issues and procedures answered.

Employee Name	Employee Signature	Date

Incident Flow Chart

Call Immediatley

Emergency → Incident Occurs → Non-Emergency

CALL 911 Emergency

Supervisor Immediately Calls After Medical Attention is Sought and Provided

Contact Supervisor HSE Coordinator and WorkCare (24/7) Hotline (888)1-XPRTS or (888) 449-7787

Verbally Contact One HSE Representative Below Within 2 Hours

E&I Corporate HSE Department Contact List

Name/Email	Office Location	Contact Information
Bruce Voss bruce.voss@amec.com	Catherdral City, CA	760.202.3737 (office) 951.897.6381 (cell)
Chad Barnes chad.barnes@amec.com	Phoenix, AZ	602.733.6000 (office) 480.495.9846 (cell)
Cindy Sundquist cynthia.sundquist@amec.com	Portland, ME	207.828.3309 (office) 207.650.7593 (cell) 207.892.4402 (home)
Don Kubik don.kubik@amec.com	Oakland, CA	510.663.4100 (office) 510.368.6433 (cell)
Gabe Sandholm gabe.sandholm@amec.com	Minneapolis, MN	612.252.3785 (office) 206.683.9190 (cell)
John Mazur john.mazur@amec.com	Wilmington, NC	910.452.1185 (office) 910.431.2330 (cell) 910.681.0538 (home)
Lori Dowling lori.dowling@amec.com	Prince George, BC	250.564.3243 (office)
Philip Neville philip.neville@amec.com	Thorold, ON	905.687.6616 (office) 905.380.4465 (cell)
Tim Kihn tim.kihn@amec.com	Edmonton, AB	780.944.6363 (office) 780.717.5058 (cell)
Vlad Ivensky (can call 24/7) vlad.ivesky@amec.com	Plymouth Meeting, PA	610.877.6144 (office) 484.919.5175 (cell) 215.947.0393 (home)

**High potential near misses, subcontractor incidents, regulatory inspections, spills, and property damage greater than $1000, should be reported within 60 minutes to one of the above HSE Representatives.*

Revised 17 July 2012-hb

Check one
Initial Report: ☐
Update: ☐
Final Report: ☐ ___

INCIDENT ANALYSIS REPORT
AMEC Environment & Infrastructure
Confidential - Privileged

Incident Potential
Letter: Select One
Number: Select One
Investigation Level: Select One

Group: Select One HSE Manager: ____ Incident Review Panel Team (if applicable): ____

Incident Date: _____ Report Date: _____

Section 1 – General Information

Employee Name: ____ Sex: ☐ M ☐ F Date of Birth: ____ Age Range: Select One Time of incident: ____ ☐ am | ☐ pm

Job Position: Select One Hire Date: ____ Time employee began work: _____

Business Line: Select One Department Number: ____ Project Manager: ____

Project Name: ____ Project Number: ____ Client: ____

Office where employee works from: ____ Immediate Supervisor: ____ Hours employee worked during last 7 days: ____ hrs

Location: Select One Is this a Company controlled work site: ☐ Yes ☐ Incident Assigned to: Select One

Location description: ____

Section 2 – Incident Type - Process (**mark at least ONE BOLD TYPE** and all that apply)

☐ **Fatality** ☐ **Environmental** ☐ **Injury/Illness Incident** If Injury/illness: Select One
☐ **Security** ☐ **Near Miss / Hazard ID** ☐ **Property Damage** If Damage: Select One ☐ 3rd Party?
☐ Hospitalization ☐ Regulatory Inspection ☐ Notice of Violation or Citation ☐ Agency Reportable?
☐ Motor Vehicle Incident Involving Injury ☐ Other (describe): ___

Outcome/Result: Select One Source of Hazard: Select One If "other", specify: ___ Immediate Cause: Select One

A. If **injury/illness**: Indicate the part of the body: Select One If "other", specify: ___
Indicate body part location: Select One If "other", specify: ___
Injury Type: Select One If "other", specify: ___ Illness Type: Select One If "other", specify: ___
B. If **property damage**: describe what happened and estimate ($) of damage to all objects involved? ___
C. If **environmental**: Type of Environmental incident?: Select One Name, CAS#, physical state and quantity? ___
Receiving Environment?: Select One Mechanism of Incident?: Select One If "other", specify: ___
Nature of Breach?: Select One Duration of Breach?: Select One
D. If **security**: Security Incident Type: Select One If Physical: Select One If Criminal: Select One If Intellectual: Select One
E. If an **inspection by a regulatory agency**, what agency, who were the inspectors, inspector contact information? ___

Section 3 – Incident Description

Attach and number additional pages, as needed, to ensure all details related to the incident are captured.

A. List the names of all persons involved in the incident, and employer information: ___
B. List the names of any witnesses, their employer, and a local/company telephone number or address: ___
C. Name of Employee's supervisor: ___ Contact phone number for supervisor: ___
D. What specific job/task or action was the employee(s) doing just prior to the incident: ___
E. Was a tool or equipment involved? ☐ Yes ☐ No What was it: ___ Last Inspection Date: ___Defects: ___
F. Explain in **detail** what happened: ___

G. Explain in **detail** what object or substance directly harmed the employee: ___

H. What were the weather conditions at time of incident?: ___

I. What was the lighting like at time of incident? Bright ☐ Shadows ☐ Dark ☐ Other: ___

J. List any damaged equipment or property (other than motor vehicles). Provide model and serial number **and** estimated costs to repair/replace damaged equipment or property, if applicable: ___

Section 4 - Incident Analysis

A. Was a Health and Safety Plan (HASP) or Activity Hazard Analysis (AHA) completed for the work being performed? ☐ Yes ☐ No
If "yes", Who prepared the document?: ___

B. Who and when was the last manager (Project, Unit, etc.) at the site of the incident?: ___

C. When and what safety training **directly related** to the incident has the person(s) involved had?: ___

D. List attached documentation (HASP acknowledgement forms, kickoff/daily/weekly meetings, inspections, photographs): ___

Section 5 - Incident Investigation Results and Corrective Actions

This section to be completed by the Group HSE Manager/IRP with support from location where incident occurred.

Causal Factors (Acts or Omissions / Conditions)

(Attach and number any additional pages as needed to completely address this section)

	IMMEDIATE CAUSE	IMMEDIATE CAUSE SUB-TYPE	DESCRIPTION
1	Select One	_____	_____
2	Select One	_____	_____
3	Select One	_____	_____
4	Select One	_____	_____

Root Cause(s) Analysis - The below items represents major root cause categories which have been determined to be Less Than Adequate (LTA). A more detailed determination of the root cause will be facilitated, if needed, by the applicable Group HSE Manager / IRP.

	ROOT CAUSE TYPE	ROOT CAUSE SUB-TYPE	DESCRIPTION
1	Select One	_____	_____
2	Select One	_____	_____
3	Select One	_____	_____
4	Select One	_____	_____

Corrective Actions

Root Cause #	Corrective Actions Taken (Attach additional pages as needed to completely address this section)	Responsible Person	Proposed Completion Date	Closed on Date	Verified by and Date Verified
_____	___	___	___	___	___
_____	___	___	___	___	___
_____	___	___	___	___	___
_____	___	___	___	___	___
_____	___	___	___	___	___

Section 6 - Notifications, Certification & Approvals

Check the appropriate boxes indicating the applicable reports have been made to the following applicable organizations:

Auto Insurance Carrier was called ☐ **Group HSE Manager Notified** ☐

WorkCare was called ☐ **Post-incident Drug/Alcohol Testing Performed** ☐

Incident Report prepared by: ___

Employee (s): ___	Date: ___	Employee's Supervisor: ___	Date: ___
HSE Coordinator/Project/Unit Manager: ___	Date: ___	Group HSE Manager:___	Date: ___

ATTACHMENT 2

VEHICLE INCIDENT REPORT

Confidential - Privileged

Section 1 - General Information

Date of Incident: _____

Time incident occurred: _____ ☐ am | ☐ pm | Illumination: ☐ Dark ☐ Dusk ☐ Light | Road Condition: ☐ Dry ☐ Wet ☐ Icy/snow

Were police summoned to scene? ☐ Yes ☐ No Police Department and Location: _____

Report #; _____ Officer's Name: _____ Officer's Badge Number: _____

Section 2 - Company Driver and Vehicle

Driver's name: _____ D/L #: _____ State: _____

Driver's home office address: _____ Driver's Phone #: _____

Company Vehicle #: _____ Year: _____ Model: _____ License #: _____ State: _____

Company car?: ☐ Yes ☐ No Personal Vehicle?: ☐ Yes ☐ No Rental Vehicle?: ☐ Yes ☐ No

If rental, rented from: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Damage to vehicle: _____

Was an employee injured?: ☐ Yes ☐ No If yes, please describe: _____

Injuries to others?: ☐ Yes ☐ No If yes, please describe: _____

Vehicle was being used for: Company business ☐ Yes ☐ No Personal business ☐ Yes ☐ No

Towed?: ☐ Yes ☐ No If yes, by whom?: _____ To Where?: _____

Section 3 - Other Driver and Vehicle Information

Driver's Name: _____ D/L # : _____ State: _____

Current address: _____ City: _____ State: _____

Telephone: _____ Work: _____ Cell: _____

Registered Owner's Name: _____ Address: _____ City: _____ State: _____

(verify registration document)

The Other Vehicle: Make: _____ Model: _____ Year: _____ License #: _____ State: _____

Insurance company name: _____ Address: _____ Phone #: _____

Policy No.: _____ Contact Person: _____ Phone #: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Damage: (*Make note of pre-existing damage and take pictures if possible – you may attach additional pages if necessary):* _____

Injuries to other driver/passengers: _____

Section 4 – Approvals (signatures required)

Form completed by (please print): _____ Date: _____

Signature: _____

Office/Project Manager (please print): _____ Date: _____

Signature: _____

Things to Do First In The Event Of a Motor Vehicle Incident

GENERAL INFORMATION

1. Do not decide on your own whether a particular incident is "covered" by insurance. Should there be any doubt, it is always preferable to report an occurrence, as this allows underwriters, the Risk Management Department and insurance adjusters to determine if a covered loss has taken place.

2. Policy Conditions do require that all losses and occurrences, which may result in a claim be promptly reported.

3. Do not admit liability or offer your opinion of liability to anyone.

4. Complete this IAR/VIR form promptly and forward with all applicable supporting documentation. It is essential both division and location information be provided.

5. For automobile collisions within the **United States**, please indicate on the IAR form that you have contacted Zurich at:

Zurich Insurance Company
1-800-987-3373 or
1-877-928-4531
24 hours a day, 7 days a week

6. For automobile collisions within **Canada**, please indicate on the IAR form that you have contacted Zurich at:

Crawford Adjusters Canada
Claims Alert
1-888-218-2346
24 hours a day, 7 days a week

The more details you have the better but, don't delay reporting if you don't have all of the information - that may be obtained later. A Zurich trained operator will answer your call and ask for all relevant information regarding the incident. The initial information required includes:

- Your division,
- Office location and division contact name – advise that you are an AMEC Company
- Name, drivers license and phone number of the driver involved in the loss
- Description of the vehicle which he/she was driving (i.e., year, make, model, license plate number, serial number)
- Date, time and location of incident
- Passenger information (if applicable)
- Third party information (i.e., name, phone number, address, vehicle information, insurance information)
- If any injuries occurred (if applicable)
- Police information
- Witness information (if applicable)

Call 911 if there are serious injuries!

If you are injured or think you were injured, **contact your supervisor and call WorkCare at 888-449-7787**. Your supervisor will notify your HSE Coordinator and your Group HSE Manager. For additional instructions on what to do, go to AMEC's HSE website at:

http://ee.amecnet.com/she/sheweb/incident_reporting.htm

1. Call for an officer if the incident occurred on public property (streets, highways or roads). Disputes often arise between the parties involved as to who was at fault; therefore, a police report is important. If an officer is unable to attend the scene of the collision, a counter police report may be filed at most stations. Insurance companies rely on police reports to determine liability.
2. Complete the Incident Investigation Report and the Vehicle Incident Report forms. It is important that both these forms are completed in detail. Include a diagram of the incident on the provided sheet. Incomplete information may lead to delays in processing associated claims and in helping to prevent this type of incident from occurring again.
3. Give only information that is required by the authorities or as directed by AMEC contractual requirements.
4. Sign only those statements required by the authorities or as directed by AMEC contractual requirements. Do not sign away your or the company's rights.

Vehicle Incident Diagram

This or a similar diagram <u>must be completed</u> with all VIRs

MACTEC, Inc.

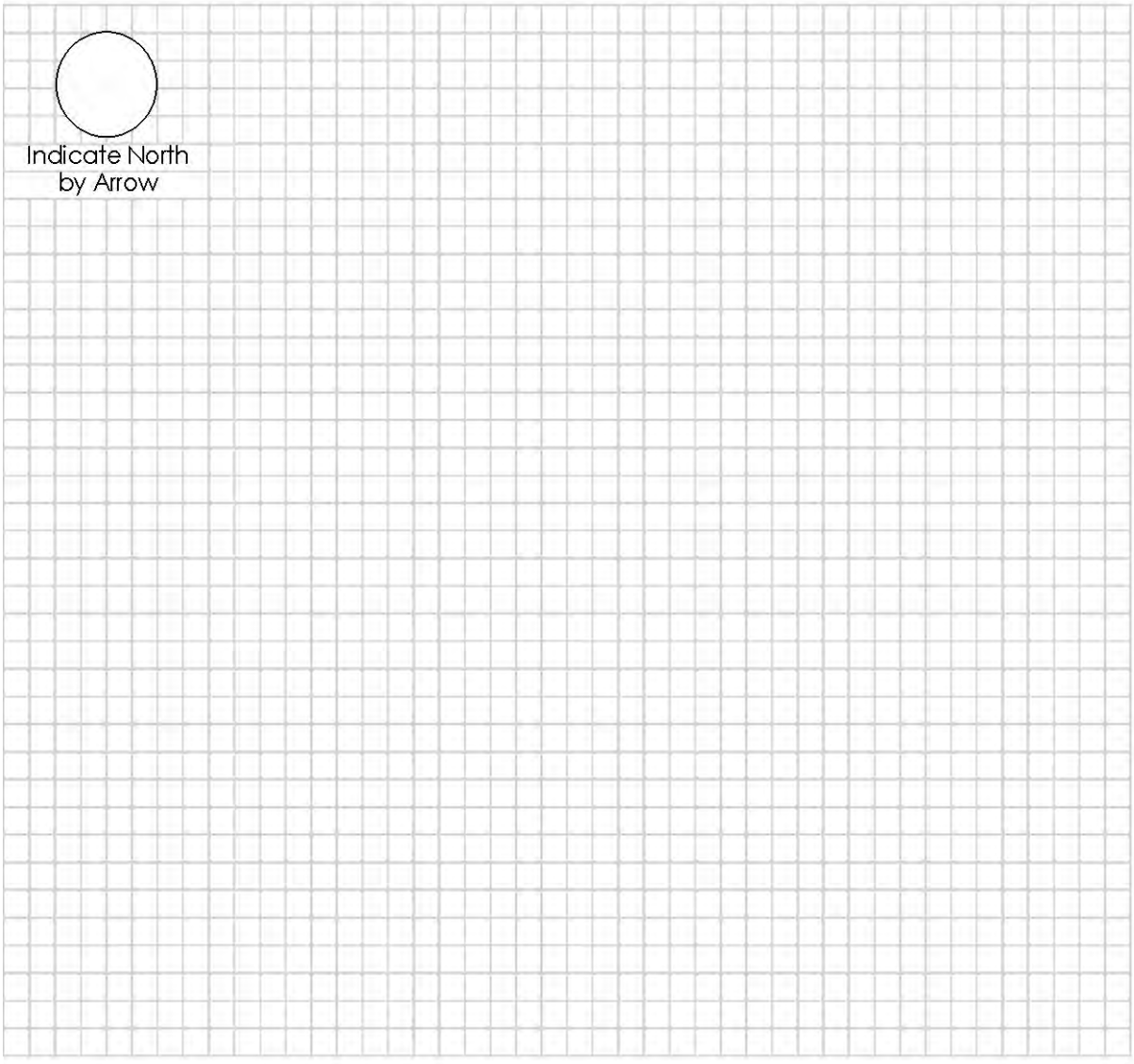
Vehicle Crash Diagram

Instructions:

1. Number each vehicle and show directions → 1 ← 2
2. Use a solid line to show path before incident and use a dotted line to show path after incient

→ 1 (before) - - - - → 1 (after)

3. Show pedestrian/non-motorist by: →○
4. Show railroad by: +-+-+-+-+-+-+-+-+-+-
5. Indicate north by arrow as: ↗
6. Show street or highway names or numbers
7. Show signs, signals, warning and traffic controls.



Prepared by: _____ Date: _____

GROUND DISTURBANCE INCIDENT REPORT

AMEC Environment & Infrastructure

Section 1 – General Information

Employee Name: _____ Time of incident: _____ ☐ am | ☐ pm Time Reported:_____ ☐ am | ☐ pm Report Date: _____

Project Name: _____ Project Number: _____ Client: _____

List of All Parties Present

Name	Company	Telephone No.	Role
____	____	____	____
____	____	____	____
____	____	____	____
____	____	____	____
____	____	____	____

Describe the chronological description of Incident and response:____

Section 2 – Date and Location of Event

A. *Date of Event: (MM/DD/YYYY)

B. ***Country** ***State** ***County** **City**

C. **Street address** **Nearest Intersection**

D. *Right of Way where event occurred

E. Public: ☐ City Street ☐ State Highway ☐ County Road ☐ Interstate Highway ☐ Public-Other

F. Private: ☐ Private Business ☐ Private Land Owner ☐ Private Easement

G. ☐ Pipeline ☐ Power /Transmission Line ☐ Dedicated Public Utility Easement

☐ Federal Land ☐ Railroad ☐ Data not collected ☐ Unknown/Other

List attached documentation (Public Utility Locates, Private Utility Locates, Copy of notifications submitted to Owner or other utility Owners, photographs): _____

Section 3 – Affected Facility Information

***What type of facility operation was affected?**

☐ Cable Television ☐ Electric ☐ Natural Gas ☐ Liquid Pipeline ☐ Sewer (Sanitary Sewer)

☐ Steam ☐ Telecommunications ☐ Water ☐ Unknown/Other

***What type of facility was affected?**

☐ Distribution ☐ Gathering ☐ Service/Drop ☐ Transmission ☐ Unknown/Other

Was the facility part of a joint trench?

☐ Unknown ☐ Yes ☐ No

Was the facility owner a member of One-Call Center?

☐ Unknown ☐ Yes ☐ No

Section 4 – Excavation Information

***Type of Excavator**

☐ Contractor ☐ County ☐ Developer ☐ Farmer ☐ Municipality ☐ Occupant
☐ Railroad ☐ State ☐ Utility ☐ Data not collected ☐ Unknown/Other

***Type of Excavation Equipment**

☐ Auger ☐ Backhoe/Trackhoe ☐ Boring ☐ Drilling ☐ Directional Drilling
☐ Explosives ☐ Farm Equipment ☐ Grader/Scraper ☐ Hand Tools ☐ Milling Equipment
☐ Probing Device ☐ Trencher ☐ Vacuum Equipment ☐ Data Not Collected ☐ Unknown/Other

***Type of Work Performed**

☐ Agriculture ☐ Cable Television ☐ Curb/Sidewalk ☐ Bldg. Construction ☐ Bldg. Demolition
☐ Drainage ☐ Driveway ☐ Electric ☐ Engineering/Survey ☐ Fencing
☐ Grading ☐ Irrigation ☐ Landscaping ☐ Liquid Pipeline ☐ Milling
☐ Natural Gas ☐ Pole ☐ Public Transit Auth. ☐ Railroad Maint. ☐ Road Work
☐ Sewer (San/Storm) ☐ Site Development ☐ Steam ☐ Storm Drain/Culvert ☐ Street Light
☐ Telecommunication ☐ Traffic Signal ☐ Traffic Sign ☐ Water ☐ Waterway Improvement
☐ Data Not Collected ☐ Unknown/Other

Section 5 – Pre-Excavation Notification

***Was the One-Call Center notified?**

☐ Yes ☐ No If Yes, which One-Call Center? Ticket number:

Was Private Contract Locator used?

☐ Yes ☐ No

Section 6 – Locating and Marking

***Type of Locator**

☐ Utility Owner ☐ Contract Locator ☐ Data Not Collected

***Were facility marks visible in the area of excavation?**

☐ Yes ☐ No ☐ Data Not Collected

***Were facilities marked correctly?**

☐ Yes ☐ No ☐ Data Not Collected

What technology was used to locate utilities?

☐ Maps ☐ Active(transmitter+receiver) ☐ Passive (receiver only) ☐ GPR
☐ Acoustic ☐ Magnetic ☐ Infrared ☐ Unknown/Other

What Factors affected the ability to locate services?

☐ Soil Type:_____ ☐ Non-Grounded ☐ Common Bonded ☐ Depth
☐ Electromagnetic interference ☐ Parallel facilities ☐ Congested facilities ☐ Unknown/Other

Section 7 – Excavator Downtime

Did Excavator incur down time?

☐ Yes ☐ No

If yes, how much time?

☐ Unknown ☐ Less than 1 hour ☐ 1 hour ☐ 2 hours ☐ 3 or more hours Exact Value _____If

Estimated cost of down time?

☐ Unknown ☐ $0 ☐ $1 to 500 ☐ $501 to 1,000 ☐ $1,001 to 2,500 ☐ $2,501 to 5,000
☐ $5,001 to 25,000 ☐ $25,001 to 50,000 ☐ $50,001 and over Exact Value _____

Section 8 – Description of Damage

***Was there damage to a facility?**
☐ Yes ☐ No (i.e. near miss)
***Did the damage cause an interruption in service?**
☐ Yes ☐ No ☐ Data Not Collected ☐ Unknown/Other
If yes, duration of interruption
☐ Unknown ☐ Less than 1 hour ☐ 1 to 2 hrs ☐ 2 to 4 hrs ☐ 4 to 8 hrs ☐ 8 to 12 hrs ☐ 12 to 24 hrs
☐ 1 to 2 days ☐ 2 to 3 days ☐ 3 or more days ☐ Data Not Collected Exact Value _____
Approximately how many customers were affected?
☐ Unknown ☐ 0 ☐ 1 ☐ 2 to 10 ☐ 11 to 50 ☐ 51 or more Exact Value _____
Estimated cost of damage / repair/restoration
☐ Unknown ☐ $0 ☐ $1 to 500 ☐ $501 to 1,000 ☐ $1,001 to 2,500 ☐ $2,501 to 5,000
☐ $5,001 to 25,000 ☐ $25,001 to 50,000 ☐ $50,001 and over Exact Value _____
Number of people injured
☐ Unknown ☐ 0 ☐ 1 ☐ 2 to 9 ☐ 10 to 19 ☐ 20 to 49 ☐ 50 to 99
☐ 100 or more Exact Value _____
Number of fatalities
☐ Unknown ☐ 0 ☐ 1 ☐ 2 to 9 ☐ 10 to 19 ☐ 20 to 49 ☐ 50 to 99
☐ 100 or more Exact Value _____

Was there a Product Release?
Product Release: ☐ No ☐ Yes ☐ N/A Type: ____ **If Yes, Incident Type is Environmental Report.**
Volume: ____ Spill Controls: ____
Repair Process: ____

Section 9 – Description of the Root Cause

Please choose one

One-Call Notification Practices Not Sufficient
☐ No notification made to the One-Call Center
☐ Notification to one-call center made, but not sufficient
☐ Wrong information provided to One Call Center

Locating Practices Not Sufficient
☐ Facility could not be found or located
☐ Facility marking or location not sufficient
☐ Facility was not located or marked
☐ Incorrect facility records/maps

Excavation Practices Not Sufficient
☐ Failure to maintain marks
☐ Failure to support exposed facilities
☐ Failure to use hand tools where required
☐ Failure to test-hole (pot-hole)
☐ Improper backfilling practices
☐ Failure to maintain clearance
☐ Other insufficient excavation practices

Miscellaneous Root Causes
☐ One-Call Center error
☐ Abandoned facility
☐ Deteriorated facility
☐ Previous damage
☐ Data Not Collected
☐ Other

Section 10 - Notifications, Certification & Approvals

Check the appropriate boxes indicating the applicable reports have been made to the following applicable organizations:

One Call was called ☐ **Spills Reporting Agency Notified** ☐

Emergency Responders (Fire) was called ☐ **Post-incident Drug/Alcohol Testing Performed**

List of All Agencies Contacted

Name/Agency	Phone #	Date	Time

Incident Report prepared by: ____

Employee (s): ____	Date: ____	Employee's Supervisor: ____	Date: ____
HSE Coordinator/Project/Unit Manager: ____	Date: ____	Group HSE Manager:____	Date: ____

APPENDIX A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
Benzene
CAS Number: 71-43-2
Synonyms:
Phenyl hydride Benzol

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid ____
Liquid X
Gas ____

Odor: Aromatic

Odor Threshold 4.68 ppm

Vapor Density: 2.7 g/L

Ionization Potential (IP): 9.24 eV

IDLH: 500 ppm

Carcinogen: OSHA X
IARC X
NTP ____
ACGIH X
NIOSH X

Skin absorbable: YES

Skin corrosive: No

Signs/Symptoms of Acute Exposure:

Eye, skin and nose irritation; headache, nausea, staggered gait, drowsiness, dizziness, headaches, vomiting, convulsions and unconsciousness

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	1 ppm	5 ppm	
ACGIH TLVs	0.5 ppm	2.5 ppm	
NIOSH RELs	0.1 ppm	1 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Micro tip 10.6 eV	Isobutylene 100 ppm	1.80	0.4

Checked by: Joanne Bacchus Date: 06/04/08

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits Viton, Teflon, Barricade, CPF3, Responder
Tychem

Gloves Viton, Teflon, Polyvinyl Alcohol (PVA) - do not use in water

Boots Teflon

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR = TWA x 10 = 4 ppm

MUC Full-Face APR = TWA x 50 = 20 ppm

FIRE/REACTIVITY DATA

Flash Point: 12 °F

LEL/UEL: 1.2/ 7.8%

Fire Extinguishing Media:

Dry Chemical X Foam X

Water Spray X CO_2 X

Incompatibilities:

Reacts violently with oxidizers, halogens, sulfuric acid, nitric acid

Attacks plastic and rubber.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
Toluene
CAS Number: 108-88-3
Synonyms:
Methylbenzene, Methyl
Benzol, Phenyl Methane
Toluol

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid / Liquid: X / Gas

Odor: Sweet Pungent

Odor Threshold: 0.16 - 37 ppm

Vapor Density: 3.7 g/L
Vapor Pressure 21 mmHg
Ionization Potential (IP): 8.82 eV

IDLH: 500 ppm

Carcinogen: OSHA: X; IARC; NTP; ACGIH; NIOSH: X
Skin absorbable: yes X no ___
Skin corrosive: yes ___ no X

Signs/Symptoms of Acute Exposure:
Irritant to eyes and nose, dizziness, fatigue, confusion, weakness, headache, dilated pupils, dermatitis, lacrimation nervousness

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	200 ppm		300 ppm
ACGIH TLVs	20 ppm		
NIOSH RELs	100 ppm	150 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	10.6	Isobutylene 100 ppm	1.81	18 ppm
PID	HNU 11.7 eV	Isobutylene 100 ppm	1.14	57 ppm

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits: Teflon, Viton, CPF3, PE/EVAL, Barricade, Responder, Tychem Trellchem
Gloves: Viton, Teflon; Polyvinyl alcohol (do not use in water)
Boots: Teflon, Viton

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR = TWA x 10 = 181 ppm
*MUC Full-Face APR = TWA x 50 = 900 ppm

FIRE/REACTIVITY DATA

Flash Point: 40° F

LEL/UEL: 1.1% / 7.1%

Fire Extinguishing Media:
Dry Chemical X; Foam X
Water Spray X; CO_2 X

Incompatibilities:
Strong oxidizers

Checked by: Cindy Sundquist Date: 4/27/10

*Use if conducted quantitative fit testing (Portacount), otherwise use MUC for 1/2 respirator if did qualitative fit testing (Irritant smoke)

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name: Ethylbenzene
CAS Number: 100-41-4
Synonyms: Ethylbenzol, Phenylethane

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid / Liquid X / Gas

Odor: Aromatic

Odor Threshold: 0.092 - 0.6 PPM

Vapor Density: 3.66 g/L

Ionization Potential (IP): 8.76 eV

IDLH: 800 ppm

Carcinogen: OSHA / IARC / NTP / ACGIH / NIOSH

Skin absorbable: yes ___ no _X_

Skin corrosive: yes ___ no ___

Signs/Symptoms of Acute Exposure: Irritant to eyes, skin, and mucous membranes; dermatitis, and headache

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	100 ppm		
ACGIH TLVs	100 ppm	125 ppm	
NIOSH RELs	100 ppm	125 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Microtip 10.6 eV	Isobutylene 100 ppm	1.63	163
PID	HNu 10.2 eV	Isobutylene 100 ppm		
FID	Foxboro TVA 1000 (10.6 eV)	Methane	3.7	370

Checked by: Emmet F. Curtis Date: 12/5/03

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits: Viton, Barricade, Tychem Responder, Teflon

Gloves: Viton, teflon

Boots: Teflon

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR= TWA x 10 = 500 ppm

MUC Full-Face APR= TWA x 10 = 500 ppm

FIRE/REACTIVITY DATA

Flash Point: 55° F

LEL/UEL: 0.8% / 6.7%

Fire Extinguishing Media:

Dry Chemical	X	Alcohol Resistant Foam	X
Water Spray	___	CO_2	X

Incompatibilities: Strong oxidizers

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

APPENDIX A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
Xylene 108-38-3,
CAS Number: 95-47-6, 106-42-3
Synonyms:
Dimethylbenzene, Xylol

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid X (below 56˚F)
Liquid X
Gas

Odor: Aromatic

Odor Threshold: 20 ppm

Vapor Density: 4.3 g/L

Ionization Potential (IP): 8.56 eV

IDLH: 900 ppm

Carcinogen: OSHA
IARC
NTP
ACGIH
NIOSH

Skin absorbable: yes ___ no X
Skin corrosive: yes ___ no X

Signs/Symptoms of Acute Exposure:
Irritant to eyes, skin, nose, throat, dizziness, drowsiness, excitement

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	100 ppm		
ACGIH TLVs	100 ppm	150 ppm	
NIOSH RELs	100 ppm	150 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Microtip 10.6 eV	Isobutylene 100 ppm	1.2	120 ppm
PID	HNu w/ 10.2 eV	Benzene 100 ppm	1.04	104 ppm

Checked by: Emmet F. Curtis Date: 12/5/03

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits: Teflon, Viton, PE/EVAL
Gloves: Teflon, Viton; Polyvinyl Alcohol (Do not use in water)
Boots: Teflon, Viton

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR=TWA x 10 = 500 ppm
MUC Full-Face APR=TWA x 10 = 500 ppm

FIRE/REACTIVITY DATA

Flash Point: 81° F

LEL/UEL: 0.9% / 6.7%

Fire Extinguishing Media:
Dry Chemical X Foam X
Water Spray X CO_2 X

Incompatibilities:
Strong oxidizers
Strong Acids

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

APPENDIX A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
Polycyclic Aromatic Hydrocarbons
CAS Number: 12-90-00
Synonyms:
Coal Tar Pitch Volatiles
(CAS 65996-93-2)

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid Residue
Liquid
Gas

Odor: NA

Odor Threshold NA

Vapor Density: >1.0 g/L

Ionization Potential (IP): NA

IDLH: 80 mg/m3

Carcinogen: OSHA
IARC X
NTP X
ACGIH X
NIOSH X

Skin absorbable: YES

Skin corrosive: YES

Signs/Symptoms of Acute Exposure:
Dermatitis, bronchitis.

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	0.2 mg/m3		
ACGIH TLVs	0.2 mg/m3		
NIOSH RELs	0.1 mg/m3		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Resonse or Conversion Factor	Meter Specific Action Level
Dust meter **Action limit will be based on soil concentrations. Contact C. Sundquist for action limits	Any		N/A	**

Checked by: Date:

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits Tyvek
Gloves Nitrile or neoprene
Boots Neoprene

Service Limit Concentration (ppm): NA

MUC 1/2 Mask APR = TWA x 10 = **2 mg/m3

MUC Full-Face APR = TWA x *50 = **10 mg/m3

*If quantitative fit testing is conducted, otherwise, use protection factor of 10

**Action limit will be based on soil concentrations. Contact C. Sundquist for action limits

FIRE/REACTIVITY DATA

Flash Point: NA

LEL/UEL: NA

Fire Extinguishing Media:

Dry Chemical X Foam X

Water Spray CO_2 X

Incompatibilities:
Strong Oxidizers

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name
Cyanide*
CAS Number: 151-50-8
Synonyms:
Potassium cyanide, sodium cyanide
calcium cyanide

HEALTH HAZARD DATA

Color: white, granular, crystalline solid

Physical State: Solid X; Liquid; Gas

Odor: Almond-like odor

Odor Threshold:

Vapor Density

Ionization Potential (IP): NA

IDLH: 25 mg/m³

Carcinogen: OSHA; IARC; NTP; ACGIH; NIOSH

Skin absorbable: yes X no

Skin corrosive: yes __ no ___

Signs/Symptoms of Acute Exposure
Headache; confusion; nausea; skin & eye irritation; weakness; slow gasping respiration; thyroid and blood change

Source	TWA (units)	STEL (units)	C (units)
OSHA PEL	5 mg/m³	---	---
ACGIH TLVs	---	---	4.7 ppm 5 mg/m³
NIOSH RELs	---	---	4.7 ppm 5 mg/m³

AIR MONITORING

Type	Brand/Mode No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level

Checked by: Emmet F. Curtis Date: 2/28/00

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials

Suits

Gloves

Boots

Service Limit Concentration (ppm): NA

MUC 1/2 Mask APR=TWA x 10= 25 mg/m³
MUC Full-Face APR=TWA x 10= 25 mg/m³

FIRE/REACTIVITY DATA

Flash Point: NA

LEL/UEL: NA / NA

Fire Extinguishing Media

Dry Chemical	X	Foam	X
Water Spray	X	CO_2	X

Incompatibilities
Strong oxidizers, such as acids, acid salts chlorates, and nitrates

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

* Listed here as a non-specific cyanide salt. Synonyms list possible cyanide compounds.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for Site Visit	1A) N/A	1A) Prior to leaving for site ▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment) ▪ If respiratory protection is required/potentially required, ensure that training and fit-testing has occurred within the past year. ▪ Familiarize yourself with route to the site
	1B) Vehicle defects	1B) Inspect company owned/leased vehicle for defects such as: ▪ Flat tires ▪ Windshield wipers worn or torn ▪ Oil puddles under vehicle ▪ Headlights, brake lights, turn signals not working
	1C) Insufficient emergency equipment, unsecured loads	1C) Insufficient emergency equipment, unsecured loads ▪ Ensure vehicle has first aid kit and that all medications are current (if first aid kits are not provided at the site) ▪ Ensure vehicle is equpped with warning flashers and/or flares and that the warning flashers work ▪ Cell phones are recommended to call for help in the event of an emergency ▪ Vehicles carrying tools must have a safety cage in place. All tools must be properly secured ▪ Vehicles must be equipped with chocks if the vehicle is to be left running, unattended. ▪ Ensure sufficient gasoline is in the tank
2. Operating vehicles – general	2A) Collisions, unsafe driving conditions	2A) Drive Defensively! ▪ Seat belts must be used at all times when operating any vehicle on company business. ▪ Drive at safe speed for road conditions ▪ Maintain adequate following distance ▪ Pull over and stop if you have to look at a map ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary
3. Driving to the jobsite	3A) Dusty, winding, narrow roads	3A) Dusty, winding, narrow roads ▪ Drive confidently and defensively at all times. ▪ Go slow around corners, occasionally clearing the windshield.
	3B) Rocky or one-lane roads	3B) Rocky or one-lane roads ▪ Stay clear of gullies and trenches, drive slowly over rocks. ▪ Yield right-of-way to oncoming vehicles---find a safe place to pull over.
	3C) Stormy weather, near confused tourists	3C) Stormy weather, near confused tourists ▪ Inquire about conditions before leaving the office. ▪ Be aware of oncoming storms. ▪ Drive to avoid accident situations created by the mistakes of others.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3D) When angry or irritated	3D) When angry or irritated ▪ Attitude adjustment; change the subject or work out the problem before driving the vehicle. Let someone else drive.
	3E) Turning around on narrow roads	3E) Turning around on narrow roads ▪ Safely turn out with as much room as possible. ▪ Know what is ahead and behind the vehicle. ▪ Use a backer if available.
	3F) Sick or medicated	3F) Sick or medicated ▪ Let others on the crew know you do not feel well. ▪ Let someone else drive.
	3G) On wet or slimy roads	3G) On wet or slimy roads ▪ Drive slow and safe, wear seatbelts.
	3H) Animals on road	3H) Animals on road ▪ Drive slowly, watch for other animals nearby. ▪ Be alert for animals darting out of wooded areas
4. Gain permission to enter site	4A) Hostile landowner, livestock, pets	4A) Hostile landowner, livestock, pets ▪ Talk to land owner, be courteous and diplomatic ▪ Ensure all animals have been secured away from work area
5. Mobilization/ Demobilization of Equipment and Supplies	5A) Struck by Heavy Equipment/Vehicles	5A) Struck by heavy equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times ▪ Employees shall wear a high visibility vest or T-shirt (reflective vest required if working at night). ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation.
	5B) Struck by Equipment/Supplies	5B) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
	5C) Overexertion Unloading/Loading Supplies	5C) Overexertion Unloading/Loading Supplies ▪ Train workers on proper body mechanics, do not bend or twist at the waist while exerting force or lifting. ▪ Tightly secure all loads to the truck bed to avoid load shifting while in transit.
	5D) Caught in/on/between	5D) Caught in/on/between ▪ Do not place yourself between two vehicles or between a vehicle and a fixed object.
	5E) Slip/Trip/Fall	5E) 1E). Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas. ▪ Drivers will maintain 3 point contact when mounting/dismounting vehicles/equipment. ▪ Drivers will check surface before stepping, not jumping down.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	5F) Vehicle accident	5F) Vehicle accident ▪ Employees should follow MACTEC vehicle operation policy and be aware of all stationary and mobile vehicles.
6. Site Preparation	6A) Slip/Trip/Fall	6A) Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas
7. Installation of soil erosion and sediment controls	7A) Overexertion	7A) Overexertion ▪ Workers will be trained in the proper method of placing erosion controls. ▪ Do not bend and twist at the waist while lifting or exerting force.
	7B) Struck by Equipment/Supplies	7C) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
8. Driving back from the jobsite	8A) See hazards listed under item #3	8A) See safe work practices under item #3

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Minimum Recommended PPE*: hard hat, steel-toed boots, safety glasses
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization/ Demobilization and Site Preparation	1A) See Mobilization/Demobilization and Site Preparation JHA	1A) See Mobilization/Demobilization and Site Preparation JHA
2. Communication	2A) Safety, crew unity	2A) Talk to each other. ▪ Log all workers and visitor on and off the site. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the wherabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone ▪ Review Emergency Evacuation Procedures (see below).
3. Walking and working in the field	3A) Falling down, twisted ankles and knees, poor footing	3A) Always watch your footing. ▪ Horseplay is strictly prohibited ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Wear laced boots with a minimum 8" high upper and non-skid Vibram-type soles for ankle support and traction.
	3B) Falling objects	3B) Protect head agains falling objects. ▪ Wear your hardhat for protection from falling limbs and pinecones, and from tools and equipment carried by other crewmembers. ▪ Stay out of the woods during extremely high winds.
	3C) Chemical/Toxicological Hazards	3C) Chemical/Toxicological Hazards ▪ See HASP for appropriate level of PPE ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Ensure that all containers are properly labelled ▪ Decon thoroughly prior to consumption of food, beverage or tobacco.
	3D) Damage to eyes	3D) Protect eyes: ▪ Watch where you walk, ecpecially around trees and brush with limbs sticking out. ▪ Exercise caution when clearing limbs from tree trunks. Advise wearing eye protection. ▪ Ultraviolet light from the sun can be damaging to the eyes; look for sunglasses that specify significant protection from UV-A and UV-B radiation. If safety glasses require, use one's with tinted lenses
	3E) Bee and wasp stings	3E) See JHA for Insect Stings and Bites
	3F) Ticks and infected mosquitos	3F) See JHA for Insect Stings and Bites
	3G) Wild Animals	3G) Wild Animals ▪ Avoid phyisical contact with wild animals ▪ Do not threaten and/or conrner animals ▪ Make noise to get the animal to retreat. ▪ Stay in or return to vehicle/equipment if in danger

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3H) Contact with poisonous plants or the oil from those plants:	3H) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Do not allow plant to touch any part of your body/clothing. ▪ Wear PPE as described in the HASP and wear Tyveks, gloves and boot covers if contact with plant is likely ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
		 POISON IVY (Rhus toxicondendron L.) POISON OAK (Rhus diversiloba) POISON SUMAC (Rhus toxicondendron vernix)
	3I) Back Injuries	3I) Back Injuries ▪ Site personnel will be instructed on proper lifting techniques. ▪ Mechanical devices should be used to reduce manual handling of materials. ▪ Split heavy loads in to smaller loads ▪ Team lifting should be utilized if mechanical devices are not available. ▪ Make sure that path is clear prior to lift.
	3J) Shoveling	3J) Shoveling ▪ Select the proper shovel for the task. A long handled, flat bladed shovel is recommend for loose material ▪ Inspect the handle for splinters and/or cracks ▪ Ensure that the blade is securely attached to the handle ▪ Never be more than 15 inches from the material you are shoveling ▪ Stand with your feet about hip width for balance and keep the shovel close to your body. ▪ Bend from the knees (not the back) and tighten your stomach muscles as you lift. ▪ Avoid twisting movements. If you need to move the snow to one side reposition your feet to face the direction the snow will be going. ▪ Avoid lifting large shoveling too much at once. When lifting heavy material, pick up less to reduce the weight lifted. ▪ Pace yourself to avoid getting out of breath and becoming fatigued too soon. ▪ Be alert for signs of stress such as pain, numbness, burning and tingling. Stop immediately if you feel any of these symptoms.
	3K) Slips/Trips/Falls	3K) Slips/Trips/Falls ▪ Maintain work areas safe and orderly; unloading areas should be on even terrain; mark or repair possible tripping hazards. ▪ Site SHSO inspect the entire work area to identify and mark hazards. ▪ Maintain three points of contact when climbing ladders or onto/off of equipment

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3L) Overhead Hazards	3L) Overhead Hazards ▪ Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. ▪ All ground personnel will stay clear of suspended loads. ▪ All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. ▪ All overhead hazards will be identified prior to commencing work operations.
	3M) Dropped Objects	3M) Dropped Objects ▪ Steel toe boots meeting ANSI Standard Z41 will be worn.
	3N) Noise	3N) Noise ▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); all equipment will be equipped with manufacturer's required mufflers. Hearing protection shall be worn by all personnel working in or near heavy equipment.
	3O) Eye Injuries	3O) Eye Injuries ▪ Safety glasses meeting ANSI Standard Z87 will be worn.
	3P) Heavy Equipment (overhead hazards, spills, struck by or against)	3P) Heavy Equipment ▪ All operators will be trained and qualified to operate equipment ▪ Equipment will have seat belts. ▪ Operators will wear seat belts when operating equipment. ▪ Do not operate equipment on grades that exceed manufacturer's recommendations. ▪ Equipment will have guards, canopies or grills to protect from flying objects. ▪ Ground personnel will stay clear of all suspended loads. ▪ Personel are prohibited from riding on the buckets, or elsewhere on the equipment except for designated seats with proper seat belts or lifts specifically designed to carry workers. ▪ Ground personnel will wear high visibility vests ▪ Spill and absorbent materials will be readily available. ▪ Drip pans, polyethylene sheeting or other means will be used for secondary containment. ▪ Ground personnel will stay out of the swing radius of excavators. ▪ Eye contact with operators will be made before approaching equipment. ▪ Operator will acknowledge eye contact by removing his hands from the controls. ▪ Equipment will not be approached on blind sides. ▪ All equipment will be equipped with backup alarms and use spotters when significant physical movement of equipment occurs on-site, (i.e., other than in place excavation or truck loading). ▪ Inspect rigging prior to each use.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3Q) Struck by vehicle/equipment	3Q) Struck by vehicle/equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop! ▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads.
	3R) Struck/cut by tools	3R) Struck/cut by tools ▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or worksurface or handed to another employee in a safe manner. ▪ Guards will be kept in place while using hand and power tools.
	3S) Caught in/on/between	3S) Caught in/on/between ▪ Workers will not position themselves between equipment and a stationary object. ▪ Workers will not wear long hair down (place in pony-tail and tuck into shirt) or jewelry if working with tools/machinery.
	3T) Contact with Electricity/Lightning	3T) Contact with Electricity/Lighting ▪ All electrical tools and equipment will be equipped with GFCI. ▪ Electrical extension cords will be of the “Hard” or “Extra Hard” service type. ▪ All extension cords shall have a three-blade grounding plug. ▪ Personnel shall not use extension cords with damaged outer covers, exposed inner wires, or splices. ▪ Electrical cords shall not be laid across roads where vehicular traffic may damage the cord without appropriate guarding. ▪ All electrical work will be conducted by a licensed electrician. ▪ All equipment will be locked out and tagged out and rendered in a zero energy state prior to commencing any operation that may exposed workers to electrical, mechanical, hydraulic, etc. hazards. ▪ All utilities will be marked prior to excavation activities. ▪ All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead powerlines known to be 50 kV or less and 35 feet from all others.) ▪ The SHSO shall halt outdoor site operations whenever lightning is visible, outdoor work will not resume until 30 minutes after the last sighting of lightning.
	3U) Equipment failure	3U) Equipment failure ▪ All equipment will be inspected before use. If any safety problems are noted, the equipment should be tagged and removed from service until repaired or replaced.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3V) Hand & power tool usage.	3V) Hand & power tool usage ▪ Daily inspections will be performed. ▪ Ensure guards are in place and are in good condition. ▪ Remove broken or damaged tools from service. ▪ Use the tool for its intended purpose. ▪ Use in accordance with manufacturers instructions. ▪ No tampering with electrical equipment is allowed (e.g., splicing cords, cutting the grounding prong off plug, etc.) ▪ See JHA for Power Tool Use - Electrical and Power Tool Use - Gasoline
	3W) Fire Protection	3W) Fire Protection ▪ Ensure that adequate number and type of fire extinguishers are present at the site ▪ Inspect fire extinguishers on a monthly basis – document ▪ All employees who are expected to use fire exinguishers will have received training on an annual basis. ▪ Obey no-smoking policy ▪ Open fires are prohibited ▪ Maintain good housekeeping. Keep rubbish and combustibles to a minimum. ▪ Keep flammable liquids in small containers with lids closed or a safety can. ▪ When dispensing flammable liquids, do in well vented area and bond and ground containers.
	3X) Confined Space Entry	3X) Confined Space Entry ▪ See JHA for Confined Space Entry
4. Environmental health considerations	4A) Heat Stress	4A) Take precautions to prevent heat stress ▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. ▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. NOTE: The severity of the effects of a given environmental heat stress is decreased by reducing the work load, increasing the frequency and/or duration of rest periods, and by introducing measures which will protect employees from hot environments. ▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability). ▪ Allow approximately 2 weeks with progressive degrees of heat exposure and physical exertion for substantial acclimatization. ▪ Acclimatization is necessary regardless of an employee's physical condition (the better one's physical condition, the quicker the acclimatization). Tailor the work schedule to fit the climate, the physical condition of employees, and mission requirements. ▪ A reduction of work load markedly decreases total heat stress. ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization. ▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.

