Lexington Machining LLC
Premier Lakewood, Inc. Site
201 Winchester Road
Village of Lakewood, Town of Busti
CHAUTAUQUA COUNTY, NEW YORK

Site Management Plan (Rev1)

NYSDEC Site Number: 907044

Prepared for:
Lexington Machining LLC
677 Buffalo Road
Rochester, New York 14611

Prepared by:
Apex Companies, LLC
520 South Main Street, Suite 2444
Akron, Ohio 44311
330.426.7625

Revisions to Final Approved Site Management Plan:

Revision #	Submitted Date	Summary of Revision	DEC Approval Date
1	4/10/2020	Updated Groundwater Monitoring Plan Updated Vapor Intrusion Evaluation Updated Groundwater Data Summary	

MAY 2013
REVISED APRIL 2020

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SITE MANAGEMENT PLAN

EXECUTIVE SUMMARY

This Site Management Plan (SMP) has been prepared for Lexington Machining LLC (LMLLC) for the LMLLC site located at 201 Winchester Road in Lakewood, New York, Site #907044 (the Site). The SMP has been prepared to address low levels of volatile organic compounds (VOCs) remaining in soil and groundwater of the Site. The SMP is required by the New York State Department of Environmental Conservation (NYSDEC) Order on Consent and Administrative Settlement Index # B9-0792-08-10.

VOCs were identified in Site soil and groundwater during due diligence environmental site investigations and underground storage tank (UST) closure activities between July 2002 and November 2006. The primary soil and groundwater contaminant, 1,1,1-trichloroethane (1,1,1-TCA), had been previously used at the Site as a solvent and degreaser from approximately 1960 through 1991. Breakdown products of 1,1,1-TCA identified in groundwater include 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), chloroethane and vinyl chloride. Also identified in several groundwater samples were 1,1,2-trichloroethane (1,1,2-TCA) and its breakdown product 1,2-dichloroethane (1,2-DCA).

An enhanced in-situ bioremediation program was conducted to address VOCs in groundwater at the Site in August through November 2006. The program included injection of bio-amendments into groundwater to support and increase the rate of naturally occurring degradation of contaminants by reductive dechlorination.

Post-remediation groundwater sampling conducted in April 2007, indicated a reduction in 1,1,1-TCA concentrations and an increase in 1,1,1-TCA breakdown products such as 1,1-DCA, and chloroethane

A groundwater sampling program was conducted in June 2010 to evaluate groundwater quality conditions at the Site. The concentrations of the primary contaminant, 1,1,1-TCA, had fallen below NYSDEC Groundwater Quality Standard (GWQS) in all but one monitoring well. The secondary contaminant, 1,1,2-TCA was detected in only one monitoring well at a concentration above the GWQS; the concentration was lower than the previously detected concentrations. Concentrations of contaminant breakdown products are generally increasing at the site. Concentrations of tertiary breakdown products chloroethane and chloroethene are increasing. Secondary breakdown product concentrations of 1,1-DCA, 1,2-DCA and 1,1-DCE, increased under the Site building but decreased in most other areas of the Site. These changes indicate that natural attenuation of the VOC contaminants at the Site is occurring.

Soil contaminants remaining at the site are located at depths of 4 to 11.5 feet beneath site structures and include chlorinated solvents and acetone at concentrations below criteria for protection of public health in residential, commercial or industrial settings, but above criteria for protection of groundwater.

Groundwater contaminants remaining at the Site, including chlorinated solvent VOCs, are present in overburden groundwater under approximately half of the 99,000 square foot manufacturing building and the northern portion of the LMLLC site. Groundwater elevations are generally encountered at depths of 10 to 16 feet below grade. One groundwater sample, collected from deep groundwater monitoring well (MW-11D) in June 2010, exhibited concentrations of four VOCs, three at concentrations below groundwater quality standards, and the fourth, acetone, detected slightly above standards. Monitoring well MW-11D is located outside the southwest corner of the manufacturing building and up-gradient of chemical use areas. No other VOCs have been detected above standards in the deep groundwater zone.

Based upon the indications of the continued degradation of VOCs on the Site, the preferred approach for site management is monitored natural attenuation of VOCs in groundwater on an annual basis.

1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM

1.1 INTRODUCTION

This document is required as an element of the remedial program at the Site under the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program administered by the New York State Department of Environmental Conservation (NYSDEC). The Site has been remediated as described in the report entitled "SUMMARY OF ENVIRONMENTAL INVESTIGATIONS AND REMEDIAL ACTIVITIES", prepared by Haley and Aldrich (H&A) of New York and dated January 9, 2007. The H&A report indicated the following:

- Low levels of the chlorinated solvent volatile organic compound (VOC) 1,1,1-trichloroethane (TCA) were present in overburden groundwater under approximately half of the 99,000 square foot manufacturing building. Information provided by plant personnel indicated that TCA was used in manufacturing operations at the plant until 1991. Although no specific TCA releases are documented in plant records and specific release areas have not been identified by the subsurface investigations that have been conducted at the Property, it is possible that a minor release or releases of the solvent prior to 1991 may have been the source of the groundwater impacts at the Property.

- The area in which VOCs have been detected in groundwater includes the north portion of the Lexington Precision Corporation property. The TCA in groundwater has been largely biodegraded by naturally-occurring microorganisms present in the subsurface, and the compounds present in groundwater at low levels are predominantly the by-products of the intrinsic breakdown of TCA rather than TCA itself.

- TCA and its breakdown products are present at concentrations that are relatively low, although higher than New York State groundwater standards. Of the groundwater VOCs that remain, the predominant compound is chloroethane. Chloroethane is the last chlorinated organic compound in the sequence of compounds produced by the intrinsic microbial degradation of TCA. Under conditions like those present at the Property, chloroethane is relatively short lived in groundwater before being degraded. Chloroethane readily degrades to ethane, which is non-toxic.

- It is apparent from the conditions observed at the Property that natural, intrinsic biodegradation will continue to reduce the concentrations of VOCs in groundwater at the Property. The data also indicates that the biodegradation process that is occurring at the site can be enhanced with a well-tested remedial technology designed to stimulate natural microbial activity using food-grade materials. Groundwater conditions at the Property are very well suited to using a dilute aqueous solution of edible food-grade soybean oil to enhance the activity of the naturally-occurring microorganisms that are degrading the VOCs. It is expected that the application of this material will cause reduction of VOCs at a faster rate than would occur naturally.

1.1.1 General

Lexington Precision Corporation entered into an Order on Consent with the NYSDEC to remediate a 6.15-acre site located in the Village of Lakewood, Town of Busti, Chautauqua County, New York. This Order on Consent required the Remedial Party, Lexington Precision Corporation, to investigate and remediate contaminated media at the site. A figure showing the site location of this 6.15-acre "site" is provided in Figure 1. The boundaries of the site are more fully described in the metes and bounds site description that is part of the Environmental Easement (See Appendix A).

After completion of the remedial work described in the Remediation Summary, some contamination was left in the subsurface at this site, which is hereafter referred to as 'remaining contamination." This Site Management Plan (SMP) was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

The SMP was prepared by Bureau Veritas North America, Inc. (Bureau Veritas, now known as Apex Companies, LLC [Apex]), on behalf of LMLLC in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated May 2010, and the guidelines provided by NYSDEC. This SMP addresses the means for implementing, monitoring and reporting associated with the Institutional Controls (ICs) and Engineering Controls (ECs) that are required by the Environmental Easement for the site.

1.1.2 Purpose

The site contains residual contamination after completion of the remedial action. Engineering Controls have been incorporated into the site remedy to control exposure to remaining residual contamination during the use of the site to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Chautauqua County Clerk, will require compliance with this SMP and all ECs and ICs placed on the site. The ICs place restrictions on site use, and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. This SMP specifies the methods necessary to ensure compliance with all ECs and ICs are required by the Environmental Easement for contamination that remains at the site. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of all procedures required to manage remaining contamination at the site after completion of the Remedial Action, including:

(1) implementation and management of all Engineering and Institutional Controls;

(2) media monitoring;

(3) performance of periodic inspections, certification of results, and submittal of Periodic Review Reports; and

(4) defining criteria for termination of media monitoring operations.

To address these needs, this SMP includes two plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; and (2) a Monitoring Plan for implementation of Site Monitoring activities.

This plan also includes a description of Periodic Review Reports for the periodic submittal of data, information, recommendations, and certifications to NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the environmental easement; and
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the Order on Consent, (Index # B9-0792-08-10) for the site, and thereby subject to applicable penalties.

1.1.3 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. In accordance with the Environmental Easement for the site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.2 SITE BACKGROUND

1.2.1 Site Location and Description

The site is located in the Village of Lakewood, Town of Busti, County of Chautauqua, New York and is situated on three lots identified as Block 385 and Lots 06-3-58, 06-3-59 and 06-3-60 on the Chautauqua County Tax Map. The site is an approximately 6.15-acre area bounded by a Chautauqua Regional Railroad Authority rail line to the north, a residential site and a vacant commercial/industrial facility to the south, Matco Tools manufacturing facility and American Legion Lakewood Memorial Post 1286 to the east, and Winchester Road to the west (see Figure 2). The boundaries of the site are more fully described in the meets and bound description in the Environmental Easement in Appendix A.

1.2.2 Site History

The site was undeveloped vacant land at least through the 1930s with initial construction of the existing manufacturing building beginning circa 1956. Die casting operations have been located at the site since that time. The manufacturing plant was occupied through the 1980s by Falconer Metal Specialties, which was succeeded by

Falconer Die Casting, Lexington Die Casting, and Premier Tool & Die, and Premier Lakewood, Inc. the current operator. Lexington Precision Corporation, the previous owner of the Site, was the owner of Lexington Die Casting before selling the manufacturing equipment and operation to Premier Tool & Die in 2006. The current site owner is LMLLC.

Historical environmental reports prepared and available for the Site include the following:

- Phase I Environmental Site Assessment, Falconer Die and Casting Company, prepared by H & A of New York, April 25, 1995
- Phase I Environmental Site Assessment, Lexington Die Casting Company, prepared by Gemini Geotechnical Associates, Inc., July 24, 2002
- Phase I Environmental Site Assessment, 201 Winchester Road, Lakewood, NY, prepared by Clayton Group Services, Inc, December 12, 2002
- Phase I Environmental Site Assessment, Premier Tool and Die, prepared by Haley & Aldrich of New York, May 3, 2006

Aluminum, magnesium, and zinc die castings are manufactured for consumer and industrial products. The castings are manufactured by melting metal ingots, forming the molten metal in molds, and removing the castings from the molds. The castings then undergo a rough finishing process where contact water is utilized to cool the castings, remove burrs and smooth rough edges. The castings are also finished by manual sanding, grinding, and smoothing.

Contact process and cooling water is handled and treated in a closed-loop system consisting of settling tanks and a filtration system. Until 2004, the process and cooling water system used five unregulated settling tanks that were located under the plant floor. In 2004, the below-grade tanks associated with the die-casting process were removed from service and replaced with aboveground tanks. Two of the 1,000-gallon below-grade tanks were cleaned and filled with concrete while the remaining three 1,000-gallon tanks were cleaned in-place and taken out of service.

Lubricants were used to release the castings from molds and in machinery. Non-hazardous cleaners and lubricants, including water-soluble products, were used at the manufacturing plant. Spent cleaning products and lubricants are accumulated in 55-gallon drums at the point of use and disposed as non-hazardous waste on an as needed basis by a licensed waste hauler.

Small-quantity hazardous wastes generated at the Site prior to 1991 reportedly included spent 1,1,1-trichloroethane (1,1,1-TCA), lubricating oils, and light-weight oils. 1,1,1-TCA, a chlorinated volatile organic compound (VOC), was used at the plant from approximately 1960 to 1991 as a solvent and degreaser and was stored in an above ground tank inside the plant. In 1991, the manufacturing plant reportedly began using only non-hazardous degreasers and cooling oils.

Available information indicates that underground fuel or solvent storage tanks are not currently and have not previously been present at the site. Available information indicates that petroleum and solvent are/were stored and handled in drums or in above ground tanks. The manufacturing plant generates solid waste in the form of paper, cardboard, wooden boxes, and spent filter media from the process and cooling water treatment system. Metal shavings and cuttings from the die casting manufacture and finishing processes are re-smelted. Dross (waste die-casting material that is not suitable for re-smelting) is sold back to suppliers.

1.2.3 Geologic Conditions

Native soils at the site are mapped in the county soil survey as Chautauqua silt loam (formed in glacial till) on the northern half, Fremont silt loam (from till derived from soft shale) on the west-central portion, Raynham silt loam (derived from silty glacio-lacustrine sediments) on the southwest portion, and Busti silt loam (formed in till derived from siltstone and shale) on the southeastern portion. The native soils at the site are presumed to have for the most part been disturbed, removed or covered during manufacturing plant construction.

Fill soils 3 to 5 feet thick and consisting primarily of silty sand and gravel with some concrete, brick, and wood fragments, are present beneath the floor of the eastern portion of the manufacturing building.

The overburden in the vicinity of the site is mapped on the regional geologic map as glacial till of varying thickness. Native overburden encountered in borings at the site includes organic silts and fine-grained glacio-lacustrine sediments and dense to very dense glacial till. Beneath the native soil, the upper few to several feet of bedrock at the site are weathered to a very dense low permeability soil-like material.

Bedrock in the vicinity of the site is mapped as Upper Devonian Conneaut Group shale and siltstone. Depth to the top of competent bedrock encountered in borings and monitoring wells ranged from approximately 13 to 19 feet below grade. Three bedrock monitoring wells have been installed at the site to depths of 27 feet below grade, and bedrock cores from these wells consisted of competent, relatively un-weathered siltstone with shale seams.

Groundwater level monitoring data indicate that the water table at the site occurs at the base of the overburden section, a few feet above the top of soil-like weathered bedrock, at depths ranging from 10 to 16 feet below exterior grade.

Permeability in the saturated overburden (including the soil-like weathered bedrock that occurs at the base of the overburden) appears to be generally very low as indicated by the occurrence of dense glacial till at the bottom of the overburden section and by observations that the overburden wells at the site are very slow to recover after being purged for groundwater sampling. The overburden wells typically have taken longer than 24 hours to recover to static levels after sampling.

The direction of groundwater flow at the site is to the north to north-northeast. The horizontal flow gradient observed at the Site ranges from approximately 0.024 to 0.034 feet per foot. Groundwater elevation data indicates that there is not a consistent upward or downward vertical gradient of groundwater flow between the overburden and underlying bedrock.

A groundwater flow figure is shown in Figure 4.

A geologic section is shown in Figure 5.

1.3 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

Remedial Investigations (RIs) were performed to characterize the nature and extent of contamination at the site. The results of the RIs are described in detail in the following reports:

- Phase II Environmental Site Assessment, Lexington Die Casting Company, prepared by Haley & Aldrich of New York, October 24, 2002
- UST Evaluation and Closure Program Work Plan, Lexington Die Casting Company, prepared by Haley & Aldrich of New York, February 12, 2004
- Site Groundwater Investigation, Lexington Die Casting Company, prepared by Haley & Aldrich of New York, October 27, 2005
- Summary of Environmental Investigations and Remedial Activities, Lexington Precision Corporation Site, prepared by Haley & Aldrich of New York, January 9, 2007

Generally, the RIs have determined that there is minimal soil VOC impact apparent in historical areas of chlorinated solvent use/storage and shallow groundwater VOC impact beneath a portion of the site. Initial in-situ enhanced biodegradation has decreased the primary VOC (i.e. 1,1,1-TCA and 1,1,2-TCA) concentrations in groundwater. Concentrations of degradation product VOCs, (e. g. 1,1-DCA and 1,1-DCE) have generally increased in some areas with the breakdown of primary VOCs. Degradation product VOC concentrations are anticipated to decrease over time with the depletion of primary VOC contaminants. No other impacts requiring additional investigation or remediation were identified during the previous noted RIs.

Below is a summary of site conditions based upon RI activities performed in 2004, 2005 and 2006:

<u>Soil</u>

Three phases of soil sampling performed at the site included the areas where chlorinated solvent had been stored, used or potentially used. The results of the sampling program indicate a minor VOC impact in soil at the site. 1,1,1-TCA was detected at a concentration of 6.3 mg/kg, above soil cleanup criteria for protection of groundwater quality in one location; however, 1,1,1-TCA was not detected at concentrations above any soil cleanup criteria for protection of public health.

1,2-DCA was detected at concentrations of 0.03 to 0.05 ppm at 6 locations at concentrations slightly above the groundwater protection criteria but well below public health and ecological resource protection criteria.

Acetone was detected in two soil samples at concentrations slightly above the groundwater protection criteria but well below public health and ecological resource protection criteria.

Test boring locations are depicted in Figure 6, Test Boring and Well Location Plan.

Site-Related Groundwater

Groundwater impacts were initially discovered at the site during an October 2002 Phase II site assessment. VOCs including 1,1,1-TCA, 1,1,2-TCA, 1,1-DCA, 1,1-DCE, and 1,2-, 1,3-, and 1,4-dichlorobenzene were detected at concentrations of 2.6 to 19.0 micrograms per liter (ug/L). Subsequent groundwater monitoring well installation and groundwater sampling at the site in 2005, 2006, 2007 and 2010 identified additional VOCs; primarily breakdown products of 1,1,1-TCA and 1,1,2-TCA. VOCs detected in groundwater at the site, with concentrations ranges as noted, include:

- acetone (3.79 to 200 ug/L) (50 ug/L NYSDEC GWQS),
- benzene (0.458 to 0.815ug/L (two detections) (1 ug/L NYSDEC GWQS),
- chloroethane (1.08 to 1100 ug/L) (5 ug/L NYSDEC GWQS),
- 1,1-dichloroethane (0.502 to 400 ug/L) (5 ug/L NYSDEC GWQS),
- 1,2-dichloroethane (0.331 to 9.15 ug/L) (0.6 ug/L NYSDEC GWQS),
- 1,1-dichoroethene (0.572 to 500 ug/L) (5 ug/L NYSDEC GWQS),
- cis-1,2-dichloroethene (0.496 to 10.3 ug/L) (5 ug/L NYSDEC GWQS),
- 1,1,1-trichloroethane (1.6 to 174 ug/L) (5 ug/L NYSDEC GWQS), and
- 1,1,2-trichloroethane (2.02 to 3.4 ug/L) (1 ug/L NYSDEC GWQS).

The groundwater VOC impact at the site appears to be limited in vertical extent to the saturated overburden. Its lateral extent appears to cover an area approximately 1.5 acres in size that includes the northern two thirds of the manufacturing building and extends down-gradient to the north and northeast from the building to the northern site boundary. Concentrations of VOCs detected in samples from wells installed in October 2006 at the northern site boundary (MW-12, -13, and -14) were an order of magnitude lower (roughly ten times lower) than concentrations detected at the wells located up-gradient and closer to the building (MW-1, -2, and -3). In general, the VOCs that occur in groundwater are predominantly the bio-degradation products of 1,1,1-TCA and 1,1,2-TCA. Continued natural degradation of site contaminants is anticipated.

Acetone was identified in three samples during one groundwater sampling event in 2005 and in six samples in 2010. Acetone was detected in the field blank during the 2010 sampling event and may be a laboratory contaminant. Benzene was identified in one sample during one groundwater sampling event in 2005 and one sample in June

2010. The presence of acetone and benzene in groundwater sampling appear to be intermittent and may be the result of laboratory or field contaminants.

Site-Related Soil Vapor Intrusion

A soil vapor intrusion evaluation was conducted in March 2014 for the current structures on the site as described in Section 2.3.2, Soil Vapor Intrusion Evaluation.

1.4 SUMMARY OF REMEDIAL ACTIONS

The site was remediated using enhanced in-situ bioremediation for groundwater impacts. The following is a summary of the Remedial Actions performed at the site:

1. Application of a bio-amendment / bioremediation barrier for remediation of VOC groundwater impacts at the site.
2. Execution and recording of Environmental Easement to restrict land use and prevent future exposure to any contamination remaining at the site.
3. Maintenance of a cover system to prevent exposure or disturbance of soil contaminants remaining in place at the site.
4. Development and implementation of a Site Management Plan for long term management of remaining contamination are required by the Environmental Easement, which includes plans for: (1) Institutional and Engineering Controls, (2) monitoring, and (3) reporting;

Remedial activities were completed at the site in October and November 2006 including phased application of emulsified edible oil and a nano-scale zero-valent iron into the saturated overburden. The materials were applied as a bio-amendment to enhance naturally occurring bio-degradation of VOCs in the subsurface and as a bioremediation barrier to mitigate potential northward migration of VOC contaminants.

1.4.1 Removal of Contaminated Materials from the Site

No removal of contaminated materials from the site was conducted as part of the site remedy.

1.4.2 Site-Related Treatment Systems

No long-term treatment systems were installed as part of the site remedy.

1.4.3 Remaining Contamination

Soil contaminants remaining at the site are located at depths of 4 to 11.5 feet beneath site structures. Contaminants remain beneath the compressor room, die casting area, and vibratory process areas (see Figure 7). Remaining soil contaminants include chlorinated solvents and acetone at concentrations below criteria for protection of public health in residential, commercial or industrial settings, but above criteria for protection of groundwater.

Groundwater contaminants remaining at the site, including chlorinated solvent VOCs, are present in overburden groundwater under approximately half of the 99,000 square foot manufacturing building and the northern portion of the Lexington Precision Corporation site. Groundwater elevations are generally encountered at depths of 10 to 16 feet below grade.

Table 1 and Figure 7 summarize the results of soil samples remaining at the site that exceed the applicable/relevant Track 1 SCOs (Part 375-6). Table 2 and Figure 7 summarize the results of groundwater samples remaining at the site that exceed groundwater quality standards.

2.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN

2.1 INTRODUCTION

2.1.1 General

Since remaining contaminated soil and groundwater exists beneath limited areas of the site, Engineering Controls and Institutional Controls (EC/ICs) are required to protect human health and the environment. This Engineering and Institutional Control Plan describes the procedures for the implementation and management of all EC/ICs at the site. The EC/IC Plan is one component of the SMP and is subject to revision by NYSDEC.

2.1.2 Purpose

This plan provides:

- A description of all EC/ICs on the site;
- The basic implementation and intended role of each EC/IC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the features to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of the Excavation Work Plan for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the EC/ICs required by the site remedy, as determined by the NYSDEC.

2.2 ENGINEERING CONTROLS

2.2.1 Engineering Control Systems

2.2.1.1 Monitored Natural Attenuation

Site groundwater investigation and monitoring indicate ongoing natural attenuation and degradation of VOC contaminants. Monitored natural attenuation effectiveness will be evaluated through a groundwater monitoring program that will be implemented to monitor groundwater plume characteristics, horizontal and vertical contaminant migration and related controlling processes. The groundwater monitoring program will be conducted on an annual basis and in accordance with the USEPA guidance for monitored natural attenuation, OSWER Directive 9200.4-17 *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* (November 1997). Groundwater monitoring wells to be included in the groundwater monitoring program are depicted on Figure 8.

Procedures for monitoring the system are included in the Monitoring Plan (Section 3 of this SMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the site, occurs.

Should the results of the groundwater monitoring program indicate that groundwater remediation measures have been unsuccessful in reduction of VOC contaminants; a contingency plan for additional measures will be developed at the time of such determination.

2.2.2 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when effectiveness monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.6 of NYSDEC DER-10.

Monitored Natural Attenuation

Groundwater monitoring activities to assess natural attenuation will continue, as determined by the NYSDEC, until residual groundwater concentrations are found to be consistently below NYSDEC standards or have become asymptotic at an acceptable level over an extended period. Natural attenuation of groundwater contaminants will be considered complete upon demonstration of groundwater contaminant concentrations below NYSDEC standards or exhibiting asymptotic conditions for two continuous annual monitoring periods.

Should the results of the groundwater monitoring program indicate that groundwater remediation measures have been unsuccessful in reduction of VOC contaminants; a contingency plan for additional measures will be developed at the time of such determination.

2.3 INSTITUTIONAL CONTROLS

A series of Institutional Controls is required by the Order on Consent and Administrative Settlement to:

(1) implement, maintain and monitor Engineering Control systems;

(2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and,

(3) limit the use and development of the site to industrial or commercial uses only. Adherence to these Institutional Controls on the site is required by the Environmental Easement and will be implemented under this Site Management Plan. These Institutional Controls are:

- Compliance with the Environmental Easement and this SMP by the Grantor and the Grantor's successors and assigns;
- All Engineering Controls must be operated and maintained as specified in this SMP;
- All Engineering Controls on the Controlled Site must be inspected at a frequency and in a manner defined in the SMP.
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to Site Management of the Controlled Site must be reported at the frequency and in a manner defined in this SMP;

Institutional Controls identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The site has a series of Institutional Controls in the form of site restrictions. Adherence to these Institutional Controls is required by the Environmental Easement. Site restrictions that apply to the Controlled Site are:

- The site may only be used for industrial or commercial use provided that the long-term Engineering and Institutional Controls included in this SMP are employed.
- The site may not be used for a higher level of use, such as unrestricted and restricted residential use, without an evaluation of potential additional remediation and amendment of the Environmental Easement, as approved by the NYSDEC;
- All future activities on the site that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- The use of the groundwater underlying the site is prohibited without treatment rendering it safe for intended use;
- The potential for vapor intrusion must be evaluated for any buildings developed in the area noted on Figure 7, and any potential impacts that are identified at concentrations that may pose a hazard must be mitigated;
- Vegetable gardens and farming on the site are prohibited;
- The site owner or remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Site are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Site at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable.

2.3.1 Excavation Work Plan

The site has been remediated for industrial or commercial use. Any future intrusive work that will encounter or disturb the remaining contamination will be performed in compliance with the Excavation Work Plan (EWP) that is attached as Appendix B to this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) prepared for the site.

A HASP will be prepared and appended to this SMP by the qualified environmental professional prior to commencement of site monitoring activities. The HASP will be in current compliance with DER-10, and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State and local regulations. Based on future changes to State and federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted with the notification provided in Section A-1 of the EWP. Any intrusive construction work will be performed in compliance with the EWP, HASP and CAMP, and will be included in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 5).

The site owner and associated parties preparing the remedial documents submitted to the State, and parties performing this work-bear responsibility for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of excavation de-water, control of runoff from open excavations into remaining contamination, and for structures that may be affected by excavations (such as building foundations and bridge footings). The site owner will ensure that site development activities will not interfere with, or otherwise impair or compromise, the engineering controls described in this SMP.

2.3.2 Soil Vapor Intrusion (SVI) Evaluation

Bureau Veritas North America, Inc. (BVNA), now known as Apex, prepared a Vapor Intrusion Evaluation Work Plan (Work Plan), dated April 2014. The Work Plan was submitted to the NYSDEC for review and approval on April 10, 2014. This evaluation was completed following the Work Plan as approved by the NYSDEC by correspondence dated April 21, 2014.

A Vapor Intrusion Evaluation Report, dated July 14, 2014, was prepared by BVNA for the site. In accordance with the SMP and approved Work Plan, the evaluation was performed over interior areas of the current site structure that contain residual volatile organic contamination and where potential SVI may occur. The sub-slab vapor sample locations were determined based on 1) site operations and general construction, 2) residual groundwater impacts, 3) residual soil impacts, and 4) potential future site use. The conceptual approach and sampling locations were based upon manufacturing and light industrial operations within the site Main Building, building construction history, interior space divisions, and areas of residual impact.

The focus of the evaluation was on the compounds remaining in soil and groundwater of the Site. Those compounds include the following:

Acetone	Benzene	Chloroethane
1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichoroethene
cis-1,2-Dichloroethene	1,1,1-Trichloroethane	1,1,2-Trichloroethane

Figure 7 depicts site operating areas, general construction, residual soil and groundwater impacts, as well as soil boring and groundwater monitoring well locations. Figure 7 also depicts sub-slab vapor, indoor air, and ambient air sampling locations.

The investigation was guided by the methods in the _Guidance for Evaluating Soil Vapor Intrusion in the State of New York_ dated October 2006, issued by the NYSDOH Center for Environmental Health, Bureau of Environmental Exposure Investigation.

Apex collected five sub-slab vapor samples, five indoor air samples, and one ambient air sample at the site. Two sub-slab vapor and two indoor air samples were collected within the approximate area of residual soil and/or groundwater impact beneath the building. Three sub-slab vapor and three indoor air samples were collected immediately outside of the approximate areas of residual impacts beneath the building. The ambient air sample was collected in a generally up-wind location of manufacturing operations on the site. Specific sampling locations were selected to avoid areas of the floor where cracks, floor penetrations or similar routes of vapor migration were apparent, areas of VOC use, and to accommodate operations and equipment. Sample locations are depicted in Figure 7.

The analytical results indicated that acetone was detected in sub-slab samples in concentrations ranging from 7.7 to 700 microgram per cubic meter by volume (ug/m3). There is no guideline value established for acetone within the Draft Guidance.

Benzene was detected in one sub-slab soil vapor sample, Sub-Slab-3, at a concentration of 23 ug/m3. Each of the five indoor air samples exhibited detectable concentrations of benzene with the highest concentration of 6.3 ug/m3 in sample Indoor-1. There does not appear to be a correlation between the sub-slab vapor and indoor air concentrations of benzene. The sub-slab sample location exhibiting the highest benzene concentration was obtained in an area where one of the two lowest indoor air sample benzene concentrations was obtained. There is no guideline value established for benzene within the Draft Guidance.

No chlorinated compounds of concern or compounds for which the Draft Guidance establishes air guideline values were detected in the sub-slab soil vapor, ambient, or indoor air samples.

Based upon the Vapor Intrusion Evaluation Report, there does not appear to be a significant risk of vapor intrusion associated with the residual contaminants of concern in soil and groundwater of the Site. For any new structures, prior to the construction of any enclosed structures located over areas that contain remaining contamination and for which a potential for soil vapor intrusion (SVI) has been identified (see Figure 7), either an SVI evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure or alternatively, an SVI mitigation system may be installed as an element of the building foundation without first conducting an investigation. This mitigation system will include a vapor barrier and passive sub-slab depressurization system that is capable of being converted to an active system. Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the most recent NYSDOH "Guidance for Evaluating Vapor Intrusion in the State of New York". Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

2.4 INSPECTIONS AND NOTIFICATIONS

2.4.1 Inspections

Inspections of all remedial components installed at the site will be conducted at the frequency specified in the SMP Monitoring Plan schedule. A comprehensive site-wide inspection will be conducted annually, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether any Engineering Controls continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Sampling and analysis of appropriate media during monitoring events;
- If site records are complete and up to date; and
- Changes, or needed changes, to the monitoring system(s);

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 3). The reporting requirements are outlined in the Periodic Review Reporting section of this plan (Section 5).

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the EC/ICs implemented at the site by a qualified environmental professional as determined by NYSDEC.

2.4.2 Notifications

Notifications will be submitted by the site owner to the NYSDEC as needed for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the Order on Consent, 6NYCRR Part 375, and/or Environmental Conservation Law.
- 7-day advance notice of any proposed ground-intrusive activities pursuant to the Excavation Work Plan.
- Notice within 48-hours of any damage or defect to the foundations structures that reduces or has the potential to reduce the effectiveness of other Engineering Controls and likewise any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of Engineering Controls in place at the site, with written confirmation within 7 days

that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the Order on Consent and all approved work plans and reports, including this SMP
- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing.

2.5 CONTINGENCY PLAN

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions.

2.5.1 Emergency Telephone Numbers

In the event of any environmentally related situation or unplanned occurrence requiring assistance the Owner or Owner's representative(s) should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted. Prompt contact should also be made to Apex Companies, LLC. These emergency contact lists must be maintained in an easily accessible location at the site.

Table 3: Emergency Contact Numbers

Medical, Fire, and Police:	911
One Call Center:	(800) 272-4480 (3 day notice required for utility markout)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362
Apex Companies, LLC	330-426-7625
NYSDEC Division of Environmental Remediation	716-851-7220

* Note: Contact numbers subject to change and should be updated as necessary

2.5.2 Map and Directions to Nearest Health Facility

Site Location: 201 Winchester Road, Lakewood, NY

Nearest Hospital Name: WCA Hospital

Hospital Location: 207 Foote Avenue
Jamestown, NY 14702-0840

Hospital Telephone: 716-487-0141

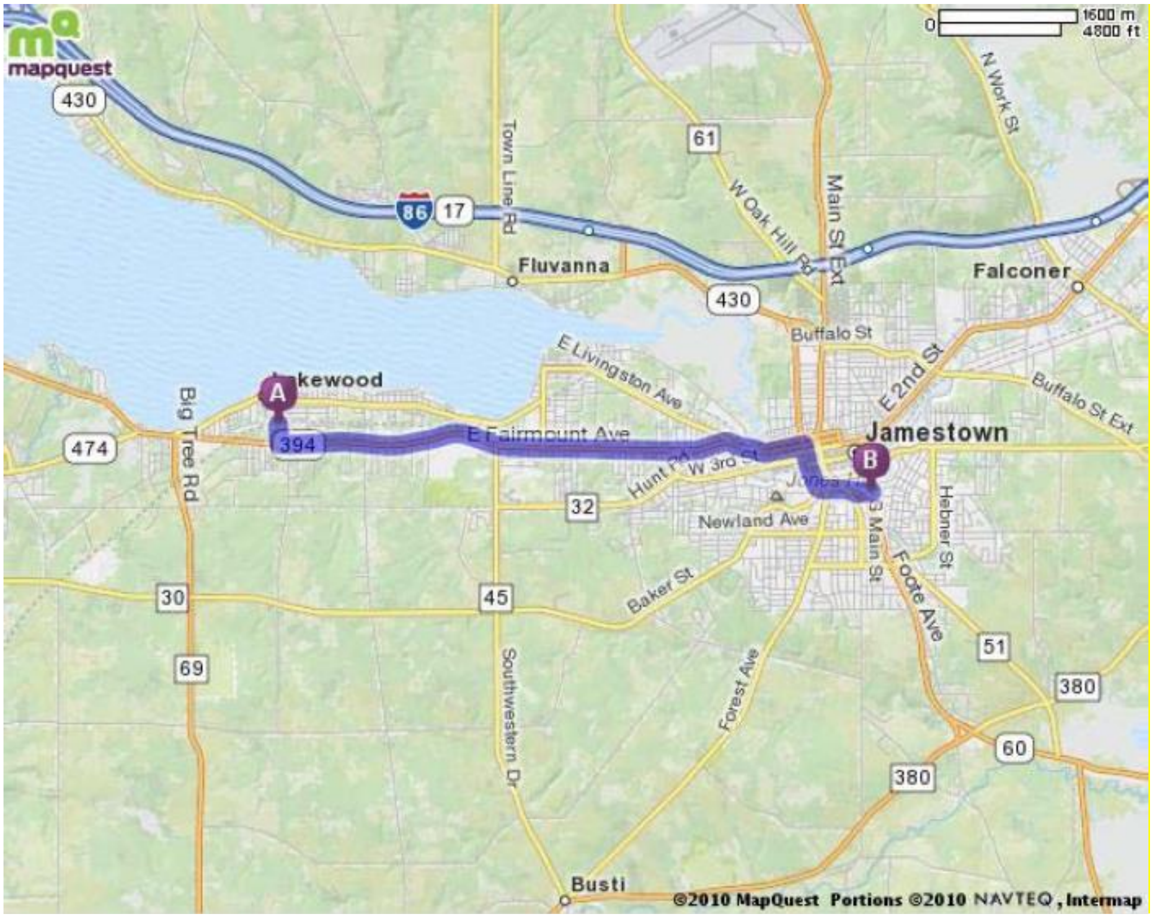
Directions to the Hospital:

1. Start South on Winchester Rd toward Hern Avenue
2. Turn left on West Fairmont Avenue / NY 394 East
3. Turn right on Washington Street / NY 60
4. Turn left on Institute Street
5. Turn right on Allen Street
6. Turn right on Foote Street, WCA Hospital on left

Total Distance: 5.61 miles

Total Estimated Time: 15 minutes

Map Showing Route from the site to the Hospital:



2.5.3 Response Procedures

As appropriate, the fire department and other emergency response group will be notified immediately by telephone of the emergency. The emergency telephone number list is found at the beginning of this Contingency Plan (Table 3). The list will also be posted prominently at the site and made readily available to all personnel at all times.

This should include a description of:

- Procedures for spills;
- Evacuation plans;
- Amendments to the contingency plan.

3.0 SITE MONITORING PLAN

3.1 INTRODUCTION

3.1.1 General

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the remedy to reduce or mitigate contamination at the site~~,~~ and all affected site media identified below. This Monitoring Plan may only be revised with the approval of NYSDEC. A letter, prepared by Apex, requesting modifications to the Monitoring Plan was submitted to NYSDEC for approval in November 2019. In February 2020, NYSDEC approved the changes to the Monitoring plan. Those changes are reflected below:

3.1.2 Purpose and Schedule

This Monitoring Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance,
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment; and
- Preparing the necessary reports for the various monitoring activities.

To adequately address these issues, this Monitoring Plan provides information on:

- Sampling locations, protocol, and frequency;
- Information on all designed monitoring systems (e.g., well logs);
- Analytical sampling program requirements;
- Reporting requirements;
- Quality Assurance/Quality Control (QA/QC) requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Annual monitoring of the performance of the remedy and overall reduction in contamination on-site will be conducted for the first two (2) years. The frequency thereafter will be determined by NYSDEC. Trends in contaminant levels in groundwater in the affected areas, will be evaluated to determine if the remedy continues to be effective in achieving remedial goals. Groundwater monitoring will be considered complete upon demonstration that concentrations of 1,1,1-TCA and 1,1,2-TCA in groundwater are below NYSDEC standards or exhibiting asymptotic conditions for two continuous annual monitoring periods. Thereafter, the monitoring program will exclude groundwater sampling activities.

Should the results of the groundwater monitoring program indicate that groundwater remediation measures have been unsuccessful in reduction of VOC contaminants, a contingency plan for additional measures will be developed at the time of such determination.

Annual groundwater monitoring will be conducted until the groundwater contaminant concentrations are demonstrated to be below NYSDEC standards or are exhibiting asymptotic conditions for two consecutive annual monitoring periods, the NYSDEC rescinds the requirement for such monitoring, the environmental easement is satisfied, or the Order On Consent is retracted. Monitoring programs are summarized in Table 4 and outlined in detail in Sections 3.2 and 3.3 below.

Table 4: Monitoring/Inspection Schedule

Monitoring Program	Frequency*	Matrix	Analysis
MNA	Annual	Groundwater	TAL VOCs

* The frequency of events will be conducted as specified until otherwise approved by NYSDEC and NYSDOH

3.2 MEDIA MONITORING PROGRAM

3.2.1 Groundwater Monitoring

Groundwater monitoring will be performed on a periodic basis to assess the performance of the remedy.

The groundwater monitoring program will be implemented to monitor groundwater plume characteristics, horizontal and vertical contaminant migration and related controlling processes, in accordance with the USEPA guidance for MNA, OSWER Directive 9200.4-17 *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* (November 1997).   An array of monitoring wells has been installed to monitor both up-gradient and down-gradient groundwater conditions at the site. The network of on-site wells has been designed based on the following criteria:

- Monitoring wells have been installed up-gradient and down-gradient of potential sources of groundwater contamination and for overall plume monitoring;
- Monitoring well locations are depicted in Figure 8;

- Monitoring well construction logs are included in Appendix E;
- The monitoring well array includes both overburden and bedrock wells to monitor vertical and horizontal extent of the plume and plume migration;
- Baseline post-remedial groundwater quality conditions are summarized in Table 2;
- Updated as of March 2020, groundwater will be sampled from the following wells during each annual monitoring event and analyzed for VOCs:
    1. MW-1,
    2. MW-2,
    3. MW-2D,
    4. MW-3,
    5. MW-7,
    6. MW-8,
    7. MW-9,
    8. MW-10,
    9. MW-11,
    10. MW-12,
    11. MW-13, and
    12. MW-14

Although MW-4, MW-5, and MW-11D are no longer required to be sampled, groundwater elevations will continue to be collected during each sampling event. The groundwater monitoring program will initially be implemented on an annual basis for two years to establish groundwater quality trends. Following the completion of the two year monitoring period, the groundwater quality data will be reviewed to determine the necessity for continued monitoring and, if necessary, revisions to the monitoring frequency. Groundwater monitoring will be considered complete upon demonstration that concentrations of 1,1,1-TCA and 1,1,2-TCA in groundwater are below NYSDEC standards or exhibiting asymptotic conditions for two continuous annual monitoring periods. Thereafter, the monitoring program will exclude groundwater sampling activities**.**

The sampling frequency may be modified with the approval of NYSDEC. The SMP will be modified to reflect changes in sampling plans approved by NYSDEC.

Deliverables for the groundwater monitoring program are specified below.

3.2.1.1 Sampling Protocol

All monitoring well sampling activities will be recorded in a field book and a groundwater-sampling log presented in Appendix F. Other observations (e.g., well integrity, etc.) will be noted on the well sampling log. The well sampling log will serve as the inspection form for the groundwater monitoring well network.

Prior to collecting groundwater samples, the groundwater level will be measured and recorded. Groundwater samples will be collected using the low-stress purging and sampling technique. In general, the sampling procedure entails the removal of ground water through a bladder pump, centrifugal pump or peristaltic pump at extremely low flow rates (example, 0.1 to 0.4 L/min (liter per minute), even lower rates for low permeable materials). The sample is collected once stabilization for three consecutive readings is achieved for the following parameters and associated variances: turbidity (10 percent for values greater than 1 NTU), dissolved oxygen (10 percent), specific conductance (3 percent), temperature (3 percent), pH (0.1 units), and oxygen reduction potential (10 millivolts). Purge water will be collected, contained in 55-gallon drums, and temporarily staged onsite pending disposal.

Groundwater samples will be collected using polyethylene tubing and a peristaltic pump. The samples will be transferred into laboratory-provided bottleware and shipped overnight in an ice-filled cooler to a New York State certified laboratory. Field blank samples (one per field day) and one trip blank sample will be collected for quality assurance/quality control (QA/QC). Appropriate decontamination procedures will be followed, and proper chain of custody procedures will be employed.

Groundwater samples will be analyzed for target compound list (TCL) volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) method 8260B. The analytical results will be compared to the NYSDEC Groundwater Quality Standards to evaluate targeted compounds present above laboratory detection limits.

3.2.1.2 Monitoring Well Repairs, Replacement And Decommissioning

If bio-fouling or silt accumulation occurs in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced (as per the Monitoring Plan), if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of monitoring wells for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent periodic report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be reinstalled in the nearest available location, unless otherwise approved by the NYSDEC.

Based on the letter, prepared by Apex, requesting modifications to the Monitoring Plan that was submitted to NYSDEC for approval in November 2019, existing monitoring wells MW-5D and MW-6, were requested, and approved, to be properly decommissioned in 2020.

3.3 SITE-WIDE INSPECTION

Site-wide inspections will be performed on a regular schedule at a minimum of once a year. Site-wide inspections will also be performed after all severe weather conditions that may affect Engineering Controls or monitoring devices. During these inspections, an inspection form will be completed (Appendix G). The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection;
- Confirm that site records are up to date.

3.4 MONITORING QUALITY ASSURANCE/QUALITY CONTROL

All sampling and analyses will be performed in accordance with the requirements of the Generic Quality Assurance Project Plan (QAPP) (Appendix H). The Generic QAPP will be revised for site specific use prior to commencement of SMP activities. Main Components of the QAPP include:

- QA/QC Objectives for Data Measurement;
- Sampling Program:
    - Sample containers will be properly washed, decontaminated, and appropriate preservative will be added (if applicable) prior to their use by the analytical laboratory. Containers with preservative will be tagged as such.
    - Sample holding times will be in accordance with the NYSDEC ASP requirements.
    - Field QC samples (e.g., trip blanks, coded field duplicates, and matrix spike/matrix spike duplicates) will be collected as necessary.
- Sample Tracking and Custody;
- Calibration Procedures:
    - All field analytical equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions.

  - The laboratory will follow all calibration procedures and schedules as specified in USEPA SW-846 and subsequent updates that apply to the instruments used for the analytical methods.

- Analytical Procedures;
- Preparation of a Data Usability Summary Report (DUSR), which will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain of custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.
- Internal QC and Checks;
- QA Performance and System Audits;
- Preventative Maintenance Procedures and Schedules;
- Corrective Action Measures.

3.5 MONITORING REPORTING REQUIREMENTS

Forms and any other information generated during regular monitoring events and inspections will be kept on file on-site or at a corporate office location. All forms, and other relevant reporting formats used during the monitoring/inspection events, will be (1) subject to approval by NYSDEC and (2) submitted at the time of the Periodic Review Report, as specified in the Reporting Plan of this SMP.

All monitoring results will be reported to NYSDEC on an annual basis in the Periodic Review Report. A letter report will also be prepared, if required by NYSDEC, subsequent to each sampling event. The letter report will include, at a minimum:

- Date of event;
- Personnel conducting sampling;
- Description of the activities performed;
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc.);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether groundwater conditions have changed since the last reporting event.

Data will be reported in hard copy or digital format as determined by NYSDEC. A summary of the monitoring program deliverables is summarized in Table 5 below.

Table 5: Schedule of Monitoring/Inspection Reports

Task	Reporting Frequency*
Groundwater monitoring letter report	Annual
Site-wide periodic review report	Annual

* The frequency and duration of events will be as specified until otherwise approved by NYSDEC.

4.0 OPERATION AND MAINTENANCE PLAN

4.1 INTRODUCTION

The Site remedy does not presently rely on any mechanical systems, such as sub-slab depressurization systems or air sparging / soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP.

A SVI evaluation will be completed for any new buildings or additions at the site. The evaluation will include, as deemed necessary, a provision for implementing actions recommended to address exposures related to soil vapor intrusion. If a soil vapor extraction system is required for the new structure or addition at the site, an Operations and Maintenance Plan will be required and this SMP will be revised accordingly.

As an alternative, a vapor mitigation system could be installed as part of the new structure without the benefit of an SVI, and the SMP would be revised accordingly to account for the vapor mitigation

5.0 INSPECTIONS, REPORTING AND CERTIFICATIONS

5.1 SITE INSPECTIONS

5.1.1 Inspection Frequency

All inspections will be conducted at the frequency specified in the schedules provided in Section 3 Monitoring Plan of this SMP. At a minimum, a site-wide inspection will be conducted annually until such conditions are met to permit discontinuance of MNA monitoring and periodic review reporting. Inspections of remedial components will also be conducted when a breakdown of any treatment system component has occurred or whenever a severe condition has taken place, such as an erosion or flooding event that may affect the ECs.

5.1.2 Inspection Forms, Sampling Data, and Maintenance Reports

All inspections and monitoring events will be recorded on the appropriate forms for their respective system, if any. Additionally, a general site-wide inspection form will be completed during the site-wide inspection (see Appendix G). These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including all media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format in the Periodic Review Report.

5.1.3 Evaluation of Records and Reporting

The results of the inspection and site monitoring data will be evaluated as part of the EC/IC certification to confirm that the:

- EC/ICs are in place, are performing properly, and remain effective;
- The Monitoring Plan is being implemented; and
- Operation and maintenance activities are being conducted properly.

5.2 CERTIFICATION OF ENGINEERING AND INSTITUTIONAL CONTROLS

After the last inspection of the reporting period, a qualified environmental professional will prepare the following certification:

"For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

- The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;
- The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;
- Nothing has occurred that would impair the ability of the control to protect the public health and environment;
- Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;
- Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;

- If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;
- Use of the site is compliant with the environmental easement;
- The engineering control systems are performing as designed and are effective;
- To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and
- The information presented in this report is accurate and complete.
- I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative]."

The signed certification will be included in the Periodic Review Report described below.

5.3 PERIODIC REVIEW REPORT

A Periodic Review Report will be submitted to the Department every year, beginning eighteen months after the Order on Consent is issued until such conditions are met to permit discontinuance of soil cover and MNA monitoring and periodic review reporting. In the event that the site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site described in Appendix B (Metes and Bounds). The report will be prepared in accordance with NYSDEC DER-10 and submitted within 45 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site;
- Results of the required annual site inspections and severe condition inspections, if applicable;
- All applicable inspection forms and other records generated for the site during the reporting period in electronic format;
- A summary of any discharge monitoring data and/or information generated during the reporting period with comments and conclusions;
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends;

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format;
- A site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the site-specific RAWP, ROD or Decision Document;
    - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
    - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring Plan for the media being monitored;
    - Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan; and
    - The overall performance and effectiveness of the remedy.

The Periodic Review Report will be submitted, in hard-copy format, to the NYSDEC Central Office and Regional Office in which the site is located, and in electronic format to NYSDEC Central Office, Regional Office and the NYSDOH Bureau of Environmental Exposure Investigation.

5.4 CORRECTIVE MEASURES PLAN

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.

TABLES

Lexington Precision Corporation
Premier Lakewood, Inc. Site
Table 1
Soil Contamination Summary

Sample ID	Date	Location	Depth (ft)	1,1,1-Trichloroethane	1,2-Dichloroethane	Toluene	Chlorobenzene	Acetone
NYSDEC Unresricted Use Soil Cleanup Objectives (SCO), Table 375-6.8(a)				0.68	0.02	0.7	1.1	0.05
B-1	9/26/2002	Shippin/Receiving	8-12	ND	ND	ND	ND	ND
B-2	9/26/2002	Vibratory Process	4-8	ND	ND	ND	ND	ND
B-3	9/26/2002	Compressor Area	0-4	ND	ND	ND	ND	ND
B-3	9/26/2002	Compressor Area	16	ND	ND	ND	ND	ND
B-4	9/26/2002	Secondary Machinery	14-15	ND	ND	ND	ND	ND
B-5	9/26/2002	Secondary Machinery	8.5-10	ND	ND	ND	ND	ND
B-6	9/26/2002	Secondary Machinery	3-4	ND	ND	ND	ND	ND
B-7	9/26/2002	Secondary Machinery	4-6	ND	ND	ND	ND	ND
B-8	9/26/2002	Vibratory Process	5-5.6	ND	ND	ND	ND	ND
B-9	9/26/2002	Outside Dust Collector	10-12	ND	ND	ND	ND	ND
B201	4/8/2004	Compressor Room	8-11.3	**6.3**	ND	0.209	ND	ND
B202	4/8/2004	Compressor Room	8-11.5	ND	**0.209**	0.26	0.144	ND
B203	4/8/2004	Die casting	4-8	ND	**0.0509**	ND	ND	**0.0566**
B204	4/8/2004	Die casting	4-8	ND	**0.0394**	ND	ND	ND
B205	4/8/2004	Vibratory Process	8-9.9	ND	**0.025**	0.0107	ND	ND
B206	4/8/2004	Vibratory Process	4-8	ND	**0.0281**	ND	ND	ND
B207	4/8/2004	Vibratory Process	8-10.9	ND	**0.029**	ND	ND	**0.0524**
B208	5/5/2004	Compressor Room	8-10.8	ND	ND	ND	ND	ND
B209	5/5/2004	Compressor Area	8-10.4	ND	ND	ND	ND	ND
B210	5/5/2004	Compressor Area	4-7.8	ND	ND	ND	ND	ND
B211	5/5/2004	Secondary Machinery	4-8	ND	ND	ND	ND	ND
B212A	5/5/2004	Secondary Machinery	8-11.6	ND	ND	ND	ND	ND
B213	5/5/2004	Compressor Room	8-10.9	ND	ND	ND	ND	ND

All data in units of mg/kg (parts per million)
ND = Analyzed for but Not Detected at the MDL
Bold data indicates exceedence of SCO

Lexington Machining LLC
201 Winchester Road, Lakewood, NY
Table 1a - Groundwater Data Summary

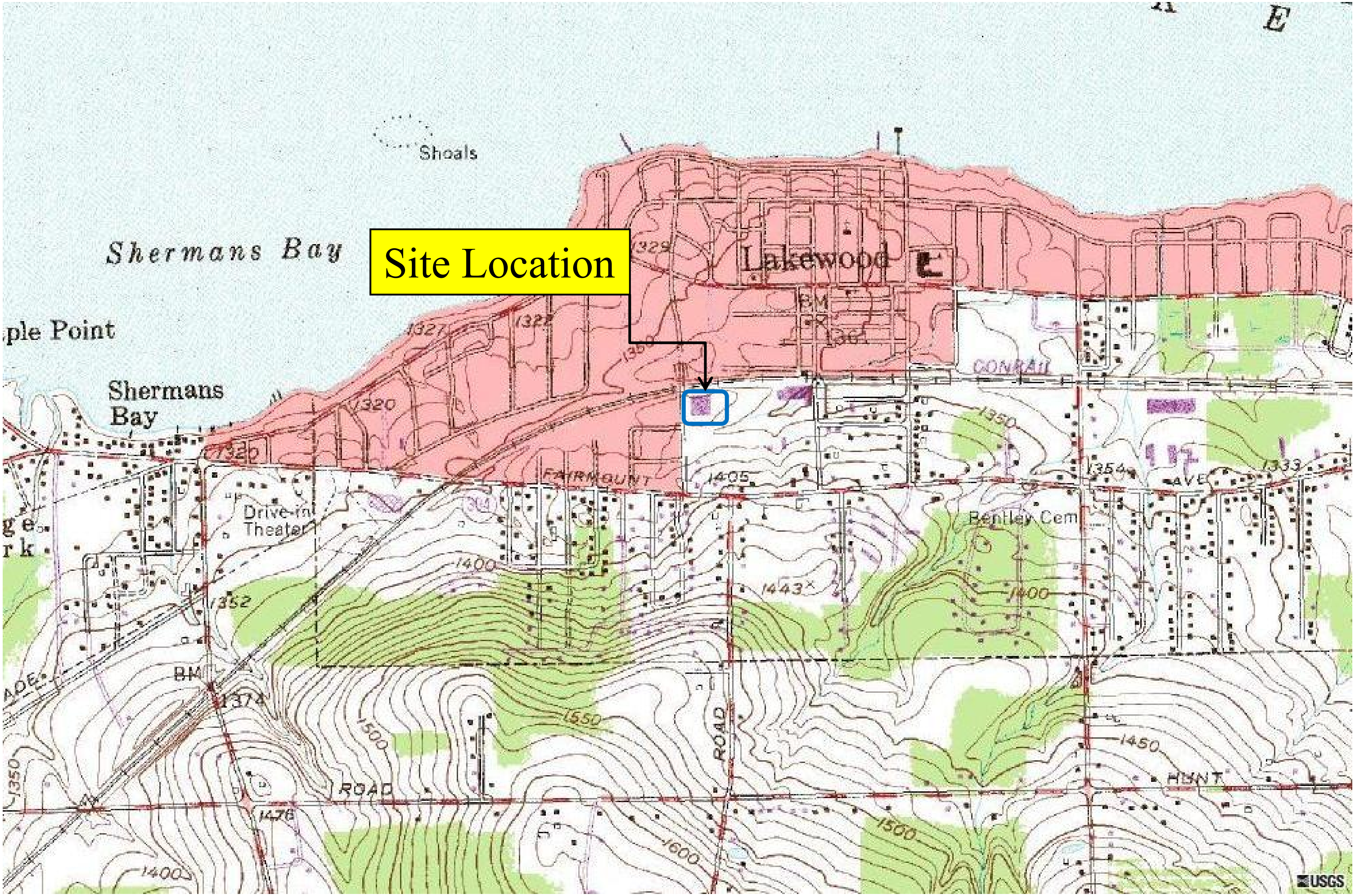
Well	Date	PCE (ug/L	Chloroethane (ug/L)	Chloroethene (ug/L)	1,1-DCA (ug/L)	1,2-DCA (ug/L)	1,1-DCE (ug/L)	cis-1,2-DCE (ug/L)	1,1,1-TCA (ug/L)	1,1,2-TCA (ug/L)	Benzene (ug/L)	Acetone (ug/L)	Toluene (ug/L)	ODCB (ug/L)	MEK (ug/L)	Total VOCs (ug/L)
NYSDEC GWQS		5	5	2	5	0.6	5	5	5	1	1	50	5	3	50	
Well	Date		Chloroethane (ug/L)	Chloroethene (ug/L)	1,1-DCA (ug/L)	1,2-DCA (ug/L)	1,1-DCE (ug/L)	cis-1,2-DCE (ug/L)	1,1,1-TCA (ug/L)	1,1,2-TCA (ug/L)	Benzene (ug/L)	Acetone (ug/L)	Toluene (ug/L)	ODCB (ug/L)	MEK (ug/L)	Total VOCs (ug/L)
MW-1	5/23/2005		BDL	BDL	210	9.15	370	BDL	174	BDL	BDL	BDL	-	-	-	763.2
	8/17/2006		BDL	BDL	85	3.6	190	BDL	61	BDL	BDL	BDL	-	-	-	339.6
	11/6/2006		13.8	BDL	16.6	BDL	19.4	BDL	5.34	BDL	BDL	BDL	-	-	-	55.1
	4/18/2007		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-	-	-	-	0
	6/2/2010		137	2.02	25.1	0.331	75.9	BDL	12.6	BDL	BDL	19.7 FB	0.502 J	0.737 J	BDL	274
	6/30/2014		11	BDL	9	0.32 J	26	BDL	0.53 J	BDL	BDL	BDL	BDL	0.45 J	BDL	47.42
	11/9/2015	BDL	1.2	BDL	10.7	BDL	16.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	28
	10/25/2016	BDL	BDL	BDL	5.8	BDL	10.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	16.5
	9/12/2017	BDL	BDL	BDL	6.71	BDL	11.4	BDL	0.761	BDL	BDL	BDL	BDL	BDL	BDL	18.9
	9/6/2018	BDL	BDL	BDL	2.7	BDL	4.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	7.3
	8/20/2019	BDL	BDL	BDL	BDL	BDL	1.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.3
MW-2	5/23/2005		1100	BDL	81.2	3.92	68.3	BDL	53.8	BDL	BDL	10.3	-	-	-	1317.5
	8/17/2006		750	BDL	82	7.3	86	2.6	42	BDL	BDL	BDL	-	-	-	969.9
	11/6/2006		701	BDL	18.6	9.06	6.8	2.68	BDL	BDL	BDL	BDL	-	-	-	738.1
	4/18/2007		760	BDL	19	6.8	8.4	3.2	BDL	BDL	-	-	-	-	-	799
	6/2/2010		1300	BDL	27.2	BDL	27.6	BDL	BDL	BDL	BDL	200 FB	BDL	BDL	BDL	1550
	6/30/2014		100	BDL	11	0.55 J	2.5	0.40 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	114.45
	11/9/2015	BDL	950	BDL	16.4	1.7	9.6	1.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	979.1
	10/25/2016	BDL	417	BDL	6.4	BDL	3.8	1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	428.2
	9/12/2017	BDL	900	BDL	28.1	0.85	7.65	1.08	BDL	BDL	BDL	BDL	BDL	BDL	BDL	946
	9/5/2018	BDL	347	BDL	46	BDL	5.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	398.3
	8/20/2019	BDL	81.8	BDL	27	BDL	20.2	BDL	5.9	BDL	BDL	BDL	BDL	1.8	BDL	136.7
MW-2D	8/1/2005		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-	-	0
	6/2/2010		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	6/30/2014		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	11/9/2015	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-	-	BDL	-	0
	10/25/2016	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	9/12/2017	BDL	4.45	BDL	0.499 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4.95
	9/5/2018	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	8/20/2019	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
MW-3	5/23/2005		15.3	BDL	87.3	2.4	72.7	BDL	98.9	BDL	0.815	58.1	-	-	-	335.5
	8/17/2006		5.4	BDL	35	BDL	62	BDL	43	BDL	BDL	BDL	-	-	-	145.4
	11/6/2006		72.8	BDL	34.1	BDL	63.4	BDL	22.1	BDL	BDL	BDL	-	-	-	192.4
	4/18/2007		BDL	BDL	4.1	BDL	6	BDL	1.8	BDL	-	-	-	-	-	12
	6/2/2010		31.1	1.23	BDL	BDL	41.6	10.3	BDL	BDL	BDL	4.96 FB	BDL	BDL	BDL	89.2
	6/30/2014		16	0.70 J	60	0.68 J	74	0.46 J	17	BDL	0.15 J	BDL	BDL	10	BDL	178.84
	11/9/2015	BDL	57	2.5	58.5	1.8	152	BDL	BDL	BDL	BDL	BDL	BDL	3.1	BDL	272.4
	10/25/2016	BDL	21.7	BDL	28.2	BDL	89.5	BDL	BDL	BDL	BDL	BDL	BDL	2.3	BDL	141.7
	9/12/2017	BDL	41.8	1.23	31.2	0.962	70.4	0.46 J	0.5	BDL	BDL	BDL	BDL	1.91	BDL	150
	9/5/2018	BDL	19.6	BDL	9.5	69.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	79.1
	8/19/2019	BDL	29.6	BDL	7.6	1	86.5	BDL	BDL	BDL	BDL	BDL	BDL	2.1	BDL	126.8
MW-4	5/23/2005		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	12.7	-	-	-	12.7
	6/2/2010		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	7/1/2014		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	11/9/2015	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	10/26/2016	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	9/12/2017	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	9/5/2018	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	8/19/2019	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
MW-5	8/1/2005		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-	-	0.0
	6/2/2010		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	6/30/2014		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	11/9/2015	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	10/25/2016	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	9/12/2017	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.18
	9/6/2018	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	8/20/2019	1.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.5
MW-5D	8/1/2005		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-	-	0.0
	6/2/2010		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	5.23 FB	BDL	BDL	BDL	5.23
	6/30/2014		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.14 J	BDL	BDL	BDL	BDL	0.14
MW-6	8/1/2005		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-	-	0.0
	6/2/2010		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	6/30/2014		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
MW-7	8/1/2005		5.93	BDL	34	BDL	21.9	BDL	42.4	BDL	BDL	BDL	-	-	-	104.2
	8/17/2006		3.3	BDL	38	BDL	49	BDL	52	BDL	BDL	BDL	-	-	-	142.3
	11/6/2006		17.2	BDL	25.6	BDL	70.9	BDL	48.9	BDL	BDL	BDL	-	-	-	162.6
	4/18/2007		BDL	1.4	6	BDL	15	BDL	8	BDL	-	-	-	-	-	30
	6/2/2010		15.5	22.3	22.3	0.453 J	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	80.1
	7/1/2014		11	9.2	20	0.33 J	35	0.27 J	0.32 J	BDL	BDL	BDL	BDL	0.62 J	BDL	79
	11/9/2015	BDL	5.3	9	12.8	BDL	10.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	28.8
	10/25/2016	BDL	3.4	6.8	10.2	BDL	9.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	29.9
	9/12/2017	BDL	3.58	9.32	9.15	BDL	5.18	BDL	BDL	BDL	BDL	BDL	BDL	0.482 J	BDL	27.7
	9/5/2018	BDL	5.6	BDL	5.6	BDL	2.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	13.8
	8/19/2019	BDL	BDL	2.1	BDL	BDL	1.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3.7
MW-8	8/1/2005		BDL	BDL	28.7	BDL	10.5	BDL	2.02	2.02	BDL	BDL	-	-	-	43.2
	8/17/2006		BDL	BDL	14	BDL	7.6	BDL	BDL	BDL	BDL	BDL	-	-	-	21.6
	11/6/2006		BDL	BDL	15.3	BDL	7.78	BDL	BDL	BDL	BDL	BDL	-	-	-	23.1
	4/19/2007		BDL	1.5	7.9	BDL	3.8	BDL	2.6	BDL	-	-	-	-	-	16
	6/2/2010		1.08	0.631 J	36.2	0.587 J	61.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	99.7
	7/1/2014		BDL	BDL	390	11	410	BDL	7.5	0.64 J	0.25 J	BDL	BDL	BDL	BDL	818.5
	11/9/2015	BDL	BDL	BDL	7.1	BDL	13.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	21
	10/26/2016	BDL	BDL	BDL	9.7	BDL	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	31.8
	9/13/2017	BDL	BDL	BDL	6.43	BDL	16.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	22.5
	9/6/2018	BDL	BDL	BDL	8.3	BDL	16.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	24.7
	8/20/2019	BDL	BDL	BDL	4.8	BDL	8.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	13.6
MW-9	8/1/2005		BDL	BDL	108	4.35	294	BDL	19	BDL	BDL	BDL	-	-	-	425.4
	8/17/2006		18	BDL	400	16	500	BDL	42	BDL	BDL	BDL	-	-	-	976
	11/6/2006		BDL	BDL	71.5	3.44	15	BDL	6.92	BDL	BDL	BDL	-	-	-	238.9
	4/19/2007		BDL	33	180	15	590	BDL	43	BDL	-	-	-	-	-	846
	6/2/2010		BDL	BDL	346	11.4	788	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1150
	7/1/2014		BDL	BDL	15	0.27 J	36	0.33	0.21 J	BDL	BDL	BDL	BDL	BDL	BDL	51.33

