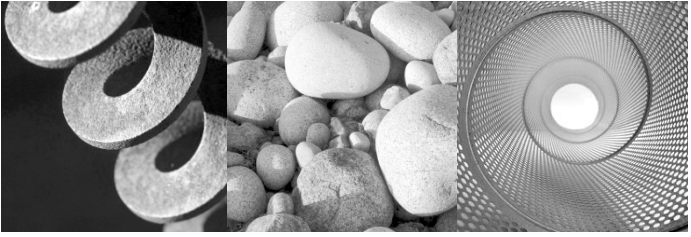

GEI Consultants

Consulting
Engineers and
Scientists

Interim Remedial Measure Work Plan

486 Sunrise Highway, Rockville Centre, New York
Site No. C130220

Submitted to:
New York State Department of Environmental Conservation
Region 1
50 Circle Road
Stony Brook, NY 11790

Submitted by:
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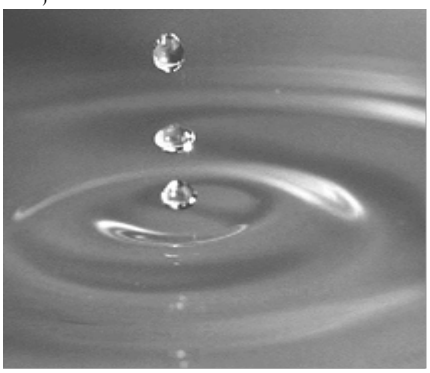
110 Walt Whitman Road, Suite 204
Huntington Station, NY 11746
631.760.9300

June 2018
Project 1500620



Christopher Morris, P.G.
Project Manager

Gary A. Rozmus, P.E.
Program Manager

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CM:gd

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Certification

I, Gary A. Rozmus, certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Interim Remedial Measure Work Plan (IRMWP) was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Signature

June 6, 2018
Date

1. Introduction

GEI Consultants, Inc., P. C. (GEI) prepared this Interim Remedial Measure Work Plan (IRMWP) for the site known as 486 Sunrise Highway, Rockville Centre (the Site), which is located at 484-486 Sunrise Highway, Rockville Centre, New York. It was prepared on behalf of BCA & Associates, LLC, (BCA) the owner of the Site. BCA is enrolled as a Volunteer into the New York State Brownfield Cleanup Program (BCP) for this Site (Site No. C130220).

This IRMWP has been prepared following the completion of several previous investigations, including a recently concluded Focused Remedial Investigation (FRI). The FRI was the first investigation conducted following the Site's acceptance in the BCP. The FRI included soil, groundwater and soil vapor sample collection. Previous investigations have included sampling of soil, groundwater, sub-slab vapor, soil vapor, indoor air, and outdoor air to investigate impacts, which primarily include chlorinated solvents, that may have resulted from historical uses of the property.

The results of the previous investigations identified tetrachloroethylene (PCE) and trichloroethylene (TCE) in soil vapor samples at concentrations that fall within the mitigation range under the New York State Department of Health (NYSDOH) October 2006 Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH Guidance). These compounds were also detected in soil and groundwater, but at concentrations below the respective Restricted Use Soil Cleanup Objectives (RUSCOs) and ambient water quality standards.

The FRI also included the investigation of an abandoned-in-place underground storage tank (UST) and other identified anomalies, two of which were consistent with USTs. No impacts associated with these anomalies were identified; however, petroleum impacts were identified in another area of the Site where a historical UST was likely present. A spill (No. 1608081) was reported to New York State Department of Environmental Conservation (NYSDEC) subsequent to these findings. No significant groundwater impacts associated with the spill were identified and no non-aqueous phase liquid (NAPL) was observed in a monitoring well installed to monitor NAPL (additional details are provided below). No soil concentrations above the applicable standards were identified. As a result of these findings, the recommended action included closure of the suspected USTs by removal or abandonment-in-place. Regarding the impacts identified with the reported spill, additional monitoring of the well installed within the spill area will be required during IRM activities as per the spill case manager.

Additional details on the previous investigations are provided below.

1.1 Project Background

Several previous investigations of the Site identified historical uses of the property that may have impacted the environmental quality of the Site. The historical uses include a dry cleaner, cabinet shop, photo shop, and machine shop. In addition, a tire repair and auto shop was located immediately adjacent to the Site.

1.1.1 Site Description

The Site consists of a two-story commercial office building containing six offices or suites on the first floor including a storage area and janitor's closet, offices on the second floor, and a parking lot in the rear of the property along Ongley Street. The current occupants of the first floor of the building include a print shop, law office, bakery, and a customs broker/freight forwarding office. Two of the suites are unoccupied. The building footprint encompasses approximately 16,000 square feet. A Site location map is shown on **Figure 1**. The interior layout of the first floor of the building including historical usage areas is shown on **Figure 2**.

1.1.2 *Description of Local Geologic and Hydrogeological Conditions*

Site Soil/Stratigraphy

The soil stratigraphy underneath the Site has been investigated to approximately 50 feet below ground surface (bgs) and consists primarily of sand and gravel. Based on regional information from the area, this stratigraphy likely remains relatively consistent to approximately 55 feet, where a clay layer is reportedly located. A clay lense was noted at 51 feet during the investigation; however, its thickness was not determined.

Groundwater Flow Direction

Regional groundwater flow direction is towards the south. Groundwater elevation measurements collected during GEI's Phase II investigation indicate that the groundwater flow direction at, and in the immediate vicinity of the Site, is to the south-southeast. The groundwater interface was encountered between approximately 10 and 13 feet below grade at the Site.

Surface Water Bodies

No surface water bodies are located within a half-mile radius of the Site.

1.1.3 *Site History and Previous Investigations*

Several previous investigations were conducted at the Site. These include:

- Phase I Environmental Site Assessment (ESA), Advanced Cleanup Technologies, Inc. (ACT), January 2011
- Phase II ESA, ACT, February 2011
- Phase IIB ESA, ACT, March 2011
- Passive Soil Gas Survey & Source Area Investigation, Preferred Environmental Services (Preferred), January 2014
- Phase II Investigation, GEI, May 2015
- Focused Remedial Investigation, GEI, (2016-2017)

ACT Phase I ESA

The Phase I ESA conducted by ACT in January 2011 identified two relevant recognized environmental conditions (RECs):

- The historical use of the Site as a machine shop, photo lab, cabinet shop and dry cleaner
- A UST was present on the Site that was no longer in service and had been abandoned in place

ACT Phase II and Phase IIB ESAs

The Phase II ESA conducted by ACT in January and February 2011 consisted of a ground penetrating radar (GPR) survey of the parking lot area and the sidewalk along Ongley Street, a soil quality investigation in the area of a suspect UST, a groundwater quality investigation near the downgradient side of the Site and in the vicinity of the suspected USTs, as well as a soil vapor intrusion investigation within the building. The Phase IIB ESA consisted of the collection and analysis of additional soil vapor and indoor air samples, as well as one additional groundwater sample.

The ACT studies determined the following: Two soil borings were advanced in the area where the out of service UST was located. No visual or olfactory evidence of contamination was identified. Samples from the borings were analyzed for volatile organic compounds (VOCs). No detections were identified.

Five temporary wells were installed at the Site to intersect the groundwater table. Samples from these temporary wells were analyzed for VOCs. Tetrachloroethylene (PCE) was detected in temporary wells in two of the temporary wells at concentrations of 1 microgram per liter (µg/L), which is below its groundwater standard.

Five soil vapor samples and five indoor air samples were collected as part of the investigations and analyzed in accordance with United State Environmental Protection Agency (USEPA) TO-15 protocols. None of the indoor air sample concentrations were above New York State Department of Health (NYSDOH) Guidance air guideline values. However, the evaluation of the trichloroethylene (TCE) and PCE concentrations collected in soil vapor and indoor air were above the no further action range of the NYSDOH Guidance. The highest detections of TCE and PCE in soil vapor were identified in the samples taken from the central portion of the building beneath the storage area.

Preferred Passive Soil Gas Survey & Source Area Investigation

Preferred's January 2014 passive soil gas survey investigation consisted of 24 sampling points located within and outside the building. The soil gas probes were installed between 20 and 36 inches below the surface finishes. The samplers were left in place for seven days, were then retrieved and analyzed for VOCs and total petroleum hydrocarbons (TPH). The

Soil vapor concentrations in these soil vapor samples were above the no further action range for TCE and PCE, which were identified in seven samples and one sample, respectively. The area in which these concentrations were detected was generally similar to that identified during ACT's investigations, although Preferred did detect lower concentrations than ACT.

The passive samples were also analyzed for TPH. TPH concentrations ranged as high as 6,390 $\mu g/m^3$ in the area along the northwest side of the building. This area is located immediately downgradient and adjacent to an offsite former tire repair and auto shop, suggesting an upgradient source of petroleum hydrocarbons may be present.

GEI Phase II Investigation

The key elements of the GEI's Phase II investigation included the following: Site Visit and Evaluation; Geophysical Investigation; Drain Investigation; Soil Vapor Intrusion Investigation; Soil Borings (Interior); Temporary Groundwater Monitoring Well Installations; Temporary Well Survey; and Groundwater Vertical Profiles and Temporary Well Sampling.