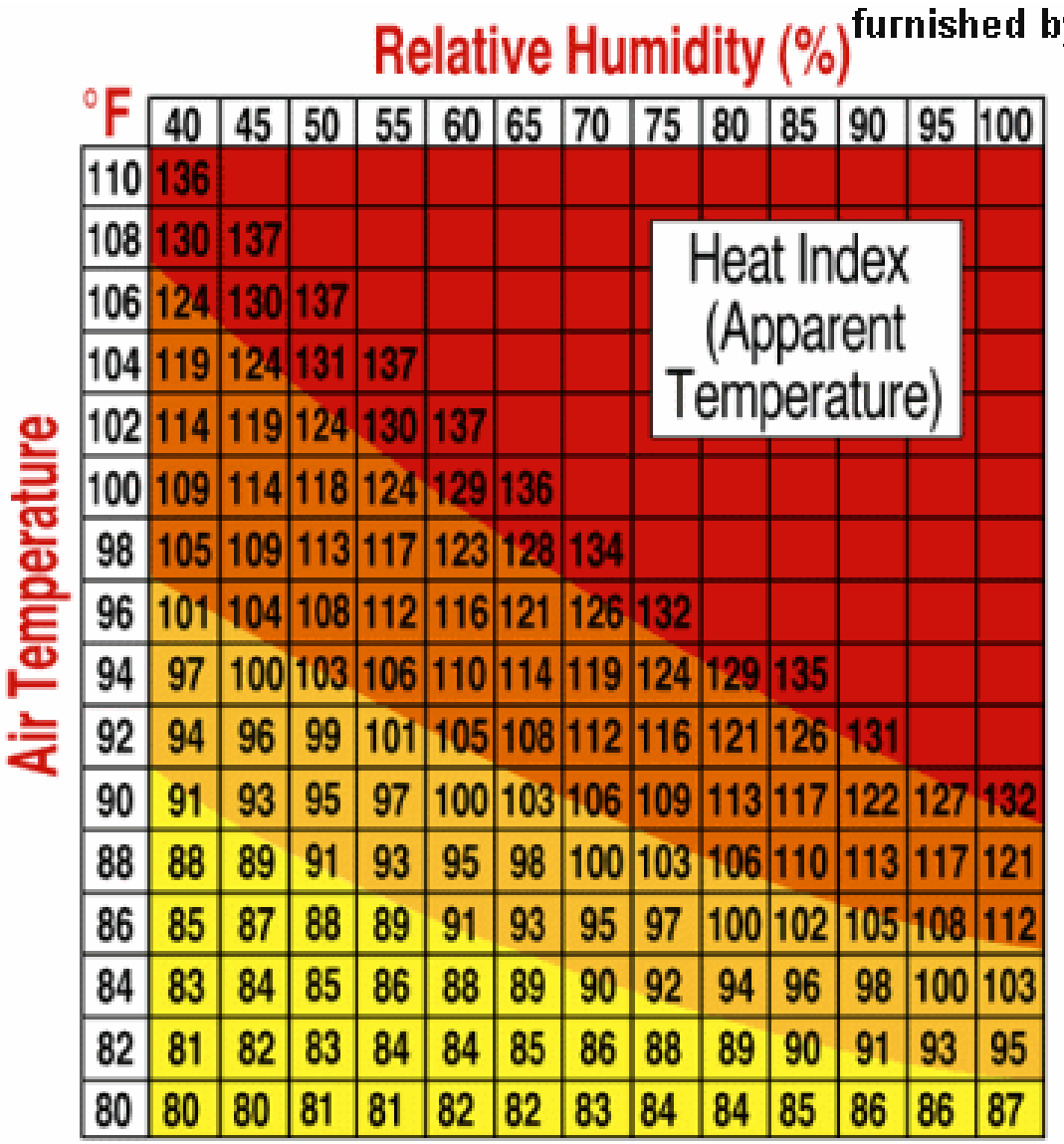
MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4B) Wet Bulb Globe Temperature (WBGT) Index	4B) WBGT ▪ Curtail or suspend physical work when conditions are extremely severe (see attached Heat Stress Index). ▪ Compute a Wet Bulb Globe Temperature Index to determine the level of physical activity (take WBGT index measurements in a location that is similar or closely approximates the environment to which employees will be exposed). WBGT THRESHOLD VALUES FOR INSTITUTING PREVENTIVE MEASURES 80-90 degrees F — Fatigue possible with prolonged exposure and physical activity. 90-105 degrees F — Heat exhaustion and heat stroke possible with prolonged exposure and physical activity. 105-130 degrees F — Heat exhaustion and heat stroke are likely with prolonged heat exposure and physical activity.
	4C) Cold Extremes	4C) Take precautions to prevent cold stress injuries ▪ Cover all exposed skin and be aware of frostbite. While cold air will not freeze the tissues of the lungs, slow down and use a mask or scarf to minimize the effect of cold air on air passages. ▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. ▪ Take layers off as you heat up; put them on as you cool down. ▪ Wear head protection that provides adequate insulation and protects the ears. ▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. ▪ Acclimate to the cold climate to minimize discomfort. ▪ Maintain adequate water/fluid intake to avoid dehydration.
	4D) Wind	4D) Effects of the wind ▪ Wind chill greatly affects heat loss (see attached Wind Chill Index). ▪ Avoid marking in old, defective timber, especially hardwoods, during periods of high winds due to snag hazards.
	4E) Thunderstorms	4E) Thunderstorms ▪ Monitor weather channels to determine if electrical storms are forcased. ▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) ▪ Suspend all field work at the first sound of thurnder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds. ▪ Only return to work 30 minutes after the after the last strike or sound of thunder

furnished by National Weather Service Gray, ME



With Prolonged Exposure and/or Physical Activity

Extreme Danger
Heat stroke or sunstroke highly likely
Danger
Sunstroke, muscle cramps, and/or heat exhaustion likely
Extreme Caution
Sunstroke, muscle cramps, and/or heat exhaustion possible
Caution
Fatigue possible

Wind Chill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Calm																		
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Decontamination **Date of Analysis:** 5/30/06

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Establish Decontamination Station	1A) Materials Handling	1A) Materials Handling ▪ Use proper lifting techniques ▪ Use mechanical aids, if available, to move heavy items.
2. Decontamination / Steam cleaning.	2A) Struck by steam/hot water/pressure washing	2A) Struck by steam/hot water ▪ Workers not directly engaged in steam cleaning operations must stay clear. ▪ Workers using steam cleaning equipment must be trained on operation and safety devices/procedures using the owners/operators manual. ▪ Use face shield **and** safety glasses or goggles, if steam cleaning. ▪ Stay out of the splash/steam radius. ▪ Pressure washer must have dead man switch. ▪ Do not direct steam at anyone. ▪ Do not hold objects with your feet or hands. ▪ Ensure that direction of spray minimizes spread of contaminants of concern. ▪ Use shielding as necessary.
	2B) Exposure to contaminants	2B) Exposure to contaminants ▪ Conduct air monitoring (see HASP). ▪ Wear proper PPE (see HASP). ▪ See MSDSs for hazards associated with the decon solutions used (if other than water alone us used).
	2C) Slips/Trips/Falls	2C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
3. Vehicle Decontamination	3A) Vehicle traffic in and out of the CRZ	3A) Large Vehicle Traffic ▪ Always wear a hard hat, steel toe boots, and a high visibility vest (unless Tyveks are used and are high visibility). ▪ Vehicle drivers are not to exit the vehicle in the CRZ. ▪ Identify an individual to communicate with vehicle drivers and maintain order ▪ Trucks will be lined with plastic and kept out of direct contact with any contaminated materials during loading. Wear PPE when removing plastic lining from truck beds. ▪ If not in the vehicle, obtain eye contact with the driver, so he is aware of your presence and location in the CRZ. ▪ If you are driving the vehicle, be aware of personnel in the CRZ and maintain communication with the identified personnel.
	3B) Exposure to contaminants	3B) Exposure to contaminants ▪ Use safety glasses or goggles, Polycoated Tyvek (if level of contamination poses dermal hazard or to keep work clothes dry), high visibility vest (if high visibility Tyveks are not used) hard hats, steel toe boots, and gloves while cleaning contaminated materials. ▪ Do not doff PPE until decontamination of the vehicle is complete and a decontamination certificate has been issued by the HSO. ▪ Conduct air monitoring (see HASP). ▪ See MSDSs for hazards associated with the decon solutions (if other than water alone is used).

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Decontamination **Date of Analysis:** 5/30/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3C) Slips/Trips/Falls	3C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
4. Equipment and Sample Decontamination	4A) Chemical exposure when handling contaminated sample jars and equipment	4A) Chemical exposure ▪ Wear PPE as outlined in the HASP. ▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for contaminants ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.) if appropriate (see HASP)
	4B) Materials Handling related injuries	4B) Materials Handling related injuries ▪ Use proper lifting techniques when lifting heavy equipment ▪ Use two person lift for heavy coolers
5. Personal Decontamination	4C) Exposure to contaminants	4C) Exposure to contaminants ▪ Avoid bringing contaminated materials via shoes and clothing into the CRZ by examining such prior to exiting the EZ. ▪ Removal of PPE will be performed by the following tasks in the listed order: ▪ Gross boot wash and rinse and removal ▪ Outer glove removal ▪ Suit removal ▪ Respirator removal (if worn). ▪ Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Respirators will be removed and decontaminated at a specified location within the CRZ by a designated technician, then placed in storage bag. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ See MSDSs for hazards associated with the decontamination solutions used. ▪ Decon solutions will be disposed of according to the work plan.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Minimum Recommended PPE*: steel-toed boots, safety glasses, chemical resistant gloves
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization	1A) See JHA Mobilization/Demobilization/Site Preparation	1A) See JHA Mobilization/Demobilization/Site Preparation
2. General Site Hazards	2A) See JHA Field Work - General	2A) See JHA Field Work - General
	2B) Chemical exposure	2B) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
3. Calibrate monitoring equipment	3A) Exposure to calibration gases	3A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
4. Opening the well cap, taking water level readings	4A) Contact with poisonous plants or the oil from poisonous plants	4A) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Wear PPE as described in the HASP. ▪ Do not touch any part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	4B) Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well.	4B) Contact with stinging/biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	4C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated groundwater/ soil); liquid splash; flammable atmospheres.	4C) Exposure to hazardous substances ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Immediately monitor breathing zone after opening well to determine exposure and verify that level of PPE is adequate – see Action Levels in HASP ▪ Monitor headspace in well. After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before obtaining water level and before sampling. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	4D) Back strain due to lifting bailers or pumps and from moving equipment to well locations	4D) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4E) Foot injuries from dropped equipment	4E) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear Steel toed boots
5. Collecting water samples	5A) Fire/Explosion/Contamination hazard from refueling generators	5A) Fire/Explosion/Contamination hazard from refueling generators ▪ Turn the generator off and let it cool down before refueling ▪ Segregate fuel and other hydrocarbons from samples to minimize contamination potential ▪ Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited ▪ See JHA for Gasoline use
	5B) Electrocution	5B) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	5C) Exposure to contaminants	5C) Exposure to Contaminants ▪ Stand up wind when sampling ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 4C) under Safe Practices above
	5D) Infectious water born diseases	5D) Infectious water born diseases ▪ Wear chemical resistant gloves and other PPE – as identified in HASP ▪ Prevent water from contacting skin ▪ Wash exposed skin with soap and water ASAP after sampling event ▪ Ensure that all equipment is adequately decontaminated using a 10% bleach solution
	5E) Exposure to water preservatives	5E) Exposure to water preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ When preserving samples always add acid to water, avoid the opposite. ▪ See JHA Working with Preservatives
	5F) Slips/trips/falls	5F) Slips/trips/falls ▪ Ground can become wet/muddy, created by spilled water ▪ Place all purged water in drums for removal ▪ Wear good slip resistant footwear
	5G) Repetitive Motion and other Ergonomic Issues	5G) Ergonomic Issues ▪ Use mechanical means where possible to raise and lower equipment into well. ▪ Alternate raising and lowering equipment between field sampling team members, and alternate bailing the well. ▪ Use safe lifting techniques.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
6. Sample Processing	6A) Contaminated water	6A) Contaminated water ▪ Wear appropriate PPE as identified in HASP ▪ Decontaminate outside of bottles ▪ Prevent water from contacting skin ▪ Work in well ventilated area – upwind of samples ▪ Waste will be returned to the operation office for storage and disposal
7. Shipping Samples	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage ▪ Wear appropriate chemical resistant gloves as identified in HASP. ▪ Wear leather or insulated gloves when handling dry ice. ▪ Follow safe lifting techniques – get help lifting heavy coolers. ▪ Samples that contain hazardous materials under the DOT definition, must be packaged, manifested and shipped by personnel that have the appropriate DOT HAZMAT training.

AHA – Soil Sampling w/ Hand Auger/Hand Tools

Activity/Work Task:	Soil Sampling w/ Hand Auger/Hand Tools		
Project Location:	**Portland, Maine**		
Contract Number:			
Date Prepared:	**12/07/2012**	**Date Accepted:**	
Prepared by (Name/Title):	Ryan Mankowski/Env.Prof. Tech 1		
Reviewed by (Name/Title):			

Notes: (Field Notes, Review Comments, etc.)

This AHA involves the following:

- Establishing site specific measures
-

This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the site HASP for additional requirements. Contractor to follow general site safety controls for Slips Trips and Falls, Biological hazards, cuts lacerations and pinch points, and emergency procedures.

Overall Risk Assessment Code (RAC) (Use highest code) **M**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
1. Going to site, work preparation	1A) Mobilization / Demobilization and Site Preparation	1A) See JHA for Mobilization Demobilization and Site Preparation	**H**
2. Working at the site	2A) General Field Work – Walking and working in the field, Environmental conditions, communication	2A) See JHA for General Field Work	**L**

	2B) Working Near Utilities	2B) Working Near Utilities • See JHA for Utility Clearance Activities • See JHA for Field Work - Oversight • On private property/active facility, walk all planned locations with a appropriate representative prior to start of exploration to identify the location of marked/unmarked utilities (underground/overhead) and note any uncertainties. Field Lead should call PM and relay any issues. Document this inspection in the field book and note subcontractor's responses to any MACTEC concerns. • Coordinate with facility representatives to gain access to restricted areas. • For areas where utility locations cannot be verified, workers must hand dig for the first 3 feet • Wear appropriate PPE • If working in close proximity to live utilities (i.e. transformers), do not tamper with the units in any way and maintain safe working distance based on voltage. • If working alone, always notify other crewmembers/project team members/facility personnel of your whereabouts. • Carry a radio and spare batteries or cell phone. • Let other crewmembers know when you see a hazard.	**M**
3. Preparing sample location	3A) Contact with poisonous plants or the oil from poisonous plants	3A) Contact with Poisonous plants or oil from poisonous plants ▪ Look for signs of poisonous plants and avoid. ▪ Wear PPE as described in the HASP. ▪ Do not touch anything part of your body/clothing. ▪ Always wash gloves before removing them ▪ Discard PPE in accordance with the HASP	**M**

	3B) Contact with biting insects (i.e., spiders, bees, etc.)	3B) Contact with biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.	**M**
	3C) Encounter wild/ dangerous animal	3C) Encounter wild/ dangerous animal • See JHA "Dog and Wildlife Safety"	**L**
	3D) Back strain due to lifting or moving equipment to sampling locations	3D) Back strain due to lifting or moving equipment to sampling locations ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques ▪ Split up heavy loads into smaller loads	**M**
	3E) Foot injuries	3E) Foot injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear steel toed boots with high tops ▪ Be observant of surroundings. Be mindful of holes and uneven terrain. Surfaces may be wet and muddy. Avoid puddles.	**L**
4. Hand Auguring/ Shoveling Test Holes	4A) Back injury from lifting and twisting equipment	4A) Back injury from lifting and twisting equipment • Use proper lifting and bending techniques. • Us 2 persons for lifting of heavy, bulky items over 50 lbs. • Use Mechanical means if available (e.g. auger jacks etc.) • Wobble auger or shovel to break suction of wet soils.	**M**

	4B) Injuries from transporting equipment to site i.e. stumbling or falling	4B) Injuries from transporting equipment to site i.e. stumbling or falling • Ensure surround are is clear of personnel and obstacles as you approach the test site. • Transport equipment in sections, beginning with equipment nearest tailgate of truck. • Use 2 person lift for heavy items • Assure pathway is clear	**M**
	4C) Injuries while adding extensions	4C) Injuries while adding extensions • Ensure that PPE is used. • Lift and connect extension with care. • Use proper lifting procedures.	**L**
	4D) Hit utilities or geo-textile membrane and contamination	4D) Hit utilities or geo-textile membrane and contamination • Locate utilities and mark. Sample in cleared area. • Use of hand tools. Be observant. Do not use excessive force. • Follow sampling work plan for location and depth.	**L**
	4E) Injury to others as equipment is removed	4E) Injury to others as equipment is removed • Assure that other are standing at a safety distance before removing equipment	**L**
	4F) Fingers injuries	4F) Fingers injuries • Assure fingers are clear as equipment is extracted - Wear PPE (gloves, eye protection, etc). • Be aware of the type of material being removed from test hole and handle appropriately	**M**
	4G) Electrocution	4G) Electrocution • A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. • Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. • Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water • Do not stand in wet areas while operating power equipment • Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. • When unplugging a cord, pull on the plug rather than the cord. • Never do repairs on electrical equipment unless you are both authorized and qualified to do so.	**M**

5. Sample Collection	5A) Exposure to contaminants	5A) Exposure to Contaminants ▪ Stand up wind when sampling and do not breathe dust (if conditions are dusty) ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Continually monitor soil samples for low level radiation. ▪ Wear chemical resistant PPE as identified in HASP / JHA ▪ Minimize sample contact ▪ Label sample in accordance with procedures	**H**
	5B) Exposure to preservatives	5B) Exposure to preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP / JHA. ▪ Review MSDSs	**H**
	5C) Slips/trips/falls	5C) Slips/trips/falls ▪ Ground can become wet/muddy ▪ Wear good slip resistant footwear	**H**
	5D) Vapors and Airborne Particulates	5D) Vapors and Airborne Particulates ▪ Monitor air concentrations using direct-reading, real-time instruments (See HASP for required monitoring instruments and action limits) ▪ If hazardous conditions are identified, stop work until precautions are taken ▪ Wear appropriate PPE including safety glasses with side shields, dust masks and respirators (See HASP)	**M**
	5E) Lifting Injury	5E) Lifting injury ▪ Use proper lifting techniques when carrying quantities of samples ▪ Use proper ergonomics when hand digging for samples	**M**
	5F) Eye injury	5F) Eye Injury ▪ Wear eye protection during operation of Geoprobe or if misc. debris may harm your eyes.	**L**
	5G) Fire	5G) Have an A-B-C rated fire extinguisher on hand in case of small equipment fires. Only individuals trained in fire extinguisher use should use a fire extinguisher.	**L**

	5H) Sharp Sampling Tools	5H) Sharp Sampling Tools • Use correct tools for opening sleeves • When opening sleeve, cut away from body • Place soil core on sturdy surface prior to cutting	**L**
	5I) Sample Cross Contamination	5I) Sample Cross Contamination ▪ Decontaminate or dispose of sampling equipment between sampling locations ▪ Double-check sample labels to ensure accuracy and adhesion to containers	**M**
6. Disposal of leftover soil	6A) Contamination from impacted soil	6A) Properly dispose of any leftover soil sample ▪ Consult the Project Manager for proper disposal of soil. ▪ Don proper PPE when handling sample cores and disposing of soils. ▪ If soils are placed in a container (i.e. drum) properly label the drum.	**L**
7. Backfill Borehole.	7A) Contamination from impacted soil and/or groundwater	7A) Minimize contact with potentially impacted soil and/or groundwater ▪ Don proper PPE when backfilling the borehole. ▪ If the borehole is located in a paved area (i.e. asphalt/concrete), carefully patch the borehole using proper patching materials.	**L**
8. Solid/Liquid Waste Management/ Disposal	8A) Contaminated Materials and Container Pinch Points	8A) Contaminated Materials and Container Pinch Points ▪ Wear appropriate PPE including Nitrile and leather gloves (See HASP) ▪ Position hands/fingers to avoid pinching/smashing/crushing when closing drum rings	**L**
	8B) Heavy Materials and Containers Lifting/ Moving	8B) Contaminated Materials and Container Pinch Points ▪ Do not lift or move heavy containers without assistance ▪ Use proper bending/lifting techniques by lifting with arms and legs and not with back ▪ If possible, use powered lift truck, drum cart, or other mechanical means Take breaks if feeling faint or overexerted ▪ Spot drums in storage area prior to filling ▪ Wear appropriate PPE including leather gloves and steel-toed boots	**M**
9. Demobilize	9A) See Mobilization/ Demobilization and Site Preparation JHA	9A) See Mobilization/ Demobilization and Site Preparation JHA	**H**

AHA – Soil Sampling w/ Hand Auger/Hand Tools

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
PPE (Hard Hat, safety glasses, gloves, steel toe work boots, high visibility safety vest, hearing protection)	**Competent / Qualified Personnel:** Name – Position/Employer **Training requirements:** List specific certification (as applicable) Site Specific HASP Orientation Toolbox safety meeting Task kick-off meeting	Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. Inspect power cord sets prior to use. Inspect all PPE prior to use

Job Hazard Analysis Form

Job Title: Field Work - Oversight **Date of Analysis:** 4/13/10
Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for site visit	1A) N/A	▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ Complete site specific/ client required training ▪ Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment) ▪ First aid kits shall be available at the work site and on each transport vehicle. ▪ Familiarize yourself with route to the site ▪ Check weather forecast. Pack appropriate clothing and other items (e.g., sunscreen) for anticipated weather conditions ▪ Verify that subsurface utilities have been identified.
2. Traveling to the site by vehicle	2A) See JHA for Mobilization, Demobilization and Site Preparation	▪ See JHA for Mobilization, Demobilization and Site Preparation
3. Initial Arrival - Assess Site Conditions	3A) Communication with subcontractor and other site personnel	▪ Develop communication methods (agree on hand signals, warning alarms) ▪ Log all workers and visitor on and off the site. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the whereabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone ▪ Hold and document Safety tailgate meetings ▪ Establish work zones, evacuation routes and rally locations.
	3B) Insect Bites and Stings	▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects. ▪ Inform crew members if allergic to insects and what to do if you need assistance. ▪ Avoid wearing heavy fragrances. ▪ Carry first-aid and sting relief kits. ▪ Carry identification of known allergies and necessary emergency medication. ▪ Spray clothing with insect repellant as a barrier. ▪ Wear light colored clothing that fits tightly at the wrists, ankles, and waist. ▪ Cover trouser legs with high socks or boots. ▪ Tuck in shirt tails.

	3C) Poisonous plants	▪ Wear long sleeves, long pants and boots ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with high visibility spray paint if working at a fixed location. ▪ Look for signs of poisonous plants and demark area to aid in avoiding plant. ▪ Do not touch any plant part to any part of your body/clothing. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	3D) Vermin, leaches, animal borne disease	▪ Survey the area for dens, nests, etc. ▪ Identify areas where biological hazards may be present. ▪ Wear long sleeve shirt and full length pants ▪ Be aware of your surroundings. ▪ Wear appropriate footwear (snake boots, etc.) ▪ Avoid high grass areas if possible ▪ Do not put hand/arm into/under an area that you cannot see into/under clearly ▪ Perform routine inspections for ticks, leaches, etc. of yourself and co-workers.
	3E) Chemical Hazards	▪ Wear chemical resistant PPE as identified in the HASP ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Ensure that all containers are properly labeled
	3F) Overhead Power Lines	▪ Identify the location of all overhead power lines at the site. ▪ Maintain clearances depending on voltage - All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV or less). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead power lines known to be 50 kV or less and 35 feet from all others.) ▪ Re-locate work so it is not close to power lines ▪ Avoid storing materials under overhead power lines
	3G) Underground Utilities	▪ All utilities will be marked prior to excavation activities ▪ For areas where utility locations cannot be verified, workers must hand dig for the first 3 feet ▪ Use lineman's gloves when locating underground power lines ▪ Work at adequate offsets from utility locations ▪ Immediately cease work if unknown utility markings are discovered.

	3H) Cold Stress	▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. ▪ Take layers off as you heat up; put them on as you cool down. ▪ Wear head protection that provides adequate insulation and protects the ears. ▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. ▪ Acclimate to the cold climate to minimize discomfort. ▪ Maintain adequate water/fluid intake to avoid dehydration. ▪ Be aware of signs of hypothermia, its prevention, detection and treatment. ▪ Have extra protection available, in case of an emergency such as blankets and heating devices. ▪ Don't work under extremely adverse weather conditions ▪ Stay in tune to current weather and extended forecasts.
	3I) Heat Stress	▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. ▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. ▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability). ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization. ▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.
	3J) Lightning and Thunder	▪ Monitor weather channels to determine if electrical storms are forecasted. ▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) ▪ Suspend all field work at the first sound of thunder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds.
	3K) Severe Weather	▪ Watch for clouds and incoming weather. ▪ Monitor weather forecasts. ▪ Train workers about weather and appropriate precautions. ▪ Identify a shelter and a safe place in event of tornado etc
	3L) Sun	▪ Keep body protected ▪ Wear sunscreen, wide brimmed hat or hardhat. ▪ Schedule work for cool part of day. ▪ Take breaks in the shade.
	3M) High Crime Areas	▪ Do not enter areas where threats are present. ▪ Contract security where applicable. Use the buddy system. ▪ Maintain contact with support such as radio or cell phone ▪ Do not work after dark.

	3N) Operations conducted at an active facility	▪ Stay well clear of operations being conducted at the facility ▪ Keep alert for moving materials, equipment or vehicles ▪ Determine client specific PPE needs prior to arriving at the site ▪ Determine client specific emergency response procedures and follow as appropriate ▪ Participate in client required safety training ▪ Get copies of Clients MSDSs for any client chemicals that workers may be exposed to. ▪ Provide MSDSs to client for all chemicals brought to the site.
	3O) Remote Locations	▪ Carry a two-way radio and know how to use it. ▪ Work in teams. Account for all at the end of the work day. ▪ Make sure someone on crew is certified in first aid. ▪ Carry a first aid kit.
	3P) Set up Decon Station	▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.), if appropriate (see HASP) ▪ Removal of PPE will be performed by the following tasks in the listed order: o Gross boot wash and rinse and removal o Outer glove removal o Suit removal o Respirator removal (if worn). o Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.
4. Walk around the Site	4A) Poisonous plants	▪ See section 3C above
	4B) Vermin, leaches, animal borne disease	▪ See Section 3 D above ▪
	4C) Chemical Hazards	▪ See Section 3 E above
	4D) Slips/Trips/Falls	▪ Wear slip resistant footwear preferably laced boots with a minimum 8" high upper and non-skid soles for ankle support and traction. ▪ Pay attention to where you place your feet ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Site SHSO will inspect the entire work area to identify and mark hazards. ▪ Clear area of trip hazards; mark or barricade those that cannot be moved; ▪ Use caution when walking around excavated areas ▪ Stay back at least 5 feet from excavated areas ▪ Use caution when walking on or around loose soil. ▪ Be aware of surroundings. Avoid muddy areas if possible.

5. Oversight during drilling, or construction operations	5A) Heavy Equipment/ Vehicles	▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the swing radius and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Personnel are prohibited from riding on the buckets, or elsewhere on the equipment except for designated seats with proper seat belts or lifts specifically designed to carry workers. Ground personnel will stay clear of all suspended loads. ▪ Ground personnel will wear high visibility vests ▪ Eye contact with operators will be made before approaching equipment.
	5B) Eye Injury	▪ Wear appropriate safety glasses (tinted for sun). ▪ Watch where you walk, especially around trees and brush with protruding limbs.
	5C) Foot Injury	▪ Wear steel toed boots ▪ Wear insulated steel toed boots during winter ▪ Ensure shoes/boots have good traction ▪ Pay attention to where you place your feet, especially when walking on uneven terrain
	5D) Head Injury	▪ Wear hardhat ▪ Do not walk or work under scaffolding or other elevated work unless there are guardrails and toeboards in place ▪ Flag or mark protruding objects at head level
	5E) Chemical Hazards	▪ See Section 3E above ▪ Wash hands and face prior to consumption of food, beverage or tobacco.
	5F) Dust - particulates (respiratory)	▪ Use dust suppression methods ▪ Stand upwind of point of dust generation
	5G) Overhead Power Lines	▪ See Section 3F above.
	5H) Underground Utilities	▪ See Section 3G above
	5I) Standing/Static Posture	▪ Change posture on a frequent basis ▪ Stretch prior to any physical activity
	5J) Slips/`Trips/Falls	▪ See Section 4D above
	5K) Noise	▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs). ▪ All equipment will be equipped with manufacturer's required mufflers. ▪ Hearing protection shall be worn by all personnel working in or near heavy equipment. ▪ Hearing protection will be worn when workers need to shout when standing two feet away from each other. ▪ Segregate noisy equipment from the operators ▪ Use sound dampening around noisy equipment

	5L) Moving Equipment	▪ Clear area of obstructions and communicate with all workers involved that drilling is beginning ▪ Do not exceed manufacturer's recommended speed, force, torque, or other specifications. and penetrate the ground slowly with hands on the controls for at least the first foot of soil to minimize chance of auger kick-out ▪ Stay clear of rotating auger ▪ Use long-handled shovel to clear away cuttings when auger has stopped ▪ Do not wear loose clothing ▪ Wear appropriate PPE including leather gloves and steel-toed boots (See HASP)
6. Sampling Oversight	6A) Chemical Hazards	▪ See Section 3E above ▪ Wash hands and face prior to consumption of food, beverage or tobacco. ▪ Calibrate meters in a clean, well ventilated area ▪ Store calibration gases in well vented area. Ensure chemical labels and warnings are legible.
	6B) Personnel Decontamination	▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.), if appropriate (see HASP) ▪ Removal of PPE will be performed by the following tasks in the listed order: o Gross boot wash and rinse and removal o Outer glove removal o Suit removal o Respirator removal (if worn). o Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.
	6C) Lifting	▪ Good lifting techniques (lift with legs not back) ▪ Mechanical devices (e.g., hand truck, cart, forklift, etc.) should be used to reduce manual handling of materials and drums. ▪ Team lifting should be utilized if mechanical devices are not available. (mandatory for items over 50 lbs) ▪ Split heavy loads in to smaller loads ▪ Make sure that path is clear prior to lift. ▪ Redesign work area to avoid low lifts ▪ Stretch prior to lifting ▪ Maintain a healthy life style and level of physical fitness.
	6D) Hand Tools	▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or work surface or handed to another employee in a safe manner. ▪ Guards will be kept in place while using hand and power tools. ▪ Daily inspections will be performed. ▪ Remove broken or damaged tools from service and tag out as defective ▪ No tampering with electrical equipment is allowed (e.g., splicing cords, cutting the grounding prong off plug, etc.) ▪ Do not use excessive force or impact ▪ Do not use tool improperly. Ensure all workers are trained

	6E) Slips/Trips/Falls	▪ See Section 4D above.
	6F) Struck by Vehicle	▪ Ground personnel in the vicinity of vehicles operations will be within the view of the operator at all times. ▪ Ground personnel will not stand directly behind vehicles when it is in operation ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop! ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads. ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary ▪ Place cones in the font and rear of the vehicle ▪ Prior to driving off, walk around vehicle to collect cones and identify any hazards - especially low level hazards that may be difficult to see when in the vehicle. ▪ Set up "Workers in the Road" or similar warning signs and cones to alert traffic. ▪ Use emergency flashers and roof top flashing light (recommended) to alert oncoming vehicular traffic. ▪ Remain alert at all times as to the traffic outside the vehicle. Step to the side of the road when distracted by by-standers. Keep unofficial personnel out of the work area. ▪ Exit vehicle with caution. ▪ Wear High Visibility Vest when outside the vehicle. ▪ Utilize vehicle as a shield from oncoming traffic, as practical
7. IDW pickup oversight	7A) Foot Injury	▪ See Section 5C above.
	7B) Chemical Hazards	▪ See Section 3E above.
	7C) Lifting	▪ See Section 6C above.
	7D) Slips/Trips/Falls	▪ See Section 4D above
8. Return to office/home	8A) See Mobilization/ Demobilization and Site Preparation JHA	**See Mobilization/ Demobilization and Site Preparation JHA**

AHA - Geoprobe Investigation – Oversight and Sample Collection ONLY

Activity/Work Task:	Geoprobe Investigation – Oversight and Sample Collection ONLY		
Project Location:			
Contract Number:			
Date Prepared:	8/29/2011	**Date Accepted:**	**5/3/2013**
Prepared by (Name/Title):			
Reviewed by (Name/Title):	Kendra Bavor, CSP		

Overall Risk Assessment Code (RAC) (Use highest code) **M**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)

This AHA involves the following:

- Establishing site specific measures
-

This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the site HASP for additional requirements. Contractor to follow general site safety controls for Slips Trips and Falls, Biological hazards, cuts lacerations and pinch points, and emergency procedures.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
1. Subcontractor Drive Geoprobe onto site	1A) Malfunction of vehicle/equipment	1A) Drivers shall perform a pre-operational check of equipment, read and be familiar with any operator's manual. ▪ Report all needed repairs promptly. ▪ Operators shall not use defective/unsafe equipment.	**L**

	1B) Wreck of Geoprobe while being driven	1B) Wreck of Geoprobe while being driven ▪ All drivers shall be properly licensed. ▪ Supervisors shall verify that drivers are capable and qualified on each type of equipment before allowing the equipment to be used unsupervised. ▪ Keep wind shields, windshield wipers, side mirrors and side windows clean ▪ Drivers shall conduct a pre-operation vehicle safety check ▪ Drivers shall plan ahead to minimize or eliminate the need for backing. Always check to the rear before backing and use an observer when available. If an observer is not available, the driver shall walk around the vehicle to make sure rear is clear prior to backing. ▪ Seat belts shall be worn when driving by driver and passengers. ▪ Choose the safest location possible to park equipment. Avoid parking in blind spots of other equipment. ▪ Adjust vehicle speed for load and weather. Tire chains should be utilized as dictated by weather conditions. ▪ When operating a vehicle off the roadway, be aware of possible hidden objects in the grass and unstable terrain. ▪ Never allow anyone between truck and trailer when backing to hook trailer ▪ Perform periodic checks of equipment on long trips to assure the load is secure. ▪ Do not leave equipment unattended with the engine running. Shut off engine and set the parking brake when equipment is not in use.	**L**
2. Loading/unloading of equipment	2A) Crush and pinch points created when loading/unloading equipment 2B) Heavy lifting, twisting, bending 2C) Slip, trips and falls	2A) Crush and pinch points created when loading/unloading equipment ▪ Be aware of crushing and pinching hazards when loading, unloading and fastening down equipment. ▪ Make sure cargo is properly loaded and secured. ▪ Wear protective equipment consistent with the hazard (hard hats, safety glasses, leather gloves, safety shoes, etc.) 2B) Size up the load, utilize help for heavy items, split loads as necessary. Use proper body mechanics and ergonomic techniques. 2C) Keep walking area clear. Proper housekeeping.	**M**

3. Geoprobe operation by Subcontractor	3A) Vehicle movement/ unstable 3B) Crushing injuries, pinch points, entanglement and flying particles, 3C) Noise 3D) slip trips and falls, 3E) material under stress, equipment limitations, rope or cable blocks, hydraulic leaks 3F) utility lines, 3G) overhead loads, 3H) lifting 3I) Chemical exposure	Geoprobe operation by the Subcontractor. Read Owner's Manual. 3A) Always apply the parking brake and shut off engine before exiting the vehicle. • Ensure back up alarm is operational. • Complete a visual inspection of the equipment prior to operation. Replace or repair equipment if necessary. Complete a checklist to document inspections and corrective actions required. • Keep body parts clear of probe foot. • Be familiar with Emergency kill switch and controls. Test prior to probing. • When on sloped surface position the unit parallel to the slope with the control on the up hill side. • Use caution on soft or loose surface. Be aware of the weight of loaded vehicle. • Be aware of weather and windy conditions. Do not operate during lighting storm or high winds. 3B) Heed all Caution, Warning or Danger decals on machine. • Ensure everyone is clear of moving parts. • Designate only one experienced operator to avoid unexpected engagement. • Operate only from the control side. Do not reach across operating probe. • Avoid placing your hands on top of the tool string when raising/lowering the hammer or swinging/ folding probe assembly. • DO not wear loose clothing. Tie back hair when operating equipment. • PPE – safety shoes, hard hat, safety glasses, hearing protection, gloves. Optional Tyvek or coveralls. 3C) PPE – hearing protection. 3D) Maintain an orderly and clean site. • Housekeeping. • Barricade or establish work zones to minimize unauthorized entry. • Adequate lighting 3E) Know the capacities, equipment limitations and acceptable operating loads. Follow the equipment operator's manual and proper maintenance requirements. • Stand clear of potential release of energy. Keep body part clear of moving parts. • Use the correct tool for the job. • Limit the rate of the hammer lowering while advancing the tool string to avoid raising the probe foot more than 6 inches off the ground surface. • In the event problem or binding, the operator should release all control levers to neutral. • Inspect hydraulic lines. Repair or replace damaged hoses. 3F) Be aware of surroundings. Establish safe "dig" zones. Contact Dig Safe or "one call" system to mark underground utilities or tanks. • Before moving onto a site, evaluate height restrictions due to overhead utilities and vegetation. • Borings to be located a minimum of 10 feet from overhead lines. • Do not drive the machine with the mast extended.	**M**

		3G) Remain alert. Establish work zone to minimize workers under overhead loads. Avoid sudden jerks or overloading. Check load for balance and appropriate support prior to hoisting. 3H) Use mechanical means to lift heavy loads and removing rod. Don appropriate PPE for chemicals of concern. Work from upwind. Be aware or combustion fumes if equipment has auxiliary power. Practice good hygiene by washing hands, and no eating/smoking within the exclusion zone.	**L**
4. Operational area	4A) adverse weather conditions (temperature extremes), 4B) uneven terrain, 4C) poisonous plants/snakes/insects hazards	4A) Keep a weather eye. Monitor the weather forecast and actual conditions. • Wear appropriate clothing that does not restrict, cause over heat or is too loose. • Be aware of muddy conditions or puddles. 4B) Be aware of drop-offs, uneven ground and potential hidden objects which may cause loss of control when maneuvering rigs or create unstable drill set-ups. In heavily wooded area, scout to locate hidden objects. Use care when walking. 4C) Be aware of poisonous plants, insects, snakes, animals and animal waste products and carcasses. Wear long sleeve shirts, gloves, and high top boots when hazards cannot be avoided. Proper first aid supplies, insect repellents shall accompany field crews.	**M**
	4D) Contaminated soils, buried power or gas lines, landfills and containment of spills	4D) Contaminated soils, buried power or gas lines, landfills and containment of spills ▪ During drilling operations, always be aware of the possibility of encountering potentially hazardous materials, such as petroleum hydrocarbons, herbicides, pesticides, chemical manufacturing by-products or solid waste materials. ▪ In the event that any unknown or questionable materials are encountered, then the drilling operations are to be suspended immediately until further instructions are received from supervision. ▪ Do not handle any suspected contaminated materials unless trained to do so and proper protective methods are followed. ▪ During drilling operations, always be aware of the possibility of striking an un-located or improperly located gas or power line. ▪ In the event a buried utility line is struck, drilling operations are to be suspended **immediately**. - If the utility line is electric, keep personnel at least 10 feet from all metal surfaces connected with the drill rig. - If the utility is gas, then the area is to be evacuated and secured. Immediate notification to the utility company is MANDATORY. ▪ In the event of a gas or oil spill, the proper authorities are to be contacted immediately so that containment operations can be implemented.	**M**
5. Subcontractor Mixing grout on site and filling/placing in hole between the well pipe and bore hole wall	5A) Lifting 5B) Chemical exposure	5A) Size the load of materials to be moved and utilize appropriate help for lifting and moving. Use proper ergonomic and body mechanics to move materials (bags of grout, etc.). Use mechanical mixer for large quantities of grout. 5B) PPE – Safety glasses, safety shoes, gloves, optional tyvek/coveralls.	**M**
6. Subcontractor cutting soil acetate sleeve open to sample soil	6A) cutting of hand with a razor blade	6A) MACTEC personnel must let the subcontractor cut the sample liners as they have the appropriate tools to do so. 6B) Subcontractor must be aware of where hands are placed prior and during cutting with hand saw	**M**
7. Subcontractor driving drilling rig offsite.	7A) Reference item # 1	7A) Reference item #1.	

AHA - Geoprobe Investigation – Oversight and Sample Collection ONLY

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
PPE (Hard Hat, safety glasses, gloves, steel toe work boots, high visibility safety vest, hearing protection)	**Competent / Qualified Personnel:** Name – Position/Employer **Training requirements:** List specific certification (as applicable) Site Specific HASP Orientation Toolbox safety meeting Task kick-off meeting	Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. Inspect power cord sets prior to use. Inspect all PPE prior to use

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Wetland and Fish Surveys **Date of Analysis:** 5/30/06

Minimum Recommended PPE*:
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Walking to and from stream or wetland	1A) Insect bites/stings	2A) Insect bites/stings ▪ Avoid wearing heavy fragrances. ▪ Carry first-aid and sting relief kits. ▪ Make sure all crew members are informed about others who are allergic and what to do if they need assistance. ▪ Carry necessary emergency medication. ▪ See JHA Insect Bites and Stings
	1B) Slips and falls	2B) Slips and falls ▪ Use traction devices on shoes. ▪ Move slowly, take your time. ▪ Use a walking staff to provide a three point support.
	1C) Eye injuries	2C) Eye injuries ▪ Travel with care through heavy brush. ▪ Use eye protection in brushy areas.
	1D) Scrapes and punctures	2D) Scrapes and punctures ▪ Wear proper clothing, long sleeved shirts and pants. No shorts.
	1E) Cuts/Lacerations due to machette use	2E) Cuts/Lacerations due to machette use ▪ Wear chaps or snake legs ▪ Cut away from the body ▪ Ensure blade of machette is sharp
	1F) Blow-down / heavy debris	2F) Blow-down / heavy debris ▪ Be aware of your surroundings, including hanging or leaning debris that may be dislodged and fall.
	1G) Animal encounters	2G) Animal encounters ▪ Moose: a. Make noise to avoid encounter. b. If you do encounter a moose, put a lot of room between you and the animal by walking around him/her if necessary. c. Do not look it in the eye. d. If charged, run away or climb a tree. e. Throwing something or shouting may deter an attack.
	1H) Severe injury in remote locations	2H) Severe injury in remote locations ▪ Carry a two-way radio and know how to use it. ▪ Work in teams. ▪ Make sure someone on crew is certified in first aid. ▪ Carry a first aid kit.
2. Entering Stream	3A) Slips and falls	3A) Slips and falls ▪ Use traction devices on shoes and waders. ▪ Move slowly, take your time. ▪ Use a walking staff to provide a three point support.
	3B) Sand or Mud – knee or ankle injury	3B) Sand or Mud ▪ Use shorter steps ▪ Use walking sticks to check firmness of soils ▪ Use buddy system ▪ Snowshoes that dissipate weight may be effective ▪ If leg gets caught, use slight back and forth motion to soften mud and remove slowly. Don't try to pull leg out with twisting or jerking motion. ▪ If possible, aeriate or bubble the mud to help releave suction.