Lexington Machining LLC
201 Winchester Road, Lakewood, NY
Table 1a - Groundwater Data Summary

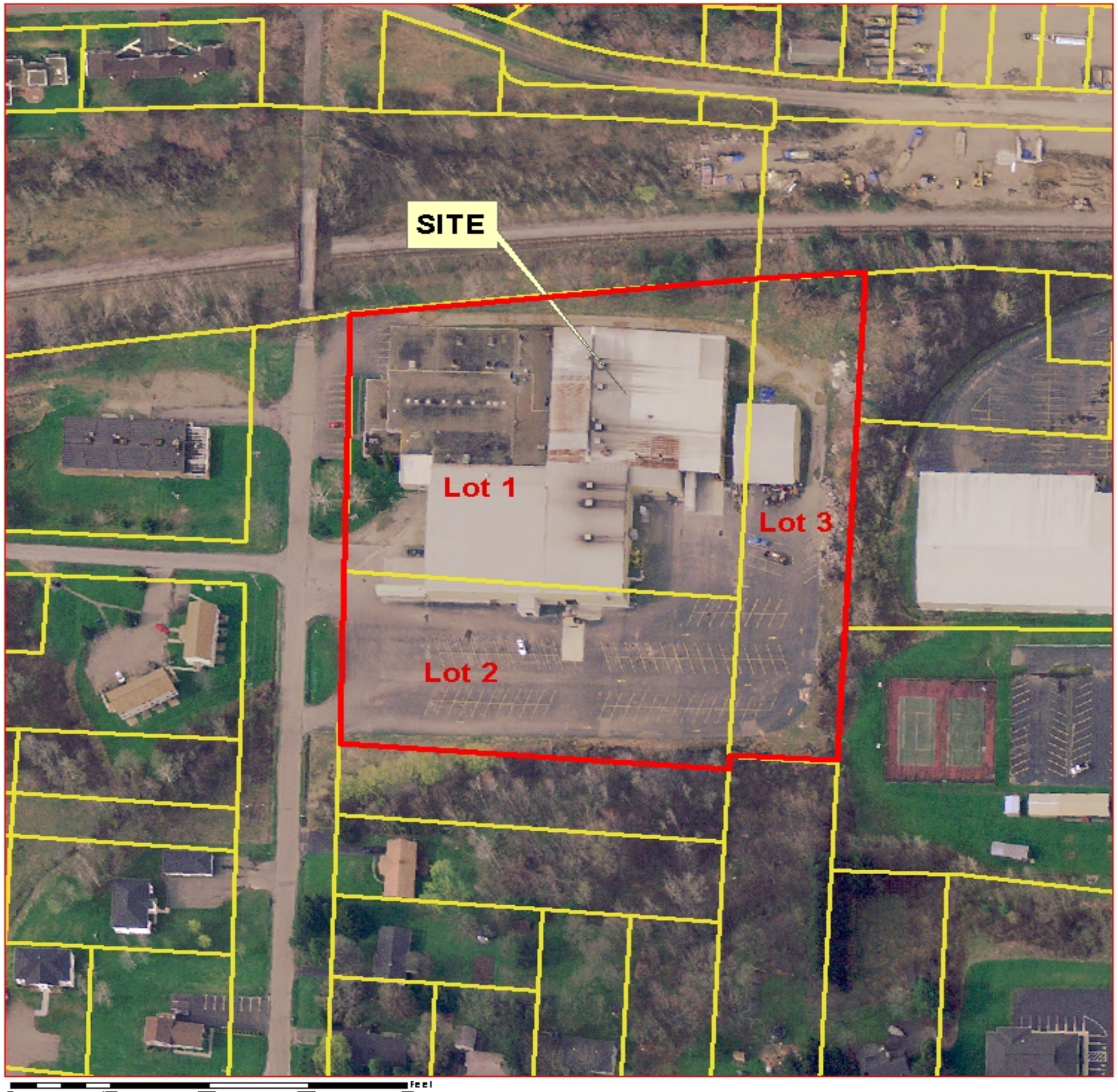
NYSDEC GWQS		5	5	2	5	0.6	5	5	5	1	1	50	5	3	50	
Well	Date		Chloroethane (ug/L)	Chloroethene (ug/L)	1,1-DCA (ug/L)	1,2-DCA (ug/L)	1,1-DCE (ug/L)	cis-1,2-DCE (ug/L)	1,1,1-TCA (ug/L)	1,1,2-TCA (ug/L)	Benzene (ug/L)	Acetone (ug/L)	Toluene (ug/L)	ODCB (ug/L)	MEK (ug/L)	Total VOCs (ug/L)
	11/9/2015	BDL	BDL	BDL	**216**	**6.8**	**328**	BDL	**17.6**	BDL	BDL	BDL	BDL	BDL	BDL	568.4
	10/26/2016	BDL	BDL	BDL	**144**	**9.1**	**232**	BDL	**10.6**	BDL	BDL	BDL	BDL	BDL	BDL	395.7
	9/13/2017	BDL	BDL	BDL	**196**	**3.97**	**181**	BDL	**11.2**	BDL	BDL	BDL	BDL	BDL	BDL	392
	9/6/2018	BDL	BDL	BDL	**166**	**4.1**	**194**	BDL	**7.8**	BDL	BDL	BDL	BDL	BDL	BDL	371.9
	8/20/2019	BDL	BDL	BDL	**123**	BDL	**107**	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	230
MW-10	8/1/2005		BDL	BDL	**77**	BDL	**5.9**	BDL	BDL	BDL	BDL	BDL	-	-	-	83
	8/17/2006		BDL	BDL	**110**	**1.6**	**14**	BDL	3.5	**3.4**	BDL	BDL	-	-	-	132.5
	6/2/2010		BDL	BDL	BDL	**0.715 J**	**58.7**	0.496 J	BDL	**2.65**	BDL	BDL	BDL	BDL	BDL	169
	7/1/2014		BDL	BDL	**44**	BDL	**8.2**	BDL	0.18 J	**1.8**	0.11 J	BDL	BDL	BDL	BDL	55.1
	11/9/2015	BDL	BDL	BDL	**40**	BDL	4.1	BDL	BDL	**1.9**	BDL	BDL	BDL	BDL	BDL	44.1
	10/26/2016	BDL	BDL	BDL	**44.7**	**1.7**	**9.4**	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	55.8
	9/13/2017	BDL	BDL	BDL	**38.1**	BDL	2.32	BDL	BDL	**1.21**	BDL	BDL	BDL	BDL	BDL	41.6
	9/6/2018	BDL	BDL	BDL	**61.1**	BDL	**10.6**	BDL	BDL	**2.2**	BDL	BDL	BDL	BDL	BDL	73.9
	8/20/2019	BDL	BDL	BDL	**50.2**	BDL	**6.1**	BDL	BDL	**2.2**	BDL	BDL	BDL	BDL	BDL	58.5
MW-11	8/1/2005	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-	-	-	-	0.0
	4/19/2007		BDL	BDL	BDL	BDL	BDL	BDL	1.6	BDL	-	-	-	-	-	
	6/2/2010		BDL	BDL	0.502 J	BDL	0.572 J	BDL	BDL	BDL	BDL	3.79 FB	BDL	BDL	BDL	4.86
	7/1/2014		BDL	BDL	0.53 J	BDL	BDL	BDL	1.1	BDL	BDL	BDL	BDL	BDL	BDL	1.63
	11/9/2015	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.3	BDL	BDL	BDL	BDL	BDL	BDL	3.2
	10/26/2016	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	9/13/2017	BDL	BDL	BDL	1.24	BDL	1.35	BDL	1.4	BDL	BDL	BDL	BDL	BDL	BDL	3.99
	9/5/2018	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	8/19/2019	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
MW-11D	8/1/2005		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-				0.0
	6/2/2010		BDL	BDL	0.999 J	BDL	BDL	BDL	BDL	BDL	0.458 J	**58.2 FB**	BDL	BDL	3.13	62.8
	7/1/2014		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.18 J	BDL	BDL	BDL	BDL	0.18
	11/9/2015	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	10/26/2016	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	9/13/2017	BDL	BDL	BDL	1	BDL	1.51	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.51
	9/5/2018	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
	8/20/2019	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0
MW-12	11/6/2006		**19.2**	BDL	**7.5**	BDL	**14**	BDL	3.4	BDL	-	-				44
	4/19/2007		**190**	BDL	**6.8**	BDL	2.2	BDL	BDL	BDL	-	-	-	-	-	199
	6/2/2010		**851**	BDL	**20.9**	BDL	**28.1**	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	900
	6/30/2014		BDL	BDL	**9.3**	0.19 J	**17**	BDL	1	BDL	BDL	BDL	BDL	0.43 J	BDL	27.9
	11/9/2015						**Unable to Locate Well - no sample**									
	10/26/2016						**Unable to Locate Well - no sample**									
	9/12/2017						**Unable to Locate Well - no sample**									
	9/6/2018	BDL	BDL	BDL	**5.9**	BDL	**12.7**	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	18.6
	8/20/2019	BDL	BDL	BDL	BDL	BDL	1.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.8
MW-13	11/6/2006		BDL	BDL	3.8	BDL	BDL	BDL	BDL	BDL	-	-				3.8
	4/19/2007		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-	-	-	-	0
	6/2/2010		**25.9**	BDL	1.96	BDL	**9.06**	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	36.9
	6/30/2014		**1200**	BDL	**69**	**2.9 J**	**8.2**	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1281
	11/9/2015	BDL	**272**	BDL	**10.6**	1	**12.5**	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	296.1
	10/25/2016	BDL	**44.5**	BDL	3.4	BDL	4.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	52.5
	9/12/2017	BDL	**665**	BDL	**13.2**	0.955	**11.7**	0.96	BDL	BDL	BDL	BDL	BDL	BDL	BDL	699
	9/5/2018	BDL	**430**	BDL	**27.6**	1.3	**7.6**	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	466.5
	8/19/2019	BDL	**198**	BDL	**19.3**	BDL	2.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	219.9
MW-14	11/6/2006		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-	-	-	-	0
	4/18/2007		BDL	BDL	**5.5**	BDL	**16**	BDL	**8.5**	BDL	-	-	-	-	-	30
	6/2/2010		1.59	1.49	2.12	BDL	2.96	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	8.16
	7/1/2014		**14**	**3.1**	**33**	0.21 J	**42**	0.22 J	3.2	BDL	BDL	BDL	BDL	2.3	BDL	99.68
	11/9/2015	BDL	BDL	1.2	**10.5**	BDL	1.8	BDL	BDL	BDL	BDL	BDL	BDL	1.6	BDL	12.3
	10/25/2016	BDL	1.7	1.1	**5.8**	BDL	4.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	13
	9/12/2017	BDL	3.91	**4.33**	**19**	BDL	**18.7**	BDL	BDL	BDL	BDL	BDL	BDL	0.845	BDL	46.8
	9/5/2018	BDL	BDL	BDL	**6.1**	BDL	**3.5**	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	9.6
	8/19/2019	BDL	BDL	BDL	BDL	BDL	**4.1**	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4.1

NYSDEC GWQS - New York State Department of Environmental conservation groundwater quality standards
"-" Not anlayzed or sampled
"BDL" Below detection limit
"J" estimated concentration
"FB" Also detected in field blank sample
"1,1-DCA" 1,1-dichloroethane
"1,2-DCA" 1,2-dichloroethane
"1,1-DCE" 1,1-dichloroethene
"cis 1,2-DCE" cis-1,2-dichloroethene
"1,1,1-TCA" 1,1,1-Trichloroethane
"1,1,2-TCA" 1,1,2-Trichloroethane
"ODCB" 1,2-Dichlorobenzene
"MEK" 2-butanone (aka Methyl ethyl ketone)
Chloroethene (a.k.a. vinyl chloride)
Bold type and shading indicates an exceedance of GWQS

FIGURES



Project Number: 08019-000102.00 Drawn By: JAS Date: 07-17-10 Reviewed By:WSM Date:07-29-10	Client: **Lexington Precision Corporation** **800 third Avenue, 15th Floor** **New York, New York 10022**	Location: **Premier Lakewood, Inc.** **201 Winchester Avenue** **Lakewood, New York 14750**	Title: **Site Location Map**	Figure: 1	APEX



Site Plan

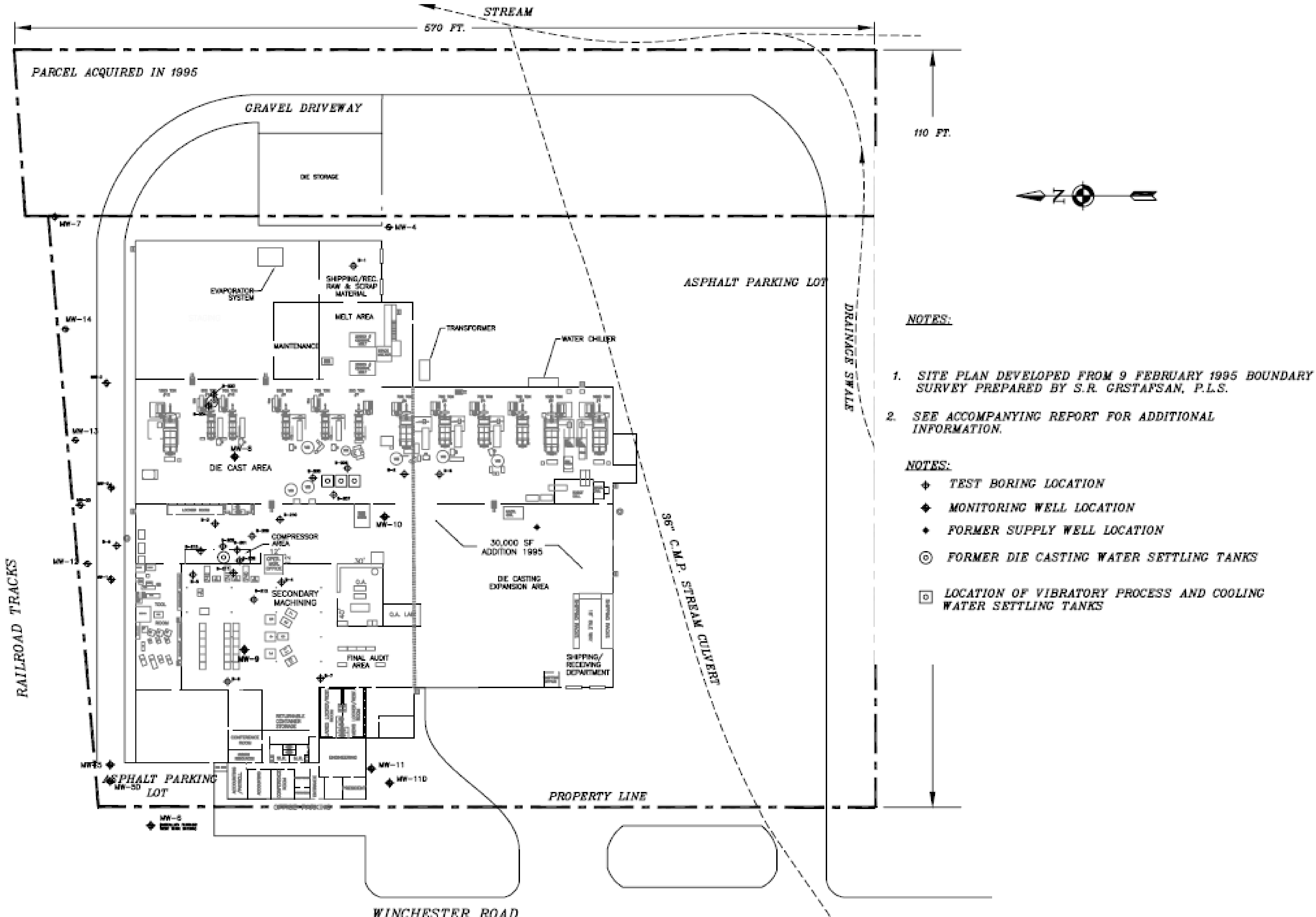
Lexington Precision Corp.

Village of Lakewood, Town of Busti, Chautauqua Co.

Site No. 907044

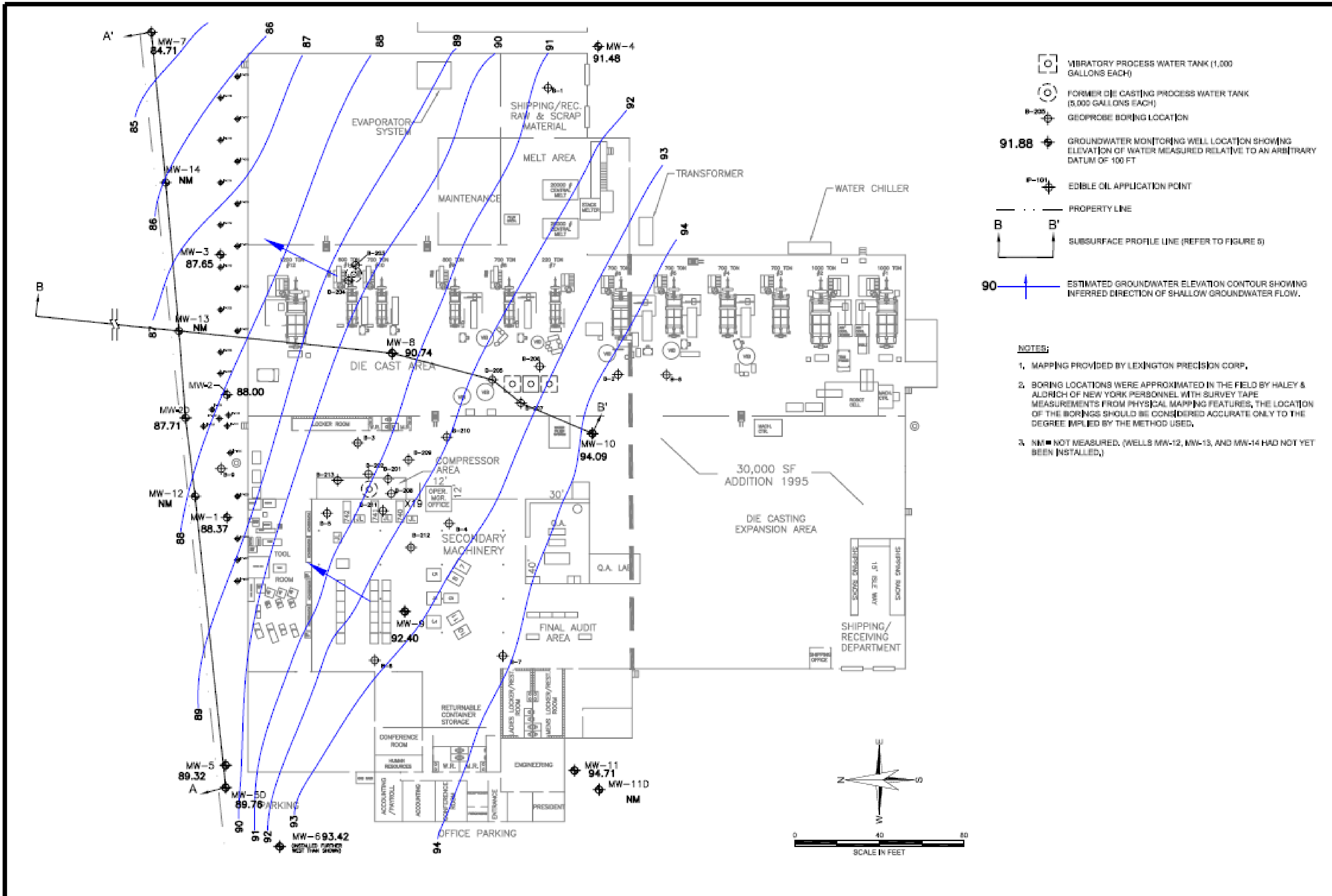
SBL: Lot 1: 385.06-3-58; Lot 2: 385.06-3-60
Lot 3: 385.06-3-59

Project Number: 08019-000102.00 Drawn By: JAS Date: 07-17-10 Reviewed By:WSM Date:07-29-10	Client: **Lexington Precision Corporation 800 third Avenue, 15th Floor New York, New York 10022**	Location: **Premier Lakewood, Inc. 201 Winchester Avenue Lakewood, New York 14750**	Title: **Site Plan**	Figure: 2	APEX



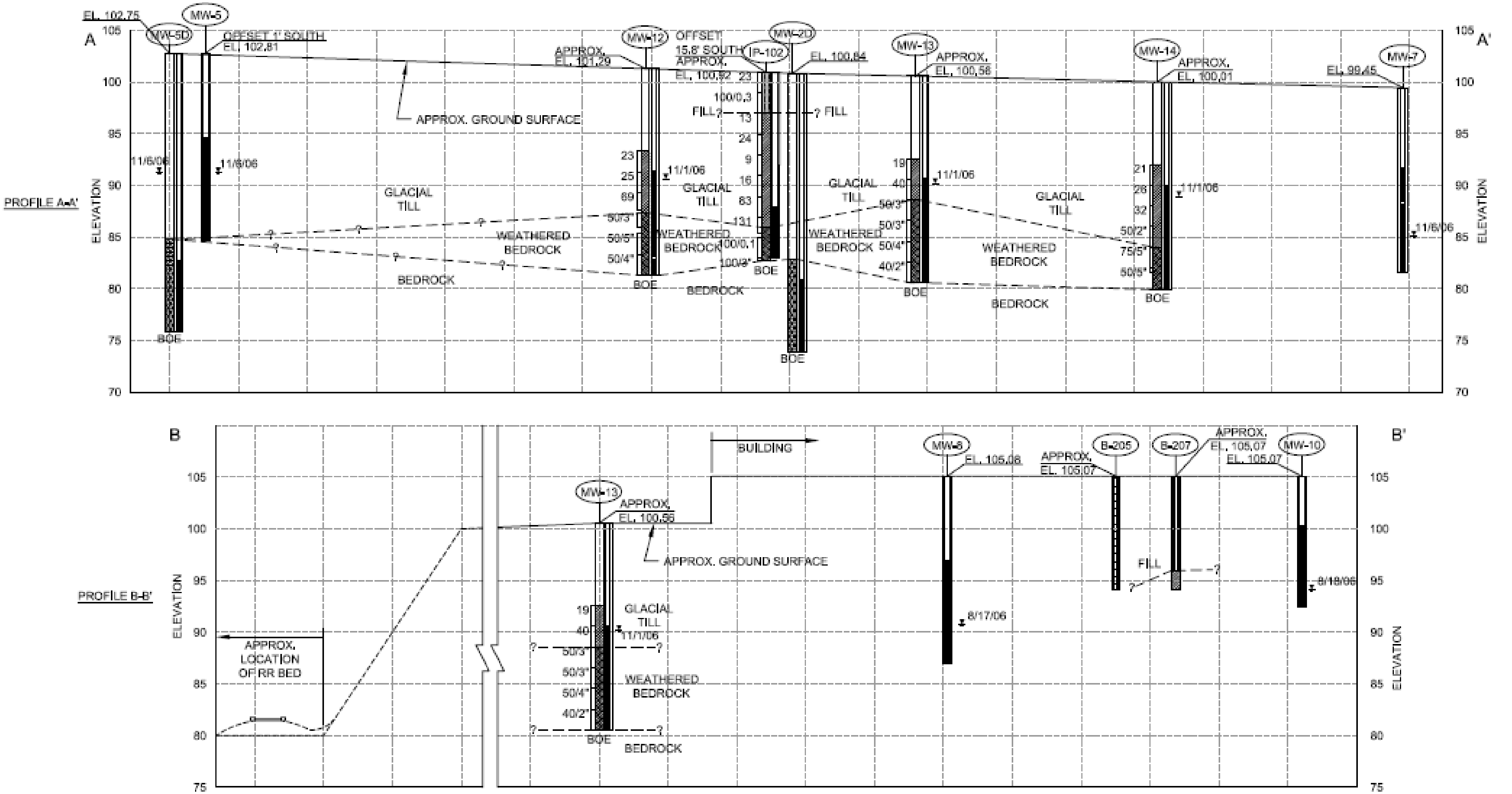
Source: Summary of Environmental Investigations and Remedial Activities, Haley & Aldrich of New York, January 9, 2007

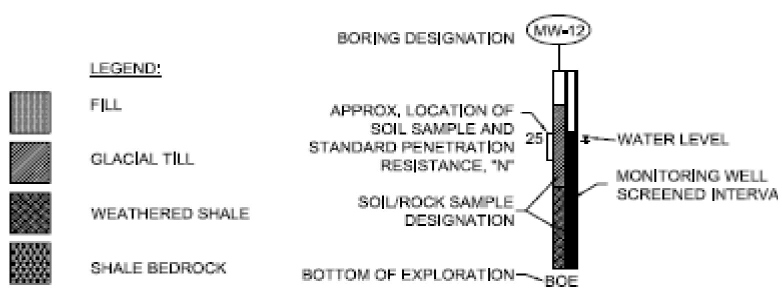
Project Number: 08019-000102.00 Drawn By: JAS Date: 07-17-10 Reviewed By:WSM Date:07-29-10	Client: **Lexington Precision Corporation** **800 third Avenue, 15th Floor** **New York, New York 10022**	Location: **Premier Lakewood, Inc.** **201 Winchester Avenue** **Lakewood, New York 14750**	Title: **Site Layout Map**	Figure: 3	APEX



Source: Summary of Environmental Investigations and Remedial Activities, Haley & Aldrich of New York, January 9, 2007

Project Number: 08019-000102.00	Client:	Location:	Title:	Figure:	APEX
Drawn By: JAS Date: 07-17-10	**Lexington Precision Corporation**	**Premier Lakewood, Inc.**	**Groundwater Elevations**	4	
Reviewed By:WSM Date:07-29-10	**800 third Avenue, 15th Floor**	**201 Winchester Avenue**			
	New York, New York 10022	**Lakewood, New York 14750**			





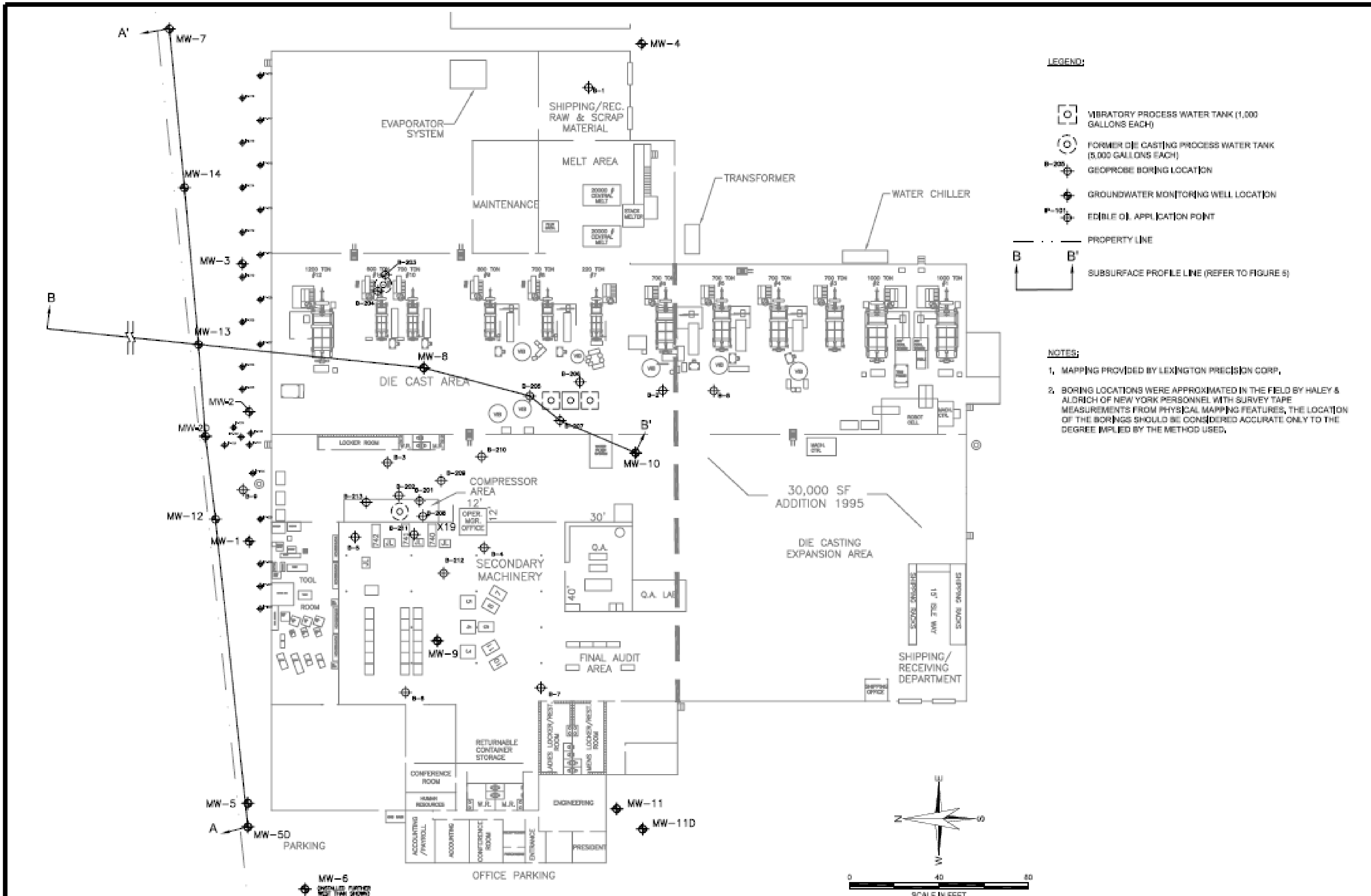
NOTE:

1. THE PROFILES DEPICT SUBSURFACE CONDITIONS ONLY AT SPECIFIC LOCATIONS AND AT THE PARTICULAR TIME DESIGNATED ON THE LOGS. SOIL CONDITIONS AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THE BORING LOCATIONS. ALSO, THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN SOIL OR GROUNDWATER CONDITIONS AT THESE BORING LOCATIONS.
2. THE STRATIFICATION LINES DESIGNATING THE INTERFACE BETWEEN SOIL TYPES ON THE PROFILE REPRESENT APPROXIMATE BOUNDARIES. THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
3. STRATIFICATION AND TOP OF ROCK LINES SHOWN ON THE PROFILES ARE INFERRED FROM AVAILABLE DATA. ACTUAL FIELD CONDITIONS MAY VARY BETWEEN BORINGS.
4. THE LOCATION OF THE RAIL ROAD BED, ELEVATION, AND SLOPES ARE ONLY APPROXIMATE AND ARE FOR ILLUSTRATION PURPOSES ONLY.

Source: Summary of Environmental Investigations and Remedial Activities, Haley & Aldrich of New York, January 9, 2007

Project Number: 08019-000102.00 Drawn By: JAS Date: 07-17-10 Reviewed By: WSM Date: 07-29-10	Client: **Lexington Precision Corporation** **800 third Avenue, 15th Floor** **New York, New York 10022**	Location: **Premier Lakewood, Inc.** **201 Winchester Avenue** **Lakewood, New York 14750**	Title: **Geologic Cross Section**	Figure: 5

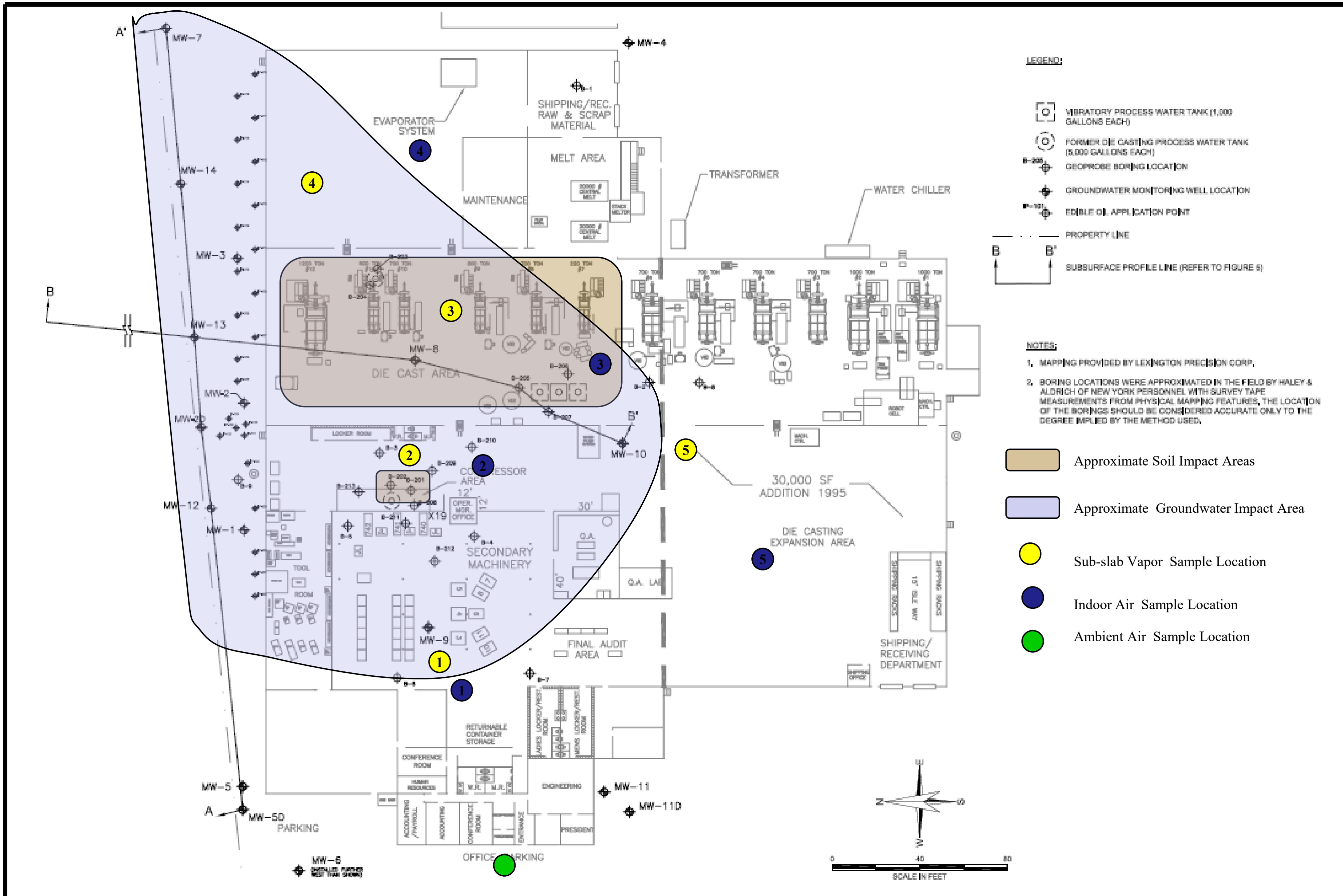
APEX



Source: Summary of Environmental Investigations and Remedial Activities, Haley & Aldrich of New York, January 9, 2007

Project Number: 08019-000102.00 Drawn By: JAS Date: 07-17-10 Reviewed By: WSM Date: 07-29-10	Client: **Lexington Precision Corporation** **800 third Avenue, 15th Floor** **New York, New York 10022**	Location: **Premier Lakewood, Inc.** **201 Winchester Avenue** **Lakewood, New York 14750**	Title: **Test Boring and Well Location Plan**	Figure: 6

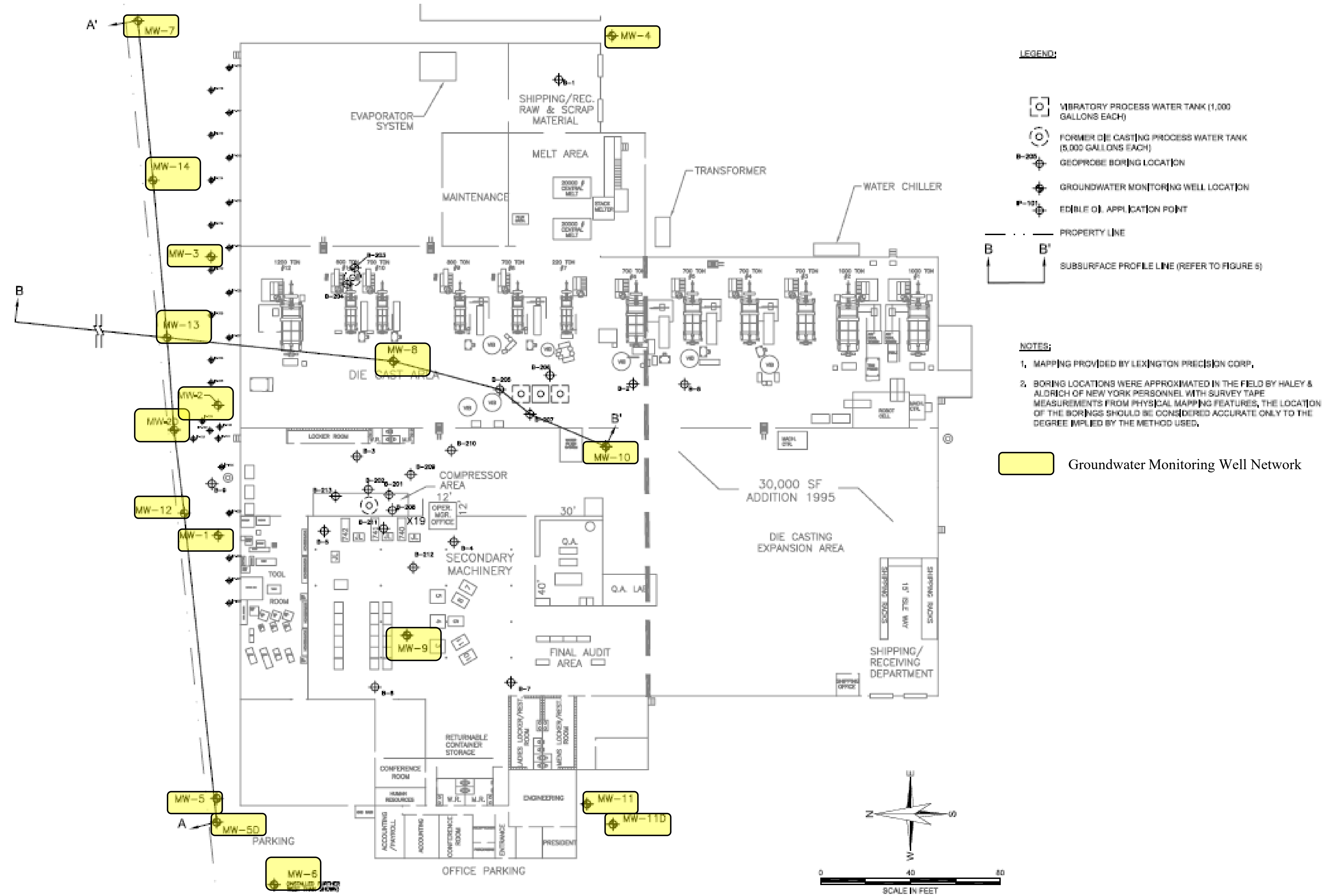
APEX



Survey Source: Summary of Environmental Investigations and Remedial Activities, Haley & Aldrich of New York, January 9, 2007

Project Number:	Client:	Location:	Title:	Figure:
Drawn By: JAS Date: 06-12-14 Reviewed By: ALF Date:06-12-14	**Lexington Precision Corporation** **800 third Avenue, 15th Floor** **New York, New York 10022**	**Premier Lakewood, Inc.** **201 Winchester Avenue** **Lakewood, New York 14750**	**Vapor Intrusion Evaluation** **Sample Locations**	7

APEX



Source: Summary of Environmental Investigations and Remedial Activities, Haley & Aldrich of New York, January 9, 2007

Project Number: 08019-000102.00 Drawn By: JAS Date: 07-17-10 Reviewed By:WSM Date:07-29-10	Client: **Lexington Precision Corporation** **800 third Avenue, 15th Floor** **New York, New York 10022**	Location: **Premier Lakewood, Inc.** **201 Winchester Avenue** **Lakewood, New York 14750**	Title: **Groundwater Monitoring Well Network**	Figure: 8	APEX

APPENDIX A – ENVIRONMENTAL EASEMENT

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this 8th day of October, 2014 between Owner(s) Lexington Machining, LLC, having an office at 677 Buffalo Road, County of Monroe, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 201 Winchester Road in the Village of Lakewood, County of Chautaugua and State of New York, known and designated on the tax map of the County Clerk of Chautaugua as tax map parcel numbers: Section 385.06 Block 3 Lots 58, 59 and 60, being the same as that property conveyed to Grantor by deed dated August 11, 2011 and recorded in the Chautaugua County Clerk's Office in Instrument No. DE2011005304, as corrected by correction deed dated November 20, 2012, recorded November 28, 2012 in Instrument No. DE2012006404. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 6.15 +/- acres, and is hereinafter more fully described in the Land Title Survey dated December 30, 2013 and published on February 3, 2014 prepared by Steven R.Gustafson, P.L.S., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Order on Consent Index Number: B9-0792-08-10, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement")

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Chautauqua County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential or Restricted Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i) and (ii), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation

pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved b the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5 the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: 907044
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

Lexington Machining LLC:

By: ______________________

Print Name: Michael A. Lubin

Title: Chairman Date: 9/8/14

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF)

On the 8 day of September, in the year 20 14, before me, the undersigned, personally appeared Michael Lubin, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public - State of New York

DENISE VEGA
Notary Public, State of New York
No. 01VE6269565
Qualified in Queens County
Commission Expires 10/01/2018

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: ______________________________
Robert W. Schick, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 8th day of October, in the year 2014, before me, the undersigned, personally appeared Robert Schick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

____
Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 2018

SCHEDULE "A" PROPERTY DESCRIPTION

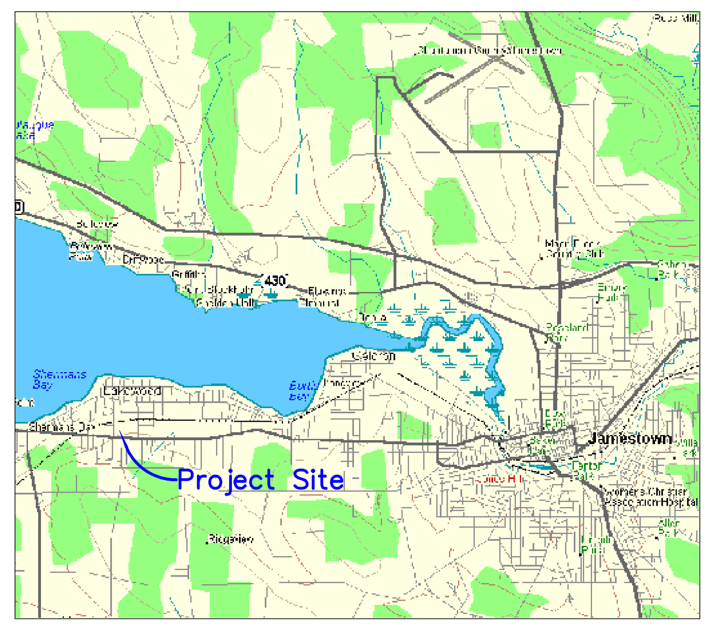
All that tract or parcel of land situate in the Village of Lakewood, County of Chautauqua and State of New York and being a part of Lot 16, Town 2 and Range 12 of the Holland Land Company's Survey and being all of that tract or parcel of land conveyed by Lexington Precision Corporation to Lexington Machining LLC by corrective deed dated November 20, 2012 and recorded in the Chautauqua County Clerk's Office on November 28, 2012 as Instrument No. DE2012006404 and being further bounded and described as follows:

Beginning at a magnetic nail set on the easterly bounds of Winchester Road at its Intersection with the southerly bounds of the former Erie Railroad right-of-way; thence easterly, along the southerly bounds of the former Erie Railroad right-of-way and along the arc of a curve concave southerly whose radius is 6549.85' an arc distance of 399.86' to a set re-bar w/ cap located N 83°-13'-38" E a distance of 399.78' from the last described point; thence N 00°-19'-30"E, continuing along said railroad right-of-way, a distance of 20.08' to a set re-bar w/ cap; thence easterly continuing along the southerly bounds of the former Erie Railroad right-of-way and along the arc of a curve concave southerly whose radius is 5669.65' an arc distance of 110.34' to a set re-bar w/cap located N 85°-49'-49" E a distance of 110.34' from the last described point; thence S 00°-19'-30" W a distance of 569.50' to a set re-bar w/cap; thence S 89°-20'-30" W a distance of 498.21' to a set re-bar with cap on the easterly bounds of Winchester Road; thence N 00°-39'-30" W, along the easterly bounds of Winchester Road, a distance of 500.00' to the point and place of beginning. Containing 6.15+/- acres of land.

ENVIRONMENTAL EASEMENT DESCRIPTION
NYSDEC SITE NO. 907044

All that tract or parcel of land situate in the Village of Lakewood, County of Chautauqua and State of New York and being a part of Lot 16, Town 2 and Range 12 of the Holland Land Company's Survey and being all of that tract or parcel of land conveyed by Lexington Precision Corporation to Lexington Machining LLC by corrective deed dated November 20, 2012 and recorded in the Chautauqua County Clerk's Office on November 28, 2012 as Instrument No. DE2012006404 and being further bounded and described as follows:

Beginning at a magnetic nail set on the easterly bounds of Winchester Road at its intersection with the southerly bounds of the former Erie Railroad right-of-way; thence easterly, along the southerly bounds of the former Erie Railroad right-of-way and along the arc of a curve concave southerly whose radius is 6549.65' an arc distance of 399.86' to a set re-bar w/ cap located N 83°-13'-38" E a distance of 399.78' from the last described point; thence N 00°-19'-30" E, continuing along said railroad right-of-way, a distance of 20.08' to a set re-bar w/ cap; thence easterly, continuing along the southerly bounds of the former Erie Railroad right-of-way and along the arc of a curve concave southerly whose radius is 5669.65' an arc distance of 110.34' to a set re-bar w/ cap located N 85°-49'-49" E a distance of 110.34' from the last described point; thence S 00°-19'-30" W a distance of 569.50' to a set re-bar w/ cap; thence S 89°-20'-30" W a distance of 498.21' to a set re-bar w/ cap on the easterly bounds of Winchester Road; thence N 00°-39'-30" W, along the easterly bounds of Winchester Road, a distance of 500.00' to the point and place of beginning. Containing 6.15 +/- acres of land.



Vicinity Map derived from U.S.G.S. 7.5' Quadrangle LAKEWOOD, NEW YORK
Project Site – 42°-06'-00" N. Latitude, 79°-19'-50" W. Longitude

NOTE: The engineering and institutional controls for this Easement are set forth in the Site Management Plan (SMP). A copy of the SMP must be obtained by any party with an interest in the property. The SMP can be obtained from NYS Department of Environmental Conservation, Division of Environmental Remediation, Site Control Section, 625 Broadway, Albany, NY 12233 or at derweb@gw.dec.state.ny.us.

ENVIRONMENTAL EASEMENT AREA ACCESS

The DEC or their agent may access the environmental easement area shown hereon through any existing street access or building ingress/egress access point.

NOTE: This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the New York Environmental Conservation Law.

INSTITUTIONAL CONTROLS

GENERAL PROVISIONS: 1.- Compliance with the Environmental Easement and the SMP by the Grantor and the Grantor's successors and assigns required. 2.- All Engineering Controls must be operated and maintained as specified in the SMP. 3.- All Engineering Controls on the Controlled Property must be inspected at a frequency and in a manner defined in the SMP. 4.- Groundwater and other environmental or public health monitoring must be performed as defined in the SMP. 5.- Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP.

SITE RESTRICTIONS: 1.- The property may only be used for industrial or commercial use provided that long-term Engineering and Institutional Controls included in the SMP are employed. 2.- The property may not be used for a higher level of use, such as unrestricted and restricted residential use, without an evaluation of potential additional remediation and amendment of the Environmental Easement, as approved by the NYSDEC. 3.- All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP. 4.- The use of groundwater underlying the property is prohibited without treatment rendering it safe for intended use. 5.- The potential for vapor intrusion must be evaluated for any buildings developed in the area noted on Figure 7 of the SMP and any potential impacts that are identified at concentrations that may pose a hazard must be mitigated. 6.- Vegetable gardens and farming on the property are prohibited. 7.- The site owner or remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (a) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC: and, (b) nothing has occurred that impairs the ability of the controls to protect public health and the environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable.

NOTE: IT IS A VIOLATION OF ARTICLE 145 SECTION 7209 PROVISION 2 OF THE N.Y.S. EDUCATION LAW FOR ANY PERSON, OTHER THAN A LICENSED LAND SURVEYOR, TO IN ANY WAY ALTER THIS DOCUMENT

NOTE: LOCATION OF ALL UNDERGROUND UTILITIES IS APPROXIMATE BASED ON SURFACE APPURTENANCES AND VENDOR RECORDS (ASCE LEVEL "C"). NO ASSURANCE OF ACCURACY OR COMPLETENESS IS IMPLIED.

NOTE: PREPARED WITHOUT BENEFIT OF TITLE ABSTRACT. PREPARED WITH REFERENCE TO TITLEVEST TITLE POLICY ORDER #: OR-CH-382921 AND DEPICTING THE SAME PREMISES AS SET FORTH UNDER SCHEDULE "A" THEREIN.

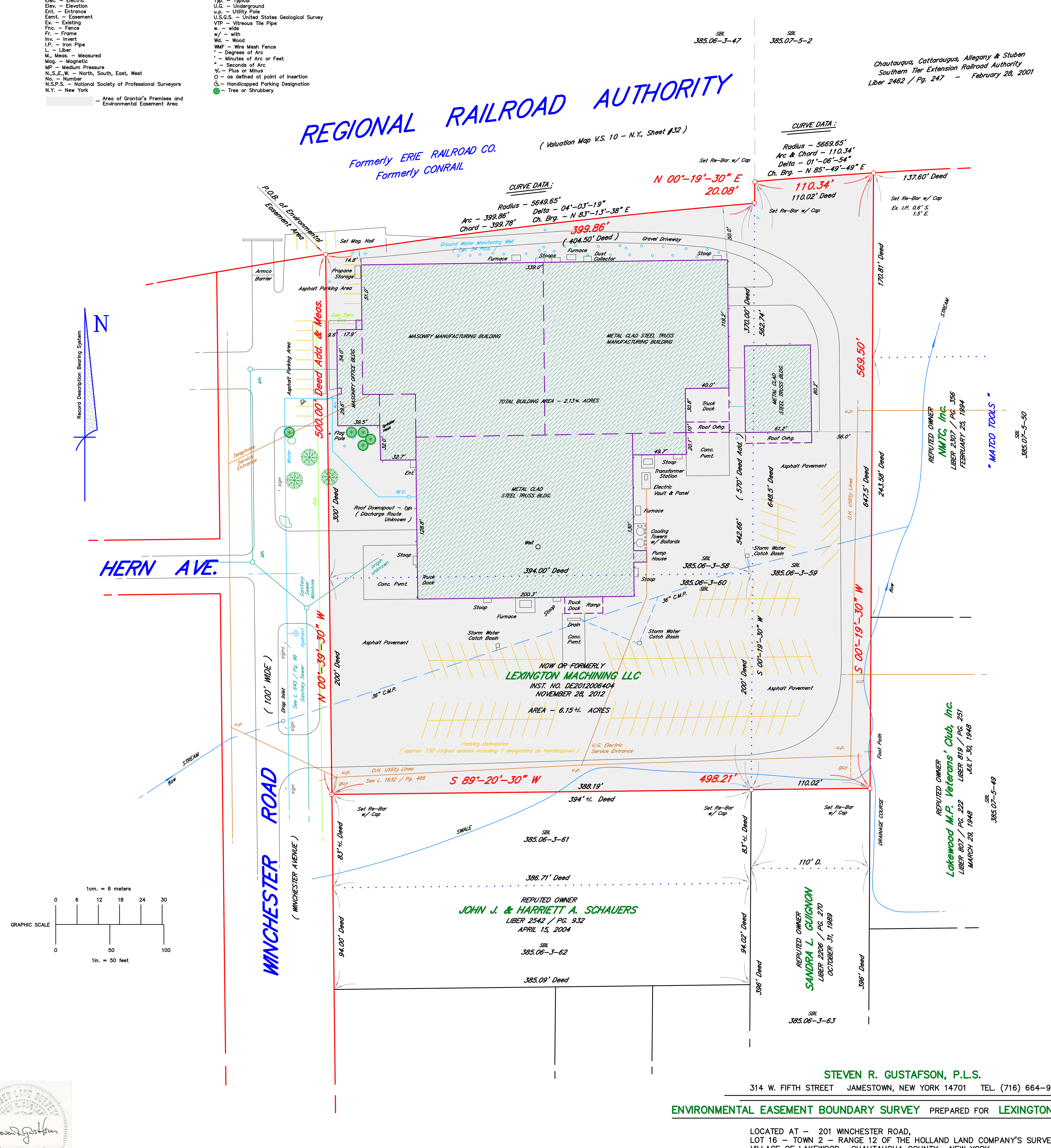
NOTE: THIS SURVEY IS CERTIFIED TO LEXINGTON MACHINING LLC, OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY, TITLEVEST AGENCY, Inc. AND TO THE PEOPLE OF THE STATE OF NEW YORK ACTING THROUGH THEIR COMMISSIONER OF THE DEPARTMENT OF ENVIRONMENTAL CONSERVATION AS HAVING BEEN PREPARED IN ACCORDANCE WITH THE CODE OF PRACTICE FOR LAND SURVEYS (SEVENTH REVISION) AS ADOPTED BY THE NEW YORK STATE ASSOCIATION OF PROFESSIONAL LAND SURVEYORS.

NOTE: THE SUBJECT PREMISES DOES NOT CONSTITUTE ANY PORTION OF A DELINEATED WETLANDS AREA AS THEY ARE DEPICTED ON AN INVENTORY MAP OF SAME STYLED NEW YORK STATE FRESHWATER WETLANDS MAP – LAKEWOOD QUADRANGLE – CHAUTAUQUA COUNTY MAP 23 OF 25 AS PROMULGATED PURSUANT TO ARTICLE 24 OF THE ENVIRONMENTAL CONSERVATION LAW (THE FRESHWATER WETLANDS ACT) ON JANUARY 8, 1986. NO KNOWN ON SITE DELINEATION HAS BEEN UNDERTAKEN.

Low Oblique Aerial View of Project Site Looking Northerly

LEGEND OF SYMBOLS & ABBREVIATIONS

A.C. Cond. – Air Conditioning Condenser
A.C.S.M. – American Congress on Surveying and Mapping
A.L.T.A. – American Land Title Association
A.S.C.E. – American Society of Civil Engineers
BM. – Benchmark
Bldg. – Building
Brg. – Bearing
CaTV – Cable Television
Ch. – Chord
CMP – Corrugated Metal Pipe
C.O. – Clean out
Conc. – Concrete
Cor. – Corner
CPP – Corrugated Plastic Pipe
D. – Deed
DI – Ductile Iron or Drop Inlet
Dia. – Diameter
Elec. – Electric
Elev. – Elevation
Ent. – Entrance
Esmt. – Easement
Ex. – Existing
Fnc. – Fence
Fr. – Frame
Inv. – Invert
I.P. – Iron Pipe
L. – Liber
M., Meas. – Measured
Mag. – Magnetic
MP – Medium Pressure
N.,S.,E.,W. – North, South, East, West
No. – Number
N.S.P.S. – National Society of Professional Surveyors
N.Y. – New York
O.H. – Overhead
Pg. – Page
Plcs. – Places
Po. – Porch
P.O.B. – Point of Beginning
Pri. – Privacy
R. – Record
Re-Bar – Reinforcing Bar
RCP – Reinforced Concrete Pipe
San. – Sanitary
SBL – Section / Block / Lot
Serv. – Service
Sq. Ft. – Square Feet
St. – Story
Sys. – System
T.B.M. – Temporary Benchmark
Tel. – Telephone
Typ. – Typical
U.G. – Underground
u.p. – Utility Pole
U.S.G.S. – United States Geological Survey
VTP – Vitreous Tile Pipe
w. – wide
w/ – with
Wd. – Wood
WMF – Wire Mesh Fence
° – Degrees of Arc
' – Minutes of Arc or Feet
" – Seconds of Arc
+/- – Plus or Minus
O – as defined at point of insertion
– Handicapped Parking Designation
– Tree or Shrubbery
– Area of Grantor's Premises and Environmental Easement Area



STEVEN R. GUSTAFSON, P.L.S.
314 W. FIFTH STREET JAMESTOWN, NEW YORK 14701 TEL. (716) 664-9331

ENVIRONMENTAL EASEMENT BOUNDARY SURVEY PREPARED FOR LEXINGTON MACHINING LLC

LOCATED AT – 201 WINCHESTER ROAD,
LOT 16 – TOWN 2 – RANGE 12 OF THE HOLLAND LAND COMPANY'S SURVEY,
VILLAGE OF LAKEWOOD, CHAUTAUQUA COUNTY, NEW YORK.

JOB NO. G-2530b SCALE 1" = 50' DATE DECEMBER 30, 2013

N.Y. L.S. 049395

APPENDIX B – EXCAVATION WORK PLAN

A-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the Department. Currently, this notification will be made to:

Regional Hazardous Waste Remediation Engineer

NYSDEC

Region 9

270 Michigan Avenue

Buffalo, NY 14203-2999

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent, plans for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control,
- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work,
- A summary of the applicable components of this EWP,
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120,
- A copy of the contractor's health and safety plan, will be appended to this document.
- Identification of disposal facilities for potential waste streams,
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

A-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based soil screening will be performed by a qualified environmental professional during all remedial and development excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal, material that requires testing, material that can be returned to the subsurface, and material that can be used as cover soil.

A-3 STOCKPILE METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by NYSDEC.

A-4 MATERIALS EXCAVATION AND LOAD OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the site and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

A-5 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks will be washed prior to leaving the site. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

All trucks loaded with site materials will exit the vicinity of the site using an approved truck route(s). This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site development or invasive activities

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

A-6 MATERIALS DISPOSAL OFF-SITE

All soil/fill/solid waste excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

A-7 MATERIALS REUSE ON-SITE

Chemical criteria for on-site reuse of material have been approved by NYSDEC and are listed in Table 11-2. Final Restricted Use SCOs as Presented in 6 NYCRR Part 375-6.8(b), Restricted Use, Industrial or Commercial site. The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for re-use on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

A-8 FLUIDS MANAGEMENT

Excavation dewatering and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, but will be managed off-site.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

A-9 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Soils that meet ‘exempt’ fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

A-10 STORMWATER POLLUTION PREVENTION

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

A-11 CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for full a full list of analytes (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the periodic reports prepared pursuant to Section 5 of the SMP.

A-12 COMMUNITY AIR MONITORING PLAN

A Community air Monitoring Program (CAMP) will be initiated in the event of planed disturbance of soils exhibiting residual contamination at the site as depicted in Figure 7. The CAMP will be conducted following guidelines and actions levels outlined in Appendix H, NYSDOH Generic Community Air Monitoring Plan.

The location of air sampling stations will be based on generally prevailing wind conditions and conditions observed during air monitoring activities. These locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

A-13 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site and on-site. Specific odor control methods to be used on a routine basis will include water misting if excavation conducted in areas containing residual contaminants. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the site owner's site contractor, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams or water mist to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

A-14 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of dedicated on-site water truck for road wetting. The truck will be equipped with water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, un-vegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

APPENDIX C – HEALTH AND SAFETY PLAN

Health and Safety Plan

For Site Monitoring and Intrusive Work Activities

Premier Lakewood Inc. Site
201 Winchester Road
Village of Lakewood, Town of Busti,
Chautauqua County, New York

May 23, 2013
Bureau Veritas Project No.: 12013-000091.00
Lexington Machining LLC

For the benefit of business and people

Bureau Veritas North America Inc.
Raritan Plaza One
110 Fieldcrest Avenue, Fourth Floor
Edison, New Jersey 08837
732.225.6040
www.us.bureauveritas.com

In accordance with 29 Code of Federal Regulations (CFR) 1910.120 Paragraph (a), BVNA has prepared this site-specific HASP for the site monitoring and/or intrusive work activities at the Premier Lakewood, Inc. Site. The purpose of this Health and Safety Plan (HASP) is to facilitate compliance with laws and regulations relating to health, safety, and the environment during site monitoring activities and/or intrusive work at the Premier Lakewood Inc. Site located at 201 Winchester Road in the Village of Lakewood, Town of Busti, Chautauqua County, New York.

As such, Bureau Veritas North America, Inc., (BVNA) has prepared this HASP for use by all personnel conducting site monitoring activities and/or intrusive work to provide the means to achieve safe working conditions through informational programs and persistent review and improvement of practices that protect the health and safety of all personnel.

This plan documents specific requirements and procedures for the protection of field personnel while performing site activities. Emergency and site contacts are provided in Appendix A along with a map to the local emergency care facility. Key BVNA personnel involved with this project and their respective titles are listed below.