The results of GEI's Phase II investigation and the previous investigations indicate the presence of PCE in onsite soil vapor. PCE was also detected in groundwater but at concentrations below its groundwater standard (PCE is considered the primary chemical of concern [COC] with respect to dry cleaning operations). TCE, another COC at the Site, was detected in soil vapor. It was also detected in groundwater but at concentrations below its groundwater standard. Detections above applicable standards or guidelines were limited to soil vapor. Soil concentrations of PCE and TCE, where detected, were below the New York State Department of Environmental Conservation (NYSDEC) Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs).

Since groundwater quality was not significantly impacted , the presence of PCE and TCE in some of the soil vapor samples taken under the Site building was thought to have indicated that a shallow source could be present in a small area of the vadose zone beneath the building. However, a shallow source of PCE and TCE was not identified.

As part of GEI's Phase II, a qualitative human health exposure assessment (QHHEA) was prepared in accordance with NYSDEC Division of Environmental Remediation (DER)-10. The QHHEA identified the potential for human exposure to soil vapor (through inhalation of vapors within the onsite building). The data from this Phase II investigation determined that groundwater and soil concentrations were below applicable standards; therefore, exposure to these media was not a concern. The results of GEI's Phase II investigation and previous investigations demonstrate there were no current complete exposure pathways. The potential for a complete exposure pathway to soil vapor for onsite receptors remains due to the concentrations of PCE and TCE in sub-slab soil vapor. Indoor air concentrations were within regulatory guidelines at the time of sampling.

GEI Focused Remedial Investigation

The FRI was implemented to further define the nature and extent of contamination previously identified at the Site. The scope of the FRI included soil sampling beneath the existing building slab, as well as in the vicinity of previously identified anomalies in the building's parking lot and around the south and southeastern edges of the property, groundwater monitoring well installation, survey and sampling, permanent soil vapor sampling point installation and sampling, and a soil communication test in advance of an anticipated IRM. The soil communication test was conducted to evaluate the air flow beneath the floor slab by applying a vacuum to several temporary extraction points and measuring the pressure at numerous temporary monitoring points located at various distances (radially) from the extraction points. The testing was performed to provide information needed for the design of a sub-slab depressurization system (SSDS). Excluding the soil communication test, the scope of work and subsequent findings are the subject of the Focused Remedial Investigation Report (FRIR).

The primary compounds of concern at the site, PCE and TCE, were identified in all three-media investigated during the FRI. Soil vapor detections of PCE and TCE were identified within the mitigation range under the 2006 New York State Department of Health Guidance for Evaluating Vapor Intrusion (NYSDOH Guidance) and subsequent updates to the document. These compounds were also detected in groundwater and soil; however, all the detections were below the respective NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values (AWQS) for Class GA Groundwater and the NYSDEC Part 375 Restricted Use Soil Cleanup Objectives (Commercial) values. Exceedances of the NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives for PCE and TCE were identified in one and two samples, respectively.

Petroleum-related impacts were identified in the area behind the building and beneath the rear of the building at several of the investigation locations. The impacts noted were limited to physical observations. As a result of the noted physical observations, a spill was reported to NYSDEC. No exceedances were identified in the laboratory analysis for soil or groundwater samples downgradient of the reported spill. Under direction of the NYSDEC spill manager, a monitoring well was installed and NAPL monitoring was conducted for a period of six months. No NAPL was observed during this period.

Detections of several metals, pesticides and one polychlorinated biphenyl (PCB) were identified in groundwater, but do not appear site related. One semivolatile organic compound (SVOC) detection above the AWQS was identified in a downgradient monitoring well; however, it is not directly downgradient of the reported spill and was not identified within the shallow well in the area.

The results of the FRI were generally similar to those of the previous investigation conducted by GEI. However, the soil vapor results from the FRI were generally lower than those detected during previous investigations.

1.2 Project Description

Based on the findings of previous reports and the FRIR, a remedy to mitigate the identified PCE and TCE concentrations in soil vapor was deemed necessary. Recommendations from the FRI included the installation of a SSDS. Prior to the completion of the FRI, a previously completed alternatives analysis report (GEI 2015) concluded that the most effective action for the Site would be a mitigative measure. The selected mitigative measure was an SSDS. The SSDS and the UST removals/abandonments are the focus of the IRM.

1.3 Citizen Participation Activities

Following submittal of the Draft IRMWP and FRIR, NYSDEC will issue a Preliminary Decision Document (PDD). The PDD will be placed in the document repository. A NYSDEC fact sheet will be created and distributed to the media and to the names on the Site Contact List to announce the availability of the PDD for public review and comment. A fact sheet and notice of public meeting, if necessary, will be distributed by a mailing to the names on the Site Contact List. Public comments will be solicited to aid in the preparation of the Final IRM Work Plan. A public meeting will be conducted, if required. Following the public comment period, NYSDEC will issue a Decision Document, at which time the IRMWP will be finalized.

1.4 Project Organization and Responsibility

GEI will be responsible for project management, subcontractor oversight, IRMWP compliance, monitoring for health and safety, perimeter-air monitoring activities and the

collection of analytical samples, if required. GEI will also serve as the Site Health and Safety Officer.

The subcontractor will be responsible for all activities associated with their tasks including compliance with all applicable Occupational Safety and Health Administration (OSHA) regulations and the health and safety of the work crews.

The following are the key personnel or agencies involved with IRMWP activities at the Site:

NYSDEC: Mr. Jahan Reza

SSDS Subcontractor: To be Selected

UST Subcontractor: To be Selected

GEI:

Mr. Gary Rozmus
Program Manager
110 Walt Whitman Road, Suite 204
Huntington Station, NY 11746
(631) 479-3510

Mr. Christopher Morris
Project Manager
110 Walt Whitman Road, Suite 204
Huntington Station, NY 11746
(631) 759-2967

Remedial Party Contact:

Mr. Christopher Accomando
BCA & Associates, LLC
486 Sunrise Highway, Suite 200
Rockville Centre, New York 11570
caccomando@gcs-ltd.com

2. Description of IRM Activities

General field activities include site meetings, mobilization, implementing the health and safety plan, UST abandonment and/or removals, soil excavation and waste disposal (if necessary), sampling and the installation of the SSDS. Subcontractors will be used for UST abandonment and removal and SSDS installation. Field work will follow the health and safety protocols detailed in the Health and Safety Plan (HASP), which is included in **Appendix A**.

Execution of the IRM

Interior work will be coordinated with the property owner to accommodate the schedule of the building tenants and will likely be limited to after-hours or weekends work. Exterior work in the parking lot may also be conducted on a similar schedule to avoid disruption of the building's tenants.

Mobilization and Site Access

The selected subcontractor will submit a Site-specific HASP meeting the minimum requirements of GEI's HASP, which is included in **Appendix A**. All work will be performed in accordance with OSHA, state, and industry safety standards. All onsite personnel performing intrusive activities that have the potential to come in contact with impacted materials will have the requisite 1910.120 OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Training, as well as Site-specific training prior to intrusive activities. All personnel performing work associated with this IRMWP will be required to have both general and Site-specific training. The general training includes all applicable OSHA and state required training, such as 40-hour HAZWOPER and the 8-hour Refresher Training. All personnel will be in a medical surveillance program.

The property owner will provide access to the Site. This access will be for all IRM activities.

The subcontractors will be responsible for contacting New York 811 to request that all utilities on the adjacent public right –of-ways be located and marked. The location of onsite utilities has been previously marked and will be confirmed prior to the start of intrusive activities. When all utilities have been verified/confirmed/protected, then intrusive activities may be initiated.

The selected subcontractor will mobilize all necessary labor, equipment, supplies and materials to complete the IRM. Lay down areas for equipment, supplies and materials, the appropriate exclusion zone(s) and support area(s) will be identified to conduct the planned

activities safely and effectively. All equipment will be inspected prior to utilization for the IRM and checked periodically for performance and corrective repair. All equipment will be cleaned prior to arrival on the project site.

Site Meeting

A Site "kick-off" meeting will be held with GEI and subcontractors prior to initiating field work activities. The purpose of the meeting will be to orient field team members and subcontractors with the Site, project personnel, Site background, scope of work, potential dangers, health and safety requirements, site-specific security and safety protocols, emergency contingencies, and other field procedures.

Odor and Fugitive Dust Control

In accordance with NYSDEC and NYSDOH requirements, a Community Air Monitoring Program (CAMP) will be implemented at the Site during exterior intrusive activities (**Appendix B**). Specialty CAMP is required for outside work within 20 feet of any occupied building. A CAMP station will be setup near any windows, doors or intake vents. Air monitoring will also be conducted with a photo-ionization detector (PID) located near the work area during interior intrusive activities even if the building is otherwise unoccupied. The objective of the CAMP is to provide a measure of protection for the downwind community (i.e., offsite receptors, including residences and businesses and onsite workers not involved with Site activities) from potential airborne contaminant releases as a direct result of intrusive IRMWP activities. Air monitoring stations will be placed up-wind and downwind of each intrusive work area (i.e., soil boring, soil vapor probe, and monitoring well locations). VOCs and respirable particulates (PM-10) will be monitored at the up-wind and downwind stations on a continuous basis. In addition, to the fixed stations, VOCs and particulates will be monitored in the work zone using hand held equipment. VOCs and particulates will also be monitored around the perimeter of the work zone on a regular basis (hourly) by the GEI air monitoring personnel.