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Wetland and Fish Surveys **Date of Analysis:** 5/30/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3C) Equipment	3C) Equipment ▪ Secure packs and hip waders with quick release straps and be ready to discard, if an emergency arises. ▪ Do not work in waders in water greater than 3 feet deep or in swift water. ▪ Wear bike or rafting helmets to protect from blows to the head.
	3D) Hypothermia	3D) Hypothermia ▪ Work in teams of two. ▪ Have warming devices available. ▪ Wear proper equipment that is in good condition. ▪ Be aware of signs of hypothermia, it's prevention, detection and treatment. ▪ Stay in tune to current weather and extended forecasts. ▪ See JHA General Field Work
	3E) High flow velocity	3E) High flow velocity ▪ Evaluate a stream before entering. ▪ Follow the "rule of 10" a. If stream is 1 foot deep and flowing @10 ft./sec, it is too hazardous to wade b. If stream is 2 feet deep and flowing at 5 ft./second, it is too hazardous to wade. c. If you do enter a stream and discover it is too dangerous to wade, back out using your wading pole for balance.
	3F) Severe weather	3F) Severe weather ▪ Suspend measurements during lightning storms or when a storm is approaching.
3. Entering Wetland	3A) Slips and falls	3A) Slips and falls • Use traction devices on shoes and boots. • Move slowly, take your time. • Use a walking staff to provide a three point support.
	3B) Sand or Mud – knee or ankle injury	3B) Sand or Mud ▪ Use shorter steps ▪ Use walking sticks to check firmness of soils ▪ Use buddy system ▪ Snowshoes that dissipate weight may be effective ▪ If leg gets caught, use slight back and forth motion to soften mud and remove slowly. Don't try to pull leg out with twisting or jerking motion. ▪ If possible, aeriate or bubble the mud to help releave suction.
	3C) Equipment	3C) Equipment ▪ Secure packs and boots with quick release straps and be ready to discard, if an emergency arises. ▪ Wear hard hat to protect from blows to the head if using an auger. ▪ Wear steel toe boots to protect feet from dropping equipment (auger)

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Wetland and Fish Surveys **Date of Analysis:** 5/30/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3D) Temperature extremes (hot or cold)	3D) Hypothermia ▪ Work in teams of two. ▪ Have warming devices available. ▪ Wear proper equipment that is in good condition. ▪ Be aware of signs of hypothermia and/or heat stroke, it's prevention, detection and treatment. ▪ Stay in tune to current weather and extended forecasts. ▪ See JHA General Field Work
	3E) Severe weather	3E) Severe weather ▪ Suspend measurements during lightning storms or when a storm is approaching.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Insect Stings and Bites **Date of Analysis:** 4/20/06

Minimum Recommended PPE*: Long sleeved shirt and pants, light colored clothing
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Traveling/working in areas with potential Tick Bites –Example outdoor wooded areas or fields.	1. Lyme Disease, Rocky Mountain Spotted Fever, etc.	▪ Spray clothing with insect repellant as a barrier. ▪ Wear light colored clothing that fits tightly at the wrists, ankles, and waist. ▪ Each outer garment should overlap the one above it. ▪ Cover trouser legs with high socks or boots. ▪ Tuck in shirt tails. ▪ Search the body on a regular basis, especially hair and clothing; ticks generally do not attach for the first couple of hours. ▪ If a tick becomes attached, pull it by grasping it as close as possible to the point of attachment and pull straight out with gentle pressure. Wash skin with soap and water then cleanse with rubbing alcohol. Place the tick in an empty container for later identification, if the victim should have a reaction. Record dates of exposure and removal. ▪ Do not try to remove the tick by burning with a match or covering it with chemical agents. ▪ If you can not remove the tick, or the head detaches, seek propmt medical help. ▪ Watch for warning signs of illness: a large red spot on the bite area; fever, chills, headache, joint and muscle ache, significant fatigue, and facial paralysis are reactions that may appear within two weeks of the attack. Symptoms specific to Lyme disease include: confusion, short-term memory loss, and disorientation.
2. Working/traveling in areas with potential bee and wasp stings-Example wooded areas and fields	2. Allergic reactions, painful stings	▪ Be alert to hives in brush or in hollow logs. Watch for insects travelling in and out of one location. ▪ If you or anyone you are working with is known to have allergic reactions to bee stings, tell the rest of the crew and your supervisor. Make sure you carry emergency medication with you at all times. ▪ Wear long sleeve shirts and trousers; tuck in shirt.. Bright colors and metal objects may attract bees. ▪ If you are stung, cold compresses may bring relief. ▪ If a stinger is left behind, scrape it off the skin. Do not use a tweezers as this squeezes the venom sack, worsening the injury. ▪ If the victim develops hives, asthmatic breathing, tissue swelling, or a drop in blood pressure, seek medical help immediately. Give victim antihistime, (Benadryl, chlo-amine tabs).
3. Traveling/working in areas of potential Mosquito Bites-Example- Woods, fields, near bodies of water and etc.	3. Skin irritation, encephalitis	▪ Wear long sleeves and trousers. ▪ Avoid heavy scents. ▪ Use insect repellants. If using DEET, do not apply directly to skin, apply to clothing only. ▪ Carry after-bite medication to reduce skin irritation.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Working with Preservatives (Acids) **Date of Analysis:** 5/30/06

Minimum Recommended PPE*: Safety glasses/goggles, nitrile gloves,
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Opening the box of ampoules	1A) Cuts or punctures with a knife	1A) Cuts or punctures with a knife ▪ Use appropriate techniques when handling a knife. Always cut away from you.
	1B) Broken ampoules in the box. Cuts from the broken glass.	1B) Broken ampoules in the box. Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Dispose of the preservative and broken glass by approved methods.
	1C) Broken ampoules in the box. Breathing fumes.	1C) Broken ampoules in the box. Breathing fumes. ▪ Wear safety goggles and protective gloves. ▪ Always work in a well-ventilated area.
2. Breaking top of glass ampoule	2A) Cuts from the broken glass.	2A) Cuts from the broken glass ▪ Wear safety goggles and protective gloves. ▪ Use a paper towel to wrap ampoule in to snap the top or use an ampoule breaker. ▪ Always point the ampoule away from you when you snap off the top.
	2B) Skin contact chemical burns.	2B) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves. ▪ Fumes may come into contact with the perspiration on your skin and rehydrate to form an acid. ▪ If your skin itches, flush affected area for 15 minutes with water.
	2C) Eye contact	2C) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	2D) Breathing fumes	2D) Breathing fumes ▪ HNO_3 and HCL have high vapor pressure. Always work in a well-ventilated area.
3. Adding acid to sample	3A) Chemical reaction	3A) Chemical reaction ▪ Wear safety goggles and protective gloves. Acid may react with high alkaline sample and fizz (releases CO_2).
	3B) Eye contact	3B) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	3C) Skin contact chemical burns.	3C) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves.
4. Ampoule disposal	4A) Cuts from the broken glass.	4A) Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Place used ampoules in an empty, non-reactive container in the field and bring it back to the office. Dispose of the preservative and broken glass by approved methods.

AHA - Surface Water and Sediment Sampling from a Boat
Activity Description

Activity/Work Task:	Boating- Surface water and sediment collection		
Project Location:			
Contract Number:	**Project #**		
Date Prepared:	**9/20/12**	**Date Accepted:**	**3-7-13**
Prepared by (Name/Title):	Tige Cunningham/Project Scientist		
Reviewed by (Name/Title):	Kendra Bavor - CSP		

Overall Risk Assessment Code (RAC) (Use highest code): **M**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)

This AHA involves the following:

- Establishing site specific measures
- Collecting samples from a boat
- The **Safe Boating Checklist** and a **Float Plan** must be filled out prior to use of a boat
- See Appendix F of the HASP for the Boating Safety and Personal Floatation Device Selection Guide

This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the site HASP for additional requirements. Contractor to follow general site safety controls for Slips Trips and Falls, Biological hazards, cuts lacerations and pinch points, and emergency procedures.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
1. Prepare for site visit	1A) Slips, trips, falls	1A) Slips, trips, falls ▪ Familiarize self with site prior to visit. ▪ Complete appropriate training before going on site. ▪ Provide appropriate person in district office your itinerary. ▪ Prepare listing of emergency phone numbers, both on and offsite. ▪ Identify site/activity PPE needs ▪ Ensure that First Aid training is current, and that tetanus booster are current	**L**
2. Check and calibrate sampling equipment.	2A) Muscle Strain - lifting, twisting, tugging	2A) Muscle Strain - lifting, twisting, tugging ▪ Inspect all PPE and equipment and ensure that it is working properly. ▪ Get assistance from a coworker or use mechanical means to move equipment (dolly, cart, etc.)	

	2B) Slips, trips and falls	2B) Slips, trips, and falls ▪ Wear proper footwear ▪ Pay attention to where walking	
3. Load/carry equipment to the site.	3A) Slips, trips, falls	3A) Slips, trips, falls ▪ See AHA for Mobilization / Demobilization and Site Preparation	**M**
	3B) Muscle Strain - lifting, twisting, tugging	3B) Muscle Strain - lifting, twisting, tugging ▪ Proper lifting, posture, ergonomic practices and body mechanics. ▪ Share the load, move items in smaller shifts, or use cart. ▪ Loading the boat: ensure no twisting. ▪ Use a trailer if possible to launch boat. ▪ Empty boat of gear prior to loading or moving boat to/from vehicle. ▪ Ensure boat is properly secured in the vehicle prior to moving. ▪ Tie a red cloth to the furthest point of the boat if overhanging from the vehicle. ▪ Ensure enough able bodies to move and launch the boat to share the load.	
	3C) Irate property owners, pets	3C) Irate property owners, pets ▪ Call property owners in advance. ▪ Check in to introduce yourself upon arrival. ▪ Be courteous and diplomatic	
	3D) Crime	3D) Crime ▪ Do not enter areas where threats are present. ▪ Contract security where applicable. Use the buddy system. ▪ Maintain contact with support such as radio or cell phone.	
	3E) Struck by traffic – launch boat.	3E) Struck by traffic – launch boat. ▪ Wear hi visibility safety vest, use buddy system. ▪ Use traffic cones and a lookout. Launch from public boat launch facilities.	
	3F) Battery handling – acid exposure	3F) Battery handling – acid exposure ▪ Use care when handling batteries. ▪ Wear gloves and protective clothing when caring batteries. ▪ Check for leaks and damage prior to use of batteries.	

	3G) Launch and load boat: Capsize	3G) Launch and load boat: Capsize ▪ Be aware of the boat maximum weight, person capacity, and engine size limit. ▪ Balance the gear and people in the boat. ▪ Personnel must wear approved, properly sized and buckled PFD when on the water. ▪ Ensure lines and body parts are out of the water before operating engine. ▪ Avoid operation within swimming areas. ▪ Provide signal flags and communication to protect the public of your activities. ▪ Test motor prior to shoving away from the pier. ▪ Ensure all appropriate equipment is provided and accessible according to AMEC EH&S Manual – Boating Safety. ▪ Include bailer, anchor, second means of propulsion, line and throwable floatation.	
	3H) Pinch points – attaching/mounting the motor	3H) Pinch points – attaching/mounting the motor ▪ Mind where hands and body parts are when moving and loading equipment.	
	3I) Fueling – chemical exposure, fumes, environmental spills.	3I) Fueling – chemical exposure, fumes, environmental spills. ▪ See AHA Gasoline	**M**
	3J) Noise – engine (optional)	3J) Noise – engine (optional) ▪ Wear hearing protection. ▪ Provide shielding from noise such as bulkhead, or sound dampening. ▪ Operate with engine box in place to dampen noise	
4. Field parameters	4A) Falling into water and capsize	4A) Falling into water and capsize ▪ Use equipment that facilitates reaching the location from a safe distance (extensions, etc.). ▪ Work using the buddy system. ▪ Wear PFD when working on the water. ▪ Balance equipment and people. ▪ Avoid leaning over the side of the boat. ▪ Anchor or secure the vessel to hold station. ▪ Steer boat to meet waves on the bow. ▪ Stay seated while in boat. ▪ If moving about, keep weight low.	
	4B) Slips trips and falls	4B) Slips trips and falls ▪ Wear appropriate footwear. ▪ Survey and clear walking area. ▪ Do not walk on slippery surfaces. ▪ Maintain good housekeeping. ▪ Provide walkways, platforms or secure walking surface. ▪ Use the buddy system and maintain communications with support staff.	

	4C) Vermin, leaches, Insect/animal born disease	4C) Vermin, leaches, Insect/animal born disease ▪ Survey the area for dens, nests, etc. ▪ Identify areas where biological hazards may be present. ▪ Be aware of your surroundings. ▪ Wear insect netting clothing or apply insect repellant on all exposed skin surfaces as appropriate – consider sample contamination ▪ Wear long sleeve shirt and full length pants ▪ Wear appropriate footwear (snake boots, etc.) ▪ Avoid high grass areas if possible ▪ Tuck pants leg into boot ▪ Do not put hand/arm into/under an area that you can not see into/under clearly ▪ Do not touch any suspected contaminant without appropriate hand PPE ▪ Wash hands as soon as possible upon completion of task. ▪ Perform routine inspections for ticks, leaches, etc. of yourself and co-workers. ▪ Contract vermin relocation, if applicable. ▪ Remain vigilant and respectful of wildlife. (See JHA for Insects, Stings and Bites) ▪ Wear wind impervious outerwear ▪ During warm months – wear a long sleeve cotton/breathable fabric shirt and pants.	
	4D) Weather – temperature extremes, hypothermia, sun stroke, heat exhaustion, dehydration, sun burn.	4D) Weather – temperature extremes, hypothermia, sun stroke, heat exhaustion, dehydration, sun burn. ▪ Train workers about weather and appropriate precautions. ▪ Heat: Familiarize self with signs of heat related illnesses: cramps, heat rash, dehydration, heat exhaustion, and heat stroke. ▪ Sun: o Keep body protected o Wear sunscreen, wide brimmed hat or hardhat. o Drink plenty of fluids to remain hydrated. (Follow AMEC guidelines, procedures and training for fluid intake, sunscreen use, proper clothing, work schedule, etc.) o Schedule work for cool part of day. o Take breaks in the shade. ▪ Wind: o Wear layered clothing, gloves, hard hat with winter liner, etc. ▪ Cold: o During cold weather - layer clothing	

	4E) Weather – inclement and strong winds	4E) Weather – inclement and strong winds ▪ Watch for clouds and incoming weather. ▪ Monitor weather forecasts. ▪ Have a float plan and communications when on and off the water. ▪ Return to shore if weather threatens. ▪ Stay close to shore if possible and abandon work until winds subside. ▪ Schedule work when weather is calm (early morning or evening.) ▪ Provide proper lighting if working after dark.	
	4F) Run aground – shifting or unbalanced vessel - equipment/personnel/slip/ fall/overboard	4F) Run aground – shifting or unbalanced vessel - equipment/personnel/slip/ fall/overboard ▪ Operate at safe speed. ▪ Post a look out for shallow or submerge obstacles. ▪ Remain seated when under way. ▪ Be wary of tides, flooding, flash floods and dam releases. ▪ Use anchor to kedge or pull back toward the way you came and deeper water. ▪ Use a pole or paddle, lighten the vessel to float off.	**L**
5. Sample collection	5A) Same as Item #4 above.	5A) Same as Item #4 above.	
	5B) Bending, pulling, twisting	5B) Bending, pulling, twisting ▪ Use a vibrating or wiggling motion on the sample device to break the soil suction. ▪ Proper lifting technique.	
	5C) Splash	5C) Splash ▪ Wear appropriate safety glasses (tinted for sun). ▪ Be aware if sampling water through a filter, if it becomes plugged with sediment it may unexpectedly “blow off” the hose and splash. ▪ Change filter prior to sedimentation back pressure. ▪ Minimize pouring distance to limit the splash between containers.	
	5D) Chemical exposure	5D) Chemical exposure ▪ Wear PPE including protective gloves, coveralls, safety glasses as appropriate. ▪ Work upwind of the sample location. Minimize exposure using a shovel/spoon or tool to collect the sample. ▪ Review and understand MSDS for all chemicals being handled. ▪ Be careful when handling acids and caustic substances. ▪ Wear adequate PPE and wash hands after completion of task.	
	5E) Vegetation, sticks, reeds, - cuts and punctures.	5E) Vegetation, sticks, reeds, - cuts and punctures. ▪ Clear access to site. ▪ Be familiar with toxic plants such as poison ivy. ▪ Avoid such plants. ▪ Wash thoroughly after accidental contact with toxic materials and plants.	

AHA - Surface Water and Sediment Sampling from a Boat
Activity Description

6. Vessel Operations	6A) Lack of boating skills, boating incident	6A) Lack of boating skills, boating incident ▪ Complete USCG/Power Squadron or other recognized boating course. ▪ All employees must wear PFDs while underway. ▪ Maintain vessel and proper safety equipment. ▪ Carry cell phone or radio. ▪ File a float plan and work in pairs.	**M**
7. Sample preparation.	7A) Lifting heavy objects (covers, pumps, sampling equipment, coolers, etc.) Muscle strain	7A) Lifting heavy objects (covers, pumps, sampling equipment, coolers, etc.) Muscle strain ▪ Use proper ergonomics when lifting heavy objects ▪ Use appropriate mechanical assistance and tools when possible.	**M**
	7B) Chemical Exposure	7B) Chemical Exposure ▪ Wear PPE including protective gloves, coveralls, safety glasses as appropriate. ▪ Wash/wipe or decontaminate exterior of sample containers and equipment. ▪ Use care handling preservatives (acids/bases.)	
	7C) Sharps and knives	7C) Sharps and knives ▪ Use care handling tape dispensers, knives and sharp objects. ▪ Use guarded dispensers	
	7D) Extreme cold (ice preservation)	7D) Extreme cold (ice preservation) ▪ Minimize exposure to ice. ▪ Use a shovel/spoon or tool to fill bags for preserving samples in coolers.	
8. Site exit and drive home or next site.	8A) Vehicle contamination	8A) Vehicle contamination ▪ Wash hands promptly. ▪ Contaminated PPE (Booties, tyvek, latex gloves) should be disposed on-site. ▪ Remove boots and soiled clothing for secure storage in trunk; decontaminate as soon as possible. ▪ Update exposure log.	**M**
	8B) Traffic hazards.	8B) Traffic hazards. ▪ Follow AHA for Mobilization / Demobilization and Site Preparation	
		• A throwable floatation device (ring) shall also be onboard during boat operation.	
	8C). Equipment Malfunction	5C). Equipment Malfunction	
		• Take a basic tool kit aboard the boat including boat plugs, fire extinguisher, and first aid kit.	
		• Carry extra engine parts and fluids in the event of engine problems.	
		• Be alert and rid the area of any spilled gas and gas fumes before doing any work on electrical parts that may cause a spark.	
	8D). Communications	5D) Communications	
		• A two-way or marine radio shall be maintained on board the boat at all times. If in a coverage area, a cell phone can be used for a communication device.	

AHA - Surface Water and Sediment Sampling from a Boat
Activity Description

9. Collecting Samples	9A). Capsizing Boat/Falling Overboard	6). Capsizing Boat/Falling Overboard	**M**
		• Make sure a proper anchor is in the boat to stabilize the boat at the sampling location.	
		• Ensure proper distribution of the load in the boat to avoid tipping and capsizing. Standing in the boat should be minimized.	
		• An appropriate Coast Guard approved personal floatation device shall be worn by each individual on board to protect against drowning.	

AHA - Surface Water and Sediment Sampling from a Boat
Activity Description

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
PPE (work gloves, PFDs, safety glasses, gloves, steel toe work boots, high visibility safety vest) Boating first Aid kit Boating Safety Kit (flares, air horn, marine radio, cell phone, tool kit)	**Competent / Qualified Personnel:** See HASP (Name – Position/Employer) **Training requirements:** List specific certification (as applicable) Site Specific HASP Orientation Toolbox safety meeting Task kick-off meeting	Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. Full boat inspection prior to use. Inspect all PPE prior to use

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for sampling event	1A) Chemical exposure	1A) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
2. Mobilization	4A) See JHA Mobilization/Demobilization/Site Preparation	2A) See JHA Mobilization/Demobilization/Site Preparation
3. General Site Hazards	3A) See JHA Field Work - General	3A) See JHA Field Work - General
4. Carrying equipment to site location	4B) Back or muscle strain	4A) Back or muscle strain ▪ Use proper lifting techniques when lifting pumps or generators ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
5. Calibrate monitoring equipment	5A) Exposure to calibration gases	5A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
6. Preparing sampling location	6A) Contact with poisonous plants or the oil from poisonous plants	6A) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Wear PPE as described in the HASP. ▪ Do not touch anything part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP.
	6B) Contact with biting insects (i.e., spiders, bees, etc.)	6B) Contact with stinging/biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	6C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated soil); flammable atmospheres.	6C) Exposure to hazardous substances ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	6D) Back strain due to lifting or moving equipment to sampling locations	6D) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	6E) Foot injuries from dropped equipment	6E) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear steel toed boots
7. Collecting soil samples	7A) Working around drill rigs	7A) See JHA - Drilling
	7B) Encountering underground or overhead utilities	7B) Have all utilities located.
	7C) Fire/Explosion/Contamination hazard from refueling generators	7C) Fire/Explosion/Contamination hazard from refueling generators ▪ Turn the generator off and let it cool down before refueling ▪ Segregate fuel and other hydrocarbons from samples to minimize contamination potential ▪ Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited ▪ See JHA for Gasoline use
	7D) Electrocution	7D) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	7E) Exposure to contaminants	7E) Exposure to Contaminants ▪ Stand up wind when sampling ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 4C) under Safe Practices above
	7F) Exposure to preservatives	7F) Exposure to preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ Review MSDSs
	7G) Slips/trips/falls	7G) Slips/trips/falls ▪ Ground can become wet/muddy ▪ Wear good slip resistant footwear
	7H) Lifting Injury	7H) Lifting injury ▪ Use proper lifting techniques when carrying quantities of samples ▪ Use proper ergonomics when hand digging for samples
	7I) Eye injury	7I) Eye Injury ▪ Wear eye protection when using picks or similar devices to loosen soil
	7J) Fire	7J) Fire ▪ When using gas powered auger, maintain fire watch whenever fueling or otherwise handling gasoline ▪ See JHA - Gasoline

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Key Work Steps	Hazards/Potential Hazards	Safe Practices
8. Soil sampling using floor corer	8A) Back injury	8A) Back Injury ▪ Use proper lifting techniques when moving floor corer and generator ▪ Use mechanincal aids if available ▪ Use two person lift for heavy items.
	8B) Electric Shock	8B) Electric Shock ▪ Use electric cords free from defects ▪ Keep cords out of water ▪ Ensure all electrical equipment is properly grounded ▪ Use GFCI
	8C) Hearing	8C) Hearing ▪ Wear hearing protection
	8D) Fire	8D) Fire ▪ When using generator, maintain fire watch whenever refueling or otherwise handling gasoline ▪ See JHA - Gasoline
	8E) Contamination	8E) Contamination ▪ Use appropriate PPE for the contaminants of concern (see HASP). ▪ Minimize sample contact ▪ Label sample in accordance with procedures ▪ Monitor breathing zone levels.

Job Hazard Analysis Form

JHA No.: JHA - Novi - ____ - ___ - ___

Job Title: Working Near Water **Date of Analysis:** _____

Job Location: _____ **Project Manager:** _____

Instructions: The Team Leader will gather the appropriate team, including subject matter experts, operators, and support personnel, to analyze the job for hazards. Using the below table or similar format, address the three phases of this process:

- **Identify Key Job Steps:** Break the job down into individual key steps where work activities are presented in sequential order.

- **Identify Job Hazards:** Create a list of known or potential hazards within each step of the job. Consider hazards associated with the various tools, equipment or other hardware involved in the job. Consider environmental hazards such as thermal stress, biohazards, etc.

- **Identify Safe Practices and Equipment:** List one or more prevention or control measures to address each hazard identified, emphasizing engineering and administrative controls over PPE. Once this has been completed, the JHA Team will determine whether the job can be performed in a manner that eliminates the identified hazards.

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Field Work Near Water	1A) Slips, trips, falls	1A) Familiarize self with site prior to visit. ▪ Complete appropriate training before going on site. ▪ Provide appropriate person in district office your itinerary. ▪ Prepare listing of emergency phone numbers, both on and offsite. ▪ Identify site/activity PPE needs. ▪ Ensure that First Aid training is current, and that tetanus booster is current. ▪ Be aware of your surroundings
	1B) Falling into water	1B) Falling into water ▪ Use equipment that facilitates reaching the location from a safe distance (extensions, etc.). ▪ Work using the buddy system. ▪ Wear PFD when working on or near the water. ▪ Avoid leaning over edge of land to water. ▪ Anchor or secure yourself to a permanent and secure structure when working near water.

	1C) Vermin, leaches, Insect/animal born disease	1C) Vermin, leaches, Insect/animal born disease ▪ Survey the area for dens, nests, etc. ▪ Identify areas where biological hazards may be present. ▪ Be aware of your surroundings. ▪ Wear insect netting clothing or apply insect repellant on all exposed skin surfaces as appropriate – consider sample contamination. ▪ Wear appropriate footwear (snake boots, etc.) ▪ Avoid high grass areas along shoreline if possible. ▪ Tuck pants leg into boot. ▪ Do not put hand/arm into/under an area that you can not see into/under clearly. ▪ Do not touch any suspected contaminant without appropriate hand PPE. ▪ Wash hands as soon as possible upon completion of task. ▪ Perform routine inspections for ticks, leaches, etc. of yourself and co-workers. ▪ Contract vermin relocation, if applicable. ▪ Remain vigilant and respectful of wildlife. (See JHA for Insects, Stings and Bites, and JHA for Dog – Wildlife Safety. ▪ Wear wind impervious outerwear ▪ During warm months – wear a long sleeve cotton/breathable fabric shirt and pants.
	1D) Bending, pulling, twisting	1D) Bending, pulling, twisting ▪ Balance weight in the boat with other personnel and equipment. ▪ Use a vibrating or wiggling motion on the sample device to break the sediment suction. ▪ Attach recovery line to sample equipment prior to deploying equipment. ▪ Proper lifting technique. ▪ Do not lean outside the boat.

Job Hazard Analysis Form
Identify Hazards and PPE

Complete the checklists for hazard identification and PPE requirements. Information from the RA and applicable permits are included in this section.

Standard Hazards			
☐ Falling Objects	X Slips and trips	☐ Pinch points	☐ Rotating equipment
X Falls	☐ Power equipment/tools	☐ Elevated work surfaces	☐ _____
Eye Hazards			
☐ Particulates	☐ Liquid splashes	☐ Welding Arc	☐ _____
Hearing Hazards			
X None (optional motor)	☐ Impact noise	☐ High frequency noise	☐ High ambient noise
Respiratory Hazards			
X None	☐ Dust/particulates	☐ Organic Vapors	☐ Acid Gases
☐ Oxygen deficient	☐ Welding fumes	☐ Aerosols/Particulates	☐ Be, Hg, Cr, Pb
☐ _____	☐ Radon	☐ Asbestos	☐ _____
Chemical Hazards			
X None	☐ Organic solvents	☐ Reactive metals	☐ PCBs
☐ Acids / bases	☐ Oxidizers	☐ Volatiles / Semi-volatiles	☐ _____

Completed by: _____ Date: _____

JOB HAZARD ANALYSIS FORM

Environmental Hazards			
□ None	X Temperature extremes	X Wet location	X Bio hazards (snakes, insects, spiders, bird / mouse droppings, fungus, etc.)
□ Explosive vapors	□ Confined space	□ Engulfment Hazard	□ _____
Electrical Hazards			
X None	□ Energized equipment or circuits	□ Overhead utilities □ Underground utilities □ Hidden utilities	□ Wet location
Fire Hazards			
X None	□ Cutting, welding, or grinding generated sparks or heat sources	□ Flammable materials present (Optional gasoline/diesel fuel)	□ Oxygen enriched location
Ergonomic Hazards			
X Lifting	X Bending	X Twisting	X Pulling/tugging
Computer Use in the: □ Office □ Field	X Repetitive motion	□ _____	□ _____
Radiological Hazards			
X None	□ Loose contamination	□ Fixed Contamination	□ Radiation
□ Airborne contamination	□ Radon	□ EMF	□ Criticality
□ Alpha	□ Beta	□ Gamma/X-rays	□ Neutron
□ Tritium	□ TRU	□ Depleted Uranium	□ Enriched Uranium
Other Hazards			
□			
□			
□			
□			

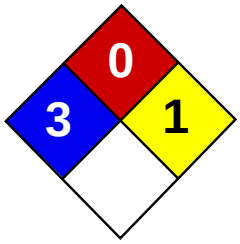
Completed by: Douglas Saigh Date: 10/07/11

Job Hazard Analysis Form

PPE and Monitoring Requirements

Standard PPE			
X Hard Hat	X Safety shoes	X Safety glasses	X Boot Covers
□ Aprons	X Rubber Boots (Optional)	X Other: PFD	X Other: Waders (shoreline)
Eye Protection			
□ Welding glasses □ Welding helmet	□ Face shield	□ Chemical goggles	□ Welding screens
Hearing Protection			
□ Ear plugs	□ Ear Muffs	□ Ear plugs and muffs	□ Other _____
Respiratory Protection			
X None	□ Dust mask	□ Full Face APR □ Half Face APR Cart. Type _____	□ PAPR Cart. Type _____
□ SCBA	□ Airline respirator	□ _____	□ _____
Protective Clothing			
X Tyvek® coveralls (optional)	□ Poly-coated Tyvek® Coveralls	□ Saranex® Coveralls	□ Fully encapsulating suit
□ Cotton coveralls	□ Modesty Clothing	□ Fire resistant clothing	X Other Rain gear
Hand Protection			
□ None	□ Cotton gloves	□ Leather gloves	□ Glove liners
X Nitrile gloves □ Viton® gloves □ Butyl gloves □ Neoprene gloves	Surgical gloves □ Latex □ Non-Latex	□ Cut-resistant gloves	□ Other _____
Monitoring Requirements			
□ Oxygen	□ Flammable gases/vapors	□ Toxic Gas/vapors	□ Hydrogen Sulfide/Carbon Monoxide
□ Asbestos	□ Full time IH coverage	□ Part time IH coverage	□ Be, Hg, Cr, Pb
□ Metals Specify: _____			
□ Organic vapors Specify: _____			
□ Radioactive air particulates	□ TLD required	□ CAM	□ Radon
□ Full time RCT coverage	□ Part time RCT coverage	□ Radioactive air particulates	□ Other _____
□ Other _____		□ Other _____	

PPE and monitoring requirements completed by: _____ Date: _____



Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 05:45 PM

Last Updated: 11/01/2010 12:00 PM

MSDS Number: N3660 * * * * * *Effective Date: 11/18/09* * * * * *Supercedes: 11/07/08*

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Rod School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO3
Product Codes:
J.T. Baker: 5371, 5796, 5801, 5826, 5856, 5876, 5896, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607, 9608, 9610, 9616, 9617, 9670, 9761
Mallinckrodt: 1409, 2704, 2705, 2706, 2707, 2716, 6623, H862, H988, H993, H998, V077, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:

Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Water spray may be used to keep fire exposed containers cool. Do not get water inside container.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial*

Ventilation, A Manual of Recommended Practices, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.
Odor:
Suffocating, acrid.
Solubility:
Infinitely soluble.
Specific Gravity:
1.41
pH:
1.0 (0.1M solution)
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
122C (252F)
Melting Point:
-42C (-44F)
Vapor Density (Air=1):
2-3
Vapor Pressure (mm Hg):
48 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Light and heat.

11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Air, I.C.A.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II

Information reported for product/size:

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the

CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 14.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

LIQUINOX MSDS

Section 1 : MANUFACTURER INFORMATION

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/02/24

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Liquid.

Appearance & odor: Odourless.
Pale yellow.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): @ 20°C (68°F).
17

Vapour density (air=1): >1

Volatiles (%)

By volume: Not available.

Evaporation rate (butyl acetate = 1): < 1.

Boiling point (°C):	100 (212F)
Freezing point (°C):	Not available.
pH:	8.5
Specific gravity @ 20 °C:	(water = 1). 1.083
Solubility in water (%):	Complete.
Coefficient of water\oil dist.:	Not available.
VOC:	None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability:	Not flammable.
Conditions of flammability:	Surrounding fire.
Extinguishing media:	Carbon dioxide, dry chemical, foam. Water Water fog.
Special procedures:	Self-contained breathing apparatus required. Firefighters should wear the usual protective gear. Use water spray to cool fire exposed containers.
Auto-ignition temperature:	Not available.
Flash point (°C), method:	None
Lower flammability limit (% vol):	Not applicable.
Upper flammability limit (% vol):	Not applicable.

Not available.

Sensitivity to mechanical impact:	Not available.
Hazardous combustion products:	Oxides of carbon (COx). Hydrocarbons.
Rate of burning:	Not available.
Explosive power:	Containers may rupture if exposed to heat or fire.

Section 5 : REACTIVITY DATA

Chemical stability:	Product is stable under normal handling and storage conditions.
Conditions of instability:	Extreme temperatures.
Hazardous polymerization:	Will not occur.
Incompatible substances:	Strong acids. Strong oxidizing agents.
Hazardous decomposition products:	See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry:	Skin contact, eye contact, inhalation and ingestion.
Effects of Acute Exposure	
Eye contact:	May cause irritation.
Skin contact:	Prolonged and repeated contact may cause irritation.
Inhalation:	May cause headache and nausea.
Ingestion:	May cause vomiting and diarrhea. May cause gastric distress.
Effects of chronic exposure:	See effects of acute exposure.
LD50 of product, species & route:	> 5000 mg/kg rat oral.
LC50 of product, species & route:	Not available.
Exposure limit of material:	Not available.
Sensitization to product:	Not available.
Carcinogenic effects:	Not listed as a carcinogen.
Reproductive effects:	Not available.
Teratogenicity:	Not available.
Mutagenicity:	Not available.
Synergistic materials:	Not available.
Medical conditions aggravated by exposure:	Not available.
First Aid	
Skin contact:	Remove contaminated clothing. Wash thoroughly with soap and water. Seek medical attention if irritation persists.
Eye contact:	Check for and remove contact lenses. Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.
Inhalation:	Remove victim to fresh air. If irritation persists, seek medical attention.
Ingestion:	Do not induce vomiting, seek medical attention. Dilute with two glasses of water. Never give anything by mouth to an unconscious person.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak / Spill:	Contain the spill. Prevent entry into drains, sewers, and other waterways. Wear appropriate protective equipment. Small amounts may be flushed to sewer with water. Soak up with an absorbent material. Place in appropriate container for disposal. Notify the appropriate authorities as required.
Waste disposal:	In accordance with local and federal regulations.
Handling procedures and equipment:	Protect against physical damage. Avoid breathing vapors/mists. Wear personal protective equipment appropriate to task.

Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Avoid extreme temperatures.
Launder contaminated clothing prior to reuse.

Storage requirements: Store away from incompatible materials.
Keep containers closed when not in use.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves / Type:

Wear appropriate gloves.

Respiratory / Type: None required under normal use.

Eye / Type:

Safety glasses recommended.

Footwear / Type: Safety shoes per local regulations.

Clothing / Type: As required to prevent skin contact.

Other / Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

PID ANALYZERS

hnu

Instrumentation for Environmental, Process & Industrial Hygiene Monitoring

Isobutylene in Air MSDS

Home

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS/**ISOBUTYLENE** IN AIR

PRODUCT NAME: 100 PPM ISOBUTYLENE/AIR (**100 PPM ISOBUTYLENE**/AIR) **MSDS**
Version:4 Date: January, 2004

---

1. Chemical Product and Company Identification **PID ANALYZERS, LLC** 25 Walpole Park Drive South Walpole, MA 02081 TELEPHONE NUMBER: (508) 660-5001 **24-HOUR EMERGENCY NUMBER: 1-617-699-4307** FAX NUMBER: (508) 660-5040 E-MAIL: sales@hnu.com

PRODUCT NAME: ISOBUTYLENE (**100 PPM** – 0.9%) IN AIR
CHEMICAL NAME: Isobutylene in air

COMMON NAMES/ SYNONYMS: Calibration Gas

CLASSIFICATION: 2.2 WHIMIS CLASSIFICTATION: A, D2A, D2B

---

2. COMPOSITION/ INFORMATION ON INGREDIENTS
INGREDIENT %: **Isobutylene** 0.0001-0.9/Air 99-99.9999
VOLUME:17L
PEL-OSHA: N/A
TLV-ACGIH: N/A
LD50or LC50Route/Species:N/A
FORMULA: C4H8/Air 99.0

---

3. HAZARDS IDENTIFICATIONEMERGENCY OVERVIEW Release of this product may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly ventilated environments); individuals in such atmospheres may be asphyxiated. **Isobutylene** may cause drowsiness and other central nervous system effects in high concentrations; however, due to the low concentration of this gas mixture, this is unlikely to occur.

ROUTE OF ENTRY:
Skin: No
Contact Skin: No
Absorption: No
Eye Contact: No
Inhalation: Yes
Ingestion:No

HEALTH EFFECTS:
Exposure Limits: Yes
Irritant: No
Sensitization: No
Reproductive Hazard: No
Mutagen: No
Carcinogenicity: No
NTP: No
IARC: No
OSHA: No

EYE EFFECTS: N/A.
SKIN EFFECTS: N/A.

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS
PRODUCT NAME: **ISOBUTYLENE** (1 **PPM** – 0.9%) IN AIR
INGESTION EFFECTS: Ingestion unlikely. Gas at room temperature.
INHALATION EFFECTS: Due to the small size of this cylinder, no unusual health effects from over-exposure are anticipated under normal routine use.

NFPA HAZARD CODES HMIS HAZARD CODES RATING SYSTEM
Health: **1**
Flammability: **0**
Flammability: **0**
Reactivity: **0**

***0= No Hazard, 1= Slight Hazard, 2= Moderate Hazard, 3= Serious Hazard, 4= Severe Hazard**

---

4. FIRST AID MEASURES EYES: N/A

SKIN: N/A

INGESTION: Not required

INHALATION: PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASED OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED THE SELF-CONTAINED BREATHING APPARATUS. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. If breathing has stopped administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

---

5. FIRE-FIGHTING MEASURES These containers hold gas under pressure, with no liquid phase. If involved in a major fire, they should be sprayed with water to avoid pressure increases, otherwise pressures will rise and ultimately they may distort or burst to release the contents. The gases will not add significantly to the fire, but containers or fragments may be

projected considerable distances - thereby hampering fire fighting efforts.

---

6. ACCIDENTAL RELEASE MEASURES In terms of weight, these containers hold very little contents, such that any accidental release by puncturing etc. will be of no practical concern.

---

7. HANDLING AND STORAGE Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Use only in well-ventilated areas. Do not heat cylinder by any means to increase rate of product from the cylinder. Do not allow the temperature where cylinders are stored to exceed 130oF (54oC).

---

8. EXPOSURE CONTROLS/PERSONAL PROTECTION Use adequate ventilation for extended use of gas.

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS PRODUCT NAME: ISOBUTYLENE (1 **PPM** – 0.9%) IN AIR

---

9. PHYSICAL AND CHEMICAL PROPERTIES PARAMETER: VALUE: Physical state : Gas Evaporation point : N/A pH : N/A Odor and appearance : Colorless, odorless gas

---

10. STABILITY AND REACTIVITY Stable under normal conditions. Expected shelf life 24 months.

---

11. TOXICOLOGICAL INFORMATION No toxicological damage caused by this product.

---

12. ECOLOGICAL INFORMATION No ecological damage caused by this product.

---

13. DISPOSAL INFORMATION Do not discharge into any place where its accumulation could be dangerous. Used containers are acceptable for disposal in the normal waste stream as long as the cylinder is empty and valve removed or cylinder wall is punctured.

---

14. TRANSPORT INFORMATION
United States DOT/Canada TDG PROPER SHIPPING NAME:
Compressed Gas N.O.S. Compressed Gas N.O.S. (**Isobutylene** in Air)
HAZARD CLASS: 2.2
IDENTIFICATION NUMBER: UN1956
SHIPPING LABEL: NONFLAMMABLE GAS

---

15. REGULATORY INFORMATION Isobutylene is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

---

16. OTHER INFORMATION This **MSDS** has been prepared in accordance with the Chemicals

(Hazard Information and Packaging for Supply (Amendment) Regulation 1996. The information is based on the best knowledge of PID Analyzers, LLC , and its advisors and is given in good faith, but we cannot guarantee its accuracy, reliability or completeness and therefore disclaim any liability for loss or damage arising out of use of this data. Since conditions of use are outside the control of the Company and its advisors we disclaim any liability for loss or damage when the product is used for other purposes than it is intended.
MSDS/S010/248/January, 2004

Top

HANNA® instruments

HI 70004
Buffer Solution pH 4.01, ± 0.01 @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 70004 Buffer Solution pH 4.01
Application: pH Buffer Solution, ± 0.01 @ 25°C/77°F

Additional Product Codes: HI 70004C
HI 70004P
HI 7004P/5

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)
International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)
E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Buffer Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	1.0 g/cm³ at 25°C
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	4.01 at 25°C	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:	*Sea:*	*Air:*
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2006-05-05
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

HANNA® instruments

HI 70007
Buffer Solution pH 7.01, ± 0.01 @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 70007 Buffer Solution pH 7.01
Application: pH Buffer Solution

Additional Product Codes: HI 70007C
HI 70007P
HI 7007P/5

Company Information (USA):

Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:

1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information:

1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information:

+1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address:

tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Buffer Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:

Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:

Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:

Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	1.0 g/cm³ at 25°C
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	7.01 at 25°C	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:
Not subject to transport regulations

Sea:
Not subject to transport regulations

Air:
Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2006-05-05
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Catalog Number(s) 00653-00	
Product Identity ZERO OXYGEN SOLUTION	
Manufacturer's Name RICCA CHEMICAL COMPANY	Emergency Telephone Number (24 hr) CHEMTREC®: 800-424-9300
Address (Number, Street, City, State, and ZIP Code) P.O. Box 13090	Telephone Number For Information 817-461-5601
Arlington, Texas 76094	Date Prepared 4-18-2000

Section 2. Composition / Information on Ingredients

Component	CAS Registry #	Percent Concentration	Exposure Limits ACGIH TLV	Exposure Limits OSHA PEL
Sodium Sulfite	7757-83-7	4.5 – 5.5	N/A	N/A
Cobalt Chloride Hexahydrate	7791-13-1	< 0.01	0.02 mg/m^3 (as Co)	0.1 mg/m^3 (Dust as Co)
Water, Deionized	7732-18-5	Balance	N/A	N/A

Section 3. Hazards Identification

☆☆☆

EMERGENCY OVERVIEW

May cause irritation to the eyes, skin and respiratory tract. Contains Cobalt Chloride, a possible carcinogen according to International Agency for Research on Cancer (IARC). Wash areas of contact with water for at least 15 minutes. If ingested, dilute with water and call a physician. Although moderately toxic in large amounts, sulfites can pose risk to some asthmatics producing central nervous system depression, broncho constriction and anaphylaxis.

☆☆☆

POTENTIAL HEALTH EFFECTS:

TARGET ORGANS: eyes, skin, respiratory tract.

EYE CONTACT: May cause irritation, redness, pain, and tearing.

INHALATION: May cause irritation. This solution is not expected to be harmful via inhalation.

SKIN CONTACT: May cause mild irritation.

INGESTION: May cause gastric irritation by the liberation of sulfurous acid. Large doses may result in circulatory disturbances, diarrhea, and central nervous system depression.

CHRONIC EFFECTS / CARCINOGENICITY: Chronic exposure may affect thyroid, heart, lungs and kidneys due to the Cobalt.
IARC – Not classifiable as to carcinogenicity to humans (Sodium Sulfite), Possible carcinogen, limited evidence in humans (Cobalt)
NTP – No
OSHA – No

TERATOLOGY (BIRTH DEFECT) INFORMATION:

Mutation data cited in "Registry of Toxic Effects of Chemical Substances" for Cobalt Chloride and Sodium Sulfite.

REPRODUCTION INFORMATION:

Reproductive effects cited in "Registry of Toxic Effects of Chemical Substances" for Cobalt Chloride.

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary.

SKIN CONTACT: Wash areas of contact with soap and water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Do not induce vomiting. Call a physician if necessary.

Section 5. Fire Fighting Measures

FLAMMABLE PROPERTIES:

FLASH POINT: N/A METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire (water, dry chemical, chemical foam).

FIRE & EXPLOSION HAZARDS: Not considered to be an explosion hazard. May emit irritating and corrosive gases in fire.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions. Poisonous gases may be produced in fire.

FIRE FIGHTING EQUIPMENT: Use protective clothing and NIOSH-approved self-contained breathing apparatus appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material (vermiculite, etc.) and dispose of in accordance with local regulations.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves, Nitrile Rubber or Neoprene.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE:	Clear, colorless liquid	**pH:**	N/A
ODOR:	odorless	**BOILING POINT (^{o}C):**	Approximately 100
SOLUBILITY IN WATER:	infinite	**MELTING POINT (^{o}C):**	Approximately 0
SPECIFIC GRAVITY:	Approximately 1	**VAPOR PRESSURE:**	N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage. This product absorbs Oxygen from the air.

INCOMPATIBILITY: Strong oxidizing agents, Acids (liberates Sulfur Dioxide), high temperatures.

HAZARDOUS DECOMPOSITION PRODUCTS: Emits toxic and irritating fumes, including Sulfur Oxides, when heated to decomposition.
HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Mouse: (Sodium Sulfite) 820 mg/kg, details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Whatever cannot be saved for recycling or recovery should be managed in an appropriate and approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME:	Not regulated
D.O.T. HAZARD CLASS:	None
U.N. / N.A. NUMBER:	None
PACKING GROUP:	None
D.O.T. LABEL:	None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: This item meets the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory or are mixtures (hydrates) of items listed on the TSCA Inventory.
CERCLA REPORTABLE QUANTITY: Cobalt Chloride RQ 1 pound
SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No
SECTION 311/312 HAZARDOUS CATEGORIES: Acute, Chronic: Yes Fire, Pressure, Reactivity: No
SECTION 313 TOXIC CHEMICALS: No
RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed

Section 16. Other Information

NFPA Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Special Notice Key: None**
HMIS® Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Protective Equipment: B (Protective eyewear, gloves)**

Rev 1, 03-25-2003: Reviewed and approved.
Rev 2, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

HI 7021
ORP Solution for Platinum and Gold Electrodes

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7021 ORP Solution

Application: ORP Solution for Platinum and Gold Electrodes.
240 mV @ 25°C/77°F

Additional Product Codes: HI 7021L
HI 7021M
HI 7021/G

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air.

After Skin Contact: Wash effected area with plenty of water.

After Eye Contact: Rinse out with water.

After Swallowing: Wash out mouth thoroughly with water and give plenty of water to drink. In severe cases obtain medical attention.

General Information: Remove contaminated, soaked clothing immediately and dispose of safely.

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Water spray, Carbon Dioxide, Dry Chemical Powder, Appropriate Foam.

Special Risks:

Non-combustible.

Special Protective Equipment:

Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:

NA

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

Avoid formation of dusts. Do not inhale dusts. Avoid substance contact.

Environmental Precautions:

Do not discharge into the drains/surface waters/groundwater.

Additional Notes:

Take up dry. Clean up affected area and dispose according to local regulation. Avoid generation of dusts.

SECTION 7: HANDLING AND STORAGE

Handling:

Cannot be stored indefinitely.

Storage:

Tightly closed. Store at room temperature (+15 to +25 °C recommended). Protect from light.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled.

Respiratory Protection:	***Protective Gloves:***	***Eye Protection:***
Required when vapors/aerosols are generated. Work under hood.	Rubber or plastic	Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Yellow liquid	***Odor:***	Odorless	***Density at 20° C:***	~ 1 g/cm³
Melting Point:	NA	***Boiling Point:***	ND	***Solubility:***	Soluble
pH at 20° C:	~ 7	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating

Hazardous Decomposition Products:

None

Hazardous Polymerization:

Will not occur.

Substances to be Avoided:

The generally known reaction partners of water

Further Information:

Not available

SECTION 11: TOXICOLOGICAL INFORMATION

No toxic effects are to be expected when the product is handled appropriately.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data:

SECTION 12: ECOLOGICAL INFORMATION

No environmental hazard.

Further Data: Can be safely disposed off as an ordinary refuse.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal:

SECTION 14: TRANSPORTATION INFORMATION

Land:	***Sea:***	***Air:***
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2008-01-17
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

HANNA® instruments

HI 7031

Conductivity Calibration Solution, 1413 µS/cm @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7031 Conductivity Calibration Solution

Application: For calibrating electrodes. 1413 µS/cm @ 25°C/77°F

Additional Product Codes: HI 7031/1G HI 7031L HI 7031L/C HI 7031M HI 7031/120ML

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	~ 1 g/cm³
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	~ 7	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating (above boiling point). Stable in the recommended storage conditions.