Bureau Veritas Health & Safety Coordinator: ______________________________

John Stangline (5/23/13)

Bureau Veritas Project Manager: ______________________________

John Stangline (5/23/13)

SITE HEALTH AND SAFETY PLAN ACKNOWLEDGMENT FORM

SITE: Premier Lakewood, Inc. Site located at 201 Winchester Road in the Village of Lakewood, New York

PROPOSED DATE OF SITE WORK: (work date(s) for each activity to be inserted)

By placing my signature below, I certify that I have read and/or been given a full verbal Health and Safety Plan (HASP) review, fully understand its requirements, and will follow all safety directives set forth by the plan or dictated by BVNA, as long as I am present at this site.

Name (Print)	Signature	Date

CONTENTS

1.0 INTRODUCTION

Lexington Machining LLC (Lexington Machining) is implementing a Site Management Plan at the Premier Lakewood, Inc. Site located at 201 Winchester Road in the Village of Lakewood, Town of Butsi, New York (Figure 1). Site management activities are in alignment with the New York State Department of Environmental Conservation (NYSDEC) Order on Consent and Administrative Settlement Index # B9-0792-08-10.

This document presents the Health and Safety Plan (HASP) to be implemented during site monitoring and intrusive work activities. This plan is applicable to all personnel taking part in these activities. On-site activities will be performed in accordance with the Occupational Safety and Health Administration (OSHA) standards (Title 29 CFR 1910 and 1926) and in accordance with other applicable federal, state, and local or specific Lexington Machining / Premier Lakewood regulations/procedures.

2.0 OBJECTIVE

It is the objective of this HASP to establish a means to provide a safe work environment for site personnel, to provide a uniform and concise policy of action, and to provide all site personnel with the necessary guidance to adhere to the policies. The organization of this program and the procedures contained herein, have been based on an evaluation of potential hazards at the site and the recognized standard procedures in response to these hazards. Contractors retained directly by Lexington Machining or others are required to implement this HASP and may be responsible for the preparation of a separate HASP for activities not included within this plan. This plan is to be updated as site conditions change and/or additional site characterization information is developed.

2.1 SITE DESCRIPTION

The Site is located in the Village of Lakewood, Town of Busti, County of Chautauqua, New York . (Figure 1 – Site Location Map). The property is situated on three lots identified as Block 385 Lots 06-3-58, 06-3-59 and 06-3-60. The site is approximately 5.7 acres and is bounded by a Chautauqua Regional Railroad Authority rail line to the north, a residential property and a vacant commercial/industrial facility to the south. Matco Tools manufacturing facility and American Legion Lakewood Memorial Post 1286 to the east, and Winchester Road to the west. (Figure 2 – Site Plan).

2.2 SUMMARY OF RECOGNIZED ENVIRONMENTAL CONDITIONS (RECS) AND ENVIRONMENTAL CONCERNS

REC: Soil

Three phases of soil sampling performed at the site included the areas where chlorinated solvent had been stored, used or potentially used. The results of the sampling program indicate a minor VOC impact in soil at the site. 1,1,1-TCA was detected at a concentration of 6.3 mg/kg, above soil cleanup criteria for protection of groundwater quality in one location; however, 1,1,1-TCA was not detected at concentrations above any soil cleanup criteria for protection of public health.

1,2-DCA was detected at concentrations of 0.03 to 0.05 ppm at 6 locations at concentrations slightly above the groundwater protection criteria but well below public health and ecological resource protection criteria.

Acetone was detected in two soil samples at concentrations slightly above the groundwater protection criteria but well below public health and ecological resource protection criteria.

REC: Groundwater

Groundwater impacts were initially discovered at the site during an October 2002 Phase II site assessment. VOCs including 1,1,1-TCA, 1,1,2-TCA, 1,1-DCA, 1,1-DCE, and 1,2-, 1,3-, and 1,4-dichlorobenzene were detected at concentrations of 2.6 to 19.0 micrograms per liter (ug/L). Subsequent groundwater monitoring well installation and groundwater sampling at the site in 2005, 2006, 2007 and 2010 identified additional VOCs; primarily breakdown products of 1,1,1-TCA and 1,1,2-TCA. VOCs detected in groundwater at the site, with concentrations ranges as noted, include:

- acetone (3.79 to 200 ug/L),
- benzene (0.458 to 0.815ug/L (two detections)),
- chloroethane (1.08 to 1100 ug/L),
- 1,1-dichloroethane (0.502 to 400 ug/L),
- 1,2-dichloroethane (0.331 to 9.15 ug/L),
- 1,1-dichloroethene (0.572 to 500 ug/L),
- cis-1,2-dichloroethene (0.496 to 10.3 ug/L),
- 1,1,1-trichloroethane (1.6 to 174 ug/L), and
- 1,1,2-trichloroethane (2.02 to 3.4 ug/L).

The groundwater VOC impacts at the site appears to be limited in vertical extent to the saturated overburden. Its lateral extent appears to cover an area approximately 1.5 acres in size that includes the northern two thirds of the manufacturing building and extends down-gradient to the north and northeast from the building to the northern property boundary. Concentrations of VOCs detected in samples from wells installed in October 2006 at the northern property boundary (MW-12, -13, and -14) were an order of magnitude lower (roughly ten times lower) than concentrations detected at the wells located up-gradient and closer to the building (MW-1, -2, and -3). In general, the VOCs that occur in groundwater are predominantly the bio-degradation products of 1,1,1-TCA and 1,1,2-TCA. Continued natural degradation of site contaminants is anticipated.

Acetone was identified in three samples during one groundwater sampling event in 2005 and in six samples in 2010. Acetone was detected in the field blank during the 2010 sampling event and may be a laboratory contaminant. Benzene was identified in one sample during one groundwater sampling event in 2005 and one sample in June 2010. The presence of acetone and benzene in groundwater sampling appear to be intermittent and may be the result of laboratory or field contaminants.

Figure 3 depicts residual soil and groundwater impacts above unrestricted use criteria.

2.3 SITE MONITORING WORK ACTIVITIES

The proposed site monitoring activities may include the following:

- Collection of groundwater samples through existing or new monitoring wells
- Soil vapor, sub-slab vapor, and/or indoor air sampling
- Drilling
- Test pit excavation
- Miscellaneous construction activities
- Soil sampling

Any proposed soil sampling will include in-field screening with a Photo Ionization Detector (PID), logging field measurements and observations, collecting and submitting samples to a NYS certified laboratory for analysis.

While not anticipated, intrusive work may include, test pit excavation, soil borings / monitoring well installation, site grading, building demolition, construction or other activities that may disturb areas of impacted soil or groundwater of the site.

Prior to commencement of work on site (including mobilization activities), a full HASP briefing shall be provided to workers participating in site monitoring or intrusive work activities. This briefing shall include an overview of all HASP requirements. Additionally, a documented daily pre-job briefing shall be performed on site prior to the day's commencement. The documentation shall state what was discussed at each meeting and who was in attendance (sign-in sheet).

At least 72 hours prior to initiation of subsurface work activities, contractors initiating intrusive work will request a utility clearance mark out by calling the NYS One-call Center to coordinate utility mark-outs of underground utilities including electric, gas, and communication lines, on public Right-of-Ways (ROWs) in the vicinity of proposed soil borings. Additionally, private utility location may be necessary to avoid buried private utilities at the site during site monitoring and/or intrusive work.

3.0 ORGANIZATION OF SITE SAFETY

BVNA has prepared this Site Specific HASP for the benefit of all personnel who participate in or provide oversight and supervision of certain field activities.

All personnel acting under the authority of BVNA shall be in compliance with all training and medical monitoring requirements as established in, but not limited to, 29 CFR 1910.120, 1910.1200, and 1910.134. In addition, certification of training and medical monitoring shall be documented in the contractor's personnel files for each contractor employee. If requested, copies of original 40-hr. HAZWOPER training documentation, as well as the most recent HAZWOPER 8-hr. refresher training, will be provided to the Lexington Machining representative on site prior to project commencement. This is required of all personnel who may enter any established Exclusion and/or the Contamination Reduction Zones, or otherwise make contact with contaminated media.

The Health and Safety Officer will have the authority to implement health and safety requirements for specific site activities, and to ensure that all BVNA employees and onsite personnel under authority of BVNA follow the policies and procedures of this program. It is the responsibility of other organizations to ensure compliance of this plan by its onsite employees or representatives.

Prior to commencement of work on site (including mobilization activities), BVNA will provide a documented full HASP briefing to site workers participating in site monitoring or intrusive work activities under the authority of BVNA. Should new workers arrive on site, they too will be given a documented full HASP briefing. Additionally, a documented daily pre-job briefing will be performed on site prior to the day's commencement. The documentation shall state what was discussed at each meeting and who was in attendance (sign-in sheet). This documentation will be provided to Lexington Machining upon request.

4.0 SITE CHARACTERIZATION

Previous soil sampling confirms the soil and groundwater impacts are present on site. Soil contaminants remaining at the site are located at depths of 4 to 11.5 feet beneath site structures. Contaminants remain beneath the compressor room, die casting area, and vibratory process areas (see Figure 3). Remaining soil contaminants include chlorinated solvents and acetone at concentrations below criteria for protection of public health in residential, commercial or industrial settings, but above criteria for protection of groundwater.

Groundwater contaminants remaining at the site, including chlorinated solvent VOCs, are present in overburden groundwater under approximately half of the 99,000 square foot manufacturing building and the northern portion of the site. Groundwater is generally encountered at depths of 10 to 16 feet below grade.

5.0 SITE CONTROL

Site control measures for reducing the possibility of employee and public exposure to potential hazards and the transport of contaminants include the following:

- limiting access to the work site(s) and posting appropriate warning signs;
- preparing the site for subsequent activities;
- establishing onsite communications consisting of sight/hand signals or two-way radio or cellular telephone;
- establishing non-routine or special work task communications;
- implementing controls for vehicular and pedestrian traffic; and
- enforcing safe work practices.

These measures will be enforced by the Health and Safety Officer (HSO) and the Project Manager (PM).

5.1 GENERAL WORK RULES

It is the duty of each and every employee to know the safety rules and to conduct their work in compliance with company/client policies and procedures and other local, state and federal regulations. Each employee is required to follow work procedures and rules, use provided equipment in a safe manner, and comply with the requirement of this HASP. Each field employee will receive an orientation when assigned to the project and will receive an opportunity to review a copy of the HASP. Hazards associated with individual tasks and other health and safety issues will be reviewed in daily tailgate safety meetings. The following is a partial list of general work rules:

- A tailgate safety meeting will be held on-site prior to the commencement of any on-site activities. Potential chemical hazards will be addressed at that time.
- The following conditions are to be avoided by field personnel:
  - Potential exposure to hazardous materials;
  - Working in toxic or explosive atmospheric conditions;
  - Entering confined spaces (sewers, man holes, crawl spaces); and
  - Buried and overhead utilities.
- The use of flames and smoking, eating, application of cosmetics, use of chewing tobacco, or drinking will not be permitted onsite within the delineated Exclusion Zone or Contamination Reduction Zone.
- Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. The location of underground utilities and tanks will be determined prior to excavation or drilling. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Markout Ticket will be retained by the drilling contractor. The drilling subcontractor will visually inspect and ground penetrating radar in areas where public utility companies may not have sufficient information on buried utilities.
- All personnel will participate in annual safety refresher training.
- All personnel will attend and participate in all training sessions for their jobs.

- All personnel must comply with safety rules, directions, and instructions of supervisors.
- Project personnel are responsible for the proper use of all safety devices, safeguards, and personal protective equipment provided to them.
- Report to supervisors any hazardous condition or practice, "near miss" incident, property damage, accident, injury, illness or signs and symptoms of exposure to any hazardous materials.
- Inform the supervisor of any medical condition (i.e., pregnancy, asthma, etc.), which can be affected by potential exposure to hazardous chemicals and/or radiological hazards.
- All employees must participate in their company's medical monitoring program.
- All work on the site will employ the buddy system.
- Field personnel shall minimize and avoid contact with excavated or contaminated materials.
- Immediately notify the supervisor if problems are encountered related to heat, cold and other work stresses from wearing protective gear or site/task operations.
- Employees who wear respirators must participate in their company's respiratory protection program including medical surveillance, training, and fit-testing. The use of respiratory protection may require the removal of facial hair to allow a proper respirator fit.
- Avoid use of alcohol. Advise the HSO/PRSO if you are taking medications/drugs (prescriptions and over-the-counter).
- Appropriate eye protection devices will be worn during any task with a potential for eye injury. Appropriate goggles and/or face shields must be worn when any grinding, work with chemicals or samples, or any other operation is performed that may produce eye hazards. Safety glasses must be worn for all fieldwork and when performing any hammering or pounding.
- Appropriate head protection (hard hat) devices will be worn when working in construction areas or areas that present an overhead hazard.
- Appropriate reflective clothing will be worn at all times.
- Leather gloves must be worn when handling objects that may produce slivers or cuts (for example, moving wooden boards and metal scaffolding). When contact with contaminated materials is possible, chemical protective gloves shall be worn. At times, it may be necessary to wear leather gloves over chemical protective gloves.
- All personnel must report any exposure incident immediately to the HSO/PM.
- All personnel must be familiar with the policies and procedures in this HASP and discuss any questions with the HSO/PM.
- All team members will be aware of emergency response and emergency evacuation responsibilities, procedures, protocols, and signals. Personnel responsibilities and alternates as well as primary and secondary routes and directions to emergency medical facilities will be outlined prior to site entry.
- Equipment and tools will be kept clean and in good repair and used only for their intended purposes.
- No horseplay is allowed.

5.2 BUDDY SYSTEM

Personnel working in contaminated or hazardous areas will work with a buddy who is capable of the following:

- Assisting his or her partner;
- Monitoring the partner for signs of chemical or other exposures (e.g., heat or cold);

- Periodically verifying the integrity of the partner's PPE; and
- Notifying the HSO/PM if emergency help is needed.

As personnel enter the Exclusion Zone through the access control point, the Site Supervisor will ensure that each employee will be working with, or in sight of, a buddy.

5.3 COMMUNICATION

Verbal communication at the sites may be impaired by onsite background noise caused by process equipment, heavy vehicular equipment and the use of PPE. When needed, hand signals to be used between personnel within the Exclusion Zone will be reviewed during site safety meetings conducted before starting work at the individual sites. External communication between onsite and offsite personnel will be conducted using cell phones.

5.4 SECURITY

Site security is essential to (1) prevent unauthorized, unprotected, or unqualified people from exposure to site hazards and (2) protect established and safe working procedures. Site security will be maintained by limiting access to the work area and in the control zones to only essential personnel. The Site Supervisor must approve all visitors to the site.

5.5 SITE LOGS AND RECORDS

The project logbook will note which personnel are onsite and will reflect site staffing. Results of monitoring will be recorded in field logs. The HSO/PRSO will maintain health and safety records that may be generated during field work including:

- Records of on-site health and safety training
- Exposure monitoring records for radiological, chemical, and/or other exposures
- Completed confined space entry permits
- Incident reports and investigations

Employees will be informed of the results of any exposure monitoring that is conducted. Records will be maintained as required by 29 CFR 1910.1020.

5.6 DESIGNATION OF WORK ZONES

The U.S. Occupational Safety and Health Administration (OSHA) regulation for Hazard Waste Operations and Emergency Response (HAZWOPER) states in 29 CFR 1910.120(a)(1)(i) that HAZWOPER requirements are applicable to "…initial investigations of government identified sites which are conducted before the presence or absence of hazardous substances has been ascertained)." Therefore, the work conducted for the project will be conducted under HAZWOPER.

Access to the work site(s) must be delineated with appropriate warning signs, physical barriers, barricade tape, and/or other means to mark work zones. The following three contiguous zones will be used where significant contamination or exposure risk potential exists:

- Zone 1: Exclusion Zone. This is the zone in which exposure to site contaminants may be expected to occur (e.g. in and around open manholes, around boreholes). Entry into the exclusion zone may be performed only by properly equipped project personnel.
- Zone 2: Contamination Reduction Zone. This is the zone where decontamination of personnel and equipment will be performed. Personnel must exit the Exclusion Zone through the Contamination Reduction Zone.
- Zone 3: Support Zone. This is the zone where equipment and supplies will be staged to support activities within the Exclusion Zone and Contamination Reduction Zone. This zone will be barricaded to prevent public access.

In establishing the work zones, the following criteria will be reviewed: the nature of the work to be performed and the hazards that may be created; the surrounding area's current usage, accessibility by project personnel, pedestrian and vehicle traffic, location (e.g. street or sidewalk); wind conditions, the presence of hazards such as buried or overhead utilities, and other constraints.

5.7 CONTAMINANT CONTROLS

Each work area will require the establishment of boundaries, separating the areas defined as exclusion zones (actual monitoring or investigation areas), decontamination zones (areas in which personal protective equipment is removed) and clean zones (uncontaminated/decontaminated areas). These areas are designed to reduce the risk of transporting contaminants outside the exclusion zone. Upon exiting the exclusion zone all employees will implement decontamination procedures for the removal of all personal protective equipment (PPE) prior to entering uncontaminated areas. Only when the decontamination and PPE doffing process is complete, will employees enter the Clean Zone prior to entering uncontaminated areas.

5.8 FALLING OBJECTS

If there is a danger of falling objects on a property, the entire area inside the exclusion zone will be a hard hat area. Depending on the height of the drilling equipment, hard hats may also be specified within 50 feet of drilling operations.

5.9 ERGONOMIC HAZARDS

When the potential exists for repetitive stress injuries, poor posturing, or other ergonomic hazards, employees will exercise extreme caution. Repeated tasks may be divided among several workers or performed at different times to prevent injuries such as carpal tunnel syndrome. Proper lifting techniques will be utilized at all times. Mechanical devices, and/or additional personnel will be utilized as needed to prevent the lifting of weights in excess of abilities.

6.0 HAZARD ASSESSMENT / ANALYSIS

6.1 CHEMICAL HAZARDS

The primary contaminants of concern that may be encountered while conducting the subsurface investigations at the site include VOCs. Carcinogenic risk is one order of magnitude greater than the USEPA benchmark value of one in ten thousand. The estimated carcinogenic risk posed by the hypothetical inhalation scenario is 2.2 occurrences in one thousand. Pathways of exposure from these compounds may occur through vapor or particle inhalation and absorption through skin. The material safety data sheets for potential chemical hazards are provided in Appendix B of this HASP.

An Emergency Response Plan (including Emergency Response Guidelines) is presented as Appendix A. A chemical hazard assessment for the following activities is described below:

1. Mobilization/Demobilization of personnel and equipment.
2. Post Excavation Soil Sample Collection.
3. Intrusive work that may disturb impacted soil or groundwater.
4. Drilling/boring for soil sample or vapor collection and/or monitoring well installation.
5. Monitoring well gauging and groundwater sampling.

Hazard Assessment

Hazard	Activity	Monitoring	Engineering Control	Administrative Control	Personal Protective Equipment (PPE)
Inhalation	Any Intrusive Work	PID / FID, Dust / Particulate Monitors	Adequate ventilation Dust suppression if needed	Only trained personnel will be allowed to work in areas with residual soil or groundwater impacts. Adherence to CAMP.	Level D
Dermal	All site activities	None	None	Only trained personnel will be allowed to work in areas with residual soil or groundwater impacts.	Level D and disposable nitrile gloves will be worn. Disposable poly-tyvek-type coveralls and disposable boot covers may also be worn.

6.2 Physical Hazards

General Construction Dangers:

- All public utilities will be marked-out by appropriate authorities prior to any intrusive work.
- Hard hats and steel toe boots shall be worn.
- "Safety glasses with attached side shields will be worn at all times while on site.
- The work area will be clutter free to minimize trip hazards.
- All contractor tools will be maintained in a safe condition and used properly.
- Only workers who have been trained in the use of a particular tool/equipment may operate that tool/equipment.
- All tools will be inspected prior to use to ensure proper operation and structural integrity.
- All hand tools that are damaged will be removed from the job site until they are repaired.
- Removing any guards from a power tool is prohibited and operating a power tool with any guards removed is prohibited.

A physical hazard assessment and specific control methods are identified in the table below. Note: EC: Engineering Control; AC: Administrative Control: Eye protection as safety glasses with attached side shields, Foot Protection as steel toes shoes, Hard Hats, Hearing protection (as necessary, depending upon the work activity)

Activity	Specific Task	Equipment	Hazard	Control Method
Mobilization/ Demobilization	Movement of personnel & equipment on to and off of the site	Wheelbarrows, rakes, 55-gallon drums,	Pinch, cut, drop hand tools	AC: Neat and organized work area. Move all slip, trip and/or fall hazards. Ensure adequate personnel are available to move equipment.

Activity	Specific Task	Equipment	Hazard	Control Method
Soil / Groundwater / Vapor Sampling	Collection of soil or groundwater samples	Small Hand Tools such shovels, scoops, bailers, 12-volt pumps polyethylene and silicone tubing.	Flying objects, dust, pinch points, cutting tools	PPE: Safety Glasses/Shield, hard hat, polytyvek-type disposable coveralls, Nitrile Gloves, steel toe boots, disposable boot covers If a contingency is called a full or half-face respirator with combination organic vapor and dust cartridges will be required.
Drilling Activities	Advancement of soil borings	Geoprobe, auger drill rig	Pinch, cut, drop, lacerations, flying objects, dust debris	PPE: Hardhat, steel toe boots, safety glasses with side shield, level D. If chop saw, all proper safety guards will be inspected and utilized. This includes dust masks and eye & hearing protection. AC: Neat and organized work area. Move all slip, trip and/or fall hazards. Ensure adequate personnel are available to move equipment
Soil Characterization	Soil sampling and characterization.	Trowel or scoop, shovel or hand auger	Slips, trips, and falls	Be aware of working surface.
Soil Restoration	Backfill borehole and/or placing impacted or excess soil in drums.	Small hand tools such shovels, scoops	Flying objects, dust	PPE: Safety Glasses/Shield, hard hat, polytyvek-type disposable coveralls, Nitrile Gloves, steel toe boots, disposable boot covers If a contingency is called a full or half-face respirator with combination organic vapor and dust cartridges will be required.

- Workers will inspect all electrical equipment, including extension cords, for the following hazards: missing ground pins on plugs (except double-insulated); insulations pulled free from plugs or support connections; damaged insulation; exposed wires; and evidence of arcing, sparking, or smoking.
- When any conditions are identified on equipment that makes it unsafe to operate, the equipment will be removed from the site until repaired by a qualified person.
- All electrical equipment used on a project (hand tools, etc.) will be protected with a ground-fault circuit interrupter (GFCI).
- Workspaces, walkways, and similar locations will be kept free of electric cords and tools.
- Flexible cords must be suitable for the condition and location of use and will be used as appropriate.
- Three-wire extension cords will be used and must be rated for hard or extra-hard use.
- Splices and/or taps are prohibited in extension cords.
- Workers will be trained in the safety-related work practices that pertain to their job and cannot work near electrical hazards without training to recognize and avoid the hazard.

- Include BVNA's policy on when it would be okay to return to work prior to or after a thunderstorm.

Traffic:

High visibility cones will be used to demarcate the work area(s). Employees will remain within the area demarcated by the cones. Workers are encouraged to exercise caution and maintain vigilance for traffic conditions and flow. All workers must wear reflective vests.

Confined Space Entry:

Confined space entry is not anticipated to be conducted within the scope of site monitoring and intrusive work activities. Should confined space entry become necessary, this HASP will be revised and appropriate procedures implemented.

Lighting:

Lighting is not expected to be an issue as work will only take place during daylight hours.

Overhead/Underground Power Lines:

All large machine equipment should maintain a minimum separation distance of 10 feet from all power lines.

Slip/Trip:

To mitigate this hazard the work area will be maintained to be clutter free to minimize the potential of slip/trip/fall hazards. While performing brush trimming and tree removal for access for any drilling equipment or to alleviate site access problems, these areas will be sectioned off to reduce the risk of slip trip, fall, and drop hazards. These areas will be monitored and cleaned up in a timely manner in order to reduce any risk involved.

Heat Stresses:

Heat exhaustion is characterized by profuse sweating, weakness, rapid pulse, dizziness, nausea, and headache. The skin is cool and sometimes pale and clammy with sweat. Body temperature is normal or subnormal. Nausea, vomiting, and unconsciousness may occur. Medical care should be obtained.

Heat stroke is indicated when sweating is diminished or absent. The skin is hot, dry, and flushed. The body increased in temperature, which if uncontrolled, may lead to delirium, convulsions, coma, and even death. Medical care is urgently needed.

The following control measures will be taken to avoid heat stress:

1. Provide for adequate liquids to replace lost body fluids and replace water and salt lost from sweating. Encourage personnel to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate fluid replacement.

2. Replacement fluids will consist of commercial mixes of water/electrolytes such as Gatorade.

3. Establish a work regiment that will provide adequate rest periods for cooling down. This may require additional shifts of work.

4. Wear cooling devices, such as vortex tubes or cooling vests beneath protective garments.

5. Take all breaks in a cool rest area (77 degrees Fahrenheit (or lower) is best).

6. Remove impermeable protective garments during rest periods.

7. Do not assign other tasks to personnel during rest periods.

8. Inform personnel of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress.

Cold Conditions:

Not applicable due to seasonal work.

Noise:

Noise will be emitted by the drilling equipment. BVNA will follow any state and local laws with regards to noise control. This may include the use of special equipment with noise restrictors in place in order to maintain compliance with these regulations. All workers with 25 feet of the drilling equipment are required to wear the appropriate hearing protection while the equipment is operating. Work is to be conducted during normal business hours (Monday through Friday, 8:00 AM to 5:00 PM).

Material Handling:

- Heavy items (such as 55-gallon steel drums filled with soil/disposal sampling material, etc.) will be lifted and moved by mechanical devices (trucks equipped with lifts) rather than by manual effort.
- Excess or impacted drill cuttings, spent PPE and acetate sleeves will be placed in 55-gallon drums. Each drum will be filled to approximately ½ capacity to reduce weight. Drums will then be securely staged onsite for waste classification sampling by BVNA.
- Upon receipt of waste classification analytical data, BVNA will retain a contractor (approved by Lexington Machining) to transport the waste to a Lexington Machining-approved disposal facility.
- All devices shall be inspected by a trained and qualified individual at least once a year and will be inspected prior to each use by the used.
- Defective equipment will be taken out of service immediately and repaired or destroyed.
- The wheels of the truck being loaded or unloaded will be chocked to prevent movement.
- Accessible fire extinguishers appropriately inspected with documentation on the tag will be available in all mechanical lifting devices.
- Employees involved in heavy lifting will be properly trained in lifting procedures and should be physically qualified for the job.
- Personnel will be trained in the procedures for material handling. This training will address the requirements of applicable regulation, for example the training or personnel who operate powered industrial trucks.
- No item will be loaded/unloaded on the street.

Hand and Power Tools:

- Powered tools will be limited to a drill rig and support vehicles. No fork lifts or other powered industrial trucks will be used.
- All contractor hand tools will be maintained in a safe condition and used properly.
- Only workers who have been trained in the use of a particular tool may operate that tool.
- All hand tools will be inspected prior to use to ensure proper operation and structural integrity.
- All hand tools that are damaged will be removed from the job site and not used until they are repaired.
- Removing any guards from a power tool is prohibited and operation a power tool with any guards removed is prohibited.
- Workers who are exposed to flying objects, dust, fumes, vapors, etc. when using hand tool must wear the appropriate personal protective equipment (PPE).
- Fiberglass tool handles must be free of splinters and cracks and be tight in the tool. <u>Wood-handled tools are not allowed</u>
- Electric hand tools must be double insulated or grounded and protected by a ground-fault circuit interrupter (GFCI).
- Face shields with safety glasses/attached side shields or safety goggles worn under face shields will be required if working with power tools.

6.3 ENVIRONMENTAL HAZARDS

The environmental hazard associated with this project appears to be potential presence of VOCs, in soil, dust, and soil vapor. This environmental hazard is of concern during drilling activities, soil/groundwater sampling activities, and materials handling/waste disposal activities.

6.4 BIOLOGICAL HAZARDS

Field personnel are encouraged to use insect repellents prior to donning PPE. Bees/wasps, mosquitoes, poison ivy/oak, etc. may be located on or in close proximity to the work site. Field personnel should be equipped and prepared to use the appropriate insecticides and/or poison ivy/oak cleaners. People that are allergic to bee stings should remain a safe distance from the work area until it has been cleared. Persons with such allergies must provide the appropriate antidotes ("Epi-pen", etc.) to the Site Safety Officer upon arriving at the Site so that it may be administered in case of an emergency.

6.5 MANAGEMENT OF CHANGE REQUIREMENTS

BVNA and its contractors will adhere to the following requirements:

- BVNA will notify the Lexington Machining Authorized Representative of any change in working conditions that could affect compliance with environmental or health and safety requirements as soon as the changed conditions are identified.
- An example of change in conditions can include, but is not limited to the following:
  - Unforeseen hazards not anticipated during the planning process.
  - Weather conditions that could affect worker safety.
  - Unexpected changes in the scope of the project.
  - The potential to generate wastes not expected during project planning.
  - The potential for unexpected sample collection.
- BVNA has identified contingencies (Section 8.2), as required, for managing change.

- BVNA shall take all appropriate precautions prior to implementing any contingencies prepared to manage change. Precautions can include the following:
  - Increasing or decreasing the levels of personal protective equipment.
  - Taking special safety precautions to deal with unsuspected conditions (for example, unanticipated mercury exposure).
  - Planning for inclement weather.
  - Identifying the potential for requiring environmental permits due to changing field conditions.
- All personnel shall be appropriately trained to perform their job function under the changed conditions prior to being allowed to work under the changed conditions.
- Contractors will be held to the management of change procedures outlined by the BVNA.
- **BVNA SHALL HAVE THE ULTIMATE RESPONSIBILITY FOR IMPLEMENTING MANAGEMENT OF CHANGE PROCEDURES RELEVENT TO THE PROJECT.**
- With the exception of the contingencies identified in Section 8.2, if, for whatever reason the scope-of-work is modified and the modification will require changes to the HASP, those changes will result in HASP Addenda. No work will be performed on those changes until the Addenda are reviewed and considered acceptable by Lexington Machining.

6.6 MINIMUM PPE REQUIREMENTS

BVNA and its contractors are responsible to adhere to the following requirements:

- BVNA, by way of development of this HASP, has completed, for its employees and those of its contractors, a hazard assessment prior to the start of the project. BVNA will identify as conditions change on the project to determine the types of PPE necessary for each task.
- The results of the hazard assessment will be communicated to every employee on the project prior to the start of work and as conditions change.
- All workers will be trained to recognize the need for and types of PPE necessary, the proper use of PPE, the limitations of PPE, and proper care and disposal of PPE.
- All workers will be trained in the procedures for inspecting PPE prior to its use to ensure it provides the required protection.
- All PPE used will meet the applicable ANSI standards.
- All PPE will be maintained in a sanitary and reliable condition.
- Where BVNA contractors supply their own PPE, the contractor is responsible for ensuring the adequacy, maintenance, and sanitation of this PPE. At a minimum the following minimum PPE is required for all workers at the job site:
  - Hard Hat
  - Safety glasses with side shields
  - Steel Toed Boots
  - Orange/Yellow Reflective Vest
- Hard hats will not be changed or modified in any way and will be appropriate for the type of work being performed.
- Additional PPE such as respirators, over boots, rubber boots and metatarsal protectors may be necessary for certain situations, for example for elevated wet conditions or chemical spills.
- BVNA contractors will provide their workers with ear plugs that are rated (NRR) at 29 decibels (dB) (based on industry standard) as required for hearing protection during certain work activities.

Note that there may be other hazards associated with site activities that should be considered and addressed during each work event at the site.

6.7 MINIMUM RESPIRATORY PROTECTION REQUIREMENTS

BVNA and its contractors are responsible to adhere to the following requirements:

- BVNA written Respiratory Protection Program (RPP) is available and will be provided if required.
- Respirator use, if required, is expected for use by the soil sampling personnel. Soil sampling activities will be conducted by BVNA. BVNA personnel are trained with the properly selected respirator, and medically evaluated to wear the respirator, and proper fit-tested of the respirator.
- Respirators shall be inspected, maintained, cleaned, disinfected, and stored according to the manufacturers' directions and applicable OSHA guidelines.
- Emergency equipment includes portable fire extinguishers on vehicles powered by oil fuel. These shall be valid and inspected prior to use. All records will be kept on file.
- Based on the RPP, the program manager shall maintain the following records at all times:
  - Hazard Assessments
  - Employee Training
  - Fit-Testing
  - Medical Surveillance
  - Respirator and Fit-Test Equipment Maintenance and Repair

6.8 UTILITY CLEARANCE PROCESS FOR INTRUSIVE ACTIVITIES

The contractor responsible for performing subsurface investigation or intrusive site work (driller, excavator, etc.) will request and document a mark-out from the NY One Call center at least 72 hours prior to the day of scheduled field activities.

7.0 AIR MONITORING PROCEDURES

An appropriate organic vapor meter will be calibrated and used to monitor ambient air conditions during certain site monitoring / intrusive work activities. The purpose of this periodic air monitoring is to assess potential areas of contamination and detect the presence of volatile organic compounds.

At a minimum, measurements of volatile organic (VO) vapor concentrations will be taken during intrusive work or drilling activities in the areas of remaining soil and groundwater impacts as depicted in Figure 3.

If ambient VOC vapor concentrations are consistently detected in excess of 5 ppm, the area will be evacuated and the use of appropriate respiratory protection will be determined and implemented (See Section 8.2). As an added precaution, personnel will make every attempt to remain upwind of and at a safe distance from activities at all times. The meter will be field calibrated prior to each field day in which it utilized. All calibration procedures will follow the manufacturer's specifications. These parameters will be recorded in the field and will be documented in a bound field notebook.

The included community air monitoring plan (CAMP), Appendix G of the SMP, as set forth by the New York Department of Health will be followed for any intrusive activities.

In the unlikely event of respirator use, all project contractors must provide to BVNA copies of fit tests and medicals prior to use. Any changes in site conditions requiring HASP modifications must be discussed with BVNA prior to implementing the change.

8.0 PERSONAL PROTECTION

8.1 PRIMARY

All field personnel shall perform onsite activities using at minimum Level D personal protective equipment. Eating or drinking will not be permitted in or near exclusion and decontaminated zones. Smoking on site will not be permitted at any time. Level D protection is designed for use when only minor skin and eye protection is needed and airborne contamination is unlikely.

PPE requirements for Level D include:

- Hard hat;
- Goggles or safety glasses with permanently attached side shields;
- Work gloves for equipment and tool handlings;
- Chemical resistant nitrile gloves for handling of any potentially contaminated materials;
- Glove liners if necessary
- Steel-toed safety boots; and
- Ear protection using ear plugs rated at 29 dB. (based on industry standard for the described scope of work), as necessary based on the work being conducted.

8.2 CONTINGENCY

Upon determination by the Site Safety Officer that respiratory protection is required, consistent VOC vapor concentration readings above 5.0 ppm, the workers in the area will be evacuated from the exclusion zone and return wearing an appropriate level of PPE (described below as PPE Requirements for Level C) – if engineering controls such as ventilation of the area do not mitigate the conditions. As an added precaution, personnel will make every attempt to remain upwind of and at a safe distance from activities at all times.

PPE requirements for Level C include:

- Hard hat;
- Half face air purifying respirator using combination organic vapor/particulate cartridges. The cartridges should be equipped with end of service life indicators. Cartridges without ESLIs will be disposed at the end of each shift, with observed increased inhalation resistance, or chemical breakthrough observed, whichever occurs first.
- Goggles or safety glasses (if half-face respirator is worn) with permanently attached side shields;
- Chemically protective nitrile gloves
- Glove liners if necessary
- PolyTyvek-type coveralls;
- Steel-toed safety boots with chemical resistant overshoes.

Any changes in site conditions with the exception of the contingencies identified above and requiring HASP modification will be followed up with an Addendum to this HASP. Those Addenda will be reviewed and accepted Lexington Machining prior to those modifications being implemented.

9.0 DECONTAMINATION AND DISPOSAL

All disposable PPE and sampling tools operations will be removed and containerized for proper disposal.

Small equipment, such as a hand auger, will be cleaned using the following procedure: Alconox solution will be made in a bucket or drum. The solution will be mixed as follows: 1% solution (2.5 Tbsp. per gallon) mixed with cold or hot water. Any cleaned equipment will then be rinsed with a water wash only. The decontamination water will be collected in a pail and transferred to the drum containing the spoils. Initially all water, soil cuttings from drilling, and decontamination materials will be classified as spoils until it has been analyzed. Based on the results of this testing the waste will be characterized as hazardous or non-hazardous. Anyone involved in the decontamination process will wear eye goggles or safety glasses to avoid any contact with the eye.

Equipment (drum vacuum, etc.) will be decontaminated using Simple Green, alconox, or an equivalent solution approved by Lexington Machining. Waste water will be managed as noted above.

The onsite supervisor or their designated representative shall periodically assess the effectiveness of the decontamination procedure and has the authority to correct the decontamination procedure to preclude the spread of contamination.

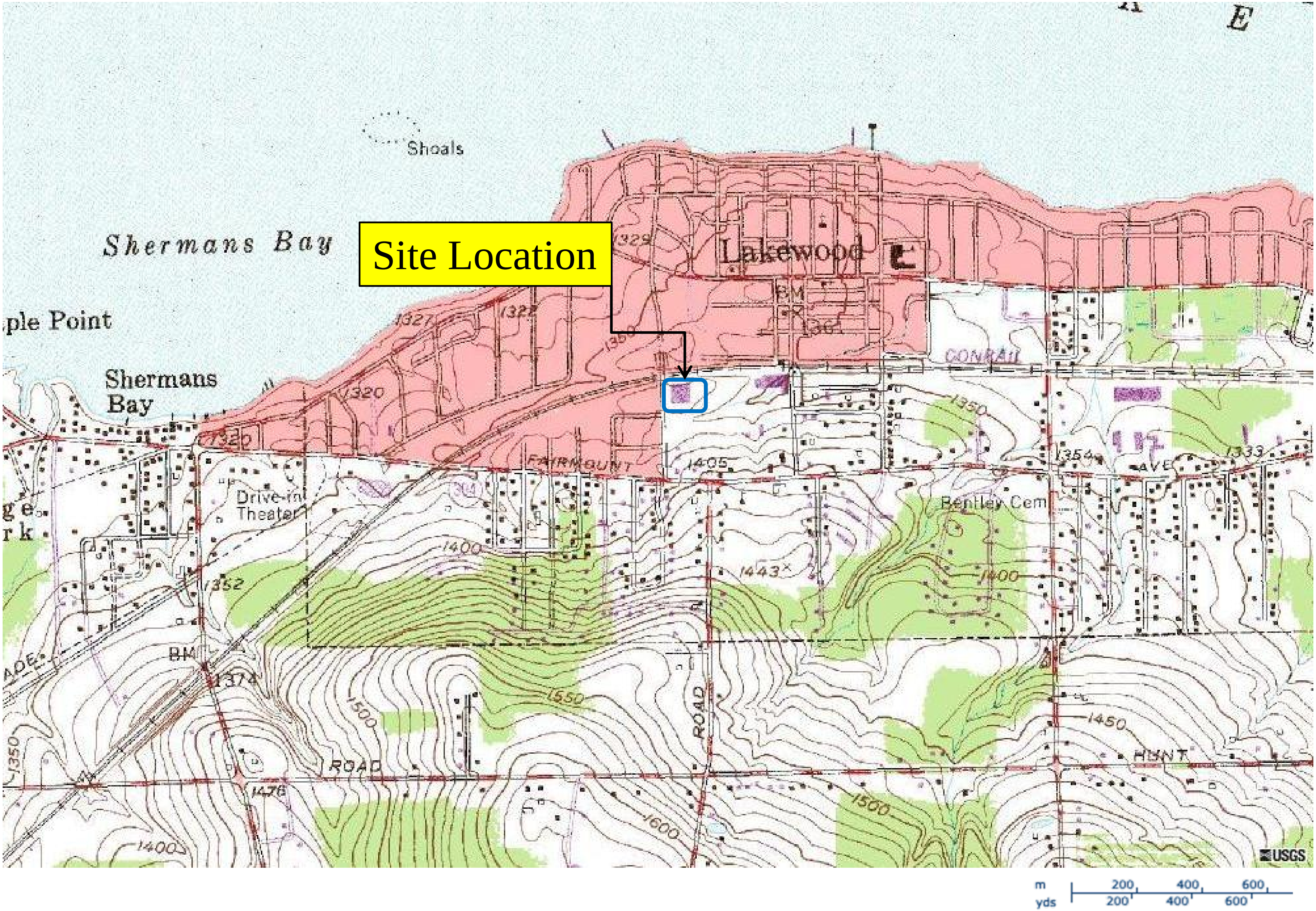
The results of waste class analysis will determine the ultimate disposition of the material.

9.1 WASTE MANAGEMENT PLAN

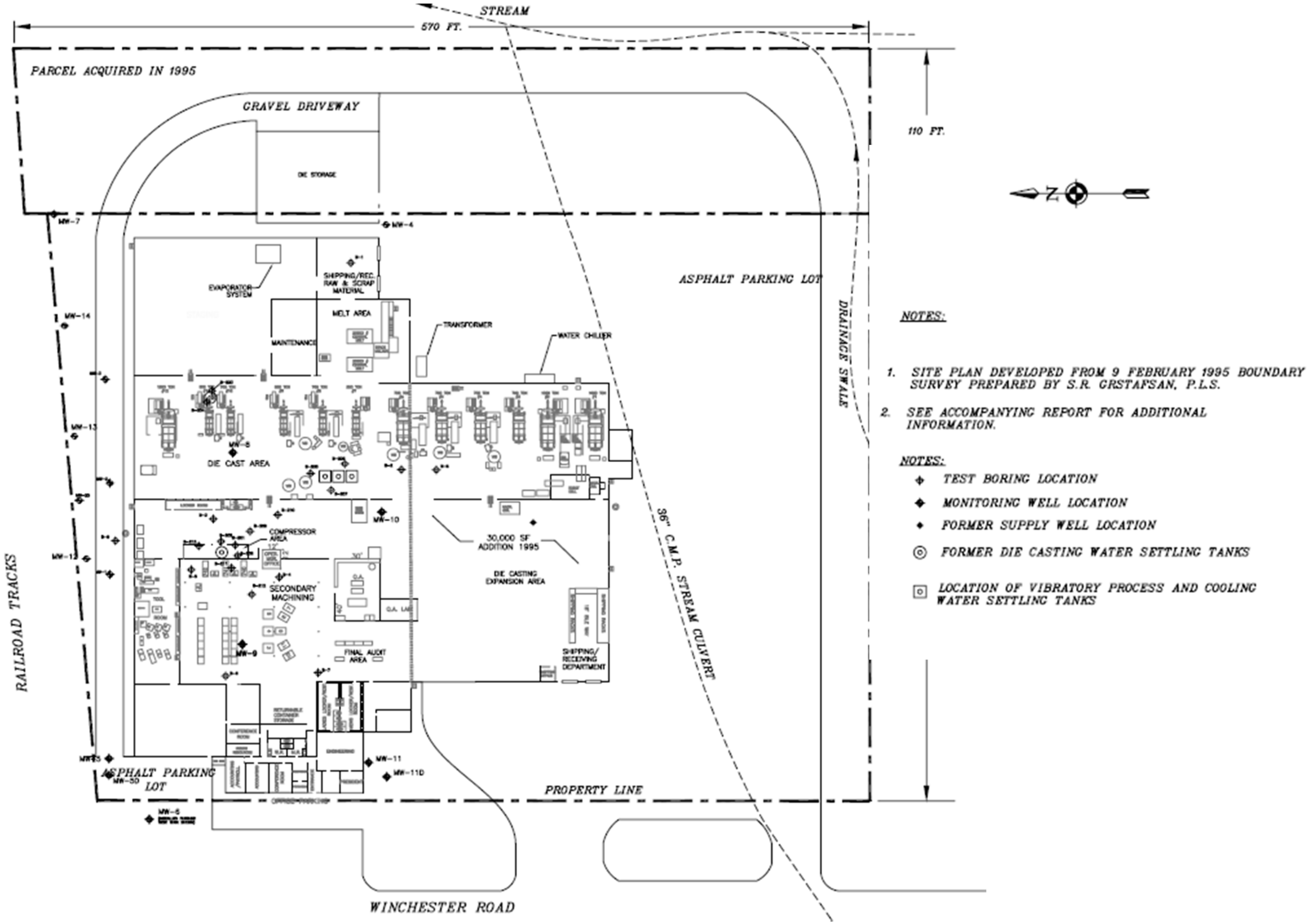
BVNA will comply with all universal and hazardous wastes requirements, including:

- Characterize waste materials/purge water
- Nonhazardous wastes will be disposed at an approved Subtitle D Landfill
- If waste is classified as hazardous a temporary EPA ID number will be obtained and the hazardous waste will be disposed at a Lexington Machining approved TSCA landfill.
- Ensure that a BVNA as well as Lexington Machining approved Subcontractor picks up the waste material.
- Ensure that containers of waste are properly labeled prior to transport.
- Maintain activity record of waste pick up.

FIGURES

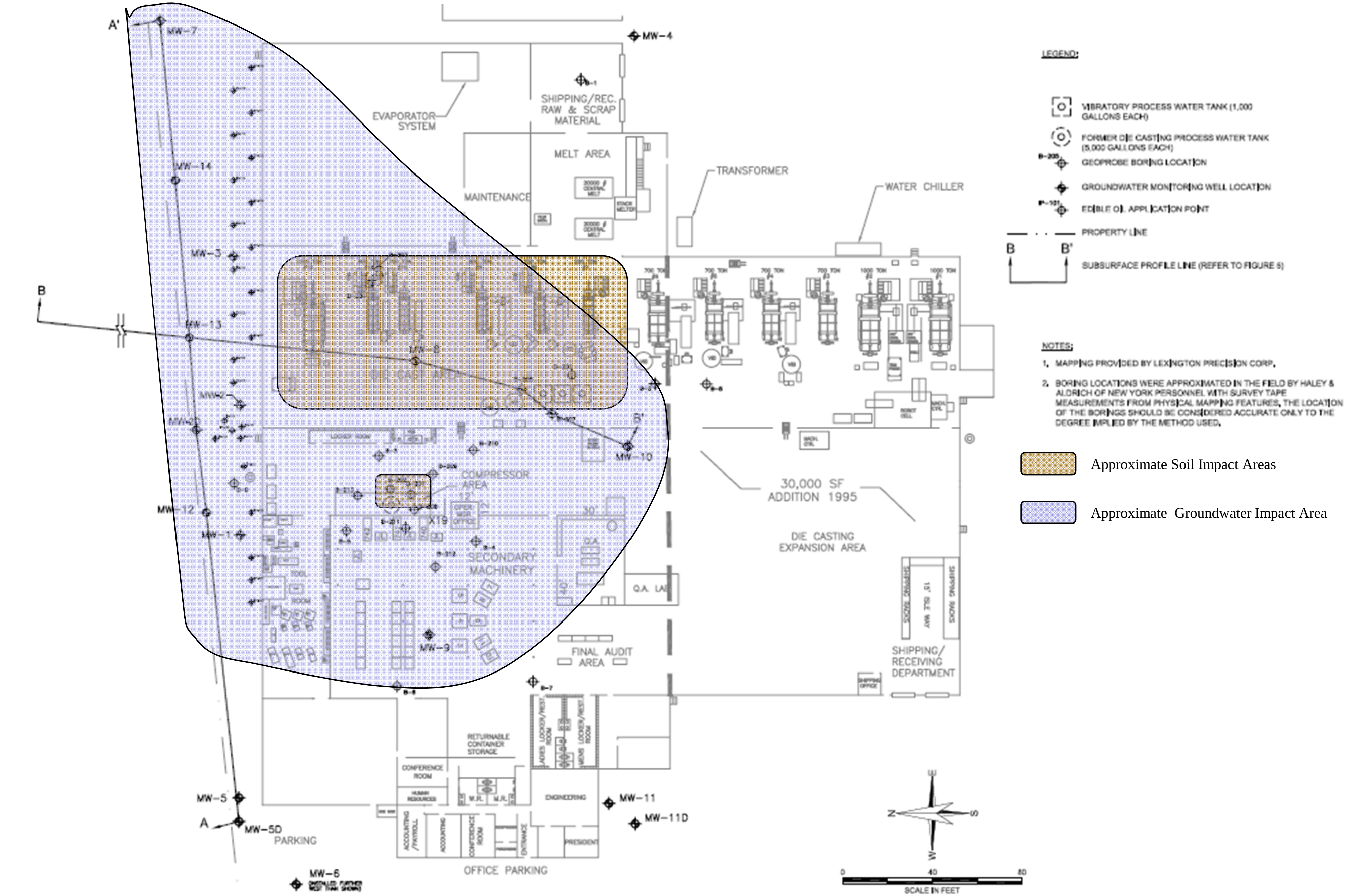


Project Number: 12010-000147.00 Drawn By: JAS Date: 07-17-10 Reviewed By:WSM Date:07-29-10	Client: **Lexington Precision Corporation** **800 third Avenue, 15th Floor** **New York, New York 10022**	Location: **Premier Lakewood, Inc.** **201 Winchester Avenue** **Lakewood, New York 14750**	Title: **Site Location Map**	Figure: 1	BUREAU VERITAS



Source: Summary of Environmental Investigations and Remedial Activities, Haley & Aldrich of New York, January 9, 2007

Project Number: 12010-000147.00 Drawn By: JAS Date: 05-17-13 Reviewed By:WSM Date:05-19-13	Client: **Lexington Precision Corporation** **800 third Avenue, 15th Floor** **New York, New York 10022**	Location: **Premier Lakewood, Inc.** **201 Winchester Avenue** **Lakewood, New York 14750**	Title: **Site Layout Map**	Figure: 2



Survey Source: Summary of Environmental Investigations and Remedial Activities, Haley & Aldrich of New York, January 9, 2007

Project Number: 12010-000147.00 Drawn By: JAS Date: 05-17-13 Reviewed By: WSM Date: 05-19-13	Client: **Lexington Precision Corporation** **800 third Avenue, 15th Floor** **New York, New York 10022**	Location: **Premier Lakewood, Inc.** **201 Winchester Avenue** **Lakewood, New York 14750**	Title: **Location of Remaining Soil and Groundwater Contamination Above Unrestricted Levels**	Figure: 3

APPENDIX A

EMERGENCY RESPONSE PLAN

EMERGENCY CONTACTS

Ambulance:	911
Poison Control Center	(800) 336-6997
Fire Department	911
Police Department:	911
Hazardous Materials National Response Center	(800) 424-8802

BUREAU VERITAS CONTACTS

John Stangline, Project Manager	(732) 225-6040, Office (732) 522-1970, Cell Phone
William S. Munoz, Health and Safety Manager:	(732) 225-6040, Office (732) 489-3175, Cell Phone

HOSPITAL:

Name:	**WCA Hospital**
Address:	**207 Foote Avenue** **Jamestown, NY 14702-0840** **Main Number 716.487.0840**

For the route to the hospital from the site see following Hospital Location Map.
From 201 Winchester Road (Site), start south on Winchester Rd. towards Hern Ave. Turn left on West Fairmont Avenue/NY 394 East, then right on Washington Street/NY 60. Turn left onto Institute Street, right on Allen Street, and right on Foote Street. WCA Hospital will be on the left.

HOSPITAL LOCATION MAP

Southern Tier Expy
86
17
Southern Tier Expy
Southern Tier Expy
Moon Brook
Country Club
Southern Tie
86
430
Fluvanna Ave
86
17
Town of
Ellicott
430
60
Celoron
CA Hospital
Burtis Bay
Washington St
E 6th St
rmount Ave
E Fairmount Ave
394
Fairmount Ave
394
394
Jamestown
Sunset Valley
Golf Course
Jamestown
West
Forest Ave
60

EMERGENCY RESPONSE GUIDELINES

1. The signal for cessation of work shall be an agreed verbal and/or hand signal. The egress signal shall be verbal or hand signal.

2. The Site Supervisor shall take full responsibility and authority to implement the ER Plan.

3. Access/egress through the decontamination corridor may be modified to expedite the egress of personnel from imminently dangerous situations. Evacuation routes will be discussed during each morning's documented site safety briefing.

4. No person shall compromise their personal health and safety when attempting to accomplish a task (for example, containing a leak, saving a life).

5. Decontamination procedures shall be followed unless an injury is life threatening where time is a critical factor. In this case, the contaminated injured person shall be covered or wrapped with uncontaminated material (plastic bags, blanket, etc.) for transport to the medical facility.

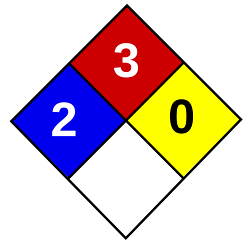
6. A worker shall accompany the injured individual to the medical facility. That person is instructed to carry a complete copy of the HASP, including MSDSs. That person has the responsibility to answer pertinent questions and give information as to the type and level of exposure and any known acute or chronic health effects of exposure.

7. Appropriate action shall be taken to minimize the spread of contamination to personnel, the public, and the environment in the event of a spill or release

APPENDIX B

CHEMICAL HAZARD SHEETS

ScienceLab.com
Chemicals & Laboratory Equipment



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
1,1-Dichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,1-Dichloroethane

Catalog Codes: SLD3280

CAS#: 75-34-3

RTECS: KI0175000

TSCA: TSCA 8(b) inventory: 1,1-Dichloroethane

CI#: Not available.

Synonym:

Chemical Name: 1,1-Dichloroethane

Chemical Formula: C2-H4-Cl2

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
{1,1-}Dichloroethane	75-34-3	100

Toxicological Data on Ingredients: 1,1-Dichloroethane: ORAL (LD50): Acute: 725 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 2 (Reasonably anticipated.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to kidneys, lungs, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

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

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

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. Seek medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 458°C (856.4°F)

Flash Points: CLOSED CUP: -17°C (1.4°F). OPEN CUP: -6°C (21.2°F).

Flammable Limits: LOWER: 5.6% UPPER: 11.4%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. 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 away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Wear suitable protective clothing 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, alkalis.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

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:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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:
TWA: 100 STEL: 250 (ppm) from ACGIH (TLV) [1999] TWA: 100 (ppm) from OSHA (PEL) Australia: TWA: 200 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Oily liquid.)

Odor: Chloroform like odor (Slight.)

Taste: Not available.

Molecular Weight: 98.96 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 57.3°C (135.1°F)

Melting Point: -96.9°C (-142.4°F)

Critical Temperature: 261.5°C (502.7°F)

Specific Gravity: 1.175 (Water = 1)

Vapor Pressure: 180 mm of Hg (@ 20°C)

Vapor Density: 3.44 (Air = 1)

Volatility: Not available.

Odor Threshold: 120 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in diethyl ether. See solubility in water, diethyl ether.

Solubility: Partially soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, alkalis.

Corrosivity: Corrosive in presence of aluminum.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Will attack some forms of plastic and rubber

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals: Acute oral toxicity (LD50): 725 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2 (Reasonably anticipated.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to kidneys, lungs, liver, central nervous system (CNS).

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

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 as toxic as the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:
CLASS 3: Combustible liquid with a flash point greater than 37.8C (100F). Marine pollutant

Identification: : 1,1-Dichloroethane : UN2362 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65 (no significant risk level): 1,1-Dichloroethane California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: 1,1-Dichloroethane Rhode Island RTK hazardous substances: 1,1-Dichloroethane Pennsylvania RTK: 1,1-Dichloroethane Florida: 1,1-Dichloroethane Minnesota: 1,1-Dichloroethane Massachusetts RTK: 1,1-Dichloroethane New Jersey: 1,1-Dichloroethane New Jersey spill list: 1,1-Dichloroethane TSCA 8(b) inventory: 1,1-Dichloroethane TSCA 8(a) PAIR: 1,1-Dichloroethane TSCA 8(d) H and S data reporting: 1,1-Dichloroethane: June 1999 TSCA 12(b) one time export: 1,1-Dichloroethane SARA 313 toxic chemical notification and release reporting: 1,1-Dichloroethane: 1% CERCLA: Hazardous substances.: 1,1-Dichloroethane: 1000 lbs. (453.6 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 B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R22- Harmful if swallowed. R37/38- Irritating to respiratory system and skin. R41- Risk of serious damage to eyes. R52- Harmful to aquatic organisms.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:07 PM

Last Updated: 05/21/2013 12:00 PM

Material Safety Data Sheet

Version 4.3
Revision Date 01/19/2012
Print Date 05/24/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	1,1-Dichloroethene
Product Number	:	48526
Brand	:	Supelco
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Target Organ Effect, Toxic by ingestion, Irritant, Carcinogen

Target Organs

Liver, Kidney, Central nervous system

GHS Classification
Flammable liquids (Category 1)
Acute toxicity, Oral (Category 3)
Skin irritation (Category 2)
Eye irritation (Category 2A)
Carcinogenicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H224	Extremely flammable liquid and vapour.
H301	Toxic if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H351	Suspected of causing cancer.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P281	Use personal protective equipment as required.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	4
Physical hazards:	2

NFPA Rating

Health hazard:	2
Fire:	4
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,1-Dichloroethylene
Vinylidene chloride

Formula : $C_2H_2Cl_2$
Molecular Weight : 96.94 g/mol

Component		Concentration
Vinylidene chloride		
CAS-No.	75-35-4	-
EC-No.	200-864-0	
Index-No.	602-025-00-8	

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability
Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Air and moisture sensitive. Store under inert gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Remarks	Potential Occupational Carcinogen See Appendix A			
Vinylidene chloride	75-35-4	TWA	5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Liver & kidney damage Not classifiable as a human carcinogen			
		TWA	1 ppm 4 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: -122 °C (-188 °F) - lit.
Boiling point	30 - 32 °C (86 - 90 °F) - lit.
Flash point	-25.0 °C (-13.0 °F) - closed cup
Ignition temperature	520 °C (968 °F)
Autoignition temperature	520.0 °C (968.0 °F) 580.0 °C (1,076.0 °F)
Lower explosion limit	6.5 %(V)
Upper explosion limit	15.5 %(V)
Vapour pressure	658.6 hPa (494.0 mmHg) 667.3 hPa (500.5 mmHg) at 20.0 °C (68.0 °F) 2,137.4 hPa (1,603.2 mmHg) at 55.0 °C (131.0 °F)
Density	1.213 g/cm3 at 20 °C (68 °F)
Water solubility	0.2 g/l at 20 °C (68 °F)
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
Oxidizing agents, Copper, Aluminum, and its alloys, Peroxides, Strong bases, Oxygen

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 200.0 mg/kg

Inhalation LC50
Lung irritation

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Vinylidene chloride)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)

no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
Nausea, Headache, Vomiting, Dizziness, Drowsiness, Confusion., Incoordination., Central nervous system depression, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: KV9275000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Daphnia magna (Water flea) - 11.60 - 11.79 mg/l
	LC50 - Pimephales promelas (fathead minnow) - 108.00 - 169.00 mg/l
	LC50 - Lepomis macrochirus (Bluegill) - 74.00 - 220.00 mg/l
	LC50 - Cyprinodon variegatus (sheepshead minnow) - 249.00 mg/l
	LC50 - other fish - 250.00 mg/l
	LC50 - other fish - 224.00 mg/l
	LC50 - Pimephales promelas (fathead minnow) - 108 mg/l - 96 h
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 80 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	LC50 - Daphnia magna (Water flea) - 11.6 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1303 Class: 3 Packing group: I
Proper shipping name: Vinylidene chloride, stabilized
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1303 Class: 3 Packing group: I EMS-No: F-E, S-D
Proper shipping name: VINYLIDENE CHLORIDE, STABILIZED
Marine pollutant: Marine pollutant

IATA
UN number: 1303 Class: 3 Packing group: I
Proper shipping name: Vinylidene chloride, stabilized

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Target Organ Effect, Toxic by ingestion, Irritant, Carcinogen

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

New Jersey Right To Know Components

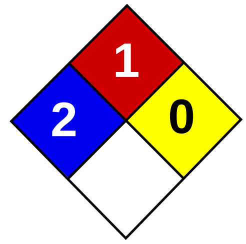
	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.



Health	2
Fire	1
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
1,1,1-Trichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,1,1-Trichloroethane

Catalog Codes:

CAS#: 71-55-6

RTECS: KJ2975000

TSCA: TSCA 8(b) inventory: 1,1,1-Trichloroethane

CI#: Not available.

Synonym:

Chemical Formula: CH3CCl3

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
{1,1,1-}Trichloroethane	71-55-6	100

Toxicological Data on Ingredients: 1,1,1-Trichloroethane: ORAL (LD50): Acute: 9600 mg/kg [Rat]. 6000 mg/kg [Mouse]. DERMAL (LD50): Acute: 15800 mg/kg [Rabbit]. VAPOR (LC50): Acute: 18000 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of ingestion. Hazardous in case of skin contact (irritant, permeator), of inhalation. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

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

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

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. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 537°C (998.6°F)

Flash Points: Not available.

Flammable Limits: LOWER: 7.5% UPPER: 12.5%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of oxidizing materials, of acids, of alkalis.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive to explosive in presence of oxidizing materials, of acids, of alkalis.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. 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 away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. 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

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

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:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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:
TWA: 350 STEL: 440 CEIL: 440 (ppm) from ACGIH (TLV) [1995] TWA: 1900 STEL: 2460 CEIL: 2380 (mg/m3) from ACGIH [1995]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 133.41 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 74.1°C (165.4°F)

Melting Point: -32.5°C (-26.5°F)

Critical Temperature: Not available.

Specific Gravity: 1.3376 (Water = 1)

Vapor Pressure: 100 mm of Hg (@ 20°C)

Vapor Density: 4.6 (Air = 1)

Volatility: Not available.

Odor Threshold: 400 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 6000 mg/kg [Mouse]. Acute dermal toxicity (LD50): 15800 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 18000 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to lungs, the nervous system, liver, mucous membranes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

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 more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : 1,1,1-Trichloroethane : UN2831 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: 1,1,1-Trichloroethane Massachusetts RTK: 1,1,1-Trichloroethane TSCA 8(b) inventory: 1,1,1-Trichloroethane SARA 313 toxic chemical notification and release reporting: 1,1,1-Trichloroethane CERCLA: Hazardous substances.: 1,1,1-Trichloroethane

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

DSCL (EEC):
R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

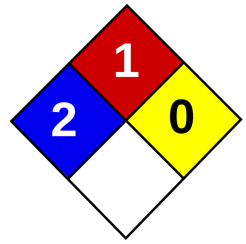
References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:31 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.



Health	2
Fire	1
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
1,1,2-Trichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,1,2-Trichloroethane

Catalog Codes: SLT1450

CAS#: 79-00-5

RTECS: KJ3150000

TSCA: TSCA 8(b) inventory: 1,1,2-Trichloroethane

CI#: Not applicable.