2.1 SSDS Design

An SSDS will be installed beneath the building as shown on **Figure 3**. Preliminary design details are shown on **Figure 4**. A qualified subcontractor, experienced with the design and installation of SSDSs will be hired to perform the work in accordance with the NYSDOH document "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" October 2006.

The planned work will be implemented during hours when building occupancy is at a minimum. If necessary, exhaust fans or other engineering controls may be used to create negative air pressure within the work area during work activities.

The SSDS will be designed to create and maintain a minimum negative pressure differential of 0.02 inches of water column (wci) below the concrete slab which function as boundaries between sub-slab space and the occupied interior space. Once the SSDS has been installed, baseline readings from effluent stack and from temporary monitoring points installed below the slab at various distances from each SSDS extraction point will be collected to verify the operational radius of influence. Post start-up readings will be limited to the effluent stack. The post start-up effluent stack readings will be compared to the baseline effluent stack readings, which will have been correlated to negative pressure readings at the temporary monitoring points. The comparison will verify that negative pressure is present at the appropriate distances from the SSDS extraction points as designed. The SSDS work effort will include the following tasks:

- installation of one multi-suction point SSDS system;
- post-installation pressure testing; and
- preparation of a IRM Closure Report with an Operations, Maintenance, and Monitoring Plan (OM&M Plan).

The results of the soil communication test and the vacuum influence calculations utilized for the SSDS design are included in **Appendix C**.

2.2 UST Abandonment/Removal

The following are the general UST abandonment/removal procedures that will be followed for the two USTs and associated impacted soil areas, if identified during abandonment or removal (**Figure 5**). Closure of the USTs will be done in accordance with 6 New York Codes, Rules and Regulations (NYCRR) Part 613.2.6 – Closure of Out-of-Service Tanks, and the Nassau County Public Health Ordinance (Article 11), and will follow NYSDEC guidance document, Permanent Closure of Petroleum Tanks (1987/1998/2003).

The suspected USTs will be uncovered and inspected to determine their size. If the USTs are over 1,100 gallons in capacity, Nassau County regulations require registration and removal. If this is the case, a waiver will be sought to allow the UST on the eastern side of the building to be abandoned-in-place to avoid compromising the structural integrity of the building's foundation.

- Overburden soil excavated to facilitate the removal of the UST will be field screened to determine if the soil is potentially impacted. Non-impacted soil (those registering 5 ppm or less on a PID during field screening) will be excavated and stockpiled onsite on 6-mil plastic and covered with 6-mil plastic for reuse onsite.
- Tank contents (i.e., liquids and tank sludge) will be removed from tank and connection lines (if any), containerized and characterized for proper off-site disposal.

The tank contents will be properly disposed of by the contractor and disposal documentation will be provided.

- The tanks will be made safe by purging any petroleum vapors via one of three approved methods: dry ice, carbon dioxide, or nitrogen gas.
- Connecting lines going from the tanks into the building, if present, will be capped closed as close to the building as practical without affecting the building foundation during the tank removal/abandonment.
- Any residual product within the connection piping will be flushed back into the USTs, removed and containerized with its respective tank contents.
- Water from the UST cleaning process will be contained in New York State Department of Transportation (NYSDOT)-approved 55-gallon drums or extracted using a vacuum truck, pending the volume needed to clean the USTs. Water will be properly disposed of by the contractor and disposal documentation will be provided.
- If the USTs are closed in place, the tank tops will be cut opened, the tank interior cleaned and the tanks will be filled with an inert material.

If removal of the UST within the building's parking lot is required, the following procedures will be implemented:

- The USTs will be cut into manageable pieces and/or crushed and removed from the Site to be either recycled or disposed of at an approved disposal facility. The contractor will supply disposal or recycling records.
- Once the USTs have been removed from the excavation an assessment will be made of the excavation side walls and bottom of the UST areas. The excavation side walls and bottom will be field screened with an PID to assess for additional petroleum impacts.
- Soils determined to be impacted, within the UST areas, based on visual observations and field screening (registering 5 ppm or greater), will be excavated and stockpiled onsite on 8-mil plastic and covered with 8-mil plastic. The excavation work will include removal of grossly impacted soils and water (if any) which contains light non-aqueous phase liquid (LNAPL). It is possible that some volume of impacted soil, if identified, may need to remain in place to protect the structural integrity of the adjacent buildings.
- Prior to the start of the subsurface soil work, a decontamination pad will be built to allow equipment used during the excavation and UST removal activities to be decontaminated. The pad will be constructed on a stable onsite surface using a minimum of 8-mil plastic sheeting and allow water generated during the decontamination processes to be contained and transferred to 55-gallon drums for

characterization and proper disposal. Upon completion of the excavation work, the decontamination pad will be disposed of with the impacted soils stockpiled for off-site disposal at a permitted disposal facility.

- The excavated soils stockpiled for off-site disposal will be analyzed for disposal parameters. After approval for disposal from the disposal facility, the soil will be loaded into dump trucks or dump trailers, covered, and transported by a licensed hauler to a permitted facility for proper disposal. Disposal documentation will be provided.
- Post-excavation soil samples will be collected from the side walls and bottom of each excavation in accordance with NYSDEC DER-10 guidelines to confirm that the remaining soil meets the Part 375 Restricted Use (Commercial) Soil cleanup Objectives (RUSCOs). One sidewall sample will be collected from each excavation sidewall that is less than 30 linear feet. If an excavation sidewall exceeds 30 linear feet, then one sample will be collected for every 30 linear feet. A minimum of one bottom sample will be collected from each UST excavation area. One sample will be collected for every 500 square feet of bottom excavation area. Quality Assurance/Quality Control (QA/QC) protocols should sampling be required are included in **Appendix D**.
- Confirmatory samples will be analyzed for VOCs via EPA Method 8260 and SVOCs via EPA Method 8270 CP-51 Tables 2 and 3. Detection limits of the sample analysis will be below the RUSCOs.
- The excavation areas will be barricaded to keep the public and unauthorized personnel away from the excavation while awaiting analytical results and prior to backfilling. If post-excavation soil samples indicate that impacted soil at levels above RUSCOs remains, it is anticipated that additional soil will be excavated for off-Site disposal.
- Although not expected to be encountered, if groundwater is encountered within an excavation, a sample will be collected for VOC and SVOC analysis to characterize for disposal.
- Upon soil excavation completion, equipment will be decontaminated prior to being removed from the Site at the decontamination pad location.
- Suitable backfill material shall be placed and compacted in lifts within the excavation areas. Backfill brought to the Site will meet the requirements outlined in Part 375-6.7(d) and DER-102 Section 5.4(e).

2.3 Permits and Approvals

The IRM Contractors are responsible for obtaining all permits and approvals required for the project.

2.4 Site Restoration

The subcontractor will restore all areas disturbed by the IRMWP activities to pre-existing conditions based on the applicable access agreements. Restoration actions shall include, but may not be limited to:

- Removal of all temporary facilities, including decontamination areas, and unused materials; and
- Replacement or repair of all asphalt and concrete surfaces, as well as interior surfaces within the building, removed or damaged during the IRMWP, as appropriate.

2.5 IRM Schedule

Key milestones of the UST and SSDS IRM schedule are detailed below:

- Submittal of plans and specifications to contractors (6 weeks)
- Submittal review and selection (4 weeks)
- Mobilization (4 weeks after selection)
- Onsite work (4 weeks)
- IRM Closure Report (8 weeks)

3. Reporting

3.1 Field Documentation

Field notes will be kept during the IRM work, in addition to daily field reports that will be generated summarizing the field work and become part of the project file. The daily field summaries will include the following daily information for the IRM activities:

- Date;
- Meteorological and site conditions;
- Identification of crew members (GEI and subcontractor present) and other personnel (e.g., agency or site owner) present;
- Description of field activities;
- Location(s) where work is performed;
- Samples collected;
- Problems encountered and corrective actions taken;
- Records of field measurements or descriptions recorded; and
- Notice of modifications to the scope of work.
- Relevant site photos will be taken for inclusion in the IRM closure report.