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:	*Sea:*	*Air:*
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2008-01-17
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

Material Safety Data Sheet
Methanol

ACC# 14280

Section 1 - Chemical Product and Company Identification

MSDS Name: Methanol
Catalog Numbers: AC167830000, AC167830025, AC167835000, AC176840000, AC176840010, AC176840025, AC176840250, AC176845000, AC177150000, AC177150010, AC177150025, AC177150050, AC177150051, AC177150250, AC177150251, AC268280000, AC268280010, AC268280025, AC325740000, AC325740010, AC325740025, AC326630000, AC326630010, AC326630025, AC326950000, AC326950010, AC326951000, AC326952500, AC327900000, AC327900010, AC364390000, AC364390010, AC364391000, AC413770000, AC413770040, AC413775000, AC423950000, AC423950010, AC423950040, AC423950200, AC423955000, AC610090040, AC610200040, AC610400010, AC61040019, AC61040019, AC61040050, AC61040050, AC610401000, AC61040115, AC61040115, AC61040200, AC610981000, AC611070040, AC615130025, S75162, S75163, S75959, S75965, S75965A, S75965HPLC, S93301, S93301A, S93302, S93302A, 19123467, A408-1, A408-4, A408-4LC, A408SK-4, A411-20, A411-4, A412-1, A412-20, A412-200, A412-200LC, A412-4, A412-4LC, A412-500, A412200001, A412CU-1300, A412FB-200, A412FB115, A412FB19, A412FB50, A412J500, A412P-4, A412P-4LC, A412POP19, A412POPB-200, A412RB-200, A412RB-50, A412RB115, A412RS-200, A412RS115, A412RS19, A412RS28, A412RS50, A412SK-4, A412SS-115, A412SS-200, A412SS-50, A413-20, A413-200, A413-4, A413-500, A433F-1GAL, A433P-1GAL, A433P-4, A433P1GAL, A433S-20, A433S-200, A433S-4, A434-20, A450-4, A452-1, A452-212, A452-4, A452-4LC, A452J1, A452N1-19, A452N2-19, A452POP-200, A452POP50, A452RS-115, A452RS-19, A452RS-200, A452RS-28, A452RS-50, A452SK-1, A452SK-4, A452SS-115, A452SS-19, A452SS-200, A452SS-28, A452SS-50, A453-1, A453-1LC, A453-4, A453-500, A453J1, A454-1, A454-4, A454-4LC, A454J1, A454RS-115, A454RS-200, A454RS-28, A454SS-19, A454SS-200, A454SS-28, A454SS-50, A455-1, A455RS19, A456-1, A456-4, A457-4, A4574LC, A935-4, A935RB-200, A935RB200, A947-4, A947-4LC, A947POP-200, A947POP200, A947RS-115, A947RS-200, A947RS-28, A947SS-115, A947SS-200, A947SS-28, A947SS-50, BP1105-1, BP1105-4, BP1105SS19, BP1105SS28, BP2618100, HC400 1GAL, NC9105104, NC9134255, NC9173853, NC9283877, NC9360649, NC9386568, NC9419923, NC9433033, NC9433739, NC9541632, NC9942270, NC9964975, SC95-1, SW2-1, TIA947-4, TIA947P-200, TIA947P-200L
Synonyms: Carbinol; Methyl alcohol; Methyl hydroxide; Monohydroxymethane; Wood alcohol; Wood naptha; Wood spirits; Columbian spirits; Methanol.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-56-1	Methanol	> 99	200-659-6

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: APHA: 10 max clear liquid. Flash Point: 12 deg C.
Danger! Poison! May be fatal or cause blindness if swallowed. Vapor harmful. **Flammable liquid and vapor.** Harmful if swallowed, inhaled, or absorbed through the skin. Causes eye, skin, and respiratory tract irritation. May cause central nervous system depression. Cannot be made non-poisonous.
Target Organs: Eyes, nervous system, optic nerve.

Potential Health Effects

Eye: May cause painful sensitization to light. Methanol is a mild to moderate eye irritant. Inhalation, ingestion or skin absorption of methanol can cause significant disturbances in vision, including blindness.
Skin: Causes moderate skin irritation. May be absorbed through the skin in harmful amounts. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. Methanol can be absorbed through the skin, producing systemic effects that include visual disturbances.
Ingestion: May be fatal or cause blindness if swallowed. Aspiration hazard. Cannot be made non-poisonous. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systemic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause cardiopulmonary system effects.
Inhalation: Methanol is toxic and can very readily form extremely high vapor concentrations at room temperature. Inhalation is the most common route of occupational exposure. At first, methanol causes CNS depression with nausea, headache, vomiting, dizziness and incoordination. A time period with no obvious symptoms follows (typically 8-24 hrs). This latent period is followed by metabolic acidosis and severe visual effects which may include reduced reactivity and/or increased sensitivity to light, blurred, doubl and/or snowy vision, and blindness. Depending on the severity of exposure and the promptness of treatment, survivors may recover completely or may have permanent blindness, vision disturbances and/or nervous system effects.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic exposure may cause effects similar to those of acute exposure. Methanol is only very slowly eliminated from the body. Because of this slow elimination, methanol should be regarded as a cumulative poison. Though a single exposure may cause no effect, daily exposures may result in the accumulation of a harmful amount. Methanol has produced fetotoxicity in rats and teratogenicity in mice exposed by inhalation to high concentrations that did not produce significant maternal toxicity.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Effects may be delayed.
Antidote: Ethanol may inhibit methanol metabolism.

Section 5 - Fire Fighting Measures

General Information: Ethanol may inhibit methanol metabolism. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than

water and a fire may be spread by the use of water. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Do NOT use straight streams of water.
Flash Point: 12 deg C (53.60 deg F)
Autoignition Temperature: 455 deg C (851.00 deg F)
Explosion Limits, Lower:6.0 vol %
Upper: 31.00 vol %
NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as sawdust. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not ingest or inhale. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid use in confined spaces.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Keep containers tightly closed.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Methanol	200 ppm TWA; 250 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	200 ppm TWA; 260 mg/m3 TWA 6000 ppm IDLH	200 ppm TWA; 260 mg/m3 TWA

OSHA Vacated PELs: Methanol: 200 ppm TWA; 260 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: clear, colorless - APHA: 10 max
Odor: alcohol-like - weak odor
pH: Not available.
Vapor Pressure: 128 mm Hg @ 20 deg C
Vapor Density: 1.11 (Air=1)
Evaporation Rate:5.2 (Ether=1)
Viscosity: 0.55 cP 20 deg C
Boiling Point: 64.7 deg C @ 760 mmHg
Freezing/Melting Point:-98 deg C
Decomposition Temperature: Not available.
Solubility: miscible
Specific Gravity/Density:.7910 g/cm3 @ 20°C
Molecular Formula:CH4O
Molecular Weight:32.04

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, ignition sources, confined spaces.
Incompatibilities with Other Materials: Oxidizing agents, reducing agents, acids, alkali metals, potassium, sodium, metals as powders (e.g. hafnium, raney nickel), acid anhydrides, acid chlorides, powdered aluminum, powdered magnesium.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, formaldehyde.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 67-56-1: PC1400000
LD50/LC50:
CAS# 67-56-1:
Draize test, rabbit, eye: 40 mg Moderate;
Draize test, rabbit, eye: 100 mg/24H Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, rabbit: LC50 = 81000 mg/m3/14H;
Inhalation, rat: LC50 = 64000 ppm/4H;
Oral, mouse: LD50 = 7300 mg/kg;
Oral, rabbit: LD50 = 14200 mg/kg;
Oral, rat: LD50 = 5600 mg/kg;
Skin, rabbit: LD50 = 15800 mg/kg;
.
Human LDLo Oral: 143 mg/kg; Human LDLo Oral: 428 mg/kg; Human TCLo Inhalation; 300 ppm caused visual field changes & headache; Monkey LDLo Skin: 393 mg/kg. Methanol is significantly less toxic to

most experimental animals than humans, because most animal species metabolize methanol differently. Non-primate species do not ordinarily show symptoms of metabolic acidosis or the visual effects which have been observed in primates and humans.
Carcinogenicity:
CAS# 67-56-1: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: There is no human information available. Methanol is considered to be a potential developmental hazard based on animal data. In animal experiments, methanol has caused fetotoxic or teratogenic effects without maternal toxicity.
Reproductive Effects: See actual entry in RTECS for complete information.
Mutagenicity: See actual entry in RTECS for complete information.
Neurotoxicity: ACGIH cites neuropathy, vision and CNS under TLV basis.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: 29.4 g/L; 96 Hr; LC50 (unspecified)Fish: Goldfish: 250 ppm; 11 Hr; resulted in deathFish: Rainbow trout: 8000 mg/L; 48 Hr; LC50 (unspecified)Fish: Rainbow trout: LC50 = 13-68 mg/L; 96 Hr.; 12 degrees CFish: Fathead Minnow: LC50 = 29400 mg/L; 96 Hr.; 25 degrees C, pH 7.63Fish: Rainbow trout: LC50 = 8000 mg/L; 48 Hr.; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 = 51,000-320,000 mg/L; 30 minutes; Microtox test No data available.
Environmental: Dangerous to aquatic life in high concentrations. Aquatic toxicity rating: TLm 96>1000 ppm. May be dangerous if it enters water intakes. Methyl alcohol is expected to biodegrade in soil and water very rapidly. This product will show high soil mobility and will be degraded from the ambient atmosphere by the reaction with photochemically produced hyroxyl radicals with an estimated half-life of 17.8 days. Bioconcentration factor for fish (golden ide) < 10. Based on a log Kow of -0.77, the BCF value for methanol can be estimated to be 0.2.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 67-56-1: waste number U154 (Ignitable waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	METHANOL	METHANOL
Hazard Class:	3	3
UN Number:	UN1230	UN1230
Packing Group:	II	II
Additional Info:		FLASHPOINT 11 C

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 67-56-1 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 67-56-1: 5000 lb final RQ; 2270 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 67-56-1: immediate, fire.

Section 313

This material contains Methanol (CAS# 67-56-1, > 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 67-56-1 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 67-56-1 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T F

Risk Phrases:

R 11 Highly flammable.
R 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
R 39/23/24/25 Toxic : danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.
S 36/37 Wear suitable protective clothing and gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 7 Keep container tightly closed.

WGK (Water Danger/Protection)

CAS# 67-56-1: 1

Canada - DSL/NDSL

CAS# 67-56-1 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D1B, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 67-56-1 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 7/21/1999
Revision #14 Date: 9/05/2006

MSDS Number: **S8234** * * * * * *Effective Date:* ***02/04/05*** * * * * * *Supercedes:* ***11/04/04***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SULFURIC ACID, 52 - 100 %

1. Product Identification

Synonyms: Oil of vitriol; Babcock acid; sulphuric acid
CAS No.: 7664-93-9
Molecular Weight: 98.08
Chemical Formula: H2SO4 in H2O
Product Codes:
J.T. Baker: 5030, 5137, 5374, 5802, 5815, 5858, 5859, 5868, 5889, 5897, 5961, 5971, 5997, 6902, 9671, 9673, 9674, 9675, 9676, 9679, 9680, 9681, 9682, 9684, 9687, 9691, 9693, 9694
Mallinckrodt: 21201, 2468, 2876, 2878, 2900, 2904, 3780, 4222, 5524, 5557, H644, H850, H976, H996, V651, XL003

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sulfuric Acid	7664-93-9	52 - 100%	Yes
Water	7732-18-5	0 - 48%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.
Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.
Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.
Eye Contact:
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Chronic Exposure:
Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. Call a physician immediately.
Eye Contact:
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

5. Fire Fighting Measures

Fire:
Concentrated material is a strong dehydrating agent. Reacts with organic materials and may cause ignition of finely divided materials on contact.
Explosion:
Contact with most metals causes formation of flammable and explosive hydrogen gas.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Do not use water on material. However, water spray may be used to keep fire exposed containers cool.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Sulfuric Acid:
- OSHA Permissible Exposure Limit (PEL) -
1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
0.2 mg/m3(T) (TWA) for sulfuric acid - A2 Suspected Human Carcinogen for sulfuric acid contained in strong inorganic mists.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear oily liquid.
Odor:
Odorless.
Solubility:
Miscible with water, liberates much heat.
Specific Gravity:
1.84 (98%), 1.40 (50%), 1.07 (10%)
pH:
1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.
% Volatiles by volume @ 21C (70F):
No information found.

Boiling Point:
ca. 290C (ca. 554F) (decomposes at 340C)
Melting Point:
3C (100%), -32C (93%), -38C (78%), -64C (65%).
Vapor Density (Air=1):
3.4
Vapor Pressure (mm Hg):
1 @ 145.8C (295F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.
Hazardous Decomposition Products:
Toxic fumes of oxides of sulfur when heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Water, potassium chlorate, potassium perchlorate, potassium permanganate, sodium, lithium, bases, organic material, halogens, metal acetylides, oxides and hydrides, metals (yields hydrogen gas), strong oxidizing and reducing agents and many other reactive substances.
Conditions to Avoid:
Heat, moisture, incompatibles.

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 2140 mg/kg; inhalation rat LC50: 510 mg/m3/2H; standard Draize, eye rabbit, 250 ug (severe); investigated as a tumorigen, mutagen, reproductive effector.
Carcinogenicity:
Cancer Status: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a known human carcinogen, (IARC category 1). This classification applies only to mists containing sulfuric acid and not to sulfuric acid or sulfuric acid solutions.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sulfuric Acid (7664-93-9)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material may be removed from the atmosphere to a moderate extent by dry deposition.
Environmental Toxicity:
LC50 Flounder 100 to 330 mg/l/48 hr aerated water/Conditions of bioassay not specified; LC50 Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC50 Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified.
This material may be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

International (Water, I.M.O.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                    TSCA  EC   Japan  Australia
-----------------------------------------------  ----  ---  -----  ---------
Sulfuric Acid (7664-93-9)                      Yes  Yes   Yes      Yes
Water (7732-18-5)                              Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                      --Canada--
Ingredient                                    Korea  DSL   NDSL  Phil.
-----------------------------------------------  -----  ---   ----  -----
Sulfuric Acid (7664-93-9)                      Yes   Yes   No     Yes
Water (7732-18-5)                              Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Sulfuric Acid (7664-93-9)                 1000  1000    Yes        No
Water (7732-18-5)                         No    No      No         No