Synonym: beta-T; beta-Trichloroethane

Chemical Name: 1,1,2-Trichloroethane

Chemical Formula: C2H3Cl3

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
{1,1,2-}Trichloroethane	79-00-5	100

Toxicological Data on Ingredients: 1,1,2-Trichloroethane: ORAL (LD50): Acute: 836 mg/kg [Rat]. 378 mg/kg [Mouse]. DERMAL (LD50): Acute: 5377 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant). Hazardous in case of skin contact (irritant). Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalians. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, the nervous system, liver, brain, digestive system, gastrointestinal tract, endocrine. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

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

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

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. Seek medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 459°C (858.2°F)

Flash Points: Not available.

Flammable Limits: LOWER: 6% UPPER: 15.5%

Products of Combustion: These products are carbon oxides (CO, CO_2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of open flames and sparks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. 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 away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

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: Splash goggles. Lab coat. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
USA: TWA: 10 (ppm) from OSHA (PEL) SKIN TWA: 55 (mg/m3) from ACGIH SKIN Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Clear)

Odor: Sweet chlorofor like

Taste: Not available.

Molecular Weight: 133.41 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 113.8°C (236.8°F)

Melting Point: -36.6°C (-33.9°F)

Critical Temperature: Not available.

Specific Gravity: 1.4416 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 4.63 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.2

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in methanol, diethyl ether. See solubility in water, methanol, diethyl ether, acetone.

Solubility:
Partially soluble in methanol, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Slightly reactive to reactive with oxidizing agents, metals, alkalis.

Corrosivity: Corrosive in presence of aluminum, of zinc.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals:
Acute oral toxicity (LD50): 378 mg/kg [Mouse]. Acute dermal toxicity (LD50): 5377 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalians. Mutagenic for bacteria and/or yeast. The substance is toxic to lungs, the nervous system, liver, brain, digestive system, gastrointestinal tract, endocrine.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

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 as toxic as the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Toxic liquids n.o.s. : UN2810 PG: Not available.

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: 1,1,2-Trichloroethane California prop. 65 (no significant risk level): 1,1,2-Trichloroethane: 0.01 mg/day (inhalation) California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: 1,1,2-Trichloroethane Rhode Island RTK hazardous substances: 1,1,2-Trichloroethane Pennsylvania RTK: 1,1,2-Trichloroethane Florida: 1,1,2-Trichloroethane Minnesota: 1,1,2-Trichloroethane Michigan critical material: 1,1,2-Trichloroethane Massachusetts RTK: 1,1,2-Trichloroethane New Jersey: 1,1,2-Trichloroethane TSCA 8(b) inventory: 1,1,2-Trichloroethane TSCA 8(a) PAIR: 1,1,2-Trichloroethane SARA 313 toxic chemical notification and release reporting: 1,1,2-Trichloroethane CERCLA: Hazardous substances.: 1,1,2-Trichloroethane: 100 lbs. (45.36 kg)

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

DSCL (EEC):
R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: j

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 12:48 PM

Last Updated: 05/21/2013 12:00 PM

Material Safety Data Sheet

Ethyl Chloride

Section 1. Chemical product and company identification

Product name	:	Ethyl Chloride
Supplier	:	AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	:	Synthetic/Analytical chemistry.
Synonym	:	Ethane, chloro-; Aethylis; Aethylis chloridum; Anodynon; Chelen; Chlorene; Chlorethyl; Chloridum; Chloroethane; Chloryl; Chloryl anesthetic; Cloretilo; Dublofix; Ether chloratus; Ether hydrochloric; Ether muriatic; Hydrochloric ether; Kelene; Monochlorethane; Monochloroethane; Muriatic ether; Narcotile; C2H5Cl; Aethylchlorid; Chloorethaan; Chloroaethan; Chlorure D'ethyle; Cloroetano; Cloruro di etile; Etylu chlorek; NCI-C06224; UN 1037; Aethylisaethylis chloridum; Chloryle anesthetic; 1-Chloroethane
MSDS #	:	001023
Date of Preparation/Revision	:	**4/26/2010.**
In case of emergency	:	1-866-734-3438

Section 2. Hazards identification

Physical state	:	Gas. [COLORLESS LIQUID OR GAS WITH A PUNGENT, ETHER-LIKE ODOR]
Emergency overview	:	WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. MAY CAUSE EYE AND SKIN IRRITATION. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. Avoid contact with eyes, skin and clothing. May cause target organ damage, based on animal data. Use only with adequate ventilation. Wash thoroughly after handling. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Target organs	:	May cause damage to the following organs: kidneys, liver, mucous membranes, cardiovascular system, upper respiratory tract, skin, eyes, central nervous system (CNS).
Routes of entry	:	Inhalation Dermal Eyes
Potential acute health effects		
Eyes	:	Moderately irritating to eyes. Contact with rapidly expanding gas may cause burns or frostbite.
Skin	:	Moderately irritating to the skin. Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	:	Acts as a simple asphyxiant.
Ingestion	:	Ingestion is not a normal route of exposure for gases
Potential chronic health effects	:	**CARCINOGENIC EFFECTS**: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animals.) by ACGIH, 3 (Possible for humans.) by European Union. 3 (Not classifiable for humans.) by IARC. **MUTAGENIC EFFECTS**: Not available. **TERATOGENIC EFFECTS**: Not available.
Medical conditions aggravated by over-exposure	:	Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

Name	CAS number	% Volume	Exposure limits
Ethyl Chloride	75-00-3	100	**ACGIH TLV (United States, 1/2009). Absorbed through skin.** TWA: 264 mg/m³ 8 hour(s). TWA: 100 ppm 8 hour(s). **OSHA PEL (United States, 11/2006).** TWA: 2600 mg/m³ 8 hour(s). TWA: 1000 ppm 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** TWA: 2600 mg/m³ 8 hour(s). TWA: 1000 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training.If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus.It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. 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. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

Flammability of the product : Flammable.

Auto-ignition temperature : 518.75°C (965.8°F)

Flash point : Closed cup: -50.15°C (-58.3°F).

Flammable limits : Lower: 3.8% Upper: 15.4%

Products of combustion : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides

Fire hazards in the presence of various substances : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge, heat and oxidizing materials.

Fire-fighting media and instructions : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions	: Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
Environmental precautions	: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
Methods for cleaning up	: Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

Handling	: Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Avoid contact with skin and clothing. Avoid contact with eyes. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Storage	: Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Engineering controls	: Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Personal protection

Eyes	: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
Skin	: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
Hands	: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Personal protection in case of a large spill	: Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Full chemical-resistant suit and self-contained breathing apparatus should be worn only by trained and authorized persons.

Product name

chloroethane	**ACGIH TLV (United States, 1/2009). Absorbed through skin.** TWA: 264 mg/m³ 8 hour(s). TWA: 100 ppm 8 hour(s). **OSHA PEL (United States, 11/2006).** TWA: 2600 mg/m³ 8 hour(s). TWA: 1000 ppm 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** TWA: 2600 mg/m³ 8 hour(s). TWA: 1000 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight	:	64.52 g/mole
Molecular formula	:	C2-H5-Cl
Boiling/condensation point	:	12.2°C (54°F)
Melting/freezing point	:	-138.9°C (-218°F)
Critical temperature	:	187.3°C (369.1°F)
Vapor density	:	2.2 (Air = 1)
Specific Volume (ft^3/lb)	:	6.0241
Gas Density (lb/ft^3)	:	0.166

Section 10. Stability and reactivity

Stability and reactivity	:	The product is stable.
Incompatibility with various substances	:	Extremely reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
chloroethane	TDLo Oral	Rat	250 mg/kg	-
	LC50 Inhalation Vapor	Rat	152 g/m3	10 minutes
	LC50 Inhalation Vapor	Rat	152 g/m3	2 hours
	LC50 Inhalation Vapor	Rat	150000 mg/m3	2 hours

IDLH : 3800 ppm

Chronic effects on humans : **CARCINOGENIC EFFECTS**: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animals.) by ACGIH, 3 (Possible for humans.) by European Union. 3 (Not classifiable for humans.) by IARC.
May cause damage to the following organs: kidneys, liver, mucous membranes, cardiovascular system, upper respiratory tract, skin, eyes, central nervous system (CNS).

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects	:	No known significant effects or critical hazards.
Mutagenic effects	:	No known significant effects or critical hazards.
Reproduction toxicity	:	No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Products of degradation	:	Products of degradation: carbon oxides (CO, CO_2) and water, halogenated compounds.
Environmental fate	:	Not available.
Environmental hazards	:	No known significant effects or critical hazards.
Toxicity to the environment	:	Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1037	ETHYL CHLORIDE	2.1	Not applicable (gas).		**Reportable quantity** 100 lbs. (45.4 kg) **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** B77, T50
TDG Classification	UN1037	ETHYL CHLORIDE	2.1	Not applicable (gas).		**Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Road or Rail Index** Forbidden
Mexico Classification	UN1037	ETHYL CHLORIDE	2.1	Not applicable (gas).		-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

U.S. Federal regulations : **United States inventory (TSCA 8b):** This material is listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: chloroethane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: chloroethane: Fire hazard, reactive, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Water Act (CWA) 307: chloroethane

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: chloroethane

Clean Air Act (CAA) 112 regulated flammable substances: chloroethane

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

SARA 313

	Product name	CAS number	Concentration
Form R - Reporting requirements :	Ethyl Chloride	75-00-3	100
Supplier notification :	Ethyl Chloride	75-00-3	100

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations : **Connecticut Carcinogen Reporting:** This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

California Prop. 65 : **WARNING:** This product contains a chemical known to the State of California to cause cancer.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Ethyl Chloride	Yes.	No.	Yes.	No.

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements : FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
MAY CAUSE EYE AND SKIN IRRITATION.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.

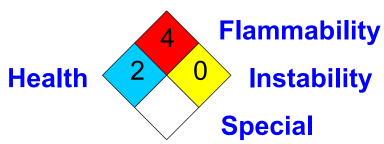
Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		4
Physical hazards		0

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



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

Vinyl Chloride (Chloroethylene)

Airgas

Section 1. Chemical product and company identification

Product name	:	Vinyl Chloride (Chloroethylene)
Supplier	:	AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	:	Synthetic/Analytical chemistry.
Synonym	:	Ethylene, chloro-; Chloroethene; Chloroethylene; Monochloroethylene; Vinyl chloride; Vinyl chloride monomer; Vinyl C monomer; C2H3Cl; Ethylene monochloride; Monochloroethene; Chlorethene; Chlorethylene; Chlorure de vinyle; Cloruro di vinile; Rcra waste number U043; Trovidur; UN 1086; VC; VCM; Vinile; Vinylchlorid; Vinyl chloride, inhibited; Vinyle(chlorure de); Winylu chlorek; 1-Chloroethylene
MSDS #	:	001067
Date of Preparation/Revision	:	**4/27/2010.**
In case of emergency	:	1-866-734-3438

Section 2. Hazards identification

Physical state	:	Gas. [COLORLESS GAS OR LIQUID (BELOW 7 F) WITH A PLEASANT ODOR AT HIGH CONCENTRATIONS. [NOTE: SHIPPED AS A LIQUEFIED COMPRESSED GAS.]]
Emergency overview	:	WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CAN CAUSE CANCER. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. Do not ingest. May cause target organ damage, based on animal data. Risk of cancer depends on duration and level of exposure. Use only with adequate ventilation. Wash thoroughly after handling. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Target organs	:	May cause damage to the following organs: blood, kidneys, liver, mucous membranes, lymphatic system, upper respiratory tract, skin, eyes, central nervous system (CNS).
Routes of entry	:	Inhalation
Potential acute health effects		
Eyes	:	Irritating to eyes.
Skin	:	Irritating to skin.
Inhalation	:	Acts as a simple asphyxiant.
Ingestion	:	Ingestion is not a normal route of exposure for gases
Potential chronic health effects	:	**CARCINOGENIC EFFECTS**: Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union. **MUTAGENIC EFFECTS**: Not available. **TERATOGENIC EFFECTS**: Not available.
Medical conditions aggravated by over-exposure	:	Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

Name	CAS number	% Volume	Exposure limits
Vinyl Chloride (Chloroethylene)	75-01-4	100	**ACGIH TLV (United States, 1/2009).** TWA: 1 ppm 8 hour(s). **OSHA PEL (United States, 11/2006).** STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training.If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus.It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. 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. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

Flammability of the product : Flammable.

Auto-ignition temperature : 471.85°C (881.3°F)

Flash point : Open cup: -79.15°C (-110.5°F).

Flammable limits : Lower: 4% Upper: 22%

Products of combustion : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds

Fire-fighting media and instructions : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

Handling : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Do not ingest. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Storage : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Personal protection in case of a large spill : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

vinyl chloride	**ACGIH TLV (United States, 1/2009).** TWA: 1 ppm 8 hour(s). **OSHA PEL (United States, 11/2006).** STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight : 62.5 g/mole
Molecular formula : C2-H3-Cl
Boiling/condensation point : -13.8°C (7.2°F)
Melting/freezing point : -160°C (-256°F)
Critical temperature : 158.5°C (317.3°F)
Vapor density : 2.21 (Air = 1)
Specific Volume (ft^3/lb) : 6.25
Gas Density (lb/ft^3) : 0.16

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.
Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
vinyl chloride	LD50 Oral	Rat	500 mg/kg	-
	LC50 Inhalation Gas.	Rat	18 pph	15 minutes
	LC50 Inhalation Gas.	Rat	5000 ppm	1 hours

Chronic effects on humans : **CARCINOGENIC EFFECTS**: Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union. May cause damage to the following organs: blood, kidneys, liver, mucous membranes, lymphatic system, upper respiratory tract, skin, eyes, central nervous system (CNS).
Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : Can cause cancer. Risk of cancer depends on duration and level of exposure.
Mutagenic effects : No known significant effects or critical hazards.
Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Products of degradation : Products of degradation: carbon oxides (CO, CO_2) and water, halogenated compounds.
Environmental fate : Not available.
Environmental hazards : No known significant effects or critical hazards.
Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1086	VINYL CHLORIDE, STABILIZED	2.1	Not applicable (gas).		**Reportable quantity** 1 lb. (0.454 kg) **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** 21, B44, T50
TDG Classification	UN1086	VINYL CHLORIDE, STABILIZED	2.1	Not applicable (gas).		**Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Road or Rail Index** Forbidden
Mexico Classification	UN1086	VINYL CHLORIDE, STABILIZED	2.1	Not applicable (gas).		-

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

United States

U.S. Federal regulations : **United States inventory (TSCA 8b):** This material is listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: vinyl chloride
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: vinyl chloride: Fire hazard, reactive, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Water Act (CWA) 307: vinyl chloride

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: vinyl chloride

Clean Air Act (CAA) 112 regulated flammable substances: vinyl chloride

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

SARA 313

	Product name	CAS number	Concentration
Form R - Reporting requirements :	Vinyl Chloride (Chloroethylene)	75-01-4	100
Supplier notification :	Vinyl Chloride (Chloroethylene)	75-01-4	100

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations : **Connecticut Carcinogen Reporting:** This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

California Prop. 65 : **WARNING:** This product contains a chemical known to the State of California to cause cancer.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Vinyl Chloride (Chloroethylene)	Yes.	No.	Yes.	No.

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).
Class F: Dangerously reactive material.

CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements : FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
HARMFUL IF SWALLOWED.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CANCER HAZARD - CAN CAUSE CANCER.
CONTENTS UNDER PRESSURE.

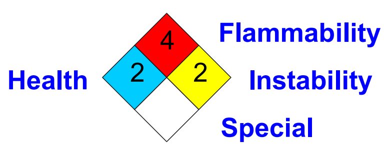
Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).
Class F: Dangerously reactive material.

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		4
Physical hazards		2

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



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

APPENDIX D – MONITORING WELL BORING AND CONSTRUCTION LOGS

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

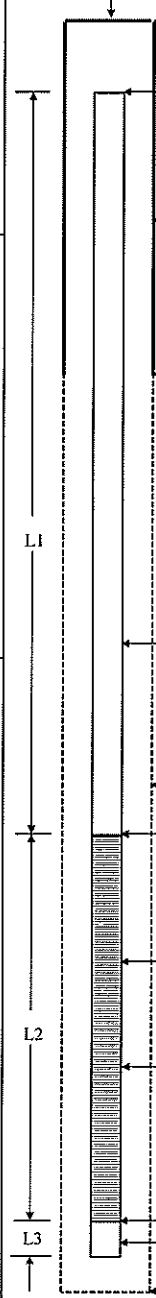
Well No.	MW-1
Boring No.	

PROJECT	Monitoring Well Installation Program	H&A FILE NO.	70533-008
LOCATION	Lexington Die Casting Inc., Lakewood, New York	PROJECT MGR.	S. Schalabba
CLIENT	Lexington Die Casting	FIELD REP.	D. Nostrant
CONTRACTOR	SJB Services	DATE INSTALLED	5/25/2005
DRILLER	R. Brown	WATER LEVEL	

Ground El. ______ ft
El. Datum ______
Location: 120' E, 10'N or NW Corner of Bldg.
☐ Guard Pipe
☐ Roadway Box

SOIL/ROCK READINGS (PPM)	BOREHOLE BACKFILL
BROWN SILT AND SAND	
ND	SOIL CUTTINGS
2.0	
	2.5
ND	
4.0	
ND	BENTONITE CHIPS
6	
GRAVEL	
ND	5.5
8.0	
ND	
10.0	QUARTZ SAND
SAND, GRAVEL	
12.0	
ND	
14.0	
DAMP TO MOIST	
16	

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	N/A	
Height/Depth of top of guard pipe/roadway box above/below ground surface	N/A	ft
Height/Depth of top of riser pipe above/below ground surface	2.7	ft
Type of protective casing:	N/A	
Length	--	ft
Inside Diameter	--	in
Depth of bottom of guard pipe/roadway box	N/A	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	NA	
Bentonite Seal	2.5	3.0

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	SEE DIAGRAM	
Diameter of borehole	8.0	in
Depth to top of well screen	7.5	ft
Type of screen	Slotted PVC	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	NJ #1 Quartz Sand	
Depth of bottom of well screen	17.5	ft
Bottom of Silt trap	17.5	ft
Depth of bottom of borehole	18.0	ft

____ ft + ____ ft + ____ ft = ____ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: 16-18' - N/D DTW (bgs) @1530 - 13.7', purged 2.5gal.
DTW (bgs) @ 0850 - 13.60' Sampled 5/26/05 @1530

Form 2007

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

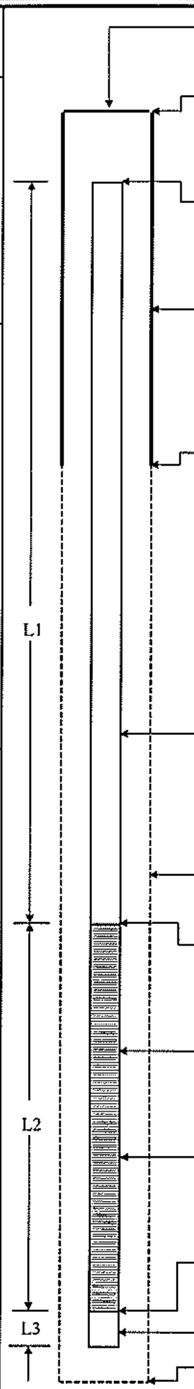
Well No. MW-2
Boring No.

PROJECT	Monitoring Well Installation Program	**H&A FILE NO.**	70533-008
LOCATION	Lexington Die Casting Inc., Lakewood, New York	**PROJECT MGR.**	S. Schalabba
CLIENT	Lexington Die Casting	**FIELD REP.**	D. Nostrant
CONTRACTOR	SJB Services	**DATE INSTALLED**	5/25/2005
DRILLER	R. Brown	**WATER LEVEL**	

Ground El. ______ ft
El. Datum ______
Location 178' E, 10'N of NW Corner of Bldg.
☐ **Guard Pipe**
☐ **Roadway Box**

SOIL/ROCK READINGS (PPM)	BOREHOLE BACKFILL
SAND WITH SILT	
ND	SOIL CUTTINGS
2.0	2.5
ND	
4.0	
ND	BENTONITE CHIPS
5.0	
ND	
7.0	
ND	
9.0	4.5
ND	
11.0	
SAND AND GRAVEL	
12.0	QUARTZ SAND
ND	
13.0	
ND	
14.0	
ND	
15.0	
ND	
16.5	

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock N/A

Height/Depth of top of guard pipe/roadway box above/below ground surface N/A ft

Height/Depth of top of riser pipe above/below ground surface 2.3 ft

Type of protective casing: N/A
Length -- ft
Inside Diameter -- in

Depth of bottom of guard pipe/roadway box N/A ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete		
Bentonite Seal	2.5	2.0

Type of riser pipe: PVC
Inside diameter of riser pipe 2.0 in
Type of backfill around riser SEE DIAGRAM

Diameter of borehole 8 +/- in

Depth to top of well screen 6.5 ft

Type of screen Slotted PVC
Screen gauge or size of openings 0.010 in
Diameter of screen 2.0 in
Type of backfill around screen NJ #1 Quartz Sand

Depth of bottom of well screen 16.5 ft

Bottom of Silt trap 16.5 ft

Depth of bottom of borehole 17.0 ft

(Not to Scale)

______ ft + ______ ft + ______ ft = ______ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: 5/26/05 -0730 - 13.3 DTW, purged 2.0 gal.
5/27/05 - 0845 - 13.35

Form 2007

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. MW-2D

Boring No.

PROJECT	Monitoring Well Installations	**H&A FILE NO.**	70533-008
LOCATION	Lexington Die Casting, Lakewood, NY	**PROJECT MGR.**	S. Schalabba
CLIENT	Lexington Pecision Corporation	**FIELD REP.**	D. Nostrant
CONTRACTOR	SJB Services	**DATE INSTALLED**	8/19/2005
DRILLER	R. Steiner	**WATER LEVEL**	

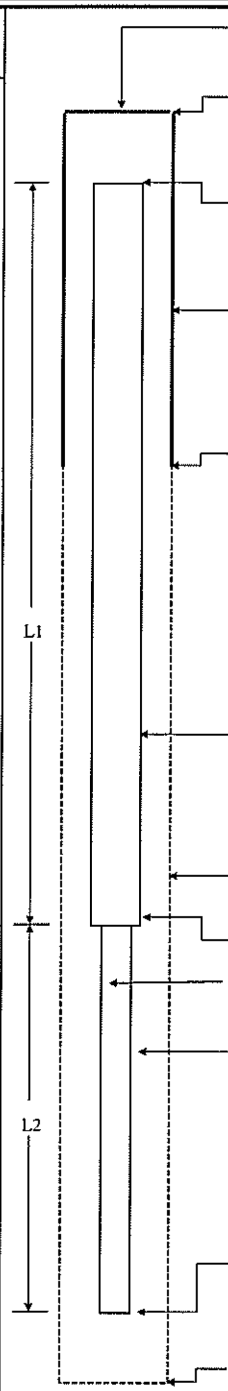
Ground El. ______ ft **Location** ______

El. Datum ______

☐ **Guard Pipe**

☑ **Roadway Box**

SOIL/ROCK READINGS (PPM)	**BOREHOLE BACKFILL**
OVERBURDEN	CEMENT/BENTONITE GROUT
18.0	20.0
BEDROCK	



Type of protective cover/lock	Steel/Riser padlock	
Height of top of roadway box above ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.2	ft
Type of protective casing:	Flushmount Roadbox	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of roadway box	1.0	ft

Type of Seals	**Top of Seal (ft)**	**Thickness (ft)**
Cement/Bentonite	0.5	19.5
Concrete	0.0	1.0

Type of casing pipe:	Steel	
Inside diameter of casing pipe	4.0	in
Diameter of borehole	10.0	in
Depth to bottom of casing	20.0	ft
Diameter of open core interval		in
Type of open core interval	HQ	
Depth to top of bedrock	18.0	ft
Depth of bottom of open core interval	27.0	ft
Depth of bottom of test borehole	27.0	ft

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

______ ft + ______ ft = ______ ft

Casing Length (L1) Cored Interval (L2) Pay length

COMMENTS:

Form # ____

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. MW-3

Boring No.

PROJECT	Monitoring Well Installation Program	H&A FILE NO.	70533-008
LOCATION	Lexington Die Casting Inc., Lakewood, New York	PROJECT MGR.	S. Schalabba
CLIENT	Lexington Die Casting	FIELD REP.	D. Nostrant
CONTRACTOR	SJB Services	DATE INSTALLED	5/26/2005
DRILLER	R. Brown	WATER LEVEL	

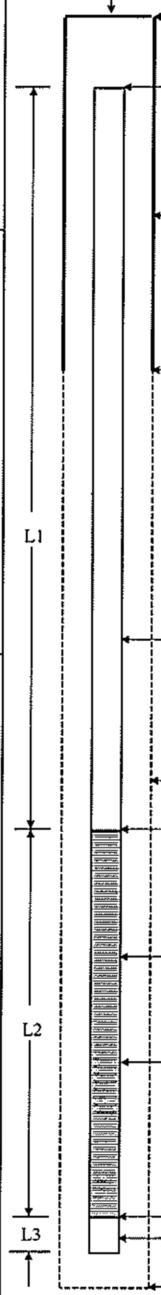
Ground El. ft | Location 45'W, 13'N OF NE Corner of Bldg. | ☐ Guard Pipe

El. Datum | | ☐ Roadway Box

SOIL/ROCK READINGS (PPM)	BOREHOLE BACKFILL
ND	
ND	SOIL CUTTINGS
2.0	1.0
SANDY GRAVEL, DRY	
4.0	
ND	BENTONITE CHIPS
6	
ND	3.0
8.0	
ND	
10.0	NJ #1 QUARTZ SAND
SAND, GRAVEL, DRY	
12.0	
ND	
14.0	
SAND, GRAVEL DRY TO DAMP	
16	

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock	N/A	
Height/Depth of top of guard pipe/roadway box above/below ground surface	N/A	ft
Height/Depth of top of riser pipe above/below ground surface	3.0	ft
Type of protective casing:	N/A	
Length	--	ft
Inside Diameter	--	in
Depth of bottom of guard pipe/roadway box	--	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	--	--
Bentonite Seal	1.0	2.0

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	SEE DIAGRAM	
Diameter of borehole	8.0	in
Depth to top of well screen	5.2	ft
Type of screen	Slotted PVC	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	NJ #1 Quartz Sand	
Depth of bottom of well screen	15.2	ft
Bottom of Silt trap	15.2	ft
Depth of bottom of borehole	16.0	ft

(Not to Scale)

______ ft + ______ ft + ______ ft = ______ ft

Riser Pay Length (L1) | Length of screen (L2) | Length of silt trap (L3) | Pay length

COMMENTS: 5/26/05 - 210 - 17.75 (TOR)-DTW, DTB - 17.92 (TOR), - Bailed dry., 1645 - 17.92 (14.65 bgs.), 14.9 (bgs) - Bailed dry

5/27/05 - 0800 - 16.60 (13.6 bgs)

Form 2007

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. MW-4

Boring No.

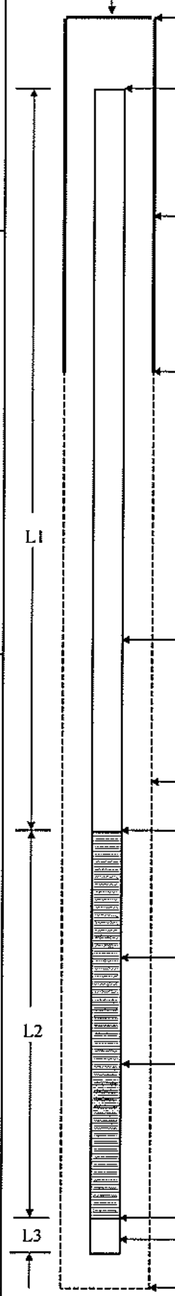
PROJECT	Monitoring Well Installation Program	H&A FILE NO.	70533-008
LOCATION	Lexington Die Casting Inc., Lakewood, New York	PROJECT MGR.	S. Schalabba
CLIENT	Lexington Die Casting	FIELD REP.	D. Nostrant
CONTRACTOR	SJB Services	DATE INSTALLED	5/26/2005
DRILLER	R. Brown	WATER LEVEL	See Below

Ground El. ______ ft   Location 45'W, 13'N OF NE Corner of Bldg.   ☐ Guard Pipe

El. Datum ______   ☐ Roadway Box

SOIL/ROCK READINGS (PPM)	BOREHOLE BACKFILL
ND	
SAND, GRAVEL WITH SILT, DRY	SOIL CUTTINGS
2.0	2.0
4.0	
ND	BENTONITE CHIPS
6	
8.0	
ND	4.2
10.0	
SAND, GRAVEL, DRY	
12.0	NJ #1 QUARTZ SAND
14.0	
SAND, GRAVEL, DAMP	
16.0	
17.0	

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock	N/A	
Height/Depth of top of guard pipe/roadway box above/below ground surface	N/A	ft
Height/Depth of top of riser pipe above/below ground surface	2.0	ft
Type of protective casing:	N/A	
Length	--	ft
Inside Diameter	--	in
Depth of bottom of guard pipe/roadway box	--	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	--	--
Bentonite Seal	2.0	2.2

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	SEE DIAGRAM	
Diameter of borehole	8.0	in
Depth to top of well screen	6.25	ft
Type of screen	Slotted PVC	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	NJ #1 Quartz Sand	
Depth of bottom of well screen	16.25	ft
Bottom of Silt trap	16.25	ft
Depth of bottom of borehole	17.0	ft

(Not to Scale)

______ ft + ______ ft + ______ ft = ______ ft

Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: 1300 - Dry at 16.25   1630 - Dry at 16.25

1400 - Dry at 16.25

Form 2007

OBSERVATION WELL INSTALLATION REPORT

HALEY & ALDRICH

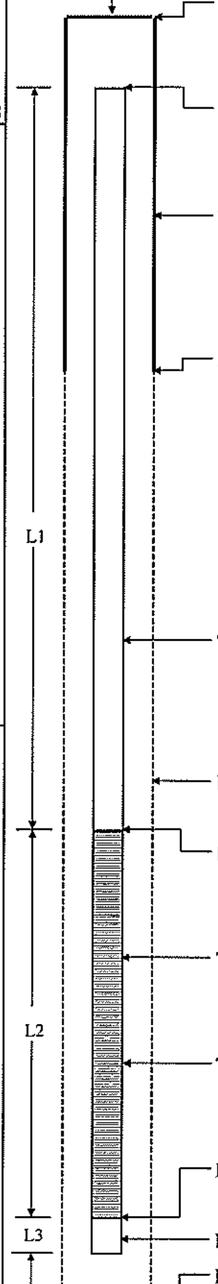
Well No.	MW-5
Boring No.	

PROJECT	Monitorinng Well Installations	H&A FILE NO.	70533-008
LOCATION	Lexington Die Casting, Lakewood, NY	PROJECT MGR.	S. Schalabba
CLIENT	Lexington Precision Corporation	FIELD REP.	D. Nostrant
CONTRACTOR	SJB Services	DATE INSTALLED	8/9/2005
DRILLER	T. Kilburn	WATER LEVEL	See Comments

Ground El. ______ ft
El. Datum ______
Location ______

☑ Guard Pipe
☐ Roadway Box

SOIL/ROCK READINGS (PPM)	BOREHOLE BACKFILL
(All readings non-detect)	CONCRETE
	0.8
	BENTONITE CHIPS
	6.0
	NJ # 0 SILICA SAND



Type of protective cover/lock: Bolted Steel Cover/Padlock

Height/Depth of top of guard pipe/roadway box above/below ground surface: 0.0 ft

Depth of top of riser pipe below ground surface: 0.3 ft

Type of protective casing: Flushmount Roadbox
Length: 1.0 ft
Inside Diameter: 8.0 in

Depth of bottom of guard pipe/roadway box: 1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	0.8
Bentonite Seal	0.8	5.2

Type of riser pipe: PVC
Inside diameter of riser pipe: 2.0 in
Type of backfill around riser: See Diagram

Diameter of borehole: 8.0 in. in

Depth to top of well screen: 8.2 ft

Type of screen: Slotted PVC
Screen gauge or size of openings: 0.01 in
Diameter of screen: 2.0 in
Type of backfill around screen: NJ #0 Silica Sand

Depth of bottom of well screen: 18.2 ft

Bottom of Silt trap: 18.2 ft

Depth of bottom of borehole: 18.2 ft

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

______ ft + ______ ft + ______ ft = ______ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: DTW 8/23- 13.57 ft.

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. **MW-5D**

Boring No.

PROJECT	Monitoring Well Installations	**H&A FILE NO.**	70533-008
LOCATION	Lexington Die Casting, Lakewood, NY	**PROJECT MGR.**	S. Schalabba
CLIENT	Lexington Pecision Corporation	**FIELD REP.**	D. Nostrant
CONTRACTOR	SJB Services	**DATE INSTALLED**	8/18/2005
DRILLER	R. Steiner	**WATER LEVEL**	

Ground El. ______ ft

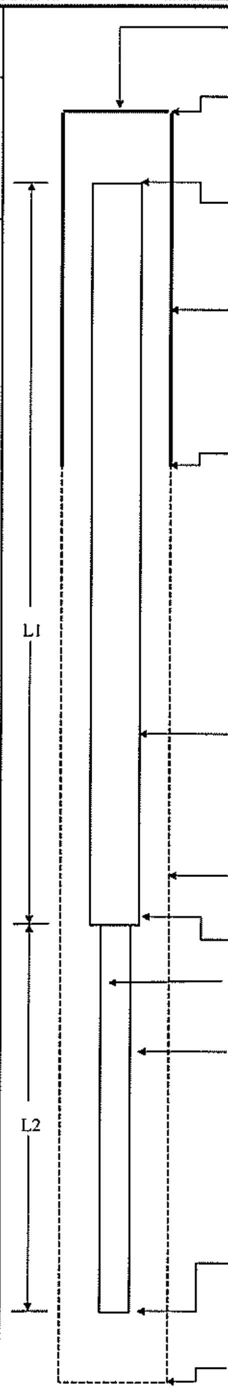
El. Datum ______

Location 8 ft. W. 11 ft. N of NW corner of bldg

☐ **Guard Pipe**

☑ **Roadway Box**

SOIL/ROCK READINGS (PPM)	**BOREHOLE BACKFILL**
all PID readings non-detect	CONCRETE
	1.0
	CEMENT/BENTONITE GROUT
	20.0
	OPEN



Type of protective cover/lock: Steel/Riser padlock

Height of top of roadway box above ground surface: 0.0 ft

Depth of top of riser pipe below ground surface: 0.3 ft

Type of protective casing: Flushmount Roadbox

Length: 1.0 ft

Inside Diameter: 8.0 in

Depth of bottom of roadway box: 1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Cement/Bentonite	0.5	19.5
Concrete	0.0	1.0

Type of casing pipe: Steel

Inside diameter of casing pipe: 4.0 in

Diameter of borehole: 10.0 in

Depth to bottom of casing: 20.0 ft

Diameter of open core interval: 3.75 in

Type of open core interval: HQ

Depth to top of bedrock: 18.0 ft

Depth of bottom of open core interval: 26.9 ft

Depth of bottom of test borehole: 26.9 ft

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

______ ft + ______ ft = ______ ft

Casing Length (L1) + Cored Interval (L2) = Pay length

COMMENTS:

Form # ____

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. MW-6

Boring No.

PROJECT	Monitorinng Well Installations	H&A FILE NO.	70533-008
LOCATION	Lexington Die Casting, Lakewood, NY	PROJECT MGR.	S. Schalabba
CLIENT	Lexington Precision Corporation	FIELD REP.	D. Nostrant
CONTRACTOR	SJB Services	DATE INSTALLED	8/10/2005
DRILLER	T. Kilburn	WATER LEVEL	See Comments

Ground El. ______ ft

El. Datum ______

Location 15 ft. S., 29 ft. W. of NW corner of bldg.

☑ Guard Pipe

☐ Roadway Box

SOIL/ROCK READINGS (PPM)	BOREHOLE BACKFILL
(All readings non-detect)	CONCRETE (0.8)
	BENTONITE CHIPS (6.0)
	NJ # 0 SILICA SAND

L1, L2, L3

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)

Type of protective cover/lock	Bolted Steel Cover	
Height/Depth of top of guard pipe/roadway box above/below ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.3	ft
Type of protective casing:	Flushmount Roadbox	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	0.8
Bentonite Seal	0.8	5.2

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	See Diagram	
Diameter of borehole	8.0 in.	in
Depth to top of well screen	8.5	ft
Type of screen	Slotted PVC	
Screen gauge or size of openings	0.01	in
Diameter of screen	2.0	in
Type of backfill around screen	NJ #0 Silica Sand	
Depth of bottom of well screen	18.5	ft
Bottom of Silt trap	18.5	ft
Depth of bottom of borehole	18.5	ft

(Not to Scale)

______ ft + ______ ft + ______ ft = ______ ft

Riser Pay Length (L1) | Length of screen (L2) | Length of silt trap (L3) | Pay length

COMMENTS: DTW 16.42 (8/11)

Form # 3010

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No.	MW-7
Boring No.	

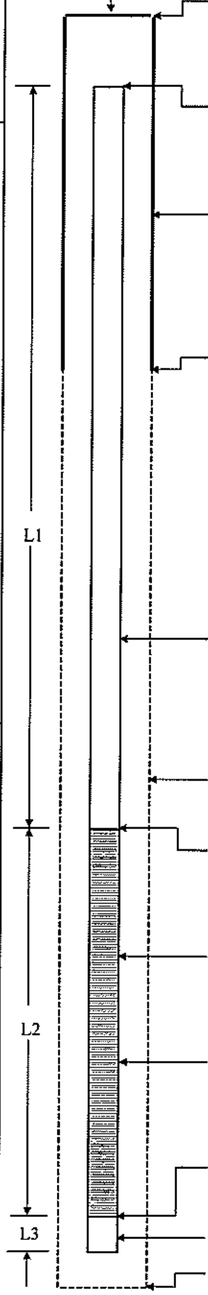
PROJECT	Monitorinng Well Installations	H&A FILE NO.	70533-008
LOCATION	Lexington Die Casting, Lakewood, NY	PROJECT MGR.	S. Schalabba
CLIENT	Lexington Precision Corporation	FIELD REP.	D. Nostrant
CONTRACTOR	SJB Services	DATE INSTALLED	8/18/2005
DRILLER	R. Steiner	WATER LEVEL	See Comments

Ground El. ______ ft
El. Datum ______

Location 24.3 ft. E., 40 ft. N. of NE corner of bldg.

☑ Guard Pipe
☐ Roadway Box

SOIL/ROCK READINGS (PPM)	BOREHOLE BACKFILL
(All readings non-detect)	CONCRETE
	0.8
	BENTONITE CHIPS
	6.0
	NJ # 0 SILICA SAND



Type of protective cover/lock	Bolted Steel Cover	
Height/Depth of top of guard pipe/roadway box above/below ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.4	ft
Type of protective casing:	Flushmount Roadbox	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of guard pipe/roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	0.8
Bentonite Seal	0.8	5.2

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	See Diagram	
Diameter of borehole	8.0 in.	in
Depth to top of well screen	7.8	ft
Type of screen	Slotted PVC	
Screen gauge or size of openings	0.01	in
Diameter of screen	2.0	in
Type of backfill around screen	NJ #0 Silica Sand	
Depth of bottom of well screen	17.8	ft
Bottom of Silt trap	17.8	ft
Depth of bottom of borehole	17.8	ft

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

______ ft + ______ ft + ______ ft = ______ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: DTW 17.8 (8/18, 1400 hrs), bailed 1.5 gal. to dry

Form # 3010

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

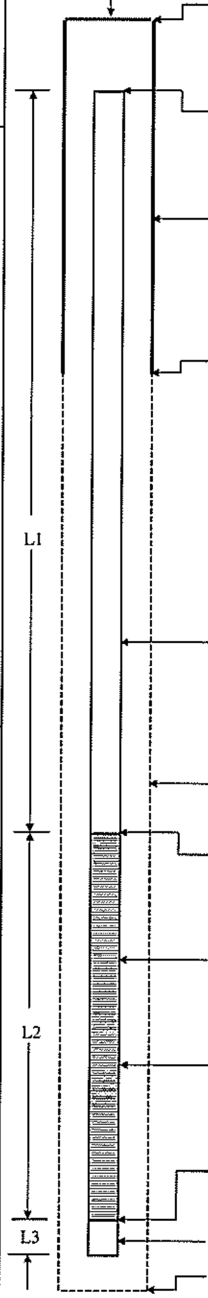
Well No. MW-8

Boring No.

PROJECT	Monitorinng Well Installations	H&A FILE NO.	70533-008
LOCATION	Lexington Die Casting, Lakewood, NY	PROJECT MGR.	S. Schalabba
CLIENT	Lexington Precision Corporation	FIELD REP.	D. Nostrant
CONTRACTOR	SJB Services	DATE INSTALLED	8/23/2005
DRILLER	S. Wolkiewicz	WATER LEVEL	See Comments

Ground El. ______ ft | Location: Interior Well | ☑ Guard Pipe
El. Datum ______ | | ☐ Roadway Box

PID READING (PPM) (DEPTH-BOREHOLE/BZ)	BOREHOLE BACKFILL
	CONCRETE (to 0.8)
4.0 - 5.9/ND	BENTONITE CHIPS (0.8 to 6.0)
5.0- 45.0/ND	
7.0-0.9/ND	
9.0-2.3/ND	
11.0-ND/ND	
13.0-ND/ND	
15.0-ND/ND	NJ # 0 SILICA SAND (6.0 to bottom)



Type of protective cover/lock	Bolted Steel Cover/Padlock	
Height/Depth of top of guard pipe/roadway box above/below ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.6	ft
Type of protective casing:	Flushmount Roadbox	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of guard pipe/roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	0.8
Bentonite Seal	1.0	5.0

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	See Diagram	
Diameter of borehole	8.0 in.	in
Depth to top of well screen	8.1	ft
Type of screen	Slotted PVC	
Screen gauge or size of openings	0.01	in
Diameter of screen	2.0	in
Type of backfill around screen	NJ #0 Silica Sand	
Depth of bottom of well screen	18.1	ft
Bottom of Silt trap	18.1	ft
Depth of bottom of borehole	18.1	ft

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

_____ ft + _____ ft + _____ ft = _____ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: DTW- 8/23- 13.57 ft.

(BZ)- Breathing Zone

Form # 3010

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. MW-9

Boring No.

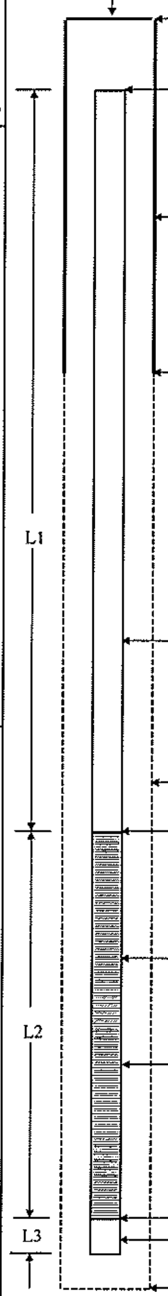
PROJECT	Monitorinng Well Installations	H&A FILE NO.	70533-008
LOCATION	Lexington Die Casting, Lakewood, NY	PROJECT MGR.	S. Schalabba
CLIENT	Lexington Precision Corporation	FIELD REP.	D. Nostrant
CONTRACTOR	SJB Services	DATE INSTALLED	8/24/2005
DRILLER	S. Wolkiewicz	WATER LEVEL	See Comments

Ground El. ______ ft | Location: Interior Well | ☑ Guard Pipe

El. Datum ______ | | ☐ Roadway Box

SOIL/ROCK READINGS (PPM) (DEPTH-BOREHOLE/BZ)	BOREHOLE BACKFILL
	CONCRETE (to 0.7)
6.0-ND/ND 8.0-6.3/ND 10.0-ND/ND 11.0-ND/ND	BENTONITE CHIPS (0.7 to 6.0)
15.0-ND/ND 17.0-ND/ND	NJ # 0 SILICA SAND

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



- Type of protective cover/lock: Bolted Steel Cover/Padlock
- Height/Depth of top of guard pipe/roadway box above/below ground surface: 0.0 ft
- Depth of top of riser pipe below ground surface: 0.3 ft
- Type of protective casing: Flushmount Roadbox
  - Length: 1.0 ft
  - Inside Diameter: 8.0 in
- Depth of bottom of guard pipe/roadway box: 1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	0.7
Bentonite Seal	1.0	1.7

- Type of riser pipe: PVC
  - Inside diameter of riser pipe: 2.0 in
  - Type of backfill around riser: See Diagram
- Diameter of borehole: 8.0 in. in
- Depth to top of well screen: 8.2 ft
- Type of screen: Slotted PVC
  - Screen gauge or size of openings: 0.01 in
  - Diameter of screen: 2.0 in
- Type of backfill around screen: NJ #0 Silica Sand
- Depth of bottom of well screen: 18.2 ft
- Bottom of Silt trap: 18.2 ft
- Depth of bottom of borehole: 18.2 ft

(Not to Scale)

______ ft + ______ ft + ______ ft = ______ ft

Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: DTW-8/31- 12.13 ft

(BZ)- Breathing Zone

Form # 3010

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

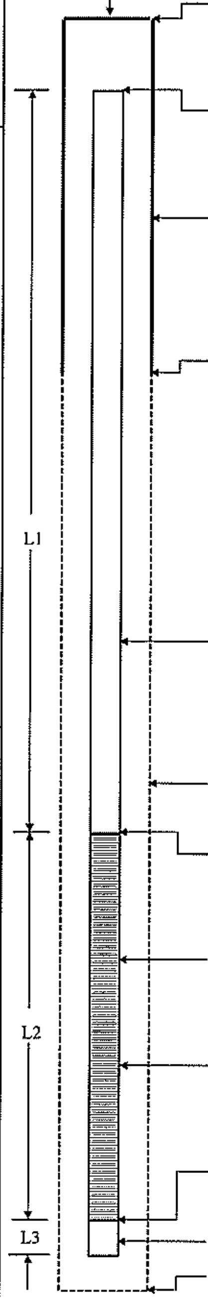
Well No. MW-8

Boring No.

PROJECT	Monitorinng Well Installations	H&A FILE NO.	70533-008
LOCATION	Lexington Die Casting, Lakewood, NY	PROJECT MGR.	S. Schalabba
CLIENT	Lexington Precision Corporation	FIELD REP.	D. Nostrant
CONTRACTOR	SJB Services	DATE INSTALLED	8/23/2005
DRILLER	S. Wolkiewicz	WATER LEVEL	See Comments

Ground El. ______ ft
El. Datum ______
Location Interior Well
☑ Guard Pipe
☐ Roadway Box

SOIL/ROCK READINGS (PPM) (DEPTH-BOREHOLE/BZ)	BOREHOLE BACKFILL
	CONCRETE (0.8)
4.0 - 5.9/ND	BENTONITE CHIPS (6.0)
5.0- 45.0/ND	
7.0-0.9/ND	
9.0-2.3/ND	
11.0-ND/ND	
13.0-ND/ND	
15.0-ND/ND	NJ # 0 SILICA SAND



Type of protective cover/lock	Bolted Steel Cover/Padlock
Height/Depth of top of guard pipe/roadway box above/below ground surface	0.0 ft
Depth of top of riser pipe below ground surface	0.6 ft
Type of protective casing:	Flushmount Roadbox
Length	1.0 ft
Inside Diameter	8.0 in
Depth of bottom of guard pipe/roadway box	1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	0.8
Bentonite Seal	1.0	5.0

Type of riser pipe:	PVC
Inside diameter of riser pipe	2.0 in
Type of backfill around riser	See Diagram
Diameter of borehole	8.0 in. in
Depth to top of well screen	8.1 ft
Type of screen	Slotted PVC
Screen gauge or size of openings	0.01 in
Diameter of screen	2.0 in
Type of backfill around screen	NJ #0 Silica Sand
Depth of bottom of well screen	18.1 ft
Bottom of Silt trap	18.1 ft
Depth of bottom of borehole	18.1 ft

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

______ ft + ______ ft + ______ ft = ______ ft
Riser Pay Length (L1) | Length of screen (L2) | Length of silt trap (L3) | Pay length

COMMENTS: DTW- 8/23- 13.57 ft.

(BZ)- Breathing Zone

Form # 3010

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. MW-10

Boring No.

PROJECT	Monitorinng Well Installations	H&A FILE NO.	70533-008
LOCATION	Lexington Die Casting, Lakewood, NY	PROJECT MGR.	S. Schalabba
CLIENT	Lexington Precision Corporation	FIELD REP.	D. Nostrant
CONTRACTOR	SJB Services	DATE INSTALLED	8/24/2005
DRILLER	S. Wolkiewicz	WATER LEVEL	See Comments

Ground El. ______ ft

El. Datum ______

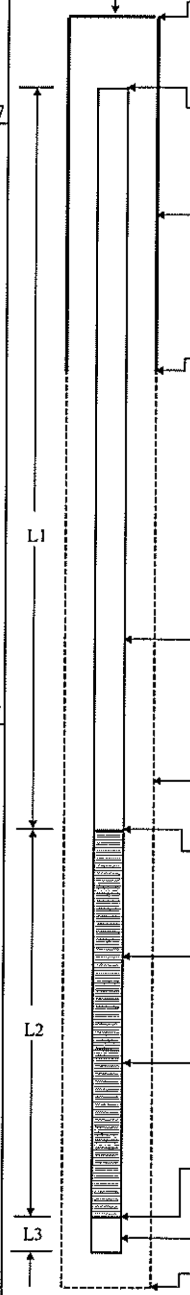
Location: Interior Well

☑ Guard Pipe

☐ Roadway Box

SOIL/ROCK READINGS (PPM) (DEPTH-BOREHOLE/BZ)	BOREHOLE BACKFILL
	CONCRETE (to 0.7)
3.0-ND/ND	
5.0-6.0/ND	BENTONITE CHIPS (0.7 to 2.7)
8.0-6.3/ND	
	NJ # 0 SILICA SAND (2.7 to bottom)

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Bolted Steel Cover/Padlock	
Height/Depth of top of guard pipe/roadway box above/below ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.3	ft
Type of protective casing:	Flushmount Roadbox	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of guard pipe/roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	0.7
Bentonite Seal	1.0	1.7

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	See Diagram	
Diameter of borehole	8.0 in.	in
Depth to top of well screen	4.7	ft
Type of screen	Slotted PVC	
Screen gauge or size of openings	0.01	in
Diameter of screen	2.0	in
Type of backfill around screen	NJ #0 Silica Sand	
Depth of bottom of well screen	12.7	ft
Bottom of Silt trap	12.7	ft
Depth of bottom of borehole	12.7	ft

______ ft + ______ ft + ______ ft = ______ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: DTW-8/31- 12.32 ft.

(BZ)- Breathing Zone

Form # 3010

HALEY & ALDRICH

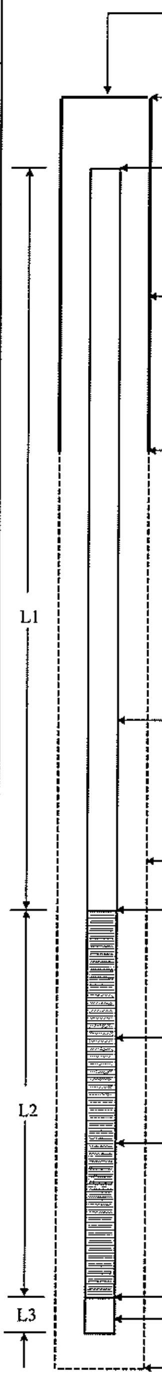
OBSERVATION WELL INSTALLATION REPORT

Well No. MW-11
Boring No.

PROJECT	Monitorinng Well Installations	**H&A FILE NO.**	70533-008
LOCATION	Lexington Die Casting, Lakewood, NY	**PROJECT MGR.**	S. Schalabba
CLIENT	Lexington Precision Corporation	**FIELD REP.**	D. Nostrant
CONTRACTOR	SJB Services	**DATE INSTALLED**	8/17/2005
DRILLER	R. Steiner	**WATER LEVEL**	See Comments

Ground El. ______ ft
El. Datum ______
Location 11.5 ft. S, 16.0 ft. E of SE corner of front office area.
☑ **Guard Pipe**
☐ **Roadway Box**

SOIL/ROCK READINGS (PPM)	BOREHOLE BACKFILL
(All readings non-detect)	CONCRETE (0.8)
	BENTONITE CHIPS (6.0)
	NJ # 0 SILICA SAND



Type of protective cover/lock	Bolted Steel Cover	
Height/Depth of top of guard pipe/roadway box above/below ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.3	ft
Type of protective casing:	Flushmount Roadbox	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of guard pipe/roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	0.8
Bentonite Seal	0.8	5.2

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	See Diagram	
Diameter of borehole	8.0 in.	in
Depth to top of well screen	8.0	ft
Type of screen	Slotted PVC	
Screen gauge or size of openings	0.01	in
Diameter of screen	2.0	in
Type of backfill around screen	NJ #0 Silica Sand	
Depth of bottom of well screen	18.0	ft
Bottom of Silt trap	18.0	ft
Depth of bottom of borehole	18.0	ft

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

______ ft + ______ ft + ______ ft = ______ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: DTW- 17.30 ft. (8/18@0930 hrs), bailed 7.5 gal. (turbid water), DTB- 18.0 ft. (hard)

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. MW-11D

Boring No.

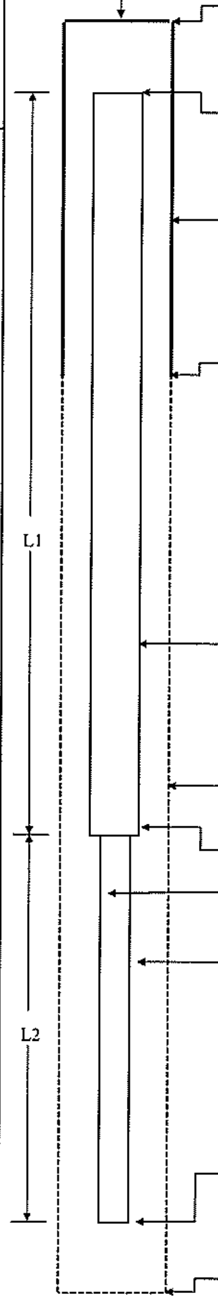
PROJECT	Monitoring Well Installations	**H&A FILE NO.**	70533-008
LOCATION	Lexington Die Casting, Lakewood, NY	**PROJECT MGR.**	S. Schalabba
CLIENT	Lexington Pecision Corporation	**FIELD REP.**	D. Nostrant
CONTRACTOR	SJB Services	**DATE INSTALLED**	8/19/2005
DRILLER	R. Steiner	**WATER LEVEL**	

Ground El. ______ ft
El. Datum ______

Location 19 ft. S. 8 ft. E of SE corner of office area

☐ **Guard Pipe**
☑ **Roadway Box**

SOIL/ROCK READINGS (PPM)	**BOREHOLE BACKFILL**
(all readings-non-detect)	CONCRETE (to 1.0)
	CEMENT/BENTONITE GROUT (1.0 to 20.0)
	OPEN (20.0 to bottom)



Type of protective cover/lock: Steel/Riser padlock

Height of top of roadway box above ground surface: 0.0 ft

Depth of top of riser pipe below ground surface: 0.2 ft

Type of protective casing: Flushmount Roadbox
Length: 1.0 ft
Inside Diameter: 8.0 in

Depth of bottom of roadway box: 1.0 ft

Type of Seals	**Top of Seal (ft)**	**Thickness (ft)**
Cement/Bentonite	0.5	19.5
Concrete	0.0	1.0

Type of casing pipe: Steel
Inside diameter of casing pipe: 4.0 in

Diameter of borehole: 10.0 in

Depth to bottom of casing: 20.0 ft
Diameter of open core interval: 3.75 in

Type of open core interval: HQ

Depth to top of bedrock: 18.0 ft

Depth of bottom of open core interval: 27.0 ft

Depth of bottom of test borehole: 27.0 ft

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

______ ft + ______ ft = ______ ft
Casing Length (L1) + Cored Interval (L2) = Pay length

COMMENTS:

Form # ____

HALEY & ALDRICH

TEST BORING REPORT

Boring No. MW-12

Project	Remedial Program Implementation Lakewood, New York
Client	Lexington Precision Corporation
Contractor	Nothnagle Drilling

File No.	70533-011
Sheet No.	1 of
Start	October 30, 2006
Finish	October 30, 2006
Driller	Jay
H&A Rep.	W. Armstrong
Elevation	
Datum	
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	--	Rig Make & Model: BK-81
Inside Diameter (in.)	4-1/4	1 3/8	--	Bit Type: Cutting Head; Drill Mud: None
Hammer Weight (lb.)	--	140	-	Casing: HSA
Hammer Fall (in.)	--	30	-	Hoist/Hammer: Winch Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Augered 0.0 to 8.0 ft.										
5																	
	5 13 10 11	S1 16/24	8.0 10.0		8.0	CL	Very stiff, red-brown to gray-brown, lean CLAY with gravel (CL), mps 20 mm., no odors, moist, trace sand and silt.										
10	9 12 13 20	S2 20/24	10.0 12.0			CL	Very stiff, gray-brown, lean CLAY (CL), mps 12 mm., no odor, moist, trace gravel and sand. -GLACIAL TILL-										
	11 24 45 50/2"	S3 20/20	12.0 13.7			CL	Hard, gray-brown, lean CLAY with gravel (CL), mps 12 mm., no odor, moist.										
					12.5	CL	Hard, gray, lean CLAY with gravel (CL), mps 20 mm., no odor, dry to moist, interbedded weathered rock.										
15	22 33 50/3"	S4 15/15	14.0 15.3		14.0		Very dense, gray, weathered rock with clay, no odor, wet from 14.0 to 14.5 ft., moist from 14.8 to 15.3 ft.										
	50/5"	S5 4/5	16.0 18.0				Very dense, gray, weathered rock with clay, no odor, wet.										
	50/4"	S6 4/4	18.0 20.0				Very dense, gray, weathered rock with clay, no odor, wet. -WEATHERED ROCK-										
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
10/31/06	0800		20.0	20.0	10.6

Sample Identification

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (lin. ft.)	20.0
Rock Cored (lin. ft.)	--
Samples	S6
Boring No.	MW-12

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. MW-12
File No. 70533-011
Sheet No. 2 of

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20					20.0		Bottom of Exploration at 20.0 ft.										

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-12

HALEY & ALDRICH

TEST BORING REPORT

Boring No. MW-13

Project	Remedial Program Implementation Lakewood, New York
Client	Lexington Precision Corporation
Contractor	Nothnagle Drilling
File No.	70533-011
Sheet No.	1 of
Start	October 30, 2006
Finish	October 30, 2006
Driller	Jay
H&A Rep.	W. Armstrong
Elevation	
Datum	
Location	See Plan

	Casing	Sampler	Barrel
Type	HSA	S	--
Inside Diameter (in.)	4-1/4	1 3/8	--
Hammer Weight (lb.)	--	140	-
Hammer Fall (in.)	--	30	-

Drilling Equipment and Procedures

Rig Make & Model: BK-81
Bit Type: Cutting Head
Drill Mud: None
Casing: HSA
Hoist/Hammer: Winch Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Toughness	Plasticity	Strength
0			0.0 8.0				0.0-0.8 ft. augered.										
5																	
	5 8 11 17	S1 6/24	8.0 10.0		8.0	CL	Very stiff, gray-brown, lean CLAY with gravel (CL), mps. 10 mm., no odor, dry, trace sand and silt.										
10	12 22 18 18	S2 20/24	10.0 12.0			CL	Hard, gray-brown, lean CLAY with gravel (CL), mps. 12 mm., no odor, dry, trace sand and silt. 1" Gravel layer at 10.7 ft. -GLACIAL TILL-										
	16 27 41 50/3"	S3 21/21	12.0 14.0			CL	Hard, gray-brown, lean CLAY with gravel (CL), mps 20 mm., no odor, moist to wet.										
					13.0		Very dense, gray, weathered rock with clay, no odor, wet.										
15	21 47 50/3"	S4 14/15	14.0 16.0				Very dense, gray, weatherd rock with clay, no odor, moist.										
	50/4"	S5 3/4	16.0 18.0				Very dense, gray, weathered rock with clay, no odor, dry.										
	42 40/2"	S6 6/8	18.0 20.0				Very dense, gray, weathered rock with clay, no odor, dry. -WEATHERED ROCK- Auger refusal at 20.0 ft.										
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
10/31/06	0810		20.0	20.0	10.3

Sample Identification

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (lin. ft.) 20.0
Rock Cored (lin. ft.) --
Samples S6

Boring No. MW-13

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20					20.0		Bottom of Exploration at 20.0 ft.										

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size.
NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. MW-14

Project: Remedial Program Implementation Lakewood, New York
Client: Lexington Precision Corporation
Contractor: Nothnagle Drilling

File No. 70533-011
Sheet No. 1 of
Start: October 30, 2006
Finish: October 31, 2006
Driller: Jay
H&A Rep.: W. Armstrong
Elevation
Datum
Location: See Plan

	Casing	Sampler	Barrel
Type	HSA	S	--
Inside Diameter (in.)	4-1/4	1 3/8	--
Hammer Weight (lb.)	--	140	-
Hammer Fall (in.)	--	30	-

Drilling Equipment and Procedures
Rig Make & Model: BK-81
Bit Type: Cutting Head
Drill Mud: None
Casing: HSA
Hoist/Hammer: Winch Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Augered 0.0 to 8.0 ft.										
	6 10 11 14	S1 22/24	8.0 10.0		8.0	CL	Very stiff, red-brown, sandy lean CLAY with gravel (CL), mps 20 mm., no odor, dry, trace silt.										
10	13 11 15 21	S2 21/24	10.0 12.0			CL	Very dense, red-brown to gray-brown, sandy lean CLAY with gravel (CL), mps 20 mm., no odor, trace silt, dry. Gray-brown at 11.4 ft.										
	7 17 15 26	S3 20/24	12.0 14.0			CL	Hard, gray-brown, lean CLAY with gravel, trace sand (CL), mps 12 mm., no odor, moist. 1" Gravel layer at 12.7 ft.										
15	11 81 50/2"	S4 8/14	14.0 16.0				Hard, gray-brown, lean CLAY with gravel (CL), mps 20 mm., no odor, wet, trace weathered rock. -GLACIAL TILL-										
	74 75/5"	S5 10/11	16.0 18.0		16.0		Very dense, gray, weathered rock, dry.										
	50/5"	S6 3/5	18.0 18.4				Very dense, gray, weathered rock, dry. -WEATHERED ROCK- Auger refusal at 20.1 ft.										
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
10/31/06	0820		20.1	20.1	11.0

Sample Identification
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (lin. ft.) 20.1
Rock Cored (lin. ft.) --
Samples S6

Boring No. MW-14

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20					20.1		Bottom of Exploration at 20.1 ft.										