3.2 IRM Closure Report

Details of completion of IRM activities will be documented in an IRM Closure Report submitted to the NYSDEC and NYSDOH. The results of all sampling and analysis will be presented. The Report will present a detailed summary of site physical conditions, chemical conditions and potential risks to human health or the environment. The IRM Report will include, but may not be limited the following:

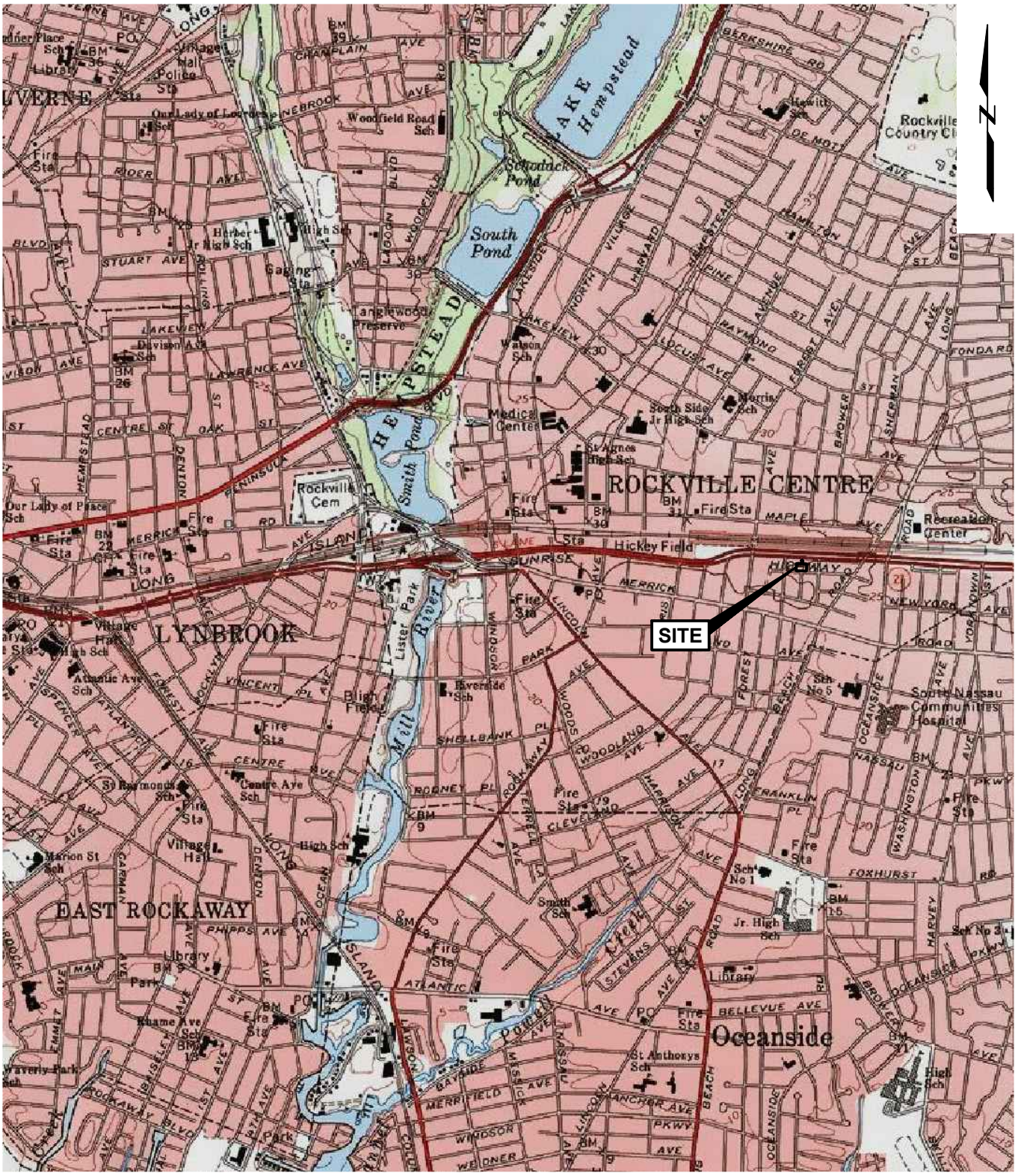
- A description of the IRM activities performed, a description of any deviations from the Work Plan and associated corrective measures taken, and other pertinent information necessary to document that Site activities were carried out in accordance with the IRMWP.
- Pressure readings will be checked and recorded to confirm negative pressure is observed at each of the four sub-slab vapor monitoring points to confirm that the SSDS was properly designed and installed.

- Copies of daily inspection reports and, if applicable, problem identification and corrective measure reports.
- Photo documentation of IRM activities.

The following items will be included in the report if soil excavation is required:

- A site map showing the sampling locations with sample identification; UST and drum locations; and significant site features.
- Tabular comparison of soil sampling and disposal characterization analytical results to disposal criteria, respectively.
- Tabular comparison of confirmation analytical results to Standards, Criteria and Guidance (SCGs) values.
- Tabular quantity summaries of the volume of materials removed.
- Documentation on the disposition of material removed from the Site.

Figures



SOURCE:.

Lynbrook, N.Y. U.S.G.S 7.5 Minute Topographic Maps, created with TOPO!
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Interim Remedial Measure Work Plan 486 Sunrise Highway Rockville Centre, NY	GEI Consultants	SITE LOCATION MAP
BCA & Associates, LLC Rockville Centre, NY	Project 1500620	June 2018 Fig. 1

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SUNRISE HIGHWAY

N

FORMER AUTO
TIRE SERVICE
(OFF SITE - ADJACENT PROPERTY)

PARKING LOT

FORMER
ROOFING
MATERIAL
WAREHOUSE

FORMER DRY
CLEANER

FORMER CABINET AND MACHINE SHOP

APPROXIMATE
SITE BOUNDARY

PARKING LOT

ONGLEY STREET

CELLAR BELOW

SIDEWALK
HATCH

0 20' 40'

SCALE: 1" = 20'

Interim Remedial Measure Work Plan 486 Sunrise Highway Rockville Centre, NY	GEI Consultants	SITE MAP
BCA & Associates, LLC Rockville Centre, NY	Project 1500620	June 2018 Fig. 2

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LEGEND:

- PERMANENT SOIL VAPOR SAMPLING POINT
- APPROXIMATE SSDS EXTRACTION POINT RADIUS OF INFLUENCE
- SSDS EXTRACTION POINT
- SSDS PIPING
- SSDS PIPING MANIFOLD

BASEMENT

SUNRISE HIGHWAY

Collection Date		4/6/2017
Sample ID		PSV-2
Matrix		Air
	Units	Result
Volatiles By TO15		
Tetrachloroethene	ug/m3	**854**
Trichloroethene	ug/m3	**2,740**

FORMER AUTO TIRE SERVICE
(OFF SITE - ADJACENT PROPERTY)

A/1 TYPICAL SSDS POINT

PARKING LOT

FORMER ROOFING MATERIAL WAREHOUSE

SSDS-01

PSV-2

SSDS-02

SSDS-05

SSDS-06

PSV-1

SSDS-07

30' RADIUS OF INFLUENCE ASSUMED

FORMER DRY CLEANER

Collection Date		4/6/2017
Sample ID		PSV-1
Matrix		Air
	Units	Result
Volatiles By TO15		
Tetrachloroethene	ug/m3	**37**
Trichloroethene	ug/m3	**2.45**

C/1 OVERHEAD OF PIPING MANIFOLD

APPROXIMATE SITE BOUNDARY

Collection Date		4/6/2017
Sample ID		PSV-3
Matrix		Air
	Units	Result
Volatiles By TO15		
Tetrachloroethene	ug/m3	**4.41**
Trichloroethene	ug/m3	**0.59**

PSV-3

PARKING LOT

SSDS-03

EXISTING 6" COLUMN

PSV-4

SSDS-04

PSV-5

SSDS-08

Collection Date		4/6/2017
Sample ID		PSV-5
Matrix		Air
	Units	Result
Volatiles By TO15		
Tetrachloroethene	ug/m3	**27.9**
Trichloroethene	ug/m3	**95.6**

CELLAR BELOW

SIDEWALK HATCH

ONGLEY STREET

Collection Date		4/6/2017
Sample ID		PSV-4
Matrix		Air
	Units	Result
Volatiles By TO15		
Tetrachloroethene	ug/m3	**11.4**
Trichloroethene	ug/m3	**19.5**

B/1 ROOF STACK DETAILS NOT SHOWN

0 20' 40'

SCALE: 1" = 20'