--------\Federal, State & International Regulations - Part 2\----------------
                                                 -RCRA-    -TSCA-
Ingredient                                CERCLA     261.33     8(d)
----------------------------------------  ------     ------    ------
Sulfuric Acid (7664-93-9)                 1000       No         No
Water (7732-18-5)                         No         No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  Yes
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: Yes         (Pure / Liquid)
```

Australian Hazchem Code: 2P
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **2** Other: **Water reactive**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Do not contact with water.
Label First Aid:
In all cases call a physician immediately. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use. Excess acid on skin can be neutralized with a 2% bicarbonate of soda solution. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

APPENDIX B
FIELD DATA RECORDS (FDRs)

Samplers: Date/Time:

Sample Information						Field Observations											
Location ID		Sample ID	Top Depth (feet bgs)	Bottom Depth (feet bgs)	Sample Date/Time	Fill /Waste /Native	Soil Type	Grain Size	Color	Moisture	MGP Impacts	MGP Waste Type	Shake Test Results	Viscosity	Odors Present	Odor Strength	Comment
F8	A	516008-F8A04	3	4	1/0/1900 00:00	Other see comments	Sand	medium	light brown	moist	Stained	NA	NA	NA	Fuel oil-like	Strong	Black stained

Sample ID is comprised of:
Sample Type/Building ID#/200'grid ID/20'grid ID/Sample within the grid/sample depth

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME: Saranac Lake OU01 PDI
PROJECT NUMBER: 3611191237
PROJECT LOCATION: Saranac Lake, NY
WEATHER CONDITIONS (AM):
WEATHER CONDITIONS (PM):

TASK NO: .03 DATE:
MACTEC CREW:
SAMPLER NAME:
SAMPLER SIGNATURE:
CHECKED BY: DATE:

MULTI-PARAMETER WATER QUALITY METER

METER TYPE
MODEL NO.
UNIT ID NO.

AM CALIBRATION Start Time _____/End Time_____

POST CALIBRATION CHECK Start Time _____/End Time_____

	Units	Standard Value	Meter Value	*Acceptance Criteria (AM)	Standard Value	Meter Value	*Acceptance Criteria (PM)
pH (4)	SU	4.0		+/- 0.1 pH Units			
pH (7)	SU	7.0		+/- 0.1 pH Units	7.0		+/- 0.3 pH Units
pH (10)	SU	10.0		+/- 0.1 pH Units			
Redox	+/- mV	240		+/- 10 mV	240		+/- 10 mV
Conductivity	mS/cm	1.413		+/- 0.5 % of standard	1.413		+/- 5% of standard
DO (saturated)	%	100		+/- 2% of standard			
DO (saturated)	mg/L[1] (see Chart 1)			+/- 0.2 mg/L			+/- 0.5 mg/L of standard
DO (<0.1)	mg/L	<0.1		< 0.5 mg/L			
Temperature	°C						
Baro. Press.	mmHg						

TURBIDITY METER

METER TYPE
MODEL NO.
UNIT ID NO.

	Units	Standard Value	Meter Value	Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1 Standard	NTU	<0.1		<0.1		+/- 0.3 NTU of stan.
20 Standard	NTU	20		20		+/- 5% of standard
100 Standard	NTU	100		100		+/- 5% of standard
800 Standard	NTU	800		800		+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE
MODEL NO.
UNIT ID NO.

Background	ppmv	<0.1		<0.1		within 5 ppmv of BG
Span Gas	ppmv	100		100		+/- 10% of standard

O_2-LEL 4 GAS METER

METER TYPE
MODEL NO.
UNIT ID NO.

Methane	%	50		50		+/- 10% of standard
O_2	%	20.9		20.9		+/- 10% of standard
H_2S	ppmv	25		25		+/- 10% of standard
CO	ppmv	50		50		+/- 10% of standard

OTHER METER

METER TYPE
MODEL NO.
UNIT ID NO.

See Notes Below for Additional Information

☐ Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.
☐ Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: Portland FOS
Lot#/Date Produced:
Trip Blank Source:
Sample Preservatives Source:
Disposable Filter Type: 0.45µm cellulose
Calibration Fluids / Standard Source:
- DO Calibration Fluid (<0.1 mg/L) Portland FOS
- Other
- Other
- Other

	Cal. Standard Lot Number	Exp. Date
pH (4)		
pH (7)		
pH (10)		
ORP		
Conductivity		
<0.1 Turb. Stan.		
20 Turb. Stan.		
100 Turb. Stan.		
800 Turb. Stan.		
PID Span Gas		
O_2-LEL Span Gas		
Other		

NOTES:

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additonal acceptance criteria obtained from instrument specific manufacturer recommendations.
** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.
1 = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 6.1
FIELD INSTRUMENT CALIBRATION RECORD
NYSDEC QUALITY ASSURANCE PROJECT PLAN

GRAB SAMPLING RECORD - WATER

MACTEC
511 Congress Street
Suite 200
Portland, Maine 04101

PROJECT NAME		LOCATION ID	DATE
Saranac Lake OU01 PDI			
PROJECT NUMBER		**START TIME**	**END TIME**
3611191237			
SAMPLE ID	**SAMPLE TIME**	**SITE NAME/INSTALLATION**	**PAGE**
			OF

SAMPLE TYPE: ☐ GROUNDWATER ☐ SURFACE WATER ☐ STORM WATER ☐ DRINKING WATER ☐ PORE WATER ☐ OTHER: _____

FIELD PARAMETERS WITH PROGRAM STABILIZATION CRITERIA (AS LISTED IN THE QPP)

TIME	DTW (FT)	PURGE RATE (mL/min)	TEMP. (°C) ±3%	SP. CONDUCTANCE (mS/cm) ±3%	DISS. O_2 (mg/L) ±10% or 3 values <0.5 mg/L	pH (units) ±0.1	REDOX (mv) ±10 mv	TURBIDITY (ntu) ±10% and <10 ntu or 3 values <5 ntu	PUMP INTAKE DEPTH (ft)	COMMENTS

FINAL STABILIZED FIELD PARAMETERS (rounded to appropriate significant figures)						

TEMP.: nearest degree (ex. 10.1 = 10)
COND.: 3 significant figure (SF) max (ex. 1.686 = 1.69)
pH: nearest tenth (ex. 5.53 = 5.5)
DO: nearest tenth (ex. 3.51 = 3.5)
TURB: 3 SF max, nearest tenth (6.19 = 6.2, 101 = 101)
ORP: 2 SF (44.1 = 44, 191 = 190)

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- ☐ PERISTALTIC
- ☐ SUBMERSIBLE
- ☐ BLADDER _____
- ☐ WATTERA
- ☐ HYDRASLEEVE
- ☐ OTHER _____

DECON FLUIDS USED
- ☐ ALCONOX
- ☐ DEIONIZED WATER
- ☐ POTABLE WATER
- ☐ NITRIC ACID
- ☐ HEXANE
- ☐ METHANOL
- ☐ OTHER _____

TUBING/PUMP/BLADDER MATERIALS
- ☐ SILICON TUBING
- ☐ HDPE TUBING
- ☐ LDPE TUBING
- ☐ OTHER _____
- ☐ OTHER _____
- ☐ S. STEEL PUMP MATERIAL
- ☐ PVC PUMP MATERIAL
- ☐ GEOPROBE SCREEN
- ☐ OTHER _____
- ☐ OTHER _____
- ☐ OTHER _____

EQUIPMENT USED
- ☐ WL METER _____
- ☐ PID _____
- ☐ WQ METER _____
- ☐ TURB. METER _____
- ☐ PUMP _____
- ☐ OTHER _____
- ☐ FILTERS NO. ___ TYPE _____

ANALYTICAL PARAMETERS

	PARAMETER	METHOD NUMBER	ANALYTE LIST	FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	QC COLLECTED
☐							
☐							
☐							
☐							
☐							
☐							
☐							

PURGE OBSERVATIONS

	YES	NO
PURGE WATER CONTAINERIZED	☐	☐
NO-PURGE METHOD UTILIZED	☐	☐

NUMBER OF GALLONS GENERATED _____

NOTES:

Sampler Signature: Print Name:

Checked By: Date:

DEVIATIONS FROM THE WORK PLAN:

LOW FLOW GROUNDWATER SAMPLING RECORD

PROJECT NAME		LOCATION ID	DATE
Saranac Lake OU01 PDI			
PROJECT NUMBER		**START TIME**	**END TIME**
3611191237			
SAMPLE ID	**SAMPLE TIME**	**SITE NAME/NUMBER**	**PAGE**
		56008	OF

WELL DIAMETER (INCHES) _____

TUBING ID (INCHES) ☐ 1/8 ☐ 1/4 ☐ 3/8 ☐ 1/2 ☐ 5/8 ☐ OTHER _____

MEASUREMENT POINT (MP) ☐ TOP OF RISER (TOR) ☐ TOP OF CASING (TOC) ☐ OTHER _____

WELL INTEGRITY

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

INITIAL DTW (BMP)	FT	**FINAL DTW (BMP)**	FT	**PROT. CASING STICKUP (AGS)**	FT	**TOC/TOR DIFFERENCE**	FT
WELL DEPTH (BMP)	FT	**SCREEN LENGTH**	FT	**PID AMBIENT AIR**	PPM	**REFILL TIMER SETTING**	SEC
WATER COLUMN	0.00 FT	**DRAWDOWN VOLUME** (initial DTW- final DTW X well diam. squared X 0.041)	0.00 GAL	**PID WELL MOUTH**	PPM	**DISCHARGE TIMER SETTING**	SEC
CALCULATED GAL/VOL (column X well diameter squared X 0.041)	0.00 GAL	**TOTAL VOL. PURGED** (mL per minute X total minutes X 0.00026 gal/mL)	GAL	**DRAWDOWN/ TOTAL PURGED**		**PRESSURE TO PUMP**	PSI

FIELD PARAMETERS WITH PROGRAM STABILIZATION CRITERIA (AS LISTED IN THE QAPP)

TIME 3-5 Minutes	DTW (FT) 0.0-0.33 ft Drawdown	PURGE RATE (mL/min)	TEMP. (°C) (+/- 3 degrees)	SP. CONDUCTANCE (mS/cm) (+/- 3%)	pH (units) (+/- 0.1 units)	DISS. O_2 (mg/L) (+/- 10%)	TURBIDITY (ntu) (+/- 10% <10 ntu)	REDOX (mv) (+/- 10 mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
	BEGIN PURGING									

FINAL STABILIZED FIELD PARAMETERS (to appropriate significant figures[SF])

TEMP.: nearest degree (ex. 10.1 = 10)
COND.: 3 SF max (ex. 3333 = 3330, 0.696 = 0.696)
pH: nearest tenth (ex. 5.53 = 5.5)
DO: nearest tenth (ex. 3.51 = 3.5)
TURB: 3 SF max, nearest tenth (6.19 = 6.2, 101 = 101)
ORP: 2 SF (44.1 = 44, 191 = 190)

EQUIPMENT DOCUMENTATION

TYPE OF PUMP	DECON FLUIDS USED	TUBING/PUMP/BLADDER MATERIALS		EQUIPMENT USED
☐ PERISTALTIC	☐ LIQUINOX	☐ SILICON TUBING	☐ S. STEEL PUMP MATERIAL	☐ WL METER _____
☐ SUBMERSIBLE	☐ DEIONIZED WATER	☐ TEFLON TUBING	☐ PVC PUMP MATERIAL	☐ PID _____
☐ BLADDER _____	☐ POTABLE WATER	☐ TEFLON LINED TUBING	☐ GEOPROBE SCREEN	☐ WQ METER _____
	☐ NITRIC ACID	☐ HDPE TUBING	☐ TEFLON BLADDER	☐ TURB. METER _____
☐ WATTERA	☐ HEXANE	☐ LDPE TUBING	☐ OTHER _____	☐ PUMP _____
☐ OTHER _____	☐ METHANOL	☐ OTHER _____	☐ OTHER _____	☐ OTHER _____
☐ OTHER _____	☐ OTHER _____	☐ OTHER _____	☐ OTHER _____	☐ FILTERS NO. ____ TYPE _____

ANALYTICAL PARAMETERS

	PARAMETER	METHOD NUMBER	FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED	QC COLLECTED	SAMPLE BOTTLE ID NUMBERS
☐	VOC	8260C	No	4C, HCl				
☐	SVOC	8270D	No	4C				
☐								
☐								
☐								
☐	PFAs	537	No	4C				
☐	1,4-Dioxane	8270-SIM	No	4C				

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED — YES ☑ NO ☐

NO-PURGE METHOD UTILIZED — YES ☐ NO ☑

NUMBER OF GALLONS GENERATED _____

If yes, purged approximately 1 standing volume prior to sampling or _____mL for this sample location.

SKETCH/NOTES

Sampler Signature: Print Name:

Checked By: Date:

MACTEC
511 Congress Street, Portland Maine 04101

MACTEC

SLUG TEST DATA FORM

Project Name: Saranac Lake OU01 PDI
Project Number: 3611191237
Location ID:
Date:
Measuring Point: Top of Riser
Initial DTW (ft bmp):
Well Depth (ft bmp):
Technician(s):
Well Diameter (in):
Boring Diameter (in):
Slug Volume (gal.):
Estimated Water Column Displacement (ft):

Data Logger File ID	Test Method	Start Time	Start Depth (ft)	Start Time	End Depth (ft)	Comments

Instruments (Manufacturer, Model, and Serial No.):

Calculations:

Estimated water column displacement: H = V / [(D^2)*0.041] = 0.00

V = Slug Volume (gal)
D = well diameter (in)
H = Water column displacement (ft)

Additional Notes:

Signature:

Name (print):

QA/QC'd by:

QA/QC Date:

DAILY PFAS PROTOCOL CHECKLIST RECORD

511 Congress Street
Suite 200
Portland, Maine 04101

PROJECT NAME	Saranac Lake OU1 PDI
PROJECT NUMBER	3611191237
CLIENT	NYSDEC

DATE	
START TIME	
WEATHER	

Field Clothing and PPE (as applicable):

- ☐ Field crew in compliance with Tables 1 and 2, SOP AFW-01
- ☐ Field crew has not used fabric softener on clothing
- ☐ Field crew has not used cosmetics, moisturizers, hand cream, or other related products on exposed body parts this morning
- ☐ Field crew has not applied unacceptable sunscreen or insect repellant

Field Clothing and PPE (as applicable):

- ☐ No Teflon® containing materials on-site
- ☐ All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene
- ☐ No waterproof field books on-site other than Rite-in-the-Rain® Products
- ☐ No plastic clipboards, binders, or spiral hard cover notebooks on-site
- ☐ No adhesives (Post-it® Notes) on-site
- ☐ Coolers filled with regular ice only. No chemical (blue) ice packs in possession

Sample Containers:

- ☐ All sample containers made of HDPE or polypropylene. Samples are not stored in containers made of LDPE
- ☐ Caps are lined or unlined and made of HDPE or polypropylene

Wet Weather (as applicable):

- ☐ For personnel in direct contact with samples and/or sampling equipment, wet weather gear made of Vinyl, polyurethane, PVC, latex or rubber-coated materials only

Equipment Decontamination:

- ☐ "PFAS-free" water on-site for decontamination of sample equipment
- ☐ Alconox and Liquinox to be used as decontamination materials

Equipment Decontamination:

- ☐ No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area

If any applicable boxes cannot be checked, the Field Manager shall describe the noncompliance issues below and work with field personnel to address noncompliance issues prior to commencement of that day's work. Corrective action shall include removal of noncompliance items from the investigation area or removal of worker offsite until in compliance. Repeated failure to comply with PFC sample protocols will result in the permanent removal of worker(s) from the investigation area.

Describe the noncompliance issues (include personnel not in compliance) and action/outcome of noncompliance:

Sampler Signature: Print Name:

Checked By: Date:

Rinsate Blank Tracking

Rinsate Blank Sample I.D.:	
Date/Time:	
DI Water Source:	
Equipment Used:	

Sample I.D.s associated with above Rinsate Blank	Comment

Created By: BPW
Checked By:

APPENDIX C
NYSDEC FIELD DESCRIPTIONS OF SAMPLES FOR FORMER MANUFACTURED GAS PLANT (MGP) SITES

Field Descriptions of Samples for Former Manufactured Gas Plant (MGP) Sites

SOIL SAMPLE DESCRIPTIONS

It is important that descriptive qualifiers are consistently used to characterize degree and nature of contaminant impacts and visual-manual soil classification. The following presents some examples of descriptive qualifiers.

SOIL LOGGING

• All soils are to be logged using the **Unified Soil Classification** (ASTM D 2488 field descriptions)

• **PID or FID** used to screen all soil samples (Jar Headspace method) – maximum readings should be recorded and included on the logs. The PID/FID should be calibrated daily at a minimum

• **Moisture terms** are: Dry, Moist, and Wet

• **Color terms** - use geotechnical color charts - colors may be combined: e.g. red-brown. Color terms should be used to describe the "natural color" of the sample as opposed to staining caused by contamination (see below)

• **Log of each sample interval** should be prepared as follows:

[Coarse Grained Example] NARROWLY GRADED SAND (SP); mostly fine sand; <5% fines; red-brown, moist, environmental/depositional/geologic descriptions.

[Fine Grained Example] SANDY SILT (ML); heterogeneous till structure, nonplastic, ~30% fine to coarse, subangular sand; ~10% subangular fine gravel, max. size ~ 10 mm; brown; environmental/depositional/geologic descriptions.

• **Representativeness** – Soil logs should include particular notes if the field representative believes that there is a possibility that the soil sample being described is not representative of the interval sampled.

• **Intervals for Description** – if using a 2' (split spoon) or 4' (Macro-core) long sampler – the field description should not necessarily be for the entire sample interval. It is important to look for, identify, and describe small-scale units and changes within each sample interval.

DESCRIPTION OF CONTAMINANTS

Visible Contamination Descriptors

• **Sheen** - iridescent petroleum-like sheen. Not to be used to describe a "bacterial sheen", which can be distinguished by its tendency to break up on the water surface at angles, whereas a petroleum sheen will be continuous and will not break up. A field test for sheen is to put a soil sample in a jar of water and shake the sample (jar shake test) , then observe the presence/absence of sheen on the surface of the water in the jar.

• **Stained** - used w/ color (i.e. black or brown stained) to indicate that the soil matrix is stained a color other than the natural (unimpacted) color of the soil.

• **Coated** - soil grains are coated with tar/free product – there is not sufficient free-phase material present to saturate the pore spaces. The degree of coating should be described as light, moderate, or heavy.

• **Blebs** - observed discrete sphericals of tar/free product - but for the most part the soil matrix was not visibly contaminated or saturated. Typically this is residual product. The estimated size and number of blebs should be reported.

• **Saturated** - the entirety of the pore space for a sample is saturated with the tar/free product. Care should be taken to ensure that you're not observing water saturating the pore spaces if you use this term. Depending on viscosity, tar/free-phase saturated materials may freely drain from a soil sample.

• **Oil** - Used to characterize free and/or residual product that exhibits a distinct fuel oil or diesel fuel like odor; distinctly different from MGP-related odors/impacts.

• **Tar** - Used to describe free and/or residual product that exhibits a distinct "coal tar" type odor (e.g. naphthalene-like odor). Colors of product can be brown, black, reddish-brown, or gold.

• **Solid Tar** - Used to describe product that is solid or semi-solid phase. The magnitude of the observed solid tar should be described (e.g. discrete granules or a solid layer).

• **Purifier Material** - Purifier material is commonly brown/rust or blue/green wood chips or granular material. It is typically associated with a distinctive sulfur-like odor. Other colors may be present.

Olfactory Descriptors

• Use terms such as " tar-like odor" or "naphthalene-like odor" or "fuel oil-like odor" that provide a qualitative description (opinion) as to the possible source of the odor.

• Use modifiers such as strong, moderate, faint to indicate intensity of the observed odor.

DNAPL/LNAPL

- A jar shake test should be performed to identify and determine whether observed tar/free phase product is either denser or lighter than water. In addition, MGP residues can include both light and dense phases - this test can help determine if both light and dense phase materials are present at a particular location.

Viscosity of Free-Phase Product – If free-phase product/tar is present a qualitative description of viscosity should be made. Use descriptors such as:

- Highly viscous (e.g. taffy-like)
- Viscous (e.g. No. 6 fuel oil or bunker crude like)
- Low viscosity (e.g. No. 2 fuel oil like)

GROUNDWATER SAMPLING OBSERVATIONS

- Any observations of sheen, blebs, free-phase product/tar, staining or coating of the sampling equipment, odor, etc. that made during sampling of groundwater are to be included in the groundwater sample collection log.

Standard Colors for Reporting MGP Impacts

	RGB Color	Auto Cad Index
TAR SATURATED	255,0,0	10
COATED MATERIAL, LENSES	255,0,255	210
HARDENED TAR	129,64,0	34
BLEBS, GLOBS, SHEEN	255,191,0	40
STAINING, ODOR	255,255,0	50
PETROLEUM IMPACTS SATURATION & SHEENS	0,191,255	140
PETROLEUM IMPACTS STAINING & ODORS	170,234,255	141
PURIFIER WASTE AND ODOR	0,0,255	170
NO OBSERVED IMPACTS	0,165,0	92

APPENDIX D

OU02 AND OU03 WELL AND PIEZOMETER CONSTRUCTION LOGS

SOIL BORING LOG

MACTEC

511 Congress Street, Portland Maine 04101

Project Name:	***Saranac Lake Gas Company***		Boring ID: SB/PZ-301
Project Location:	Saranac Lake, NY		Page No. 1
Project No.: 3611161193	Client: NYSDEC		of: 1
Boring Location:	Refusal Depth: NA	Total Depth: 12' bgs	Bore Hole ID/OD: 2.25"
Weather: Overcast (35° F)	Soil Drilled: 12 '	Method: Direct Push	Casing Size: 2.25"
Subcontractor: Precision Environmental		Protection Level: D	Sampler: Macrocore
Driller: Mike Dudley	Date Started: 11/17/2016	Date Completed: 11/17/2016	Sampler ID/OD: 2.0"
Rig Type/Model: Geoprobe/Bobcat	Logged By: D. Farrell	Checked By: B. Havens	
Reference Elevation:	Water Level: ~ 4.0 ft bgs	Time: 830	

Sample Information			Monitoring				
Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	PID	Waste Encountered	Sample Description and Classification	USCS Group Symbol	Remarks
1	1	4.0/2.8	0.0	NOI	0 - 1.8 No recovery		
2					1.8 - 2.2 Organics, dark brown fine sand, leaves/twigs	Pt	
3					2.2 - 4.0 Light brown, medium sand, dry poorly graded	SP	
4							▽ 4.0 ft bgs
5	2	4.0/3.3	0.0	NOI	4.0 - 5.6 Same as above, now wet	SP	
6					5.6 - 6.9 Dark brown, very fine sand with trace silts, poorly graded, wet	SP	
7					6.9 - 8.0 Dark brown, fine to medium sand, wet, poorly graded	SP	
8							
9	3	4.0/2.8	0.0	NOI	8.0 - 10 Gray/brown, medium sand, poorly graded, wet	SP	
10					10 - 12 Light brown/gray, fine to medium sand, poorly graded	SP	
11							
12							

Bottom of Boring - 12' bgs

NOTES: No observable impacts

WELL/PIEZOMETER CONSTRUCTION DIAGRAM STICKUP

LOCATION ID: PZ-301

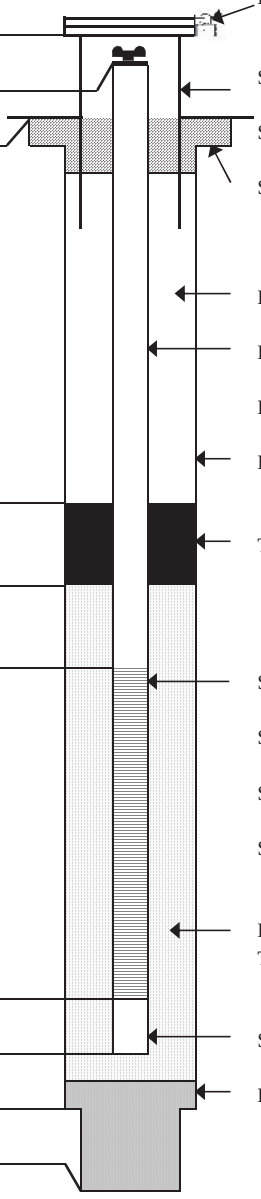
Project Name:	*Saranac Lake Gas Company*			Date Started: 11/17/2016	Date Completed: 11/17/2016
Project Location:	*Saranac Lake, NY*			Logged By: D. Farrell	
Project Number:	*3611161193*	Task Number	.03	Checked By: B. Havens	Checked Date: 1/5/2017
Subcontractor:	Precision Environmental	Drilling Method:	Direct Push		
Development Method:	Low Flow / Purge	Development Date:	01/20/2017		
Bucking Posts/Ballards:	NA				
Notes:					

Measuring Point Information

Measuring Point (MP) Type Top Of Riser

MP Elevation (ft):

Item	Depth BMP (ft)	Elevation (ft)
Stickup		
Riser Pipe (Top)		
Ground Surface Elevation		
Top of Well Seal	0.0	
Top of Sand Pack	1.0 ft bgs	
Top of Screen	2.0 ft bgs	
Base of Screen	12.0 ft bgs	
End Cap	12.0 ft bgs	
Drilled Depth	12.0 ft bgs	
Bottom of Exploration	12.0 ft bgs	
Bedrock Surface	NA	



Description	
Lock Identification	NA
Stickup Casing Type:	NA
Stickup Casing Diameter:	NA
Surface Seal Type:	Hydrated 3/8 Bentonite
Backfill/Grout Type:	Hydrated 3/8 Bentonite
Riser Pipe Type:	1 3/8 Sch. 40 PVC
Riser Pipe ID:	1 "
Borehole Diameter:	2.25"
Type of Seal:	Hydrated 3/8 Bentonite
Screen Type:	Slotted 1 3/8 Sch. 40 PVC
Screen ID:	1"
Screen Slot Size:	0.010"
Screen Length:	10'
Filter/Sand Pack Type:	#1 Sand (Filpro Quartz)
Sump:	
Fallback/Backfill:	NA

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.7
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - STICKUP
NYSDEC QUALITY ASSURANCE PROJECT PLAN

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

Project Name:	***Saranac Lake Gas Company***		Boring ID: SB/PZ-302
Project Location:	Saranac Lake, NY		Page No. 1
Project No.: 3611161193	Client: NYSDEC		of: 1
Boring Location: ~50 ft east of MW-104	Refusal Depth: NA	Total Depth: 16' bgs	Bore Hole ID/OD: 2.25"
Weather: Overcast (35° F)	Soil Drilled: 16'	Method: Direct Push	Casing Size: 2.25"
Subcontractor: Precision Environmental		Protection Level: D	Sampler: Macrocore
Driller: Mike Dudley	Date Started: 11/9/2016	Date Completed: 11/9/2016	Sampler ID/OD: 2.0"
Rig Type/Model: Geoprobe/Bobcat	Logged By: D. Farrell	Checked By: B. Havens	
Reference Elevation:	Water Level: ~ 9.6 ft bgs	Time: 920	

Sample Information			Monitoring				
Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	PID	Waste Encountered	Sample Description and Classification	USCS Group Symbol	Remarks
1			0.9	NOI	0 - 1.1 No recovery 1.1 - 1.2 Black.dark brown, organics, fine sand, poorly graded	Pt	
2	1	4.0/2.9	(see note)		1.2 - 4.0 Light orange/light brown, fine sand, poorly graded, moist	SP	
3			0.9				
4							
5			0.9	NOI	4.0 - 8.0 Light orange/light brown, fine sand, poorly graded, moist	SP	
6	2	4.0/4.0					
7			0.9				
8							
9			0.9	NOI	8.0 - 8.3 Cave-in from above 8.3 - 8.5 Brown, fine sands with trace silts, poorly graded, moist	SP SP	
10	3	4.0/4.0			8.5 - 12 Light brown, fine sands with some silts, poorly graded, wet	SM	▽ 9.6 ft bgs
11			0.9				
12							
13			0.9	NOI	12.0 - 12.4 Cave-in from above 12.4 - 16.0 Light brown, fine to medium sands, poorly graded	SP	
14	4	4.0/4.0					
15			0.9				
16					Bottom of Boring - 16' bgs		

NOTES: No observable impacts
Well installed 6 - 16'bgs
PID recalibrated after boring, reading 0.9 ppm as background ambient

SOIL BORING LOG

WELL/PIEZOMETER CONSTRUCTION DIAGRAM STICKUP

LOCATION ID: PZ-302

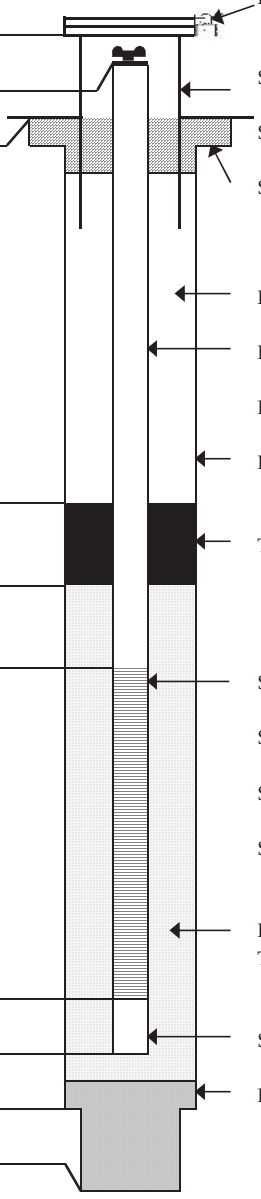
Project Name:	*Saranac Lake Gas Company*			Date Started: 11/9/2016	Date Completed: 11/9/2016
Project Location:	*Saranac Lake, NY*			Logged By: D. Farrell	
Project Number:	*3611161193*	Task Number	.03	Checked By: B. Havens	Checked Date: 1/5/2017
Subcontractor:	Precision Environmental	Drilling Method:	Direct Push		
Development Method:	Low Flow / Purge	Development Date:	11/18/2016		
Bucking Posts/Ballards:	NA				
Notes:					

Measuring Point Information

Measuring Point (MP) Type Top Of Riser

MP Elevation (ft):

Item	Depth BMP (ft)	Elevation (ft)
Stickup		
Riser Pipe (Top)	3.90	
Ground Surface Elevation		
Top of Well Seal	0.0	
Top of Sand Pack	3.0 ft bgs	
Top of Screen	6.0 ft bgs	
Base of Screen	16.0 ft bgs	
End Cap	16.0 ft bgs	
Drilled Depth	16.0 ft bgs	
Bottom of Exploration	16.0 ft bgs	
Bedrock Surface	NA	



Description	
Lock Identification	NA
Stickup Casing Type:	NA
Stickup Casing Diameter:	NA
Surface Seal Type:	Hydrated 3/8 Bentonite
Backfill/Grout Type:	Hydrated 3/8 Bentonite
Riser Pipe Type:	1 3/8 Sch. 40 PVC
Riser Pipe ID:	1 "
Borehole Diameter:	2.25"
Type of Seal:	Hydrated 3/8 Bentonite
Screen Type:	Slotted 1 3/8 Sch. 40 PVC
Screen ID:	1"
Screen Slot Size:	0.010"
Screen Length:	10'
Filter/Sand Pack Type:	#1 Sand (Filpro Quartz)
Sump:	
Fallback/Backfill:	NA

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.7
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - STICKUP
NYSDEC QUALITY ASSURANCE PROJECT PLAN

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

Project Name:	***Saranac Lake Gas Company***		Boring ID: SB/PZ-303
Project Location:	Saranac Lake, NY		Page No. 1
Project No.: 3611161193	Client: NYSDEC		of: 1
Boring Location: ~50 ft east of SB-304	Refusal Depth: 7.5 ' bgs	Total Depth: 7.5' bgs	Bore Hole ID/OD: 2.25"
Weather: Overcast (35° F)	Soil Drilled: 7.5'	Method: Direct Push	Casing Size: 2.25"
Subcontractor: Precision Environmental		Protection Level: D	Sampler: Macrocore
Driller: Mike Dudley	Date Started: 11/9/2016	Date Completed: 11/9/2016	Sampler ID/OD: 2.0"
Rig Type/Model: Geoprobe/Bobcat	Logged By: D. Farrell	Checked By: B. Havens	
Reference Elevation:	Water Level: ~ 2.5 ft bgs	Time: 1115	

Sample Information			Monitoring				
Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	PID	Waste Encountered	Sample Description and Classification	USCS Group Symbol	Remarks
1	1	4.0/2.0	0.0	NOI	0 - 2.0 No recovery 2.0 - 2.6 Organics, change to light brown/dark gray, fine sands with trace silts, poorly graded wet at 2.5	Pt/SM	
2							
3			0/0		2.6 - 4.0 Gray fine to medium sand, poorly graded wet	SP	▽ 2.5 ft bgs
4							
5	2	3.5/0.0	0.0	NOI	- No recovery, unable to collect core from macrocore sampler due to buildup of fine sands - What soil we push from sampler shows no signs of waste impacts - Soils are a light brown/gray, fine to medium sand, poorly graded, wet	SP	
6							
7							
7.5							

Bottom of Boring - Refusal at 7.5' bgs

NOTES: No observable impacts
Well installed 3 - 8' bgs

SOIL BORING LOG

WELL/PIEZOMETER CONSTRUCTION DIAGRAM STICKUP

LOCATION ID: PZ-303

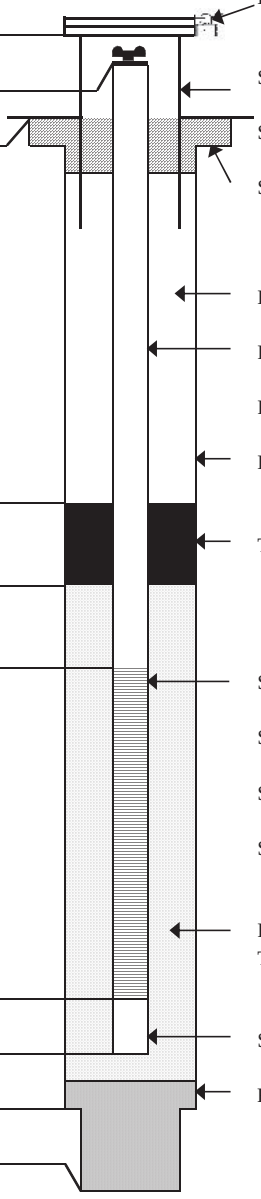
Project Name:	*Saranac Lake Gas Company*			Date Started: 11/9/2016	Date Completed: 11/9/2016
Project Location:	*Saranac Lake, NY*			Logged By: D. Farrell	
Project Number:	*3611161193*	Task Number	.03	Checked By: B. Havens	Checked Date: 1/5/2017
Subcontractor:	Precision Environmental	Drilling Method:	Direct Push		
Development Method:	Low Flow / Purge	Development Date:	11/18/2016		
Bucking Posts/Ballards:	NA				
Notes:					

Measuring Point Information

Measuring Point (MP) Type Top Of Riser

MP Elevation (ft):

Item	Depth BMP (ft)	Elevation (ft)
Stickup		
Riser Pipe (Top)	1.92	
Ground Surface Elevation		
Top of Well Seal	0.0	
Top of Sand Pack	1.5 ft bgs	
Top of Screen	3.0 ft bgs	
Base of Screen	8.0 ft bgs	
End Cap	8.0 ft bgs	
Drilled Depth	8.0 ft bgs	
Bottom of Exploration	8.0 ft bgs	
Bedrock Surface	NA	



Description	
Lock Identification	NA
Stickup Casing Type:	NA
Stickup Casing Diameter:	NA
Surface Seal Type:	Hydrated 3/8 Bentonite
Backfill/Grout Type:	Hydrated 3/8 Bentonite
Riser Pipe Type:	1 3/8 Sch. 40 PVC
Riser Pipe ID:	1 "
Borehole Diameter:	2.25"
Type of Seal:	Hydrated 3/8 Bentonite
Screen Type:	Slotted 1 3/8 Sch. 40 PVC
Screen ID:	1"
Screen Slot Size:	0.010"
Screen Length:	5'
Filter/Sand Pack Type:	#1 Sand (Filpro Quartz)
Sump:	
Fallback/Backfill:	NA

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.7
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - STICKUP
NYSDEC QUALITY ASSURANCE PROJECT PLAN

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

Project Name:	***Saranac Lake Gas Company***		Boring ID: SB/PZ-304
Project Location:	Saranac Lake, NY		Page No. 1
Project No.: 3611161193	Client: NYSDEC		of: 1
Boring Location:	Refusal Depth: NA	Total Depth: 12' bgs	Bore Hole ID/OD: 2.25"
Weather: Overcast (35° F)	Soil Drilled: 12 '	Method: Direct Push	Casing Size: 2.25"
Subcontractor: Precision Environmental		Protection Level: D	Sampler: Macrocore
Driller: Mike Dudley	Date Started: 11/9/2016	Date Completed: 11/9/2016	Sampler ID/OD: 2.0"
Rig Type/Model: Geoprobe/Bobcat	Logged By: D. Farrell	Checked By: B. Havens	
Reference Elevation:	Water Level: ~ 6.5 ft bgs	Time: 1040	

Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	PID	Waste Encountered	Sample Description and Classification	USCS Group Symbol	Remarks
1	1	4.0/2.1	0.0	NOI	0 - 1.9 No recovery		
2					1.9 - 2.9 Organics, dark brown fine sand, trace silt, poorly graded leaves/twigs	SP	
3					2.9 - 4.0 Light brown, fine sand, poorly graded, moist	SP	
4							
5	2	4.0/3.8	0.0	NOI	4.0 - 4.2 No recovery	SP	
6					4.2 - 6.0 Light brown/orange, fine sand, poorly graded, moist		
7					6.0 - 7.8 Light brown, fine sands trace silts, iron in water, wet	SP	▽ 6.5 ft bgs
8					7.8 - 8.0 Gray, fine sands with some silt, wet	SM	
9	3	4.0/2.8	0.0	NOI	- No recovery, unable to collect core from macrocore sampler due to buildup of fine sands	SP	
10					- What soil we push from sampler shows no signs of waste impacts		
11					- Soils are a light brown/brown, fine to medium sand, poorly graded, wet	SP	
12							

Bottom of Boring - 12' bgs

NOTES: No observable impacts
Well installedfrom 1 - 11 ' bgs

SOIL BORING LOG

WELL/PIEZOMETER CONSTRUCTION DIAGRAM STICKUP

LOCATION ID: PZ-304

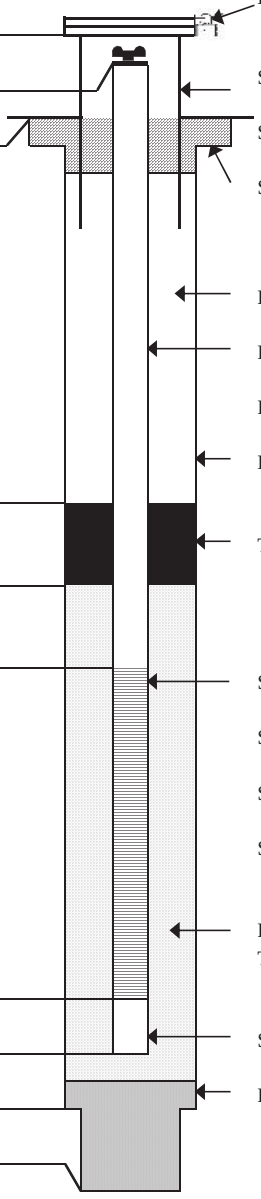
Project Name:	*Saranac Lake Gas Company*			Date Started: 11/9/2016	Date Completed: 11/9/2016
Project Location:	*Saranac Lake, NY*			Logged By: D. Farrell	
Project Number:	*3611161193*	Task Number	.03	Checked By: B. Havens	Checked Date: 1/5/2017
Subcontractor:	Precision Environmental	Drilling Method:	Direct Push		
Development Method:	Low Flow / Purge	Development Date:	11/18/2016		
Bucking Posts/Ballards:	NA				
Notes:					

Measuring Point Information

Measuring Point (MP) Type Top Of Riser

MP Elevation (ft):

Item	Depth BMP (ft)	Elevation (ft)
Stickup		
Riser Pipe (Top)	2.85	
Ground Surface Elevation		
Top of Well Seal	0.0	
Top of Sand Pack	1.0 ft bgs	
Top of Screen	1.0 ft bgs	
Base of Screen	11.0 ft bgs	
End Cap	11.0 ft bgs	
Drilled Depth	12.0 ft bgs	
Bottom of Exploration	12.0 ft bgs	
Bedrock Surface	NA	



Description	
Lock Identification	NA
Stickup Casing Type:	NA
Stickup Casing Diameter:	NA
Surface Seal Type:	Hydrated 3/8 Bentonite
Backfill/Grout Type:	Hydrated 3/8 Bentonite
Riser Pipe Type:	1 3/8 Sch. 40 PVC
Riser Pipe ID:	1 "
Borehole Diameter:	2.25"
Type of Seal:	Hydrated 3/8 Bentonite
Screen Type:	Slotted 1 3/8 Sch. 40 PVC
Screen ID:	1"
Screen Slot Size:	0.010"
Screen Length:	10'
Filter/Sand Pack Type:	#1 Sand (Filpro Quartz)
Sump:	
Fallback/Backfill:	1.0'

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.7
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - STICKUP
NYSDEC QUALITY ASSURANCE PROJECT PLAN

WELL/PIEZOMETER CONSTRUCTION DIAGRAM STICKUP

LOCATION ID: PZ-311

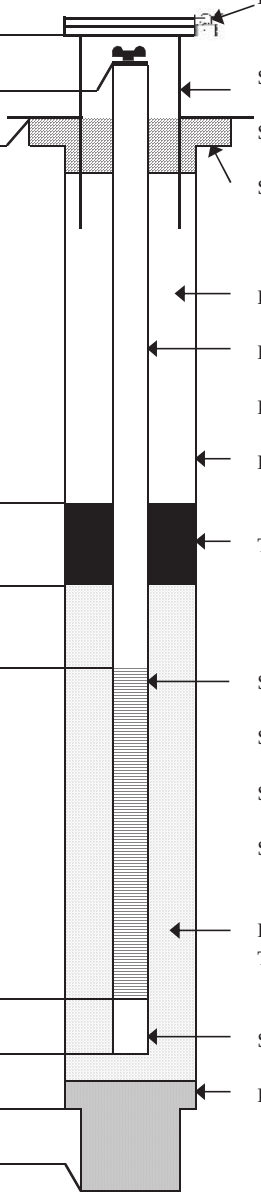
Project Name:	*Saranac Lake Gas Company*			Date Started: 11/17/2016	Date Completed: 11/17/2016
Project Location:	*Saranac Lake, NY*			Logged By: D. Farrell	
Project Number:	*3611161193*	Task Number	.03	Checked By: B. Havens	Checked Date: 1/5/2017
Subcontractor:	Precision Environmental	Drilling Method:	Direct Push		
Development Method:	Low Flow / Purge	Development Date:	01/20/2017		
Bucking Posts/Ballards:	NA				
Notes:					

Measuring Point Information

Measuring Point (MP) Type Top Of Riser

MP Elevation (ft):

Item	Depth BMP (ft)	Elevation (ft)
Stickup		
Riser Pipe (Top)		
Ground Surface Elevation		
Top of Well Seal	0.0	
Top of Sand Pack	1.0 ft bgs	
Top of Screen	2.0 ft bgs	
Base of Screen	12.0 ft bgs	
End Cap	12.0 ft bgs	
Drilled Depth	12.0 ft bgs	
Bottom of Exploration	12.0 ft bgs	
Bedrock Surface	NA	



Description	
Lock Identification	NA
Stickup Casing Type:	NA
Stickup Casing Diameter:	NA
Surface Seal Type:	Hydrated 3/8 Bentonite
Backfill/Grout Type:	Hydrated 3/8 Bentonite
Riser Pipe Type:	1 3/8 Sch. 40 PVC
Riser Pipe ID:	1 "
Borehole Diameter:	2.25"
Type of Seal:	Hydrated 3/8 Bentonite
Screen Type:	Slotted 1 3/8 Sch. 40 PVC
Screen ID:	1"
Screen Slot Size:	0.010"
Screen Length:	10'
Filter/Sand Pack Type:	#1 Sand (Filpro Quartz)
Sump:	
Fallback/Backfill:	NA

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.7
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - STICKUP
NYSDEC QUALITY ASSURANCE PROJECT PLAN

WELL/PIEZOMETER CONSTRUCTION DIAGRAM
FLUSHMOUNT

LOCATION ID: PZ-317

Project Name:	*Saranac Lake Gas Company*		
Project Location:	*Saranac Lake, NY*		
Project Number:	*3611161193*	Task Number	.03
Subcontractor:	Precision Environmental	Drilling Method:	Direct Push
Development Method:	Low Flow / Purge	Development Date:	11/18/2016
Bucking Posts/Ballards:	NA		
Notes:			

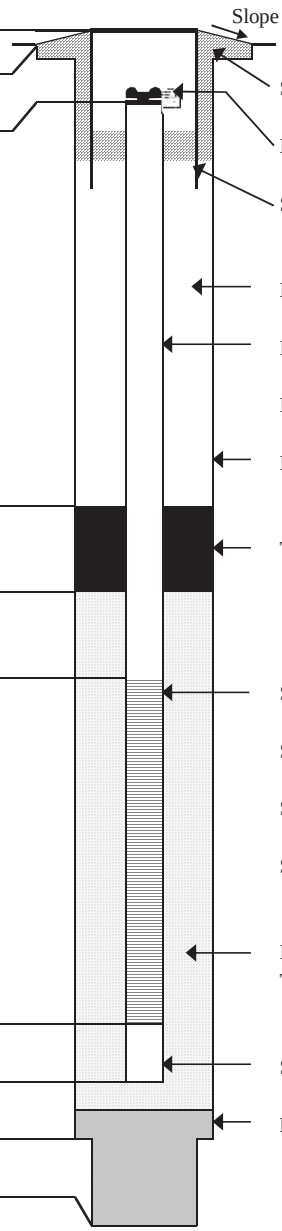
Date Started:	11/9/2016	Date Completed:	11/9/2016
Logged By:	D. Farrell		
Checked By:	B. Havens	Checked Date:	1/5/2017

Measuring Point Information

Measuring Point (MP) Type: Top Of Riser

MP Elevation (ft):

Item	Depth BMP (ft)	Elevation (ft)
Surface Casing Elevation		
Ground Surface Elevation		
Riser Pipe (Top)		
Top of Well Seal	0.0	
Top of Sand Pack	2.0 ft bgs	
Top of Screen	3.0 ft bgs	
Base of Screen	8.0 ft bgs	
End Cap	8.0 ft bgs	
Drilled Depth	9.5 ft bgs	
Bottom of Exploration	9.5 ft bgs	
Bedrock Surface	NA	



Description	
Surface Seal Type:	Concrete
Lock Identification	NA
Stickup Casing Diameter:	
Backfill/Grout Type:	Hydrated 3/8 Bentonite
Riser Pipe Type:	1 3/8 Sch. 40 PVC
Riser Pipe ID:	1 "
Borehole Diameter:	2.25"
Type of Seal:	Hydrated 3/8 Bentonite
Screen Type:	Slotted 1 3/8 Sch. 40 PVC
Screen ID:	1"
Screen Slot Size:	0.010"
Screen Length:	5'
Filter/Sand Pack Type:	#1 Sand (Filpro Quartz)
Sump:	
Fallback/Backfill:	1.5 '

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.8
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - FLUSHMOUNT
NYSDEC QUALITY ASSURANCE PROJECT PLAN

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

Project Name:	***Saranac Lake Gas Company***		Boring ID: SB/PZ-318
Project Location:	Saranac Lake, NY		Page No. 1
Project No.: 3611161193	Client: NYSDEC		of: 1
Boring Location: Front yard of foreclosed home	Refusal Depth: NA	Total Depth: 12' bgs	Bore Hole ID/OD: 2.25"
Weather: Overcast (40° F)	Soil Drilled: 12'	Method: Direct Push	Casing Size: 2.25"
Subcontractor: Precision Environmental		Protection Level: D	Sampler: Macrocore
Driller: Mike Dudley	Date Started: 11/9/2016	Date Completed: 11/9/2016	Sampler ID/OD: 2.0"
Rig Type/Model: Geoprobe/Bobcat	Logged By: D. Farrell	Checked By: B. Havens	
Reference Elevation:	Water Level: ~ 3.0 ft bgs	Time: 1430	

Sample Information			Monitoring				
Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	PID	Waste Encountered	Sample Description and Classification	USCS Group Symbol	Remarks
1	1	4.0/2.1	0.0	NOI	0 - 1.9 No recovery		
2					1.9 - 2.0 Organics, dark brown fine sand, trace silt, poorly graded leaves/twigs	SP	
3					2.0 - 3.7 Light brown/light gray, fine sand with some gravel with trace silts, well graded	SP	▽ 3.0 ft bgs
4					3.7 - 4.0 Gray, fine to medium sand, poorly graded, wet	SP	
5	2	4.0/0.6	0.0	NOI	Much of the macrocore sample fell onto table due to looseness of soils. NOI in soil	SP	
6							
7					Soils are a gray, fine to medium sand, poorly graded, wet	SP	
8							
9	3	4.0/4.0	0.0	NOI	8.0 - 8.8 Gray, fine to medium sand, poorly graded, wet	SP	
10					8.8 - 11.0 Dark brown/dark gray, fine sands with trace silts, poorly graded, wet		
11					11.0 - 12.0 Gray, fine sands with trace grave, poorly graded, wet	SP	
12							

Bottom of Boring - 12' bgs

NOTES: No observable impacts
Well installed 3 - 8' bgs

SOIL BORING LOG

WELL/PIEZOMETER CONSTRUCTION DIAGRAM
FLUSHMOUNT

LOCATION ID: PZ-318

Project Name:	*Saranac Lake Gas Company*		
Project Location:	*Saranac Lake, NY*		
Project Number:	*3611161193*	Task Number	.03
Subcontractor:	Precision Environmental	Drilling Method:	Direct Push
Development Method:	Low Flow / Purge	Development Date:	11/18/2016
Bucking Posts/Ballards:	NA		
Notes:			

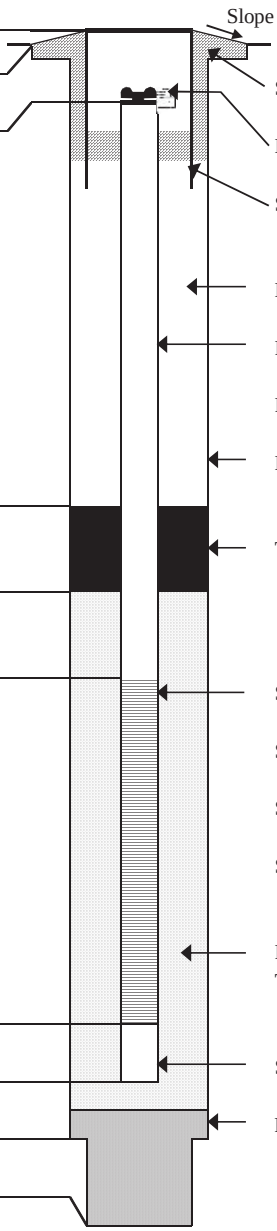