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size.
NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH	TEST BORING REPORT	Boring No. B-1

Project: Phase II Investigation Lakewood, New York	File No. 70533-004
Client: Lexington Die Casting Company	Sheet No. 1 of 1
Contractor: SLC Environmental Services	Start: September 26, 2002
	Finish: September 26, 2002
	Driller: G. Janik
	H&A Rep.: M. Reay
	Elevation
	Datum
	Location

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type		S		Rig Make & Model: Geoprobe
Inside Diameter (in.)		2		Bit Type:
				Drill Mud:
Hammer Weight (lb.)			-	Casing:
Hammer Fall (in.)			-	Hoist/Hammer:

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		S1 24/48	0.0 4.0	NO WELL INSTALLED			-CONCRETE SLAB-											
					1.6	GP	Loose, brown, poorly graded GRAVEL with sand (GP), mps 19mm, no odor or structure, dry to moist	PID = 0.0 ppm PID = 0.0 ppm PID = 0.0 ppm		80			15	5				
		S2 46/48	4.0 8.0		4.0	ML	Dense, brown to red-gray, sandy SILT with gravel (ML), mps 15mm, moist, no structure or odor	PID = 0.0 ppm										
5					5.0	GP	Loose, brown, poorly graded GRAVEL (GP), with sand, mps 19mm, no odor or structure, dry to moist	PID = 0.0 ppm PID = 0.0 ppm										
		S3 48/48	8.0 12.0					PID = 0.0 ppm										
10					10.0	GP-GM	Brown, poorly graded GRAVEL with silt and sand (GP-GM), mps 20mm, no odor or structure, dry to moist	PID = 0.0 ppm PID = 0.0 ppm										
		S4 42/48	12.0 14.0		12.0	ML	Soft, brown with mottled gray SILT with sand (ML), no odor or structure, 12-13 ft., dry and 13-14 ft., moist	PID = 0.0 ppm PID = 0.0 ppm										
					14.0		Bottom of Exploration at 14.0 ft. NOTE: Observed refusal at 14.0 ft. Boring Terminated at 14.0 ft.											

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
		not			

Sample Identification

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (lin. ft.) 14

Rock Cored (lin. ft.)

Samples S4

Boring No. **B-1**

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High

Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-2

Project Phase II Investigation Lakewood, New York
Client Lexington Die Casting Company
Contractor SLC Environmental Services

File No. 70533-004
Sheet No. 1 of 1
Start September 26, 2002
Finish September 26, 2002
Driller G. Janik
H&A Rep. M. Reay
Elevation
Datum
Location

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type		S		Rig Make & Model: Geoprobe
Inside Diameter (in.)		2		Bit Type: / Drill Mud:
Hammer Weight (lb.)			-	Casing:
Hammer Fall (in.)			-	Hoist/Hammer:

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Toughness	Plasticity	Strength
0		S1 24/48	0.0 4.0	NO WELL INSTALLED			-CONCRETE SLAB-											
					2.5	ML	Medium stiff to hard, light-brown SILT with gravel (ML), mps 30mm, some orange staining at 4ft,. (sporadic), no odor or structure, dry to moist at 4-6ft., yellow-brown sandy SILT	PID = 0.0 ppm PID = 0.0 ppm										
5		S2 48/48	4.0 8.0															
					6.0	GM	Dense, brown, silty GRAVEL with sand (GM), mps 40mm, red-gray silt with some sand.	PID = 0.0 ppm PID = 0.0 ppm										
		S3 48/48	8.0 12.0		8.0	ML	Very stiff with pockets of loose soft, light-brown SILT with gravel (ML), mps 20mm, moist.	PID = 0.0 ppm										
10								PID = 0.0 ppm										
					12.0		Bottom of Exploration at 12.0 ft. NOTE: Observed refusal at 12.0 ft.											

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
Not					

Sample Identification
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (lin. ft.) 12
Rock Cored (lin. ft.)
Samples S3

Boring No. B-2

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

HALEY & ALDRICH

Boring No. B-3

Project: Phase II Investigation Lakewood, New York
Client: Lexington Die Casting Company
Contractor: SLC Environmental Services

File No. 70533-004
Sheet No. 1 of 1
Start: September 26, 2002
Finish: September 26, 2002
Driller: G. Janik
H&A Rep.: M. Reay
Elevation:
Datum:
Location:

	Casing	Sampler	Barrel
Type		S	
Inside Diameter (in.)		2	
Hammer Weight (lb.)			-
Hammer Fall (in.)			-

Drilling Equipment and Procedures
Rig Make & Model: Geoprobe
Bit Type:
Drill Mud:
Casing:
Hoist/Hammer:

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0		S1 24/48	0.0 4.0	NO WELL INSTALLED			-CONCRETE SLAB-											
					2.0	SM	Soft, brown with mottled dark- brown silty SAND with some gravel (SM)	PID = 0.0 ppm										
						SM	4.6 inch thick zone of staining, dark-brown to black, no odor, structure, moist, stiff	PID = 0.0 ppm										
							Same as 2-2.8'											
		S2 46/48	4.0 8.0		4.0	ML	Stiff, light-brown, SILT with sand (ML), mps 10mm, no odor or structure, moist											
5								PID = 0.0 ppm										
							6ft., light-brown to yellow-brown	PID = 0.0 ppm										
		S3 48/48	8.0 12.0					PID = 0.0 ppm										
								PID = 0.0 ppm										
10							10-12 ft., increased density compared to 4-10 ft.	PID = 0.0 ppm										
								PID = 0.0 ppm										
		S4 48/48	12.0 16.0			ML	Same as 4-10'											
							12.5 ft., hit water, WET soil	PID = 0.0 ppm										
								PID = 0.0 ppm										
							13.6 ft., transition to red-gray.											
15								PID = 0.0 ppm										
					16.0		Bottom of Exploration at 16.0 ft.											

NOTES:
1. Observed refusal at 16.0 ft.
2. Installed temporary PVC wellscreen to obtain groundwater sample.

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
9/26/02					12.5

Sample Identification
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (lin. ft.) 16
Rock Cored (lin. ft.)
Samples S4

Boring No. B-3

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1] SPT = Sampler blows per 6 in. [2] Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

USCS_TB3APID USCSLIB4.GLB USCSTC3A.GDT G:\PROJECTS\70533\004\EXPLOR~1\TESTBORE.GPJ Dec 12, 06

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-4

Project Phase II Investigation Lakewood, New York
Client Lexington Die Casting Company
Contractor SLC Environmental Services

File No. 70533-004
Sheet No. 1 of 1
Start September 26, 2002
Finish September 26, 2002
Driller G. Janik
H&A Rep. M. Reay
Elevation
Datum
Location

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type		S		Rig Make & Model: Geoprobe
Inside Diameter (in.)		2		Bit Type: / Drill Mud:
Hammer Weight (lb.)			-	Casing:
Hammer Fall (in.)			-	Hoist/Hammer:

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		S1 24/48	0.0 4.0	NO WELL INSTALLED			-CONCRETE SLAB-											
					3.5	GP	Very loose, dry to moist, brown, poorly graded GRAVEL with sand (GP), dry to moist.	PID = 1.5 ppm										
5		S2 48/48	4.0 8.0		4.0	ML	Stiff, brown, SILT with gravel (ML), mps 30mm, no odor or structure, dry, to moist.	PID = 2.1 ppm PID = 1.5 ppm PID = 1.7 ppm										
10		S3 48/48	8.0 12.0			ML	Stiff to very stiff, brown to olive-brown, SILT with gravel, mps 10mm, no odor or structure, moist	PID = 1.2 ppm PID = 2.3 ppm										
		S4 48/48	12.0 15.0			ML	Stiff, light-brown to brown, SILT with gravel (ML), mps 30mm, no odor or structure, moist	PID = 4.4 ppm										
15					15.0		Bottom of Exploration at 15.0 ft. NOTE: Observed refusal at 15.0 ft.											

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
Not					

Sample Identification
- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary
Overburden (lin. ft.) 15
Rock Cored (lin. ft.)
Samples S4

Boring No. B-4

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

USCS_TB3APID USCSLIB4.GLB USCSTC3A.GDT G:\PROJECTS\70533\004\EXPLOR~1\TESTBORE.GPJ Dec 12, 06

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-5

Project: Phase II Investigation Lakewood, New York
Client: Lexington Die Casting Company
Contractor: SLC Environmental Services

File No. 70533-004
Sheet No. 1 of 1
Start: September 26, 2002
Finish: September 26, 2002
Driller: G. Janik
H&A Rep.: M. Reay
Elevation:
Datum:
Location:

	Casing	Sampler	Barrel
Type		S	
Inside Diameter (in.)		2	
Hammer Weight (lb.)			-
Hammer Fall (in.)			-

Drilling Equipment and Procedures
Rig Make & Model: Geoprobe
Bit Type:
Drill Mud:
Casing:
Hoist/Hammer:

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Toughness	Plasticity	Strength
0		S1 24/48	0.0 4.0	NO WELL INSTALLED			-CONCRETE SLAB-											
					2.5	SP	Loose, dark-brown to brown, poorly graded SAND with gravel (SP), mps 30mm, no odor or structure, moist	PID = 1.9 ppm PID = 1.4 ppm										
					3.6	ML	Soft, dark-brown, SILT with some gravel (ML), no odor or structure, moist	PID = 0.7 ppm										
5		S2 48/48	4.0 8.0		4.0	ML	Stiff, yellow-brown mottled with red-brown, sandy SILT to SILT with gravel (ML), mps 10mm, no odor or structure, moist. Gravel more than sand between 7-8 ft. less dense than 4.4-7 ft.	PID = 1.1 ppm PID = 1.1 ppm PID = 1.4 ppm PID = 0.9 ppm PID = 1.1 ppm										
10		S3 48/48	8.0 12.0		8.0	ML	Very stiff, brown SILT with sand and gravel (ML), mps 20mm, no odor or structure, moist											
15		S4 48/48	12.0 15.0		12.0	ML	Very dense, very stiff to hard, brown to red-gray, SILT with gravel (ML), mps 15mm, no odor or structure, moist	PID = 1.2 ppm PID = 1.3 ppm PID = 1.2 ppm PID = 1.3 ppm										
					15.0		Bottom of Exploration at 15.0 ft. NOTE: Observed refusal at 15.0 ft.											

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
Not					

Sample Identification
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (lin. ft.) 15
Rock Cored (lin. ft.)
Samples S4

Boring No. B-5

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None. Toughness: L-Low, M-Medium, H-High. Plasticity: N-Nonplastic, L-Low, M-Medium, H-High. Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

HALEY & ALDRICH

Boring No. B-6

Project: Phase II Investigation Lakewood, New York
Client: Lexington Die Casting Company
Contractor: SLC Environmental Services

File No. 70533-004
Sheet No. 1 of 1
Start: September 26, 2002
Finish: September 26, 2002
Driller: G. Janik
H&A Rep.: M. Reay
Elevation
Datum
Location

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type		S		Rig Make & Model: Geoprobe
Inside Diameter (in.)		2		Bit Type:
				Drill Mud:
Hammer Weight (lb.)			-	Casing:
Hammer Fall (in.)			-	Hoist/Hammer:

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		S1 36/48	0.0 4.0	NO WELL INSTALLED			-CONCRETE SLAB-	PID = 1.3 ppm										
					1.5	SP	Loose to medium dense, dark-brown, poorly-graded SAND with gravel (SP), mps 40mm, no oder or structure, moist	PID = 1.0 ppm										
							At 3.8 ft. yellow-brown color.	PID = 2.1 ppm										
5		S2 42/48	4.0 8.0		4.0	ML	Stiff, yellow-brown SILT (ML) with sand, mps 10mm, no odor or structure, moist 6-8ft., more light-brown color than yellow-brown	PID = 1.9 ppm PID = 1.8 ppm										
10		S3 48/48	8.0 12.0		8.0	ML	Hard, light-brown, mottled with gray, SILT with sand, mps 10mm, no odor or structure, moist	PID = 1.7 ppm PID = 1.1 ppm										
					12.0		Bottom of Exploration at 12.0 ft. NOTE: Observed refusal at 12.0 ft.											

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
Not					

Sample Identification
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (lin. ft.) 12
Rock Cored (lin. ft.)
Samples S3

Boring No. B-6

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1] SPT = Sampler blows per 6 in. [2] Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

USCS_TB3APID USCSLIB4.GLB USCSTC3A.GDT G:\PROJECTS\70533\004\EXPLOR~1\TESTBORE.GPJ Dec 12, 06

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-7

Project: Phase II Investigation Lakewood, New York
Client: Lexington Die Casting Company
Contractor: SLC Environmental Services

File No. 70533-004
Sheet No. 1 of 1
Start: September 26, 2002
Finish: September 26, 2002
Driller: G. Janik
H&A Rep.: M. Reay
Elevation:
Datum:
Location:

	Casing	Sampler	Barrel
Type		S	
Inside Diameter (in.)		2	
Hammer Weight (lb.)			-
Hammer Fall (in.)			-

Drilling Equipment and Procedures
- Rig Make & Model: Geoprobe
- Bit Type:
- Drill Mud:
- Casing:
- Hoist/Hammer:

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		S1 18/48	0.0 4.0	NO WELL INSTALLED			-CONCRETE SLAB-											
					3.0	SP-SC	Very loose, brown, poorly graded SAND with silt and gravel (SP-SC), mps 30mm, no odor or structure, mooist	PID = 1.1 ppm										
5		S2 48/48	4.0 8.0		4.0	ML	Very stiff, light-brown, sandy SILT with gravel (ML), mps 30mm, no odor or structure, moist.	PID = 1.2 ppm PID = 0.4 ppm PID = 0.8 ppm										
		S3 48/48	8.0 10.0		8.0	SP-SC	Very loose, brown, poorly graded SAND with silt and gravel (SP-SC), mps 40mm, no odor or structure, moist.	PID = 1.1 ppm										
10					9.5	ML	Hard, brown to light-brown SILT with gravel (ML), no odor or structure, moist.	PID = 0.4 ppm PID = 0.6 ppm										
					11.0		Bottom of Exploration at 11.0 ft. NOTE: Observed refusal at 11.0 ft.											

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
Not					

Sample Identification
- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary
- Overburden (lin. ft.) 11
- Rock Cored (lin. ft.)
- Samples S3

Boring No. B-7

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-8

Project: Phase II Investigation Lakewood, New York
Client: Lexington Die Casting Company
Contractor: SLC Environmental Services

File No. 70533-004
Sheet No. 1 of 1
Start: September 26, 2002
Finish: September 26, 2002
Driller: G. Janik
H&A Rep.: M. Reay
Elevation
Datum
Location

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type		S		Rig Make & Model: Geoprobe
Inside Diameter (in.)		2		Bit Type:
				Drill Mud:
Hammer Weight (lb.)			-	Casing:
Hammer Fall (in.)			-	Hoist/Hammer:

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0		S1 30/48	0.0 4.0	NO WELL INSTALLED			-CONCRETE SLAB-											
					2.4	SP-SC	Loose, brown, poorly graded SAND with silt and gravel (SP-SC), mps, 30 mm, no structure or odor, slightly moist.	PID = 1.1 ppm										
5		S2 48/48	4.0 8.0		4.0	ML	Hard, light-brown to red-grey SILT with (ML) gravel, mps 40mm, miost, no structure, strong odor at 6.1 ft. less string odor at 5.5 ft. + 7.5 ft. -still smells (hard to distinguish smell, pungent)	PID = 1.4 ppm PID = 524 ppm PID = 407 ppm PID = 13.3 ppm										
		S3 48/48	8.0 10.0			ML	Very stiff to hard SILT with gravel, (ML), mps 40mm, no structure, no odor noticed, moist.	PID = 4.7 ppm PID = 49.5 ppm PID = 9.0 ppm										
10					10.0		Bottom of Exploration at 10.0 ft. NOTES: 1. Picture number 163 = boring number 8 location 2. Observed refusal at 10.0 ft.											

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
Not					

Sample Identification
- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary
Overburden (lin. ft.) 10
Rock Cored (lin. ft.)
Samples S3

Boring No. B-8

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-9

Project: Phase II Investigation Lakewood, New York
Client: Lexington Die Casting Company
Contractor: SLC Environmental Services

File No. 70533-004
Sheet No. 1 of 1
Start: September 26, 2002
Finish: September 26, 2002
Driller: G. Janik
H&A Rep.: M. Reay
Elevation
Datum
Location

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type		S		Rig Make & Model: Geoprobe
Inside Diameter (in.)		2		Bit Type:
				Drill Mud:
Hammer Weight (lb.)			-	Casing:
Hammer Fall (in.)			-	Hoist/Hammer:

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		S1 24/48	0.0 4.0	NO WELL INSTALLED			-FILL- (Topsoil/Grass)											
					2.2	MH	Soft, dark-brown, elastic SILT with sand (MH), mps 30mm, no structure or odor, very moist to wet (due to large puddle of standing water next to building).	PID = 0.0 ppm										
5		S2 48/48	4.0 8.0		4.0	ML	Same as 2-4', moist to very moist.	PID = 0.0 ppm										
					6.0	MH	Soft, dark-brown, elastic SILT with sand (MH), mps 30mm, no structure or odor, very moist to wet (very soft due to wet soil).	PID = 0.0 ppm										
		S3 48/48	8.0 12.0		8.0		Top 2 ft. is wet FLUFF											
10						ML	Hard, dark-brown SILT with sand (ML), mps 10mm, no odor or structure, moist to wet	PID = 0.0 ppm										
					12.0		Bottom of Exploration at 12.0 ft. NOTE: Boring was completed from dusk to dark, observed refusal at 12 ft.	PID = 0.0 ppm										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water
Not					

Sample Identification
- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary
- Overburden (lin. ft.) 12
- Rock Cored (lin. ft.)
- Samples S3

Boring No. B-9

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1] SPT = Sampler blows per 6 in. [2] Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

USCS_TB3APID USCSLIB4.GLB USCSTC3A.GDT G:\PROJECTS\70533\004\EXPLOR~1\TESTBORE.GPJ Dec 12, 06

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-201

Project Lexington Die Casting, UST Evaluation and Closure Program Lakewood, New York
Client Lexington Die Casting Company
Contractor SLC, Inc.

File No. 70533-006
Sheet No. 1 of 1
Start April 8, 2004
Finish April 8, 2004
Driller R. Rose
H&A Rep. S. Amrozowicz
Elevation
Datum
Location Inside Fencing

	Casing	Sampler	Barrel
Type	--	G	--
Inside Diameter (in.)	--	1 3/8	--
Hammer Weight (lb.)	--	140	-
Hammer Fall (in.)	--	30	-

Drilling Equipment and Procedures
Rig Make & Model: Geoprobe 5LT
Bit Type:
Drill Mud: None
Casing:
Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0			0.0	NO WELL INSTALLED			Concrete slab to 0.3 ft.		100									
	N/A	G1 37	0.3 / 0.3 / 4.0		0.3	SM	G1: Mottled, tan-brown-gray silty SAND with gravel (SM), mps .75 in., no structure, no odor, moist, some ash and crushed concrete, some organics. -FILL-	PID = 1.2 ppm PID = 1.4 ppm PID = 1.3 ppm	10	15	15	10	10	40			N	
	N/A	G2 40	4.0 / 8.0		3.6	MH	G2: Soft gray to tan sandy elastic SILT with clay (MH), mps 4mm, slightly cohesive and striated structure, no odor, moist to wet from 5 ft. to 6 ft. and then moist from 6 ft. to 8 ft. -LACUSTRINE-	PID = 1.7 ppm PID = 1.3 ppm PID = 1.5 ppm PID = 1.4 ppm				10	5	85	S	L	N	
5	N/A	G3 30	8.0 / 11.3		9.0	MH	G3: Soft gray and brown sandy elastic SILT with gravel (MH), mps 1 in., no structure, slight odor (?), moist to wet -GLACIAL TILL-	PID = 1.6 ppm PID = 15.2 ppm PID = 0.9 ppm	20	15		10	5	50	S	L	N	
10					11.3		Refusal at 11.3 ft. Bottom of boring at 11.3 ft.											

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (lin. ft.) 11.3
Rock Cored (lin. ft.) --
Samples 3G

Boring No. B-201

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-202

Project	Lexington Die Casting, UST Evaluation and Closure Program Lakewood, New York
Client	Lexington Die Casting Company
Contractor	SLC, Inc.

File No.	70533-006
Sheet No.	1 of 1
Start	April 8, 2004
Finish	April 8, 2004
Driller	R. Rose
H&A Rep.	S. Amrozowicz
Elevation	
Datum	
Location	Outside Fencing

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	--	G	--	Rig Make & Model: Geoprobe 5LT
Inside Diameter (in.)	--	1 3/8	--	Bit Type:
				Drill Mud: None
Hammer Weight (lb.)	--	140	-	Casing:
Hammer Fall (in.)	--	30	-	Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0			0.0	NO WELL INSTALLED			Concrete slab to 0.3 ft.		100									
	N/A	G1 31	0.3 0.3 4.0		0.3	SM	G1: Mottled, tan-brown-gray silty SAND with gravel (SM), mps .75 in., no structure, no odor, moist with some wet conditions at 2-2.5 ft., concrete and tiny glass chips (or metal?) -FILL-	PID = 0.9 ppm PID = 1.3 ppm	10	10	10	15	15	40				
	N/A	G2 42	4.0 8.0		3.8	MH	G2: Soft gray organic silty layer with sand to mottled light brown and gray elastic SILT with clay (MH), slightly striated, no odor, moist -LACUSTRINE-	PID = 1.1 ppm			5	15	10	70	S	L	N	
5								PID = 0.8 ppm PID = 0.7 ppm PID = 1.3 ppm										
	N/A	G3 38	8.0 11.5		9.1	GP	G3: Brown and gray poorly-graded GRAVEL with sand and silt (GP), mps 1.5 in., no structure, wet, odor (?) -GLACIAL TILL-	PID = 0.9 ppm	25	20	10	5	10	30				
10								PID = 1.4 ppm PID = 10.5 ppm PID = 9.9 ppm										
					11.5		Refusal at 11.5 ft. Bottom of boring at 11.5 ft. Note: Refusal at 5.0 ft. offset 4.0 ft. North for B-202A											

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (lin. ft.) 11.5
Rock Cored (lin. ft.) --
Samples 3G

Boring No. B-202

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-203

Project	Lexington Die Casting, UST Evaluation and Closure Program Lakewood, New York
Client	Lexington Die Casting Company
Contractor	SLC, Inc.

File No.	70533-006
Sheet No.	1 of 1
Start	April 8, 2004
Finish	April 8, 2004
Driller	R. Rose
H&A Rep.	S. Amrozowicz
Elevation	
Datum	
Location	

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	--	G	--	Rig Make & Model: Geoprobe 5LT
Inside Diameter (in.)	--	1 3/8	--	Bit Type:
Hammer Weight (lb.)	--	140	-	Drill Mud: None Casing:
Hammer Fall (in.)	--	30	-	Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0			0.0	NO WELL INSTALLED			Concrete slab to 0.3 ft.		100									
	N/A	G1 27	0.3 0.3 4.0		0.3	SP	G1: Brown poorly-graded SAND with gravel (SP), mps 1.25 in., no structure, no odor, moist to dry -FILL-	PID = 1.3 ppm PID = 1.4 ppm PID = 2.0 ppm	15	20	15	10	35	5				
5	N/A	G2 48	4.0 8.0		4.2	MH	G2: Mottled blue-gray to brown elastic SILT with sand (MH), mps 1in., blocky structure, no odor, moist to dry, occasional coarse gravel -LACUSTRINE-	PID = 0.8 ppm PID = 0.9 ppm PID = 0.8 ppm				5	5	90		M	N	
10	N/A	G3 30	8.0 10.5			ML	G3: Light brown SILT (ML0, mps 3/4 in., of siltstone, blocky structure, dry -LACUSTRINE-	PID = 0.4 ppm PID = 0.8 ppm		10				90	N		N	
					10.5		Refusal at 10.5 ft. Bottom of boring at 10.5 ft.											

Water Level Data						Sample Identification	Well Diagram	Summary
Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water	O Open End Rod	Riser Pipe	Overburden (lin. ft.) 10.5
						T Thin Wall Tube	Screen	Rock Cored (lin. ft.) --
						U Undisturbed Sample	Filter Sand	Samples 3G
						S Split Spoon	Cuttings Grout	**Boring No.** B-203
						G Geoprobe	Concrete Bentonite Seal	

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-204

Project: Lexington Die Casting, UST Evaluation and Closure Program Lakewood, New York
Client: Lexington Die Casting Company
Contractor: SLC, Inc.

File No. 70533-006
Sheet No. 1 of 1
Start: April 8, 2004
Finish: April 8, 2004
Driller: R. Rose
H&A Rep.: S. Amrozowicz
Elevation:
Datum:
Location:

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	--	G	--	Rig Make & Model: Geoprobe 5LT
Inside Diameter (in.)	--	1 3/8	--	Bit Type:
Hammer Weight (lb.)	--	140	-	Drill Mud: None; Casing:
Hammer Fall (in.)	--	30	-	Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Toughness	Plasticity	Strength
0			0.0	NO WELL INSTALLED			Concrete slab to 0.3 ft.		100									
	N/A	G1 14	0.3 0.3 4.0		0.3	SP	G1: Brown poorly-graded SAND with gravel (SP), mps, 1 in., no structure, no odor, wet with concrete -FILL-	PID = 1.1 ppm	10	15	15	30	25	5				
	N/A	G2 70	4.0 8.0			SP	G2A: Brown poorly-graded SAND with gravel (SP), mps, 1 in., no structure, no odor, wet -FILL-	PID = 2.0 ppm PID = 2.1 ppm										
5					5.7	ML	G2B: Mottled blue-gray to brown SILT (ML), mps 1 in., gravel, blocky structure, no odor, moist to dry -LACUSTRINE-	PID = 1.8 ppm PID = 1.9 ppm		10				90				
	N/A	G3 14	8.0 10.0			ML	G3: Mottled blue-gray to brown SILT with gravel (ML), mps 1 in., gravel, blocky structure, no odor, moist with occasional moist to wet areas LACUSTRINE-	PID = 1.3 ppm PID = 1.4 ppm	5	10								
10					10.0		Refusal at 10.0 ft. Bottom of boring at 10.0 ft.	PID = 0.6 ppm										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification
- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary
- Overburden (lin. ft.) 10
- Rock Cored (lin. ft.) --
- Samples 3G

Boring No. B-204

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Toughness: L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

USCS_TB3APID USCSLIB4.GLB USCSTC3A.GDT G:\PROJECTS\70533\006\70533-006TB.GPJ Dec 19, 06

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-205

Project	Lexington Die Casting, UST Evaluation and Closure Program Lakewood, New York
Client	Lexington Die Casting Company
Contractor	SLC, Inc.

File No.	70533-006
Sheet No.	1 of 1
Start	April 8, 2004
Finish	April 8, 2004
Driller	R. Rose
H&A Rep.	S. Amrozowicz
Elevation	
Datum	
Location	

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	--	G	--	Rig Make & Model: Geoprobe 5LT
Inside Diameter (in.)	--	1 3/8	--	Bit Type:
Hammer Weight (lb.)	--	140	-	Drill Mud: None
				Casing:
Hammer Fall (in.)	--	30	-	Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0			0.0	NO WELL INSTALLED			Concrete slab to 0.3 ft.		100									
	N/A	G1 26	0.3 0.3 4.0		0.3	SM	G1: Gray-brown silty SAND with gravel (SM), mps 0.75 in., no structure, no odor, moist -FILL-	PID = 0.4 ppm PID = 1.8 ppm PID = 2.6 ppm		10	15	10	35	30	R			
	N/A	G2 23	4.0 8.0			SM	G2: Gray-brown silty SAND with gravel (SM), mps 0.75 in., no structure, no odor, moist to wet at 7.0 ft. -FILL-	PID = 3.1 ppm PID = 2.4 ppm PID = 2.6 ppm PID = 2.5 ppm										
5																		
	N/A	G3 20	8.0 9.9			SM	G3: Gray-brown silty SAND with gravel (SM), mps 0.75 in., no structure, no odor, wet -FILL-	PID = 0.4 ppm PID = 0.4 ppm		10	15	10	10	20	35			
10					10.9		Refusal at 10.9 ft. Bottom of boring at 10.9 ft.											

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (lin. ft.) 10.9
Rock Cored (lin. ft.) --
Samples 3G

Boring No. B-205

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-206

Project: Lexington Die Casting, UST Evaluation and Closure Program Lakewood, New York
Client: Lexington Die Casting Company
Contractor: SLC, Inc.

File No. 70533-006
Sheet No. 1 of 1
Start: April 8, 2004
Finish: April 8, 2004
Driller: R. Rose
H&A Rep.: S. Amrozowicz
Elevation
Datum
Location

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	--	G	--	Rig Make & Model: Geoprobe 5LT
Inside Diameter (in.)	--	1 3/8	--	Bit Type:
				Drill Mud: None
Hammer Weight (lb.)	--	140	-	Casing:
Hammer Fall (in.)	--	30	-	Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0			0.0	NO WELL INSTALLED			Concrete slab to 0.3 ft.		100									
	N/A	G1 39	0.3 0.3 4.0		0.3	SP	G1: Tan-brown poorly-graded SAND with gravel (SP), mps 1 in., no structure, no odor, moist to dry -FILL-	PID = 0.4 ppm PID = 0.7 ppm	10	5	20	20	40	5				
5	N/A	G2 40	4.0 8.0		3.9	ML	G2: Mottled tan, gray and brown sandy SILT with gravel (ML), mps 1 in., blocky structure to no structure, moist, no odor -probable LACUSTRINE-	PID = 0.6 ppm PID = 0.5 ppm PID = 0.8 ppm PID = 0.6 ppm	5	10	15	10	20	40		L	N	
10	N/A	G3 30	8.0 10.4			ML	G3: Blue-gray to brown SILT (ML), blocky structure, no odor, dry -LACUSTRINE-	PID = 0.4 ppm PID = 0.6 ppm		5				95				
					10.4		Refusal at 10.4 ft. Bottom of boring at 10.4 ft.											

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification
- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary
Overburden (lin. ft.) 10.4
Rock Cored (lin. ft.) --
Samples 3G

Boring No. B-206

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. B-207

Project Lexington Die Casting, UST Evaluation and Closure Program Lakewood, New York
Client Lexington Die Casting Company
Contractor SLC, Inc.

File No. 70533-006
Sheet No. 1 of 1
Start April 8, 2004
Finish April 8, 2004
Driller R. Rose
H&A Rep. S. Amrozowicz
Elevation
Datum
Location

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	--	G	--	Rig Make & Model: Geoprobe 5LT
Inside Diameter (in.)	--	1 3/8	--	Bit Type: / Drill Mud: None
Hammer Weight (lb.)	--	140	-	Casing:
Hammer Fall (in.)	--	30	-	Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Toughness	Plasticity	Strength
0			0.0	NO WELL INSTALLED			Concrete slab to 0.3 ft.		100									
	N/A	G1 19	0.3 0.3 4.0		0.3	SP	G1: Brown and gray poorly-graded SAND with gravel (SP), mps 0.75 in., no structure, no odor, moist to dry, trace organic silts -FILL-	PID = 0.9 ppm; PID = 1.0 ppm; PID = 0.4 ppm	10	10	20	25	30	5				
5	N/A	G2 35	4.0 8.0		4.3	SM	G2: Brown to gray silty SAND with gravel (SM), mps 0.75 in., some striated and blocky structure, moist -PROBABLE REWORKED LACUSTRINE-	PID = 0.6 ppm; PID = 0.8 ppm; PID = 0.4 ppm	10	20	10		20	40				
	N/A	G3 31	8.0 10.9															
10					9.1	MH	G3: Mottled blue-gray to tan elastic SILT with sand and gravel (MH), mps 1 in., blocky structure, no odor, moist -LACUSTRINE-			10		5	5	80				
					10.9		Refusal at 10.9 ft. Bottom of boring at 10.9 ft.											

Water Level Data					
Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (lin. ft.) 10.9
Rock Cored (lin. ft.) --
Samples 3G

Boring No. B-207

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

USCS_TB3APID USCSLIB4.GLB USCSTC3A.GDT G:\PROJECTS\70533\006\70533-006TB.GPJ Dec 19, 06

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-208

Project LAKEWOOD UST INVESTIGATION LAKEWOOD, NEW YORK
Client Lexington Die Casting Company
Contractor SLC Drilling, Inc.

File No. 70533-007
Sheet No. 1 of 1
Start May 5, 2004
Finish May 5, 2004
Driller R. Rose
H&A Rep. S. Amrozowicz
Elevation
Datum
Location

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	--	G	--	Rig Make & Model: Geoprobe 5 LT
Inside Diameter (in.)	--	1 7/8	--	Bit Type:
Hammer Weight (lb.)	--	Auto	-	Drill Mud: None
Hammer Fall (in.)	--	Auto	-	Casing:
				Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0				NO WELL INSTALLED			Concrete slab thickness of 0.3 ft.											
	N/A	G1 22	0.3 4.0		0.3	OL/OH	G1: Soft, gray, ORGANIC SILTS (OL/OH), mps 1/2 in., no structure, organic odor, wood fragments, very moist, some broken brick present. -FILL-	PID = 3.1 ppm; PID = 3.0 ppm; PID = 2.8 ppm		5		15	5	80		L	N	
5	N/A	G2 29	4.0 8.0		4.4	MH	G2: Mottled, brown-gray, dark gray, sandy elastic SILT (MH), similar consistency to G1, no structure, no odor, moist. probable reworked glacial lacustrine	PID = 2.6 ppm; PID = 2.8 ppm; PID = 3.1 ppm		5	10	5	5	75		L	N	
	N/A	G3 38	8.0 10.8			ML	G3: Similar to G2 except moist to wet, presence of red brick. Dry weathered bedrock at 10.6 ft. to 10.8 ft.	PID = 0.8 ppm; PID = 2.0 ppm; PID = 1.6 ppm			5	10	20	65		L	N	
10					10.8		Refusal at 10.8 ft. Bottom of boring at 10.8 ft.											
15																		

Water Level Data					
Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (lin. ft.) 10.8
Rock Cored (lin. ft.) --
Samples 3G

Boring No. HA-208

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1] SPT = Sampler blows per 6 in. [2] Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-209

Project LAKEWOOD UST INVESTIGATION LAKEWOOD, NEW YORK
Client Lexington Die Casting Company
Contractor SLC Drilling, Inc.

File No. 70533-007
Sheet No. 1 of 1
Start May 5, 2004
Finish May 5, 2004
Driller R. Rose
H&A Rep. S. Amrozowicz
Elevation
Datum
Location In front of men's door (10ft. from corner)

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	--	G	--	Rig Make & Model: Geoprobe 5 LT
Inside Diameter (in.)	--	1 7/8	--	Bit Type:
Hammer Weight (lb.)	--	Auto	-	Drill Mud: None
Hammer Fall (in.)	--	Auto	-	Casing: / Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0				NO WELL INSTALLED			Concrete slab thickness of 0.3 ft.											
	N/A	G1 37	0.3 4.0		0.3	ML	G1: Light brown to gray sandy SILT with a trace of clay (ML), mps 3/4 in., angular, no odor, no structure, moist, wood fragments -FILL-	PID = 2.8 ppm	5	5		10	5	75		L	N	
								PID = 1.6 ppm										
								PID = 1.8 ppm										
5	N/A	G2 47	4.0 8.0		4.4	MH	G2: Mottled tan and brown with dark brown streaks, sandy elastic SILT (MH), mps 9mm, slightly cohesive structure, no odor, moist to wet from 5.0 ft. to 6.0 ft. -POSSIBLE REWORKED GLACIAL TILL-	PID = 1.8 ppm			10	5	30	65		L		
								PID = 2.3 ppm										
								PID = 2.4 ppm										
	N/A	G3 27	8.0 10.4		8.0	SP	G3: Light brown, silty SAND with gravel (SP), mps 1 in., no structure, no odor, wet from 9.0 ft. to 9.2 ft., remainder is moist -GLACIAL TILL-	PID = 1.1 ppm	5	10	25	5	20	35		L		
10								PID = 0.8 ppm										
					10.4		Refusal at 10.4 ft. Bottom of boring at 10.4 ft.	PID = 0.6 ppm										
15																		

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (lin. ft.) 10.4
Rock Cored (lin. ft.) --
Samples 3G

Boring No. HA-209

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None; Toughness: L-Low, M-Medium, H-High; Plasticity: N-Nonplastic, L-Low, M-Medium, H-High; Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-210

Project	LAKEWOOD UST INVESTIGATION LAKEWOOD, NEW YORK
Client	Lexington Die Casting Company
Contractor	SLC Drilling, Inc.

File No.	70533-007
Sheet No.	1 of 1
Start	May 5, 2004
Finish	May 5, 2004
Driller	R. Rose
H&A Rep.	S. Amrozowicz
Elevation	
Datum	
Location	15 ft. from corner wall by bathroom

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	--	G	--	Rig Make & Model: Geoprobe 5 LT
Inside Diameter (in.)	--	1 7/8	--	Bit Type:
Hammer Weight (lb.)	--	Auto	-	Drill Mud: None
Hammer Fall (in.)	--	Auto	-	Casing:
				Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Concrete slab thickness of 0.3 ft.											
	N/A	G1 27	0.3 4.0		0.3		G1: Mix of brown SILT and pulverized white to light gray concrete, mps 3-5mm, no structure, no odor, dry, ash-like appearance -FILL-	PID = 0.4 ppm			5	15	80					
								PID = 0.6 ppm										
								PID = 0.9 ppm										
	N/A	G2 42	4.0 7.8					PID = 0.3 ppm										
5				NO WELL INSTALLED	4.9	MH	G2A: Tan to light brown, sandy, elastic SILT (MH), mps 1mm, slight cohesive structure, no odor, moist -LACUSTRINE-	PID = 0.6 ppm		8		5	35	60		L	L	
								PID = 0.2 ppm										
					6.2	SM	G2B: Mottled, red-brown to light brown silty SAND (SM), mps 3/4 in., no structure, no odor, moist -GLACIAL TILL-	PID = 0.4 ppm			5	10	50	30				
					7.8		Refusal at 7.8 ft. Bottom of boring at 7.8 ft.	PID = 0.3 ppm										
10																		
15																		

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Depth (ft.) to: Bottom of Hole	Water

Sample Identification

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon
- G Geoprobe

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (lin. ft.)	7.4
Rock Cored (lin. ft.)	--
Samples	2G

Boring No. HA-210

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

USCS_TB3APID USCSLIB4.GLB USCSTC3A.GDT G:\PROJECTS\70533\007\70533-007TBPID.GPJ Jun 2, 04

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-211

Project LAKEWOOD UST INVESTIGATION LAKEWOOD, NEW YORK
Client Lexington Die Casting Company
Contractor SLC Drilling, Inc.

File No. 70533-007
Sheet No. 1 of 1
Start May 5, 2004
Finish May 5, 2004
Driller R. Rose
H&A Rep. S. Amrozowicz
Elevation
Datum
Location Between 2 c&c lather, 10 ft. from dividing wall

	Casing	Sampler	Barrel
Type	--	G	--
Inside Diameter (in.)	--	1 7/8	--
Hammer Weight (lb.)	--	Auto	-
Hammer Fall (in.)	--	Auto	-

Drilling Equipment and Procedures
Rig Make & Model: Geoprobe 5 LT
Bit Type:
Drill Mud: None
Casing:
Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Toughness	Plasticity	Strength
0				NO WELL INSTALLED			Concrete slab thickness of 0.3 ft.											
	N/A	G1 20	0.3 4.0		0.3	SP	G1: Tan-brown, poorly-graded SAND with gravel (SP), mps 3/4 in., no structure, n odor, dry -FILL-	PID = 0.3 ppm	20	15	5	30	25	5				
								PID = 0.4 ppm										
								PID = 0.2 ppm										
								PID = 0.8 ppm										
	N/A	G2 33	4.0 8.0															
5					4.6	SM	G2: Brown, silty SAND with gravel (SM), mps 1.25 in., no structure, sewer-like odor smell at 7.4 ft. to 7.6 ft. with gray staining, moist -PROBABLE GLACIAL TILL-	PID = 1.4 ppm	10	5	15	20	30	20				
								PID = 2.0 ppm										
								PID = 1.7 ppm										
	N/A	G3 41	8.0 11.6				G3A: Brown, silty SAND with gravel (SM), mps 1.25 in., no structure, slight odor, moist -PROBABLE GLACIAL TILL-	PID = 1.2 ppm	5	5	10	25	30	25				
10								PID = 0.8 ppm										
					11.0		G3B: Tan, sandy SILT with gravel (ML), mps 1 in., -GLACIAL TILL-	PID = 1.3 ppm	10	5			20	65				
					11.6		Refusal at 11.6 ft. Bottom of boring at 11.6 ft.											
15																		

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (lin. ft.) 11.6
Rock Cored (lin. ft.) --
Samples 3G

Boring No. HA-211

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Toughness: L-Low, M-Medium, H-High Plasticity: N-Nonplastic, L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA-212

Project LAKEWOOD UST INVESTIGATION LAKEWOOD, NEW YORK
Client Lexington Die Casting Company
Contractor SLC Drilling, Inc.

File No. 70533-007
Sheet No. 1 of 1
Start May 5, 2004
Finish May 5, 2004
Driller R. Rose
H&A Rep. S. Amrozowicz
Elevation
Datum
Location

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	--	G	--	Rig Make & Model: Geoprobe 5 LT
Inside Diameter (in.)	--	1 7/8	--	Bit Type: / Drill Mud: None
Hammer Weight (lb.)	--	Auto	-	Casing:
Hammer Fall (in.)	--	Auto	-	Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0							Concrete slab thickness of 0.3 ft.											
	N/A	G1 13	0.3 4.0	NO WELL INSTALLED	0.3	SP-SM	G1: Brown, poorly-graded SAND with silt and gravel (SP/SM), mps 1 in., no structure, no odor, moist to dry, topsoil appearance -FILL-	PID = -- ppm	10	10	5	5	60	10				
								PID = -- ppm										
								PID = 1.1 ppm										
								PID = -- ppm										
	N/A	G2 47	4.0 8.0		4.2	ML	G2A: Refusal at 4.6 ft., limestone cobble in spoon. Offset approximately 8 ft.	PID = 2.9 ppm				10	30	60		L	N	
5					5.3	SP	G2B(B212A): Light brown, sandy SILT (ML) from 4.2 ft. to 5.3 ft. then mottled, gray-brown, poorly-graded SAND (SP), mps 1/2 in., no structure, no odor, moist -PROBABLE GLACIAL TILL-	PID = 2.7 ppm		5	10	25	55	5				
								PID = 2.8 ppm										
								PID = 2.9 ppm										
	N/A	G3 44	8.0 11.6					PID = 1.7 ppm										
								PID = 4.3 ppm										
10					9.8	ML	G3: Light brown, sandy SILT (ML) blocky structure, no odor, moist to dry					5	15	80				
								PID = 2.4 ppm										
					11.6		Refusal at 11.6 ft. Bottom of boring at 11.6 ft.											
15																		

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (lin. ft.) 11.6
Rock Cored (lin. ft.) --
Samples 3G

Boring No. HA-212

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1] SPT = Sampler blows per 6 in. [2] Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

USCS_TB3APID USCSLIB4.GLB USCSTC3A.GDT G:\PROJECTS\70533\007\70533-007TBPID.GPJ Jun 2, 04

TEST BORING REPORT

HALEY & ALDRICH

Boring No. HA-213

Project LAKEWOOD UST INVESTIGATION LAKEWOOD, NEW YORK
Client Lexington Die Casting Company
Contractor SLC Drilling, Inc.

File No. 70533-007
Sheet No. 1 of 1
Start May 5, 2004
Finish May 5, 2004
Driller R. Rose
H&A Rep. S. Amrozowicz
Elevation
Datum
Location

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	--	G	--	Rig Make & Model: Geoprobe 5 LT
Inside Diameter (in.)	--	1 7/8	--	Bit Type: / Drill Mud: None
Hammer Weight (lb.)	--	Auto	-	Casing:
Hammer Fall (in.)	--	Auto	-	Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT[1]	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size[2], structure, odor, moisture, optional descriptions, geologic interpretation)		Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0				NO WELL INSTALLED			Concrete slab thickness of 0.3 ft.											
	N/A	G1 36	0.3 4.0		0.3	SP-SM	G1: Mottled, red-brown, poorly-graded SAND woth silt (SP/SM), sameday, no structure, no odor, moist -FILL-	PID = 1.6 ppm			5	10	75	10				
								PID = 1.8 ppm										
								PID = 1.2 ppm										
								PID = 1.4 ppm										
	N/A	G2 40	4.0 8.0															
5					5.2	SM	G2: Mottled, red-brown, silty SAND with clay seams (SM), no structure, no odor, moist -REWORKED LACUSTRINE-	PID = 0.7 ppm PID = 1.2 ppm			5	10	50	35				
								PID = 0.8 ppm										
								PID = 0.9 ppm										
	N/A	G3 29	8.0 10.9			SM	G3: Mottled, red-brown, silty SAND with gravel (SM), mps 1 in., angular broken cobble, no structure, no odor, moist to wet	PID = 0.6 ppm PID = 0.6 ppm										
10								PID = 1.1 ppm										
								PID = 0.7 ppm										
					10.9		Refusal at 10.9 ft. Bottom of boring at 10.9 ft.											
15																		

Water Level Data					
Date	Time	Elapsed Time (hr.)	Depth (ft.) to: Bottom of Casing	Bottom of Hole	Water

Sample Identification
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (lin. ft.) 10.9
Rock Cored (lin. ft.) --
Samples 3G

Boring No. HA-213

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

[1]SPT = Sampler blows per 6 in. [2]Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

USCS_TB3APID USCSLIB4.GLB USCSTC3A.GDT G:\PROJECTS\70533\007\70533-007TBPID.GPJ Jun 2, 04

APPENDIX E – GROUNDWATER MONITORING WELL SAMPLING FORM

GROUNDWATER MONITORING WELL SAMPLING LOG
WELL NO. ________
PROJECT: 12014-000048.00
LOCATION: 201 WINCHESTER ROAD, LAKEWOOD, NY
SAMPLING DATE:________ SAMPLED BY: JOHN STANGLINE
SAMPLING METHOD: PERISTALTIC PUMP
WEATHER:__________________________
SAMPLING TIME:____________________AMBIENT TEMP:____________________

WATER ELEVATION DATA:
METHOD OF MEASUREMENT: DEPTH SOUNDER:_______
WATER LEVEL GAUGE: X
DEPTH TO WATER (FT):________________________________
PURGE METHOD: LOW FLOW
DEPTH OF PUMP BELOW TOP OF CASING (FT):_________________
WAS WELL PUMPED DRY?_____ YES _______NO
TOTAL GALLONS PURGED:______________________

TIME	DEPTH TO WATER	TURBIDITY	CONDUCTIVITY	TEMP	DO	PH	ORP

Comments:____

APPENDIX F – SITE WIDE INSPECTION FORM

SITE-WIDE INSPECTION FORM

Inspection Period: ____________________

Reason for inspection: _____Annual _____Severe Weather Event
(Site-wide inspection required annually or following a severe weather event that may have damaged site engineering controls or monitoring wells)

Project location:____

Inspection date / time:____________ conducted by:_______________________
Weather:__________________________________
Site remains industrial/commercial use? ________Yes ________No
If no, what is the current use?_____________________________
Is site occupied and operational?___________________________

Are structures indicated on the Site Layout Map of SMP Figure 2 remaining?
___________Yes ________No
If no, described current site conditions, specifically condition of the concrete floor of the existing / former structure____
____

Are monitoring wells depicted on SMP Figure 8 in place and undamaged?
___________Yes ________No
If no, described monitoring well conditions_____________________________________
____

Has the annual groundwater monitoring program been implemented for the inspection period? __________Yes ________No

Have monitoring results been reported to the NYSDEC as indicated in the SMP?
___________Yes ________No

Are records required by the SMP complete, current and available at the Site?
___________Yes ________No
If not available on-site are there records available elsewhere?
___________Yes ________No Where?_______________________________

Have any reportable spills of regulated materials occurred or evidence of former spills be discovered? _______Yes ________No . If Yes, describe: _______________________
____
____

APPENDIX G – NEW YORK STATE DEPARTMENT OF HEALTH GENERIC COMMUNITY AIR MONITORING PLAN

New York State Department of Health
Generic Community Air Monitoring Plan

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

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a **continuous** basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored **continuously** at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must 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 downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

June 20, 2000

P:\Bureau\Common\CommunityAirMonitoringPlan (CAMP)\GCAMPR1.DOC

APPENDIX H – QUALITY ASSURANCE PROJECT PLAN

Quality Assurance Project Plan

For Site Monitoring and Intrusive Work Activities

Premier Lakewood Inc. Site
201 Winchester Road
Village of Lakewood, Town of Busti,
Chautauqua County, New York

May 23, 2013
Bureau Veritas Project No.: 12013-000091.00

Lexington Machining LLC

For the benefit of business and people

Bureau Veritas North America Inc.
Raritan Plaza One
110 Fieldcrest Avenue, Fourth Floor
Edison, New Jersey 08837
732.225.6040
www.us.bureauveritas.com

CONTENTS

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) for site monitoring activities of the Premier Lakewood site located in the Village of Lakewood, Town of Busti, County of Chautauqua, New York, has been prepared on behalf of Lexington Machining LLC by Bureau Veritas North America, Inc. (BVNA). This QAPP presents the organization, data quality objectives, functional activities, analytical methods, and specific Quality Assurance and Quality Control (QA/QC) procedures to be used by BVNA and its subcontractors. Specific protocols that will be followed for data collection, sampling, sample handling, chain of custody, and laboratory and field analysis are discussed herein.

Planned site monitoring activities are part of the annual monitoring required within the Site Management Plan (SMP) of the performance of the remedy and the overall reduction in contamination on-site. The groundwater monitoring program was implemented to monitor groundwater plume characteristics, horizontal and vertical contaminant migration and related controlling processes. A soil vapor intrusion (SVI) evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure or alternatively, an SVI mitigation system may be installed as an element of the building foundation without first conducting an investigation. This QAPP has been prepared in accordance with applicable New York State Department of Environmental Conservation "Technical Guidance for Site Investigation and Remediation" Final DER-10 dated May 2010 and good engineering practices.

2.0 PROJECT DESCRIPTION

Site drilling, sampling and monitoring activities will be conducted to periodically evaluate the performance of the remedy and overall reduction in contamination on-site. Monitoring will be conducted in accordance with SMP section 3.0, Site Monitoring Plan and referenced sample locations and scope. The proposed site monitoring activities, at a minimum, include the following:

- Collection of groundwater samples through existing or new monitoring wells
- Soil vapor, sub-slab vapor, and/or indoor air sampling
- Drilling
- Soil samples

Sampling will include in-field screening with a Photo Ionization Detector (PID) field measurement and observations, drilling and sample collection, and submission of samples to a NYS certified laboratory for analysis.

Anticipated intrusive work may include, test pit excavation, soil borings / monitoring well installation, site grading, building demolition, construction or other activities that may disturb areas of impacted soil or groundwater of the site.

2.1 SITE DESCRIPTION

The Site is located in the Village of Lakewood, Town of Busti, County of Chautauqua, New York on, (Figure 1 – Site Location Map). The property is situated on three lots identified as Block 385 Lots 06-3-58, 06-3-59 and 06-3-60. The site is approximately 5.7 acres and is bounded by a Chautauqua Regional Railroad Authority rail line to the north, a residential property and a vacant commercial/industrial facility to the south. Matco Tools manufacturing facility and American Legion Lakewood Memorial Post 1286 to the east, and Winchester Road to the west. (Figure 2 – Site Plan).

2.2 SITE HISTORY

The site was undeveloped vacant land at least through the 1930s with initial construction of the existing manufacturing building beginning circa 1956. Die casting operations have been located at the property since that time. The manufacturing plant was occupied through the 1980s by Falconer Metal Specialties, which was succeeded by Falconer Die Casting, Lexington Die Casting, and Premier Tool & Die, and Premier Lakewood, Inc. the current operator. Lexington Precision Corporation, the previous owner of the Property, was the owner of Lexington Die Casting before selling the manufacturing equipment and operation to Premier Tool & Die in 2006. The current site owner is LMLLC. Historical environmental reports prepared and available for the Site include the following:

- Phase I Environmental Site Assessment, Falconer Die and Casting Company, prepared by H & A of New York, April 25, 1995

- Phase I Environmental Site Assessment, Lexington Die Casting Company, prepared by Gemini Geotechnical Associates, Inc., July 24, 2002

- Phase I Environmental Site Assessment, 201 Winchester Road, Lakewood, NY, prepared by Clayton Group Services, Inc, December 12, 2002

- Phase I Environmental Site Assessment, Premier Tool and Die, prepared by Haley & Aldrich of New York, May 3, 2006

Aluminum, magnesium, and zinc die castings are manufactured for consumer and industrial products. The castings are manufactured by melting metal ingots, forming the molten metal in molds, and removing the castings from the molds. The castings then undergo a rough finishing process where contact water is utilized to cool the castings, remove burrs and smooth rough edges. The castings are also finished by manual sanding, grinding, and smoothing.

Contact process and cooling water is handled and treated in a closed-loop system consisting of settling tanks and a filtration system. Until 2004, the process and cooling water system used five unregulated settling tanks that were located under the plant floor. In 2004, the below-grade tanks associated with the die-casting process were removed from service and replaced with aboveground tanks. Two of the 1,000-gallon below-grade tanks were cleaned and filled with concrete while the remaining three 1,000-gallon tanks were cleaned in-place and taken out of service.

Lubricants were used to release the castings from molds and in machinery. Non-hazardous cleaners and lubricants, including water-soluble products, were used at the manufacturing plant. Spent cleaning products and lubricants are accumulated in 55-gallon drums at the point of use and disposed as non-hazardous waste on an as needed basis by a licensed waste hauler.

Small-quantity hazardous wastes generated at the Site prior to 1991 reportedly included spent 1,1,1-trichloroethane (1,1,1-TCA), lubricating oils, and light-weight oils. 1,1,1-TCA, a chlorinated volatile organic compound (VOC), was used at the plant from approximately 1960 to 1991 as a solvent and degreaser and was stored in an above ground tank inside the plant. In 1991, the manufacturing plant reportedly began using only non-hazardous degreasers and cooling oils.

Available information indicates that underground fuel or solvent storage tanks are not currently and have not previously been present at the site. Available information indicates that petroleum and solvent are/were stored and handled in drums or in above ground tanks. The manufacturing plant generates solid waste in the form of paper, cardboard, wooden boxes, and spent filter media from the process and cooling water treatment system. Metal shavings and cuttings from the die casting manufacture and finishing processes are re-smelted. Dross (waste die-casting material that is not suitable for re-smelting) is sold back to suppliers.

2.3 WORK PLAN TASKS

Details of the scope of work are discussed in BVNA's Site Management Plan (SMP) dated March, 2013. In summary, BVNA will:

- Conduct a SVI evaluation in accordance with the most recent NYSDOH "Guidance for Evaluating Vapor Intrusion in the State of New York."
- Obtain groundwater samples from onsite monitoring well to be analyzed at New York State certified laboratory.

2.3.1 Monitoring Wells

All monitoring well sampling activities and observations will be recorded in a field book and a groundwater-sampling log as presented in Appendix E of the SMP.

Soil sampling is not anticipated but if evidence gives suggestion that advancing soil borings is required; all borings will be advanced by a well driller licensed by the State of New York. Samples will be collected from soil borings advanced using the hollow stem auger drilling method. A boring log will be prepared by a qualified individual for all drilling locations. The boring log will include:

- soil types and description of non-soil materials:
- field instrument measurement readings (PID or FID);
- depth to groundwater (if encountered); and
- document physical evidence of impact, including (but not limited to):
    - soil mottling;
    - presence of odor or vapors;
    - soil discoloration or staining; and
    - non-aqueous phase liquid (NAPL), free and/or residual product

- sample locations will be documented by use of GPS;

Soil will be described using the New York State Department of Transportation *Soil Description Procedure* (NYSDOT Soil Mechanics Bureau STP-2 dated May 1, 1975 as amended) or unified soil classification system (USCS) set forth in ASTM 2488.

Any soil exhibiting NAPL or gross contamination will be segregated for disposal in accordance with the applicable regulations.

Should soil borings be advanced, backfilling the borehole with cuttings will create a significant pathway for the vertical movement of contaminants. Soil additives (bentonite) may be added to the cuttings to reduce permeability. The soil that cannot fit into the borehole must be containerized, waste classified and disposed offsite. In unpaved areas, the top 12 inched of material place in the borehole must be cohesive, compact soil meeting the requirements of DER-10 Appendix 5 or sealed with bentonite mixture.

2.3.2 Soil Vapor Investigation (SVI)

An SVI evaluation will be performed over interior areas of the current site structure that contains residual volatile organic contamination and where potential SVI may occur (See SMP Figure 7). According to the New York State Department of Health (NYSDOH) Guidance for Evaluating Vapor Intrusion in the State of New York NYSDOH, indoor air samples should be collected in the following manner:

“a. sampling duration should reflect the exposure scenario being evaluated without compromising the detection limit or sample collection flow rate (e.g., an 8 hour sample from a workplace with a single shift versus a 24 hour sample from a workplace with multiple shifts). To ensure that air is representative of the locations sampled and to avoid undue influence from sampling personnel, samples should be collected for at least 1 hour. If the goal is to represent average concentrations over longer periods, then longer duration sampling periods may be appropriate.

b. personnel should avoid lingering in the immediate area of the sampling device while samples are being collected;

c. sample flow rates must conform to the specifications in the sample collection method and, if possible, should be consistent with the flow rates for concurrent outdoor air and sub-slab samples; and

d. samples must be collected, using conventional sampling methods, in an appropriate container—one which

  i. meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation),
  ii. is consistent with the sampling and analytical methods (e.g. low flow rate; Summa canisters if analyzing by using EPA Method TO-15), and
  iii. is certified by the laboratory”

2.3.3 Field Screening and Sample Collection

Groundwater samples will be collected using polyethylene tubing and peristaltic pump and/or disposable polyethylene micro-bailers. Groundwater samples will be collected using the low-stress purging and sampling technique. The samples will be transferred into laboratory-provided bottleware, and shipped overnight in an ice-filled cooler to a New York State certified laboratory. (Test America, Inc. – NELAC - 10026). Field blank samples (one per field day) and one trip blank sample will be collected for quality assurance/quality control (QA/QC). Appropriate decontamination procedures will be followed, and proper chain of custody procedures will be employed.

Groundwater samples will be analyzed for target compound list (TCL) volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) method 8260B. The analytical results will be compared to the NYSDEC Groundwater Quality Standards to evaluate targeted compounds present above laboratory detection limits. All samples will be placed in laboratory provided, clean, glass jars and store them in a cooler with ice until they are delivered to the selected New York State Department of Health “Environmental Laboratory Accreditation Program” or “ELAP” certified laboratory for analysis USEPA Method 8260.

Indoor air samples will be analyzed for volatile chemicals which have been previously detected in environmental media at the site. In addition to analyzing for volatile chemicals which are known or demonstrated constituents of the contamination in question, their expected degradation products of the chemicals aforementioned will also be screened. A sample log sheet containing the following information will be kept by the field sampling team:

a. Sample identification,
b. Date and time of sample collection,
c. Sampling depth,
d. Identity of samplers,
e. Sampling methods and devices,
f. Purge volumes,
g. Volume of soil vapor extracted,

h. If canisters used, the vacuum before and after samples were collected,
i. Apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and
j. Chain of custody protocols and records used to track samples from sampling point to analysis.

2.3.4 Sample Analysis

Groundwater and quality assurance/quality control samples will be analyzed per USEPA Method 8260B for VOCs. Soil vapor and indoor air samples will be analyzed for VOCs by USEPA Method TO-15. The laboratory reports will be limited to the following VOCs:

- o The four previously identified principal VOCs noted below; and
  - tetracholoethene (PCE)
  - trichloroethene (TCE
  - 1,1,1-trichloroethane (1,1,1-TCA)
- o their associated degradation products:
  - 1,1-dichloroethene (1,1-DCE)
  - cis-1,2-dichloroethene (c-DCE)
  - trans-1,2-dichloroethene (t-DCE)
  - vinyl chloride (VC)
  - 1,1-dichloroethane (1,1-DCA)
  - chloroethane

2.4 STANDARDS, CRITERIA AND GUIDANCE (SCGS)

Groundwater data will be compared to the NYSDEC Groundwater Quality Standard (GWQS). The State of New York does not have any standards, criteria or guidance values for concentrations of volatile chemicals in subsurface vapors (either soil vapor or sub-slab vapor).

Indoor and outdoor air sampling results will be compared to the air guideline values derived by the NYSDOH in Table 3.1 of the Final NYSDOH CEH BEEI Soil Vapor Intrusion Guidance, October 2006.

2.5 WASTE MANAGEMENT

It is anticipated that two waste streams will be generated during this investigation; 1) purge water 2) personal protective equipment and acetate sleeve, Soil vapor wastes?

All monitoring wells will be closed and secured at the end of each day. Purge water will be stored in 55 gallon drums and characterized for disposal in accordance with regulatory requirements.

Personal protective equipment (such as disposable gloves), acetate sleeves and any decontamination water will be staged in drums, appropriate labeled, sampled for waste classification purposes (if necessary) and removed from the site for disposition in accordance with the applicable NYS regulations. Investigative derived waste (primarily soils) will be analyzed using Toxicity Characterization Leaching Procedure (TCLP) USEPA Test Method 1311 and RCRA Characteristics analysis. Consumable items, (gloves, acetate sleeves etc.) will be disposed at the equivalent waste disposal classification as the investigation derived soil waste.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Subcontractors have been retained to perform drilling, laboratory analysis, and other activities. Responsible individuals participating in the project and each key person's responsibilities are summarized below:

Principle/Project Director

Mr. William Muñoz, P.E., P.G., will be responsible for coordinating project activities. He will further be responsible for coordinating communications between the BVNA field team. Mr. Muñoz will coordinate project activities, will be responsible for directing the implementation of the project plan, as well as scheduling, cost control, and integrating the various technical disciplines required during this project.

Project Site Coordinator

Mr. John Stangline will function as the Project Site Coordinator on this project. All discussions, requests, reporting (including monthly progress reports, technical memoranda, requests for completion approval), and final reports will be directed to Mr. Stangline or his designee.

Project Quality Control Officer

Mr. John Stangline will serve as BVNA's Project Quality Control Officer. Mr. Stangline will provide general oversight and guidance to BVNA's field team, coordinate BVNA's field activities, communicate with field personnel, and serve as BVNA's Project Health and Safety Officer.

Data Coordinator

BVNA's Data Coordinator, Renee Cohen will be retained as a third party reviewer as necessary and will be responsible for:

- QA/QC evaluation of analytical data generated by BVNA,
- Maintaining analytical tracking information consistent with DER-10,
- Maintaining and addressing any QA/QC issues identified during the data evaluation with the respective laboratory, and
- Data Validation and development of the associated Data Usability Summary Report (DUSR) .