Interim Remedial Measure Work Plan
486 Sunrise Highway
Rockville Centre, NY

BCA & Associates, LLC
Rockville Centre, NY

GEI Consultants

SOIL VAPOR SAMPLING RESULTS AND SUB-SLAB DEPRESSURIZATION SYSTEM LAYOUT

Project 1500620 | June 2018 | Fig. 3

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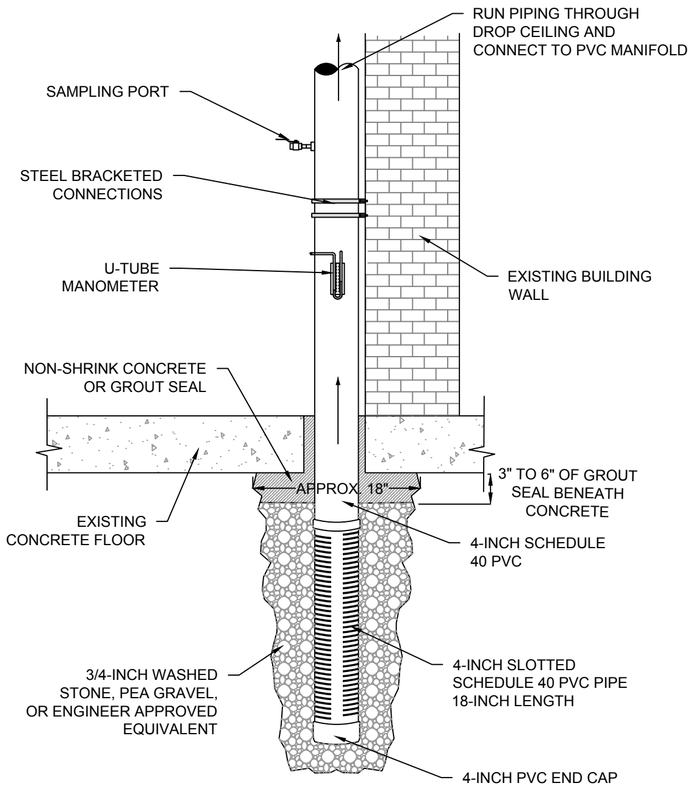
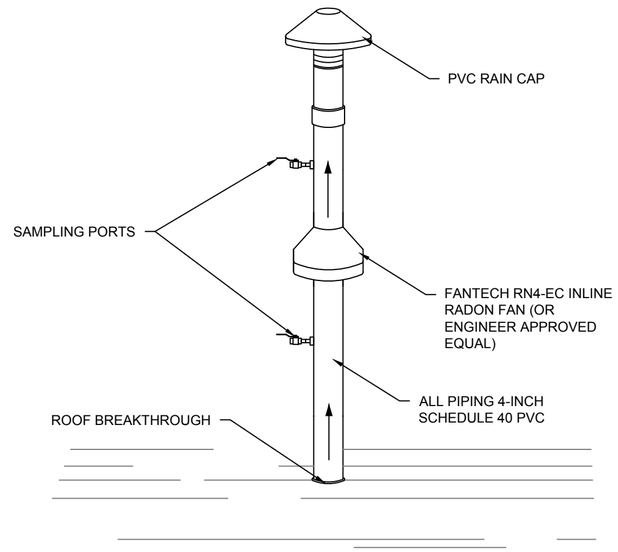


A 1 TYPICAL SSDS POINT
(NOT TO SCALE)

TYPICAL SSDS POINT NOTES:

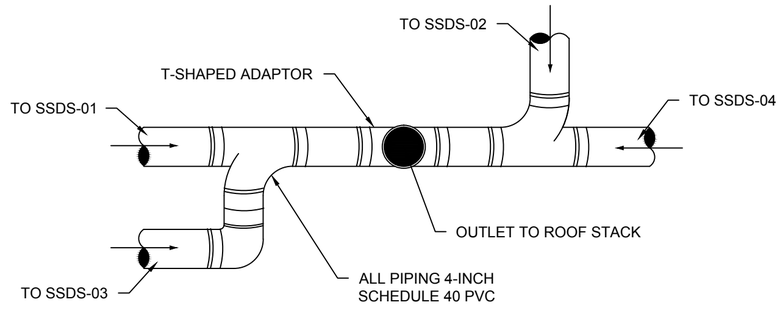
1. MANOMETER SHALL BE INSPECTUSA MODEL NUMBER 50017 4.5-INCH WATER COLUMN U-TUBE MANOMETER (OR ENGINEER APPROVED EQUIVALENT).
2. SAMPLING PORTS SHALL BE 1/4-INCH BRASS VALVES (OR ENGINEER APPROVED EQUIVALENT).
3. VAPOR POINTS SHALL BE PLACED IN CORNERS, AS CLOSE TO WALLS AS POSSIBLE TO MINIMIZE IMPACT TO ROOMS.
4. SPECIFIC SSDS POINTS WILL BE LAID OUT BY CONTRACTOR FOR ENGINEER REVIEW AND APPROVAL PRIOR TO CORE DRILLING. ENGINEER MUST APPROVE ALL LOCATIONS.



B 1 ROOF STACK DETAILS
(NOT TO SCALE)

ROOF STACK NOTES:

1. VENT PIPE EXHAUST AT LEAST 12-INCHES ABOVE THE SURFACE OF THE ROOF.
2. VENT PIPE EXHAUST SHALL BE AT LEAST 10 FEET AWAY FROM ANY OPENING THAT IS LESS THAN 2 FEET BELOW THE EXHAUST POINT.
3. VENT PIPE EXHAUST SHALL BE 10 FEET FROM ANY ADJOINING OR ADJACENT BUILDINGS, HVAC INTAKES, OR SUPPLY REGISTERS.



C 1 OVERHEAD OF PIPING MANIFOLD
(NOT TO SCALE)

PIPING MANIFOLD *NOTES:*

1. MANIFOLD DESIGN MAY BE ALTERED WITH ENGINEER APPROVED TO ACCOMMODATE FIELD CONDITIONS.

GENERAL NOTES:

1. SUB-SLAB DEPRESSURIZATION SYSTEM SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE INSTALLATION GUIDELINES PROVIDED IN THE NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH) "GUIDANCE FOR EVALUATING SOIL VAPOR INTRUSION IN THE STATE OF NEW YORK" - OCTOBER 2006: HTTPS://WWW.HEALTH.NY.GOV/ENVIRONMENTAL/INVESTIGATIONS/SOIL_GAS/SVI_GUIDANCE/
2. CONTRACTOR WILL BE RESPONSIBLE FOR LOCAL PERMITTING.

Interim Remedial Measure Work Plan 486 Sunrise Highway Rockville Centre, NY	GEI Consultants	SUB-SLAB DEPRESSURIZATION SYSTEM DETAILS AND NOTES
BCA & Associates, LLC Rockville Centre, NY	Project 1500620	June 2018 Fig. 4

LEGEND:

SUSPECTED UST LOCATION

HISTORICAL STRUCTURE OUTLINE

SUNRISE HIGHWAY

N

FORMER AUTO TIRE SERVICE
(OFF SITE - ADJACENT PROPERTY)

PARKING LOT

FORMER ROOFING MATERIAL WAREHOUSE

FORMER DRY CLEANER

FORMER CABINET AND MACHINE SHOP

BAKERY SALES

BAKERY 2463 ±SF

COMMON ENTRANCE 144sf

STORAGE

TOILET

MINUTE-MAN PRINTING 2325sf

OFFICE

SALES

CL

COPY

LUNCH RM

OFFICE

OFFICE

CL

COPY

STORAGE

BAKERY DELIVERY

SUITE 103 1486sf

WIF

WIF

BAKERY DECORATING

SCEPTRE STORAGE

KITCHEN

COMMON HALLWAY

PRINTING PRODUCTION

COMMON HALLWAY & LOBBIES 1306 sf

STRG

PRINTER STORAGE

COMMON HALLWAY

ENTRANCE 107sf

EXISTING 6" COLUMN

SUITE 101 1589sf

SUITE 102 985±sf

EXISTING 6" COLUMN

SUITE 100A 650sf

SUITE 100B 1284sf

SUITE 100C 1750sf

EXISTING SEWER

CELLAR BELOW

SIDEWALK HATCH

APPROXIMATE SITE BOUNDARY

ONGLEY STREET

0 20' 40'

SCALE: 1" = 20'

Interim Remedial Measure Work Plan 486 Sunrise Highway Rockville Centre, NY	GEI Consultants	UST ABANDONMENT LOCATIONS
BCA & Associates, LLC Rockville Centre, NY	Project 1500620	June 2018 Fig. 5

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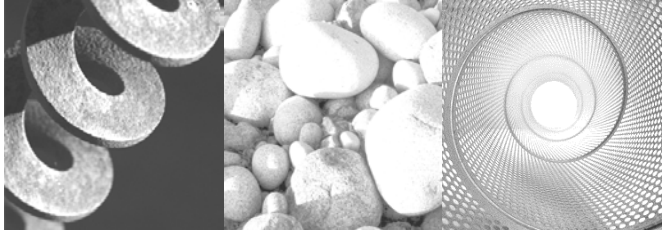
Appendix A

Health and Safety Plan



GEI Consultants

Consulting
Engineers and
Scientists

Health and Safety Plan

486 Sunrise Highway, Rockville Centre, NY
Site No. C130220

Prepared For:
BCA & Associates, LLC
486 Sunrise Highway
Rockville Centre, NY 11570

Submitted by:
GEI Consultants, Inc., P.C.
110 Walt Whitman Road
Huntington Station, New York
631.760.9300

February 2016

Project No. 1500620

Chris Morris
Project Manager

Autumn Eberhardt
Regional Health and Safety Officer

Table of Contents

Tables

Appendices

CM:gd
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1. Emergency Contact Information