Date Started:	11/9/2016	Date Completed:	11/9/2016
Logged By:	D. Farrell		
Checked By:	B. Havens	Checked Date:	1/5/2017

Measuring Point Information

Measuring Point (MP) Type: Top Of Riser

MP Elevation (ft):

Item	Depth BMP (ft)	Elevation (ft)
Surface Casing Elevation		
Ground Surface Elevation		
Riser Pipe (Top)		
Top of Well Seal	0.0	
Top of Sand Pack	1.5 ft bgs	
Top of Screen	3.0 ft bgs	
Base of Screen	8.0 ft bgs	
End Cap	8.0 ft bgs	
Drilled Depth	12.0 ft bgs	
Bottom of Exploration	12.0 ft bgs	
Bedrock Surface	NA	

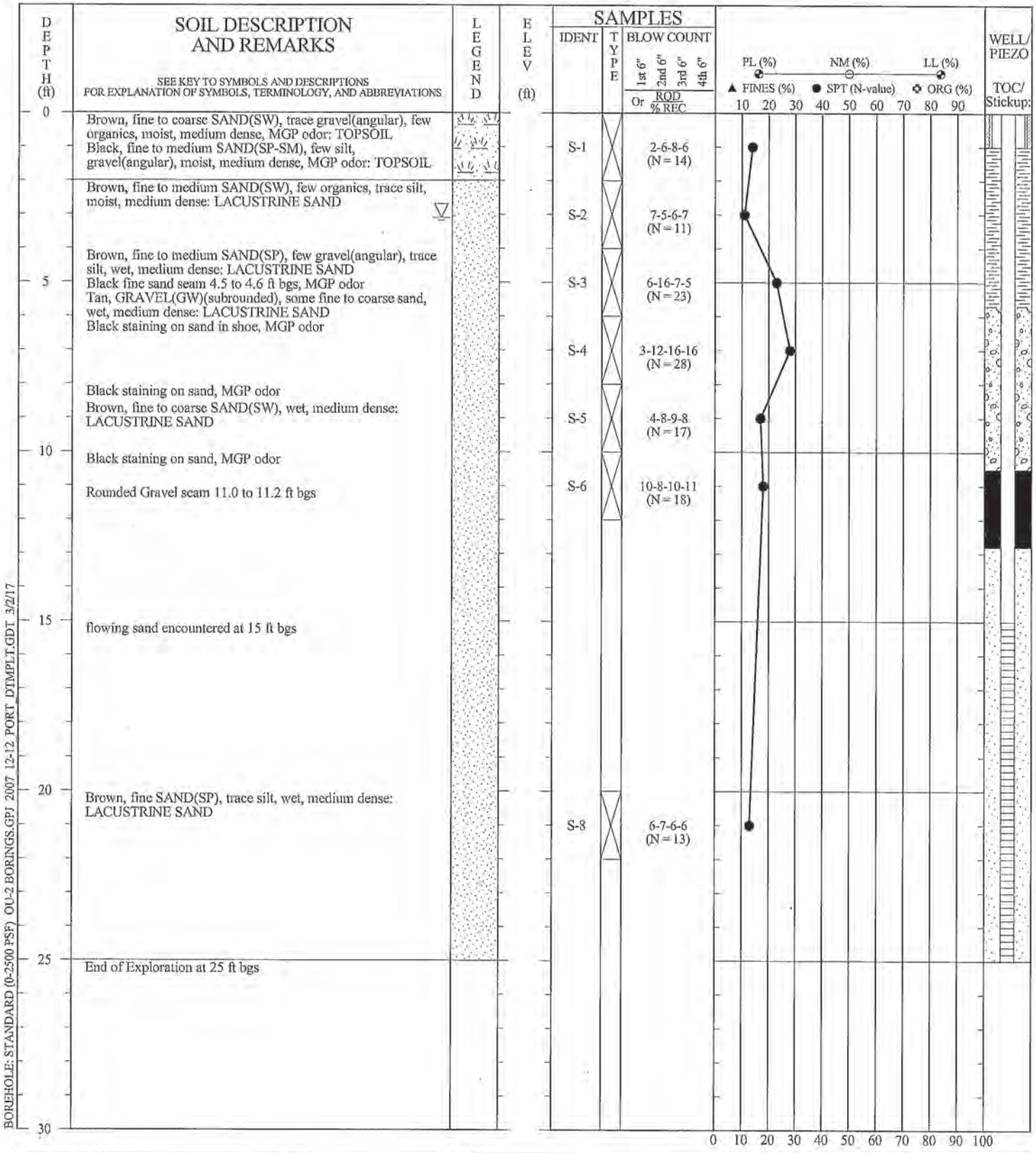


Description	
Surface Seal Type:	Concrete
Lock Identification	NA
Stickup Casing Diameter:	
Backfill/Grout Type:	Hydrated 3/8 Bentonite
Riser Pipe Type:	1 3/8 Sch. 40 PVC
Riser Pipe ID:	1 "
Borehole Diameter:	2.25"
Type of Seal:	Hydrated 3/8 Bentonite
Screen Type:	Slotted 1 3/8 Sch. 40 PVC
Screen ID:	1"
Screen Slot Size:	0.010"
Screen Length:	5'
Filter/Sand Pack Type:	#1 Sand (Filpro Quartz)
Sump:	
Fallback/Backfill:	4.0 '

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.8
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - FLUSHMOUNT
NYSDEC QUALITY ASSURANCE PROJECT PLAN



BOREHOLE: STANDARD (0-2500 PSF) OU-2 BORINGS.GPJ 2007 12-12 PORT_DTMPLT.GDT 3/2/17

DRILLER:	Aztech Enviromental Technologies
RIG TYPE:	Geo Probe 3230DT
METHOD:	Hollow-Stem Augers
HOLE DIAM.:	4.25" ID
SPTs:	140 lb auto hammer
REMARKS:	Boring was backfilled with cement grout. Soil cuttings and water were placed in drums.

LOGGED BY: JC CHECKED BY/DATE: JB / 3-2-2017

THIS BORING RECORD PRESENTS A REASONABLE INTERPRETATION OF THE SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS MAY DIFFER. STRATA INTERFACES (AS SHOWN) ARE APPROXIMATE. ACTUAL TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

GEOTECHNICAL BORING RECORD

BORING NO.:	SB/PZ-328
DRILLED:	11/29/2016
PROJECT:	Saranac Lake Gas Company
LOCATION:	Saranac Lake, NY
PROJECT NO.:	3611161193.03

MACTEC

WELL/PIEZOMETER CONSTRUCTION DIAGRAM
FLUSHMOUNT

LOCATION ID: PZ-328

Project Name:	*Saranac Lake Gas Company*		
Project Location:	*Saranac Lake, NY*		
Project Number:	*3611161193*	Task Number	.03
Subcontractor:	Precision Environmental	Drilling Method:	Direct Push
Development Method:	Low Flow / Purge	Development Date:	11/18/2016
Bucking Posts/Ballards:	NA		
Notes:			

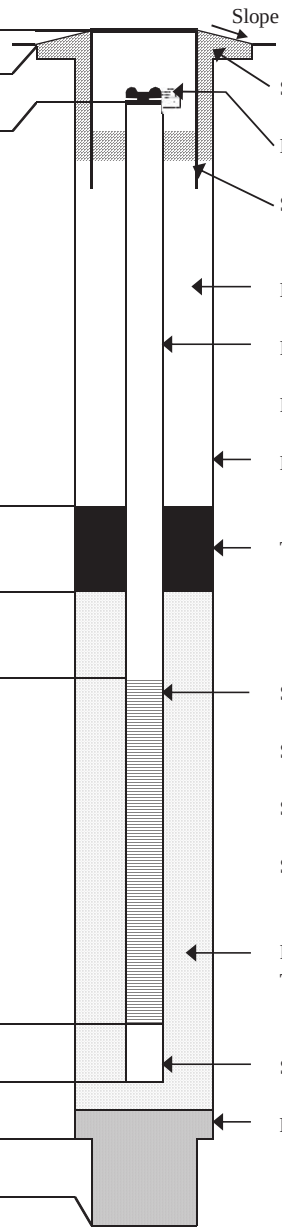
Date Started:	11/10/2016	Date Completed:	11/10/2016
Logged By:	D. Farrell		
Checked By:	B. Havens	Checked Date:	1/5/2017

Measuring Point Information

Measuring Point (MP) Type: Top Of Riser

MP Elevation (ft):

Item	Depth BMP (ft)	Elevation (ft)
Surface Casing Elevation		
Ground Surface Elevation		
Riser Pipe (Top)		
Top of Well Seal	0.0	
Top of Sand Pack	2.0 ft bgs	
Top of Screen	3.0 ft bgs	
Base of Screen		
End Cap		
Drilled Depth	15.0 ft bgs	
Bottom of Exploration	15.0 ft bgs	
Bedrock Surface	NA	

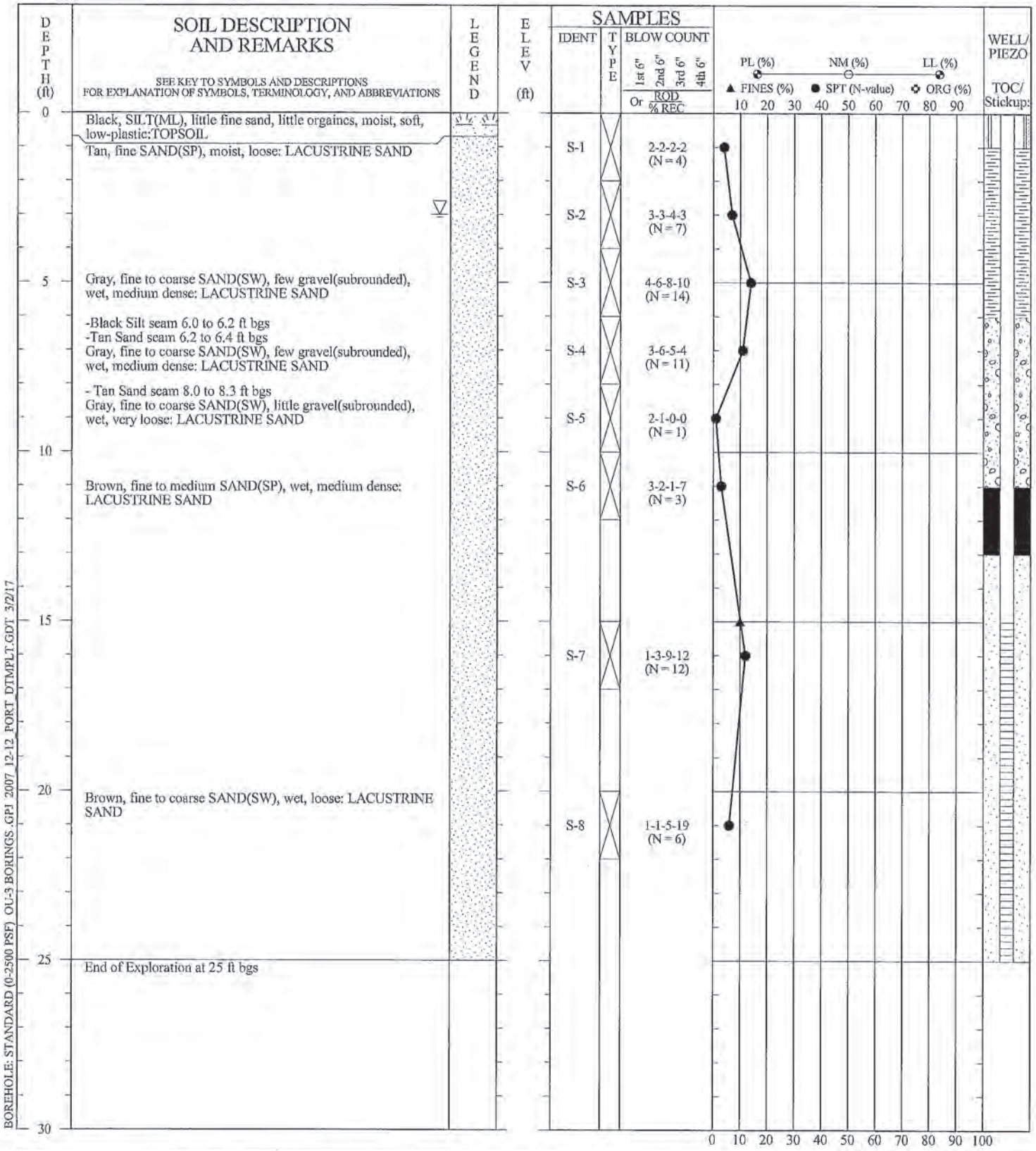


Description	
Surface Seal Type:	Concrete
Lock Identification	NA
Stickup Casing Diameter:	
Backfill/Grout Type:	Hydrated 3/8 Bentonite
Riser Pipe Type:	1 3/8 Sch. 40 PVC
Riser Pipe ID:	1 "
Borehole Diameter:	2.25"
Type of Seal:	Hydrated 3/8 Bentonite
Screen Type:	Slotted 1 3/8 Sch. 40 PVC
Screen ID:	1"
Screen Slot Size:	0.010"
Screen Length:	5'
Filter/Sand Pack Type:	#1 Sand (Filpro Quartz)
Sump:	
Fallback/Backfill:	

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.8
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - FLUSHMOUNT
NYSDEC QUALITY ASSURANCE PROJECT PLAN



BOREHOLE: STANDARD (0-2500 PSF) OU-3 BORINGS.GPJ 2007_12-12_PORT_DTMPLT.GDT 3/2/17

DRILLER:	Aztech Enviromental Technologies
RIG TYPE:	Geo Probe 3230DT
METHOD:	Hollow-Stem Augers
HOLE DIAM.:	4.25" ID
SPTs:	140 lb auto hammer
REMARKS:	Boring was backfilled with cement grout. Soil cuttings and water were placed in drums.

LOGGED BY: JC CHECKED BY/DATE: JB / 3/2/2017

THIS BORING RECORD PRESENTS A REASONABLE INTERPRETATION OF THE SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS MAY DIFFER. STRATA INTERFACES (AS SHOWN) ARE APPROXIMATE. ACTUAL TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

GEOTECHNICAL BORING RECORD

BORING NO.:	SB/PZ-331
DRILLED:	11/28/2016
PROJECT:	Saranac Lake Gas Company
LOCATION:	Saranac Lake, NY
PROJECT NO.:	3611161193.03

MACTEC

SOIL BORING LOG

MACTEC

511 Congress Street, Portland Maine 04101

Project Name:	***Saranac Lake Gas Company***		Boring ID: SB/PZ-332
Project Location:	Saranac Lake, NY		Page No. 1
Project No.: 3611161193	Client: NYSDEC		of: 1
Boring Location: Yard of Adrirondack Inn	Refusal Depth: 9.0' bgs	Total Depth: 9.0' bgs	Bore Hole ID/OD: 2.25"
Weather: Overcast (40° F)	Soil Drilled: 9.0 '	Method: Direct Push	Casing Size: 2.25"
Subcontractor: Precision Environmental		Protection Level: D	Sampler: Macrocore
Driller: Mike Dudley	Date Started: 11/10/2016	Date Completed: 11/10/2016	Sampler ID/OD: 2.0"
Rig Type/Model: Geoprobe/Bobcat	Logged By: D. Farrell	Checked By: B. Havens	
Reference Elevation:	Water Level: ~ 1.1 ft bgs	Time: 715	

Sample Information			Monitoring				
Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	PID	Waste Encountered	Sample Description and Classification	USCS Group Symbol	Remarks
1	1	4.0/2.3	0.0	NOI	0 - 1.7 No recovery 1.7 - 2.0 Organics, brown fine sand, grass 2.0 - 4.0 Brown, fine sand with trace silts, moist to wet, poorly graded	SP	▽ 1.1 ft bgs
2							
3							
4							
5	2	4.0/3.8	0.0	NOI	4.0 - 4.2 No recovery 4.2 - 6.2 Gray, medium sands with trace gravel, wet, poorly graded 6.2 - 8.0 Light brown/gray, fine sand with trace silts, poorly graded, wet		
6							
7							
8							
9	3	1.0/1.0	0.0	NOI	8.0 - 9.0 Dark gray, medium sands, some gravel, poorly graded, wet		

Bottom of Boring - Refusal - 9.0' bgs

NOTES: No observable impacts

WELL/PIEZOMETER CONSTRUCTION DIAGRAM
FLUSHMOUNT

LOCATION ID: PZ-332

Project Name:	*Saranac Lake Gas Company*		
Project Location:	*Saranac Lake, NY*		
Project Number:	*3611161193*	Task Number	.03
Subcontractor:	Precision Environmental	Drilling Method:	Direct Push
Development Method:	Low Flow / Purge	Development Date:	11/18/2016
Bucking Posts/Ballards:	NA		
Notes:			

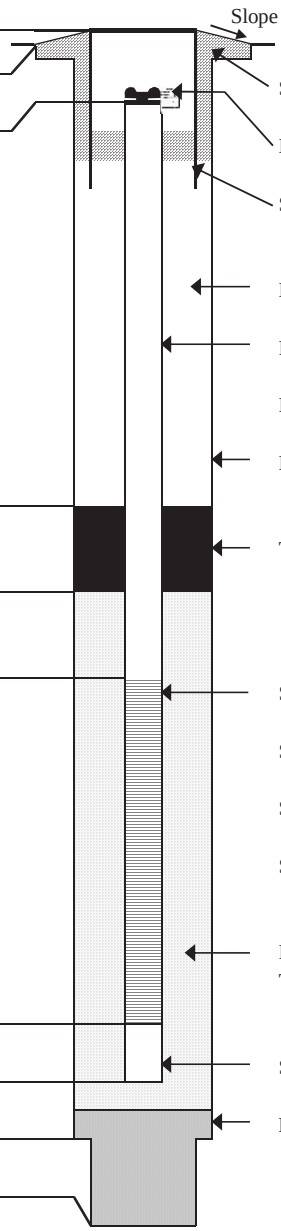
Date Started:	11/10/2016	Date Completed:	11/10/2016
Logged By:	D. Farrell		
Checked By:	B. Havens	Checked Date:	1/5/2017

Measuring Point Information

Measuring Point (MP) Type: Top Of Riser

MP Elevation (ft):

Item	Depth BMP (ft)	Elevation (ft)
Surface Casing Elevation		
Ground Surface Elevation		
Riser Pipe (Top)		
Top of Well Seal	0.0	
Top of Sand Pack	2.0 ft bgs	
Top of Screen	4.0 ft bgs	
Base of Screen	9.0 ft bgs	
End Cap	9.0 ft bgs	
Drilled Depth	9.0 ft bgs	
Bottom of Exploration	9.0 ft bgs	
Bedrock Surface	NA	

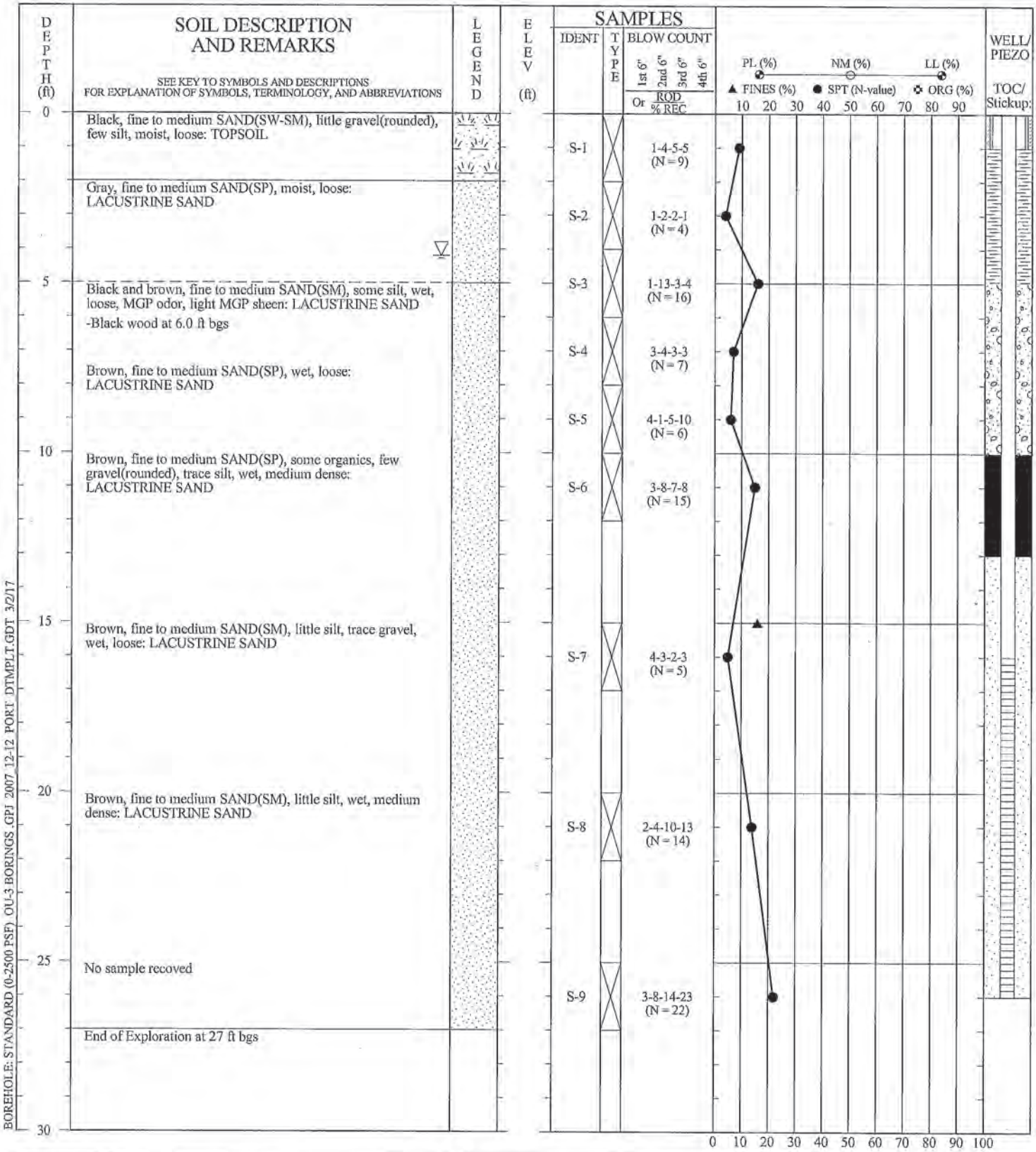


Description	
Surface Seal Type:	Concrete
Lock Identification	NA
Stickup Casing Diameter:	
Backfill/Grout Type:	Hydrated 3/8 Bentonite
Riser Pipe Type:	1 3/8 Sch. 40 PVC
Riser Pipe ID:	1 "
Borehole Diameter:	2.25"
Type of Seal:	Hydrated 3/8 Bentonite
Screen Type:	Slotted 1 3/8 Sch. 40 PVC
Screen ID:	1"
Screen Slot Size:	0.010"
Screen Length:	5'
Filter/Sand Pack Type:	#1 Sand (Filpro Quartz)
Sump:	
Fallback/Backfill:	NA

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.8
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - FLUSHMOUNT
NYSDEC QUALITY ASSURANCE PROJECT PLAN



BOREHOLE: STANDARD (0-2500 PSF) OU-3 BORINGS .GPJ 2007_12-12 PORT_DTMPLT.GDT 3/2/17

DRILLER:	Aztech Enviromental Technologies
RIG TYPE:	Geo Probe 3230DT
METHOD:	Hollow-Stem Augers
HOLE DIAM.:	4.25" ID
SPTs:	140 lb auto hammer
REMARKS:	Boring was backfilled with cement grout. Soil cuttings and water were placed in drums.

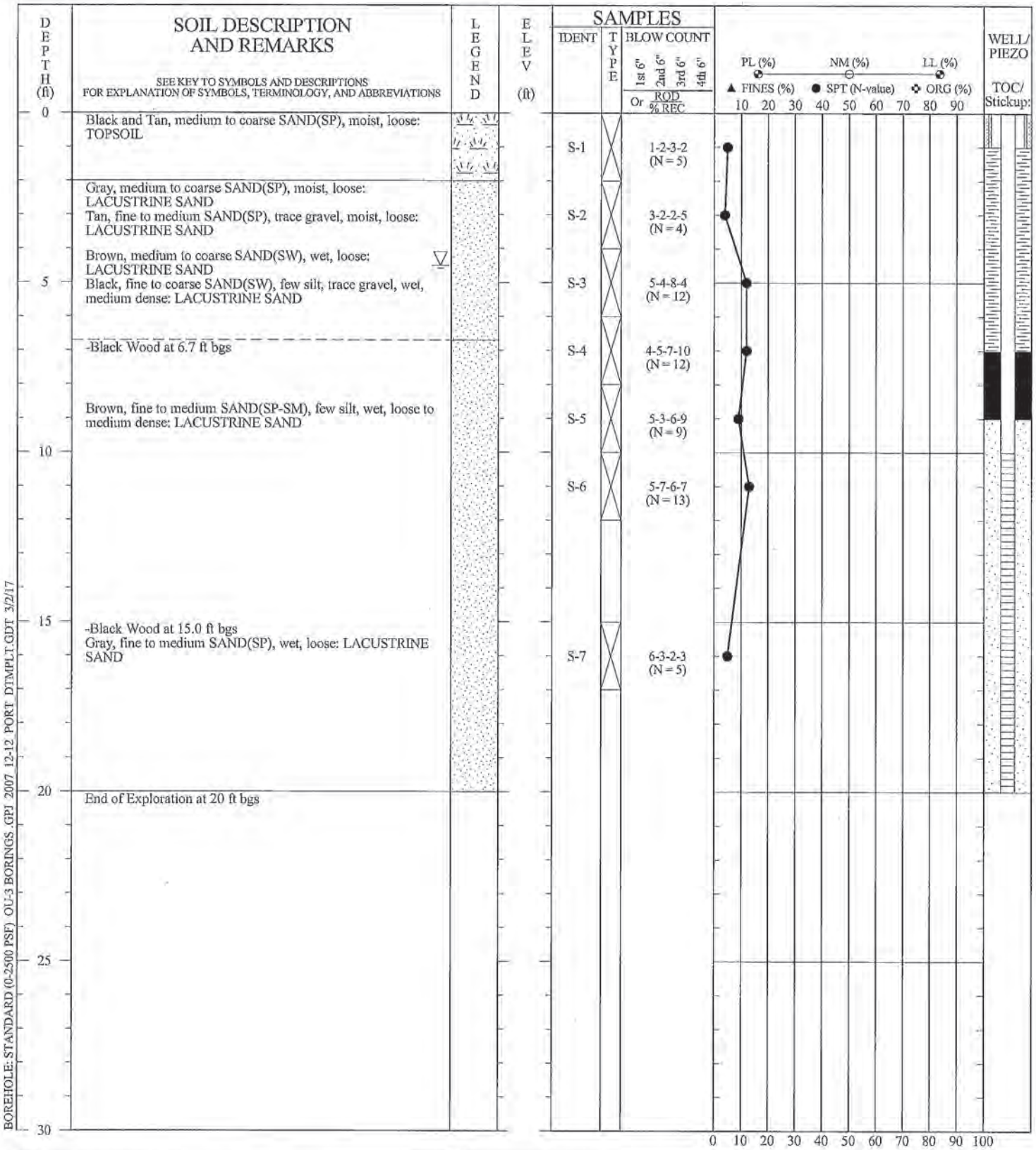
LOGGED BY: JC CHECKED BY/DATE: JB / 3/2/2017

THIS BORING RECORD PRESENTS A REASONABLE INTERPRETATION OF THE SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS MAY DIFFER. STRATA INTERFACES (AS SHOWN) ARE APPROXIMATE. ACTUAL TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

GEOTECHNICAL BORING RECORD

BORING NO.:	SB/PZ-335
DRILLED:	11/23/2016
PROJECT:	Saranac Lake Gas Company
LOCATION:	Saranac Lake, NY
PROJECT NO.:	3611161193.03

MACTEC



BOREHOLE: STANDARD (0-2500 PSF) OU-3 BORINGS .GPJ 2007 12-12 PORT DTMPLT.GDT 3/2/17

DRILLER:	Aztech Environmental Technologies
RIG TYPE:	Geo Probe 3230DT
METHOD:	Hollow-Stem Augers
HOLE DIAM.:	4.25" ID
SPTs:	140 lb auto hammer
REMARKS:	Boring was backfilled with cement grout. Soil cuttings and water were placed in drums.

LOGGED BY: JC CHECKED BY/DATE: JB / 3/2/2017

THIS BORING RECORD PRESENTS A REASONABLE INTERPRETATION OF THE SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS MAY DIFFER. STRATA INTERFACES (AS SHOWN) ARE APPROXIMATE. ACTUAL TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

GEOTECHNICAL BORING RECORD

BORING NO.:	SB/PZ-336
DRILLED:	11/22/2016
PROJECT:	Saranac Lake Gas Company
LOCATION:	Saranac Lake, NY
PROJECT NO.:	3611161193.03

MACTEC

WELL/PIEZOMETER CONSTRUCTION DIAGRAM STICKUP

LOCATION ID: PZ-337

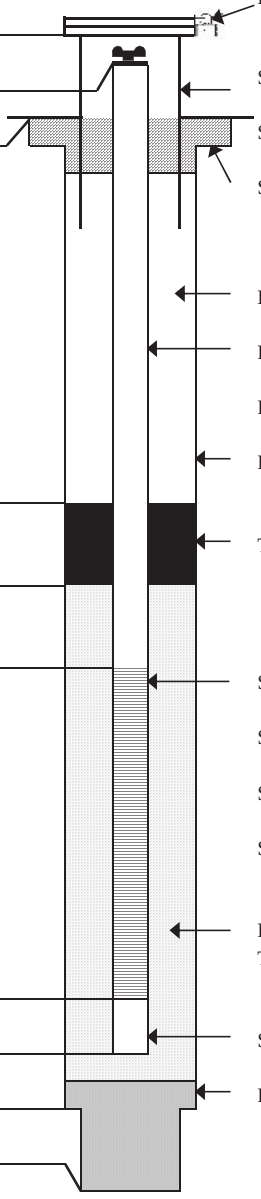
Project Name:	*Saranac Lake Gas Company*			Date Started: 11/17/2016	Date Completed: 11/17/2016
Project Location:	*Saranac Lake, NY*			Logged By: D. Farrell	
Project Number:	*3611161193*	Task Number	.03	Checked By: B. Havens	Checked Date: 1/5/2017
Subcontractor:	Precision Environmental	Drilling Method:	Direct Push		
Development Method:	Low Flow / Purge	Development Date:	01/20/2017		
Bucking Posts/Ballards:	NA				
Notes:					

Measuring Point Information

Measuring Point (MP) Type Top Of Riser

MP Elevation (ft):

Item	Depth BMP (ft)	Elevation (ft)
Stickup		
Riser Pipe (Top)		
Ground Surface Elevation		
Top of Well Seal	0.0	
Top of Sand Pack	3.5 ft bgs	
Top of Screen	7.0 ft bgs	
Base of Screen	17.0 ft bgs	
End Cap	17.0 ft bgs	
Drilled Depth	20.0 ft bgs	
Bottom of Exploration	20.0 ft bgs	
Bedrock Surface	NA	



Description	
Lock Identification	NA
Stickup Casing Type:	NA
Stickup Casing Diameter:	NA
Surface Seal Type:	Hydrated 3/8 Bentonite
Backfill/Grout Type:	Hydrated 3/8 Bentonite
Riser Pipe Type:	1 3/8 Sch. 40 PVC
Riser Pipe ID:	1 "
Borehole Diameter:	2.25"
Type of Seal:	Hydrated 3/8 Bentonite
Screen Type:	Slotted 1 3/8 Sch. 40 PVC
Screen ID:	1"
Screen Slot Size:	0.010"
Screen Length:	10'
Filter/Sand Pack Type:	#1 Sand (Filpro Quartz)
Sump:	
Fallback/Backfill:	3'

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.7
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - STICKUP
NYSDEC QUALITY ASSURANCE PROJECT PLAN

APPENDIX E
IN SITU STABILIZATION BENCH TEST PROPOSAL

MACTEC

Request for Proposal

Saranac Lake OU01 (Site No. 516008) Remedial Design

In-Situ Stabilization Bench Scale Study

1.0 INTRODUCTION

On behalf of the New York State Department of Environmental Conservation (NYSDEC), MACTEC Engineering and Consulting, P.C. (MACTEC) has prepared this Request for Proposal (RFP) to conduct a bench-scale study to identify possible reagent additions to inform In-Situ Solidification (ISS) activities that may achieve Project Requirements. The bench-scale study will be conducted in support of MACTEC's pre-remedial design for environmental cleanup at Saranac Lake Gas Company Operable Unit 1 (Site # 516008) (Site) in the Village of Saranac Lake, Town of North Elba, New York. The planned bench-scale study generally consists of homogenizing three representative Soil Samples (supplied by MACTEC); and mixing those with Mix Water (supplied by MACTEC), and two reagents (supplied by Subcontractor) to produce mixtures that meet Project Requirements (hydraulic conductivity and unconfined compressive strength), and at a minimum reporting the information as described herein. The Site constituents of concern are related to its use as a former Manufactured Gas Plant (MGP).

Please submit your proposal and associated costs via email to Nathan.Vogan@woodplc.com by Tuesday, May 7, 2019.

1.1 BACKGROUND

MACTEC is conducting pre-design studies in support of a remedial design for ISS at the Site. The pre-design studies will include the collection of representative site soils, Mix Water, Site Water, and Products for use in these bench-scale study. The required material volumes identified in the Subcontractor Bid will be provided by MACTEC.

2.0 SERVICES TO BE PERFORMED

The services to be performed by the Subcontractor to complete the bench-scale study are described in this section.

Limited Site Data: Existing site data, including soil and groundwater analytical data as provided in the Remedial Investigation Report (MACTEC Engineering and Consulting, P.C., January 2015) for the Site is included in Appendix A.

Project Requirements: The Project Requirements identified for ISS at the Site are as follows:

- Maximum Hydraulic Conductivity of 1 x 10^{-6} cm/sec after a minimum of 28-day curing time, using Site water (supplied by MACTEC) as a permeant. This value is subject to change based on on-going studies and the Subcontractor will be informed of the final value when it is available.
- Minimum unconfined compressive strength (maximum within the linear elastic range, not peak) of 25 psi after 28-day curing time.
- Testing and reporting shall be completed within 12 weeks of notice to proceed, with monthly updates (at a minimum) to MACTEC.

Bench-Scale Testing Work Plan: Provide a Bench-Scale Testing Work Plan describing details of Subcontractor plans to produce mixtures, form samples, cure samples and complete the testing. MACTEC proposes the use of two reagents (Cement and Bentonite) and water (Mix Water and Site Water) in differing proportions as indicated. Should the Subcontractor have suggested changes, those should be in the Work Plan. The Bench-Scale Testing Work Plan shall at a minimum:

A. Define the mixing methods, sample prep and curing and testing methods for grout and soil-grout.
B. Identify the quantity of materials (soil, water and product) to be provided by MACTEC required to complete the testing. Identify reagents to be provided by the Subcontractor.
C. Subcontractor schedule to meet Project Requirements.

D. Describe the Subcontractor's experience successfully completing similar studies including evidence of data management and decision-making processes used to efficiently execute the work.
E. State the Subcontractor methodologies to be implemented, standard test methods to be used, and QA/QC program to be implemented.
F. Include examples of calculations to be used for accurate proportioning of materials for mixing.
G. Identify any additional information Subcontractor requires to complete the work.
H. Include a cost table showing items, quantities and unit rates, and total costs. Include fees for MGP materials handling and cost to return samples and excess materials to the Site after testing is complete.

Bench-Scale Study Outline: The Subcontractor shall utilize the following phased approach when developing their Work Plan. There are three (3) phases to be completed generally in the order presented and described here:

- Phase 1 shall be completed first.
- Phase 2a shall be simultaneously completed with Phase 3a, using the prepared grouts to form soil-grout mixtures.
- Data assessment and Phases 2a and 3a, and Phase 2b/3b mix proportion determination by MACTEC.
- Phase 2b shall be simultaneously completed with Phase 3b, using the prepared grouts to form soil-grout mixtures.
- Final reporting.

2.1 PHASE 1: MATERIAL CHARACTERIZATION TESTING

The Subcontractor shall characterize the materials used in testing, as indicated in Tables 1a and 1b or as described in the Work Plan. The Subcontractor shall supply the following reagents in sufficient quantity to complete the required testing from supplies as close to the Site as practical:

- Type II Portland Cement is preferred; however, Type I/II is acceptable if this is what is available locally (Cement); and
- American Petroleum Institute (API) Specification for Drilling-Fluid Materials 13A Section 9 (API Section 9) (Bentonite).

The following materials shall provided by MACTEC; MACTEC will provide analytical test results for the parameters identified in Table 1b.

MACTEC shall supply soils in sufficient quantities based on the Subcontractors Work Plan, identified as follows:

- Soil Type 1: Below the Purifier box waste where viscous Product (aka DNAPL) exists, where PAHs, cyanide and arsenic are more prevalent.
- Soil Type 2: Within the Light Oil area where Product (aka LNAPL) exists, where BTEX are most prevalent.
- Soil Type 3: Typical of the remainder of the Site, where a mixture of less concentrated NAPL and coal tar residuals exist.
- All soils are generally fine-medium sands with trace amounts of silts and clays, which contain free-phase Product.

MACTEC shall supply waters in sufficient quantities, based on the Subcontractor's Work Plan, identified as follows:

- Mix Water, expected to come from an available non-potable water source near the Site
- Site Water, from representative groundwater monitoring well(s) at the Site.
- Waters will be supplied in plastic containers by MACTEC, sent to the Subcontractor by MACTEC and maintained by the Subcontractor at temperatures between 35 and 40 degrees fahrenheit when not in-use.

MACTEC shall supply Product in sufficient quantities, based on the Subcontractors Work Plan, identified as follows:

- Dense-Phase Non-Aqueous Phase Liquids (DNAPL)
- Light-Phase Non-Aqueous Phase Liquids (LNAPL)
- Product samples will be supplied in sealed plastic containers by MACTEC, sent to the subcontractor by MACTEC and maintained by the subcontractor at temperatures between 35 and 40 degrees fahrenheit when not in use.

MACTEC

Table 1a: Phase 1 Soil and Reagent Characteristics Testing

Test	Test Method	Phase 1(a) (Soil Mixtures)	Phase 1(b) (Reagents)
Homogenize Bulk Soil Sample	Provide in Work Plan	3	NA
Grain-Size with Hydrometer	ASTM D6913/D7928	3	NA
Moisture Content	ASTM D2216	3	NA
Atterberg Limits	ASTM D4318	3	NA
Hydraulic Conductivity[2,4]	ASTM D5084	3	NA
Unconfined Compression[3,4]	ASTM D1633, with stress-strain plots	3	NA
Specific Gravity	ASTM D854	3	2

Notes

1. Homogenization of soil samples, which have become segregated during shipping or using discrete samples to form a homogeneous mixture for subsequent testing. Maintain moisture content to +/-5% throughout study.
2. Hydraulic conductivity tests shall be performed at a net confining stress of 5 psi, compact with modest effort, comparable to 90 percent of standard Proctor compaction. Use Site Water as the permeant.
3. Mix Site Source Water with Reagent, at a ratio of 0.5:1, weight basis. Make and cure grout mixture test cylinders, 2' x 4", for unconfined compression testing. Include sufficient extra cylinders in-case of damage.
4. Test after nominal 7 and 28-day cure times.

Table 1b: Phase 1 Material Analytical to be Provided by MACTEC

Parameter	Each Soil Type	Mix Water	Site Water	DNAPL	LNAPL
pH	X[1]	X	X	X	X
TSS		X	X	X	X
Organic Content	X	X	X	X	X
Salinity		X	X	X	X
Sulfides	X				
Free-chlorine		X			
SVOCs	X		X	X	X
VOCs	X		X	X	X

Note:

1. X indicates results will be provided by MACTEC to Subcontractor.

2.2 PHASE 2: GROUT MIXING AND TESTING

A grout mixture consists of a mixture of water and reagents (cement-bentonite blends). The reagents may be changed by MACTEC, but the number of reagent blends are expected to be three (3) during Phase 2a and two (2) during Phase 2b. Report all actual mix proportions on a weight basis.

Phase 2a: Prepare grout mixtures 1 through 3 (G-MIX 1 through 4b), using the materials and proportions listed in Table 2-1. These six (6) grout mixtures shall be tested first, and those results reported to MACTEC, before subsequent testing is performed under Phase 2b. MACTEC shall determine the two (2) reagent blends to be produced and tested in Phase 2b testing to reasonably bracket project requirements based on Phase 2a test results. In the event MACTEC determuines that Phase 2a and 3a produced results sufficient to meet testing objectives, Phase 2b will not occur. Mix sufficient quantities as a single batch to produce specimens for testing, as indicated in Table 2-2.

Phase 2b: Similar to Phase 2a, based on results of Phase 2a. Perform testing as indicated in Table 2-2.

Table 2-1: Phase 2 Grout Mixtures

Phase	Grout Mix	Proportions, weight[1]		
		Mix Water[2]	Reagents [3]	
			Cement	Bentonite
2a	G1a	1	1	0
	G1b	1.5	1	0
	G2a	1	1	0.025
	G2b	1.5	1	0.025
	G3a	1	1	0.05
	G3b	1.5	1	0.05
2b	G4a	TBD[4]	TBD[4]	TBD[4]
	G4b	TBD[4]	TBD[4]	TBD[4]

Notes

1. Mix water and reagents on a weight basis, using the proportions indicated.
2. Mix water is to be provided by MACTEC, as identified in Table 1b.
3. Reagents are to be provided by Subcontractor. Report actual materials used and provide photographs of packaging and any other available information. Reagents shall be as identified in Phase 1.
4. TBD: To be determined by MACTEC, based on Phase 2a test results.

Table 2-2: Phase 2 Grout Mixing and Testing

Test	Test Method	Phase 2a	Phase 2b
Create Grout Mixes[1]	Provide in Work Plan	6	2
Marsh Funnel Viscosity[2]	API RP 13B-1	6	2
Mud Balance[2]	ASTM D4380 or API RP 13B-1	6	2
Make and Cure cube samples[3]	Provide in Work Plan	Provide in Work Plan	Provide in Work Plan
Pocket Penetrometer, 3- and 7-day[4]	Provide in Work Plan	6 x 2 = 12	4

Notes

1. Grout mixtures shall be proportioned as indicated in Table 2-1 and sufficient quantity made for Phase 2 and 3.
2. Perform the testing indicated on freshly mixed grouts. Use left-over and un-altered grout (i.e., from Marsh Funnel testing) for testing in this table and Phase 3 soil-grout mixing and testing.
3. Make and cure grout mixture test cubes, 2" x 2" for Pocket Penetrometer testing, unless another size is recommended in Subcontractor Work Plan. Include at least 1 extra sample in the event of damage.
4. Pocket penetrometer testing is to be done on specimens at 3, and 7-days after mixing. Use of a foot on the penetrometer may be appropriate when testing low-strength materials to report values less than 1 TSF. Once a grout achieves the maximum strength measurable by the device, subsequent testing shall not be performed.

2.3 PHASE 3: SOIL-GROUT MIXING AND TESTING

Soil-grout mixtures consisting of the Phase 2 Grout mixed with the Site soils shall be prepared and tested by the Subcontractor. Prepare soil-grout mixtures, using the materials and mixes listed in Table 3-1. Test the soil-grout mixtures as indicated in Table 3-2. Report all actual mix proportions on a weight basis.

Phase 3a: Prepare soil-grout mixtures, using soils 1, 2 and 3 in separate mixes, with Phase 2a grouts. A range of soil to grout mixtures will be created and tested. Report findings to MACTEC, for determination of Phase 3b proportioning and testing, if determined by MACTEC to be required. Additional Site Liquids will be added to simulate uptake and to replace materials potentially lost during soil sample collection, as shown in Table 3-1.

Phase 3b: If required by MACTEC, prepare soil-grout mixtures, using soils 1, 2, and 3 in separate mixes with Phase 2b grouts. These soil-grout mixes are intended to meet all Project Requirements, should one from Phase 3a not, for each soil. During scoping it's not possible to know how close the program will come to that goal; consequently, this Phase is included for budgeting and may not be required, or supplemental testing (Phase 3c) may be required. It may also be necessary to perform a Phase 3c, using the same number of mixes; however, this is not

included in this scope but should be included in Subcontractor estimates of material volume requirements so sufficient materials can be collected and provided to the Subcontractor.

Table 3-1: Phase 3 Soil-Grout Mixtures

Phase		SOIL-GROUT				Additional Liquids		Total Soil-Grout Mixes
		Material Types		Soil-Grout, weight[4]		Site Water[5], weight[4]	Site Product[6] Type, weight[4]	
		Soil Type[1]	Grout Mix[2]	Wet Soil[3]	Grout			
Phase 3a		1	G1a, G2a	20	2.0	0.3	DNAPL, 0.03	2
		1	G2b	20	2.5	0.3	DNAPL, 0.03	1
		2	G1a, G2a and G3a	20	2.0	0.3	LNAPL, 0.03	3
		2	G1b, G2b and G3b	20	2.5	0.3	LNAPL, 0.03	3
		3	G1a and G2a	20	2.0	0.3	NA	2
		3	G2b	20	2.5	0.3	NA	1
		1	G1a and G2a	10	2.0	0.15	DNAPL, 0.015	2
		1	G2b	10	2.5	0.15	DNAPL, 0.015	1
Phase 3b		1, 2 and 3	TBD[7]	TBD[7]	TBD[7]	TBD[7]	TBD[7]	3
		1, 2 and 3	TBD[7]	TBD[7]	TBD[7]	TBD[7]	TBD[7]	3

Notes

1. Soil Type is as identified in Phase 1.
2. Grout Mix is as identified in Table 2-1.
3. Soils should be within +/- 5% of the moisture content determined in Phase 1.
4. Weights as shown are weights for a mixture. Example: combine 20 gm Soil Type 1, 2 gm grout mix G1a, 0.3 gm Site Water and no Product and mix to produce the first mix shown in this table.
5. Site Water will be as identified in Table 1b.
6. Produce will be as identified in Table 1b.
7. TBD = To Be Determined by MACTEC, based on results of Phase 3a testing.

Table 3-2: Phase 3 Soil-Grout Mixing and Testing

Test	Test Method	Phase 3a	Phase 3b
Create Soil-Grout Mixes[1] make samples[2] and Cure[3]	Provide in Work Plan	15	6
Pocket Penetrometer, at 3-, 7- and 14-days[4]	Provide in Work Plan	15 x 3 = 45	6 x 3 = 18
Unconfined Compressive Strength (UCS), 28-day cure[5]	ASTM D1633	15	6
Hydraulic Conductivity[6,]	ASTM D5084	15	6
Photographs[7]	Provide in Work Plan	(30) x 2 = 60	(12) x 2 = 24

Notes

1. Soil-Grout mixtures shall be proportioned as indicated in Table 3-1 and sufficient quantity made for all Phase 3 testing.
2. Samples shall be cured in accordance with industry standard wet curing methods, as identified in the Subcontractors Work Plan.
3. Make samples of an appropriate size such that tests can be performed consistent with testing methods used. Should maximum stone size require sample sizes greater than 3-inches, inform MACTEC and seek resolution/modification of procedures.
4. Pocket penetrometer testing is to be done on specimens at 3, 7 and 14-days after mixing. Use of a foot on the penetrometer may be appropriate when testing low-strength materials to report values less than 1 TSF. Once a soil-grout achieves the maximum strength measurable by the device, subsequent testing shall not be performed.
5. Unconfined compressive strength, with stress-strain plots. Test on samples cured for 28-days.
6. Hydraulic conductivity tests shall be performed at a net confining stress of 10 psi, and after at-least 90-percent consolidation has occurred. Soft, uncompacted samples may require stepped confining pressures to limit sample deformation. Use laboratory tap water as permeant.
7. Take photographs of test samples, before and after UCS and hydraulic testing.

2.4 PHASE 4: REPORTING

Reporting and intermediate communications between MACTEC and the Subcontractor is required for smooth project execution. Produce a report which documents all mixes made on a weight basis. Utilize a naming convention consistent with this scope of work. Submit a draft report to MACTEC within seven (7) days of the completion of testing; make edits and supplement as requested by MACTEC.

The Subcontractor shall furnish the following copies of the Bench-Scale Testing Work Plan and Final Report:

1. One (1) electronic copy in .pdf format
2. One (1) bound hard copy

Submit copies of final report to:

Wood Environment & Infrastructure Solutions
Attention: Mr. Brian Johnson
511 Congress Street, Suite 200
Portland, Maine 04101
brian.johnson3@woodplc.com

MACTEC

APPENDIX A

SITE DATA

Legend

2007 Site Characterization Locations:
- Direct Push Boring
- Direct Push Boring/Groundwater Grab
- Direct Push Boring/Monitoring Well
- Sediment Sample Location
- Test Pit

2013/2014 Remedial Investigation Locations:
- Direct Push Boring
- Direct Push Boring/Groundwater Grab
- Direct Push Boring/Monitoring Well
- Monitoring Well
- Sediment Sample
- Surface Water Sample
- Test Boring
- Benchmark

H6 Location has no analytical results
MW-108 Location has analytical results
- Fence
- Brandy Brook
- Existing Structure
- Former Structure
- Adirondack Scenic Railroad
- Saranac Lake Gas Co. Parcel

N
0 30 60 Feet

Essex County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 12/10/14
Checked/Date: JMF 12/10/14

NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

OU01 and OU02 Sample Locations

Project 3612132271 Figure 1.3

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RI_FS\4.0_Deliverables\4.1_Reports\RI Report\Figures\Figure 1.3 - OU1 and OU2 Locations.pdf 12/10/2014 2:26 PM brian.peters
PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RI_FS\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Phase II RI\Locations_22x34P_Inset.mxd

Table 2.1: OU01 Remedial Investigation Summary of Findings

Sample Location ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Visual MGP Description Type	Estimated Groundwater Level (ft bgs)	Field Scan PID (ppm)	Shake Test Observations	Analytical Results		
							Total PAH (ug/kg)	Naphthalene (ug/kg)	Total BTEX (ug/kg)
A-1	0	9	NOI	4.5	<0.1	NA			
	9	12	strong odor		<0.1	NA			
A-2	0	16	NOI	0.7	<0.1	NA			
B-2	0	16	NOI	2.7	<0.1	NA			
B-3	0	4.8	NOI	2.5	16.5	NA			
	4.8	6.5	DNAPL/staining/ odor		45.2	NA			
	6.5	16	NOI		3.4	NA			
B-4	0	16	NOI	3.7	<0.1	NA			
C-2	0	8.4	NOI	4.7	<0.1	NA			
	8.4	11.8	residual/staining/ very faint odor		<0.1	NA			
	11.8	16	NOI		<0.1	NA			
C-3	0	2	NOI	1.2	18.5	NA			
	2	6.5	residual/odor		63.2	NA			
	6.5	8	DNAPL - iridescent/staining/ strong odor		122	NA	**21,457**	**1,500 J**	**28,700**
	8	11.5	faint odor		75.2	NA			
	11.5	16	NOI		0.9	NA			
C-4	0	3.5	NOI	3.5	17	NA			
	3.5	8	DNAPL/residual staining		132	NA	**137,100**	**2,000 J**	**2,200**
	8	12	odor - moderate to faint		35.4	NA			
	12	16	NOI		<0.1	NA			
C-5	0	13.5	NOI	8.7	<0.1	NA			
	13.5	16	residual/staining/ moderate-faint odor		<0.1	NA			
C-7	0	8	NOI	10.5	<0.1	NA			
	8	10.5	faint odor		5.5	NA			
	10.5	20	NOI		0.5	NA			
D-4	0	5.5	NOI	2.5	1.7	NA			
	5.5	8	residual odor and staining/DNAPL		7.5	NA			
	8	16	NOI		<0.1	NA			
D-5	0	8	NOI	8	<0.1	NA			
	8	9	residual/staining/ odor		18.7	NA			
	9	19	DNAPL/residual staining		420	NA	**1,163,700**	**340,000**	**11,720**
	19	20	moderate odor		17.5	NA			
D-6	0	3.5	NOI	7	<0.1	NA			
	3.5	4	strong odor		32.5	NA			
	4	12	DNAPL		232	NA	**551,800**	**110,000**	**38,000**
D-7	0	0.8	NOI	4.2	<0.1	NA			
	0.8	5	faint to moderate odor		38.5	NA			
	5	8.5	DNAPL		312	NA			
	8.5	11	very strong odor		56.2	NA			
	11	16	NOI		<0.1	NA	**2,093**	**1,800 J**	**202**
D-8	0	0.5	NOI	8	5.1	NA			
	0.5	1.5	ash/slag		2.7	NA			
	1.5	8.5	NOI		0.5	NA			
	8.5	9.5	very strong odor		359	NA			
	9.5	16	NOI		11	NA			

Table 2.1: OU01 Remedial Investigation Summary of Findings

Sample Location ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Visual MGP Description Type	Estimated Groundwater Level (ft bgs)	Field Scan PID (ppm)	Shake Test Observations	Analytical Results		
							Total PAH (ug/kg)	Naphthalene (ug/kg)	Total BTEX (ug/kg)
D-9	0	0.2	NOI	8	0.7	NA			
	0.2	1.5	ash/slag/coal		1.2	NA			
	1.5	5.5	NOI		79.5	NA			
	5.5	9	very strong odor		322	NA	**2,989,000**	**1,600,000 J**	**166,800**
	9	11	DNAPL		522	NA	**1,032,300**	**150,000 J**	**136,000**
	11	14	very strong to moderate odor		89.5	NA			
	14	16	NOI		8.1	NA			
E-2	0	16	NOI	0.2	<0.1	NA			
E-3	0	16	NOI	2.2	0.6	NA			
E-4	0	1.5	NOI (staining)	2.7	1.2	NA			
	1.5	11	residual/staining/ strong to moderate odor		25.9	NA	**845,800**	< 3,400	**431**
	11	16	NOI		0.2	NA			
E-5	0	4	NOI	Unknown	<0.1	NA			
	4	6	residual staining/moderate odor		5.7	NA			
	6	16	NOI		<0.1	NA	**113**	< 99	ND
E-6	0	0.7	NOI	3.5	<0.1	NA			
	0	6	residual/staining/ very strong odor		289	NA	**16,990,000**	**6,000,000 J**	**66,800**
	6	15.5	DNAPL		532	NA	**5,112,000**	**2,400,000**	**668,000**
	15.5	18	moderate odor		89.1	NA			
	18	20	NOI		13.2	NA			
E-7	0	2	NOI	3.2	<0.1	NA			
	2	2.5	faint odor		102	NA			
	2.5	4.5	NOI		<0.1	NA			
	4.5	8.5	moderate odor		70.5	NA			
	8.5	11	DNAPL		352	NA			
	11	14.5	moderate odor		68.3	NA			
	14.5	16	NOI		15.3	NA			
E-7A	0	2	residual staining/ moderate odor	Unknown	3.1	NA			
	2	16	DNAPL		850	blebs			
	16	49	moderate to faint odor		30	no visual impact	**NA**	**220**	**6.1**
E-8	0	3	NOI	4	1.8	NA			
	3	5	residual staining/ strong odor		111	NA			
	4	16	DNAPL		391	NA			
E-9	0	2	NOI	8	0.8	NA			
	2	4	residual staining/ strong odor		335	NA	**2,484,000**	**310,000 J**	**40,400**
	4	7.5	DNAPL		420	NA			
	7.5	10	residual staining/ strong odor		174	NA			
	10	14.5	strong odor		62.5	NA			
	14.5	16	NOI		22.1	NA			
E-10	0	13.5	NOI	12	13.5	NA			
	13.5	20	moderate to faint odor		76.5	NA			
	20	40	NOI		<0.1	NA			
E-11	0	7.5	NOI	6.7	<0.1	NA			
	7.5	20	DNAPL/residual staining/strong odor		430	NA			
E-12	0	17	NOI	10.6	2.2	no visual impact			
	17	28	moderate to faint odor		8.2	no visual impact	**62**	< 7.3	ND
	28	36	moderate odor		3.8	faint sheen	**76**	**6.5 J**	**8.2 J**

Table 2.1: OU01 Remedial Investigation Summary of Findings

Sample Location ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Visual MGP Description Type	Estimated Groundwater Level (ft bgs)	Field Scan PID (ppm)	Shake Test Observations	Analytical Results		
							Total PAH (ug/kg)	Naphthalene (ug/kg)	Total BTEX (ug/kg)
E-16	0	17	NOI	9.5	2.0	no visual impact			
	17	18	faint odor		1.1	NA			
	18	22	NOI		0.2	NA			
	22	40	faint to moderate odor		22.8	NA	**52**	**13**	**77**
F-2	0	16	NOI	1.7	<0.1	NA	**6.8 J**	< 85	ND
F-3	0	16	NOI	1.7	11.5	NA	ND	< 84	ND
F-4	0	4	NOI	Unknown	2.1	NA			
	4	8	DNAPL/residual staining		101	NA			
	8	16	NOI		0.3	NA			
F-5	0	5	NOI	5.7	<0.1	NA			
	5	7	residual staining/ strong odor		412	NA			
	7	10.5	DNAPL		1105	NA			
	10.5	16	strong odor		211	NA			
F-6	0	1.5	NOI	2.5	<0.1	NA			
	1.5	3.5	staining/coal/ash/ slag		<0.1	NA	**33,890**	**650 J**	**5,100**
	3.5	8	faint to moderate odor		258	NA	**242,350**	**59,000 J**	**12,200**
	8	14	DNAPL/residual staining		1590	NA	**1,757,740**	**710,000 J**	**260,000**
	14	16	strong odor		101	NA			
F-7	0	4.2	NOI	3.8	<0.1	NA			
	4.2	7.5	residual staining/ possible wood (purifier) waste		121	NA			
	7.5	12	DNAPL		382	NA			
	12	16	moderate to faint odor		58.5	NA	**1,307**	**840 J**	**8,450**
F-8	0	3.5	staining/coal/ash/ slag	4	112	NA			
	3.5	12.5	DNAPL		522	NA	**3,748,000**	**1,100,000 J**	**630,000**
	12.5	16	strong to moderate odor		73.5	NA			
F-9	0	0.6	NOI (staining)	3.5	3.1	NA			
	0.6	12	DNAPL/staining		552	NA	**1,611,000**	**500,000 J**	**46,600**
	12	14	residual/staining/ strong odor		75.5	NA			
	14	16	strong odor		50.5	NA			
F-9A	16	32	strong odor	Unknown	51.2	moderate sheen 29'			
	32	48	strong to moderate odor		55.3	strong sheen 48'			
	48	52	no recovery		-	NA			
	52	56	moderate to strong odor		10.7	NA			
F-10	0	3.5	NOI	5.7	4.5	NA			
	3.5	4.5	residual staining/ strong odor		79.5	NA			
	3.5	20	DNAPL/residual staining		785	NA			
F-11	0	14.5	NOI	5.5	2.5	NA			
	14.5	15.5	faint odor		35.2	NA			
	15.5	20	NOI		0.5	NA			
F-11A	0	3.5	NOI	Unknown	0.8	NA			
	3.5	5.5	faint to moderate odor		22.5	NA			
	5.5	10	DNAPL/residual staining		29.5	sheen 4', blebs 5'			
	10	24	strong to moderate odor		29.5	sheen 15.5'			

Table 2.1: OU01 Remedial Investigation Summary of Findings

Sample Location ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Visual MGP Description Type	Estimated Groundwater Level (ft bgs)	Field Scan PID (ppm)	Shake Test Observations	Analytical Results		
							Total PAH (ug/kg)	Naphthalene (ug/kg)	Total BTEX (ug/kg)
F-12	0	18	NOI	15.8	<0.1	NA			
	18	20	strong odor		68.5	NA			
F-12A	0	19.5	NOI	7.5	1.5	NA			
	19.5	28	faint to moderate odor		0.8	faint sheen 28'			
G-7	0	3.5	NOI	8	<0.1	NA			
	3.5	5.5	residual staining/ odor		104	NA			
	5.5	7.5	DNAPL/residual staining		452	NA			
	7.5	16	faint odor		14.5	NA - slight odor			
G-8	0	3	NOI	4	0.3	NA			
	3	11	DNAPL/residual staining		432	NA	**4,286,000**	**1,300,000 J**	**396,000**
	11	14	strong to moderate odor		48.5	Sheen on standing water			
	14	16	NOI		3.3	NA	**7,021**	**540 J**	**2,040**
G-9	0	2.5	NOI	8	0.7	NA			
	2.5	7	residual staining/ strong odor		85.2	NA			
	7	16	DNAPL/residual staining		522	NA			
G-10	0	2	NOI	6.6	122	NA - odor			
	2	5.5	residual staining/ strong odor		38.5	NA			
	5.5	8.5	DNAPL		102	NA	**729,350**	**180,000 J**	**5,960**
	8.5	16	strong to faint odor		36.8	NA	**119**	< 85	**1,120**
G-12	0	8	NOI	Unknown	2.3	NA - slight odor			
H-6	0	16	NOI	10.7	0.3	NA			
H-7	0	20	NOI	12.5	<0.1	NA - slight odor 14'			
H-8	0	15	NOI	12.5	<0.1	NA			
	15	15.2	faint odor		5.5	NA			
	15.2	16	NOI		<0.1	NA - slight odor			
H-13	0	14	NOI	12.5	<0.1	NA			