The following subcontractors may provide services to support field activities:

Laboratory – Chemical Analysis – TestAmerica, Inc. of Buffalo, New York will also support the analysis of samples collected.

Drilling - Drilling services will be provided by Aquifer Drilling and Testing (ADT) of Mineola, New York.

4.0 QUALITY ASSURANCE OBJECTIVES

The overall Quality Assurance (QA) objective is to ensure that suitable and verifiable data result from the plan's soil characterization (in the event that soil is sampled and logged), sampling of groundwater, and soil vapor and the analysis of these mediums. To achieve this objective the quality assurance procedures detailed in this plan must be followed for all data collection, field sampling, chain of custody, laboratory analysis, and reporting that will provide results legally defensible in a court of law. BVNA has prepared the following Quality Assurance Summary Table (see attached).

4.1 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements specified so that data of known and appropriate quality or suitable integrity are obtained to satisfy the objectives of the investigation. The investigation DQOs have been established in accordance with DER-10.

DQOs are typically classified by defining the level of analytical support assigned to each type of data measurement. The DQO analytical levels that may be used for the investigation are discussed below:

Level I - Field Screening

This level is characterized by use of portable instruments, such as a PID or a FID, which can provide real-time data to assist in selecting samples for laboratory analysis and monitoring for health and safety. Qualitative data can be generated regarding the presence or absence of certain types of potential constituents (e.g., volatile organics) at sampling locations. However, results are generally not compound-specific or quantitative. Operation and maintenance manuals for each portable instrument will be kept with the instrument during field operations. All field direct read instruments will calibrated at minimum of once per day in accordance with manufacturers guidelines.

Level II - Laboratory Analyses

This level refers to chemical analyses conducted by a NYSDOH certified laboratory. Level II chemical analyses are performed under NYSDOH ELAP guidelines using USEPA-approved methods.

Laboratory chemical analysis of soil and water samples (for parameters including volatile organic compounds [VOCs], semi-volatile organic compounds [SVOCs], and inorganics) to be collected during the implementation of investigative activities will provide Level II quality with standard QA/QC protocols and documentation requirements. These data will be used to characterize the subsurface conditions in the area of the Lexington Machining building.

BVNA will utilize it internal and and/or TestAmerica, Inc. to perform laboratory chemical analysis of soil, water and investigation derived waste samples. BVNA and TestAmerica, Inc. maintain ELAP certification by the NYSDOH.

4.2 Analytical Methods and Detection Limits

The proposed analytical methods and their respective detection limits, and practical quantitation limits for the soil and water samples to be collected by Bureau Veritas during the investigative activities are provided in the attached tables. (See Tables tab)

4.3 Data Usability

BVNA will prepare a Data Usability Summary Report (DUSR) of the analytical data prepared by the laboratory. Ms. Renee Cohen will be retained as a third party data reviewer to evaluate the usability of the data to be generated under the proposed Lexington Machining work plan. Ms. Cohen will review and affirm as applicable the following:

- Is the data package complete as defined under the requirements for the most current DEC ASP Category B or USEPA CLP data deliverables?
- Have all holding times been met?

- Do all the QC data; blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?
- Have all of the data been generated using established and agreed upon analytical protocols?
- Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?
- Have the correct data qualifiers been used and are they consistent with the most current DEC ASP?
- Have any quality control (QC) exceedances been specifically noted in the DUSR and have the corresponding QC summary sheets from the data package been attached to the DUSR?

The laboratory will take corrective action if the QC sample analyses do not fall within the 99 percent confidence intervals. The corrective action may include but is not limited to recalibration of the instruments or re-analysis of the QC sample(s). The Project Managers and/or Data Coordinators will be notified of any laboratory nonconformance and subsequent corrective actions taken.

4.4 QA Objectives for Measurement Data

Precision is the repeatability or reproducibility of individual measurements expressed as standard deviation or relative standard deviation (RSD). Precision will be assessed by the use of LCS and MS samples. Relative percent differences (RPDs) will be calculated for detected compounds in LCS and MS pairs, as available. An RPD of 20 percent will be used as an advisory limit, but professional judgment will be used for any data qualification.

Precision for field measurements will be assessed through the collection and analysis of duplicate samples. Duplicate samples will be collected at a rate of one duplicate per 20 investigative samples for each sample media (soil). Duplicate samples, along with their corresponding sample, will be reported in the analytical data set/tables. One trip blank will be included with each shipping container containing water and/or soil samples submitted for VOC analysis. Equipment blanks and rinseate blanks will be collected at a rate of one blank for every 20 samples for each type of sampling procedure. If fewer than 20 project samples are collected, a minimum of one equipment blank and rinseate blank will be submitted per sampling event.

5.0 SAMPLING PROCEDURES

Groundwater and soil vapor / indoor air samples will be collected during the site monitoring activities. The specific sampling procedures for collecting these samples are discussed in the Site Management *Plan*. As future field/activity sampling and work plans are developed, they will discuss their own specific sampling procedures.

5.1 SAMPLE CONTAINERS

Required sample containers, sample preservation methods, and maximum holding times are summarized in the “Data Quality Assurance” tables *(See Tables Tab)*. Groundwater samples collected for VOC analysis, they will be collected in accordance with USEPA method 8260.

5.2 SAMPLE CHAIN OF CUSTODY

In order to ensure the integrity of the analytical/testing results, a sample handling and chain of custody program will be followed. Descriptions of documentation procedures, chain of custody, and sample processing follow.

5.2.1 Field Documentation Procedures

Field logbooks will be maintained by personnel to provide the means of recording the field activities performed during the investigation. The field logbook entries will be described in as much detail as possible so that persons could reconstruct a particular situation solely from the logbook.

Field logbooks will consist of bound field survey books or notebooks with numbered pages. All entries in the logbooks will be made in ink with no scratch-outs or erasures. Errors will be struck with one line and initialed. The title page of each logbook will contain the following:

- Project name
- Start date of the logbook
- End date of the logbook
- Logbooks will be appropriately numbered

At a minimum, the logbooks will be used to record the following:

- Date
- Location/facility name
- Work activity and area
- Objective of each field activity
- Daily recording of climatic conditions
- Personnel within the work area
- Subcontractors and authorized visitors onsite
- Health and safety issues and concerns
- Time of each activity
- Sketch maps and sample locations (if applicable)
- Field decisions that deviate from scope of work
- General field observations
- Signature of documenting person

All photographs or video recordings will be appropriately documented in the field logbook with date, time, and subject and should include aspects such as direction if appropriate.

Documentation of sample acquisition will be performed in the field logbooks and on specified field data sheets. Entries in the logbook regarding sample acquisition will include the following:

- Unit / location identification
- Sample location and depth
- Sample acquisition procedure/equipment
- Sample identification
- Date and time of sample collection
- Type and number of sample containers used
- Preservatives used, if required
- Parameters requested for analysis
- Field measurements (i.e., pH, temperature, etc.)
- Sample transporter and laboratory name
- Field observations
- Name(s) and signature(s) of collector(s)

In addition to the field logbooks, pertinent sample information will be recorded on sample labels and sample description forms. Each sample will be labeled with a unique sample number to facilitate tracking and cross-referencing sample information. Field duplicate samples will be numbered with a unique sample number to prevent laboratory bias of field QC samples. Trip blanks, equipment blanks, and rinseate blank samples selected for analysis will not be submitted to the laboratory in a blind manner. BVNA's sample numbering system to be used follows:

SAMPLE NOMENCLATURE		
Soil	Sample Location / Interval / YYMMDD	Example: SB-20 / 10-12 FT / 060512
Duplicate	DUP-### / YYMMDD	Example: DUP-001 / 060512

SAMPLE NOMENCLATURE		
Equipment Blank	EQB-### / YYMMDD	Example: EQB-003 / 060512
Rinseate Blank	RB-### / YYMMDD	Example: RB-003 / 060512
Trip Blank	TB-### / YYMMDD	Example: TB-005 / 060512

5.2.2 Chain of Custody

Chain of custody forms will be used to track all samples from the time of sampling to the arrival of samples at the laboratory. The chain of custody process involves sample identification, appropriate sample containers, packaging, handling, and shipping.

A copy of the chain of custody record (three-part carbonless form) will be retained by the Field Manager. One original and one copy of the chain of custody record will accompany the sample shipment to the laboratory and will be signed by the receiving laboratory's sample custodian, who will retain the copy. The Field Manager will submit copies of the chain of custody record to the Data Coordinator.

5.2.3 Sample Packaging and Shipping Protocol

The sample packaging and shipping procedures summarized below will ensure that the samples arrive at the laboratory with the chain of custody intact:

- The field sampler is personally responsible for the care and custody of the samples until they are transferred to another person or the laboratory. As few people as possible will handle the samples.
- All sample containers will be identified by using sample labels that include the date of collection, sampler's initials, and analyses to be performed.
- Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook entry would explain that a pencil was used to fill out the sample label because a ballpoint pen would not function in freezing weather.
- The chain of custody form documents sample custody transfers from the sampler to another person, to the laboratory, or to/from a secure storage area. Samples will be accompanied by a properly completed chain of custody form bearing the sample identification numbers. When transferring the possession of samples, the individuals relinquishing and receiving the samples will sign and record the date and time on the form. The sampling team, after signing and relinquishing custody to the shipper, will retain the bottom copy. The middle copy will be retained by the laboratory, and the fully executed white copy will be returned as part of the data deliverables package.
- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis accompanied by a properly completed chain of custody. A separate signed chain of custody form will be enclosed in each sample cooler if shipped by common carrier. Shipping coolers will be secured with tape for shipment to the laboratory.
- If the samples are sent by common carrier, a bill of lading will be used, and copies will be retained as permanent documentation. Commercial carriers are not required to sign the chain of custody form as long as the form is sealed inside the sample cooler and the tape remains intact.
- Samples will be shipped or delivered to the laboratory the same day the samples are collected in the field unless field conditions dictate otherwise. Samples not shipped or delivered to the

laboratory on the same day they were collected will be maintained to ensure the integrity of the analytical results.

5.2.4 Sample Containers and Handling

All samples will be placed in appropriate sample containers, labeled, and properly sealed.

The sample labels will include sample number, place of collection, date and time of collection, initials of samplers, and analyses to be performed. Samples will be cushioned within the shipping coolers by the use of foam chips, bubble wrap, or other appropriate packing material. Samples will be kept cool by the use of sealed plastic bags of wet ice only. One trip blank will be included with each shipping container containing soil or water samples submitted for VOC analysis.

5.2.5 Sample Processing

Upon receipt by the laboratories, samples will proceed through an orderly processing sequence specifically designed to ensure continuous integrity of both sample and its documentation.

All samples received by the facility's sample control group will be carefully checked for label identification and completed accurate chain of custody records. Each sample (with the exception of geotechnical samples) will be assigned a unique laboratory identification number through a computerized Laboratory Information Management System (LIMS) that stores all identification and essential information. Samples must be transmitted under chain of custody both between the field and laboratory and between the laboratory and any subcontractor laboratory as documentation of sample possession.

5.3 FINAL EVIDENCE FILES CUSTODY PROCEDURES

Evidentiary files for the entire project, which will be maintained by Project Manager, may consist of, but are not limited to the following:

- Project plan(s)
- Project logbooks
- Field data records
- Correspondence
- References and literature
- Laboratory data deliverables with chain of custody records
- Interim project/progress reports
- Chemical analytical data group tracking forms
- Miscellaneous (photos, maps, drawings, etc.)
- Project report(s)

6.0 CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy of all instruments and measuring equipment used for conducting field and laboratory tests. These instruments and equipment will be calibrated prior to each use or on a scheduled periodic basis.

Instruments and equipment used to collect, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specification.

6.1 FIELD EQUIPMENT

Equipment used during field-testing will be examined to confirm that it is in operating condition. Equipment maintenance records will be maintained at the office where the equipment is housed.

Routine calibration results will be recorded in field logbooks to document the condition of field equipment used to obtain field measurements. Operation and maintenance manuals for each portable instrument will be kept with the instrument during field operations.

7.0 LABORATORY PROCEDURES

Reference sources for the chemical analyses anticipated during the investigative activities are found in, but are not limited to the following documents:

- *Test Methods for Evaluation of Solid Waste: Physical/Chemical Methods*, USEPA. Office of Solid Waste 1998, 3d ed. (as amended by Updates I, II, IIA, IIB, III, and IIIA). EPA Publication SW-846. Washington: GPO, April.
- *Standard Methods for the Examination of Water and Wastewater*, 18th Edition, 1992.
- *Methods for Chemical Analysis of Water and Wastes*, USEPA, EPA-600/4-79-020.
- *Annual Book of ASTM Standards*, American Society for Testing and Materials, 1990 and 1994.

8.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

This section describes the internal QC checks and frequency that will be performed for the field samples collected during the investigation.

8.1 FIELD INSTRUMENTS

QC procedures for the field measurements will be limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and calibrating the instruments (both where appropriate).

The level of QC effort for the field measurements will consist of daily calibration of the PID, Multi Gas Detector, water quality meter, and other field instrumentation utilized (if applicable).

8.2 OFFSITE LABORATORY

To assess the quality of chemical analytical data resulting from soil and water sampling, field duplicates, equipment blanks, and rinseate blank samples will be collected and submitted for analysis as specified in the work plan(s).

A field duplicate is analyzed to assess precision for field measurements. Field duplicate samples will be collected at a frequency of one duplicate per 20 investigative samples for each sample medium (soil and water). If fewer than 20 project samples are collected, a minimum of one field duplicate sample will be submitted per sampling event. In order to avoid laboratory bias, field duplicate samples will receive a unique sample identification number before being submitted to the laboratory.

Equipment blank samples are analyzed to check for potential contamination present on/in new, sealed, disposable (one-time use) sampling equipment (e.g., disposable bailers) as received from the manufacturer. Equipment blanks will be collected by pouring distilled water over the new sampling equipment upon removing the protective wrapping or sealing, and allowing the water to flow directly into the sample containers. One equipment blank will be collected for every 20 investigative samples using such equipment. If fewer than 20 project samples are collected, a minimum of one equipment blank will be submitted per sampling event.

Rinseate blank samples are analyzed to check for procedural contamination that may cause sample contamination from reusable sampling equipment. Rinseate blanks will be collected by pouring distilled water over the decontaminated reusable sampling equipment and allowing the water to flow directly into the sample containers. One rinseate blank will be collected for every 20 investigative samples using such equipment.

If fewer than 20 project samples are collected, a minimum of one rinsate blank will be submitted per sampling event.

Analysis of trip blanks will provide a measure of potential cross-contamination of samples during shipment and handling. Preserved trip blank samples for VOC analyses (prepared by the laboratory and consisting of distilled water poured into the pre-preserved sample vials) will be shipped with each container including VOC soil or water samples. Trip blank samples will be handled in a manner consistent with actual field sample handling. Trip blanks will not be opened in the field.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

The laboratories will perform analytical data reduction and validation in-house under the supervision of the laboratory QA officer. The laboratory QA officer, or designee, will be responsible for assessing data quality and advising of any data that were rated “preliminary” or “unacceptable” or other qualifications based on laboratory QC criteria.

The data evaluations will consider the finished data sheets and recovery data for surrogates. The material will be checked for legibility, completeness, correctness, and presence of requisite dates, initials, and signatures. The results of these checks will be reported to the Project Manager and/or Data Coordinator noting any discrepancies and their effect upon the acceptability of the data. Assessment of analytical data will include checks for potential sample contamination as indicated by the results of equipment and/or laboratory blank samples, adherence to accuracy and precision criteria for QC samples, transmittal errors, anomalous high or low parameter values, and back calculation of raw data.

Data reduction, validation, reporting, and sign-off required by the laboratory will be conducted as detailed below.

- Raw data produced and checked by the responsible analyst will be turned over for independent review by a peer analyst or group leader.
- The analyst and peer reviewer will assess the data for attainment of QC criteria presented in the referenced analytical methods and SOPs.
- Upon completion of all reviews and acceptance of the raw data, a report will be generated and sent to the Laboratory Project Manager.
- The Laboratory Project Manager will complete a thorough inspection of the reports.
- The Project Manager and area supervisor will decide whether any sample re-analysis is required. The laboratory QA officer will provide consultation where necessary actions are unclear.
- Upon acceptance and usability of the data by the Data Coordinator, the DUSR will be generated and signed by the Data Coordinator.

In addition to laboratory level data reduction, validation, and reporting, the Data Coordinator will be responsible for the QA/QC evaluation of analytical and geotechnical data, maintenance of analytical tracking information consistent with DER-10 and addressing any QA/QC issues identified during the data evaluation with the respective laboratory.

10.0 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of both field and laboratory activities may be conducted to verify that sampling and analysis are performed in accordance with the procedures established in DER-10, Technical Guidance for Site Investigation and Remediation; any future field/activity sampling and work plans; and the QAPP. These audits will verify that all established procedures are being followed.

Internal field audits may be conducted at the beginning of sample collection activities to identify deficiencies in the field sampling and documentation procedures. Any deficiencies identified will be documented, and corrective actions will be taken to rectify the deficiencies. Follow-up audits will be performed as necessary to verify that deficiencies have been corrected, and that QA procedures are maintained throughout the project.

Internal field audits will include the examination of field sampling records, field logbooks, field instrument calibration records, and chain of custody documentation. In addition, sample collection, handling, and packaging in compliance with the established procedures will be reviewed during field audits.

Internal performance and system audits of the laboratories will be performed as deemed necessary by the Project Manager. This audit will include but not be limited to examination of laboratory documentation of sample receiving, sample log-in, sample storage, chain of custody procedures, sample preparation and analysis, and instrument operating records.

11.0 PREVENTIVE MAINTENANCE

11.1 FIELD EQUIPMENT

The field equipment for this project includes, but is not limited to a PID or FID, Global Positioning System (GPS) Unit or equivalent. Specific preventive maintenance procedures to be followed for field equipment are those recommended by the manufacturer. Field instruments will be checked and calibrated (if applicable) daily before use, unless the manufacturer guidelines dictate an alternative inspection and/or calibration frequency.

11.2 LABORATORY EQUIPMENT

Preventative maintenance of laboratory equipment is described in the laboratories' Quality Assurance Program Manuals.

12.0 CORRECTIVE ACTION

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or out of quality control performance that can affect data quality. Corrective action can occur during field activities, laboratory analyses, and data validation and assessment. All corrective action proposed and implemented will be documented.

12.1 FIELD ACTIVITIES

Corrective action in the field may be necessary when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the work plan[s]), or when sampling procedures and/or field analytical procedures require modification due to unexpected conditions. In general, the field sampling team may identify the need for corrective action. The field sampling team, in consultation with the Project Coordinator, will recommend a corrective action.

The Project Manager will approve the corrective action to be implemented by the field team. It will be the responsibility of the Project Manager to ensure the corrective action has been implemented.

Corrective action resulting from internal field audits will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. The Project Coordinator will identify deficiencies and recommended corrective action to the Project Manager. Implementation of corrective actions will be performed by the Project Coordinator and field team. Corrective action will be documented in the field logbook and/or the project file.

12.2 LABORATORY

Corrective actions will be required whenever an out-of-control event or potential out-of-control event is noted. The investigative action taken is somewhat dependent on the analytical method and the event.

Corrective action procedures are typically handled at the bench level by the analyst who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration times, instrument sensitivity, and so on. If a problem persists or cannot be identified, the matter will be referred to the laboratory supervisor, manager, and/or QA personnel for further investigation. Once resolved, full documentation of the corrective action procedure is filed with the QA personnel. The QA manager will provide verbal and written notification of the non-conformance and the corrective action measure(s) implemented to the Project Manager and/or Data Coordinator.

13.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Project Quality Control Office will receive reports from the chemical analytical laboratories or Data Coordinator on data quality on an as-needed basis.

Minimally, these reports will include:

- Assessment of measurement quality indicators (i.e., data accuracy, precision, and completeness).
- Any changes in the QA/QC program.
- Results of system audits.
- QA problems, action taken, and resolutions.

The final chemical analytical report(s) for the project will also include a separate Data Usability Summary report that will summarize data quality information and overall data assessment in accordance with NYSDEC DER-10.

TABLES

Sample Methodology Summary								
Proposed Boring Identification No.	**No. of Samples**	**Sample Collection Method**	**Matrix**	**Field Screening**	**Analytical Method USEPA 8260**	**Preservation**	**Sample Container (Type & Size)**	**Sample Hold Time**
Groundwater	TBD	Micro-bailer	Water	6 GW Parameters	Volatile Organics	HCL to pH < 2 Cooled 4^{o} C $\pm 2^{o}$C	40ml Septum Vials	14-days from collection
Soil Vapor / Air	TBD	Soil Probe	Air	N/A	Volatile Organics (method TO-15)	NA	6-Liter Summa Canister	30-days from collection
Soil Samples	TBD	Split-Spoon	Soil	PID/FID	Volatile Organics	Cooled 4^{o} C $\pm 2^{o}$C	4 ounce, Glass	14-days from collection
Field Rinseate Blank (if applicable)	TBD	Laboratory	Water	N/A	Volatile Organics	HCL to pH < 2 Cooled 4^{o} C $\pm 2^{o}$C	40ml Septum Vials	14-days from collection
Blind Duplicate-1	TBD	Micro-bailer	Water	6 GW Parameters	Volatile Organics	HCL to pH < 2 Cooled 4^{o} C $\pm 2^{o}$C	40ml Septum Vials	14-days from collection
Trip Blank	TBD	Laboratory	Water	N/A	Volatile Organics	HCL to pH < 2 Cooled 4^{o} C $\pm 2^{o}$C	40ml Septum Vials	14-days from collection
QA/QC Matrix Spike	TBD	Laboratory	[redacted]	N/A	Volatile Organics	HCL to pH < 2 Cooled 4^{o} C $\pm 2^{o}$C		[redacted]

STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURE	SOP-001 REVISION: 0
CHIP, WIPE, AND SWEEP SAMPLING	PAGE 1 OF 7 DATE:

REVIEWED BY:____ **DATE:** ____________

APPROVED BY:____**DATE:** ____________

CONTENTS

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) outlines the recommended protocol and equipment for collection of representative chip, wipe, and sweep samples to monitor potential surficial contamination.

This method of sampling is appropriate for surfaces contaminated with non-volatile species of analytes (i.e., radioactive sands/waste, PCB, PCDD, PCDF, metals, cyanide, etc.). Detection limits are analyte specific. Sample size should be determined based upon the detection limit desired and the amount of sample requested by the analytical laboratory. Typical sample area is one square foot. However, based upon sampling location, the sample size may need modification due to area configuration.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent on site conditions, equipment limitations or limitations imposed by the procedure or other procedure limitations. In all instances, the ultimate procedures employed should be documented and associated with the final report.

2.0 METHOD SUMMARY

Since surface situations vary widely, no universal sampling method can be recommended. Rather, the method and implements used must be tailored to suit a specific sampling site. The sampling location should be selected based upon the potential for contamination as a result of manufacturing processes or personnel practices.

Chip sampling is appropriate for porous surfaces and is generally accomplished with either a hammer and chisel, or an electric hammer. The sampling device should be laboratory cleaned and wrapped in clean, autoclaved aluminum foil until ready for use. To collect the sample, a measured and marked off area is chipped both horizontally and vertically to an even depth of 1/8 inch. The sample is then transferred to the proper sample container.

Wipe samples are collected from smooth surfaces to indicate surficial contamination; a sample location is measured and marked off. While wearing a new pair of surgical gloves, a sterile gauze pad is opened, and soaked with solvent. The solvent used is dependent on the surface being sampled. This pad is then stroked firmly over the sample surface, first vertically, then horizontally, to ensure complete coverage. The pad is then transferred to the sample container.

Sweep sampling is an effective method for the collection of dust or residue on porous or non-porous surfaces. To collect such a sample, an appropriate area is measured off. Then, while wearing a new pair of disposable surgical gloves, a dedicated brush is used to sweep material into a dedicated dust pan. The sample is then transferred to the proper sample container.

Samples collected by all three methods are then sent to the laboratory for analysis.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Samples should be stored out of direct sunlight to reduce photodegredation, cooled to 4^{o}C, and shipped to the laboratory performing the analysis. Appropriately sized laboratory cleaned, glass sample jars should be used for sample collection. The amount of sample required will be determined in concert with the analytical laboratory.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

This method has few significant interferences or problems. Typical problems result from rough porous surfaces which may be difficult to wipe, chip, or sweep.

5.0 EQUIPMENT

Equipment required for performing chip, wipe, or sweep sampling is as follows:

- Lab clean sample containers of proper size and composition
- Site logbook
- Sample analysis request forms
- Chain of Custody records
- Custody seals
- Field data sheets
- Sample labels
- Disposable surgical gloves
- Sterile wrapped gauze pad (3 in. x 3 in.)
- Appropriate pesticide (HPLC) grade solvent
- Medium sized laboratory cleaned paint brush
- Medium sized laboratory cleaned chisel
- Autoclaved aluminum foil
- Camera
- Hexane (pesticide/HPLC grade)
- Iso-octane
- Distilled/deionized water

6.0 REAGENTS

Reagents are not required for preservation of chip, wipe or sweep samples. However, reagents will be utilized for decontamination of sampling equipment. Decontamination solutions are specified in SOP #007, Sampling Equipment Decontamination.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.

2. Obtain necessary sampling and monitoring equipment.

3. Decontaminate or pre-clean equipment, and ensure that it is in working order.

4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.

6. Mark all sampling locations. If required the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

7.2 Chip Sample Collection

Sampling of porous surfaces is generally accomplished by using a chisel and hammer or electric hammer. The sampling device should be laboratory cleaned or field decontaminated as per SOP# 007, Sampling Equipment Decontamination. It is then wrapped in cleaned, autoclaved aluminum foil. The sampler should remain in this wrapping until it is needed. Each sampling device should be used for only one sample.

Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.

Record surface area to be chipped.

1. Don a new pair of disposable surgical gloves.
2. Open a laboratory-cleaned chisel or equivalent sampling device.
3. Chip the sample area horizontally, then vertically to an even depth of approximately 1/8 inch.
4. Place the sample in an appropriately prepared sample container with a Teflon lined cap.
5. Cap the sample container, attach the label and custody seal, and place in a plastic bag.
6. Record all pertinent data in the site logbook and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.
7. Store samples out of direct sunlight and cool to 4oC.
8. Follow proper decontamination procedures then deliver sample(s) to the laboratory for analysis.

7.3 Wipe Sample Collection

Wipe sampling is accomplished by using a sterile gauze pad, adding a solvent in which the contaminant is most soluble, then wiping a pre-determined, pre-measured area. The sample is packaged in an amber jar to prevent photodegradation and packed in coolers for shipment to the lab. Each gauze pad is used for only one wipe sample.

1. Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.
2. Record surface area to be wiped.
3. Don a new pair of disposable surgical gloves.
4. Open new sterile package of gauze pad.
5. Soak the pad with solvent of choice.
6. Wipe the marked surface area using firm strokes. Wipe vertically, then horizontally to insure complete surface coverage.
7. Place the gauze pad in an appropriately prepared sample container with a Teflon-lined cap.
8. Cap the sample container, attach the label and custody seal, and place in a plastic bag. Record all pertinent data in the site logbook and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.
9. Store samples out of direct sunlight and cool to 4oC.
10. Follow proper decontamination procedures, and then deliver sample(s) to the laboratory for analysis.

7.4 Sweep Sample Collection

Sweep sampling is appropriate for bulk contamination. This procedure utilizes a dedicated, hand held sweeper brush to acquire a sample from a pre-measured area.

1. Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.
2. Record the surface area to be swept.
3. Don new pair of disposable surgical gloves.
4. Sweep the measured area using a dedicated brush; collect the sample in a dedicated dust pan.
5. Transfer sample from dust pan to sample container.
6. Cap the sample container, attach the label and custody seal, and place in a plastic bag. Record all pertinent data in the site log book and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.
7. Store samples out of direct sunlight and cool to 4OC.
8. Leave contaminated sampling device in the sample material, unless decontamination is practical.
9. Follow proper decontamination procedures, and then deliver sample(s) to the laboratory for analysis.

8.0 CALCULATIONS

Results are usually provided in mg/g, µg/g, mass per unit area, or other appropriate measurement. Calculations are typically done by the laboratory.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

The following general quality assurance procedures apply:

1. All data must be documented on standard chain of custody forms, field data sheets or within the site logbook.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

The following specific quality assurance activities apply to wipe samples:

For wipe samples, a blank should be collected for each sampling event. This consists of a sterile gauze pad, wet with the appropriate solvent, and placed in a prepared sample container. The blank will help identify potential introduction of contaminants via the sampling methods, the pad, solvent or sample container. Spiked wipe samples can also be collected to better assess the data being generated. These are prepared by spiking a piece of foil of known area with a standard of the analyte of choice. The solvent containing the standard is allowed to evaporate, and the foil is wiped in a manner identical to the other wipe samples.

Specific quality assurance activities for chip and sweep samples should be determined on a site specific basis.

10.0 DATA VALIDATION

A review of the quality control samples will be conducted and the data utilized to qualify the environmental results.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow EPA, OSHA and corporate health and safety procedures.

12.0 REFERENCES

NJDEP, Field Sampling Procedures Manual, April, 2005.

NYSDEC, Bureau of Spill Prevention and Response (DEC BSPR), Sampling Guidelines and Protocols Manual, 1991.

U.S. EPA, A Compendium of Superfund Field Operation Methods. EPA/540/5-87/001.

STANDARD OPERATING PROCEDURE	SOP-002 REVISION: 0
DESCRIPTION AND QUANTIFICATION OF SOILS	PAGE 1 OF 10 DATE:

REVIEWED BY:____ **DATE:** ___________

APPROVED BY:____**DATE:** ___________

CONTENTS

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) outlines the description and identification of soils in the field using a modified Burmister System. The intent of this SOP is to establish a consistent method for describing oils that are to be sampled and analyzed in the course of a site investigation. Soil descriptions and identifications provide key information when investigating hazardous waste sites. More precise engineering parameters may be determined in a laboratory using industry-recognized methods such as those published by the American Society for Testing and Materials (ASTM).

"Soil", as used in this SOP and in the environmental field in general, is considered to be any unconsolidated natural material composed of solid particles, with the pore spaces occupied by water, gas, or liquid. The term encompasses the engineering and geological properties of the material and is not limited by depth below ground surface (bgs) or the origin of the material. According to this usage, "soils" may therefore include formal or informal geologic units and material that may also be classified as "sediments", thus implying an origin. The more traditional use of the term "soil" was generally limited to the near-surface material that serves as a medium for plant growth.

2.0 METHOD SUMMARY

Major attributes of a representative soil sample to be identified in the field include soil type or lithology (sand, silt, clay), color, texture as determined by major and minor particle sizes, and sorting. Other characteristics that may be recorded include structure, cementation, moisture content, density, the presence of accessory minerals, foreign material, odor, and hydrochloric acid (HCl) reaction. Other critical parameters of the sample collected include method of collection, location, and depth.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

This section is not applicable to this SOP.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

Because field identification of soil is a learned skill, results may vary due to experience, weather conditions, and type of sampling. Determining if a sample is representative of native soil may also present difficulties. During borehole investigations, "fallback" of material in the hole is common, particularly in loose sediment, and thus it may be difficult to identify native soil. Sampling or drilling methods other than coring may segregate size fractions so that finer-grained portions of the samples may be lost or not recognized. Soils containing large gravel or cobbles may be difficult to core consistently.

5.0 EQUIPMENT/APPARATUS

Standard materials and equipment required for soil classification are:

- Pocket knife or small spatula,
- Hand magnification lens,
- Tape measure or ruled scale,
- Grain size chart,
- Munsell color charts
- Soil boring log or field logbook

6.0 REAGENTS

Dilute 10 percent (%) hydrochloric acid

Water; city, non-potable or any other natural source

7.0 PROCEDURES

The following items are typically determined and recorded for soil classification.

7.1 Soil Sample Origin

A soil sample should be representative of the stratum from which it was obtained using an industry-recognized procedure (e.g., ASTM D-1581). The sample is identified by soil boring number, location, and depth. This information is recorded in a field logbook or on soil boring logs (Figure 1, Appendix B) so that the origin of the sample can be readily ascertained away from the field. An example of a completed soil boring log is presented in Figure 2, Appendix B.

7.2 Soil Name or Type

The bulk soil type should be described by a generic name such as gravel, sand, silt, or clay. This is the primary descriptor with confirming or more detail added by the identification of major and minor particle sizes.

7.3 Color

The general color of the whole sample, preferably while it is moist, is described in the field. It is preferable that the Munsell Soil Color Charts be used for the soil color determination. The Munsell system provides a field standard for classifying soil color. It embodies three aspects of color - hue, value, and chroma. The hue documents the spectral color. The value is the lightness of the color. The chroma is the degree of departure from a specific color (e.g., weak or vivid). When using the Munsell description, the order for recording color is hue, value/chroma, followed by the description. F or example, 5YR 5/6 describes the hue as 5YR, yellowish-red with a value of 5 and a chroma of 6. Half values can also be used for colors falling halfway between chips (e.g. 5YR 5.5/6 yellowish-red). It should be noted if the Munsell Color Charts are not used for soil color descriptions.

Soil colors may be associated with certain soil attributes and environmental conditions. Yellow to reddish soil color may be indicative of the presence of oxidized iron (Fe+3) and well-aerated soils.

The terms redoximorphic or mottling are used when several colors are present within a soil. These features are described using the following terms:

- size (small, medium, large),
- shape (round, semi-round, angular),
- edge contrast (smooth, sharp, distinct),
- density/abundance (frequent, infrequent).

7.4 Soil Density Classification

Density is determined through standard penetration resistance. Resistance in granular (cohesionless) soils is referred to as relative density while resistance in cohesive soils is referred to as soil consistency.

In the field, standard penetration resistance is the number of blows required to drive a standard two-inch outer diameter (OD) split-spoon sampler 12 inches into the soil column using a 140-pound hammer falling freely through 30 inches. The sampler is driven in three six-inch intervals for a total of 18 inches. The number of blows is recorded for each 6-inch interval. The N value is the number of blows required for the last 12 inches. This test demonstrates the compactness of granular soils, while it demonstrates the consistency of cohesive (silt and clay) soils on a shearing strength basis (Table 1, Appendix A).

7.5 Soil Structure Classification

Record soil structure attributes, as applicable, using the criteria described in Table 2, Appendix A.

7.6 Identification and Description of Soil Components.

7.6.1 Major and Minor Components

Examine the soil sample to determine the following components:

Amount of sorting in the sediment (Figure 3, Appendix B),

Size distribution (gravel, sand, silt, clay) (Tables 3 and 4, Appendix A),

Major and minor components,

Predominating grain shape (roundness) (Figure 4, Appendix B),

Degree of compaction.

7.6.2 Other Components

Examine the soil sample to identify other components that may be present:

Roots and root mass,

Vegetation, peat, organic matter,

Shells or fossils,

Accessory minerals such as mica, gypsum, and magnetite,

Slag, cinder or charcoal, trash, rubbish, fill, bricks, glass.

7.6.3 Recording Modified Burmister Soil Descriptions

Use the following guidelines when recording soil descriptions:

- If major component comprises more than 50% of the soil, than fully capitalize the major component descriptor (e.g., SAND);
- If the major component comprises less than 50% of the soil, capitalize the descriptor (e.g., Sand);
- Place a comma after the major and minor component descriptors;
- Place size qualifiers such as coarse, medium, or fine before the major component descriptors (Table 1, Appendix A);
- Describe the minor component with the first letter capitalized, preceded by the size descriptor (e.g., Fine Sand);
- Use these adjectives when describing the minor fraction(s):

  and = 35 to 50%

  some = 20 to 35%

  little = 10 to 20%

  trace = <10%
- Record formal or informal geological names for soil bodies when probable identification can be made from the literature or local experience.

Some examples of modified Burmister soil descriptions are:

- Gray medium to fine GRAVEL and coarse to fine Sand, trace silt;
- 2.5YR 5/4 reddish brown coarse to medium SAND, little Clayey Silt, some medium to fine Gravel; layered, occasional lens coarse Sand;
- Wet, Very loose grey 3/1 dark gray to black, fine to coarse SAND, little rounded fine to coarse Gravel, trace Silt, some debris (wood, organics, cinders)(fill).

7.7 Soil Moisture

Note the moisture content as dry, moist or wet. Dry refers to the absence of moisture, dusty, dry to the touch; moist is damp with no visible water; wet has visible free water and the soil sample is usually collected below the water table. The top of the capillary fringe should be recorded, if it can be identified, and the date noted on the soil boring log or in the field logbook.

7.8 Soil Odor

Soil odor may be classified as organic or chemical. Some decaying organic soils may exhibit a rotten egg or vegetable odor; whereas, contaminated soils may have a petroleum or chemical smell. Caution should be used and soil odors should not be inhaled directly if contaminants are suspected.

7.9 Photoionization/Flame Ionization Detectors

Photoionization detectors (PIDs) and/or flame ionization detectors (FIDs) may be used to identify areas of contamination. Detectors are sensitive to particular compounds, depending on the type of detector. Weather conditions, temperature, and moisture content of the sample may affect the readings. When measured, these readings are recorded on the soil boring logs or in the field logbook along with location and any other descriptors (i.e., discoloration between laminations or in fill).

7.10 Hydrochloric Acid Reaction

Reaction to a drop or two of dilute HCl is noted as strong, weak, or none. Strong refers to a violent reaction, with bubbles forming immediately; weak is some reaction, with the slow formation of bubbles; and none is any visible reaction. This test identifies the presence of carbonates, either in the cement (if present) or the soil matrix. Caution must be exercised when handling acids.

7.11 Cementation

Cementation is an indicator of cohesiveness and should be recorded as strong, moderate, or weak. Intact soils that will not crumble or break with finger pressure are classified as strong. Moderate refers to intact soils that crumble or break with considerable finger pressure and weak refers to those that crumble or break with handling or little finger pressure. Cement type can often be recognized. Common cement types are iron and carbonate (effervesces with dilute hydrochloric acid).

8.0 CALCULATIONS

This section not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

All data must be documented on soil boring logs or in field logbooks.

10.0 DATA VALIDATION

If additional analyses (e.g., sieve analyses or other engineering tests) are required by a laboratory, the results will be reviewed prior to release. All soil boring logs will become part of a deliverable package and will be reviewed in accordance with SERAS Administrative Procedure (AP) #22, *Peer Review of SERAS Deliverables.*

11.0 HEALTH AND SAFETY

General field safety practices must be followed. Waste samples should be handled with care and disposed of in accordance with the SOP, *Investigation-Derived Waste Management*. Refer to the specific material safety data sheet (MSDS) for any chemical or reagent utilized in this procedure. All excess samples, used samples, and waste material generated during any additional analysis not covered in this SOP must be disposed in accordance with the SOP , *Hazardous Waste Management.*

When working with potentially hazardous materials, follow United States Environmental Protection Agency (U.S. EPA), Occupational Safety and Health Administration (OSHA), and corporate health and safety procedures.

12.0 REFERENCES

American Society of Testing and Materials (ASTM). 2000. *Annual Book of ASTM Standards*, Designation D2488 - 00: Description and Identification of Soils (Visual-Manual Procedure).

NJDEP, Field Sampling Procedures Manual, April, 2005.

NYSDEC, Bureau of Spill Prevention and Response (DEC BSPR), Sampling Guidelines and Protocols Manual, 1991.

U.S. EPA, A Compendium of Superfund Field Operation Methods. EPA/540/5-87/001.

13.0 APPENDICES

A - Tables

B - Figures

APPENDIX A

Tables

TABLE 1. Relative Density and Consistency of Soils

Compactness of Cohesionless Soils *Relative Density*	*Standard Penetration Resistance,* (bpf) blows per foot
very loose	0-4
loose	5-10
medium dense	11-30
dense	31-50
very dense	>50

REVIEWED BY:____ **DATE:** ___________

APPROVED BY:____**DATE:** ___________

CONTENTS

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) is applicable to the collection of representative sediment samples. Analysis of sediment may be biological, chemical, or physical in nature and may be used to determine the following:

- toxicity;
- biological availability and effects of contaminants;
- benthic biota;
- extent and magnitude of contamination;
- contaminant migration pathways and source;
- fate of contaminants;
- grain size distribution;
- deposition environment;
- sediment type.

For the purpose of this procedure, sediment is the mineral and/or organic material situated beneath an aqueous layer. The aqueous layer may be either static, as in lakes, ponds, and impoundments or flowing, as in rivers and streams. The methodologies discussed in this SOP are applicable to the sampling of sediment in both flowing and standing water.

These are standard (i.e. typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

2.0 METHOD SUMMARY

Sediment samples may be collected using a variety of methods and equipment, depending on the depth of the aqueous layer, the portion of the sediment profile required (surface vs. subsurface), the type of sample required (disturbed vs. undisturbed), contaminants present, sediment type, and analyses required.

Sediment is collected from beneath an aqueous layer either directly, using a hand-held device such as a shovel, trowel, or auger, or indirectly, using a remotely activated device such as an Ekman or Ponar dredge. Following collection, sediment is transferred from the sampling device to a sample container of appropriate size and construction for the analysis (es) requested. If composite sampling techniques are employed, multiple grabs are placed into a container constructed of an inert material (e.g. stainless steel), homogenized, and transferred to the sample container(s) appropriate for the analysis (es) requested. The homogenization procedure should not be used if the sample analysis includes volatile organic compounds (VOCs). In this case, sediment, or multiple grabs of sediment, should be transferred directly from the sample collection device or homogenization container to the sample container. Cores may also be collected directly into an acetate sleeve that serves as the sample container for undisturbed samples.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

1. Chemical preservation of solids is generally not recommended. Cooling to 4 degrees Celsius (OC) is usually the best approach, supplemented by the appropriate holding time for the analyses requested.

2. Wide-mouth glass containers with Teflon lined caps are utilized for sediment samples. The sample volume is a function of the analytical requirements and will be specified in the Work Plan or Sampling and Analysis Plan.

3. If analysis of sediment from a discrete depth or location is desired, sediment is transferred directly from the sampling device to a labeled sample container(s) of appropriate size and construction for the analysis (es) requested. Transfer is accomplished with a stainless steel or plastic lab spoon or equivalent.

4. If composite sampling techniques or multiple grabs are employed, equal portions of sediment from each location or collocation are deposited into a decontaminated stainless steel, plastic, or other appropriate container (e.g., Teflon). The sediment is homogenized thoroughly to obtain a mixture representative of the area sampled. The composite sediment sample is transferred to a labeled container(s) of appropriate size and construction for the analysis(es) requested. Transfer of sediment is accomplished with a stainless steel or plastic lab spoon or equivalent. Samples for VOC analysis must be transferred directly from the sample collection device or pooled from multiple areas in the homogenization container prior to mixing. This is done to minimize the loss of contaminant due to volatilization during homogenization.

5. All sampling devices should be decontaminated, then wrapped in aluminum foil. The sampling device should remain wrapped until needed. Dedicated sampling devices should be used for each sample. Disposable sampling devices for sediment are generally impractical due to cost and the large number of sediment samples which may be required. Sampling devices should be cleaned in the field using the decontamination procedure described in the SOP, *Sampling Equipment Decontamination*.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

Substrate particle size and organic matter content are a direct consequence of the physical characteristics of a water body and the watershed. Contaminants are more likely to be concentrated in sediment typified by fine particle size and high organic matter. This type of sediment is most likely to be collected from depositional zones. In contrast, coarse sediment with low organic matter does not typically concentrate contaminants and are generally found in erosional zones. The selection of a sampling location can, therefore, greatly influence the analytical results and should be justified and discussed in the Work Plan or Sampling and Analysis Plan.

5.0 EQUIPMENT/APPARATUS

Equipment needed for collection of sediment samples may include:

- Maps/plot plan
- Safety equipment
- Compass
- Global positioning system (GPS)
- Tape measure
- Survey stakes, flags, or buoys and anchors
- Camera and film

- Stainless steel, plastic, or other appropriate composition bucket
- 4-oz., 8-oz., and one-quart wide mouth jars w/Teflon lined lids
- Ziploc plastic bags
- Logbook
- Sample jar labels
- Chain of Custody records, field data sheets
- Cooler(s)
- Ice
- Decontamination supplies/equipment
- Spade or shovel
- Spatula
- Scoop
- Trowel (plastic or stainless steel)
- Bucket auger
- Tube auger
- Extension rods and pipe wrenches
- "T" handle
- Sediment coring device (tube, drive head, eggshell check value, nosecone, acetate tube, extension rods)
- Ponar dredge
- Ekman dredge
- Nylon rope or steel cable
- Messenger device
- VibraCore
- Power drill
- S.C.U.B.A. and/or other appropriate dive gear

6.0 REAGENTS

Reagents are not used for preservation of sediment samples. Decontamination solutions are specified in SOP, *Sampling Equipment Decontamination*.

7.0 PROCEDURES

7.1 Preparation

1. Determine the objective(s) and extent of the sampling effort. The sampling methods to be employed, and the types and amounts of equipment and supplies required will be a function of site characteristics and objectives of the study.

2. Obtain the necessary sampling and monitoring equipment.

3. Prepare schedules, and coordinate with staff, client, and regulatory agencies, if appropriate.

4. Decontaminate or preclean equipment, and ensure that it is in working order.

5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan (HASP).

6. Use stakes, flags, or buoys to identify and mark all sampling locations. Site specific factors including flow regime, basin morphology, sediment characteristics, depth of overlying aqueous layer, contaminant source, and extent and nature of contamination should be considered when selecting sample locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

7.2 Sample Collection

Selection of a sampling device is most often contingent upon: (1) the depth of water at the sampling location, (2) the physical characteristics of the sediment to be sampled, (3) the type of sample required and (4) the parameters being analyzed.

7.2.1 Sampling Surface Sediment with a Trowel or Scoop from Beneath a Shallow Aqueous Layer

For the purpose of this procedure, surface sediment is considered to range from 0 to 6 inches in depth and a shallow aqueous layer is considered to range from 0 to 12 inches in depth. Collection of surface sediment from beneath a shallow aqueous layer can be accomplished with tools such as spades, shovels, trowels, and scoops. Although this method can be used to collect both unconsolidated and/or consolidated sediment, it is limited somewhat by the depth and movement of the aqueous layer. Deep and rapidly flowing water render this method less accurate than others discussed below. However, representative samples can be collected with this procedure in shallow sluggish water provided care is demonstrated by the sampler. A stainless steel or plastic sampling implement will suffice in most applications. Care should be exercised to avoid the use of devices plated with chrome or other materials; plating is particularly common with garden trowels.

The following procedure will be used to collect sediment with a scoop, shovel, or trowel:

1. Using a decontaminated sampling implement, remove the desired thickness and volume of sediment from the sampling area carefully to minimize movement between sample sediment and water.

2. Transfer the sample into an appropriate sample or homogenization container. Ensure that non-dedicated containers have been adequately decontaminated.

3. Surface water should be decanted from the sample or homogenization container prior to sealing or transfer; care should be taken to retain the fine sediment fraction during this procedure.

7.2.2 Sampling Surface Sediment with a Bucket Auger or Tube Auger from Beneath a Shallow Aqueous Layer

For the purpose of this procedure, surface sediment is considered to range from 0 to 6 inches in depth and a shallow aqueous layer from 0 to 24 inches in depth. Collection of surface sediment from beneath a shallow aqueous layer can be accomplished with a system consisting of a bucket or tube auger, a series of extensions, and a "T" handle (Figure 1, Appendix A). The use of additional extensions in conjunction with a bucket auger can increase the depth of water from which sediment can be collected from 24 inches to 10 feet or more. However, sample handling and manipulation increases in difficulty with increasing depth of water. The bucket or tube auger is driven into the sediment and used to extract a core. The various depths represented by the core are homogenized or a subsample of the core is taken from the appropriate depth.

The following procedure will be used to collect sediment samples with a bucket or tube auger:

1. If the study objectives and characteristics of the sediment or water body warrant, an acetate core may be inserted into the bucket or tube auger prior to sampling, By using this technique, an intact core can be extracted.

2. Attach the auger head to the required length of extensions, then attach the "T" handle to the upper extension.

3. If possible, clear the area to be sampled of any rocks or surface debris.

4. Insert the bucket or tube auger into the sediment at a 0 degrees (o) to 20o angle from vertical. This orientation minimizes spillage of the sample from the sampler upon extraction from the sediment and water.

5. Rotate the auger to cut a core of sediment.

6. Slowly withdraw the auger; if using a tube auger, make sure that the open slot is facing upward.

7. Transfer the sediment into an appropriate sample or homogenization container. Ensure that non-dedicated containers have been adequately decontaminated.

7.2.3 Sampling Deep Sediment with a Bucket Auger or Tube Auger from Beneath a Shallow Aqueous Layer

For the purpose of this procedure, deep sediment is considered to range from 6 to greater than 18 inches in depth and a shallow aqueous layer from 0 to 24 inches. Collection of deep sediment from beneath a shallow aqueous layer can be accomplished with a system consisting of a bucket auger, a tube auger, a series of extensions and a "T" handle (Figure 1, Appendix A). The use of additional extensions can increase the depth from which sediment can be collected from 24 inches to 5 feet or more. However, water clarity must be high enough to permit the sampler to directly observe the sampling operation. In addition, sample handling and manipulation increases in difficulty with increasing depth of water. The bucket auger is used to bore a hole to the upper range of the desired sampling depth and then withdrawn. The tube auger is then lowered down the borehole, and driven into the sediment to the lower range of the desired sampling depth. The tube is then withdrawn and the sample recovered from the tube. This method can be used to collect firmly consolidated sediments, but is somewhat limited by the depth of the aqueous layer, and the integrity of the initial borehole.

The following procedure will be used to collect deep sediment samples with a bucket auger and a tube auger:

1. Attach the bucket auger to the required lengths of extensions, then attach the "T" handle to the upper extension.

2. If possible, clear the area to be sampled of any rocks or surface debris.

3. Begin augering, periodically removing any accumulated sediment (i.e., cuttings) from the auger bucket. Cuttings should be disposed of far enough from the sampling area to minimize cross contamination of various depths.

4. After reaching the upper range of the desired depth, slowly and carefully remove bucket auger from the boring.

5. Attach the tube auger to the required lengths of extensions, then attach the "T" handle to the upper extension.

6. Carefully lower the tube auger down the borehole using care to avoid making contact with the borehole sides, and cross-contaminating the sample. Gradually force the tube auger into the sediment, to the desired sampling depth. Hammering of the tube auger to facilitate coring should be avoided as the vibrations may cause the boring walls to collapse.

7. Remove the tube auger from the borehole, again taking care to avoid making contact with the borehole sides and cross contaminating the sample.

8. Discard the top of core (approximately 1 inch); this represents material collected by the tube auger before penetration to the layer of concern.

9. Transfer the sediment into an appropriate sample or homogenization container. Ensure that non-dedicated containers have been properly decontaminated.

7.2.4 Sampling Surface Sediment with an Ekman or Ponar Dredge from Beneath a Shallow Aqueous Layer or in Deep Water

For the purpose of this procedure, surface sediment is considered to range from 0 to 6 inches in depth. Collection of surface sediment can be accomplished with a system consisting of a remotely activated device (dredge) and a deployment system. This technique consists of lowering a sampling device (dredge) to the surface of the sediment by use of a rope, cable, or extended handle. The mechanism is activated, and the device entraps sediment in spring loaded or lever operated jaws.

An Ekman dredge is a lightweight sediment sampling device with spring activated jaws. It is used to collect moderately consolidated, fine textured sediment. The following procedure will be used for collecting sediment with an Ekman dredge (Figure 2, Appendix A):

1. Attach a sturdy nylon rope or stainless steel cable through the hole on the top of the bracket, or secure the extension handle to the bracket with machine bolts.

2. Fix the jaws so that they are in the open position by placing trip cables over the release studs. Ensure that the hinged doors on the dredge top are free to open.

3. Lower the sampler to a point 4 to 6 inches above the sediment surface.

4. Drop the sampler to the sediment.

5. Trigger the jaw release mechanism by lowering the messenger weight down the line, or by depressing the button on the upper end of the extension handle.

6. Raise the sampler and slowly decant any free liquid through the top of the sampler. Care should be taken to retain the fine sediment fraction during this procedure.

7. Open the dredge jaws and transfer the sediment into an appropriate container. Ensure that non-dedicated containers have been properly decontaminated.

A Ponar dredge is a heavyweight sediment sampling device with weighted jaws that are lever activated. It is used to collect consolidated fine to coarse textured sediment. The following procedure will be used for collecting sediment with a Ponar dredge (Figure 3, Appendix A):

1. Attach a sturdy nylon rope or steel cable to the ring provided on top of the dredge.

2. Arrange the Ponar dredge with the jaws in the open position, setting the trip bar so the sampler remains open when lifted from the top. If the dredge is so equipped, place the spring loaded pin into the aligned holes in the trip bar.

3. Slowly lower the sampler to a point approximately 2 inches above the sediment.

4. Drop the sampler to the sediment. Slack on the line will release the trip bar or spring loaded pin; pull up sharply on the line closing the dredge.

5. Raise the dredge to the surface and slowly decant any free liquid through the screens on top of the dredge. Care should be taken to retain the fine sediment fraction during this operation.

6. Open the dredge and transfer the sediment to an appropriate container. Ensure that non-dedicated containers have been properly decontaminated.

7.2.5 Sampling Subsurface Sediment with a Coring Device from Beneath a Shallow Aqueous Layer

For purposes of this procedure, subsurface sediment is considered to range from 6 to 18 inches in depth and a shallow aqueous layer is considered to range from 0 to 24 inches in depth. Collection of subsurface sediment from beneath a shallow aqueous layer can be accomplished with a system consisting of a tube sampler, acetate sleeve, eggshell check valve, nosecone, extensions, and "T" handle or drivehead. The use of additional extensions can increase the depth of water from which sediment can be collected from 24 inches to 10 feet or more. This sampler may be used with either a drive hammer for firm sediment, or a "T" handle for soft sediment. However, sample handling and manipulation increases in difficulty with increasing depth of water.

The following procedure describes the use of a sample coring device (Figure 4, Appendix A) used to collect subsurface sediments.

1. Assemble the coring device by inserting the acetate sleeve into the sampling tube.

2. Insert the "egg-shell" check valve into the lower end of the sampling tube with the convex surface positioned inside the acetate sleeve.

3. Screw the nosecone onto the lower end of the sampling tube, securing the acetate sleeve and egg-shell check valve. Screw the bracket to the top of the sampling tube.

4. Attach the sampling device to the required length of extensions; then attach the “T” handle or the drive hammer onto the upper extension.

5. Place the sampler in a perpendicular position on the sediment to be sampled.

6. If the "T" handle is used, place downward pressure on the device until the desired depth is reached. After the desired depth is reached, slowly withdraw the sampler from the sediment and proceed to Step 10.

7. If the drive hammer is selected, drive the sampler into the sediment to the desired depth.

8. Record the length of the tube that penetrated the sediment, and the number of blows required to obtain this depth.

9. Sharply pull the drive hammer upwards and dislodge the sampler from the sediment. Slowly withdraw the sampler from the sediment.

10. Carefully remove the coring device from the water.

11. Unscrew the nosecone and remove the eggshell check valve.

12. Slide the acetate sleeve out of the sampler tube. Decant surface water, using care to retain the fine sediment fraction. The sample may be used in this fashion, or the contents transferred to a sample or homogenization container.

13. If head space is present in the upper end, a hacksaw may be used to shear the acetate tube off at the sediment surface. The acetate core may then be capped at both ends. Indicate on the acetate tube the appropriate orientation of the sediment core using a waterproof marker.

14. The sediment may be extracted from the acetate sleeve and manipulated in the typical fashion. Extrude the sample from or open the acetate tube and transfer the sediment to an appropriate homogenization or sample container. Ensure that non-dedicated containers have been adequately decontaminated.

7.2.6 VibraCore

Sampling with a vibratory corer is divided into four steps: intrusion, extraction, core sampling, and packaging. The following procedure describes the use of a VibraCore to collect subsurface sediments.

7.2.6.1 Intrusion

The vibrator head should be attached near the top of the unsharpened end of the core barrel prior to initiating the coring procedure. After a coring location has been determined, the core pipe will be vertically positioned. The core barrel will initially sink into the sediment by its own weight, giving the barrel stability. Once the vibrator head engine is started, the pipe will rapidly penetrate into the sediment. Tying a teather line (rope) to the core barrel and pulling down by adding weight will aid in getting the pipe through resistant subsurfaces.

7.2.6.2 Extraction

After removing the vibrator head, the remaining pipe is cut off with a hacksaw approximately 2 feet above the ground surface. The distance to the sediment surface inside and outside of the pipe is measured to determine the amount of compaction. The pipe is then filled with water and a gas-main sealer plug is inserted and tightened to prevent loss of sediment from the core pipe when it is removed.

A tripod is assembled and placed over the intruded pipe. Two come-alongs are fastened to the eyeballs on the tripod head and to a rope securely fastened to the core pipe. The core is guided through the core pipe slot in the tripod head and then rested against the tripod head to prevent falling over during extraction. When the core is completely out of the sediment, the come-alongs are removed and the core pipe slot is opened by pulling on the cord that moves the spring-loaded slot gate. The core barrel is gently placed horizontally, to prevent disturbance of the core, and examined.

7.2.6.3 Core Sampling

Sediment samples can be removed from the core either by splitting the core lengthwise and removing the sample or by drilling holes in the core liner. Splitting the core lengthwise is preferred since it allows direct observation of the sediment structure, bedding, lithologies, and other features. Samples can be collected from one half of the core and the other half can be preserved for future studies or sampling. Alternatively, a power drill fitted with a 1.5- to 2-inch saw can be used to make holes in the liner. Samples can then be removed with a spoon and the hole closed by replacing the cutout disk and sealing with duct or plastic electrical tape. Spacing of approximately 1 foot is recommended to ensure that the samples are representative of the lithologies in the cores.

7.2.6.4 Packaging

If the core is to be homogenized at the laboratory, the extracted core is cut in the field using a hacksaw. Aluminum foil, plastic caps, or wooden plugs held securely with duct tape may be used to cap the core liner. Each core section must be carefully labeled, indicating the top and bottom, with a waterproof marker.

7.2.7 Diver-Assisted Core Sampling (using S.C.U.B.A. or surface-supplied air)

For the purposes of this procedure, surface sediment is considered to range from 6 to 72 inches in depth and the overhead water column is between 4 and 120 feet. Collection can be accomplished by the diver using an acetate sleeve cut to the desired sampling depth, two plastic end caps, and a metal cap and hammer. The diver may either push the core to the desired depth in soft sediment or use the metal cap and hammer to drive the core into firmer sediment. This method can be applicable in chemically and biologically hazardous environments, if the divers are properly trained, equipped, and following appropriate precautions.

The following procedure describes the use of a diver-assisted core sampling device to collect subsurface sediments.

1. The diver is supplied with one acetate sampling tube, two plastic end caps, duct tape, a hammer, and metal hammering cap that fits over one end of the tube to receive the hammer blows. The hammering should not damage the acetate sleeve.

2. Once the sampling location is reached, the diver notes the time, depth, and any other conditions to be transferred into the appropriate logbook or sample data sheet. If on surface-supplied air, the diver communicates this information directly to the surface control.

3. The sleeve is inserted vertically into the soft sediment until the desired depth is reached. If the desired depth cannot be achieved, a metal hammer cap is assembled on top of the vertical sleeve. The diver delivers blows to the cap with a hammer until the sleeve reaches the desired depth.

4. The hammer cap is removed without disturbing the sleeve that remains at the desired depth. One plastic end cap is placed over the exposed end of the sleeve, and when possible, duct taped to secure the cap to the sleeve.

5. With the single end cap firmly in place, the sleeve is slowly removed from the sediment. In firmer sediments, a twisting or rotating motion is used to extract the sleeve.

6. While maintaining the tube vertically, a second end cap will be placed over the other end of the core to minimize any loss of material from the sleeve. Again, when possible, the cap is duct taped to secure the cap to the sleeve.

7. With both caps in place, the core is transported vertically to the surface. The diver will place their hands over the “bottom” end of the core to secure the sleeve.

8. The core will be transferred to surface personnel to maintain custody.

9. The acetate sleeve may be cut with a hacksaw at the sediment surface if headspace is present in the core. It is then recapped for shipping and storage. The sample location must be marked on each tube. The sample may be used as is, or the contents homogenized and transferred to another container.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following QA procedures apply:

1. All data must be documented on field data sheets or in site logbooks.

2. All instrumentation and equipment must be operated in accordance with the operating instructions supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout activities must occur prior to sampling/operation, and must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, Occupational Safety and Health Act (OSHA), and Corporate health and safety procedures.

More specifically, when sampling sediment from water bodies, physical hazards must be identified and adequate precautions must be taken to ensure the safety of the sampling team. The team member collecting the sample should not get too close to the edge of the water body, where bank failure may cause loss of balance. As a preventive measure, the person performing the sampling should be on a lifeline, and be wearing adequate protective equipment. This may include a personal flotation device (PFD), if necessary. If sampling from a vessel, appropriate protective measures including a PFD must be implemented.

12.0 REFERENCES

de Vera, E.R., B.P. Simmons, R.D. Stephen, and D.L. Storm. 1980. *Samplers and Sampling Procedures for Hazardous Waste Streams.* EPA-600/2-80-018.

Mason, B.J. 1983. *Preparation of Soil Sampling Protocol: Technique and Strategies*. EPA-600/4-83-020.

Barth, D.S. and B.J. Mason. 1984. *Soil Sampling Quality Assurance User's Guide*. EPA-600/4-84-043.

U.S. Environmental Protection Agency. 1984. *Characterization of Hazardous Waste Sites - A Methods Manual, Available Sampling Methods*. 2nd Ed. Vol. II. EPA-600/4-84-076.

13.0 APPENDICES

APPENDIX A

FIGURE 1. Sampling Auger

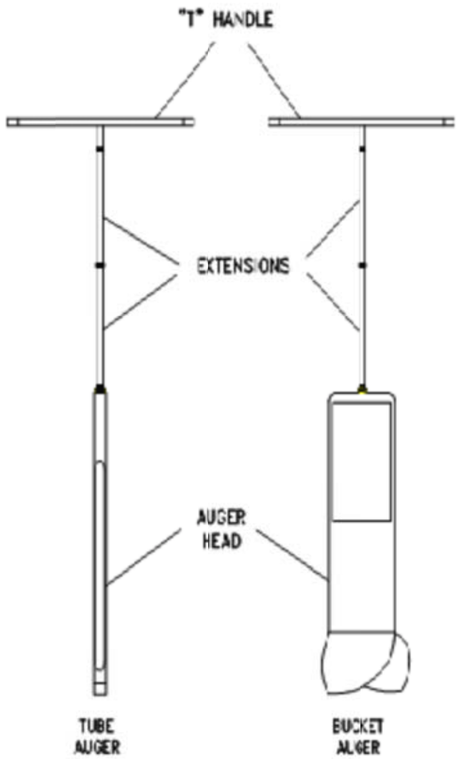


FIGURE 2. Ekman Dredge

FIGURE 3. Ponar Dredge

FIGURE 4. Sampling Coring Device

STANDARD OPERATING PROCEDURE	SOP-004 REVISION: 0
SOIL SAMPLING	PAGE 1 OF 8 DATE:

REVIEWED BY:______________________________________ DATE: __________

APPROVED BY:_______________________________________DATE: __________

CONTENTS

1.0 INTRODUCTION

For site investigations, primary consideration must be given to obtaining samples that are representative of existing conditions and valid for chemical analysis. The samples must not be contaminated by drilling fluids or by the sampling procedures.