Table 1. Emergency Information

Important Phone Numbers		Directions to Hospital
Local Police:	911	Hospital and Occupational Health Clinic. **See Attached Maps and Directions in Appendix A**
Fire Department:	911	
Ambulance:	911	
State Police or County Sheriff:	911	
South Nassau Communities Hospital 1 Healthy Way Oceanside, NY 11572	(516) 632-3000	
Nassau South Walk in Medical Care 2710 Long Beach Road Oceanside, NY 11572	(516) 558-7858	
Project Manager: Chris Morris	(631) 759-2967 office (631) 484-9152 cell	
Corporate Health and Safety Officer : Robin B. DeHate, Ph.D.	(813) 774-6564 office (813) 323-6220 cell	
Regional Health and Safety Officer Steve Hawkins	(860) 368-5348 office (860) 916-4167 cell	
Client Contact: Christopher Accomando	(516) 881- 3315 office	
Nearest Telephone Location: On-site cellular		

2. Background Information

2.1 General

Engineer	GEI Consultants, Inc., P. C. (GEI) 110 Walt Whitman Road Huntington Station, New York 11746:
Project Name	486 Sunrise Highway, Rockville Centre, NY Site No. C130220

This Health and Safety Plan (HASP) establishes policies and procedures to protect GEI personnel from the potential hazards posed by the activities at the 486 Sunrise Highway, Rockville Centre, New York. Reading of the HASP is required of on-site GEI personnel and will be reviewed by GEI subcontractors. Subcontractors will prepare their own Site-specific HASP and may use this as a guide. The plan identifies measures to minimize accidents and injuries, which may result from project activities or during adverse weather conditions. A copy of this HASP will be maintained on site for the duration of the work.

Included in **Appendix A** is a route to the nearest medical facility from the Site with directions and contact information. Safety data sheets (formerly known as Material Safety Data Sheets [MSDS]), specific to chemicals that may be encountered while working at the Site, are in **Appendix B**. **Appendix C** details the signs, symptoms, care and procedures to both heat and cold stress. **Appendix D** includes the Tailgate Safety Briefing form, the Project Safety Briefing form, the Accident/Incident Report Form, and the Near Miss Reporting Form. **Appendix E** contains the GEI Health and Safety (H&S) Standard Operating Procedures (SOPs) that apply to this project.

2.2 Project Description

An investigation of soil and potentially groundwater in the vicinity of identified anomalies is being performed to identify potential environmental impacts these structures. A pilot test for the potential installation of a sub-slab depressurization system is also being performed. The current task will consist at a minimum of onsite soil sampling and the installation of vacuum extraction and monitoring point within the building. The scope of work may be modified based on the findings. Several previous investigations have been conducted at the site.

2.3 Site Description

Based on information provided by BCA & Associates, LLC (BCA), Phase I and Phase II Environmental Site Assessments and additional investigation activities have been conducted

previously at the site. The investigations have centered on the past use of part of the site as a dry cleaner. Dry cleaning operations are believed to have occurred at the site from approximately 1950 to 1971. The contaminants of concern (COCs) related to dry cleaning operations include tetrachloroethene (PCE) and its breakdown products, trichloroethene (TCE), cis-1,2-dichlorothene, trans-1,2-dichlorethene and vinyl chloride. The analytical results of samples collected during these previous investigations indicated that dry cleaning-related COCs, primarily PCE and TCE, were identified in soil vapor beneath the site at concentrations that exceeded the New York State Department of Health (NYSDOH) guidance levels, as established in their document titled, "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006 (NYSDOH Guidance). The indoor air sample data indicated that indoor air concentrations were below regulatory guidelines.

The former dry cleaner was located in the northeast portion of the site. Other reported uses of the site and adjacent properties that may have impacted the site include a machine shop, cabinet shop, and photo shop in the southern portion of the site. An auto tire service shop was present in an adjoining building immediately to the north/west. The site previously consisted of as many as three separate buildings, which have either been demolished, modified or expanded. Presently, the site is occupied by one building with a parking lot in the southwest portion of the property.

3. Statement of Safety and Health Policy

GEI is committed to providing a safe and healthy work environment for its employees. To maintain a safe work environment, GEI has established an organizational structure and a Corporate Health and Safety Program to promote the following objectives:

- Reduce the risk of injury, illness, and loss of life to GEI employees.
- Maintain compliance with federal, state, and other applicable safety regulations; and minimize GEI employees' work exposure to potential physical, chemical, biological, and radiological hazards.

Safety policy and procedure on any one project cannot be administered, implemented, monitored, and enforced by any one individual. The total objective of a safe, accident free work environment can only be accomplished by a dedicated, concerted effort by every individual involved with the project from management down to all employees.

Each GEI employee must understand their value to the company; the costs of accidents, both monetary, physical, and emotional; the objective of the safety policy and procedures; the safety rules that apply to the safety policy and procedures; and what their individual role is in administering, implementing, monitoring, and compliance of their safety policy and procedures. This allows for a more personal approach to compliance through planning, training, understanding, and cooperative effort, rather than by strict enforcement. If for any reason an unsafe act persists, strict enforcement will be implemented.

4. Hazard/Risk Analysis

Physical hazards associated with heavy equipment are present. The heavy equipment associated with this project will include drilling equipment. Some of the hazards associated with this equipment include crushing of limbs, slipping, tripping, or falling, and heavy lifting.

GEI will verify that electric, gas, water, steam, sewer, and other service lines are shut off, capped, or otherwise controlled, at or outside the building before work is started. In each case, any utility company that is involved will be notified in advance by the GEI, and its approval or services, if necessary, will be obtained.

The site consists of four active businesses so the public concerns are present. Proper care will be taken to make sure areas where work is taking place are properly marked as an exclusion zone.

Smoking is prohibited at or in the vicinity of hazardous operations or materials. Where smoking is permitted, safe receptacles will be provided for smoking materials. The hazards for this operation are listed in the following Activity Hazard Analysis and Site Hazards sections.

4.1 Personal Safety

Field activities have the potential to take employees into areas which may pose a risk to personal safety. The following websites (sources) have been researched to identify potential crime activity in the area of the project:

- www.crimereports.com: No crimes identified in the past 30 days within a mile of the Site.
- www.cityrating.com/crimestatistics.asp: No crimes identified in the past 30 days within a mile of the Site.
- www.crimemapping.com: No crimes identified in the past 30 days within a mile of the Site.

To protect yourself, take the following precautions:

- If deemed necessary by the PM, use the buddy system (teams of a minimum of two persons present);
- Let the Site Safety Officer (SSO) know when you begin work in these areas and when you leave;
- Call in regularly;

- Pay attention to what is going on around you; and
- If you arrive in an area and it does not look safe to get out of your vehicle, lock the doors and drive off quickly but safely.

Employees must not knowingly enter into a situation where there is the potential for physical and violent behaviors to occur. If employees encounter hostile individuals or a confrontation develops in the work area, suspend work activities, immediately leave the area of concern, and contact local 911 for assistance. Notify the SSO and Corporate Health and Safety Officer (CHSO) of any incidents once you are out of potential danger.

In the event of an emergency, prompt communications with local emergency responders is essential. At least one charged and otherwise functioning cell phone to facilitate emergency communications will be on-site. Confirmation of cellular phone operation will be confirmed at the start of each working day.

4.2 Activity Hazard Analysis

The potential hazards for this project associated with site conditions and activity hazards associated with GEI onsite activities have been identified in Table 2. General hazards and control measures that are applicable to all site activities are identified in the General Hazards section. The site-specific tasks, potential hazards, and control measures established to reduce the risk of injury or illness are identified in the Activity Hazard section of Table 2. Health and Safety SOPs for routine hazards and common site conditions are referenced in the table below and included in **Appendix E**.

Table 2. Activity Hazard Analysis

General Hazards	Control Measure
Chemical / Contaminant Exposure – Skin and eye injury/irritation	• Wear protective coveralls (e.g. Tyvek ®) with shoe covers, safety glasses, face shield, Nitrile gloves. • Dispose of gloves after use and wash hands. • Avoid contact with pooled liquids and limit contact with contaminated soils/groundwater.