	14	15	faint odor		<0.1	NA - slight odor			
H-15	0	22	NOI	7	0.2	NA			
	22	23	faint odor		1.2	NA - slight odor			
	23	28	NOI		0.2	NA			
J-14	0	16	NOI	Unknown	<0.1	NA			

Notes:
ft bgs - feet below ground surface
DNAPL - Dense Non-Aqueous Phase Liquid
residual/stain - visual evidence of coal tar impact but no product observed
NOI - no observable impact
=Sample located in source area.
Blank cell indicates that sample was not evaluated for that parameter.
PAH = polyaromatic hydrocarbons
BTEX compounds = benzene, toluene, ethylbenzene and xylene
Results shown in micrograms per kilogram

Table 4.1: OU01 Soil Organics Results

Location ID				C-3	C-4	C-4	D-5	D-6	D-7	D-9	D-9	E-4	E-5	E-6	E-6	E-7A	E-9	E-12	E-12
Sample Depth (ft bgs)				6.5-7.2	6.8-8	6.8-8	15-16	11-12	12.5-13	7.8-8	10.7-11	1.4-1.7	15-16	1.5-2	10.4-12	48	2.6-3	28	32
MGP Description Type				DNAPL - iridescent/staining/ strong odor	DNAPL/residual staining	DNAPL/residual staining	DNAPL/residual staining	DNAPL	NOI	very strong odor	DNAPL	residual/staining/ strong to moderate odor	NOI	residual/staining/ very strong odor	DNAPL	moderate to faint odor	residual staining/ strong odor	moderate to faint odor	residual/odor
Approximate Depth to GW (ft bgs)				1.2	3.5	3.5	8	7	4.2	8	8	2.7	unk	3.5	3.5	unk	8	10.2	10.2
Sample Date				8/10/2013	8/8/2013	8/8/2013	8/8/2013	8/8/2013	8/7/2013	8/6/2013	8/6/2013	8/12/2013	8/8/2013	8/8/2013	8/8/2013	9/19/2014	8/6/2013	9/17/2014	9/17/2014
Sample ID				516008-C307	516008-C408	516008-C408D	516008-D516	516008-D612	516008-D712	516008-D908	516008-D911	516008-E402	516008-E516	516008-E602	516008-E612	516008-E7A48	516008-E903	516008-E1228	516008-E1232
QC Code				FS	FS	FD	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
Parameter Name	**RES**	**COMM**	**IND**																
Volatile Organic Compounds - 8260B																			
1,2,4-Trimethylbenzene	47000	190000	380000													**10** J		39 U	38 U
1,3,5-Trimethylbenzene	47000	190000	380000													28 U		39 U	38 U
4-iso-Propyltoluene	NS	NS	NS													28 U		39 U	38 U
Acetic acid, methyl ester	NS	NS	NS	280 U	1100 U	1100 U	640 U	630 U	3.9 U	2100 U	2100 U	**140**	**27** J	1900 U	520 U	**21** J	2500 U	**32** J	**32** J
Acetone	100000	500000	1000000	1400 UJ	5300 U	5300 U	3200 U	3200 U	**14** J	11000 U	10000 U	170 U	230 U	9700 U	2600 U	140 U	13000 U	200 U	190 U
Carbon disulfide	NS	NS	NS	280 U	1100 U	1100 U	640 U	630 U	3.9 U	2100 U	2100 U	**27** J	47 U	1900 U	520 U	28 U	2500 U	39 U	38 U
Chloroform	10000	350000	700000	280 U	1100 U	1100 U	640 U	630 U	3.9 U	2100 U	2100 U	35 U	47 U	1900 U	520 U	28 U	2500 U	39 U	38 U
Cyclohexane	NS	NS	NS	280 UJ	1100 U	1100 U	640 U	630 U	3.9 U	2100 U	2100 U	35 U	47 U	1900 U	520 U	28 U	2500 U	39 U	38 U
Isopropylbenzene	NS	NS	NS	**610**	**410** J	**320** J	**700**	**3400**	**3.9**	**1200** J	**810** J	35 U	47 U	**4100**	**1700**	28 U	**1500** J	39 U	38 U
Methyl cyclohexane	NS	NS	NS	280 U	1100 U	1100 U	640 U	630 U	3.9 U	2100 U	2100 U	35 UJ	47 U	1900 U	520 U	28 U	2500 U	39 U	38 U
Methylene chloride	51000	500000	1000000	280 U	**430** J	**410** J	**250** J	630 U	3.9 U	2100 U	2100 U	35 U	47 U	**620** J	**180** J	28 U	2500 U	39 U	38 U
n-Butylbenzene	100000	500000	1000000													28 U		39 U	38 U
Naphthalene	**100000**	**500000**	**1000000**													**220**			
Propylbenzene	100000	500000	1000000													28 U		39 U	38 U
sec-Butylbenzene	100000	500000	1000000													28 U		39 U	38 U
Styrene	NS	NS	NS	**1700**	**880** J	**920** J	**3600**	**620** J	3.9 U	**98000**	**82000**	**130**	47 U	1900 U	**400000** J	28 U	2500 U	**11** J	38 U
BTEX - 8260B																			
Benzene	**2900**	**44000**	**89000**	280 U	1100 U	1100 U	640 U	630 U	2.5 UJ	2100 U	2100 U	**130**	47 U	1900 U	**75000**	28 U	2500 U	39 U	38 U
Ethyl benzene	**30000**	**390000**	**780000**	**7700**	1100 U	1100 U	**1900**	**11000**	**78**	**20000**	**16000**	**31** J	47 U	**5700**	**63000**	28 U	**6400**	39 U	38 U
Toluene	**100000**	**500000**	**1000000**	**2000**	1100 U	1100 U	**520** J	**1000**	**35**	**6800**	**10000**	**160**	47 U	**1100** J	**380000** J	28 U	**3000**	39 U	38 U
Xylene, o	100000	500000	1000000																
Xylenes (m&p)	100000	500000	1000000																
Xylenes, Total	**100000**	**500000**	**1000000**	**19000**	**2200**	**2300**	**9300**	**26000**	**89**	**140000**	**110000**	**110**	93 U	**60000**	**150000**	**6.1** J	**31000**	79 U	**8.2** J
TOTAL BTEX	NA	NA	NA	**28700**	**2200**	**2300**	**11720**	**38000**	**202**	**166800**	**136000**	**431**	ND	**66800**	**668000**	**6.1**	**40400**	ND	**8.2**
Polycyclic Aromatic Hydrocarbons - 8270C																			
Acenaphthene	**100000**	**500000**	**1000000**	**440** J	**1600** J	**4600** J	**14000** J	**30000** J	**73** J	**26000** J	**9600** J	3400 UJ	99 UJ	**870000** J	**30000** J		**320000** J	7.3 U	7.5 U
Acenaphthylene	**100000**	**500000**	**1000000**	**2300** J	**9500** J	**47000** J	**140000** J	**55000** J	**80** J	**210000** J	**94000** J	**23000** J	**26** J	**690000** J	**550000** J		**44000** J	**4.1** J	7.5 U
Anthracene	**100000**	**500000**	**1000000**	**1500** J	**10000** J	**23000** J	**72000** J	**36000** J	**25** J	**100000** J	**42000** J	**11000** J	**32** J	**740000** J	**160000** J		**120000** J	**6.3** J	**6.7** J
Benzo(a)anthracene	**1000**	**5600**	**11000**	**770** J	**7100** J	**11000** J	**31000** J	**16000** J	**19** J	**57000** J	**23000** J	**58000**	99 UJ	**470000** J	**100000** J		**97000** J	7.3 U	7.5 U
Benzo(a)pyrene	**1000**	**1000**	**1100**	**600** J	**6600** J	**9700** J	**23000** J	**14000** J	**13** J	**48000** J	**21000** J	**90000**	99 UJ	**420000** J	**100000** J		**84000** J	7.3 U	7.5 U
Benzo(b)fluoranthene	**1000**	**5600**	**11000**	**460** J	**6600** J	**8700** J	**21000** J	**12000** J	**11** J	**38000** J	**19000** J	**100000**	99 UJ	**340000** J	**65000** J		**66000** J	7.3 U	7.5 U
Benzo(ghi)perylene	100000	500000	1000000	**350** J	**2600** J	**4000** J	100000 UJ	**7600** J	100 UJ	**30000** J	**7000** J	**46000**	99 UJ	**300000** J	**63000** J		**58000** J	7.3 U	7.5 U
Benzo(k)fluoranthene	**1000**	**56000**	**110000**	**140** J	**2000** J	**3800** J	**7700** J	**4500** J	**5.4** J	**16000** J	**6900** J	**32000** J	99 UJ	**120000** J	**46000** J		**29000** J	7.3 U	7.5 U
Chrysene	**1000**	**56000**	**110000**	**680** J	**6700** J	**9500** J	**25000** J	**14000** J	**17** J	**54000** J	**20000** J	**67000**	99 UJ	**430000** J	**94000** J		**92000** J	7.3 U	7.5 U
Dibenz(a,h)anthracene	**330**	**560**	**1100**	**77** J	110 UJ	5100 UJ	100000 UJ	**1400** J	100 UJ	20000 UJ	**1600** J	**8600**	99 UJ	400000 UJ	99000 UJ		43000 UJ	7.3 U	7.5 U
Fluoranthene	**100000**	**500000**	**1000000**	**1500** J	**18000** J	**29000** J	**57000** J	**37000** J	**44** J	**140000** J	**56000** J	**100000**	**8.9** J	**1100000** J	**280000** J		**250000** J	**10**	**5.9** J
Fluorene	**100000**	**500000**	**1000000**	**1600** J	**7500** J	**23000** J	**60000** J	**39000** J	**48** J	**110000** J	**50000** J	**2100** J	**12** J	**820000** J	**190000** J		**160000** J	7.3 U	**5.4** J
Indeno(1,2,3-cd)pyrene	**500**	**5600**	**11000**	**240** J	**1900** J	**2600** J	100000 UJ	**4300** J	100 UJ	**20000** J	**5200** J	**33000**	99 UJ	**190000** J	**44000** J		**34000** J	7.3 U	7.5 U
Naphthalene	**100000**	**500000**	**1000000**	**1500** J	**2000** J	**37000** J	**340000** J	**110000** J	**1800** J	**1600000** J	**450000** J	3400 UJ	99 UJ	**6000000** J	**2400000** J		**310000** J	7.3 U	**6.5** J
Phenanthrene	**100000**	**500000**	**1000000**	**6900** J	**27000** J	**78000** J	**190000** J	**120000** J	**120** J	**350000** J	**150000** J	**5100** J	**23** J	**3000000** J	**640000** J		**480000** J	**30**	**46**
Pyrene	**100000**	**500000**	**1000000**	**2400** J	**28000** J	**41000** J	**83000** J	**51000** J	**59** J	**190000** J	**77000** J	**270000** J	**11** J	**1500000** J	**350000** J		**340000** J	**12**	**5.3** J
TOTAL PAH	NA	NA	NA	**21457**	**137100**	**331900**	**1163700**	**551800**	**2093**	**2989000**	**1032300**	**845800**	**113**	**16990000**	**5112000**		**2484000**	**62**	**76**
Semi-volatile Organic Compounds - 8270C																			
2-Methylnaphthalene	NS	NS	NS	**4000** J	**6200** J	**47000** J	**240000** J	**140000** J	**590** J	**520000** J	**190000** J	**630** J	99 UJ	**2600000** J	**510000** J		**260000** J	7.3 U	7.5 U
4-Methylphenol	34000	500000	1000000	160 U	210 U	9900 U	200000 U	3800 U	200 U	40000 U	1900 U	6600 U	190 U	770000 U	190000 U		83000 U		
Benzaldehyde	NS	NS	NS	83 U	110 UJ	5100 UJ	100000 UJ	2000 UJ	100 UJ	20000 UJ	990 UJ	3400 UJ	99 UJ	400000 UJ	99000 UJ		43000 UJ	110 U	110 U
Acetophenone	NS	NS	NS	**4.9** J	**50** J	5100 UJ	100000 UJ	**1100** J	**10** J	20000 UJ	990 UJ	3400 UJ	99 UJ	400000 UJ	99000 UJ		43000 UJ	110 U	110 U
Biphenyl	NS	NS	NS	**710** J	**1100** J	**9800** J	**36000** J	**16000** J	**51** J	**74000** J	**26000** J	3400 UJ	99 UJ	**390000** J	**100000** J		**39000** J	55 U	56 U
Bis(2-Ethylhexyl)phthalate	NS	NS	NS	83 U	**290** J	5100 UJ	100000 UJ	2000 UJ	100 UJ	20000 UJ	990 UJ	3400 U	99 UJ	400000 UJ	99000 UJ		43000 UJ	77 U	79 U
Carbazole	NS	NS	NS	83 U	110 UJ	5100 UJ	100000 UJ	2000 UJ	100 UJ	20000 UJ	990 UJ	3400 UJ	99 UJ	400000 UJ	99000 UJ		43000 UJ	55 U	56 U
Dibenzofuran	**14000**	**350000**	**1000000**	**230** J	**400** J	**2200** J	**8000** J	**5300** J	**6.3** J	**12000** J	**4600** J	3400 UJ	99 UJ	**87000** J	99000 UJ		**18000** J	55 U	56 U

Table 4.1: OU01 Soil Organics Results

Parameter Name	RES	COMM	IND	Location ID	C-3	C-4	C-4	D-5	D-6	D-7	D-9	D-9	E-4	E-5	E-6	E-6	E-7A	E-9	E-12	E-12
				Sample Depth (ft bgs)	6.5-7.2	6.8-8	6.8-8	15-16	11-12	12.5-13	7.8-8	10.7-11	1.4-1.7	15-16	1.5-2	10.4-12	48	2.6-3	28	32
				MGP Description Type	DNAPL - iridescent/staining/ strong odor	DNAPL/residual staining	DNAPL/residual staining	DNAPL/residual staining	DNAPL	NOI	very strong odor	DNAPL	residual/staining/ strong to moderate odor	NOI	residual/staining/ very strong odor	DNAPL	moderate to faint odor	residual staining/ strong odor	moderate to faint odor	residual/odor
				Approximate Depth to GW (ft bgs)	1.2	3.5	3.5	8	7	4.2	8	8	2.7	unk	3.5	3.5	unk	8	10.2	10.2
				Sample Date	8/10/2013	8/8/2013	8/8/2013	8/8/2013	8/8/2013	8/7/2013	8/6/2013	8/6/2013	8/12/2013	8/8/2013	8/8/2013	8/8/2013	9/19/2014	8/6/2013	9/17/2014	9/17/2014
				Sample ID	516008-C307	516008-C408	516008-C408D	516008-D516	516008-D612	516008-D712	516008-D908	516008-D911	516008-E402	516008-E516	516008-E602	516008-E612	516008-E7A48	516008-E903	516008-E1228	516008-E1232
				QC Code	FS	FS	FD	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
Pesticides - 8081																				
4,4'-DDD	2600	92000	180000		110 U	200 U								1.9 U	1900 U					
4,4'-DDE	1800	62000	120000		110 U	200 U								1.9 U	R					
4,4'-DDT	1700	47000	94000		110 U	200 U								1.9 U	1900 U					
Alpha-BHC	**97**	**3400**	**6800**		110 U	200 U								1.9 U	**360** J					
Alpha-Chlordane	910	24000	47000		110 U	200 U								1.9 U	1900 U					
Beta-BHC	72	3000	14000		110 U	200 U								1.9 U	1900 U					
Dieldrin	**39**	**1400**	**2800**		110 U	200 U								1.9 UJ	1900 U					
Endosulfan II	4800	200000	920000		110 U	200 U								1.9 U	1900 U					
Endosulfan sulfate	4800	200000	920000		110 U	200 U								1.9 U	R					
Endrin	2200	89000	410000		110 U	200 U								1.9 U	**280** J					
Endrin aldehyde	NS	NS	NS		110 U	200 U								1.9 U	1900 U					
Endrin ketone	NS	NS	NS		110 U	200 U								1.9 U	1900 U					
Gamma-BHC/Lindane	280	9200	23000		110 U	**27** J								1.9 UJ	1900 U					
Gamma-Chlordane	NS	NS	NS		110 U	200 U								1.9 U	1900 U					
Heptachlor epoxide	NS	NS	NS		110 U	200 U								1.9 U	1900 U					
Methoxychlor	NS	NS	NS		R	R								1.9 U	R					
PCB Target Compound	NA	NA	NA		ND	ND								ND	ND					

Notes:
Results reported in milligrams per kilogram (mg/kg)

Table 4.1: OU01 Soil Organics Results

Location ID				E-16	E-16	F-2	F-3	F-6	F-6	F-6	F-7	F-8	F-9	G-8
Sample Depth (ft bgs)				27-28	34	5.9-6.4	6.5-7	1.5-2	4.6-5.4	9.6-9.9	15.5-16	3.5-4	3-3.8	5.2-6
MGP Description Type				moderate odor	faint to moderate odor	NOI	NOI	staining/coal/ash/slag	faint to moderate odor	DNAPL/residual/staining	moderate to faint odor	DNAPL	DNAPL/staining	DNAPL/residual staining
Approximate Depth to GW (ft bgs)				9.5	9.5	1.7	1.7	2.5	2.5	2.5	3.8	4	3.5	4
Sample Date				9/18/2014	9/18/2014	8/9/2013	8/12/2013	8/10/2013	8/10/2013	8/10/2013	8/7/2013	8/6/2013	8/6/2013	8/7/2013
Sample ID				516008-E1628	516008-E1634	516880-F206	516880-F307	516880-F602	516880-F605	516880-F610	516880-F716	516880-F804	516880-F903	516008-G806
QC Code				FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
Parameter Name	**RES**	**COMM**	**IND**											
Volatile Organic Compounds - 8260B														
1,2,4-Trimethylbenzene	47000	190000	380000	**10** J	**8.8** J									
1,3,5-Trimethylbenzene	47000	190000	380000	27 U	26 U									
4-iso-Propyltoluene	NS	NS	NS	27 U	26 U									
Acetic acid, methyl ester	NS	NS	NS	**17** J	26 U	**110**	41 U	**76**	**360** J	560 U	**29** J	2200 U	**140**	1100 U
Acetone	100000	500000	1000000	130 U	130 U	160 UJ	200 UJ	180 UJ	2200 UJ	2800 UJ	220 U	11000 U	240 U	5500 U
Carbon disulfide	NS	NS	NS	27 U	26 U	32 U	41 U	37 U	450 U	560 U	43 U	2200 U	49 U	1100 U
Chloroform	10000	350000	700000	27 U	26 U	32 U	41 U	37 U	450 U	560 U	43 U	2200 U	49 U	1100 U
Cyclohexane	NS	NS	NS	27 U	26 U	32 UJ	41 UJ	**34** J	450 UJ	560 UJ	43 U	2200 U	49 U	1100 U
Isopropylbenzene	NS	NS	NS	27 U	26 U	32 U	41 U	**20** J	**320** J	**980**	43 U	**22000**	**1600**	**1800**
Methyl cyclohexane	NS	NS	NS	27 U	26 U	32 U	41 U	**76**	450 U	560 U	43 U	2200 U	49 U	1100 U
Methylene chloride	51000	500000	1000000	27 U	26 U	32 U	41 U	37 U	450 U	560 U	43 U	2200 U	49 U	**280** J
n-Butylbenzene	100000	500000	1000000	27 U	26 U									
Naphthalene	**100000**	**500000**	**1000000**											
Propylbenzene	100000	500000	1000000	27 U	26 U									
sec-Butylbenzene	100000	500000	1000000	27 U	26 U									
Styrene	NS	NS	NS	27 U	26 U	32 U	41 U	**35** J	450 U	**84000**	**80**	**3800**	**510**	**120000**
BTEX - 8260B														
Benzene	**2900**	**44000**	**89000**	**20** J	**35**	32 U	41 U	**1700**	**1400**	**43000**	**3800**	**50000**	**3300**	**100000**
Ethyl benzene	**30000**	**390000**	**780000**	**11** J	**27**	32 U	41 U	**300**	**6500**	**51000**	**1200**	**210000**	**14000**	**46000**
Toluene	**100000**	**500000**	**1000000**	27 U	26 U	32 U	41 U	**1800**	450 U	**88000**	**2600**	**140000**	**8300**	**140000**
Xylene, o	100000	500000	1000000											
Xylenes (m&p)	100000	500000	1000000											
Xylenes, Total	**100000**	**500000**	**1000000**	**13** J	**15** J	64 U	81 U	**1300**	**4300**	**78000**	**850**	**230000**	**21000**	**110000**
TOTAL BTEX	NA	NA	NA	**44**	**77**	ND	ND	**5100**	**12200**	**260000**	**8450**	**630000**	**46600**	**396000**
Polycyclic Aromatic Hydrocarbons - 8270C														
Acenaphthene	**100000**	**500000**	**1000000**	7.8 U	**4.2** J	85 U	84 UJ	**270** J	**23000** J	**13000** J	**69** J	**330000** J	**150000** J	**58000** J
Acenaphthylene	**100000**	**500000**	**1000000**	7.8 U	**6.1** J	**6.8** J	84 UJ	**1800** J	**2100** J	**190000** J	**51** J	**160000** J	**41000** J	**470000** J
Anthracene	**100000**	**500000**	**1000000**	7.8 U	7.8 U	85 U	84 UJ	**640** J	**18000** J	**63000** J	**27** J	**240000** J	**100000** J	**330000** J
Benzo(a)anthracene	**1000**	**5600**	**11000**	7.8 U	**5.1** J	85 U	84 UJ	**1700** J	**7500** J	**41000** J	97 UJ	**84000** J	**38000** J	**94000** J
Benzo(a)pyrene	**1000**	**1000**	**1100**	7.8 U	7.8 U	85 U	84 UJ	**2200** J	**8600** J	**40000** J	**10** J	**76000** J	**38000** J	**87000** J
Benzo(b)fluoranthene	**1000**	**5600**	**11000**	7.8 U	7.8 U	85 U	84 UJ	**6500** J	**7300** J	**29000** J	**9.1** J	**57000** J	**36000** J	62000 J
Benzo(ghi)perylene	100000	500000	1000000	7.8 U	7.8 U	85 U	84 UJ	**4400** J	**4500** J	**14000** J	97 UJ	**54000** J	**25000** J	**57000** J
Benzo(k)fluoranthene	**1000**	**56000**	**110000**	7.8 U	7.8 U	85 U	84 UJ	**2700** J	**3000** J	**13000** J	**4.6** J	**36000** J	**13000** J	**39000** J
Chrysene	**1000**	**56000**	**110000**	7.8 U	7.8 U	85 U	84 UJ	**2700** J	**8200** J	**37000** J	**10** J	**81000** J	**38000 J**	**89000** J
Dibenz(a,h)anthracene	**330**	**560**	**1100**	7.8 U	7.8 U	85 U	84 UJ	**650** J	**550** J	**840** J	97 UJ	120000 UJ	58000 UJ	110000 UJ
Fluoranthene	**100000**	**500000**	**1000000**	7.8 U	**4.8** J	85 U	84 UJ	**2000** J	**22000** J	**110000** J	**42** J	**280000** J	100000 J	**280000** J
Fluorene	**100000**	**500000**	**1000000**	7.8 U	**5.7** J	85 U	84 UJ	**280** J	**8900** J	**77000** J	**43** J	**190000** J	**82000** J	**230000** J
Indeno(1,2,3-cd)pyrene	**500**	**5600**	**11000**	7.8 U	7.8 U	85 U	84 UJ	**3000** J	2700 J	**9900** J	97 UJ	120000 UJ	58000 UJ	110000 UJ
Naphthalene	**100000**	**500000**	**1000000**	**4** J	**13**	85 U	84 UJ	**650** J	**59000** J	**710000** J	**840** J	**1100000** J	**500000** J	**1300000** J
Phenanthrene	**100000**	**500000**	**1000000**	7.8 U	**8.8**	85 U	84 UJ	**1400** J	**41000** J	**270000** J	**150** J	**710000** J	**290000** J	**800000** J
Pyrene	**100000**	**500000**	**1000000**	7.8 U	**4.4** J	85 U	84 UJ	**3000** J	**26000** J	**140000** J	**51** J	**350000** J	**160000** J	**390000** J
TOTAL PAH	NA	NA	NA	**4**	**52**	**6.8**	ND	**33890**	**242350**	**1757740**	**1307**	**3748000**	**1611000**	**4286000**
Semi-volatile Organic Compounds - 8270C														
2-Methylnaphthalene	NS	NS	NS	7.8 U	**6.5** J	**23** J	84 UJ	**220** J	**13000** J	**200000** J	**190** J	**360000** J	**330000** J	**500000** J
4-Methylphenol	34000	500000	1000000			170 U	160 U	1700 U	1700 U	**1600** J	190 U	230000 U	110000 U	220000 U
Benzaldehyde	NS	NS	NS	120 U	120 U	85 U	84 UJ	850 U	860 U	**1800** J	97 UJ	120000 UJ	58000 UJ	110000 UJ
Acetophenone	NS	NS	NS	120 U	120 U	85 U	84 UJ	**73** J	**87** J	**840** J	97 UJ	120000 UJ	58000 UJ	110000 UJ
Biphenyl	NS	NS	NS	59 U	58 U	85 U	84 UJ	**120** J	**3900** J	**38000** J	**31** J	**81000** J	**44000** J	**110000** J
Bis(2-Ethylhexyl)phthalate	NS	NS	NS	82 U	81 U	85 U	84 UJ	850 U	860 U	**840** J	97 UJ	120000 UJ	58000 UJ	110000 UJ
Carbazole	NS	NS	NS	59 U	58 U	85 U	84 UJ	850 U	**130** J	**910** J	97 UJ	120000 UJ	58000 UJ	110000 UJ
Dibenzofuran	**14000**	**350000**	**1000000**	59 U	58 U	85 U	84 UJ	**52** J	**1000** J	**8900** J	**5.6** J	**21000** J	**12000** J	**21000** J

Table 4.1: OU01 Soil Organics Results

			Location ID	**E-16**	**E-16**	**F-2**	**F-3**	**F-6**	**F-6**	**F-6**	**F-7**	**F-8**	**F-9**	**G-8**
			Sample Depth (ft bgs)	27-28	34	5.9-6.4	6.5-7	1.5-2	4.6-5.4	9.6-9.9	15.5-16	3.5-4	3-3.8	5.2-6
			MGP Description Type	moderate odor	faint to moderate odor	NOI	NOI	staining/coal/ash/ slag	faint to moderate odor	DNAPL/residual/ staining	moderate to faint odor	DNAPL	DNAPL/staining	DNAPL/residual staining
			Approximate Depth to GW (ft bgs)	9.5	9.5	1.7	1.7	2.5	2.5	2.5	3.8	4	3.5	4
			Sample Date	9/18/2014	9/18/2014	8/9/2013	8/12/2013	8/10/2013	8/10/2013	8/10/2013	8/7/2013	8/6/2013	8/6/2013	8/7/2013
			Sample ID	516008-E1628	516008-E1634	516880-F206	516880-F307	516880-F602	516880-F605	516880-F610	516880-F716	516880-F804	516880-F903	516008-G806
			QC Code	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
Parameter Name	**RES**	**COMM**	**IND**											
Pesticides - 8081														
4,4'-DDD	2600	92000	180000										2300 U	
4,4'-DDE	1800	62000	120000										2300 U	
4,4'-DDT	1700	47000	94000										2300 U	
Alpha-BHC	**97**	**3400**	**6800**										2300 U	
Alpha-Chlordane	910	24000	47000										2300 U	
Beta-BHC	72	3000	14000										2300 U	
Dieldrin	**39**	**1400**	**2800**										2300 U	
Endosulfan II	4800	200000	920000										2300 U	
Endosulfan sulfate	4800	200000	920000										2300 U	
Endrin	2200	89000	410000										2300 U	
Endrin aldehyde	NS	NS	NS										2300 U	
Endrin ketone	NS	NS	NS										2300 U	
Gamma-BHC/Lindane	280	9200	23000										2300 U	
Gamma-Chlordane	NS	NS	NS										2300 U	
Heptachlor epoxide	NS	NS	NS										2300 U	
Methoxychlor	NS	NS	NS										2300 U	
PCB Target Compound	NA	NA	NA										ND	

Notes:
Results reported in milligrams per kilogram (mg/kg)

Table 4.1: OU01 Soil Organics Results

			Location ID	**G-8**	**G-10**	**G-10**	**GS-01**	**GS-02**	**GS-03**	**GS-03**	**GS-04**	**GS-05**	**GS-06**	**GS-07**	**GS-08**	**GS-09**	**GS-10**	**GS-11**	**GS-12**
			Sample Depth (ft bgs)	13.6-14.2	6.5-7	14.7-15.2	1	4	3	3	3	3	7	7	10	2	6	6	3
			MGP Description Type	NOI	DNAPL	strong to faint odor	NOI	staining	residual/odor	residual/odor	NOI	residual/odor	tar-like/staining	tar-like/staining	residual/odor	NOI	DNAPL/odor	NOI	NOI
			Approximate Depth to GW (ft bgs)	4	6.6	6.6	1	6.1	2.6	2.6	3.5	1	1.5	1	6	1	1	3	3.5
			Sample Date	8/7/2013	8/12/2013	8/12/2013	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/2/2007	5/2/2007	5/2/2007
			Sample ID	516008-G814	516008-G1007	516008-G1015	SLGS00101SCXX	SLGS00204SCXX	SLGS00303SCXD	SLGS00303SCXX	SLGS00403SCXX	SLGS00503SCXX	SLGS00607SCXX	SLGS00707SCXX	SLGS00810SCXX	SLGS00902SCXX	SLGS01006SCXX	SLGS01106SCXX	SLGS01203SCXX
			QC Code	FS	FS	FS	FS	FS	FD	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
Parameter Name	**RES**	**COMM**	**IND**																
Volatile Organic Compounds - 8260B																			
1,2,4-Trimethylbenzene	47000	190000	380000				4 U	3 U	**2** J	4 UJ	4 U	**18000** J	**60000** J	**2** J	**160** J	7 U	**21000** J	**1** J	4 U
1,3,5-Trimethylbenzene	47000	190000	380000				4 U	3 U	**1** J	4 UJ	4 U	**7000** J	130000 U	4 U	**80** J	7 U	**9800** J	4 U	4 U
4-iso-Propyltoluene	NS	NS	NS				4 U	3 U	4 UJ	4 UJ	4 U	22000 U	130000 U	4 U	260 U	7 U	21000 U	4 U	4 U
Acetic acid, methyl ester	NS	NS	NS	**28** J	330 U	**21** J													
Acetone	100000	500000	1000000	230 U	1600 UJ	150 UJ	R	**68** J	**30** J	R	R	R	R	**28** J	R	R	21000 U	20 U	4 U
Carbon disulfide	NS	NS	NS	47 U	330 U	30 U	4 U	3 U	4 UJ	4 UJ	4 U	22000 U	130000 U	4 U	260 U	7 U	21000 U	4 U	4 U
Chloroform	10000	350000	700000	47 U	330 U	30 U	4 U	3 U	4 UJ	**3** J	4 U	22000 U	130000 U	4 U	260 U	7 U	21000 U	4 U	4 U
Cyclohexane	NS	NS	NS	47 U	330 UJ	30 UJ													
Isopropylbenzene	NS	NS	NS	47 U	330 U	30 U	4 U	3 U	4 UJ	2 UJ	4 U	22000 U	130000 U	4 U	260 U	7 U	21000 U	4 U	4 U
Methyl cyclohexane	NS	NS	NS	47 U	330 U	30 U													
Methylene chloride	51000	500000	1000000	47 U	330 U	30 U	4 U	3 U	4 UJ	**30** J	4 U	22000 UJ	130000 UJ	**1** J	260 U	**2** J	**4400** J	**2** J	4 U
n-Butylbenzene	100000	500000	1000000				4 UJ	3 UJ	4 UJ	4 UJ	4 U	22000 U	130000 U	4 U	260 U	7 U	21000 U	4 U	4 U
Naphthalene	**100000**	**500000**	**1000000**				**2** J	**4**	**41** J	8 UJ	**28**	**500000**	**3300000**	**42**	**7800** J	**38**	**510000**	**23**	4 U
Propylbenzene	100000	500000	1000000				4 U	3 U	4 UJ	4 UJ	4 U	22000 U	130000 U	4 U	260 U	7 U	21000 U	4 U	4 U
sec-Butylbenzene	100000	500000	1000000				4 U	3 U	4 UJ	4 UJ	4 U	22000 U	130000 U	4 U	260 U	7 U	21000 U	4 U	4 U
Styrene	NS	NS	NS	**100**	**1400**	30 U	4 U	3 U	4 UJ	4 UJ	4 U	22000 U	**73000** J	4 U	260 U	7 U	21000 U	4 U	4 U
BTEX - 8260B																			
Benzene	**2900**	**44000**	**89000**	**920**	330 U	**440**	4 U	**9**	**4** J	4 UJ	4 U	22000 U	**67000** J	4 U	260 UJ	7 U	21000 U	4 U	4 U
Ethyl benzene	**30000**	**390000**	**780000**	**220**	**620**	**190**	4 U	3 U	**1** J	4 UJ	4 U	**7400** J	**100000** J	4 U	260 U	7 U	**30000**	4 U	4 U
Toluene	**100000**	**500000**	**1000000**	**650**	**140** J	**340**	4 U	3 U	**1** J	4 UJ	4 U	22000 U	**160000**	4 U	260 U	7 U	**8200** J	4 U	4 U
Xylene, o	100000	500000	1000000				4 U	3 U	4 UJ	4 UJ	4 U	**5800** J	**42000** J	4 U	260 U	7 U	**7500** J	4 U	4 U
Xylenes (m&p)	100000	500000	1000000				4 U	3 U	**2** J	4 UJ	4 U	**11000** J	**100000** J	4 U	**90** J	7 U	**19000** J	4 U	4 U
Xylenes, Total	**100000**	**500000**	**1000000**	**250**	**5200**	**150**	4 U	3 U	**2** J	4 UJ	4 U	**17000** J	**140000**	4 U	**90** J	7 U	**26000**	4 U	4 U
TOTAL BTEX	NA	NA	NA	**2040**	**5960**	**1120**	ND	**9**	**8**	ND	ND	**24200**	**427000**	ND	**90**	ND	**64700**	ND	ND
Polycyclic Aromatic Hydrocarbons - 8270C																			
Acenaphthene	**100000**	**500000**	**1000000**	**97** J	**11000** J	85 UJ	390 U	**30000**	**5300** J	**5400** J	380 U	**82000**	**200000**	450 U	**24000**	**2900**	**14000**	400 U	430 U
Acenaphthylene	**100000**	**500000**	**1000000**	**590** J	**100000** J	**14** J	**56** J	**25000**	**12000** J	**13000** J	380 U	**110000**	**600000**	**69** J	**22000**	**4400**	**110000**	400 U	**78** J
Anthracene	**100000**	**500000**	**1000000**	**950** J	**33000** J	**9.2** J	390 U	**24000**	**8500** J	**14000** J	380 U	**69000**	**180000** J	**120** J	**20000**	**7200**	**58000**	400 U	430 U
Benzo(a)anthracene	**1000**	**5600**	**11000**	**220** J	**15000**	85 UJ	**160** J	**69000**	**12000** J	**17000** J	380 U	**120000**	**140000** J	**190** J	**8700**	**13000**	**30000**	400 U	430 U
Benzo(a)pyrene	**1000**	**1000**	**1100**	**210** J	**13000**	85 UJ	**120** J	**88000**	**26000** J	**34000** J	380 U	**160000**	**110000** J	**160** J	**6600**	**16000**	**25000**	400 U	430 U
Benzo(b)fluoranthene	**1000**	**5600**	**11000**	**140** J	**13000**	85 UJ	**180** J	**72000**	**22000** J	**27000** J	380 U	**120000**	**86000** J	**120** J	**5000**	**13000**	**17000**	400 U	430 U
Benzo(ghi)perylene	100000	500000	1000000	**150** J	**4400**	85 UJ	**140** J	**54000**	**20000** J	**24000** J	380 U	**90000**	**62000** J	**140** J	**3200** J	**9300**	**10000**	400 U	430 U
Benzo(k)fluoranthene	**1000**	**56000**	**110000**	**86** J	**3800** J	85 UJ	**70** J	**32000**	**8600** J	**12000** J	380 U	**55000**	**31000**	**66** J	**1600** J	**4800**	**6200** J	400 U	430 U
Chrysene	**1000**	**56000**	**110000**	**220** J	**15000**	85 UJ	**180** J	**72000**	**16000** J	**23000** J	380 U	**110000**	**110000** J	**140** J	**6100**	**12000**	**21000**	400 U	430 U
Dibenz(a,h)anthracene	**330**	**560**	**1100**	100 UJ	**850**	85 UJ	390 U	**10000**	**2900** J	**3200** J	380 U	**14000** J	**10000**	450 U	**580** J	**1500** J	**1900** J	400 U	430 U
Fluoranthene	**100000**	**500000**	**1000000**	**670** J	**50000**	**15** J	**190** J	**190000**	**27000** J	**44000** J	380 U	**220000**	**430000**	**360** J	**20000**	**20000**	**58000**	400 U	430 U
Fluorene	**100000**	**500000**	**1000000**	**420** J	**55000** J	**10** J	390 U	**20000**	**4700** J	**6300** J	380 U	**69000**	**280000**	450 U	**18000**	**2200**	**56000**	400 U	430 U
Indeno(1,2,3-cd)pyrene	**500**	**5600**	**11000**	**98** J	**3300**	85 UJ	**100** J	**36000**	**14000** J	**16000** J	380 U	**61000**	**39000** J	**90** J	**2100** J	**6400**	**6900** J	400 U	430 U
Naphthalene	**100000**	**500000**	**1000000**	**540** J	**180000** J	85 UJ	390 U	**10000**	**1100** J	**1700** J	380 U	**240000**	**2400000**	450 U	**72000**	**560** J	**140000**	**78** J	430 U
Phenanthrene	**100000**	**500000**	**1000000**	**1700** J	**150000** J	**47** J	**53** J	**85000**	**25000** J	**41000** J	380 U	**210000**	**1100000**	**400** J	**54000**	**10000**	**180000**	400 U	**90** J
Pyrene	**100000**	**500000**	**1000000**	**930** J	**82000** J	**24** J	**310** J	**270000**	**30000** J	**57000** J	380 U	**260000**	**610000**	**620**	**32000**	**28000**	**92000**	400 U	**71** J
TOTAL PAH	NA	NA	NA	**7021**	**729350**	**119**	**1559**	**1087000**	**235100**	**338600**	ND	**1990000**	**6388000**	**2475**	**295880**	**151260**	**826000**	**78**	**239**
Semi-volatile Organic Compounds - 8270C																			
2-Methylnaphthalene	NS	NS	NS	**410** J	**240000** J	**17** J	390 U	**3400**	**1300** J	**1900** J	380 U	**160000**	**780000**	450 U	**61000**	**1500** J	**210000**	400 U	**49** J
4-Methylphenol	34000	500000	1000000	200 U	1600 U	160 U	390 U	2000 U	1900 UJ	3900 UJ	380 U	18000 U	**750** J	450 U	4200 U	1900 U	7900 U	400 U	430 U
Benzaldehyde	NS	NS	NS	100 UJ	830 UJ	85 UJ													
Acetophenone	NS	NS	NS	100 UJ	**650** J	85 UJ													
Biphenyl	NS	NS	NS	**130** J	**26000** J	85 UJ													
Bis(2-Ethylhexyl)phthalate	NS	NS	NS	100 UJ	830 U	**29** J	390 U	2000 U	1900 UJ	3900 UJ	380 U	18000 U	2400 U	450 U	4200 U	1900 U	7900 U	400 U	430 U
Carbazole	NS	NS	NS	**5.5** J	830 UJ	85 UJ	390 U	2000 U	1900 UJ	3900 UJ	380 U	18000 U	**5500**	450 U	4200 U	1900 U	7900 U	400 U	430 U
Dibenzofuran	**14000**	**350000**	**1000000**	**32** J	**11000** J	85 UJ	390 U	2000 U	**380** J	**460** J	380 U	**7100** J	**35000**	450 U	**1400** J	1900 U	7900 U	400 U	430 U

Table 4.1: OU01 Soil Organics Results

			Location ID	**G-8**	**G-10**	**G-10**	**GS-01**	**GS-02**	**GS-03**	**GS-03**	**GS-04**	**GS-05**	**GS-06**	**GS-07**	**GS-08**	**GS-09**	**GS-10**	**GS-11**	**GS-12**
			Sample Depth (ft bgs)	13.6-14.2	6.5-7	14.7-15.2	1	4	3	3	3	3	7	7	10	2	6	6	3
			MGP Descriptio n Type	NOI	DNAPL	strong to faint odor	NOI	staining	residual/odor	residual/odor	NOI	residual/odor	tar-like/staining	tar-like/staining	residual/odor	NOI	DNAPL/odor	NOI	NOI
			Approximate Depth to GW (ft bgs)	4	6.6	6.6	1	6.1	2.6	2.6	3.5	1	1.5	1	6	1	1	3	3.5
			Sample Date	8/7/2013	8/12/2013	8/12/2013	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/2/2007	5/2/2007	5/2/2007
			Sample ID	516008-G814	516008-G1007	516008-G1015	SLGS00101SCXX	SLGS00204SCXX	SLGS00303SCXD	SLGS00303SCXX	SLGS00403SCXX	SLGS00503SCXX	SLGS00607SCXX	SLGS00707SCXX	SLGS00810SCXX	SLGS00902SCXX	SLGS01006SCXX	SLGS01106SCXX	SLGS01203SCXX
			QC Code	FS	FS	FS	FS	FS	FD	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
Parameter Name	**RES**	**COMM**	**IND**																
Pesticides - 8081																			
4,4'-DDD	2600	92000	180000									**180** J	24 U				**19**		
4,4'-DDE	1800	62000	120000									44 U	**36** J				**20** J		
4,4'-DDT	1700	47000	94000									**200** J	**140**				12 U		
Alpha-BHC	**97**	**3400**	**6800**									23 U	12 U				6.1 U		
Alpha-Chlordane	910	24000	47000									23 U	12 U				**9.8** J		
Beta-BHC	72	3000	14000									23 U	**18** J				**57** J		
Dieldrin	**39**	**1400**	**2800**									44 U	**52** J				12 U		
Endosulfan II	4800	200000	920000									**78** J	**54** J				12 U		
Endosulfan sulfate	4800	200000	920000									44 U	24 U				**18** J		
Endrin	2200	89000	410000									44 U	24 U				**19** J		
Endrin aldehyde	NS	NS	NS									**190** J	**200** J				**38**		
Endrin ketone	NS	NS	NS									44 U	**58** J				12 U		
Gamma-BHC/Lindane	280	9200	23000									23 U	12 U				6.1 U		
Gamma-Chlordane	NS	NS	NS									23 U	**41** J				**29** J		
Heptachlor epoxide	NS	NS	NS									23 U	**19** J				**33** J		
Methoxychlor	NS	NS	NS									**420**	120 U				61 U		
PCB Target Compound	NA	NA	NA									ND	ND				ND		

Notes:
Results reported in milligrams per kilogram (mg/kg)

Table 4.1: OU01 Soil Organics Results

			Location ID	**GS-13**	**GS-14**	**GS-15**	**GS-16**	**TP-01**	**TP-02**	**TP-03**	**TP-04**	**TP-04**	**TP-05**
			Sample Depth (ft bgs)	10	3	2	11	6-6.5	3	9	6	6	2
			MGP Descriptio n Type	NOI	NOI	NOI	NOI	residual/odor	residual/odor	residual	odor	odor	ash/residual/ odor
			Approximate Depth to GW (ft bgs)	7	1	1	11.5	6	3	9.5	4	4	2.5
			Sample Date	5/2/2007	5/2/2007	5/2/2007	5/1/2007	4/30/2007	4/30/2007	4/30/2007	4/30/2007	4/30/2007	4/30/2007
			Sample ID	SLGS01310SCXX	SLGS01403SCXX	SLGS01502SCXX	SLGS01611SCXX	SLTP00106SCXX	SLTP00203SCXX	SLTP00309SCXX	SLTP00406SCXD	SLTP00406SCXX	SLTP00502SCXX
			QC Code	FS	FS	FS	FS	FS	FS	FS	FD	FS	FS
Parameter Name	**RES**	**COMM**	**IND**										
Volatile Organic Compounds - 8260B													
1,2,4-Trimethylbenzene	47000	190000	380000	4 U	3 U	4 U	4 U	**2200**	**7900** J	**10**	4 UJ	4 UJ	**2** J
1,3,5-Trimethylbenzene	47000	190000	380000	4 U	3 U	4 U	4 U	**1800**	21000 U	**14**	4 UJ	4 UJ	**2** J
4-iso-Propyltoluene	NS	NS	NS	4 U	3 U	4 U	4 U	**1200**	21000 U	4 U	4 UJ	4 UJ	4 U
Acetic acid, methyl ester	NS	NS	NS										
Acetone	100000	500000	1000000	4 U	3 U	16 U	R	R	R	R	4 UJ	R	R
Carbon disulfide	NS	NS	NS	4 U	3 U	4 U	4 U	450 U	21000 U	4 U	4 UJ	4 UJ	4 U
Chloroform	10000	350000	700000	4 U	**2** J	4 U	4 U	450 U	21000 U	4 U	4 UJ	**11** J	4 U
Cyclohexane	NS	NS	NS										
Isopropylbenzene	NS	NS	NS	4 U	3 UJ	4 U	4 U	**260** J	21000 U	4 U	4 UJ	4 UJ	4 UJ
Methyl cyclohexane	NS	NS	NS										
Methylene chloride	51000	500000	1000000	**1** J	**1** J	4 U	4 U	450 UJ	21000 UJ	4 U	4 UJ	**4** J	4 U
n-Butylbenzene	100000	500000	1000000	4 U	3 U	4 U	4 UJ	**1900**	21000 U	**3** J	4 UJ	4 UJ	**2** J
Naphthalene	**100000**	**500000**	**1000000**	4 U	3 U	4 U	**6**	**9500**	**440000**	**39**	4 UJ	4 UJ	**12** J
Propylbenzene	100000	500000	1000000	4 U	3 U	4 U	4 U	**280** J	21000 U	4 U	4 UJ	4 UJ	4 UJ
sec-Butylbenzene	100000	500000	1000000	4 U	3 U	4 U	4 U	**170** J	21000 U	4 U	4 UJ	4 UJ	4 UJ
Styrene	NS	NS	NS	4 U	3 U	4 U	4 U	450 U	21000 U	**3** J	4 UJ	4 UJ	4 U
BTEX - 8260B													
Benzene	**2900**	**44000**	**89000**	4 U	3 U	4 U	4 U	450 U	21000 U	4 U	4 UJ	4 UJ	**10** J
Ethyl benzene	**30000**	**390000**	**780000**	4 U	3 U	4 U	4 U	**140** J	21000 U	**0.8** J	4 UJ	4 UJ	4 U
Toluene	**100000**	**500000**	**1000000**	4 U	3 U	4 U	4 U	450 U	21000 U	**2** J	**2** J	4 UJ	**6** J
Xylene, o	100000	500000	1000000	4 U	3 U	4 U	4 U	**160** J	21000 U	**24**	4 UJ	4 UJ	4 U
Xylenes (m&p)	100000	500000	1000000	4 U	3 UJ	4 U	4 U	**360** J	**6300** J	**8**	**2** J	4 UJ	**2** J
Xylenes, Total	**100000**	**500000**	**1000000**	4 U	3 UJ	4 U	4 U	**510**	**6300** J	**33**	**2** J	4 UJ	**2** J
TOTAL BTEX	NA	NA	NA	ND	ND	ND	ND	**660**	**6300**	**34.8**	**8**	ND	**18**
Polycyclic Aromatic Hydrocarbons - 8270C													
Acenaphthene	**100000**	**500000**	**1000000**	370 U	410 U	440 U	340 U	**32000**	**27000** J	**6400** J	390 UJ	380 UJ	**2400**
Acenaphthylene	**100000**	**500000**	**1000000**	**40** J	**1300**	440 U	340 U	**4700** J	**86000**	**42000**	390 UJ	380 UJ	**79000**
Anthracene	**100000**	**500000**	**1000000**	370 U	**230** J	440 U	340 U	**5900** J	**36000** J	**29000**	390 UJ	380 UJ	**29000**
Benzo(a)anthracene	**1000**	**5600**	**11000**	370 U	**110** J	**50** J	340 U	**4000**	**18000**	**32000**	390 UJ	380 UJ	**57000**
Benzo(a)pyrene	**1000**	**1000**	**1100**	370 U	**430**	440 U	340 U	**4700** J	**29000**	**33000**	390 UJ	380 UJ	**120000**
Benzo(b)fluoranthene	**1000**	**5600**	**11000**	370 U	**250** J	**55** J	340 U	**3400** J	**19000**	**22000**	390 UJ	380 UJ	**130000**
Benzo(ghi)perylene	100000	500000	1000000	370 U	**890**	440 U	340 U	**3100** J	**30000**	**14000**	390 UJ	**64** J	**110000**
Benzo(k)fluoranthene	**1000**	**56000**	**110000**	370 U	**74** J	440 U	340 U	**2000** J	**13000**	**12000**	390 UJ	380 UJ	**64000**
Chrysene	**1000**	**56000**	**110000**	370 U	**200** J	440 U	340 U	**4100**	**20000**	**28000**	390 UJ	380 UJ	**62000**
Dibenz(a,h)anthracene	**330**	**560**	**1100**	370 U	**120** J	440 U	340 U	**490** J	**4200**	**2700** J	390 UJ	380 UJ	**26000**
Fluoranthene	**100000**	**500000**	**1000000**	**43** J	**130** J	**51** J	340 U	**5600** J	**60000** J	**65000**	390 UJ	380 UJ	**84000**
Fluorene	**100000**	**500000**	**1000000**	370 U	**120** J	440 U	340 U	**14000**	**34000** J	**20000**	390 UJ	380 UJ	**13000**
Indeno(1,2,3-cd)pyrene	**500**	**5600**	**11000**	370 U	**570**	440 U	340 U	**1800** J	**18000**	**9900**	390 UJ	380 UJ	**71000**
Naphthalene	**100000**	**500000**	**1000000**	370 U	410 U	440 U	340 U	**5600** J	**640000**	**900** J	390 UJ	380 UJ	**16000**
Phenanthrene	**100000**	**500000**	**1000000**	**72** J	**140** J	440 U	340 U	**56000**	**130000**	**24000**	390 UJ	380 UJ	**47000**
Pyrene	**100000**	**500000**	**1000000**	**88** J	**250** J	**77** J	340 U	**28000**	**90000**	**86000**	390 UJ	380 UJ	**160000**
TOTAL PAH	NA	NA	NA	**243**	**4814**	**233**	ND	**175390**	**1254200**	**426900**	ND	**64**	**1070400**
Semi-volatile Organic Compounds - 8270C													
2-Methylnaphthalene	NS	NS	NS	370 U	**110** J	440 U	340 U	**54000**	**110000**	**6000** J	390 UJ	380 UJ	**9200**
4-Methylphenol	34000	500000	1000000	370 U	410 U	440 U	340 U	400 U	2100 U	8000 U	390 UJ	380 UJ	**260** J
Benzaldehyde	NS	NS	NS										
Acetophenone	NS	NS	NS										
Biphenyl	NS	NS	NS										
Bis(2-Ethylhexyl)phthalate	NS	NS	NS	370 U	410 U	440 U	340 U	400 UJ	2100 UJ	8000 U	390 UJ	380 UJ	2000 U
Carbazole	NS	NS	NS	370 U	410 U	440 U	340 U	400 UJ	**360** J	8000 U	390 UJ	380 UJ	**880** J
Dibenzofuran	**14000**	**350000**	**1000000**	370 U	410 U	440 U	340 U	**2200**	**3500**	8000 U	390 UJ	380 UJ	2000 U

Table 4.1: OU01 Soil Organics Results

				Location ID	**GS-13**	**GS-14**	**GS-15**	**GS-16**	**TP-01**	**TP-02**	**TP-03**	**TP-04**	**TP-04**	**TP-05**