This guideline provides a description of the principles of operation, applicability, and implementability of standard soil sampling methods used during site investigations. The purpose of this document is to aid in the selection of soil sampling methods that are appropriate for site-specific conditions. It is intended to be used by the project manager, project engineer, field team leader, and site geologist to develop an understanding of each method sufficient to plan, schedule, and perform soil sampling.

This guideline focuses on methods and equipment that are readily available and typically applied. It is not intended to provide an all-inclusive discussion of soil sampling methods. Sample types, samplers, and sampling methods are discussed.

2.0 DEFINITIONS

Blow Counts	Number of hammer blows needed to advance a split-spoon sampler. Blow counts are usually counted in 6-inch increments.
VOCs	Volatile organic compounds.

3.0 RESPONSIBILITIES

The **Project Manager** will select site-specific soil sampling methods with input from the field team leader and site geologist; and will maintain close supervision of the activities and progress.

The **Site Geologist** selects site specific drilling and sampling options; helps prepare technical provisions for soil sampling.

The **Field Team Leader** implements the selected drilling program and assists in the selection of drilling methods and sampling procedures.

The **Rig Geologist** supervises and/or performs actual sampling procedures.

4.0 SOIL SAMPLING

4.1 Types of Samples

Four basic types of samples are collected in site investigation work: bulk samples, representative samples, “undisturbed” samples, and composite samples.

4.1.1 Bulk Samples

Bulk samples are generally a shovelful or trowelful of material taken from cuttings. There is usually significant uncertainty regarding which interval the cuttings represent. This type of sampling is rarely used and is the least accurate of the four basic sample types.

4.1.2 Representative Samples

Representative samples are collected with a drive or push tube. They do not represent undisturbed conditions but do represent all the constituents that exist at a certain interval.

4.1.3 Undisturbed Samples

“Undisturbed” samples are high-quality samples collected under strictly controlled conditions to minimize the structural disturbance of the sample. Undisturbed samples should be collected when all the presampling relationships need to be preserved. Every effort is made to avoid altering the sample during the sampling process. Undisturbed samples are generally required for geotechnical work and are rarely necessary to assess environmental quality.

4.1.4 Composite Samples

Composite samples are a blend or mix of sample material, usually combined from two or more stratigraphic intervals and mixed in such a way as to represent the total borehole. Homogenized samples are composited over a discreet interval. For example, if a sample represented the 10- to 11.5-foot interval, the material from that interval would be mechanically blended before being put into the appropriate sample container. VOC samples are never composited or homogenized.

4.2 Sampling Methods

4.2.1 Solid-Barrel Samplers

The diameter of the solid barrel sampler is 1 to 6 inches and the length is between 12 and 60 inches. The sampler is usually steel or stainless steel and can be used with thin-walled liners that can be slid into or out of the sampler barrel. Liners may be made of brass, aluminum, stainless steel, or synthetic materials. Liner materials are acceptable based on the types of materials, tests, and analyses performed.

4.2.2 Split-Spoon Samplers

Split-spoon samplers are the most commonly used samplers for monitoring and geotechnical work and can be applied to a variety of drilling methods. Split-spoon samplers are usually steel or stainless steel, are tubular in shape, and are split longitudinally into two semi cylindrical halves. They may be lined or unlined. Liners are made of brass, aluminum, stainless steel, or various synthetic materials. Split-spoon samplers are generally available in 2-, 2.5-, 3-, 3.5-, and 4-inch outside diameters (OD). Lengths range between 12 and 60 inches. The 18-inch long sampler is the most commonly used. Three 6-inch liners are generally used with this sampler. Sixty-inch samplers are used when continuous coring is necessary.

Driving (hammering) is the usual method of obtaining split-spoon samples up to 2.5 feet in length. Samples are collected from the split-spoon sampler by driving the sampler into undisturbed material beneath the bottom of the casing or borehole with a weighted hammer. For most sampling, a 140-pound hammer is used. The hammer may either be at the ground surface or in-hole. The number of blow counts per 6-inch increment of total drive is recorded. An estimate of the density and consistency of the subsurface soils can be made from the relationships among the hammer weight, drop, and number of blows required to advance the split spoon in 6-inch increments.

If the sampler cannot be advanced 6 inches with a reasonable number of blows (usually about 50), sampler refusal occurs and the sampling effort at that particular interval is terminated. If “auger refusal” has not occurred, the hole is advanced to the next sampling interval where another attempt at sample retrieval is made.

After the split spoon is removed, it is opened for visual inspection and classification. If an adequate volume of sample has not been retrieved, additional sample shall be collected from a second sampler from the interval immediately below the preceding interval.

If VOCs are to be analyzed, the sample is immediately transferred into the appropriate sampling jars upon retrieval of the split spoon from the borehole. Following sample description, sample material for non-VOC analyses may be composited, homogenized, or collected from discrete intervals as provided in the project work plan. Care shall be taken to ensure that the sample collected is representative of the sample interval of interest, and not slough material. All slough material shall be discarded. If a representative sample is to be retained for future reference, the sample must be stored in a container that is compatible with potential contaminants in the sample and minimizes the potential for accidental spillage.

4.2.3 Thin-Walled Tube Samplers

The thin-walled tube (Shelby tube) sampler is an 18-, 30-, or 36-inch long, thin-walled steel, aluminum, brass, or stainless steel tube equipped with a connector head. It is primarily used in soft or clayey formations where it will provide more sample recovery than a split-spoon sampler and when relatively undisturbed samples are desired. The most commonly used sampler has a 3-inch OD and a 2.81-inch cutting diameter, and is 30 inches long.

Pressing or pushing without rotation is the normal mode of advance for the thin-walled sampler. If the tube cannot be advanced by pressing, it may become necessary to drive the sample with drill rods and hammers without rotation. The tubes are generally allowed to stay in the hole 10 to 15 minutes to allow the buildup of skin friction prior to removal. The tube is then rotated to separate it from the soil beneath it, prior to being brought to the surface.

After removal, the sample is inspected to ensure an adequate sample volume has been collected. If an inadequate volume has been collected, the above sampling procedure is repeated.

Upon retrieval, a description of the soil core is recorded in the logbook and any disturbed soil removed from the end of the tube. VOC samples are removed and placed in the appropriate sample containers immediately upon sample retrieval. Thin-walled tubes are capped with nonreactive material for transport.

4.2.4 Continuous Coring

Continuous coring is usually performed with a 60-inch split-spoon sampler that is advanced by pressing without rotating while the drill bit is rotating. The sampling tube is lowered into and retrieved from the augers or drill stem using a wireline or drill rods.

The sampling tube is locked into place so the sampler protrudes slightly ahead of the drill bit. As the bit is advanced, the auger is pressed into the formation. After the hole has been advanced the length of the sampling tube, the full sampler is retrieved and an empty sampler is put down the hole. Sampling procedures will follow those described in Section 5.3 of the SAP.

5.0 Tools, Material and Equipment

Typical soil sampling devices and accessories include but are not limited to the following:

- Air Knife
- Hand clearing tools
- VanTron
- Split spoon sampler
- Macro core sampler with acetate liner
- Scoop or trowel
- Hand auger
- Gloves, safety glasses
- Plastic sheeting
- Ruler or measuring tape

- Small bowl/cup
- Radiological bottle
- Camera

All soil sampling devices used for chemical analysis must be decontaminated or certified clean prior to use at each sample location or interval.

6.0 Documentation / Field Notes

During the collection of soil samples, soil and borehole data should be logged or recorded. This information should include:

- Date
- Boring number
- Boring location
- Drilling method
- Drilling company
- Diameter of borehole
- Depth of borehole
- Inspector
- Sampling depths
- Sample recovery
- Blow counts (if applicable)
- Field screening results
- Textural description of soil
- Depth radiological is encountered
- Odors, staining, or evidence of soil contamination

The sample descriptions should be performed in a precise manner to ensure that strata and contaminant distribution are accurate and correlation to different locations is possible. Textural soil descriptions must follow either the USCS or the Modified Burmister Soil Classification Scheme.

Soil descriptions must provide at a minimum the following information in the required format of the classification system chosen:

- Color - soil colors may be determined with the use of a color chart (eg. Munsell)
- Soil Texture - the amount of gravel, sand, and fines (silt and clays)
- Particle Shape - shape of individual soil particles (i.e. angular, sub-angular, sub-rounded, or rounded)
- Mottles - blotches or spots of contrasting color interspersed with the dominant soil color
- Structure - shape of the natural soil aggregates

- Consistency - degree of resistance to breaking or crushing; descriptions will vary with moisture condition, and clay content
- Thickness of layers - layers of soil with distinct changes of above features

7.0 Field Screening

An air-monitoring device (PID/FID) may be required to record the presence of any volatiles. To obtain the most representative monitor reading, a decontaminated stainless steel spoon, knife or other appropriately constructed device will be used to make a cross sectional slice(s) of the soil core, or, to score a longitudinal line along the length of the core deep enough to expose a porous surface. Simultaneously the probe of the monitoring device will be placed into the opened area being careful not to touch the sample, or, by moving the probe slowly above the lateral scoring. Results will be recorded. If the probe of an air monitoring device is simply moved above the soil core without breaking the smooth compact surface, instrument readings may be biased low.

Additional field screening data may be obtained by utilizing the Field Headspace Method. Follow the following procedure to perform Field Headspace analysis:

- Place approximately 10 grams of soil in a plastic ziplock bag.
- Break up any clumps of soil.
- Agitate the sample for 15 seconds.
- Place the bag in a warm place and let it sit for approximately 10 minutes.
- Shake the bag for another 15 seconds.
- Insert the probe into the bag and note the highest reading of the instrument.
- Discard the portion of the sample used for the headspace analysis.

Headspace analysis should be completed within 20 minutes of retrieval of the sample.

8.0 Sample Collection

Select a discrete 0.5 foot interval of soil for the sample. If samples are going to be analyzed for volatile organic compounds (VOCs), collect the volatile fraction first. Once this is completed, proceed to mix the remaining portion of the 0.5 foot interval in a stainless steel mixing bowl or tray. Fill the remaining sample containers with the homogenized materials. Do not collect any sample that has fallen outside of the sampling equipment as unwanted contamination may be introduced.

8.1 Field Blanks

To ensure decontamination procedures are adequately removing contaminants, the Field Team will collect a field blank for all sampling procedures utilizing reusable equipment per day. The field blank will be collected by pouring laboratory supplied distilled radiological over the sampling equipment and collecting the rinsate in the appropriate laboratory provided glassware. The field blank will be analyzed for the same parameters as the samples collected that day. One field blank will be collected and analyzed for each media sampled. If a dedicated pump is used for monitoring well sampling, a field blank will not be collected.

8.2 Trip Blanks

To ensure interference from cross-contamination is adequately accounted for, the Field Team will include one trip blank per chain of custody per day for soil samples to be analyzed for VOCs. The trip blank will be provided by the laboratory in the appropriate glassware including the appropriate preservative. The trip blank will be analyzed for the same parameters as the samples collected that day

9.0 REFERENCES

NJDEP, Field Sampling Procedures Manual, April, 2005.

NYSDEC, Bureau of Spill Prevention and Response (DEC BSPR), Sampling Guidelines and Protocols Manual, 1991.

U.S. EPA, A Compendium of Superfund Field Operation Methods. EPA/540/5-87/001.

STANDARD OPERATING PROCEDURE	SOP-005 REVISION: 0
SAMPLE DOCUMENTATION	PAGE 1 OF 8 DATE:

REVIEWED BY:____ DATE: ___________

APPROVED BY:____DATE: ___________

CONTENTS

1.0 OBJECTIVE

The objective of this Standard Operating Procedure (SOP) is to define the procedures for preparing and maintaining documentation which provides the details of field sampling activities. The sample documentation discussed in this procedure includes: site and personal logbooks, Field Data Sheets and labels, and Chain of Custody (COC) records and Custody seals.

2.0 APPLICABILITY This SOP is applicable to all Bureau Veritas North America, Inc. (BVNA) field activities which involve the generation of environmental measurements.

3.0 DESCRIPTION

3.1 General

Accurate sample documentation is essential for proper site evaluation. A clear traceable paper trail must follow each sample from its point of origin to the Final Report (or other appropriate report). It is important that specific procedures be adopted so that the desired degree of accuracy is achieved.

All sample documents must be completed legibly and in ink. Any corrections or revisions must be made by lining through the incorrect entry and initialing the error.

3.2 Site Logbook

The site logbook is used to record data and observations so that an accurate account of field operations can be reconstructed in the writer's absence. There is the potential, especially on Superfund sites, for site logs to be used as legal evidence sometime in the future. The site logbook is essentially a descriptive notebook detailing site activities and observations. All entries should be dated and signed by the individual(s) making the entries. Site logbooks should contain at a minimum, the following information:

- Site name and location on inside cover
- Date and location of field work
- Times (military times preferred, or reference a.m. or p.m.)
- Names and addresses of field contacts
- Site sketches and photographic references
- Weather conditions (Optional if provided on Field Data Sheets. See Section 3.1.)
- Sample descriptions, locations, times taken, identification numbers (Optional if provided on Field Data Sheets. See Section 3.4.1.)
- Chain of Custody information, shipping paper identification number, recipient address, and phone number, etc.
- Field observations and discussion (Optional if provided on Field Data Sheets. See Section 3.4.1.)
- Field measurements (i.e., pH, temperature, surface water flow rates, etc.) (Optional if provided on Field Data Sheets. See Section 3.4.1.)
- Instructions issued by the Work Assignment Manager
- Field activities by all field personnel on site

Entries may be made in site logbooks by any BVNA personnel on site and should detail the activities of all personnel involved in the field operations. Each entry should be signed by the person making the entry and should relate to previous entries or have sufficient background detail. The sequence of site activities should be clear to a reader who was not at the site.

When a site logbook is completed, no longer needed for site documentation, or after a project is finished, the site logbook must be transmitted to the appropriate Work Assignment folder of the Central File. If the site logbook is transmitted to an entity other than BVNA, documentation of the transmittal must be prepared and maintained in the Central File.

3.3 Personal Logbooks

When involved in field operations, all BVNA personnel will maintain a personal logbook. The personal logbook will be a chronological compilation of the individual's daily field activities. Personal logbooks are to be maintained, even if a BVNA member is entering information in a site log. The personal logbook may reference the site logbook, but must also identify what, if any, work was performed when not on site. In the absence of a dedicated site logbook, the personal logbook must detail all site related activities that would typically be entered in a site logbook.

If personal logbooks are used for site-related information in lieu of a dedicated site logbook, the BVNA Task Leader must obtain copies of the site notes from each individual field member and transmit the notes under a standard cover memo to the Central File. This must be done within 10 working days of completion of field activities.

Personal logbooks may be maintained for the individual's daily office activities at the discretion of the individual. When a BVNA member is in the office, the personal logbook should contain, at a minimum, meetings attended and meeting notes, telephone conversations, and detail of any work performed that relates to a particular site. Any task related entries should include the Work Assignment number. Entries should include, but are not limited to, the following:

- Field and project-related activities performed
- Directives from Work Assignment Manager
- Verbal instructions from NYCDEP BWSO personnel
- Personal injuries or potential exposures
- Phone conversations relevant to Work Assignments

When a personal logbook is completed or the person to whom it is assigned leaves BVNA, the personal logbook shall be returned to the Quality Assurance (QA) Office. People who must access information in a personal logbook may obtain photocopies from the person to whom the logbook is assigned.

3.4 Field Data Sheets and Sample Labels

Field Data Sheets and corresponding sample labels are used to identify samples and document field sampling conditions and activities. There are several different Field Data Sheets and sample labels used within the BVNA project.

Field Data Sheets will be maintained by the Task Leader or designee. Task Leaders are responsible for conveying original Field Data Sheets to the corresponding Central File folder upon completion of the Trip or Final Report. Field Data Sheets may be transmitted to the Central File as an attachment to these reports or as a stand alone document.

3.4.1 Field Data Sheets and Sample Labels

Prenumbered Field Data Sheets and corresponding prenumbered sample labels are used for all types of samples except soil gas and air samples (see Sections 3.4.2 and 3.4.3).

Upon sample collection at a particular sampling location, Field Data Sheet(s) shall be completed with the following information:

1. Site name, sampling location, date and time of sampling, name(s) of sampler(s), Chain of Custody record number, BVNA Task Leader's name, NYCDEP BWSO Work Assignment Manager's name, and the Work Assignment number.
2. Site description and, as applicable, soil type, surface water, stream, and bottom information.
3. Sample type, sampling device, sample information (e.g., color, odor, temperature, pH, etc.) and weather parameters.
4. Analyses to be performed and sample preparation information.

Also upon sample collection, the corresponding prenumbered sample labels must be completed and securely affixed to the sample container(s).

Because samples are often collected from the same location in more than one container (for more than one analysis), the sample label consists of several parts. The largest part of the sample label consists of the project name and NYCDEP BWSO contract number, the unique sample identification number consisting of a prefix followed by a number, and spaces for inserting the following information: site name, work order number, date and time of collection, the analysis requested, and the preservative. Other parts of the sample label include additional sample labels numbered with the same sample identification number and consecutive letter prefixes.

When a sample is collected in only one container, the largest part of the sample label is completed and affixed to the sample container. When the sample is collected in multiple containers, the largest part of the sample label is completed and affixed to one of the sample containers, and the additional labels, beginning with letter prefix "B," are affixed to the additional containers in a consecutive order. If more than 12 containers are included in a sample set, then the sampler may use blank labels and insert the sample identification number beginning with letter prefix "M" (M01001).

If duplicates or blanks are collected at a sampling location, the sample sets must be treated as being unique from the original sample and labeled with different sample identification numbers. When collecting samples for parameters which require extra volume for matrix spike/matrix spike duplicate (MS/MSD) analysis, the original sample container(s) and the MS/MSD containers are labeled with the same sample identification number and consecutive letter prefixes. For example, a water sample for BNA analysis that also requires MS/MSD analysis would be collected in four sample containers which would be labeled A01003 through D01003. Required volumes for MS/MSD analysis for typical parameters are specified in Bureau Veritas SOP #, *Chain of Custody*.

3.4.2 Soil Gas Sampling Data Sheets and Sample Labels

Soil Gas Sampling Data Sheets and prenumbered sample labels are used for all soil gas sampling activities.

The heading of the data sheets shall be completed with the following information: site name, samplers, date, BVNA Task Leader, NYSDEC Work Assignment Manager, the project number, and the weather parameters.

After the soil gas well is screened with field instrument(s), the location identification, pertinent remarks, time, depth, and the instrument reading(s) are recorded in the first available column on the Soil Gas Sampling Data Sheet. A total of five (5) columns are available to record data from five sampling points on each Data Sheet.

If a soil gas sample was collected at that particular location, "Y" is circled to indicate this. The soil gas sample label is completed with the site name, sample location, date, time, remarks, and instrument readings; then the label is affixed to the sample container. A corresponding sample label (with sample identification number only) is inserted on the sample number line in the appropriate column on the soil gas sampling data sheet. If a soil gas sample was not collected at that particular location, "N" is circled to indicate this.

If necessary, the additional sample label (with the sample identification number only) can be inserted in the logbook used for documenting sampling activities, or it can be used for additional sample containers if the sample is collected in multiple containers. Blank sample labels are also provided so that sample numbers can be written in, when needed. Trip standards, field blanks, and samples containing spikes must be assigned unique sample identification numbers. Soil Gas Sampling Data Sheets and sample labels will be prepared and maintained for these types of samples in the same manner as other sample matrices.

3.4.3 Air Sampling Work Sheets and Sample Labels

Air Sampling Work Sheets and prenumbered sample labels are used for all air sampling activities.

The heading of the Air Sampling Worksheet is completed with the following information: site name, samplers, date, Work Assignment number, the name of the NYCDEP BWSO Work Assignment Manager, and the BVNA Task Leader.

When air sampling is initiated, the following information is recorded in the first available column on the Air Sampling Worksheet: sample number, location, pump number media, analysis/method and time/counter start. At the end of the sampling period the following information is recorded: time/counter stop, total time, pump fault (indicate by using "Y" or "N"), flow rate start, flow rate stop, flow rate average, and volume, are recorded. A total of five columns are available to record data from five sampling locations on each air sampling worksheet.

The total sampling time is calculated by subtracting the start time/counter value from the stop time/counter value. The flow rate average is calculated from the start and stop flow rates. The volume sampled is calculated by multiplying the total sampling time by the average flow rate. All calculated values, along with the analysis requested, are recorded in the appropriate location on the air sampling worksheets.

If real-time air monitoring instruments are used at a particular sample location, the instrument readings are recorded on an Air Monitoring Work Sheet. If air samples are collected outdoors, then the appropriate weather parameters are also recorded on the Air Monitoring Work Sheet.

The pre-numbered air sample label consists of several parts. The largest part includes the project name, the contract number, the sample identification number, and space for the following information: the site name, volume of air, date, time, requested analysis, and remarks. Other parts include two additional sample labels with only the sample identification number.

When a sample is collected, the largest part of the sample label is completed and affixed to the sample container in the manner described by the appropriate BVNA air sampling SOP. If samples are collected from a single sampling location in more than one sample media, separate sample numbers are used for each different sample medium used. The blank space at the end of the sample identification number is used to indicate the media. The small sample labels are affixed to the additional sample containers. If available, the small sample labels may be inserted in the sample number space in the appropriate column on the Air Sampling Work Sheet. Blank sample labels are provided for use as necessary.

Alternatively, at the Task Leader's discretion, separate sample numbers may be used for each media in which samples are collected at a single sampling location. In this case, the largest part of the sample label will be completed and affixed to the sample container in the manner described by the appropriate BVNA air sampling SOP. The small sample labels (with sample identification number only) will be affixed to the Air Sampling Worksheet and the logbook.

Quality Control (QC) samples must be assigned unique sample identification numbers. Air Sampling Work Sheets and prenumbered sample labels will be prepared and maintained in the same manner as for other sample matrices.

3.4.4 Specialized Field Data Sheets

Task Leaders, with the approval of the Group Leader, the Work Assignment Manager, and the QA Officer, may develop specialized Field Data Sheets if none of the three types described above meet the specific needs of the project. At a minimum, the Field Data Sheet must include space for recording the name(s) of the sampler(s), the sample number(s), the location of the sample, the date and time that the sample was taken, and any pertinent field conditions. The following information will be included in the header of the data sheet: (Matrix) Data Sheet, BVNA, Edison, NJ, NYSDEC Contract:

3.5 Chain of Custody

A Chain of Custody record must be maintained from the time a sample is collected to its final deposition. The Chain of Custody record shall contain, at a minimum, the following information: project name, project number, the BVNA contact, and the contact telephone number. For each sample collected, the Chain of Custody record shall include the sample number, sampling location, sample matrix, date collected, number of bottles, container/preservative, the analysis requested, and special instructions, if any are applicable.

Chain of Custody records must be completed legibly, with all required information, so that miscommunication with, or misunderstanding by, the receiving laboratory is prevented.

If samples collected during a sampling event are being forwarded to more than one laboratory, then a separate Chain of Custody record, indicating which samples are being sent to that particular laboratory, must be completed.

The Chain of Custody provides a means by which the entire path and life of a sample can be traced. Every transfer of custody must be noted and signed for on the Chain of Custody record. If a sample or group of samples is not under direct control or observation of the individual responsible for the samples, then they must be stored in a locked container that has been sealed with a Custody Seal (Section 3.6). A copy of the Chain of Custody record should be kept by each individual who has signed it. The final copy should be included with the Analytical Report.

3.6 Custody Seals

Custody Seals demonstrate that a sample container has not been opened or tampered with during transport or storage. Two seals should be affixed in such a manner that the shipping container cannot be opened without breaking the seal. The person in direct possession of the samples shall sign and date the seal. The name of the individual signing the seal and a description of the packaging shall be noted in the site logbook.

4.0 RESPONSIBILITIES

4.1 Task Leaders and Field Staff

Task Leaders and field staff are responsible for preparing and maintaining sample documentation in accordance with this SOP.

4.2 Group Leaders and Section Leaders

Group Leaders and Section Leaders are responsible for ensuring implementation of the procedures outlined in this SOP.

4.3 QA Office

The QA Office is responsible for ensuring compliance with this SOP by auditing reports prepared by Bureau Veritas personnel.

5.0 REFERENCES

NJDEP, Field Sampling Procedures Manual, April, 2005.

NYSDEC, Bureau of Spill Prevention and Response (DEC BSPR), Sampling Guidelines and Protocols Manual, 1991.

U.S. EPA, A Compendium of Superfund Field Operation Methods. EPA/540/5-87/001.

STANDARD OPERATING PROCEDURE	SOP-006 REVISION: 0
INVESTIGATION-DERIVED WASTE (IDW) MANAGEMENT	PAGE 1 OF 9 DATE:

REVIEWED BY:____ **DATE:** ____________

APPROVED BY:____**DATE:** ____________

CONTENTS

1.0 SCOPE AND APPLICATION

The objective of this standard operating procedure (SOP) is to provide general reference information on management of investigation-derived wastes (IDW) generated during site investigations. IDW includes soil cuttings, drilling muds, purged groundwater, decontamination fluids (water and other fluids), disposable sampling equipment, and disposable personal protective equipment (PPE).

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

2.0 METHOD SUMMARY

The Task Leader should evaluate IDW handling and management options based on:

- The site contaminants and their concentrations, and total projected volume of IDW.
- Media potentially affected (e.g., groundwater, soil) by management options.
- Location of the nearest population(s) and likelihood and/or degree of site access.
- Potential exposure to workers.
- Potential environmental impacts.

Every effort must be made to ensure the selection of investigation method(s) that minimize the generation of IDW, contact with contaminants, and cost of disposal. Efforts made to characterize IDW shall be consistent with the scope and purpose of the site investigation.

The QA Work Plan describing the anticipated approach and procedures for IDW management shall be clear, detailed, and concise. Any deviation or modification due to unexpected and unforeseen field conditions will be noted in the site logbook.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

This section is not applicable to this SOP.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

IDW can be contaminated with various hazardous substances. To handle IDW in compliance with regulations, reasonable efforts should be made to characterize the wastes.

5.0 EQUIPMENT/APPARATUS

Equipment, materials, and supplies needed for containerizing IDW are generally selected based on waste characteristics or constituents. Other considerations include the case of decontaminating or disposing of the equipment. Most equipment and supplies can be easily procured. For example, 5-gallon buckets, plastic bags, etc. can help segregate contaminated materials. Contaminated liquid can be stored temporarily in metal or plastic cans or drums.

5.1 Waste Disposal

- Trash bags
- Trash containers
- 55-gallon drums or 5-gallon pails
- Metal/plastic buckets/containers for storage and disposal of decontamination solutions

5.2 Decontamination Equipment

- Drop cloths of plastic or other suitable materials
- Large galvanized tubs
- Wash solutions
- Rinse solutions
- Long-handled, soft-bristled brushes
- Paper or cloth towels
- Metal or plastic cans or drums
- Soap or wash solution

6.0 REAGENTS

There are no reagents used in this procedure aside from decontamination solutions. In general, the following solvents are typically utilized for decontamination purposes:

- 10% nitric acid
- Acetone (pesticide grade)
- Hexane (pesticide grade)
- Methanol

7.0 PROCEDURES

7.1 Regulatory Background and Options for Management of IDW

The most important general elements of managing IDW are as follows:

Leaving a site in no worse condition than existed prior to the investigation.

Removing those wastes that pose an immediate threat to human health or the environment

Leaving on site those wastes that do not require off-site disposal or long-term above-ground containerization.

Complying with federal and state ARARs to the extent practicable.

Planning and coordination for IDW management.

Minimizing the quantity of wastes generated

The specific elements of the approach are as follows:

Characterizing IDW through the use of existing information (manifests, Material Safety Data Sheets, previous test results, knowledge of the waste generation process, and other relevant records) and best professional judgment.

Containerizing and disposing of RCRA hazardous decontamination fluids, PPE, and disposable sampling equipment (if generated in excess of 100 kg/month) at RCRA Subtitle C facilities.

Leaving on site nonhazardous soil cuttings, groundwater, and decontamination fluids preferably without containerization and testing.

Based on this information and the guidelines included in the following sections, the Task Leader should include a plan for handling IDW in the QA Work Plan. Any deviations from or modifications to the plan due to unexpected or unforeseen field conditions must be noted in the site logbook.

7.2 Identification of IDW

To handle IDW properly, the Task Leader must know whether it contains CERCLA hazardous substances and whether these substances are RCRA hazardous wastes or contaminants regulated under other statutes. To handle IDW in compliance with regulations, reasonable efforts should be made to characterize them. However, these efforts should be consistent with the scope and purpose of the site investigation.

In particular, extensive testing is not warranted in most cases; instead, the nature of the wastes should be assessed by applying professional judgment, using readily available information about the site (such as manifests, storage reports, preliminary assessments, and results of earlier studies), as well as direct observation of the wastes for discoloration, odor, or other indicators of contamination. Similarly, RCRA procedures for determining whether a waste exhibits RCRA hazardous characteristics do not require testing if the decision can be made by applying knowledge of the characteristic in light of the materials or process used. In most instances, a determination may be made based on available information and professional judgment. This does not mean that IDW can be assumed to be nonhazardous unless clearly proven otherwise. Given the limited information available, the Task Leader, in conjunction with the Work Assignment Manager, must determine whether it more likely than not that the wastes are hazardous.

Even if the IDW do not contain RCRA hazardous waste, the Task Leader should determine whether they contain other CERCLA hazardous substances. CERCLA hazardous substances include, in addition to RCRA hazardous wastes, substances, elements, compounds, solutions, or mixtures designated as hazardous or toxic under CERCLA itself or under the authority of other laws such as TSCA, CWA, CAA, and SDWA. Therefore, even if RCRA is not applicable, one of these statutes may be.

IDW may include, but is not limited to, the following items:

- Solid Waste
- Soil
- Sediment
- Sludge
- Drum solids
- Drill cuttings
- Used glassware
- Dedicated/expendable equipment (bailers, fitters, hose, buckets, XRF cups, etc.)
- Clean trash
- PPE
- Decontamination equipment (buckets, brushes, clothing, tools, etc.)
- Field analytics waste (immunoassay, chlor-n-oil, chlor-in-soil, HACH kits, sample extracts, etc.)

<u>Aqueous Waste</u>

- Drilling fluids
- Purge water
- Development water
- Decontamination fluids

7.3 Management of IDW

7.3.1 Waste Minimization

The Task Leader should select site investigation methods that minimize the generation of IDW, particularly RCRA hazardous wastes. The site investigation team should limit contact with contaminants and use drilling and decontamination methods (such as steam cleaning) that minimize PPE, disposable equipment, decontamination fluids, and soil cuttings. In particular, the inspection team should minimize the amounts of solvents used for decontamination or eliminate solvents altogether. Minimizing the amount of wastes generated reduces the number of IDW handling problems and costs of disposal.

7.3.2 Types, Hazards, and Quantities of IDW

To handle IDW properly, the Task Leader must determine the types (such as soil cuttings, groundwater, decontamination fluids, PPE, or disposable equipment), characteristics (whether RCRA hazardous or containing other CERCLA hazardous substances), and quantities of anticipated wastes. As discussed previously, testing will generally not be required to characterize waste.

Upon determining the types of anticipated IDW, the Task Leader should determine IDW characteristics, in particular whether it is expected to be RCRA hazardous or to contain high concentrations of PCBs. For RCRA hazardous IDW, the Task Leader should determine whether it poses an increased hazard to human health and the environment relative to conditions that existed prior to the site investigation. Field analytical screening results, if available, may be helpful indicators of IDW characteristics. However, the Task Leader must remember that these are not RCRA tests and that the test results usually do not identify RCRA hazardous wastes. The Task Leader must also determine the exact properties of RCRA nonhazardous IDW to select an appropriate disposal facility when the off-site disposal is required.

Upon determining the type and characteristics of IDW to be generated, the Task Leader must assess the anticipated quantities of waste. This should be done based on past experience with site investigations of similar scope.

7.3.3 On-Site IDW Handling Options

In planning the scope of work, the Task Leader must decide if IDW can be left on site or if it must be disposed off site.

Handling of RCRA hazardous IDW and IDW with high PCB concentrations (greater than 50 ppm) may involve either moving the IDW within an AOC unit, or containerization, storage, testing, treatment, and off-site disposal. Handling of RCRA nonhazardous IDW usually involves various methods of on-site disposal. It is preferable to leave both RCRA hazardous and nonhazardous IDW on site whenever it complies with regulations and does not pose any immediate threat to human health and the environment.

If IDW are RCRA nonhazardous soil or water, they should be left on site unless other circumstances, such as state ARARs or a high probability of serious community concerns, require off-site disposal. RCRA hazardous soil also may be left on site within an AOC unit. The Task Leader must determine procedures for handling IDW on site in conjunction with the Work Assignment Manager.

The on-site handling options available to the Task Leader when IDW are RCRA nonhazardous are listed below.

For soil cuttings:

1. Spread around the well.
2. Put back into the boring.
3. Put into a pit within the AOC.
4. Dispose of at the site's operating treatment/disposal unit (TDU).

For groundwater:

1. Pour onto ground next to well to allow infiltration.
2. Dispose of at the site's TDU.

For decontamination fluids:

1. Pour onto ground (from containers) to allow infiltration.
2. Dispose of at the site's TDU.

For decontaminated PPE and disposable equipment:

1. Double bag and deposit in the site or U.S. EPA dumpster, or in any municipal landfill.
2. Dispose of at the site's TDU.

If IDW are considered RCRA nonhazardous due to lack of information on the waste hazard, the Task Leader should have an alternate plan for handling IDW if field conditions indicate that these wastes are hazardous. In such a case, there should be an adequate number of containers available for collecting groundwater, decontamination water, soil cuttings, etc.

If IDW consists of RCRA hazardous soils that pose no immediate threat to human health and the environment, the Task Leader should plan on leaving it on site within a delineated AOC unit. However, the Task Leader must consider the proximity of residents and workers in the surrounding area and use best professional judgment to make these decisions. Planning for leaving RCRA hazardous waste on site involves:

- Delineating the AOC unit.
- Determining pit locations close to the borings within the AOC unit for waste burial.
- Covering hazardous IDW in the pits with surficial soil.
- Not containerizing and testing wastes designated to be left on site.

Another alternative for handling RCRA hazardous soil is disposal in a TDU located on the same property as the AOC under investigation. If the TDU is outside the AOC, it must comply with the off-site policy. If any decontamination fluids are generated which are RCRA hazardous wastes, they should be disposed of off site in compliance with the off-site policy or in compliance with the conditionally exempt small quantity generator exemption. Small quantities (i.e., no more than 100 kg/month) of decontamination fluids may be containerized prior to delivery to a hazardous waste facility.

7.3.4 Off-Site Disposal of IDW Options

IDW should be disposed of off site in the following situations:

- When they are RCRA hazardous water.
- When they are RCRA hazardous soil that may pose a substantial risk if left at the site.
- When they are RCRA hazardous PPE and disposable equipment.
- If leaving them on site would create increased risks at the site.

RCRA nonhazardous wastes could be disposed of off-site at appropriate RCRA nonhazardous facilities that are in compliance with CERCLA section 121(d)(3) and off-site policy when it is necessary to comply with legally enforceable requirements such as state ARARs that preclude on-site disposal. IDW designated for off-site disposal must be properly containerized, tested, and stored before pick up and disposal. Decontaminated PPE and disposable equipment should be double-bagged if sent to an off-site dumpster or municipal landfill.

Planning for off-site disposal should include the following guidelines:

- Informing the Work Assignment Manager that containerized IDW may be temporarily stored on site while awaiting pick up for off-site disposal.
- Initiating the procurement process for IDW testing, pick up and disposal.
- Coordinating IDW testing and pick-up activities.
- Preparing adequate numbers and types of containers. Drums should be used for collecting small amounts of IDW. Larger amounts of soil and water can be contained in Baker tanks, poly tanks, and bins. PPE and disposable equipment should be double-bagged for disposal at a municipal landfill or collected in drums for disposal at a hazardous waste facility.
- Designating a storage area (either within the site's existing storage facility, existing fenced area, or within a temporary fence constructed for the site investigation). No humans, children in particular, may have access to the storage area.

All IDW shipped off site, whether RCRA hazardous or not, must go to facilities that comply with the RCRA disposal policy, and the Task Leader, in conjunction with the NYSDEC, must verify that the facilities operate in accordance with this policy.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

a. There are no specific quality assurance activities which apply to the implementation of these procedures. However all IDW disposal information must be documented within site logbooks. Additionally, all shipping and transport of hazardous and nonhazardous samples will comply with Department of Transportation (DOT) and International Air Transport Association (IATA) regulations.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and corporate health and safety procedures.

12.0 REFERENCES

Code of Federal Regulations (CFR), Title 40, Part 261, Section 23, Section 11 (a) (3), and Section 24 (a) (b).

CFR Proposed Criteria: 51 FR 21685, June 30, 1986 and 51 FR 21450, May 20, 1992. 5.0

NJDEP, Field Sampling Procedures Manual, April, 2005.

NYSDEC, Bureau of Spill Prevention and Response (DEC BSPR), Sampling Guidelines and Protocols Manual, 1991.

U.S. EPA, A Compendium of Superfund Field Operation Methods. EPA/540/5-87/001.

U.S. EPA, Guide to Management of Investigation Derived Wastes, OERR Directive 9345.3.03FS, January 1992.

U.S. EPA, Management of Investigations - Derived Wastes During Site Inspections, OERR Directive 9345.3-02, May 1991.

STANDARD OPERATING PROCEDURE	SOP-007 REVISION: 0
SAMPLING EQUIPMENT DECONTAMINATION	PAGE 1 OF 14 DATE:

REVIEWED BY:____ **DATE:** ____________

APPROVED BY:____**DATE:** ____________

CONTENTS

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide a description of the methods used for preventing, minimizing, or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination and to provide general guidelines for developing decontamination procedures for sampling equipment to be used during hazardous waste operations as per 29 Code of Federal Regulations (CFR) 1910.120. This SOP does not address personnel decontamination.

These are standard (i.e. typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitation, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

2.0 METHOD SUMMARY

Removing or neutralizing contaminants from equipment minimizes the likelihood of sample cross contamination, reduces or eliminates transfer of contaminants to clean areas, and prevents the mixing of incompatible substances.

Gross contamination can be removed by physical decontamination procedures. These abrasive and non-abrasive methods include the use of brushes, air and wet blasting, and high and low pressure water cleaning.

The first step, a soap and water wash, removes all visible particulate matter and residual oils and grease. This may be preceded by a steam or high pressure water wash to facilitate residuals removal. The second step involves a tap water rinse and a distilled/deionized water rinse to remove the detergent. An acid rinse provides a low pH media for trace metals removal and is included in the decontamination process if metal samples are to be collected. It is followed by another distilled/deionized water rinse. If sample analysis does not include metals, the acid rinse step can be omitted. Next, a high purity solvent rinse is performed for trace organics removal if organics are a concern at the site. Typical solvents used for removal of organic contaminants include acetone, hexane, or water. Acetone is typically chosen because it is an excellent solvent, miscible in water, and not a target analyte on the Priority Pollutant List. If acetone is known to be a contaminant of concern at a given site or if Target Compound List analysis (which includes acetone) is to be performed, another solvent may be substituted. The solvent must be allowed to evaporate completely and then a final distilled/deionized water rinse is performed. This rinse removes any residual traces of the solvent.

The decontamination procedure described above may be summarized as follows:

1. Physical removal
2. Non-phosphate detergent wash
3. Tap water rinse
4. Distilled/deionized water rinse
5. 10% nitric acid rinse
6. Distilled/deionized water rinse
7. Solvent rinse (pesticide grade)
8. Air dry
9. Distilled/deionized water rinse

If a particular contaminant fraction is not present at the site, the nine (9) step decontamination procedure specified above may be modified for site specificity. For example, the nitric acid rinse may be eliminated if metals are not of concern at a site. Similarly, the solvent rinse may be eliminated if organics are not of concern at a site. Modifications to the standard procedure should be documented in the site specific work plan or subsequent report.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample to be collected and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest.

More specifically, sample collection and analysis of decontamination waste may be required before beginning proper disposal of decontamination liquids and solids generated at a site. This should be determined prior to initiation of site activities. Here, for the proper disposal of the radioactive waste, a baseline sampling of the site soils is planned.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

- The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be analyte free (specifically for the contaminants of concern).
- The use of an untreated potable water supply is not an acceptable substitute for tap water. Tap water may be used from any municipal or industrial water treatment system.
- If acids or solvents are utilized in decontamination they raise health and safety, and waste disposal concerns.
- Damage can be incurred by acid and solvent washing of complex and sophisticated sampling equipment.

5.0 EQUIPMENT/APPARATUS

Decontamination equipment, materials, and supplies are generally selected based on availability. Other considerations include the ease of decontaminating or disposing of the equipment. Most equipment and supplies can be easily procured. For example, soft-bristle scrub brushes or long-handled bottle brushes can be used to remove contaminants. Large galvanized wash tubs, stock tanks, or buckets can hold wash and rinse solutions. Children's wading pools can also be used. Large plastic garbage cans or other similar containers lined with plastic bags can help segregate contaminated equipment. Contaminated liquid can be stored temporarily in metal or plastic cans or drums.

The following standard materials and equipment are recommended for decontamination activities:

5.1 Decontamination Solutions

- Non-phosphate detergent
- Selected solvents (acetone, hexane, nitric acid, etc.)
- Tap water
- Distilled or deionized water

5.2 Decontamination Tools/Supplies

- Long and short handled brushes
- Bottle brushes
- Drop cloth/plastic sheeting
- Paper towels

- Plastic or galvanized tubs or buckets
- Pressurized sprayers (H2O)
- Solvent sprayers
- Aluminum foil

5.3 Health and Safety Equipment

Appropriate personal protective equipment (i.e., safety glasses or splash shield, appropriate gloves, aprons or coveralls, respirator, emergency eye wash)

5.4 Waste Disposal

- Trash bags
- Trash containers
- 55-gallon drums
- Metal/plastic buckets/containers for storage and disposal of decontamination solutions

6.0 REAGENTS

There are no reagents used in this procedure aside from the actual decontamination solutions. Table 1 (Appendix A) lists solvent rinses which may be required for elimination of particular chemicals. In general, the following solvents are typically utilized for decontamination purposes:

- 10% nitric acid is typically used for inorganic compounds such as metals. An acid rinse may not be required if inorganics are not a contaminant of concern.
- Acetone (pesticide grade)(1)
- Hexane (pesticide grade)(1)
- Methanol(1)

(1) - Only if sample is to be analyzed for organics.

7.0 PROCEDURES

As part of the health and safety plan, a decontamination plan should be developed and reviewed. The decontamination line should be set up before any personnel or equipment enters the areas of potential exposure. The equipment decontamination plan should include:

- The number, location, and layout of decontamination stations.
- Decontamination equipment needed.
- Appropriate decontamination methods.
- Methods for disposal of contaminated clothing, equipment, and solutions.
- Procedures can be established to minimize the potential for contamination. This may include: (1) work practices that minimize contact with potential contaminants; (2) using remote sampling techniques; (3) covering monitoring and sampling equipment with plastic, aluminum foil, or other protective material; (4) watering down dusty areas; (5) avoiding laying down equipment in areas of obvious contamination; and (6) use of disposable sampling equipment.

7.1 Decontamination Methods

All samples and equipment leaving the contaminated area of a site must be decontaminated to remove any contamination that may have adhered to equipment. Various decontamination methods will remove contaminants by: (1) flushing or other physical action, or (2) chemical complexing to inactivate contaminants by neutralization, chemical reaction, disinfection, or sterilization.

Physical decontamination techniques can be grouped into two categories: abrasive methods and non-abrasive methods, as follows:

7.1.1 Abrasive Cleaning Methods

Abrasive cleaning methods work by rubbing and wearing away the top layer of the surface containing the contaminant. The mechanical abrasive cleaning methods are most commonly used at hazardous waste sites. The following abrasive methods are available:

<u>Mechanical</u>

Mechanical methods of decontamination include using metal or nylon brushes. The amount and type of contaminants removed will vary with the hardness of bristles, length of time brushed, degree of brush contact, degree of contamination, nature of the surface being cleaned, and degree of contaminant adherence to the surface.

<u>Air Blasting</u>

Air blasting equipment uses compressed air to force abrasive material through a nozzle at high velocities. The distance between nozzle and surface cleaned, air pressure, time of application, and angle at which the abrasive strikes the surface will dictate cleaning efficiency. Disadvantages of this method are the inability to control the amount of material removed and the large amount of waste generated.

<u>Wet Blasting</u>

Wet blast cleaning involves use of a suspended fine abrasive. The abrasive/water mixture is delivered by compressed air to the contaminated area. By using a very fine abrasive, the amount of materials removed can be carefully controlled.

7.1.2 Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods work by forcing the contaminant off a surface with pressure. In general, the equipment surface is not removed using non-abrasive methods.

<u>Low-Pressure Water</u>

This method consists of a container which is filled with water. The user pumps air out of the container to create a vacuum. A slender nozzle and hose allow the user to spray in hard-to-reach places.

<u>High-Pressure Water</u>

This method consists of a high-pressure pump, an operator controlled directional nozzle, and a high-pressure hose. Operating pressure usually ranges from 340 to 680 atmospheres (atm) and flow rates usually range from 20 to 140 liters per minute.

<u>Ultra-High-Pressure Water</u>

This system produces a water jet that is pressured from 1,000 to 4,000 atmospheres. This ultra-high-pressure spray can remove tightly-adhered surface films. The water velocity ranges from 500 meters/second (m/s) (1,000 atm) to 900 m/s (4,000 atm). Additives can be used to enhance the cleaning action.

<u>Rinsing</u>

Contaminants are removed by rinsing through dilution, physical attraction, and solubilization.

Damp Cloth Removal

In some instances, due to sensitive, non-waterproof equipment or due to the unlikelihood of equipment being contaminated, it is not necessary to conduct an extensive decontamination procedure. For example, air sampling pumps hooked on a fence, placed on a drum, or wrapped in plastic bags are not likely to become heavily contaminated. A damp cloth should be used to wipe off contaminants which may have adhered to equipment through airborne contaminants or from surfaces upon which the equipment was set.

Disinfection/Sterilization

Disinfectants are a practical means of inactivating infectious agents. Unfortunately, standard sterilization methods are impractical for large equipment. This method of decontamination is typically performed off-site.

7.2 Field Sampling Equipment Decontamination Procedures

The decontamination line is setup so that the first station is used to clean the most contaminated item. It progresses to the last station where the least contaminated item is cleaned. The spread of contaminants is further reduced by separating each decontamination station by a minimum of three (3) feet. Ideally, the contamination should decrease as the equipment progresses from one station to another farther along in the line.

A site is typically divided up into the following boundaries: Hot Zone or Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ), and the Support or Safe Zone (SZ). The decontamination line should be setup in the Contamination Reduction Corridor (CRC) which is in the CRZ. Figure 1 (Appendix B) shows a typical contaminant reduction zone layout. The CRC controls access into and out of the exclusion zone and confines decontamination activities to a limited area. The CRC boundaries should be conspicuously marked. The far end is the hotline, the boundary between the exclusion zone and the contamination reduction zone. The size of the decontamination corridor depends on the number of stations in the decontamination process, overall dimensions of the work zones, and amount of space available at the site. Whenever possible, it should be a straight line.

Anyone in the CRC should be wearing the level of protection designated for the decontamination crew. Another corridor may be required for the entry and exit of heavy equipment. Sampling and monitoring equipment and sampling supplies are all maintained outside of the CRC. Personnel don their equipment away from the CRC and enter the exclusion zone through a separate access control point at the hotline. One person (or more) dedicated to decontaminating equipment is recommended.

7.2.1 Decontamination Setup

Starting with the most contaminated station, the decontamination setup should be as follows:

Station 1 Segregate Equipment Drop

Place plastic sheeting on the ground (Figure 2, Appendix B). Size will depend on amount of equipment to be decontaminated. Provide containers lined with plastic if equipment is to be segregated. Segregation may be required if sensitive equipment or mildly contaminated equipment is used at the same time as equipment which is likely to be heavily contaminated.

Station 2 Physical Removal With A High-Pressure Washer (Optional)

As indicated in 7.1.2, a high-pressure wash may be required for compounds which are difficult to remove by washing with brushes. The elevated temperature of the water from the high-pressure washers is excellent at removing greasy/oily compounds. High pressure washers require water and electricity.

A decontamination pad may be required for the high-pressure wash area. An example of a wash pad may consist of an approximately 1 1/2 foot-deep basin lined with plastic sheeting and sloped to a sump at one corner. A layer of sand can be placed over the plastic and the basin is filled with gravel or shell. The sump is also lined with visqueen and a barrel is placed in the hole to prevent collapse. A sump pump is used to remove the water from the sump for transfer into a drum.

Typically heavy machinery is decontaminated at the end of the day unless site sampling requires that the machinery be decontaminated frequently. A separate decontamination pad may be required for heavy equipment.

Station 3 Physical Removal With Brushes And A Wash Basin

Prior to setting up Station 3, place plastic sheeting on the ground to cover areas under Station 3 through Station 10.

Fill a wash basin, a large bucket, or child's swimming pool with non-phosphate detergent and tap water. Several bottle and bristle brushes to physically remove contamination should be dedicated to this station. Approximately 10 - 50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 4 Water Basin

Fill a wash basin, a large bucket, or child's swimming pool with tap water. Several bottle and bristle brushes should be dedicated to this station. Approximately 10 - 50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 5 Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to contain the water during the rinsing process. Approximately 10-20 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 6 Nitric Acid Sprayers

Fill a spray bottle with 10% nitric acid. An acid rinse may not be required if inorganics are not a contaminant of concern. The amount of acid will depend on the amount of equipment to be decontaminated. Provide a 5-gallon bucket or basin to collect acid during the rinsing process.

Station 7 Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 8 Organic Solvent Sprayers

Fill a spray bottle with an organic solvent. After each solvent rinse, the equipment should be rinsed with distilled/deionized water and air dried. Amount of solvent will depend on the amount of equipment to decontaminate. Provide a 5-gallon bucket or basin to collect the solvent during the rinsing process.

Solvent rinses may not be required unless organics are a contaminant of concern, and may be eliminated from the station sequence.

Station 9 Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 10 Clean Equipment Drop

Lay a clean piece of plastic sheeting over the bottom plastic layer. This will allow easy removal of the plastic in the event that it becomes dirty. Provide aluminum foil, plastic, or other protective material to wrap clean equipment.

7.2.2 Decontamination Procedures

Station 1 Segregate Equipment Drop

Deposit equipment used on-site (i.e., tools, sampling devices and containers, monitoring instruments radios, clipboards, etc.) on the plastic drop cloth/sheet or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross contamination. Loose leaf sampling data sheets or maps can be placed in plastic zip lock bags if contamination is evident.

Station 2 Physical Removal With A High-Pressure Washer (Optional)

Use high pressure wash on grossly contaminated equipment. Do not use high- pressure wash on sensitive or non-waterproof equipment.

Station 3 Physical Removal With Brushes And A Wash Basin

Scrub equipment with soap and water using bottle and bristle brushes. Only sensitive equipment (i.e., radios, air monitoring and sampling equipment) which is waterproof should be washed. Equipment which is not waterproof should have plastic bags removed and wiped down with a damp cloth. Acids and organic rinses may also ruin sensitive equipment. Consult the manufacturers for recommended decontamination solutions.

Station 4 Equipment Rinse

Wash soap off of equipment with water by immersing the equipment in the water while brushing. Repeat as many times as necessary.

Station 5 Low-Pressure Rinse

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 6 Nitric Acid Sprayers (required only if metals are a contaminant of concern)

Using spray bottle rinse sampling equipment with nitric acid. Begin spraying (inside and outside) at one end of the equipment allowing the acid to drip to the other end into a 5-gallon bucket. A rinsate blank may be required at this station. Refer to Section 9.

Station 7 Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 8 Organic Solvent Sprayers

Rinse sampling equipment with a solvent. Begin spraying (inside and outside) at one end of the equipment allowing the solvent to drip to the other end into a 5-gallon bucket. Allow the solvent to evaporate from the equipment before going to the next station. A QC rinsate sample may be required at this station.

Station 9 Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure washer.

Station 10 Clean Equipment Drop

Lay clean equipment on plastic sheeting. Once air dried, wrap sampling equipment with aluminum foil, plastic, or other protective material.

7.2.3 Post Decontamination Procedures

1. Collect high-pressure pad and heavy equipment decontamination area liquid and waste and store in appropriate drum or container. A sump pump can aid in the collection process. Refer to the Department of Transportation (DOT) requirements for appropriate containers based on the contaminant of concern.

2. Collect high-pressure pad and heavy equipment decontamination area solid waste and store in appropriate drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

3. Empty soap and water liquid wastes from basins and buckets and store in appropriate drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

4. Empty acid rinse waste and place in appropriate container or neutralize with a base and place in appropriate drum. pH paper or an equivalent pH test is required for neutralization. Consult DOT requirements for appropriate drum for acid rinse waste.

5. Empty solvent rinse sprayer and solvent waste into an appropriate container. Consult DOT requirements for appropriate drum for solvent rinse waste.

6. Using low-pressure sprayers, rinse basins, and brushes. Place liquid generated from this process into the wash water rinse container.

7. Empty low-pressure sprayer water onto the ground.

8. Place all solid waste materials generated from the decontamination area (i.e., gloves and plastic sheeting, etc.) in an approved DOT drum. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

9. Write appropriate labels for waste and make arrangements for disposal. Consult DOT regulations for the appropriate label for each drum generated from the decontamination process.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

A rinsate blank is one specific type of quality control sample associated with the field decontamination process. This sample will provide information on the effectiveness of the decontamination process employed in the field. Rinsate blanks are samples obtained by running analyte free water over decontaminated sampling equipment to test for residual contamination. The blank water is collected in sample containers for handling, shipment, and analysis. These samples are treated identical to samples collected that day. A rinsate blank is used to assess cross contamination brought about by improper decontamination procedures. Where dedicated sampling equipment is not utilized, collect one rinsate blank per day, per type of sampling device for samples, to meet QA2 and QA3 objectives. For further information, refer to SOP #009, Quality Control Samples.

If sampling equipment requires the use of plastic tubing it should be disposed of as contaminated and replaced with clean tubing before additional sampling occurs.

10.0 DATA VALIDATION

Results of quality control samples will be evaluated for contamination. This information will be utilized to qualify the environmental sample results in accordance with the project's data quality objectives.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow OSHA, U.S. EPA, corporate, and other applicable health and safety procedures.

Decontamination can pose hazards under certain circumstances. Hazardous substances may be incompatible with decontamination materials. For example, the decontamination solution may react with contaminants to produce heat, explosion, or toxic products. Also, vapors from decontamination solutions may pose a direct health hazard to workers by inhalation, contact, fire, or explosion.

The decontamination solutions must be determined to be acceptable before use. Decontamination materials may degrade protective clothing or equipment; some solvents can permeate protective clothing. If decontamination materials do pose a health hazard, measures should be taken to protect personnel or substitutions should be made to eliminate the hazard. The choice of respiratory protection based on contaminants of concern from the site may not be appropriate for solvents used in the decontamination process.

Safety considerations should be addressed when using abrasive and non-abrasive decontamination equipment. Maximum air pressure produced by abrasive equipment could cause physical injury. Displaced material requires control mechanisms.

Material generated from decontamination activities requires proper handling, storage, and disposal. Personal Protective Equipment may be required for these activities.

Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard (i.e., acetone, alcohol, and trisodiumphosphate). In some jurisdictions, phosphate containing detergents (i.e., TSP) are banned.

12.0 REFERENCES

Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, USEPA Region IV, April 1, 1986.

Guidelines for the Selection of Chemical Protective Clothing, Volume 1, Third Edition, American Conference of Governmental Industrial Hygienists, Inc., February, 1987.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, October, 1985. 12.0 REFERENCES

NJDEP, Field Sampling Procedures Manual, April, 2005.

NYSDEC, Bureau of Spill Prevention and Response (DEC BSPR), Sampling Guidelines and Protocols Manual, 1991.

U.S. EPA, A Compendium of Superfund Field Operation Methods. EPA/540/5-87/001.

U.S. EPA, Guide to Management of Investigation Derived Wastes, OERR Directive 9345.3.03FS, January 1992.

U.S. EPA, Management of Investigations - Derived Wastes During Site Inspections, OERR Directive 9345.3-02, May 1991.

FIGURE 1. Contamination Reduction Zone Layout

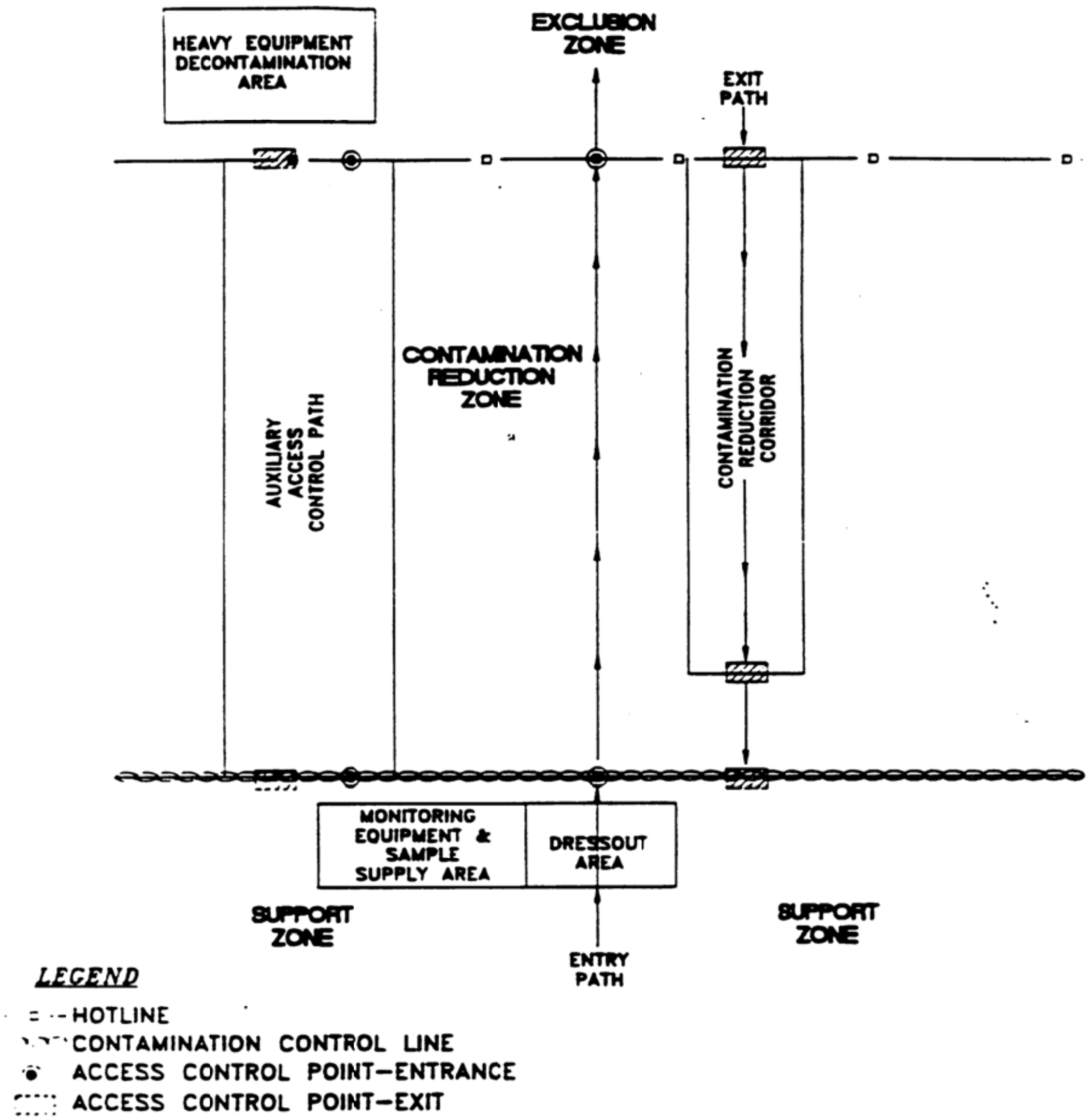
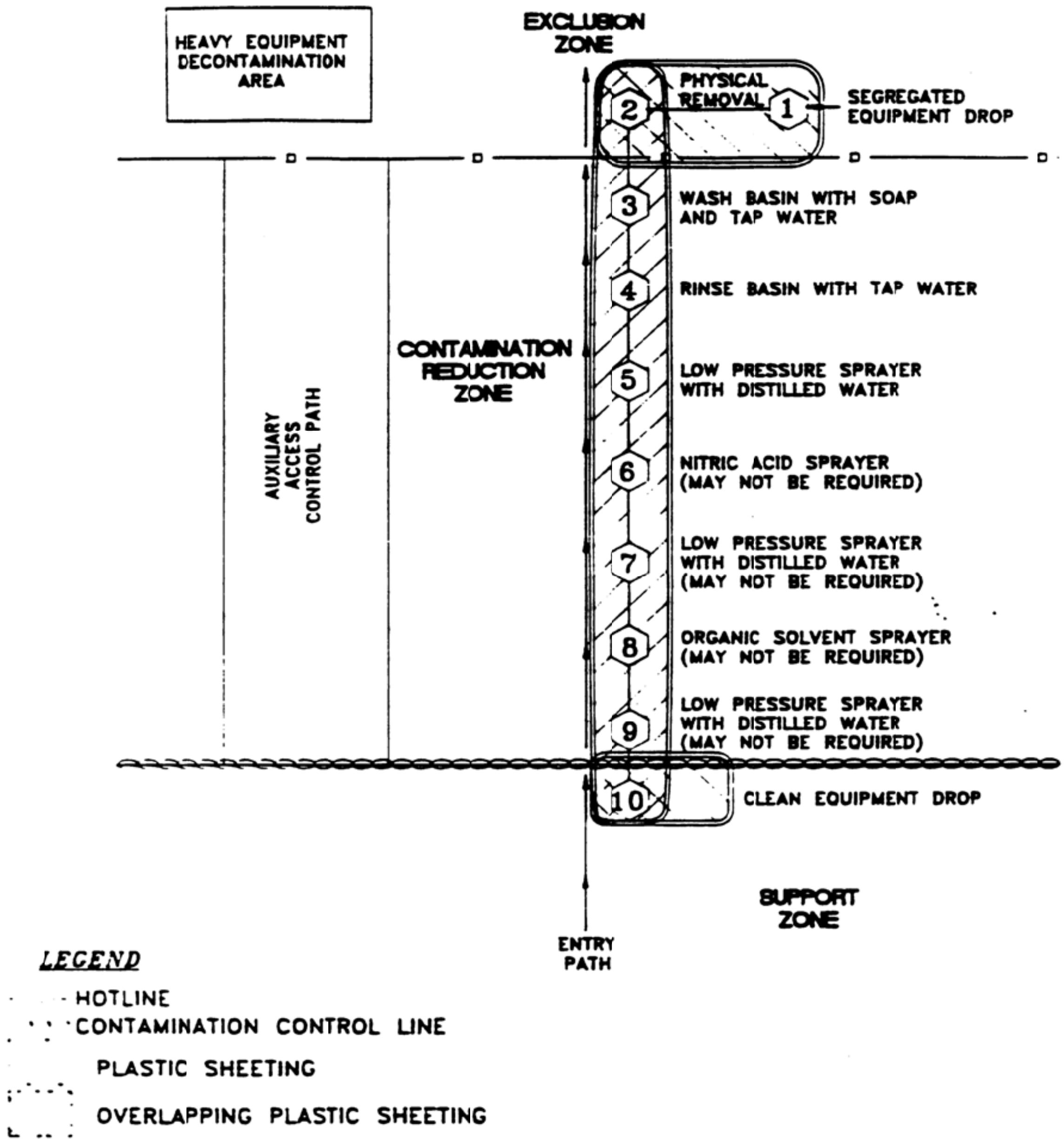


FIGURE 2. Decontamination Layout



STANDARD OPERATING PROCEDURE	**SOP-008** **REVISION: 0**
SUBSURFACE SOIL SAMPLING WHILE DRILLING	**PAGE 1 OF 8** **DATE:**

REVIEWED BY:____ DATE: ___________

APPROVED BY:____DATE: ___________

CONTENTS

1.0 PURPOSE

This standard operating procedure (SOP) establishes guidelines and procedures for subsurface soil sampling while drilling. Several methods may be used to collect subsurface samples. The more common drilling methods and sampling procedures are described below. Proper collection procedures are necessary to assure the quality and integrity of all subsurface soil samples. Additional specific procedures and requirements will be provided in the task-specific sampling or work plans, as necessary.