General Hazards	Control Measure
Cold Stress – Hypothermia, Frostbite	• Take breaks in heated shelters when working in extremely cold temperatures. • Drink warm liquids to reduce the susceptibility to cold stress. • Wear protective clothing (recommended three layers: an outside layer to break the wind, a middle layer to provide insulation, and an inner layer of cotton of synthetic weave to allow ventilation). • Wear a hat and insulated boots. • Keep a change of dry clothing available in case clothes become wet. • Do heavy work during the warmer parts of the day and take breaks from the cold. • If possible shield work areas from drafts of wind and use insulating material on equipment handles when temperatures are below 30°F • Watch for symptoms of cold stress. (see Appendix C in HASP)
Driving	• Employees must wear their safety belt while in a moving vehicle. • Vehicle accidents will be reported in accordance with GEI's accident reporting procedures. • Vehicles will be properly maintained and safely operated (refer to GEI's Fleet Maintenance Program). • Employees will follow safe driving behaviors, which include limiting distractions such as manipulating radios or other equipment that may cause a distraction. Employees should not exceed the posted speed limit and should maintain a safe distance between other vehicles. • Use defensive driving techniques. • Driving distance and time after a 12-hour shift should not exceed 30 miles or 30 minutes (whichever is greater). • See SOP HS-004
Dusty Conditions – Eye and respiratory irritation	• Avoid travel at extreme times • Wear protective gear – dust masks, safety glasses

General Hazards	Control Measure
Heat stress – Fainting, Fatigue, Heat Stroke	• Increase water intake while working. • Increase number of rest breaks and/or rotate workers in shorter work shifts. Rest in cool, dry areas. • Watch for signs and symptoms of heat exhaustion and fatigue. • Plan work for early morning or evening during hot months. • Use ice vests when necessary. • In the event of heat stroke, bring the victim to a cool environment and initiate first aid procedures. • See Appendix C of the HASP
Inclement Weather	• Listen to local forecasts for warnings about specific weather hazards such as tornados, thunder storms, and flash floods. • If the storms produce thunder and/or lightning, leave the work area immediately and move to a safe area. • Discuss an action plan prior to the severe weather. • Wear appropriate PPE for the type of weather that could be encountered. • Stop work until conditions are suitable. Take cover in vehicles or shelter as appropriate. • See SOP HS-010
Insects – Bites, Stings, Allergic Reactions	• Apply insect repellent prior to performing field work and as often as needed throughout the work shift • Wear proper protective clothing (work boots, socks and light colored clothing) • Wear shoes, long pants with bottoms tucked into boots or socks, and a long-sleeved shirt when outdoors for long periods of time, or when many insects are most active (between dawn and dusk). • When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible • Field personnel who may have insect allergies should have bee sting allergy medication on site and should provide this information to the SSO and the CHSO prior to commencing work. • Field personnel should perform a self-check at the end of the day for ticks. • See SOP HS-001

General Hazards	Control Measure
Noise	• Wear hearing protection when equipment such as a drill rig, jackhammer, cut saw, air compressor, blower or other heavy equipment is operating on the site. • Wear hearing protection whenever you need to raise your voice above normal conversational speech due to a loud noise source; this much noise indicates the need for protection. • Wear/use hearing protection appropriately. • See SOP HS-012
Physical Injury – Slips, Trips and Falls	• Wear PPE that properly fits, is in good condition and appropriate for the activities and hazards. • Maintain good visibility of the work area. • Avoid walking on uneven, steeply sloped or debris ridden ground surfaces. • Plan tasks prior to preforming them including an activity hazard analysis. • Keep trafficked areas free from slip/trip/fall hazards. • Maintain weed growth in sampling areas, especially on slopes. • Wear shoes with traction. • Avoid traversing steep areas in slippery conditions. • Do not carry heavy objects to sampling areas, on steeply sloped areas, or where steep areas must be traversed to arrive at sample points.
Poisonous Plants – Poison Ivy, Poison Oak, and Poison Sumac	• Avoid areas infested with poisonous plants. • Use a barrier cream to provide some protection. • Wash exposed clothing separately in hot water with detergent. • After use, clean tools, and soles of boots with rubbing alcohol or soap and lots of water. • Immediately wash with soap and water any areas that come into contact with poisonous plants. • If exposed to a poisonous plant, wash with soap and water or a product such as TechnuTM. First aid kits are available in the company vehicles. • See SOP HS-001
Repetitive Motion Injury – Standing, Squatting, and Bending Over	• Take regular breaks and do not work in unusual positions for long periods of time. • Walk and stretch between tasks.

General Hazards	Control Measure
Unsecured or High Crime Areas	• Be aware of your surroundings. • Use the buddy system. Do not remain on site alone. Accompany or be accompanied by others to vehicles. • Request police detail when appropriate. • Let the Site Safety Officer (SSO) know when you begin work in these areas and when you leave. • Call in regularly. • If you arrive in an area and it does not look safe to get out of your vehicle, lock the doors and drive off quickly but safely.
Utilities – Shock, Electrocution, Fire, Explosion	• A thorough underground utility survey must be conducted prior to intrusive activities. Coordination with utility locating services, property owner(s) or utility companies must be conducted. • Utilities are to be considered live or active until documented otherwise. • For overhead utilities within 50 feet, determine with the utility company the appropriate distance. Minimum distance for clearance is based on voltage of the line. • If exposing a utility, proper support and protection must be provided so that the utility will not be damaged. • If a gas line is contacted, the contractor must notify police, fire, and emergency personnel, and evacuate employees according to the site evacuation procedures. No attempt should be made to tamper with or correct the damaged utility. • See SOP HS-014
Vehicular Traffic – Struck by injury, crushing	• Increase visibility of the work area to others by using cones, flags, barricades, proper lighting and caution tape to define work area. • Use a "spotter" to locate oncoming vehicles. • Use vehicle to block work area. • Engage police detail for all work conducted in appropriate areas. • Wear high-visibility, reflective vest at all times. • Maintain minimum DOT defined distances to other traffic lanes. • See SOP HS-016.

Activity	Potential Hazard	Control Measures
Construction Site Entry	Struck-by, caught-in-between equipment, crushing, pinch points	• Wear hardhat; high visibility reflective safety vest; steel-toed, steel-shank boots or (electrical hazard) EH-rated safety boots with composite toe and shank; safety glasses; nitrile/neoprene gloves; and earplugs. • Identify yourself and your work location to heavy equipment operators, so they may incorporate you into their operations. • Coordinate hand signals with operators. • Stay Alert! Pay attention to equipment backup alarms and swing radii. • Wear a high-visibility, reflective vest when working near equipment or motor vehicle traffic. • Position yourself in a safe location when filling out logs talking with the contractor. • Notify the contractor immediately if any problems arise. • Do not stand or sit under suspended loads or near any pressurized equipment lines. • Do not operate cellular telephones in the vicinity of heavy equipment operation
Cutting Cores	Cuts/lacerations	• Use care when cutting cores. Use mechanical shears, electric knife or self-retracting safety blade when handling cores. • Eliminate hazard by having the drillers open the cores for you. • When using cutting tools, follow the safety precautions listed below: • Keep free hand out of the way. • Secure work if cutting through thick material. • Use only sharp blades; dull blades require more force that results in less knife control. • Pull the knife toward you; pulling motions are easier to manage. • Do not put the knife in your pocket. • Wear leather or Kevlar® gloves when using knives or blades, or when removing sharp objects caught or dangling in sampling gear.
Disinfecting Gear	Possible exposure to Sparquat®/Super HDQ Neutral	• Wear rubber gloves, and glasses to provide eye protection from splashing. Wash hands immediately after use.
Drilling Oversight/ Sampling	Contaminant Exposure, Noise, Contact with Utilities, Cuts/Scrapes, Heavy Lifting, Repetition, Slips/Trips/Falls	• Wear hardhat; high visibility reflective safety vest; steel-toed, steel-shank boots or composite toe and shank; safety glasses; Nitrile/neoprene gloves; and earplugs. • Confirm utility locate has been completed. • Confirm adequate clearance from overhead utilities. • Dispose of gloves after use and wash hands. • Take regular breaks and do not work in unusual positions for long periods of time. • Keep trafficked areas free from slip/trip/fall hazards.

Activity	Potential Hazard	Control Measures
Heavy Lifting	Back injury, knee injury	• Use proper lifting techniques. • Ask fellow worker for help. • Use a mechanical lifting device or a lifting aid where appropriate. • If you must lift, plan the lift before doing it. • Check your route for clearance. • Bend at the knees and use leg muscles when lifting. • Use the buddy system when lifting heavy or awkward objects. • Do not twist your body while lifting.
Heavy Equipment – Working Near	Struck-by, caught-in-between equipment, crushing, pinch points	• Wear hardhat; high visibility reflective safety vest; steel-toed, steel-shank boots or (electrical hazard) EH-rated safety boots with composite toe and shank; safety glasses; nitrile/neoprene gloves; and earplugs. • Identify yourself and your work location to heavy equipment operators, so they may incorporate you into their operations. • Coordinate hand signals with operators. • Stay Alert! Pay attention to equipment backup alarms and swing radii. • Wear a high-visibility, reflective vest when working near equipment or motor vehicle traffic. • Position yourself in a safe location when filling out logs talking with the contractor. • Notify the contractor immediately if any problems arise. • Do not stand or sit under suspended loads or near any pressurized equipment lines. • Do not operate cellular telephones in the vicinity of heavy equipment operation.
Groundwater Sampling	Contaminant Exposure, Heavy Lifting, Repetition, Slips/Trips/Falls	• Wear hardhat; high visibility reflective safety vest; steel-toed, steel-shank boots or composite toe and shank; safety glasses and Nitrile/neoprene gloves. • Dispose of gloves after use and wash hands. • Use proper lifting techniques. • Take regular breaks and do not work in unusual positions for long periods of time. • Keep trafficked areas free from slip/trip/fall hazards.
Soil Sampling/Soil Vapor Sampling	Contaminant Exposure, Cuts/Scrapes, Heavy Lifting, Repetition, Slips/Trips/Falls	• Wear hardhat; high visibility reflective safety vest; steel-toed, steel-shank boots or composite toe and shank; safety glasses; Nitrile/neoprene gloves; and earplugs as necessary. • Dispose of gloves after use and wash hands. • Wear work gloves over nitrile gloves. • Take regular breaks and do not work in unusual positions for long periods of time. • Keep trafficked areas free from slip/trip/fall hazards.