				Sample Depth (ft bgs)	10	3	2	11	6-6.5	3	9	6	6	2
				MGP Descriptio n Type	NOI	NOI	NOI	NOI	residual/odor	residual/odor	residual	odor	odor	ash/residual/ odor
				Approximate Depth to GW (ft bgs)	7	1	1	11.5	6	3	9.5	4	4	2.5
				Sample Date	5/2/2007	5/2/2007	5/2/2007	5/1/2007	4/30/2007	4/30/2007	4/30/2007	4/30/2007	4/30/2007	4/30/2007
				Sample ID	SLGS01310SCXX	SLGS01403SCXX	SLGS01502SCXX	SLGS01611SCXX	SLTP00106SCXX	SLTP00203SCXX	SLTP00309SCXX	SLTP00406SCXD	SLTP00406SCXX	SLTP00502SCXX
				QC Code	FS	FS	FS	FS	FS	FS	FS	FD	FS	FS
Parameter Name	**RES**	**COMM**	**IND**											
Pesticides - 8081														
4,4'-DDD	2600	92000	180000									4 UJ	3.9 UJ	**170** J
4,4'-DDE	1800	62000	120000									4 UJ	3.9 UJ	40 UJ
4,4'-DDT	1700	47000	94000									4 UJ	3.9 UJ	**71** J
Alpha-BHC	**97**	**3400**	**6800**									2 UJ	2 UJ	20 UJ
Alpha-Chlordane	910	24000	47000									2 UJ	2 UJ	20 UJ
Beta-BHC	72	3000	14000									2 UJ	2 UJ	20 UJ
Dieldrin	**39**	**1400**	**2800**									4 UJ	3.9 UJ	40 UJ
Endosulfan II	4800	200000	920000									4 UJ	3.9 UJ	40 UJ
Endosulfan sulfate	4800	200000	920000									4 UJ	3.9 UJ	**71** J
Endrin	2200	89000	410000									4 UJ	3.9 UJ	40 UJ
Endrin aldehyde	NS	NS	NS									4 UJ	3.9 UJ	40 UJ
Endrin ketone	NS	NS	NS									4 UJ	3.9 UJ	**110** J
Gamma-BHC/Lindane	280	9200	23000									2 UJ	2 UJ	20 UJ
Gamma-Chlordane	NS	NS	NS									2 UJ	2 UJ	20 UJ
Heptachlor epoxide	NS	NS	NS									2 UJ	2 UJ	20 UJ
Methoxychlor	NS	NS	NS									20 UJ	20 UJ	200 UJ
PCB Target Compound	NA	NA	NA									ND	ND	ND

Notes:
Results reported in milligrams per kilogram (mg/kg)

Table 4.2: OU01 Soil Inorganics Results

				Location ID	**C-3**	**C-4**	**C-4**	**D-5**	**D-6**	**D-7**	**D-9**	**D-9**
				Sample Depth (ft bgs)	6.5-7.2	6.8-8	6.8-8	15-16	11-12	12.5-13	7.8-8	10.7-11
				MGP Waste Type	DNAPL	DNAPL	DNAPL	DNAPL	DNAPL	NOI	residual/odor/ staining	DNAPL
				Approximate GW Depth (ft bgs)	1.2	3.5	3.5	8	7	4.2	8	8
				Sample Date	8/10/2013	8/8/2013	8/8/2013	8/8/2013	8/8/2013	8/7/2013	8/6/2013	8/6/2013
				Sample ID	516008-C307	516008-C408	516008-C408D	516008-D516	516008-D612	516008-D712	516008-D908	516008-D911
				QC Code	FS	FS	FD	FS	FS	FS	FS	FS
Parameter Name	**RES**	**COMM**	**IND**									
Aluminum	NS	NS	NS		**2870** J	**3620** J	**4230** J	**1400** J	**1790** J	**1290** J	**6210** J	**2790** J
Antimony	NS	NS	NS		16.1 UJ	20.2 UJ	18.5 UJ	18.7 UJ	15.5 UJ	18.7 UJ	19.3 UJ	16.1 UJ
Arsenic	**16**	**16**	**16**		**0.77** J	**0.78** J	2.5 U	2.5 U	**1.2** J	**0.7** J	**1.6** J	**0.98** J
Barium	350	400	10,000		**8.9** J	**11.1** J	**13.9** J	**4.4** J	**10.8** J	**8.2** J	**34.7** J	**15.1** J
Beryllium	14	590	2,700		**0.2** J	**0.18** J	**0.21** J	**0.063** J	**0.16** J	**0.078** J	**0.34**	**0.32**
Cadmium	2.5	9.3	60		0.21 U	0.27 U	0.25 U	0.25 U	0.21 U	0.25 U	0.26 U	0.21 U
Calcium	NS	NS	NS		**1000** J	**1250** J	**910** J	**607** J	**561** J	**717** J	**1370** J	**1310** J
Chromium	22	400	800		**2.2**	**3.4**	**3.5**	**1.6**	**1.8**	**2**	**4.3**	**2.4**
Cobalt	NS	NS	NS		**2.5**	**1.2**	**1.5**	**0.87**	**1.9**	**0.88**	**3.5**	**1.7**
Copper	270	270	10,000		**0.81** J	**1.5**	**1.6**	**0.37** J	**1.2**	**0.71** J	**3**	**2**
Iron	NS	NS	NS		**6360** J	**4290** J	**4820** J	**2380** J	**5090** J	**4860** J	**13100** J	**7030** J
Lead	**400**	**1,000**	**3,900**		**0.53** J	**2.2**	**1.6**	**0.77** J	**1.2**	**0.71** J	**2.3**	**1.2**
Magnesium	NS	NS	NS		**1180** J	**823** J	**982** J	**539** J	**776** J	**539** J	**1370** J	**791** J
Manganese	2,000	10,000	10,000		**28.8** J	**28** J	**30.6** J	**13.7** J	**21.5** J	**19.5** J	**98.3** J	**38.9** J
Mercury	0.81	2.8	5.7		0.02 U	0.026 U	0.025 U	0.023 U	0.022 U	0.023 U	0.022 U	0.023 U
Nickel	140	310	10,000		**1.9** J	**2.5** J	**2.9** J	**1.6** J	**1.5** J	**1.2** J	**4.1** J	**2.3** J
Potassium	NS	NS	NS		**177**	**265**	**312**	**124**	**171**	**160**	**543**	**267**
Selenium	36	1,500	6,800		4.3 U	5.4 UJ	4.9 UJ	5 UJ	4.1 UJ	5 UJ	5.1 UJ	4.3 UJ
Silver	36	1,500	6,800		0.54 U	0.67 U	0.62 U	0.62 U	0.52 U	0.62 U	0.64 U	0.54 U
Sodium	NS	NS	NS		**39.7** J	**58.7** J	**58.8** J	**39** J	**33.1** J	**36.7** J	**71.8** J	**56.3** J
Thallium	NS	NS	NS		6.4 U	8.1 U	7.4 U	7.5 U	6.2 U	7.5 U	7.7 U	6.4 U
Vanadium	NS	NS	NS		**5.6**	**7.6**	**7.8**	**3.2**	**4**	**4.3**	**11.4**	**6.3**
Zinc	2,200	10,000	10,000		**25.1**	**19.4**	**21.3**	**11.1**	**14.2**	**9**	**27.5**	**14.5**
Cyanide, Total	**27**	**27**	**10,000**		1 UJ	1.2 UJ	1.2 UJ	**0.99** J	1.2 UJ	1.2 UJ	1.2 UJ	1.2 UJ

Notes:
Results reported in milligrams per kilogram (mg/kg)

Table 4.2: OU01 Soil Inorganics Results

				Location ID	E-4	E-5	E-6	E-6	E-9	F-2	F-3	F-6	F-6
				Sample Depth (ft bgs)	1.4-1.7	15-16	1.5-2	10.4-12	2.6-3	5.9-6.4	6.5-7	1.5-2	4.6-5.4
				MGP Waste Type	residual/odor/ staining	NOI	residual/odor/ staining	DNAPL	residual/odor	NOI	NOI	coal/ash/slag	residual/odor - faint to moderate
				Approximate GW Depth (ft bgs)	2.7	unk	3.5	3.5	8	1.7	1.7	2.5	2.5
				Sample Date	8/12/2013	8/8/2013	8/8/2013	8/8/2013	8/6/2013	8/9/2013	8/12/2013	8/10/2013	8/10/2013
				Sample ID	516008-E402	516008-E516	516008-E602	516008-E612	516008-E903	516880-F206	516880-F307	516880-F602	516880-F605
				QC Code	FS	FS	FS	FS	FS	FS	FS	FS	FS
Parameter Name	**RES**	**COMM**	**IND**										
Aluminum	NS	NS	NS		**3540** J	**2280** J	**929** J	**2120** J	**1630** J	**5100** J	**1980** J	**1050** J	**2440** J
Antimony	NS	NS	NS		16 UJ	17 UJ	**5** J	16.7 UJ	19.4 UJ	13.6 UJ	13.9 UJ	13.2 UJ	15.8 UJ
Arsenic	**16**	**16**	**16**		**6.5**	**0.97** J	**34.8**	**0.56** J	**8**	**0.97** J	1.9 U	**4.7**	**0.83** J
Barium	350	400	10,000		**13.7** J	**13.6** J	**19.9** J	**6.3** J	**74.8** J	**7.8** J	**11.9** J	**36.6** J	**12.5** J
Beryllium	14	590	2,700		**0.39**	**0.23**	**0.23** J	**0.094** J	**0.46**	**0.29**	**0.11** J	**0.16** J	**0.25**
Cadmium	2.5	9.3	60		**0.28**	0.23 U	**1.8**	0.22 U	0.26 U	**0.049** J	**0.032** J	**0.064** J	**0.17** J
Calcium	NS	NS	NS		**1510** J	**752** J	**603** J	**861** J	**634** J	**3570** J	**607** J	**428** J	**2050** J
Chromium	22	400	800		**5.5**	**2.5**	**21.9**	**1.9**	**6**	**2.6**	**2.1**	**3.1**	**1.3**
Cobalt	NS	NS	NS		**1.7**	**2**	**2.7**	**1.1**	**8.1**	**5.3**	**1.2**	**1.2**	**1.4**
Copper	270	270	10,000		**3.9**	**0.91** J	**57.6**	**0.56** J	**33.1**	**2.6**	**0.79** J	**20.3**	**2.4**
Iron	NS	NS	NS		**13900** J	**9190** J	**21400** J	**3270** J	**21800** J	**13400** J	**2500** J	**10900** J	**7400** J
Lead	**400**	**1,000**	**3,900**		**64**	**1.6**	**639**	**1.3**	**10.1**	**1.5**	**0.45** J	**44.8**	**1.2**
Magnesium	NS	NS	NS		**857** J	**1170** J	**259** J	**743** J	**73.5** J	**3470** J	**616** J	**439** J	**1400** J
Manganese	2,000	10,000	10,000		**44.4** J	**38** J	**65** J	**24.3** J	**16.8** J	**41** J	**16.8** J	**20.3** J	**59.2** J
Mercury	0.81	2.8	5.7		**0.036**	0.022 U	**0.53**	0.022 U	0.023 U	0.021 U	0.02 U	**0.017** J	**0.013** J
Nickel	140	310	10,000		**6.1**	**2.7** J	**6.4**	**1.9** J	**18.8**	**2.2** J	**2.1** J	**2.8** J	**1.2** J
Potassium	NS	NS	NS		**146**	**297**	**145**	**177**	**153**	**126**	**184**	**116**	**54**
Selenium	36	1,500	6,800		**0.57** J	4.5 UJ	**4.4** J	4.4 UJ	**0.69** J	3.6 U	3.7 U	**0.73** J	4.2 U
Silver	36	1,500	6,800		0.53 U	0.57 U	**0.73**	0.56 U	0.65 U	0.45 U	0.46 U	0.44 U	0.53 U
Sodium	NS	NS	NS		**32.5** J	**41** J	**36.7** J	**32** J	**34** J	**53.9** J	**25** J	**31.5** J	**36.7** J
Thallium	NS	NS	NS		6.4 U	6.8 U	**2.6** J	6.7 U	7.7 U	5.4 U	5.6 U	5.3 U	6.3 U
Vanadium	NS	NS	NS		**6.8**	**5.9**	**3.1**	**3.7**	**14.9**	**14.9**	**2.8**	**8.9**	**3.1**
Zinc	2,200	10,000	10,000		**111**	**16.3**	**290**	**13**	**14.2**	**60.6**	**11**	**26.4**	**53.5**
Cyanide, Total	**27**	**27**	**10,000**		**62.8** J	1.2 UJ	**7.5** J	1.2 UJ	1.3 UJ	0.99 UJ	1 UJ	**2.6** J	1 UJ

Notes:
Results reported in milligrams per kilogram (mg/kg)

Table 4.2: OU01 Soil Inorganics Results

			Location ID	**F-6**	**F-7**	**F-8**	**F-9**	**G-8**	**G-8**	**G-10**	**G-10**
			Sample Depth (ft bgs)	9.6-9.9	15.5-16	3.5-4	3-3.8	5.2-6	13.6-14.2	6.5-7	14.7-15.2
			MGP Waste Type	DNAPL/residual	residual/odor	coal/ash/slag	DNAPL/staining	DNAPL/residual	NOI	DNAPL	residual odor
			Approximate GW Depth (ft bgs)	2.5	3.8	4	3.5	4	4	6.6	6.6
			Sample Date	8/10/2013	8/7/2013	8/6/2013	8/6/2013	8/7/2013	8/7/2013	8/12/2013	8/12/2013
			Sample ID	516880-F610	516880-F716	516880-F804	516880-F903	516008-G806	516008-G814	516008-G1007	516008-G1015
			QC Code	FS	FS	FS	FS	FS	FS	FS	FS
Parameter Name	**RES**	**COMM**	**IND**								
Aluminum	NS	NS	NS	**2580** J	**2630** J	**1490** J	**1150** J	**961** J	**4050** J	**3440** J	**2730** J
Antimony	NS	NS	NS	13.7 UJ	17.8 UJ	23.3 UJ	19.6 UJ	18.1 UJ	19.7 UJ	14.1 UJ	14.4 UJ
Arsenic	**16**	**16**	**16**	**0.55** J	2.4 U	**5.2**	**7.6**	**1.1** J	2.6 U	**0.42** J	**0.76** J
Barium	350	400	10,000	**7.1** J	**6.4** J	**20.5** J	**29.2** J	**7.1** J	**17** J	**10.7** J	**11.6** J
Beryllium	14	590	2,700	**0.16** J	**0.13** J	**0.13** J	**0.19** J	0.24 U	**0.27**	**0.24**	**0.26**
Cadmium	2.5	9.3	60	**0.054** J	0.24 U	**0.096** J	**0.082** J	**0.036** J	0.26 U	**0.039** J	0.19 U
Calcium	NS	NS	NS	**823** J	**952** J	**1820** J	**1790** J	**828** J	**1300** J	**781** J	**784** J
Chromium	22	400	800	**2.2**	**2.1**	**2.5**	**2.3**	**1.5**	**3.4**	**2.9**	**4.4**
Cobalt	NS	NS	NS	**0.93**	**1.1**	**1.2**	**2.1**	0.6 U	**2**	**1.5**	**1.7**
Copper	270	270	10,000	**1.5**	**1.8**	**8.1**	**6.1**	**1.1** J	**2.6**	**1.4**	**1.8**
Iron	NS	NS	NS	**2920** J	**3290** J	**4940** J	**4230** J	**1190** J	**5350** J	**6080** J	**16900** J
Lead	**400**	**1,000**	**3,900**	**0.72** J	**0.98** J	**33.1**	**11**	**2.7**	**1.8**	**0.77** J	**0.93** J
Magnesium	NS	NS	NS	**754** J	**963** J	**406** J	**63.7** J	**70.4** J	**1130** J	**957** J	**1400** J
Manganese	2,000	10,000	10,000	**19** J	**23.7** J	**39.4** J	**17.1** J	**11.1** J	**37.4** J	**28.1** J	**47.6** J
Mercury	0.81	2.8	5.7	0.019 U	0.022 U	**0.047**	**0.017** J	0.025 U	0.023 U	0.019 U	0.02 U
Nickel	140	310	10,000	**1.5** J	**2.2** J	**2.7** J	**10.6**	**0.51** J	**3.1** J	**3.8** J	**3.2** J
Potassium	NS	NS	NS	**166**	**225**	**81**	**61.7**	**88.9**	**388**	**235**	**296**
Selenium	36	1,500	6,800	3.6 U	4.7 UJ	**0.68** J	**0.92** J	4.8 UJ	5.2 UJ	3.8 U	3.8 U
Silver	36	1,500	6,800	0.46 U	0.59 U	0.78 U	0.65 U	0.6 U	0.66 U	0.47 U	0.48 U
Sodium	NS	NS	NS	**45.1** J	**44.3** J	**30.7** J	**23.2** J	**32.3** J	**73.3** J	**31.9** J	**38.9** J
Thallium	NS	NS	NS	5.5 U	7.1 U	9.3 U	7.8 U	7.2 U	7.9 U	5.7 U	5.8 U
Vanadium	NS	NS	NS	**4**	**4.4**	**3.9**	**4.7**	**1.4**	**8.4**	**6.4**	**5.9**
Zinc	2,200	10,000	10,000	**28.3**	**17.9**	**39.2**	**91.6**	**6.4**	**18**	**18.7**	**22.1**
Cyanide, Total	**27**	**27**	**10,000**	0.99 UJ	1.2 UJ	1.4 UJ	1.4 UJ	**1.3** J	1.2 UJ	1 UJ	1 UJ

Notes:
Results reported in milligrams per kilogram (mg/kg)

Table 4.2: OU01 Soil Inorganics Results

				Location ID	**GS-05**	**GS-06**	**GS-10**	**TP-04**	**TP-04**	**TP-05**
				Sample Depth (ft bgs)	3	7	7	6	6	2
				MGP Waste Type	Oily residue/ odor	tar-like/staining	tar-like/staining	slight odor	slight odor	strong odor/ sheen
				Approximate GW Depth (ft bgs)	1	1.5	1	4	4	2.5
				Sample Date	5/1/2007	5/1/2007	5/2/2007	4/30/2007	4/30/2007	4/30/2007
				Sample ID	SLGS00503SCXX	SLGS00607SCXX	SLGS01006SCXX	SLTP00406SCXD	SLTP00406SCXX	SLTP00502SCXX
				QC Code	FS	FS	FS	FD	FS	FS
Parameter Name	**RES**	**COMM**	**IND**							
Aluminum	NS	NS	NS		**3870**	**2970**	**2030**	**3710**	**3430**	**2580**
Antimony	NS	NS	NS		**1.8** JN	1 UJ	0.039 U	0.68 UJ	0.9 UJ	1 UJ
Arsenic	**16**	**16**	**16**		0.082 U	0.095 U	0.34 U	0.23 U	0.5 U	**45.6**
Barium	350	400	10,000		**13.5**	**13.9**	**10.1**	**14.4**	**15.1**	**37.2**
Beryllium	14	590	2,700		0.0065 U	0.0076 U	0.0042 U	0.0045 U	0.005 U	**0.26**
Cadmium	2.5	9.3	60		**0.63**	**0.11**	**0.15**	**0.14**	**0.14**	**0.62**
Calcium	NS	NS	NS		**3330**	**3080**	**604**	**1350**	**1290**	**1940**
Chromium	22	400	800		**12.6**	**2.6**	**2.6**	**2.6**	**2.5**	**6.3**
Cobalt	NS	NS	NS		**2.4**	**0.72**	**1.6**	**1.3**	**1.3**	**0.55**
Copper	270	270	10,000		**28**	**2.8**	1.5 U	**1.8**	**1.8**	**28.9**
Iron	NS	NS	NS		**7460**	**2070**	**2280**	**4730**	**4650**	**18100**
Lead	**400**	**1,000**	**3,900**		**12.3**	**1.3**	**1.9**	**2.3**	**2.6**	**166**
Magnesium	NS	NS	NS		**825**	**497**	**619**	**718**	**736**	**1120**
Manganese	2,000	10,000	10,000		**32**	**42.8**	**16.8**	**34.6**	**37.2**	**58.2**
Mercury	0.81	2.8	5.7		0.0086 U	**0.019**	0.0069 U	0.0074 U	0.0076 U	**0.25**
Nickel	140	310	10,000		**13.2**	**1.2**	**1.5**	**2.3**	**2.2**	**5**
Potassium	NS	NS	NS		**125**	**76.5**	**144**	**172**	**176**	**194**
Selenium	36	1,500	6,800		**3.4**	**0.53**	0.046 U	**1.7**	**1.8**	**10.5**
Silver	36	1,500	6,800		**3.4**	0.54 U	0.018 U	**3**	**2.9**	**8.3**
Sodium	NS	NS	NS		**43.8**	**20.4**	**21.7**	**23.2**	**23.6**	**37.1**
Thallium	NS	NS	NS		0.41 U	0.12 U	0.055 U	0.21 U	0.15 U	0.93 U
Vanadium	NS	NS	NS		**7**	**4.1**	**3.1**	**8.4**	**8.2**	**6.7**
Zinc	2,200	10,000	10,000		**395**	**9**	**28.6**	**37.9**	**36.8**	**97.2**
Cyanide, Total	**27**	**27**	**10,000**		**1.7**	1.2 U		**423**	0.99 U	**12.9**

Notes:
Results reported in milligrams per kilogram (mg/kg)

Table 4.3: OU01 Groundwater Organics Results

Location ID		GW-02	GW-02	GW-05	GW-06	GW-07	GW-08	GW-09	GW-10	GW-11	GW-11	GW-12
Sample Date		5/1/2007	8/22/2013	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/2/2007	5/2/2007	8/22/2013	5/2/2007
Sample Depth (ft bgs)		9.5	5	8	8	8	12	8	7	6.5	6	10
Sample ID		SLGW00211SCXX	516008-GW0209	SLGW00508SCXX	SLGW00608SCXX	SLGW00708SCXX	SLGW00812SCXX	SLGW00908SCXX	SLGW01007SCXX	SLGW01111SCXX	516008-GW1110	SLGW01210SCXD
Qc Code		FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FD
Parameter Name	**GA GW**											
Volatile Organic Compounds - 8260B												
1,2,4-Trimethylbenzene	**5**	**9** J		**47** J	**39** J	5 U	**200** J	5 U	5 UJ	**87**		5 UJ
1,2-Dibromo-3-chloropropane	**0.04**	5 UJ	1 U	5 UJ	5 UJ	5 U	10 UJ	5 U	5 UJ	5 U	1 UJ	5 U
1,3,5-Trimethylbenzene	**5**	**3** J		**18** J	**13** J	5 U	**64** J	5 U	5 UJ	**29**		5 UJ
2-Butanone	50	R	10 U	R	R	R	R	R	R	R	10 U	R
4-iso-Propyltoluene	**5**	5 UJ		**7** J	**4** J	5 U	10 UJ	5 U	5 UJ	**5**		5 U
Acetone	50	R	**9.5** J	R	R	R	R	R	R	R	10 U	R
Carbon disulfide	60	5 UJ	1 U	5 UJ	5 UJ	5 U	10 UJ	5 U	5 UJ	5 U	1 UJ	5 U
Chloromethane	5	5 UJ	1 U	5 UJ	5 UJ	5 U	10 UJ	5 UJ	5 UJ	5 UJ	1 U	5 UJ
Cyclohexane	NS		1 UJ								1 UJ	
Isopropylbenzene	**5**	5 UJ	**1.3**	**3** J	**3** J	5 U	**17** J	5 U	5 UJ	**19**	**18**	5 U
Methyl cyclohexane	NS		1 U								1 UJ	
n-Butylbenzene	**5**	5 UJ		5 UJ	5 UJ	5 U	**7** J	5 U	5 UJ	**6**		5 U
Naphthalene	**10**	**330**		**1100**	**1500**	**7**	**6400**	**130** J	**44** J	**1400**		**2** J
Propylbenzene	**5**	5 UJ		**3** J	**2** J	5 U	**20** J	5 U	5 UJ	**9**		5 U
Styrene	**5**	**8** J	**20**	5 UJ	**10** J	5 U	**510**	5 U	5 UJ	5 U	1 U	5 UJ
BTEX - 8260B												
Benzene	**1**	**84** J	**23**	**6** J	**110** J	5 U	**150** J	**2** J	5 UJ	**12**	**15**	5 U
Ethyl benzene	**5**	**150** J	**150**	**44** J	**84** J	5 U	**240** J	5 U	**3** J	**130**	**140**	5 U
Toluene	**5**	**9** J	**24**	**13** J	**90** J	5 U	**850**	5 U	**1** J	**33**	**28**	5 U
Xylene, o	**5**	**13** J		**34** J	**40** J	5 U	**260** J	5 U	5 UJ	**99**		5 U
Xylenes (m&p)	**5**	**29** J		**60** J	**63**	5 U	**500** J	5 U	**1** J	**180**		5 U
Xylenes, Total	**5**	**42** J	**140**	**95** J	**100** J	5 U	**760** J	5 U	**1** J	**280**	**220**	5 U
Total BTEX	NS	**285**	**337**	**157**	**387**	ND	**2000**	**2**	**5**	**454**	**403**	ND
Polycyclic Aromatic Hydrocarbons - 8270C												
Acenaphthene	**20**	**38**	**0.69** J		**180**	10 U	**75** J	**17**	**6** J	**63** J	**59** J	10 U
Acenaphthylene	NS	**8** J	**1.9** J		**90** J	**1** J	**260** J	10 U	**12**	**13** J	**4** J	10 U
Anthracene	**50**	**3** J	**0.77** J		**37** J	10 U	400 U	10 U	**9** J	100 U	**1.5** J	10 U
Benzo(a)anthracene	NS	**3** J	5.1 U		**29** J	10 U	400 U	10 U	**12**	100 U	4.7 U	10 U
Benzo(a)pyrene	NS	**2** J	**3.5** J		**28** J	10 U	400 U	10 U	**12**	100 U	4.7 U	10 U
Benzo(b)fluoranthene	NS	**2** J	**2.7** J		**20** J	10 U	400 U	10 U	**17**	100 U	4.7 U	10 U
Benzo(ghi)perylene	NS	20 U	**2.1** J		**18** J	10 U	400 UJ	10 U	**14**	100 UJ	4.7 U	10 U
Benzo(k)fluoranthene	NS	20 U	5.1 U		100 U	10 U	400 U	10 U	**5** J	100 U	4.7 U	10 U
Chrysene	NS	**2** J	**2.7** J		**20** J	10 U	400 U	10 U	**8** J	100 U	4.7 U	10 U
Dibenz(a,h)anthracene	NS	20 U	5.1 U		100 U	10 U	400 UJ	10 U	**2** J	100 UJ	4.7 U	10 U
Fluoranthene	**50**	**10** J	**2.4** J		**71** J	10 U	400 U	10 U	**23**	100 U	4.7 U	10 U
Fluorene	**50**	**11** J	**0.56** J		**70** J	10 U	**53** J	**3** J	**9** J	**15** J	**13**	10 U
Indeno(1,2,3-cd)pyrene	NS	20 U	**1.7** J		**12** J	10 U	400 UJ	10 U	**10**	100 UJ	4.7 U	10 U
Naphthalene	**10**	**250**	8.8 U		**810**	10 U	**3600**	**61**	**42**	**1200**	**990** J	10 U
Phenanthrene	**50**	**11** J	**1.4** J		**160**	10 U	**94** J	**5** J	**26**	**20** J	**7**	10 U
Pyrene	**50**	**19** J	**3.6** J		**110**	10 U	400 U	**1** J	**59**	100 U	4.7 U	10 U
TOTAL PAH	NA	**359**	**24**		**1655**	**1**	**4082**	**87**	**266**	**1311**	**1075**	ND

Table 4.3: OU01 Groundwater Organics Results

Location ID		GW-02	GW-02	GW-05	GW-06	GW-07	GW-08	GW-09	GW-10	GW-11	GW-11	GW-12
Sample Date		5/1/2007	8/22/2013	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	5/2/2007	5/2/2007	8/22/2013	5/2/2007
Sample Depth (ft bgs)		9.5	5	8	8	8	12	8	7	6.5	6	10
Sample ID		SLGW00211SCXX	516008-GW0209	SLGW00508SCXX	SLGW00608SCXX	SLGW00708SCXX	SLGW00812SCXX	SLGW00908SCXX	SLGW01007SCXX	SLGW01111SCXX	516008-GW1110	SLGW01210SCXD
Qc Code		FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FD
Parameter Name	**GA GW**											
Semi-volatile Organic Compounds - 8270C												
4-Methylphenol	NS	20 U	10 U		100 U	10 U	400 U	10 U	10 U	100 U	9.3 U	10 U
2,4-Dimethylphenol	**1**	20 U	5.1 U		100 U	10 U	400 U	10 U	10 U	100 U	**1.2** J	10 UJ
2-Methylnaphthalene	NS	**9** J	**1.5** J		**230**	10 U	**600**	**11**	**21**	**200**	**95** J	10 U
2-Methylphenol	NS	20 U	5.1 U		100 U	10 U	400 U	10 U	10 U	100 U	4.7 U	10 U
Benzaldehyde	NS		5.1 UJ								**14** J	
Biphenyl	**5**		**0.72** J								**19**	
Bis(2-Ethylhexyl)phthalate	5	20 U	5.1 U		100 U	10 U	400 U	10 U	10 U	100 U	4.7 U	**1** J
Carbazole	NS	20 U	5.1 U		100 U	10 U	400 U	10 U	10 U	100 U	**1.3** J	10 U
Di-n-butylphthalate	50	20 U	5.1 U		100 U	10 U	400 U	10 U	10 U	100 U	**0.81** J	10 U
Dibenzofuran	NS	20 U	10 U		**11** J	10 U	400 U	10 U	10 U	100 U	**0.93** J	10 U
Diethylphthalate	50	**2** J	5.1 U		100 U	10 U	400 U	10 U	10 U	100 U	4.7 U	10 U
Phenol	**1**	**3** J	**0.4** J		100 U	10 U	400 U	10 U	10 U	100 U	4.7 U	10 U
Pesticides - 8081												
4,4'-DDD	**0.3**				**0.53** J	0.1 U						0.1 U
4,4'-DDE	0.2				0.1 U	0.1 U						0.1 U
4,4'-DDT	**0.2**				**0.2** J	0.1 U						0.1 U
Aldrin	NS				0.05 U	0.05 U						0.05 U
Alpha-BHC	**0.01**				0.05 U	0.05 U						0.05 U
Endosulfan sulfate	NS				0.1 UJ	0.1 U						0.1 U
Endrin aldehyde	5				**0.26** J	0.1 U						0.1 U
Endrin ketone	5				0.1 U	0.1 U						0.1 U
Gamma-BHC/Lindane	**0.05**				0.05 UJ	0.05 UJ						0.05 UJ
PCB Target Compounds - 8082	NS				ND	ND						ND

Notes: See Table 4A
Results shown in microgram per liter (ug/L)

Table 4.3: OU01 Groundwater Organics Results

Location ID		GW-12	GW-13	GW-14	GW-14	GW-15	MW-101	MW-102	MW-103	MW-104
Sample Date		5/2/2007	5/2/2007	5/2/2007	8/22/2013	5/2/2007	8/22/2013	8/22/2013	8/22/2013	8/22/2013
Sample Depth (ft bgs)		10	8	11	6	7	8	10	15	11
Sample ID		SLGW01210SCXX	SLGW01308SCXX	SLGW01411SCXX	516008-GW1410	SLGW01507SCXX	516008-MW10110	516008-MW10213	516008-MW10317	516008-MW10410
Qc Code		FS	FS	FS	FS	FS	FS	FS	FS	FS
Parameter Name	**GA GW**									
Volatile Organic Compounds - 8260B										
1,2,4-Trimethylbenzene	**5**	5 UJ	5 U	**4** J		5 U				
1,2-Dibromo-3-chloropropane	**0.04**	5 U	5 U	5 U	1 UJ	5 UJ	**9.4**	1 UJ	1 U	1 U
1,3,5-Trimethylbenzene	**5**	5 UJ	5 U	**2** J		5 U				
2-Butanone	50	R	R	R	10 U	R	10 U	10 U	10 U	10 U
4-iso-Propyltoluene	**5**	5 U	5 U	5 U		5 U				
Acetone	50	R	R	R	10 U	R	**3.5** J	**3.9** J	10 U	10 U
Carbon disulfide	60	5 U	5 U	5 U	1 UJ	5 U	1 U	1 UJ	1 U	1 U
Chloromethane	5	5 U	5 UJ	**1** J	1 U	5 U	1 U	1 UJ	1 U	1 U
Cyclohexane	NS				1 UJ		1 UJ	**0.62** J	1 UJ	1 UJ
Isopropylbenzene	**5**	5 U	5 U	5 U	1 U	5 UJ	**26**	**56**	1 U	1 U
Methyl cyclohexane	NS				1 UJ		1 U	**0.44** J	1 U	1 U
n-Butylbenzene	**5**	5 U	5 U	5 U		5 U				
Naphthalene	**10**	5 U	5 UJ	**34**		5 U				
Propylbenzene	**5**	5 U	5 U	5 U		5 U				
Styrene	**5**	5 UJ	5 U	5 U	1 U	5 U	**250**	**680**	1 U	1 U
BTEX - 8260B										
Benzene	**1**	5 U	5 U	**80**	**0.62** J	5 U	**1100**	**97**	1 U	1 U
Ethyl benzene	**5**	5 U	5 U	**5**	1 U	5 U	**940**	**2900**	1 U	1 U
Toluene	**5**	5 U	5 U	**9**	1 U	5 U	**2100**	**880**	1 U	1 U
Xylene, o	**5**	5 U	5 U	**51**		5 U				
Xylenes (m&p)	**5**	5 U	5 U	**16**		5 U				
Xylenes, Total	**5**	5 U	5 U	**67**	2 U	5 U	**1100**	**1700**	2 U	2 U
Total BTEX	NS	ND	ND	**161**	**0.62**	ND	**5240**	**5577**	ND	ND
Polycyclic Aromatic Hydrocarbons - 8270C										
Acenaphthene	**20**	10 U	10 U	10 U	5 U	10 U	**46** J	**86**	**0.42** J	**9.9**
Acenaphthylene	NS	10 U	10 U	**4** J	**1** J	10 U	**540**	**490**	**0.95** J	**0.52** J
Anthracene	**50**	10 U	10 U	10 U	**0.41** J	10 U	**17** J	**17** J	4.6 U	**3.1** J
Benzo(a)anthracene	NS	10 U	10 U	10 U	5 U	10 U	94 U	48 U	4.6 U	5.9 U
Benzo(a)pyrene	NS	10 U	10 U	10 U	5 U	10 U	94 U	48 U	4.6 U	5.9 U
Benzo(b)fluoranthene	NS	10 U	10 U	10 U	5 U	10 U	94 U	48 U	4.6 U	5.9 U
Benzo(ghi)perylene	NS	10 U	10 U	10 U	**0.77** J	10 U	94 U	48 U	4.6 U	5.9 U
Benzo(k)fluoranthene	NS	10 U	10 U	10 U	5 U	10 U	94 U	48 U	4.6 U	5.9 U
Chrysene	NS	10 U	10 U	10 U	5 U	10 U	94 U	48 U	4.6 U	5.9 U
Dibenz(a,h)anthracene	NS	10 U	10 U	10 U	5 U	10 U	94 U	48 U	4.6 U	5.9 U
Fluoranthene	**50**	10 U	**1** J	10 U	5 U	10 U	**10** J	**10** J	4.6 U	**2.9** J
Fluorene	**50**	10 U	10 U	10 U	5 U	10 U	**92** J	**58**	**0.4** J	**6**
Indeno(1,2,3-cd)pyrene	NS	10 U	10 U	10 U	5 U	10 U	94 U	48 U	4.6 U	5.9 U
Naphthalene	**10**	10 U	10 U	**9** J	5 U	10 U	**5800**	**9700** J	4.9 U	5.9 U
Phenanthrene	**50**	10 U	10 U	10 U	5 U	10 U	**120**	**86**	**0.7** J	**17**
Pyrene	**50**	10 U	**2** J	10 U	5 U	10 U	**9.1** J	**9.5** J	4.6 U	**3.7** J
TOTAL PAH	NA	ND	**3**	**13**	**2**	ND	**6634**	**10457**	**2**	**43**

Table 4.3: OU01 Groundwater Organics Results

Location ID		GW-12	GW-13	GW-14	GW-14	GW-15	MW-101	MW-102	MW-103	MW-104
Sample Date		5/2/2007	5/2/2007	5/2/2007	8/22/2013	5/2/2007	8/22/2013	8/22/2013	8/22/2013	8/22/2013
Sample Depth (ft bgs)		10	8	11	6	7	8	10	15	11
Sample ID		SLGW01210SCXX	SLGW01308SCXX	SLGW01411SCXX	516008-GW1410	SLGW01507SCXX	516008-MW10110	516008-MW10213	516008-MW10317	516008-MW10410
Qc Code		FS	FS	FS	FS	FS	FS	FS	FS	FS
Parameter Name	**GA GW**									
Semi-volatile Organic Compounds - 8270C										
4-Methylphenol	NS	10 U	10 U	10 U	10 U	10 U	**17** J	96 U	9.2 U	12 U
2,4-Dimethylphenol	**1**	10 UJ	10 U	10 U	5 U	10 U	94 U	48 U	4.6 U	5.9 U
2-Methylnaphthalene	NS	10 U	10 U	10 U	5 U	10 U	**720**	**490**	**0.66** J	**3.4** J
2-Methylphenol	NS	10 U	10 U	10 U	5 U	10 U	**20** J	48 U	4.6 U	5.9 U
Benzaldehyde	NS				5 UJ		94 UJ	48 UJ	4.6 UJ	5.9 UJ
Biphenyl	**5**				5 U		**76** J	**65**	**0.69** J	**2.6** J
Bis(2-Ethylhexyl)phthalate	5	10 U	10 U	10 U	5 U	10 U	94 U	48 U	4.6 U	5.9 U
Carbazole	NS	10 U	10 U	10 U	5 U	10 U	**17** J	**13** J	4.6 U	5.9 U
Di-n-butylphthalate	50	10 U	10 U	10 U	**0.45** J	10 U	94 U	48 U	**0.64** J	5.9 U
Dibenzofuran	NS	10 U	10 U	10 U	10 U	10 U	**13** J	**7.5** J	9.2 U	**0.98** J
Diethylphthalate	50	10 U	10 U	10 U	5 U	10 U	94 U	48 U	4.6 U	5.9 U
Phenol	**1**	10 U	10 U	**3** J	5 U	10 U	94 U	48 U	4.6 U	5.9 U
Pesticides - 8081										
4,4'-DDD	**0.3**	0.1 U					0.23 U	0.47 UJ		
4,4'-DDE	0.2	0.1 U					**0.15** J	0.47 U		
4,4'-DDT	**0.2**	0.1 U					0.23 U	0.47 U		
Aldrin	NS	0.05 U					**0.033** J	0.47 U		
Alpha-BHC	**0.01**	0.05 U					**2.9**	**3.2**		
Endosulfan sulfate	NS	0.1 U					**0.12** JN	0.47 U		
Endrin aldehyde	5	0.1 U					0.23 U	0.47 UJ		
Endrin ketone	5	0.1 U					**0.11** J	0.47 U		
Gamma-BHC/Lindane	**0.05**	0.05 UJ					**0.052** JN	**0.074** J		
PCB Target Compounds - 8082	NS	ND					ND	ND		

Notes: See Table 4A
Results shown in microgram per liter (ug/L)

Table 4.3: OU01 Groundwater Organics Results

Location ID		MW-105	MW-106	MW-107	MW-108	MW-109	MW-109	MW-110	MW-204	MW-205D	MW-205S
Sample Date		8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	9/30/2014	9/30/2014	9/30/2014
Sample Depth (ft bgs)		15	10	10	14	10	10	15	17	25	15
Sample ID		516008-MW10518	516008-MW10610	516008-MW10713	516008-MW10819	516008-MW10915	516008-MW10915D	516008-MW11018	516008-MW204023	516008-MW205D025	516008-MW205S014
Qc Code		FS	FS	FS	FS	FS	FD	FS	FS	FS	FS
Parameter Name	**GA GW**										
Volatile Organic Compounds - 8260B											
1,2,4-Trimethylbenzene	**5**								**51**	**70**	1 UJ
1,2-Dibromo-3-chloropropane	**0.04**	1 U	1 U	1 U	1 U	1 U	1 U	1 U	33 U	40 U	2 U
1,3,5-Trimethylbenzene	**5**								**17**	**23**	1 U
2-Butanone	50	10 U	10 U	10 U	10 U	**3** J	**3.2** J	10 U	170 U	200 U	10 U
4-iso-Propyltoluene	**5**								17 U	20 U	1 U
Acetone	50	10 U	**3.6** J	10 U	10 U	**17** J	**17** J	10 U	170 U	200 U	10 UJ
Carbon disulfide	60	1 U	1 U	1 U	1 U	1 U	**0.64** J	1 U	17 U	20 U	1 U
Chloromethane	5	1 U	1 U	1 U	1 U	**0.85** J	1 U	1 U	17 U	20 U	1 U
Cyclohexane	NS	1 UJ	1 UJ	1 UJ	1 UJ	**0.5** J	**0.48** J	1 UJ	17 U	20 U	1 U
Isopropylbenzene	**5**	1 U	**3.7**	**3.1**	1 U	**8.1** J	**7.9** J	1 U	17 U	**9.8** J	1 UJ
Methyl cyclohexane	NS	1 U	1 U	1 U	1 U	1 U	1 U	1 U	17 U	20 U	1 U
n-Butylbenzene	**5**								17 U	20 U	1 U
Naphthalene	**10**								17 U		
Propylbenzene	**5**								17 U	20 U	1 U
Styrene	**5**	1 U	**31**	**780**	1 U	**810**	**860**	1 U	**340**	**15** J	1 U
BTEX - 8260B											
Benzene	**1**	1 U	**5.1**	**120**	1 U	**2400**	**2500**	1 U	**20**	**570**	**0.52** J
Ethyl benzene	**5**	1 U	**100**	**150**	1 U	**1200**	**1300**	1 U	**67**	**320**	1 U
Toluene	**5**	**0.58** J	**78**	**780**	1 U	**4900**	**5200**	**0.61** J	**270**	**31**	1 U
Xylene, o	**5**										
Xylenes (m&p)	**5**										
Xylenes, Total	**5**	2 U	**230**	**700**	2 U	**1200** J	**1200** J	2 U	**340**	**280**	2 U
Total BTEX	NS	**0.58**	**413**	**1750**	ND	**9700**	**10200**	**0.61**	**697**	**1201**	**0.52**
Polycyclic Aromatic Hydrocarbons - 8270C											
Acenaphthene	**20**	4.7 U	**28**	**1.2** J	4.8 U	**580** J	**440** J	4.6 U	**5.8**	**110** J	4.7 U
Acenaphthylene	NS	**0.91** J	**75**	**3.2** J	**0.47** J	**8800** J	**5100** J	**0.55** J	**36**	**140** J	4.7 U
Anthracene	**50**	4.7 U	**3.5** J	**0.91** J	4.8 U	1900	**1400**	4.6 U	**2.3** J	460 U	4.7 U
Benzo(a)anthracene	NS	4.7 U	**0.83** J	4.7 U	4.8 U	**1300**	**900**	4.6 U	4.6 U	460 U	4.7 U
Benzo(a)pyrene	NS	4.7 U	**0.46** J	4.7 U	4.8 U	**1200**	**870**	4.6 U	4.6 U	460 UJ	4.7 U
Benzo(b)fluoranthene	NS	4.7 U	**0.7** J	4.7 U	4.8 U	**1000**	**730**	4.6 U	4.6 U	460 UJ	4.7 U
Benzo(ghi)perylene	NS	4.7 U	4.9 U	4.7 U	4.8 U	**180** J	**170** J	4.6 U	4.6 U	460 UJ	4.7 U
Benzo(k)fluoranthene	NS	4.7 U	4.9 U	4.7 U	4.8 U	**430** J	**380** J	4.6 U	4.6 U	460 UJ	4.7 U
Chrysene	NS	4.7 U	**0.93** J	4.7 U	4.8 U	**1000**	**790**	4.6 U	4.6 U	460 U	4.7 U
Dibenz(a,h)anthracene	NS	4.7 U	4.9 U	4.7 U	4.8 U	930 U	480 U	4.6 U	4.6 U	460 UJ	4.7 U
Fluoranthene	**50**	4.7 U	**3.9** J	**0.6** J	4.8 U	**4300**	**3100**	**0.44** J	4.6 U	460 U	4.7 U
Fluorene	**50**	4.7 U	**17**	**4.8**	4.8 U	**3000**	**2300**	4.6 U	**11**	460 U	4.7 U
Indeno(1,2,3-cd)pyrene	NS	4.7 U	4.9 U	4.7 U	4.8 U	**190** J	**140** J	4.6 U	4.6 U	460 UJ	4.7 U
Naphthalene	**10**	19 U	**890** J	4.7 U	6.3 U	**29000**	**23000**	7 U	**570**	**2200**	**2.9** J
Phenanthrene	**50**	**0.65** J	**20**	**1** J	**0.53** J	**9500**	**7100**	**0.68** J	**12**	460 U	4.7 U
Pyrene	**50**	4.7 U	**4.3** J	**0.55** J	4.8 U	**4700**	**3500**	**0.38** J	4.6 U	460 U	4.7 U
TOTAL PAH	NA	**2**	**1045**	**12**	**1**	**71380**	**49920**	**2**	**637**	**2450**	**3**

Table 4.3: OU01 Groundwater Organics Results

Location ID		MW-105	MW-106	MW-107	MW-108	MW-109	MW-109	MW-110	MW-204	MW-205D	MW-205S
Sample Date		8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	9/30/2014	9/30/2014	9/30/2014
Sample Depth (ft bgs)		15	10	10	14	10	10	15	17	25	15
Sample ID		516008-MW10518	516008-MW10610	516008-MW10713	516008-MW10819	516008-MW10915	516008-MW10915D	516008-MW11018	516008-MW204023	516008-MW205D025	516008-MW205S014
Qc Code		FS	FS	FS	FS	FS	FD	FS	FS	FS	FS
Parameter Name	**GA GW**										
Semi-volatile Organic Compounds - 8270C											
4-Methylphenol	NS	9.3 U	**3.6** J	9.4 U	9.6 U	1900 U	970 U	9.2 U	9.2 U	920 UJ	9.4 U
2,4-Dimethylphenol	**1**	4.7 U	**1.3** J	**3.7** J	4.8 U	930 U	480 U	4.6 U	4.6 U	460 U	4.7 U
2-Methylnaphthalene	NS	**2** J	**220**	4.7 U	**1.1** J	**7900** J	**6100**	**1.1** J	**37**	**190** J	4.7 U
2-Methylphenol	NS	4.7 U	**3.4** J	4.7 U	4.8 U	930 U	480 U	4.6 U	4.6 U	460 UJ	4.7 U
Benzaldehyde	NS	4.7 UJ	4.9 UJ	4.7 UJ	4.8 UJ	930 UJ	480 UJ	4.6 UJ	4.6 U	460 UJ	4.7 U
Biphenyl	**5**	**0.71** J	**22**	**0.89** J	4.8 U	**1400**	**980**	4.6 U	**8.5**	460 U	4.7 U
Bis(2-Ethylhexyl)phthalate	5	4.7 U	4.9 U	4.7 U	**1.8** J	930 U	480 U	4.6 U	4.6 U	460 U	4.7 U
Carbazole	NS	4.7 U	**2.5** J	4.7 U	4.8 U	930 U	480 U	4.6 U	4.6 U	460 U	4.7 U
Di-n-butylphthalate	50	**0.32** J	**0.55** J	**0.37** J	**1** J	930 U	480 U	**0.41** J	4.6 U	460 U	4.7 U
Dibenzofuran	NS	9.3 U	**1.9** J	**0.62** J	9.6 U	**330** J	**250** J	9.2 U	**1.6** J	920 U	9.4 U
Diethylphthalate	50	4.7 U	4.9 U	4.7 U	4.8 U	930 U	480 U	4.6 U	**0.57** J	460 U	4.7 U
Phenol	**1**	4.7 U	4.9 U	4.7 U	4.8 U	930 U	480 U	4.6 U	4.6 U	460 UJ	4.7 U
Pesticides - 8081											
4,4'-DDD	**0.3**					9.4 U	9.5 U				
4,4'-DDE	0.2					9.4 U	9.5 U				
4,4'-DDT	**0.2**					9.4 U	9.5 U				
Aldrin	NS					9.4 U	9.5 U				
Alpha-BHC	**0.01**					**1.3** J	9.5 U				
Endosulfan sulfate	NS					9.4 U	9.5 U				
Endrin aldehyde	5					9.4 U	9.5 U				
Endrin ketone	5					9.4 U	9.5 U				
Gamma-BHC/Lindane	**0.05**					9.4 U	9.5 U				
PCB Target Compounds - 8082	NS					ND	ND				

Notes: See Table 4A
Results shown in microgram per liter (ug/L)

Table 4.4: OU01 Groundwater Inorganics Results

Location ID		GW-06	GW-07	GW-12	GW-12	GW-02	GW-11	GW-14	MW-101	MW-102
Sample Date		5/1/2007	5/1/2007	5/2/2007	5/2/2007	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013
Sample Depth (ft bgs)		8	8	12	12	5	6	6	8	10
Sample ID		SLGW00608SCXX	SLGW00708SCXX	SLGW01210SCXD	SLGW01210SCXX	516008-GW0209	516008-GW1110	516008-GW1410	516008-MW10110	516008-MW10213
QC Code		FS	FS	FD	FS	FS	FS	FS	FS	FS
Parameter Name	**GA GW**									
Metals Total - 6010B										
Aluminum	NS	**13300**	**3740**	**271**	**292**	**80100** J	**150** J	**3700** J	**230** J	**410** J
Arsenic	25	**17.5**	1.6 U	1.6 U	1.6 U	**47**	10 U	10 U	10 U	10 U
Barium	1000	**232**	**78.1**	**19.3**	**18.9**	**170**	**27**	**180**	**170**	**29**
Beryllium	3	**0.38**	**0.16**	0.15 U	0.15 U	**8.8**	2 U	**0.32** J	2 U	2 U
Cadmium	5	**0.97**	**0.15**	0.1 U	0.1 U	**3.3**	1 U	1 U	1 U	1 U
Calcium	NS	**81600**	**23400**	**3170**	**3130**	**21900**	**17600**	**30000**	**35300**	**41000**
Chromium	50	**20.5**	**3.2**	**0.95**	**0.42**	**30**	**2** J	**9.5**	**1.2** J	**1.8** J
Cobalt	NS	**11.3**	0.15 U	**3**	**3.3**	**9.1**	**1.8** J	**2.7** J	4 U	4 U
Copper	**NS**	**148**	**8.4**	6.3 U	6.3 U	**2000**	10 U	**4.6** J	10 U	10 U
Iron	**300**	**25900**	**22000**	**1450**	**1470**	**257000**	**25500**	**33000**	**26900**	**19600**
Lead	**25**	**142**	**11**	**0.64** J	0.46 UJ	**580**	5 U	5 U	5 U	5 U
Magnesium	35000	**4760**	**1190**	**725**	**729**	**1900**	**1800**	**1600**	**1700**	**2000**
Manganese	**300**	**395**	**122**	**918**	**900**	**140**	**250**	**110**	**230**	**850**
Mercury	0.7	0.21 U	0.05 U	0.05 U	0.07 U	**0.31**	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	100	**31.2**	0.59 U	0.59 UJ	**0.83** J	**36**	10 U	**7.5** J	**1.4** J	10 U
Potassium	NS	**2410**	**5650**	**419**	**394**	**1600**	**710**	**1300**	**1100**	**3000**
Selenium	**10**	**9.3**	**10.4**	0.98 UJ	**2.7** J	15 U	15 U	15 UJ	15 U	15 U
Silver	50	0.91 U	1.1 U	0.91 U	0.91 U	15 U	3 U	3 U	3 U	3 U
Sodium	20000	**1600**	**3640**	**1290**	**1270**	**1500** J	**4600**	**1300**	**1200**	**4100**
Thallium	**0.5**	**3.6**	1.2 U	1.2 U	1.2 U	20 U	20 U	20 U	20 U	20 U
Vanadium	NS	**30.7**	**7.6**	0.47 U	0.47 U	**130**	**5.6**	**5.6**	**1.7** J	**2.2** J
Zinc	2000	**317**	**19**	10.5 U	8.1 U	**290** J	**7.7** J	**29** J	**2.3** J	10 UJ
Cyanide, Total (7196)	200					**540**	**41**	**38**	**74**	**24**
Metals Dissolved - 6010B							0	0		
Aluminum	NS					**550** J	0	200 U		
Arsenic	25					10 U	0	10 U		
Barium	1000					**46**	0	**140**		
Beryllium	3					2 U	0	2 U		
Cadmium	5					1 U	0	1 U		
Calcium	NS					**14700**	0	**27700**		
Chromium	50					4 U	0	4 U		
Cobalt	NS					**4.2**	0	**2.2** J		
Copper	200					**13** J	0	10 U		
Iron	**300**					**20900**	0	**24700**		
Lead	25					**4** J	0	5 U		
Magnesium	35000					**1400**	0	**1100**		
Manganese	**300**					**150**	0	**86**		
Mercury	0.7					0.2 U	0	0.2 U		
Nickel	100					**8.1** J	0	**5.4** J		
Potassium	NS					**1600**	0	**1100**		
Selenium	10					15 U	0	**8.8** J		
Silver	50					3 U	0	3 U		
Sodium	20000					**2100** J	0	**1200**		
Thallium	0.5					20 U	0	20 U		
Vanadium	NS					**4.1** J	0	5 U		
Zinc	2000					**53**	0	**14**		

Table 4.4: OU01 Groundwater Inorganics Results

Parameter Name	Location ID / Sample Date / Sample Depth (ft bgs) / Sample ID / QC Code / GA GW	MW-103 8/22/2013 15 516008-MW10317 FS	MW-104 8/22/2013 11 516008-MW10410 FS	MW-105 8/22/2013 15 516008-MW10518 FS	MW-106 8/22/2013 10 516008-MW10610 FS	MW-107 8/22/2013 10 516008-MW10713 FS	MW-108 8/22/2013 14 516008-MW10819 FS	MW-109 8/22/2013 10 516008-MW10915 FS	MW-109 8/22/2013 10 516008-MW10915D FD	MW-110 8/22/2013 15 516008-MW11018 FS
Metals Total - 6010B										
Aluminum	NS	**240** J	**580** J	**420** J	**1200** J	**88** J	**260** J	**3700** J	**2800** J	**160** J
Arsenic	25	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Barium	1000	**13**	**8.8**	**22**	**36**	**19**	**2.5**	**37**	**32**	**6.8**
Beryllium	3	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cadmium	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Calcium	NS	**11700**	**9500**	**6300**	**5800**	**15400**	**2700**	**10500**	**9900**	**9000**
Chromium	50	**2.5** J	**1** J	**1** J	**7.9**	4 U	4 U	**11**	**9.8**	4 U
Cobalt	NS	4 U	4 U	**3.3** J	**2** J	**2.1** J	4 U	**1.8** J	**1.4** J	**0.93** J
Copper	**NS**	10 U	10 U	10 U	**2.1** J	**1.9** J	10 U	**3.8** J	**3.5** J	10 U
Iron	**300**	**20600**	**3900**	**6900**	**26000**	**4200**	**830**	**25900**	**25200**	**400**
Lead	**25**	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	5 U
Magnesium	35000	**960**	**1600**	**1100**	**1600**	**750**	**840**	**1800**	**1700**	**930**
Manganese	**300**	**120**	**230**	**200**	**260**	**220**	**21**	**370**	**370**	**72**
Mercury	0.7	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	100	10 U	10 U	**3.1** J	**1.4** J	10 U	10 U	**2.6** J	**2.2** J	**1.4** J
Potassium	NS	**310** J	**570**	**340** J	**950**	**980**	**450** J	**1600**	**1400**	**460** J
Selenium	**10**	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U
Silver	50	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Sodium	20000	**4900**	**7200**	**5700**	**4500**	**1500**	**5500**	**6900**	**6800**	**1700**
Thallium	**0.5**	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Vanadium	NS	**6.5**	**2.7** J	5 U	**8**	5 U	5 U	**11**	**9.9**	5 U
Zinc	2000	**1.9** J	0.01 UJ	**4.6** J	**5.3** J	**3.6** J	**3.1** J	**28** J	**21** J	**6.6** J
Cyanide, Total (7196)	200	10 U	10 U	10 U	**11**	23 U	10 U	**70**	**65**	**63**
Metals Dissolved - 6010B										
Aluminum	NS							**640** J	**650** J	
Arsenic	25							10 U	10 U	
Barium	1000							**23**	**22**	
Beryllium	3							2 U	2 U	
Cadmium	5							1 U	1 U	
Calcium	NS							**9600**	**9600**	
Chromium	50							**2.7** J	**2.8** J	
Cobalt	NS							**1.1** J	**1.1** J	
Copper	200							10 U	10 U	
Iron	**300**							**23400**	**24200**	
Lead	25							5 U	5 U	
Magnesium	35000							**1500**	**1500**	
Manganese	**300**							**380**	**380**	
Mercury	0.7							0.2 U	0.2 U	
Nickel	100							10 U	**1.4** J	
Potassium	NS							**1400**	**1500**	
Selenium	10							15 U	15 U	
Silver	50							3 U	**2.2** J	
Sodium	20000							**6700**	**6600**	
Thallium	0.5							20 U	20 U	
Vanadium	NS							**6.9**	**7.4**	
Zinc	2000							**6.9** J	**5.8** J	