2.0 REFERENCES

2.1 *American Society for Testing Materials (ASTM), 1989, Standard Method for Penetration Test and Split-Barrel Sampling of Soils, Method D-1586-84, Philadelphia, PA*

2.2 *ASTM, 1986, Standard Practice for Thin-Walled Tube Sampling of Soils, Method D-1587-83, Philadelphia, PA, p. 304-307*

2.3 *ASTM, 1986, Standard Practice for Ring-Lined Barrel Sampling of Soils, Method D-3550-84, Philadelphia, PA, p. 560-563*

3.0 DEFINITIONS

3.1 Borehole

A borehole is any hole drilled into the subsurface for the purpose of identifying lithology, collecting soil or water samples, and/or installing monitoring wells.

3.2 Split-Spoon Sampler

A split-spoon sampler is a steel tube, split in half lengthwise, with the halves held together by threaded collars at either end of the tube. This device can be driven into resistant (semiconsolidated) materials using a drive weight or drilling jars mounted in the drilling rig. A standard split-spoon sampler (used for performing standard penetration tests) is 2 inches in outside diameter and 1.375 inches in inside diameter. This standard spoon typically is available in two common lengths, providing either 20-inch or 26-inch internal longitudinal clearance for obtaining 18-inch or 24-inch long samples, respectively. Six-inch long sleeves (tubes) of brass, stainless steel, or plasticare commonly placed inside the sampler to collect and retain soil samples. A five-foot long split-spoon sampler is also available.

The design is similar to the standard split-spoon except the outside diameter is 2.5 inches and the inside diameter is 2 inches.

3.3 Shelby Tube Sampler

A Shelby tube sampler is a thin-walled metal tube used to recover relatively undisturbed samples. These tubes are available in various sizes, ranging from 2 to 5 inches in outside diameter and 18 to 54 inches in length. A stationary piston device is included in the sampler to reduce sampling disturbance and increase sample recovery.

3.4 Drilling Jars

Drilling jars are a set of linked, heat-treated steel bars. The jars may be attached to a wireline sampling string incorporating a split spoon or other impact sampler. The jars are used to drive the sampler into the soil below the bottom of the borehole.

3.5 Direct-Push Continuous Core Sampler

Continuous core sampling system methods utilize a core barrel, which recovers a soil core from the interval through which the barrel is advanced. Soil samples are collected in 1.5-inch to 2.65-inch diameter brass or stainless steel sleeves inside the inner sample barrel. The sleeves are removed from the sample barrel and given to the site geologist or engineer for testing and lithologic description. The outer-drive barrel is recovered after the total depth of the boring is attained.

4.0 PROCEDURES

This section describes both the responsibilities and procedures involved with subsurface soil sampling while drilling. Proper subsurface soil sampling procedures are necessary to ensure the quality and integrity of the samples. This SOP should be used in conjunction with task-specific sampling or work plans, which will generally provide the following information:

- Sample collection objectives;
- Locations of soil borings and target horizons or depths of soil samples to be
- collected;
- Numbers and volumes of samples to be collected;
- Types of analyses to be conducted for the samples;
- Specific quality control procedures and sampling required; and,
- Any additional subsurface soil sampling requirements or procedures beyond those covered in this SOP, as necessary.

There are many different methods that may be used for subsurface soil sample collection during drilling. This SOP focuses on the two most common methods of soil sample collection: split-spoon sampling and direct-push continuous core sampling. At a minimum, the procedures outlined below for these two subsurface soil sampling methods will be followed. If other subsurface soil sampling methods are deemed necessary to meet project objectives, the procedures for these methods will be updated in this SOP or included in the task-specific sampling or work plans.

4.1 Responsibilities

4.1.1 The Project Manager is responsible for ensuring that all sample collection activities are conducted in accordance with this SOP and any other appropriate procedures. This will be accomplished through staff training and by maintaining quality assurance/quality control.

4.1.2 The QA/QC Officer is responsible for periodically reviewing field-generated documentation associated with this SOP.

4.1.3 Field personnel assigned to subsurface soil sampling during drilling are responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff are responsible for reporting deviations from procedures to the Project Manager or the QA/QC Officer.

4.2 General Sampling Considerations

4.2.1 The two subsurface soil sampling methods covered in this SOP, split-spoon and Shelby tube, are commonly used in conjunction with hollow stem auger, air rotary and dual tube percussion drilling methods. Split-spoon or Shelby tube sampling may be conducted when drilling with mud rotary methods. However, when using this drilling method, the samples are not generally useful for chemical analyses. This is because the samples may become invaded or chemically altered when they are travel through the drilling mud during sample retrieval. In addition, loose unconsolidated soils may also literally wash out of the samplers when they travel through the mud column.

4.2.2 The procedures described in this SOP must be used in conjunction with the SOP prescribed for the specific drilling method used at the site. SOP 009 specifically covers hollow stem auger drilling methods.

Included in this drilling method SOP are specific drilling requirements related to subsurface soil sampling. These also include, but are not limited to, site clearance, site preparation, and health and safety requirements. Consequently, the SOP for the specific drilling method to be used at the site, the task-specific sampling or work plans, and this SOP must be reviewed together before the initiation of drilling and sampling.

4.3 Split-Spoon Sampling

Split-spoon samples for chemical analysis are usually obtained in brass, plastic, or stainless steel sleeves. The types, dimensions and number of sleeves to be used, along with the length and type of sampler, will be stated in the task-specific sampling or work plans. The split-spoon sampler, lined with the sleeves, is connected to the drill rod string or a wireline sampling string and is driven by a hammer (140 or 340 pounds, depending on the size of the sampler) or drilling jars into the undisturbed soil below the bottom of the borehole. The procedure for collecting samples from the split-spoon sampler will be outlined in the task-specific sampling or work plans. The standard procedure is described below.

4.3.1 Calibrate all field analytical and health and safety monitoring equipment according to the instrument manufacturer's specifications. Calibration results will be recorded on the appropriate form(s) as specified by the task-specific sampling or work plans. Instruments that cannot be calibrated according to the manufacturer's specifications will be removed from service and tagged.

4.3.2 Wear the appropriate personal protective equipment as specified in the task-specific sampling or work plans and the applicable drilling method SOP. Personnel protection will typically include a hard hat, safety glasses, gloves, steel-toed boots, hearing protection, and coveralls.

4.3.3 Between each sampling location and prior to each sampling run, decontaminate the sampler, sleeves, and other sampling equipment as described in SOP 007.

4.3.4 Advance the borehole to the desired depth or target horizon where the sampling run is to begin. During drilling, monitor vapors in the breathing zone according to the task-specific sampling or work plans and drilling method SOP.

4.3.5 When the desired sampling depth or target horizon is reached, remove the drill bit or plug from inside the drive casing or augers.

4.3.6 Insert the sleeves into the split-spoon sampler, connect the halves, and screw together the rear threaded collar and front drive shoe. Attach the split-spoon sampler to the bottom end of the drill rod string or wireline sampling string. Set up and attach the specified weight hammer, if used.

4.3.7 Drive the sampler into the soil at the bottom of the borehole. Record the type of sampler assembly and hammer weight on the Borehole/Well Construction Log (Attachment 1) and/or other appropriate form(s), as specified in the task-specific sampling or work plans. To minimize offgassing of the volatiles, the sampler should not be driven until the sampling team is ready to process the sample.

4.3.8 When conducting penetration testing, observe and record on the Borehole/Well Construction Log the number of hammer blows per six inches of penetration.

4.3.9 Pull the drill rod or wireline sampling string up from the bottom of the borehole and remove the sampler.

4.3.10 Remove the drive shoe and rear collar from the sampler and open the split barrel.

4.3.11 Remove the sleeves one at a time. Observe and record the amount of sample recovery on the Borehole/Well Construction Log. Any observed field problems associated with the sampling attempt (e.g., refusal) or lack of recovery should also be noted.

4.3.12 Select sleeve(s) to be submitted for laboratory analysis. Sample sleeve selection should be based on five factors: judgment that the sample represents relatively undisturbed intact material, not slough; proximity to the drive shoe; minimal exposure to air; lithology; and obvious evidence of contamination. The task-specific sampling or work plans will specify which sample sleeves will be submitted for specific analyses and confirm the selection criteria.

4.3.13 Place Teflon® film over each end of sleeves to be submitted for chemical analysis and seal each end with plastic end caps. Custody seals may be used for additional sample security.

4.3.14 Appropriately label and number each sleeve to be submitted for analysis per SOP 005. The label will be completed using waterproof ink and will contain, at a minimum, the following information:

- Project number;
- Boring number;
- Sample number;
- Bottom depth of sleeve;
- Date and time of sample collection;
- Parameters for analysis; and,
- Sampler's initials.

4.3.15 Document the sampling event on the Borehole/Well Construction Log (Attachment 1) or an equivalent form as specified in the task-specific sampling or work plans. At a minimum, this log will contain:

- Project name and number;
- Date and time of the sampling event;
- Drilling and sampling methods;
- Sample number;
- Sample location;
- Boring number;
- Sample depth;
- Sample description;
- Weather conditions;
- Any detected odor, discoloration and/or other evidence of the presence of contaminants;
- Unusual events; and,

- Signature or initials of the sampler.

4.3.16 Appropriately preserve, package, handle, and ship the samples in accordance with the task-specific sampling or work plans. The samples shall also be managed per SOP 012.

4.3.17 Samples collected for volatile organic compound analysis by EPA Method 5035 must be collected and preserved in accordance with SOP 004, Soil Sampling.

4.4 Continuous Core Sampling Method

Continuous core sampling system methods may be specified where continuous soil cores are to be recovered by direct-push coring methods (e.g., Geoprobe or Envirocore). The continuous core sampling method utilizes a core barrel, which recovers soil core from the interval through which the barrel is advanced. The barrel is recovered after the total depth of the boring is attained. The standard procedure for collecting samples using a continuous core sampling device is described below.

4.4.1 Calibrate all field analytical and health and safety monitoring equipment as discussed in Section 4.3.1.

4.4.2 Wear the appropriate personal protective equipment as described in Section 4.3.2.

4.4.3 Between each sampling location, prior to each sampling run and/or as required, decontaminate the sampler and other sampling equipment as described in SOP 007.

4.4.4 Advance the continuous sampler to the desired depth or target horizon while monitoring the breathing zone according to the task-specific sampling or work plans and applicable drilling method SOP. A three-foot section of the sampler (consisting of inner sampling rods and outer drive casing) is driven into the ground .

4.4.5 After being driven three feet, the small diameter (1.5-inch) inner sampling rods are removed from the borehole using a hydraulic winch. The larger (2-inch) diameter drive casing is left in place to prevent the borehole from collapsing. Soil samples are collected in 1.5-inch diameter stainless steel sleeves inside the inner sample barrel. The sleeves are removed from the sample barrel and given to the site geologist or engineer for lithologic interpretation. New sleeves are then added to the sample barrel and it is lowered back into the borehole. An additional three or more feet of inner rods and outer drive casing are attached, and the process is repeated until the desired depth is reached.

4.4.6 Once the soil has been continuously cored to the desired depth, the inner sampling rods are removed, while the outer casing remains in place to hold the boring open. Observe and record the amount of sample recovery and any associated problems as discussed in Section 4.3.11.

4.4.7 Place Teflon® film over each end of the tube if it is to be submitted for chemical analysis and seal the ends with plastic end caps. Custody seals should be added for additional sample security.

4.4.8 Appropriately label and number the tube as described in Section 4.3.14.

4.4.9 Document the sampling event on the Borehole/Well Construction Log (Attachment 7.1) as discussed in Section 4.3.15.

4.4.10 Appropriately preserve, package, handle and ship the sample in accordance with the procedures outlined in SOP 012 and the task-specific sampling or work plans.

4.4.11 Samples collected for volatile organic compound analysis by EPA Method 5035 must be collected and preserved in accordance with SOP 0041, Soil Sampling.

4.4.12 Repeat this sampling procedure continuously until the bottom of the borehole is reached and/or last sample collected as specified in the task-specific sampling or work plan.

4.4.13 Finally, cement grout is place in the borehole, from bottom to top, as the drive casing is withdrawn. This seals the borehole and prevents it from acting as a conduit for potential contaminant migration.

5.0 QUALITY CONTROL SOIL BLANK PREPARATION

One quality control soil blank will be sent with each shipment requiring analysis for volatile organic compounds. The soil blank will be prepared according to the following procedure:

5.1 Collect approximately eight ounces of soil from the container labeled "QC blank soil" located on the table in the on-site laboratory.

5.2 Lay the soil evenly over a one-foot by one-foot square of aluminum foil and place it under the heat lamps.

5.3 Adjust the lamps so that the soil temperature stabilizes at approximately 115 degrees (°) Celsius (C), ±15° (240° Fahrenheit [F], ±30°).

5.4 Shut the lamps off and measure the temperature of the soil with the digital thermometer after temperature stabilization. Record the temperature in a field notebook and turn the lamps back on.

5.5. Heat the soil for one hour.

5.6 After the one-hour period, shut the lamps off and measure the temperature again. If the second temperature measurement is above 100°C (212°F), then record the temperatures in a field notebook and proceed to Step 5.7. If the second measurement is below 100°C (212°F), then adjust the lamps to achieve a temperature greater than 100°C for one hour and measure the beginning and ending temperatures. Record the temperatures in a field notebook.

5.7 Allow the soil to cool below 50°C (122°F), then collect and preserve the sample in accordance with SOP 3.1, Surface and Shallow Subsurface Soil Sampling, Section 4.3.11.

5.8 Assign the sample an identification number that is indistinguishable from the rest of the soil samples to be collected, so the blank will not be obvious to the laboratory.

5.9 Ship the soil blank with other soil samples on the same chain-of-custody form.

6.0 RECORDS

Records generated as a result of this SOP will be controlled and maintained in the project record files in accordance with SQP 4.2.

7.0 ATTACHMENT

Borehole/Well Construction Log

A form referenced or attached to this SOP may be replaced with a substitute form, with the approval of the Project Quality Assurance Manager, if the substitute form contains equivalent information as the referenced form.

STANDARD OPERATING PROCEDURE	SOP-009 REVISION: 0
HOLLOW STEM AUGER DRILLING	PAGE 1 OF 7 DATE:

REVIEWED BY:____ DATE: ___________

APPROVED BY:____DATE: ___________

CONTENTS

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for field personnel to use during the supervision of drilling operations involving hollow stem auger techniques. Additional specific hollow stem auger drilling procedures and requirements will be provided in the project work plans.

2.0 REFERENCES

2.1 SOP 008 - Subsurface Soil Sampling While Drilling

2.2 SOP 007 - Sampling Equipment and Well Material Decontamination

3.0 DEFINITIONS

3.1 Hollow Stem Auger Drilling

3.1.1 A drilling method using rotating auger flights (typically in 5 foot joints) with a bit on the bottom of the lead flight (sometimes called the "lead auger"). The flights consist of a hollow pipe and an outer spiral plate, which when rotated, forces soil cuttings upward along the borehole wall to the surface. The auger string is advanced by rotation, with pressure exerted by the rig, forcing the bit to cut the soil at the bottom and direct cuttings to the augers.

3.1.2 A retractable plug with a pilot bit is placed at the bottom of the auger string to prevent cuttings from entering the hollow stem. When the plug is retracted, a sampler may be sent through the hollow center to sample soil at the bottom of the borehole without requiring the augers to be removed. A wireline sampler may also be attached to the inside of the lead auger for coring as the borehole is advanced.

3.1.3 This method is commonly used for drilling and sampling of soil borings, collection of soil gas and screening-level water samples, and installation of some smaller diameter wells. The well casing string may be placed through the hollow stem.

3.1.4 The hollow stem auger drilling method has advantages over other drilling techniques in certain circumstances, and disadvantages in others. This method is highly suitable for unconsolidated and consolidated fine-grained soils. Hollow-stem auger drilling can achieve the most rapid rates of penetration in soft sticky clay-dominated soils. However, coarse and consolidated gravels and hard bedrock may be too dense for adequate drill penetration. Soil cuttings are typically disaggregated and remolded, making bedding, fabric, and soil property determination difficult.

3.1.5 The most reliable method for logging of soils during hollow stem auger drilling is by collecting relatively intact samples through the hollow stem. An advantage of the hollow stem auger method is that soil samples can be readily obtained from the bottom of the hole without requiring the removal of the auger string (unlike air or mud rotary methods).

3.1.6 This drilling method may be used to install monitoring wells (limited by diameter) as there is good depth control, and the auger can be progressively pulled as well construction materials are added to the borehole. The methodology may also be used to drill out monitoring wells for abandonment.

3.1.7 Another advantage of the hollow stem auger method is that air or mud is not required as circulating media. Therefore, there is limited to no potential for flushing of soil samples collected for chemical analyses, and a reduction in volumes of investigated derived wastes requiring costly handling and management procedures. Auger-type rigs can be significantly smaller than other types of rigs, making them the most suitable for some jobs with significant space constraints, including overhead clearance.

3.1.8 Additional disadvantages of the hollow stem auger method include a typical maximum depth of 100 to 200 feet (may be less depending on soil conditions). Hard soil horizons or very coarse gravel (cobbles and boulders) may be impenetrable with this method.

4.0 PROCEDURE

This section contains responsibilities, procedures and requirements for hollow stem auger drilling. The selection and implementation of hollow stem auger drilling techniques must incorporate site specific conditions and requirements. Consequently, the project work plans will identify the following:

- The purpose of each borehole (e.g., to install monitoring well, soil sampling, well abandonment, etc.)
- Specific methodology for drilling, including equipment and cuttings/fluid containment
- Specific locations, depths, and diameters of boreholes
- Objectives and types of sampling and/or logging of borehole
- Details of mobilization/demobilization and decontamination of equipment
- Appropriate health and safety guidelines and personnel protective equipment
- Additional procedures or requirements beyond those covered in this SOP

4.1 Responsibilities

4.1.1 The Project Manager is responsible for ensuring that all hollow stem auger drilling activities are conducted and documented in accordance with this SOP and any other appropriate procedures. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

4.1.2 The Project QA/QC Officer is responsible for periodic review of field generated documentation associated with this SOP. The Project QA/QC Officer is also responsible for the implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to hollow stem auger drilling requirements, issuing nonconformances, etc.) if problems occur.

4.1.3 Field personnel assigned to hollow stem auger drilling activities are responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff responsible for reporting deviations from the procedures to the Project Manager or the QA/QC Officer.

4.2 Rig Decontamination and Preparation

4.2.1 All drilling and sampling equipment should be decontaminated before drilling as per SOP 007, and the project work plans.

4.2.2 The driller and rig geologist/engineer should inspect the drilling equipment for proper maintenance and appropriate decontamination prior to each time the rig is mobilized to a site. All clutches, brakes and drive heads should be in proper working order. All cables and hydraulic hoses should be in good condition. All auger joints and bits should also be in good condition (e.g., no cracked or bent blades, bits are not excessively worn, etc.).

4.2.3 Any observed leakage of fluids from the rig should be immediately repaired and the rig decontaminated again before it is allowed to mobilize

4.3 Site Preparation

4.3.1 The logistics of drilling, logging, sampling, cuttings/fluid containment, and/or well construction should be determined before mobilizing. The site should be prepared as per the project work plans.

4.3.2 Before mobilization, the PM and/or the rig geologist/engineer should assess the drilling site with the driller. This assessment should identify potential hazards (slip/trip/fall, overhead power lines, etc.), and determine how drilling operations may impact the environment (dust, debris, noise). Potential hazards should be evaluated and corrected, or the borehole location changed or shifted, as per the project work plans.

4.3.3 The Project Manager or appropriate designee should ensure that all identifiable underground utilities around the drilling location have been marked, and the borehole location appropriately cleared per the project work plans. At a minimum, copies of the site clearance documents should be kept on-site.

4.4 Mobilization and Set-Up

4.4.1 Once the site is prepared, the rig is mobilized to the site and located over the borehole location. The rig is leveled with a set of hydraulic pads attached to the front and rear of the rig. The driller should always raise the mast slowly and carefully to prevent tipping or damaging the rig, and avoiding obstructions or hazards.

4.4.2 Appropriate barriers and markers should be in place prior to drilling, as per the site health and safety plan. Visqueen (plastic) may be required beneath the rig.

4.4.3 Appropriate cuttings and other investigation-derived waste containment should be set on site prior to commencement of drilling.

4.5 Health and Safety Requirements

4.5.1 Tailgate Safety Meetings should be held in the manner and frequency stated in the health and safety plan. All Contractor and subcontractor personnel at the site should have appropriate training and qualifications as per the health and safety plan.

4.5.2 During drilling all personnel within the exclusion zone should pay close attention to rig operations. The rotating auger blades can snag or catch loose clothing and literally screw someone into the ground.

4.5.3 Establishing clear communication signals with the drilling crew is mandatory since verbal signals may not be heard during the drilling process. The entire crew should be made aware to inform the rig geologist/engineer of any unforeseen hazard, or when anyone is approaching the exclusion zone.

4.6 Breaking Ground

4.6.1 Prior to the commencement of drilling, all safety sampling and monitoring equipment will be appropriately calibrated per the project work plans.

4.6.2 The rig geologist/engineer should inform the driller of the appropriate equipment (e.g., cookie cutter, etc.) to be used for penetration of the surface cover (e.g., asphalt, concrete, cement, etc.). In the event of breaking ground where a shallow subsurface hazard may exist (unidentifiable utility, trapped vapors, etc.), the driller should be informed of the potential hazard and drilling should commence slowly to allow continuous visual inspection and/or monitoring, and if necessary, stop for probing.

4.7 Borehole Drilling

4.7.1 During drilling operations, and as the borehole is advanced, the rig geologist/engineer will generally:

- Observe and monitor rig operations;
- Conduct all health and safety monitoring and sampling, and supervise health and safety compliance;
- Prepare a lithologic log from soil samples or cuttings;
- Supervise the collection of, and prepare soil, soil vapor, and ground water samples; and,
- As drilling progresses the rig geologist/engineer should observe and be in frequent communication with the driller regarding drilling conditions. This includes relative rates of penetration (indicative of fast or slow drilling) and chattering or bucking of the rig. These conditions, including the relative drilling rate, should be recorded on the boring log per SOP 002. Drilling should not be allowed to progress faster than the rig geologist/engineer can adequately observe conditions, compile boring logs, and supervise safety and sampling activities.

4.7.2 The rig geologist/engineer should also observe the rig operations, including the make-up and tightening of connections as additional auger joints are added to the auger string. Any observed problems, including significant down time, and their causes are recorded on the Field Activity Daily Log.

4.7.3 Cuttings and fluids containment during drilling should be observed and supervised by the rig geologist/engineer, as per specifications in the project work plans.

4.7.4 The rig geologist/engineer will oversee or conduct appropriate health and safety sampling and monitoring. If any potentially unsafe conditions are evident from the above drilling observations and the health and safety sampling and monitoring, the rig geologist/engineer may suspend drilling operations at any time and take appropriate actions as per the health and safety plan. In the event suspension of drilling activities occur:

- The Project Manager or Project Task Leader must be informed of the situation;
- Appropriate corrective action must be implemented before drilling may be continued; and,
- The observed problem, suspension, and corrective action are entered on the FADL.

4.7.5 During drilling the rig geologist/engineer will compile a boring log as per SOP 002.

The log will be compiled preferably from soil samples recovered while drilling as directed in the project work plans. Observations of drilling conditions are also entered on the log as discussed above and in SOP No. 15.1. If total depth was reached prematurely due to refusal, the cause of refusal should be noted on the boring log and the Daily Log.

4.7.6 Subsurface soil samples may be collected with a split spoon sampler or Shelby tube during drilling per SOP 008. The sampling will be supervised by the rig geologist/engineer. Soil samples (drive samples) can be readily obtained at discrete intervals with these methods.

4.7.7 Soil organic vapor (SOV) sampling may be conducted at discrete intervals during hollow stem auger drilling. This is done by stopping at the desired depth and driving a sample probe through the hollow stem into the soil ahead of the bit and then collecting a vapor sample. The sampling should be supervised by the rig geologist/engineer.

4.7.9 Borehole Abandonment: If the borehole is to be abandoned once drilling is completed, the abandonment will follow procedures outlined in SOP 013. The abandonment will be supervised by the rig geologist/engineer.

4.8 Demobilization/Site Restoration

After drilling, sampling, well installation or borehole abandonment is completed the hollow stem rig is rigged down and removed from the borehole location. The demobilization/site restoration will be supervised by the rig geologist/engineer or appropriate designee.

4.8.1 All debris generated by the drilling operation will be appropriately disposed.

4.8.2 The site should be cleaned (ground washed if necessary) and surface conditions restored as per the project work plans.

4.8.3 All abandoned borings should be topped off and completed as per the project work plans. All monitoring wells will also have their surface completions finished as per the project work plans.

4.8.4 Any remaining hazards as a result of drilling activities will be identified and appropriate barriers and markers put in place, as per the health and safety plan.

4.8.5 All soil cuttings and fluids will be properly contained, clearly labeled, and maintained as per the project work plans.

4.8.6 The Project Manager or appropriate designee should inspect the site to make sure that post-drilling site conditions are in compliance with the project work plans.

5.0 RECORDS

Records generated as a result of implementation of this SOP will be maintained in the Project Records file.

STANDARD OPERATING PROCEDURE	SOP-010 REVISION: 0
SURFACE AND SUBSURFACE GEOPHYSICS	PAGE 1 OF 10 DATE:

REVIEWED BY:____ DATE: ____________

APPROVED BY:____DATE: ____________

CONTENTS

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for acquiring surface geophysical data. This includes the direct use of surface geophysical equipment by contractor personnel themselves, or the supervision of subcontractors conducting surface geophysical surveys. Additional specific surface geophysical procedures and requirements will be provided in the project work plans.

Surface geophysical surveys image into the subsurface using measuring equipment that is placed or located upon or above the ground surface. Common applications of surface geophysics for environmental projects include utility clearance, buried waste delineation, plume delineation, and geologic or hydrologic characterization. The most common surface geophysical techniques used for environmental applications and therefore, covered in this SOP, include: electrical resistivity, seismic refraction, electromagnetics (EM), ground penetrating radar (GPR), metal detectors, and magnetometry.

2.0 REFERENCES

2.1 SAP – Utility Clearance

3.0 DEFINITIONS

3.1 Electromagnetic Induction (EM or EMI)

A method of sending electromagnetic waves into the ground and measuring the responding secondary electromagnetic wave. The secondary wave is generated in the proportion to the conductivity of the earth or objects therein. EM may be used to reveal utility lines, buried waste dumps, former excavations, and in some specific cases, changes in groundwater conductivity.

3.2 Ground Penetrating Radar

A method utilizing radar waves generated and propagated into the ground surface. The reflected (backscattered) waves are received back as data. GPR is typically used to reveal buried manmade objects, such as tanks, pipes, drums, etc. It may also, at times, be used to delineate backfilled excavations and waste cells.

3.3 Magnetic Survey

The process of accurately measuring the earth's magnetic field (on the order of 10/50,000 of the total field). The survey reveals magnetic anomalies that may result from buried metal objects or rock-type differences.

3.4 Metal Detector

An EM tool with a specialized sensor to detect metallic objects.

3.5 Resistivity Survey

A geophysical method of determining the resistivity of the earth's layers. The survey is conducted by inducing electrical currents into the subsurface and measuring electrical potential differences at points of secondary electrical fields generated in the earth in response to the input of electrical current. Resistivity surveys are typically used to provide information on subsurface lithologies and, in certain instances, plume distributions.

3.6 Seismic Methods

Seismic surveys are conducted by inducing seismic (acoustic) waves into the ground and recording the arrival times at varying distances of the reflected or refracted waves. They are typically used to reveal buried geologic structures and contacts between rock units.

4.0 PROCEDURE

This section contains responsibilities, requirements and procedures for conducting surface geophysical surveys. Selection and design of the geophysical surveys to be used on a site must be based upon several factors. These include, but are not limited to, the following:

- Specific objectives or anticipated use of the survey (e.g., surface clearance, buried object identification, waste cell delineation, etc.);
- Known or expected site-specific conditions;
- Targeted parameters and overall surface areas to be evaluated;
- Potential site-induced effects which may limit specific survey methods; and,
- Applicability of specific survey methods in meeting above objectives given the site-induced effects.

Consequently these factors must be considered and the tests designed well before generation of the project work plans and implementation in the field. The project work plans will specify all necessary details to complete the geophysical surveys at a particular site. Surface geophysical survey information and specifications to be included in the project work plans will include, at a minimum, the following:

- Objectives of the surveys;
- Type(s) of surveys to be conducted;
- Equipment to be used;
- Lay-outs of survey grids at each site or location, including sample point spacing;
- Type, duration and frequency of measurements to be made; and,
- Additional procedures or requirements beyond those covered in this SOP.

Subcontracted geophysical surveys will also be directed by specifications defined in Statements of Work for sub-contractor services, as well as the project work plans.

At a minimum the requirements, responsibilities and procedures described in the following section must be incorporated into the surface geophysical activities to be conducted at each site.

4.1 Responsibilities

4.1.1 The Project Manager/Field Coordinator is responsible for ensuring that all surface geophysical activities are conducted and documented in accordance with this SOP and any other appropriate procedures. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

4.1.2 The Project QA Specialist (PQAS) is responsible for periodic review of field generated documentation associated with this SOP. The PQAS is also responsible for the implementation of corrective action (i.e., retaining personnel, additional review of work plans and SOPs, variances to surface geophysics requirements, issuing nonconformances, etc.) if problems occur.

4.1.3 Field personnel assigned to surface geophysical activities are responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff are responsible for reporting deviations from the procedures to the Field Coordinator or the PQAS.

4.2 General Requirements

The following requirements apply to all surface geophysical surveys and should be performed as required by the project work plans and the conditions present at each survey site.

4.2.1 Inspect all equipment and supplies to ensure that they are in proper working order, using the equipment manuals provided by the equipment manufacturer.

4.2.2 Assure that annual calibration/service by the manufacturer has been conducted as recommended by the manufacturer. Calibration/service records should be maintained in the office where the instrument is stored between investigations. A copy of the calibration records should be kept with the equipment at all times. More frequent calibration/services may be necessary if field measurements indicate possible instrument malfunction.

4.2.3 Prior to mobilization to the site, conduct appropriate decontamination as and if required by the project work plans.

4.2.4 Perform field calibration checks where required by instrument manufacturer or the project work plans. Perform calibration (accuracy and reproducibility) checks in accordance with manufacturer's specifications or the project work plans.

The calibration checks should be entered on a Test Equipment Calibration Log Book or other document as specified in the project work plans. At a minimum, this document should contain the following information:

- Make and model number of the geophysical instrument;
- Serial number of the instrument;
- The date and time of calibration or instrument check;
- All calibration or instrument check measurements; and,
- The name and signature of the person conducting the calibration or instrument check.

4.2.5 Establish grid and stake locations or set up traverses for locations of sampling stations as necessary.

4.2.6 Make sure all survey or sampling locations are properly staked and the location ID is readily visible on the location stake.

4.2.7 Include a diagram of the measurement locations with the data records on a daily basis. The diagram should include grid alignment, station numbering (if used), and base station location(s).

4.2.8 At the termination of each survey, ensure that all equipment is accounted for and decontaminated as required by project work plans.

4.2.9 Any unusual conditions or problems encountered during the survey must be recorded on the Field Activity Daily Log and brought to the attention of the PM.

4.2.10 When the activity is completed, or at the end of the day, return the instrument(s) to a secure area. Equipment requiring electrical charging should be placed on charge.

4.2.11 It is recommended that surface geophysical survey data be stored on diskette for retrieval and management. The following information should be included for each stored data field:

- Site Location;
- Location ID (or station);
- Date; and,
- Time.

Base station values and calibration measurements do not necessarily need to be recorded on the diskette. However, they must accompany the diskette record in paper copy.

4.3 Surface Geophysical Surveying

4.3.1 Electrical Resistivity **-** The electrical resistivity method uses an instrument to measure the apparent electrical resistivity of the subsurface. This includes the underlying soil, rock, and groundwater. An electrical current is introduced into the ground through surface electrodes. The resulting potential field (voltage) is measured at the surface between a second pair of electrodes. The procedure below requires the following elements, in addition to the general requirements listed in Section 4.2.

- Set up and operate the geophysical electrical resistivity instrument according to manufacturers operating instructions. Record the readings and other pertinent information on the appropriate forms per the project work plans.
- Calculate apparent resistivities and review plots in the field as a means of quality control. Sounding curves should be relatively smooth. Abrupt changes commonly occur in sounding and profiling data. Unwanted noise may be caused by near-surface inhomogeneities, electrode contact problems, or changes in hydrogeology. Any changes or noise should be identified. Corrective actions may be taken and the survey re-run if significant improvement to the survey may be attained.
- Identified noise problems, corrective actions taken, and re-runs should be noted in the Field Log.

4.3.2 Seismic Refraction **-** Seismic refraction techniques use instruments to determine the travel time or velocity of seismic waves within layers and interpret the thickness and depth of geologic units and other subsurface features. Other potential applications include the location of the water table and definition of burial pits and trenches. The procedure below requires the following elements, in addition to the general requirements listed in Section 4.2.

- Verify that factory maintenance and calibration has been conducted as recommended by the equipment manufacturer. Manufacturer maintenance should include the electronic calibration of the seismograph timing circuits.
- Check the seismic signal and noise conditions on the instrument display to verify the proper functioning of the source geophones and trigger cables.
- If possible, obtain or install boring logs before the survey in order to detect hidden layers or velocity inversions.
- Set up and operate the geophysical seismic refraction instrument according to operating instructions supplied by the manufacturer. Record the readings and other pertinent information on the appropriate forms.
- Where possible, collect seismic data where known geologic information is available to establish background responses. This information is useful for evaluating complex site conditions.
- Make a hard copy of the data if the data output is on paper records.

- In cases where paper records are not produced, plot arrival time picks made from the electronic display on a time/distance graph in the field. Problems with improper picks are often discovered through an early inspection of these plots.
- Review all output and records of the survey, identifying any potential problems requiring corrective actions.
- Implement corrections and re-run the survey as appropriate and if significant improvement to the survey may be attained.
- Any identified problems, corrective actions taken, and re-runs should be noted in the Field Log.

4.3.3 Electromagnetics **-** The EM survey detects lateral and vertical variations of electrical conductivity in the subsurface environment. EM is used for the assessment of hydrogeologic conditions, and identification and mapping of contaminant plumes, trench boundaries, buried conductive wastes, steel drums, and metallic utility lines. The procedure below requires the following elements, in addition to the general requirements listed in Section 4.2.

- Establish a local standard site in the field. This will provide a reference base station to check the instrument's performance and allow correlation between instruments.
- Check the signal and noise conditions on the instrument display to verify proper functioning and assure the correct setting of the instrument.
- Before conducting the survey, select a temporary site on location for daily base station measurements and calibration checks. Calibration checks should be made twice daily, before and after conducting daily survey operations.

Note: Do not make calibration checks in the presence of sources of cultural interference like power lines or buried utilities. Make them on a relatively flat surface outside of topographic lows and away from areas that may include subsurface waste materials.

- Operate the EM instrument according to operating instructions supplied by the manufacturer. Record instrument sensitivity settings, readings and all other pertinent information on the appropriate forms. When using an automatic recording device, enter the readings from the first and last stations of each traverse. Compare these data to data from the automatic recorder at the end of each day. Recorded data and field transcribed data must agree to within ±5 percent to meet acceptability requirements.
- Instrument stability should be checked by the field operating party when there is local or distant thunderstorm activity. Electromagnetic radiation from thunderstorms can generate noise in the EM system. Operations may have to be postponed during thunderstorms.
- Review all output and records of the survey, identifying any potential problems requiring corrective actions.
- Implement corrections and re-run the survey as appropriate and if significant improvement to the survey may be attained.
- Any identified problems, corrective actions taken, and re-runs should be noted in the Field Log.

4.3.4 Ground Penetrating Radar **-** GPR uses high frequency radio waves to acquire subsurface information. The method produces a continuous cross-sectional image or profile of shallow subsurface conditions. The procedure below requires the following elements in addition to the general requirements listed in Section 4.2.

Calibration and calibration checks of the radar system requires the process described below:

- Accurately determine the total time window (range) set by the operator.
- Determine or estimate the electromagnetic velocity (or travel time) of the local soil/rock condition.

- Calibrate the time window picked for the survey by using a signal calibrator in the field. This device is used to produce a series of time marks on the graphic display measured in nanoseconds. These pulses are counted to determine the total time of the radar unit. A calibration curve can be designed for each radar system.
- If possible, use known trenches, buried pipes, and road culverts to provide a radar target of known depth. The depth of a known target, a radar record taken over the known target, and a time scale provided by the signal calibrator will provide a basic calibration record. From these data, a velocity can be accurately determined at the given target location from the following equation:

$$V=2d/t$$

The average dielectric constant of the soil is then calculated using

where:

v1 = Average electromagnetic wave velocity, feet/nanosecond

t = Two-way travel time, nanoseconds

d = Distance of antenna to the buried object, feet

Er = Average relative dielectric constant of the soil (unitless)

c = Velocity of light in air equal to 1 foot/nanosecond

v2 = Average electromagnetic wave velocity of the soil, feet/nanosecond

Note: The above assumes a soil with a relative magnetic permeability of 1 (unitless). If significant changes in soil type or moisture content occur with depth, velocity will not be the same throughout the vertical radar profile. Therefore, the vertical radar depth scale will be nonlinear. This approach will provide calibration at a specific site, however, this assumes that conditions in other areas are the same as the calibration area. Calibration should be repeated at each new site:

- Repeat a short GPR traverse twice daily over a known feature before and after conducting daily operations to insure that readings are caused by changing soil conditions, rather than the electronics.
- Conduct the GPR traverse at the sites or locations specified in the project work plans.
- Record calibration, instrument settings, measurements and all other pertinent information on the appropriate forms.
- Print out and review all hardcopies and records of the survey, identifying any potential problems requiring corrective actions.
- Implement corrections and re-run the survey as appropriate and if significant improvement to the survey may be attained.
- Any identified problems, corrective actions taken, and re-runs should be noted in the Field Log.

4.3.5 Metal Detection **-** Metal detectors are electromagnetic devices designed to locate metallic objects buried near the surface. In hazardous waste site investigations, metal detectors are invaluable for detecting utility lines, survey markers, steel drums buried at shallow depths, and delineating areas that may potentially include metallic waste materials.

Metal detectors respond to nearby metallic objects in a relative way. For instance, closer or large metallic objects create a greater output level than more distant or smaller ones. An experienced operator can usually make a reasonably accurate estimate of target size and depth. Metal detection survey requirements, at a minimum, include:

- Set up and operate the metal detector according to operating instructions supplied by the manufacturer.
- Record the readings and all other pertinent information on the appropriate forms as outlined in the project work plans.
- Review all data and records of the survey, identifying any potential problems requiring corrective actions.
- Implement corrections and re-run the survey as appropriate and if significant improvement to the survey may be attained.
- Any identified problems, corrective actions taken, and re-runs should be noted in the Field Log.

4.3.6 Magnetometer **-** Magnetometer surveys are used to locate metallic objects buried near the surface such as well casings, utility lines, steel drums, and tanks. They may also be used to delineate trenches and landfills. Ferrous metal objects carried by the operator will have a detrimental effect on the accuracy of the magnetometer data. Therefore, metal items like rings, watches, belt buckles, coins, and steel-toed boots should not be worn by the survey team.

Total field and vertical field measurements may be corrected for the diurnal variation of the earth's magnetic field by employing a reference base station magnetometer. Changes in the earth's field are removed by adding or subtracting variations of fixed base station readings from the moving survey data. Gradiometers do not require the use of a base station because they inherently eliminate time variation in the data. Requirements are as follows:

- Conduct a swing sensor test with the proton precision magnetometer before initiating operations at a site and at least once more during the day. Four readings with the sensor oriented 90° to the other readings should be taken with the operator moving with the sensor. Variations greater than one gamma should not be observed. Correct any directional bias by washing the sensor with ordinary soap and water and maintaining an adequate distance between the sensors and battery pack.
- Obtain a daily background reading in the immediate vicinity of the site to be surveyed. This reading should be outside the influence of all possible sources of cultural magnetic fields (e.g., power lines or pipelines). This daily background reading should repeat to within reasonable diurnal variations in the earth's magnetic field.
- Take base station readings to remove the effects of the diurnal variation of the earth's magnetic field from the data as outlined in the project work plans. Periods of rapid variation may be documented at a permanent base station, set up at the site, where continuous readings are automatically recorded approximately every 10 to 15 minutes. Alternatively, a base station(s) may be reoccupied during the survey at intervals of 45 to 60 minutes.
- Collect survey data and record on the appropriate form per the project work plans. Site locations influenced by cultural magnetic fields should be recorded in the logbook. Take three to four sequential readings and record time when recording data manually. In the absence of magnetic storms, the readings should compare within several tenths of a gamma. Repeatability during magnetic storms may degrade to one gamma or more.
- The use of automatic recording magnetometers requires recording the magnetometer readings for the first and last station of each traverse in a logbook. Compare the data recorded in the logbook with data from the automatic recording device. Data recorded in the logbook should be within one gamma of the values derived from the recording device.

- During cold weather, maintain the battery pack for a fluxgate magnetometer at a relatively warm temperature. This is most easily accomplished by surveying with the battery pack beneath the operator's coat or jacket.

5.0 RECORDS

Records generated as a result of implementation of this SOP will be maintained in the Project Records file.

REVIEWED BY:____ **DATE:** ___________

APPROVED BY:____**DATE:** ___________

CONTENTS

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the method and responsibilities associated with the maintenance and custody of samples which are to be used to provide data which form a basis for making project related decisions. It outlines the general procedures for maintaining and documenting sample chain of custody from the time of sample collection through sample disposition.

2.0 REFERENCES

2.1 Quality Assurance Project Plan

3.0 DEFINITIONS

3.1 Chain-of-Custody

The Chain-of-Custody (COC) document is the written record that traces the sample possession from the time each sample is collected until its final disposition, sometimes called the "cradle to grave" record. Chain-of-Custody is maintained by compliance with one of the following criteria:

- The sample is in the individual's physical possession;
- The sample is maintained in the individual's physical view after being in his/her possession;
- The sample is transferred to a designated secure area restricted to authorized personnel; and,
- The sample is sealed and maintained under lock and key to prevent tampering, after having been in physical possession.

3.2 Waybill

A document that contains a list of the goods and shipping instructions relative to a shipment.

4.0 PROCEDURE

4.1 Responsibilities

4.1.1 The Project Manager is responsible for assuring proper COC is initiated at the time the sample(s) are collected and maintained throughout the handling and subsequent transportation of the sample(s) to the designated laboratory. Additionally, the Project Manager is the project authority for determining the disposition and fate of sample(s) which have identified deficiencies (e.g., missed holding times, elevated temperature at receipt, etc.).

4.1.2 The sample team member(s) are responsible for properly documenting and maintaining the COC from the time of sample collection until the sample(s) are delivered to the lab.

4.1.3 Laboratory personnel are responsible for receipt and entry of samples into the laboratory which have been submitted under a COC document. Additionally, samples received will be entered into the laboratory COC procedures by properly documenting and maintaining COC from the moment that they take custody of the sample(s) at the laboratory until the sample(s) are disposed of or returned to the client.

4.2 General

4.2.1 An overriding consideration for data resulting from laboratory analyses is the ability to demonstrate that the samples were obtained from the locations stated and that they reached the laboratory without alteration. Evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal must be documented to accomplish this. Documentation will be accomplished through a COC Record that lists each sample and the individuals performing the sample collection, shipment, and receipt.

4.2.2 The original COC document will accompany the samples while a copy will be retained in the project file.

4.3 Field Sample Custody

4.3.1 Sampling personnel, upon collection of samples for analysis, will properly complete a COC Record (Attachment 1). The COC document will be the controlling document to assure that sample handling and custody are maintained thereby assuring the sample(s) are representative of the environment from which they were collected. At a minimum, the following information will be recorded on the COC document:

- The unique identification number assigned to each sample;
- A physical description of the sample type (e.g., soil, water, etc.);
- The date and time of the sample collection;
- Container type (e.g., glass, poly, brass sleeve, etc.);
- Sample volume and number of containers (e.g., 2 x 40 ml, 3 x 1 liter);
- Sample preservation (e.g., HNO3, H2SO4, 4oC);
- Requested analyses;
- Special instructions to the laboratory including handling requirements, quality
- assurance/quality control, health and safety, and sample disposition;
- The project name and number;
- The date the analytical report is due;
- The names of all sampling personnel;
- The name and phone number of the project contact;
- The name and phone number of the laboratory contact; and,
- The name of the courier and the waybill number (if applicable).

4.3.2 The COC document will be initiated in the field by the person collecting the samples and signed by each individual who has the samples in their possession. Each time that sample custody is transferred, the former custodian must sign over the COC as Relinquished By, and the new custodian must sign on to the COC as Received By. Each signature must be accompanied by the date, time, and the name of their project or company affiliation.

4.3.3 Transferring of COC from sampling personnel to the analytical laboratory will be performed in accordance with the requirements stated below.

4.3.4 If the sampling personnel deliver the samples to the laboratory, transfer of COC occurs as follows:

- The sample custodian delivers the samples to the laboratory and relinquishes the samples directly to a laboratory representative. Any person involved in the collection of the samples may act as the sample custodian.
- The custodian signs the COC listing his/her name, affiliation, the date, and time.
- The laboratory representative must receive the samples by signing his/her name, affiliation, the date, and time on the COC. The laboratory representative may decline to take receipt of the samples if the COC is not properly completed or if the samples are not properly packaged. Any designated laboratory personnel may act as the sample custodian.
- One copy of the COC is given to the sample collector to be returned to the project files and one copy is maintained with the samples at the laboratory.

4.3.5 If the sampling personnel transfer sample(s) to the laboratory utilizing a common carrier, sampling personnel will retain COC responsibility and the common carrier is not responsible for maintaining sample custody. The sample collectors are responsible for packaging the samples in a manner that meets the COC definition criteria, that is, the samples are sealed to prevent tampering. When transferring samples to the courier for transport, COC procedures are maintained as follows:

- The sample collector lists the courier affiliation and waybill number on the COC.
- The sample collector relinquishes custody by signing his name, affiliation, date, and time. The collector keeps a copy of the relinquished COC for the project file.
- The relinquished original COC is sealed in a watertight plastic bag and taped to the inside of the lid of the container used for transportation.
- The transportation container is sealed to prevent tampering and given to the courier for delivery to the laboratory.
- The sample collector obtains a copy of the waybill from the courier for the project file.
- The laboratory representative must receive the samples by signing his/her name, affiliation, the date, and time on the COC. This copy is maintained with the samples at the laboratory.
- The laboratory representative obtains a copy of the waybill from the courier for the project file.

4.3.6 Sampling personnel should record field events on a “Field Activity Daily Log” and/or a “Sample Collection Log” as may be necessary to document the field work.

4.4 Analytical Laboratory Custody

4.4.1 Upon receipt at the analytical laboratory, the field generated COC document will be signed and dated; the time, temperature and condition of the samples will be noted; and laboratory identification will be provided in the appropriate spaces.

4.4.2 Laboratory receipt personnel will enter the samples into the laboratory by implementing the sample custody procedures addressed within their approved QA Program.

4.4.3 After completion of analytical testing, sample remnants not consumed during testing may be kept for six months beyond the completion of analysis, unless otherwise specified by a notation on the COC that samples are to be returned to the project site for disposal. Once this time period has elapsed, the samples will be disposed of and the disposal record number will be recorded on the laboratory record copy of the COC.

5.0 RECORDS

Records generated as a result of implementation of this SOP will be controlled and maintained in the project record files in accordance with the project’s QA procedures.

6.0 ATTACHMENTS

6.1 Chain-of-Custody Record

6.2 Field Activity Daily Log

A form referenced or attached to this SOP may be replaced with a substitute form, with the approval of the QAQC Officer, if the substitute form contains equivalent information as the referenced form.

ATTACHMENT 1

CHAIN-OF-CUSTODY RECORD

REVIEWED BY:____ DATE: ____________

APPROVED BY:____DATE: ____________

CONTENTS

1.0 PURPOSE

This Standard Operating Procedure (SOP) outlines the methods and responsibilities for field personnel to use in the packaging and shipping of environmental samples, including hazardous, low-level radioactive, and mixed waste samples, for chemical and physical analysis. This SOP only applies to the packaging and shipping of limited quantity, environmental samples. The details in this SOP are only applicable to the general requirements for sample packaging and shipping and should only be used as a guide for developing more job-specific work plans.

2.0 REFERENCES

2.1 *EPA, September 1987, Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14*

2.2 *EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies Under CERCLA, Interim Final OSWER Directive 9355.3-01*

2.3 *Code of Federal Regulations, DOT 49 CFR Parts 100 to 177*

2.4 *Dangerous Goods Regulations, IATA, January 1, 1994*

3.0 DEFINITIONS

3.1 Environmental Sample

A limited quantity sample of soil, water, air, or other substance found in the environment collected specifically for chemical or physical analysis.

3.2 Hazardous Material

Hazardous material means a substance or material, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated. For the LEHR site, the term includes hazardous substances and hazardous wastes, materials designated as hazardous under the provisions of 49 CFR Sec. 172.101, and materials that meet the defining criteria for hazard classes and divisions in 49 CFR part 173.

3.3 Hazardous Substance

Hazardous substance for the purposes of this SOP, means a material, including its mixtures and solutions, that:

- Is listed in Appendix A to 49 CFR Sec. 172.101;
- Is in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) listed in Appendix A to 49 CFR Sec. 172.101; and
- When in a mixture or solution:

− For radionuclides, conforms to paragraph 6 of Appendix A to Sec. 172.101.

− For other than radionuclides, is in a concentration by weight which equals or exceeds the concentration corresponding to the RQ of the material, as described in 49 CFR Sec. 173.133.

3.4 Hazardous Waste

Any substance listed in 40 CFR Subpart D (260.30 et seq.) or otherwise characterized as ignitable, corrosive, reactive, or toxic as specified in Subpart C (261.20 et seq.) that would be subject to manifest and packaging requirements specified in 40 CFR 262. Hazardous waste is defined and regulated by the U.S. Environmental Protection Agency (EPA).

3.5 Sample

Physical evidence collected from a facility or the environment which is representative of conditions at the point and time at which the sample is collected.

4.0 PROCEDURE

4.1 Responsibilities

4.1.1 Compliance with this procedure is the responsibility of project management, site management, health and safety, and field personnel.

4.1.2 The Project Manager (PM) is responsible for the development and review of site-specific work plans which address the specific sample handling, packaging, and shipping requirements for the project. The PM should review the project-specific documentation forms to ensure they are appropriate for the field activities. The PM is also responsible for seeing that field personnel receive proper training and maintain quality assurance/quality control (QA/QC).

4.1.3 The Project Quality Assurance Specialist (PQAS) is responsible for the periodic review of documentation generated during sample handling, packaging, and shipping and the periodic review and audit of field personnel as they perform the work. If problems arise, the PQAS is also responsible for swift implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to requirements, issuing nonconformances).

4.1.4 The Site Health and Safety Officer (SHSO) is responsible for ensuring complete compliance with the Health and Safety Plan by all personnel on site. He/She is responsible for ensuring that all protective measures are identified and implemented to adequately protect site workers.

4.1.5 The Radiological Control Technician (RCT) is responsible for assisting the SHSO in the performance of monitoring, posting and evaluation of work-site safety and radiological controls conditions.

4.1.6 The Sample Manager (SM) is responsible for the proper implementation of the sampling plan and to ensure that all sample collection activities are conducted in accordance with this SOP.

4.1.7 The LEHR Project Chemist or designee is responsible for coordinating with the analytical laboratory and to ensure that all analytical activities are conducted in accordance with the sampling and analysis plan.

4.2 Sample Handling

4.2.1 Inspect the sampling containers to ensure that they are appropriate for the samples being collected, correctly preserved, and undamaged.

4.2.2 When collecting a sample, always use approved/site specific personal protective equipment (e.g., gloves, etc.) to prevent cross-contamination from sample to sample but also as a health and safety requirement.

4.3 Field Packaging

4.3.1 Collect the samples in accordance with the site-specific sampling plans and applicable SOPs.

4.3.2 As soon as possible after sample collection, tightly seal the container. Custody seals may be used for additional sample security. The custody seal should be placed over the cap so that any attempt to remove the cap will cause the seal to be broken. Do not place custody seal over a volatile organic analysis (VOA) vial septum.

4.3.3 Place all containers in separate, appropriately sized, airtight, seam sealing polyethylene bags (e.g., Ziploc™). Seal the bag, removing any excess air.

4.3.4 Place the bagged container inside an insulating shipping container, "cooler." This cooler should have frozen blue ice inside to assure samples remain cool, "4°C," during transit from field to the packaging location.

4.3.5 Maintain the samples under chain-of-custody (COC) (SOP 1.1) in accordance with the site-specific work plans and appropriate SOPs.

4.4 Sample Packaging

4.4.1 Ensure that packages meet applicable requirements of Reference 2.3.

4.4.2 Inspect the integrity of the shipping container. The container is generally a "cooler" constructed of heavy plastic or metal with appropriate insulating properties so that variations in temperature during shipping are minimized. Also, make sure that the drain plug has been sealed.

4.4.3 Place two or more inches of absorbent packaging material (e.g., Vermiculite™) in the bottom of the shipping container. There should be sufficient absorbent material to absorb two times the volume of liquid, if liquid is present.

4.4.4 Carefully check the COC record against the collected sample labels and containers to ensure that the sample numbers, sample description, date and time of collection, container type and volume, preservative, and the required analytical methods are correct and in agreement.

When shipping potentially radioactive samples:

- Place samples within an inner container (a clear plastic bag or other transparent packaging);
- Seal the inner-container;
- Label the container “Radioactive”;
- Include a copy of the LEHR limited quantity statement. This statement includes the sentence “This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive materials, exempted package—limited quantity of material, UN2910.”

4.4.5 Place the samples in the shipping container, allowing sufficient room between the samples to place ice and/or packing material.

4.4.6 Double bag and seal crushed or cubed ice in heavy-duty polyethylene bags. Place these bags of ice on top of and between samples. Blue ice should only be used along with crushed/cubed ice; it does not maintain the 4°C temperature necessary for regulatory compliance. The remaining space will be filled with packing material. Place temperature blank between ice and inner-package.

4.4.7 All samples requiring 4°C temperature preservation will be acceptable "as in" within the range of 4°C ± 2°C. The laboratory should record the temperature of receipt on the COC. For all samples received from 6°C to 10°C, the sample(s) and temperature (in 1°C increments) will be noted on the COC and then analyzed. Samples with temperatures greater than 10°C and VOA samples below 0°C will be reported immediately to the Project Manager.

4.5 Sample Shipping

4.5.1 Shipping shall meet all applicable requirements of References 2.3 and 2.4.

4.5.2 All materials being offered for transportation shall be properly classified based on existing data, site history, chemical characteristics, and radiological characteristics, etc. This is necessary in order to ensure that all appropriate packaging, marking, labeling, handling, placarding, shipping papers, and mode of transportation are utilized as applicable/required.

4.5.3 Samples that contain or could potentially contain radioactive material shall only be sent to laboratories with an appropriate NRC or Agreement State Radioactive Materials License. Prior to shipment of radioactive material, it should be verified that the laboratory/facility is able to receive/possess the nuclides and total activity present in the shipment.

4.5.4 As applicable, all radiological surveys mandated by Reference 2.3 shall be performed for packages and conveyances for shipping and receipt of radioactive material.

4.5.5 The person in charge of sample custody will time, date, and sign over relinquishment of custody on the COC. When a common carrier is to be used for sample shipment, also record the air/waybill number (tracking number) and the name of the carrier on the COC record. Place the original copy of the COC record in a sealed, clear plastic envelope or bag and tape the COC record envelope to the inside lid of the shipping container. Retain a copy of the COC record for tracking purposes.

4.5.6 Using nylon reinforced strapping tape or mailing tape, bind the shipping container. Using duct tape, seal all potential leak points including any drainspout.

4.5.7 Place custody tape (see Attachment 6.1) over opposite ends of the lid.

4.5.8 Mark the container "THIS END UP," or apply arrow labels that indicate the proper position to be maintained during shipping.

4.5.9 Apply a label stating the name and address of the shipper and the receiving laboratory on the outside of the cooler.

4.5.10 Turn the sample(s) over to the courier or carrier for delivery to the laboratory. All samples should be shipped by the fastest available method to the laboratory as soon as possible after sample collection.

NOTE: The courier or carrier is not responsible for sample custody and is not required to sign the COC.

4.5.11 Contact the appropriate laboratory personnel to advise them of the sample shipment. In addition, fax a copy of the COC to the laboratory and the GEL Project Chemist.

4.5.12 Review the COC and sample collection forms for completeness and turn them over to site or project management personnel.

5.0 RECORDS

Records generated as a result of implementation of this SOP will be controlled and maintained in the project record files.

STANDARD OPERATING PROCEDURE	SOP-013 REVISION: 0
BOREHOLE ABANDONMENT	PAGE 1 OF 5 DATE:

REVIEWED BY:____ DATE: ___________

APPROVED BY:____DATE: ___________

CONTENTS

BOREHOLE AND WELL ABANDONMENT

STANDARD OPERATING PROCEDURE

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes guidelines and procedures for field personnel to use in the supervision of borehole or soil boring abandonment and groundwater monitoring well abandonment (destruction) activities. Additional specific borehole and well abandonment procedures and requirements will be provided in the project work plans.

2.0 REFERENCES

None

3.0 DEFINITIONS

3.1 Borehole Abandonment

The process whereby boreholes or soil borings are grouted or sealed following completion of drilling, sampling and/or logging.

4.0 PROCEDURE

This section contains responsibilities, procedures and requirements for borehole and well abandonment. Abandonment procedures to be used at a particular site must incorporate project-specific regulatory requirements. Consequently, the project work plans will identify the following:

- Abandonment objectives;
- Boreholes to be abandoned; and,
- Specific procedures for borehole abandonment beyond those covered in this SOP.

4.1 Responsibilities

4.1.1 The Project Manager is responsible for ensuring that all abandonment activities are conducted and documented in accordance with this SOP and any other appropriate procedures. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

4.1.2 The Project QA/QC Officer is responsible for periodic review of field generated documentation associated with this SOP. He is also responsible for the implementation of corrective action (i.e., retraining personnel, additional review of work plans and SOPs, variances to the abandonment requirements, issuing nonconformances, etc.) if problems occur.

4.1.3 Field personnel assigned to borehole and well abandonment activities are responsible for completing their tasks according to specifications outlined in this SOP and other appropriate procedures. All staff are responsible for reporting deviations from the procedures to the Field Coordinator, Project Manager or the QA/QC Officer.

4.2 Abandonment of Boreholes

After drilling, logging and/or sampling, boreholes should be backfilled by the method described in the project work plans. This typically consists of backfilling to the surface with a bentonite-cement grout.

4.2.1 Bentonite should be thoroughly mixed into the grout and within the percentage range specified in the work plans. The grout is usually tremied into the hole; however for selected boreholes (e.g., shallow borings well above the water table) at certain sites, the grout may be allowed to free fall. In either case, care must be taken to ensure the grout does not bridge, forming gaps or voids in the grout column.

4.2.2 The volume of the borehole should be calculated and compared to the grout volume used during grouting to aid in verifying that bridging did not occur.

4.2.3 When using a tremie to place grout in the borehole, the bottom of the tremie should be submerged into the grout column and withdrawn slowly as the hole fills with grout. If allowing the grout to free fall (and not using a tremie), the grout should be poured slowly into the boring. The rise of the grout column should also be visually monitored or sounded with a weighted tape.

4.2.4 If the method used to drill the boring utilized a drive casing, the casing should be slowly extracted during grouting such that the bottom of the casing does not come above the top of the grout column.

4.2.5 During the grouting process, the personnel performing the task should be supervised to assure that potentially contaminating material (oil, grease, or fuels from gloves, pumps, hoses, et. al) does not enter the grout mix and that personnel are properly wearing personal protective equipment as specified in the Project Health and Safety Plan.

4.2.6 Following grouting, barriers should be placed over grouted boreholes as the grout is likely to settle in time, creating a physical hazard. Grouted boreholes will typically require at least a second visit to "top off" the hole.

4.2.7 The surface hole condition should match the pre-drilling condition (asphalt, concrete, or smoothed flush with native surface), unless otherwise specified in the project work plans.

5.0 RECORDS

Records generated as a result of implementation of this SOP will be maintained in the Project Records file.