Activity	Potential Hazard	Control Measures
Drum Handling	Contaminant Contact *Wear proper PPE during sampling including nitrile gloves and safety glasses.* Cuts or Abrasions Heavy Lifting , Slips/Trips/Falls	• Wear proper PPE during sampling including nitrile gloves and safety glasses and face shield as appropriate. • Use proper dollies or drum moving tools. • Use applicable tools to open/close drum lids. • Do not handle drums with bulging sides. • Dispose of gloves after use and wash hands. • Wear work gloves over nitrile gloves. • Use proper lifting techniques. • Ask fellow worker(s) for help. • Keep trafficked areas free from slip/trip/fall hazards.
Waste Characterization	Contaminant Contact *Wear proper PPE during sampling including nitrile gloves and safety glasses.* Cuts or Abrasions, Slips/Trips/Falls	• Wear proper PPE during sampling including nitrile gloves and safety glasses. • Dispose of gloves after use and wash hands. • Wear work gloves over nitrile gloves. • Keep trafficked areas free from slip/trip/fall hazards.

Personal Protective Equipment (PPE) is the initial level of protection based on the activity hazards and Site conditions which have been identified. Upgrades to respiratory protection may be required based on the designated Action Levels found in Section 9. General on-site provisions will include: extra nitrile, leather, and/or Kevlar gloves, extra protective coveralls (e.g. Tyvek®) with boot covers, drinking water and electrolyte fluids, reflective vest, first aid kit, fire extinguisher, hearing protection, and washing facilities.

If Site conditions suggest the existence of a situation more hazardous than anticipated, the Site personnel will evacuate the immediate area. The hazard, the level of precautions, and the PPE will then be reevaluated with the assistance and approval of the CHSO (Robin DeHate) and the Project Manager (PM) Nick Recchia.

4.2.1 Handling Drums and Containers

Regulations for handling drums and containers are specified by Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120(j). Potential hazards associated with handling drums include vapor generation, fire, explosions, and possible physical injury. Handling of drums/containers during the Site investigation and remediation activities may be necessary. If drum/container handling is necessary, it will be performed in accordance with applicable regulations.

4.2.2 Electrical Hazards

4.2.2.1 Utilities

The Site may have shallow, buried utilities and also overhead utilities in certain areas. It will be necessary for parties disturbing the existing ground surface and conducting operations with heavy equipment having high clearances to exercise caution in performing project-related work with respect to the presence of utilities. Utility companies with active, buried lines in the Site area will be asked by the Contractor performing intrusive activities to mark their facilities. Employees will use these data to choose work locations.

4.2.2.2 Underground Utilities

No excavating, drilling, boring, or other intrusive activities will be performed until an underground utility survey, conducted by knowledgeable persons or agencies, has been made. This survey will identify underground and in-workplace utilities such as the following:

- Electrical lines and appliances;
- Telephone lines;
- Cable television lines;
- Gas lines;
- Pipelines;
- Steam lines;
- Water lines;
- Sewer lines; and/or
- Pressurized air lines.

The location of utilities will be discussed with GEI employees and subcontractors during a Site Safety Briefing. Identified utilities should be marked or access otherwise restricted to avoid chance of accidental contact.

Even when a utility search has been completed, drilling, boring, and excavation should commence with caution until advanced beyond the depth at which such utilities are usually located. Utilities will be considered “live” or active until reliable sources demonstrate otherwise.

4.2.2.3 Overhead Utilities

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

Overhead or above-ground electric lines should be considered active until a reliable source has documented them to be otherwise. Elevated work platforms, ladders, scaffolding, man-lifts, and drill or vehicle superstructures will be erected a minimum of 20 feet (the actual distance is dependent upon the voltage of the line) from overhead electrical lines until the line is de-energized, grounded, or shielded so arcing cannot occur between the work location or superstructure.

4.2.3 Heat Stress

Employees may be exposed to the hazards associated with heat stress when ambient temperatures exceed 70ºF. Employees should increase water intake while working in conditions of high heat. Enough water should be available so that each employee can consume 1 quart of water per hour. In addition, they should increase number of rest breaks and/or rotate employees in shorter work shifts. Employees should rest in cool, dry, shaded areas for at least 5 minutes. Employees should not wait until they feel sick to cool down. Watch for signs and symptoms of heat exhaustion and fatigue. In the event of heat stroke, bring the victim to a cool environment, call for help, and initiate first aid procedures

The procedures to be followed regarding avoiding heat stress are provided in **Appendix C** – Heat Stress Guidelines and in GEI's Heat Stress program.

4.2.4 Cold Stress

Employees may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia, as well as slippery surfaces, brittle equipment, and poor judgment. The procedures to be followed regarding avoiding cold stress are provided in **Appendix C** – Cold Stress Guidelines and in GEI's Cold Stress program.

4.2.5 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps, and generators. Employees who will perform suspected or established high noise tasks and operations for short durations (less than 1-hour) will wear hearing protection. If deemed necessary by the SSO, the CHSO will be consulted on the need for additional hearing protection and the need to monitor sound levels for Site activities. Other employees

who do not need to be in proximity of the noise should distance themselves from the equipment generating the noise.

4.2.6 Hand and Power Tools

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

4.2.7 Slips, Trips, and Falls

Working in and around the Site may pose slip, trip, and fall hazards due to slippery and uneven surfaces. Excavation at the Site may cause uneven footing in trenches and around the soil piles. Steep slope and uneven terrain conditions at the Site are also a primary concern. GEI employees will wear proper foot gear and will employ good work practice and housekeeping procedures to minimize the potential for slips, trips, and falls.

4.2.8 Manual Lifting

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

4.2.9 Projectile Objects and Overhead Dangers

Overhead dangers, including but not limited to falling debris and equipment, can occur while operating drill rigs. GEI employees will maintain a minimum distance from large overhead operations and to maintain proper communication with heavy equipment operators and their handlers, should work necessitate their presence beyond the minimum safety distance. Proper PPE will be worn during these types of activities including steel-toed/shank boots, safety vests, and hard hats.

4.2.10 Cuts and Lacerations

The core sampling program may require employees to use powered cutting tools (circular saw or shears) or a hooked knife to cut open the sample liner. Safety box cutters will be utilized for routine operations such as opening boxes of supplies or cutting rope or string. When using cutting tools, follow the safety precautions listed below:

- Keep free hand out of the way.
- Secure work if cutting through thick material.
- Use only sharp blades; dull blades require more force that results in less knife control.
- Pull the knife toward you; pulling motions are easier to manage.
- Do not put the knife in your pocket.
- Wear leather or Kevlar® gloves when using knives or blades, or when removing sharp objects caught or dangling in sampling gear.

4.3 Chemical Hazards

The characteristics of compounds at the Site are discussed below for information purposes. Adherence to the safety and health guidelines in this HASP should reduce the potential for exposure to the compounds discussed below.

4.3.1 Volatile Organic Compounds (VOCs)

Volatile organic chemicals (VOCs), such as trichloroethen (TCE) and perchloroethene (PCE) are present as soil and groundwater contaminants, and in some cases chemical components in non-aqueous phase liquids (NAPL) within soils. These compounds are at environmental concentrations and are not expected to be at concentrations that exposure symptoms would occur. These compounds generally have a depressant effect on the Central Nervous System (CNS), may cause chronic liver and kidney damage, and some are suspected human carcinogens. Benzene is a known human carcinogen. Acute exposure may include headache, dizziness, nausea, and skin and eye irritation. The primary route of exposure to VOCs is through inhalation and therefore respiratory protection is the primary control against exposure to VOCs.

4.3.2 SVOCs

Semi-volatile organic compounds (SVOCs) usually consist of a mixture of acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluorethene, benz(a)pyrene, benzo(e)pyrene, benzo(g,h,i)peryline, chrysene, dibenz(a,h)anthracene,

fluoranthene, fluorene, indeno(1,2,3cd)pyrene, 2-methyl naphthalene, naphththalene, phenanthrene, phenols, and pyrene.

These SVOCs may be present at the Site within impacted soil and groundwater. These compounds are at environmental concentrations and are not expected to be at concentrations that exposure symptoms would occur. SVOCs such as those listed above may cause contact dermatitis. Direct contact can be irritating to the skin and produce itching, burning, swelling, and redness. Direct contact or exposure to the vapors may be irritating to the eyes. Conjunctivitis may result from prolonged exposure. Many SVOCs are considered to be very toxic, if ingested. High levels of exposure to SVOCs, though not anticipated during work activities conducted during this project, may increase the risk of cancer including lung, kidney, and skin cancer. Naphthalene is also an eye and skin irritant and can cause nausea, headache, fever, anemia, liver damage, vomiting, convulsions, and coma. Poisoning may occur by ingestion of large doses, inhalation, or skin absorption.

The major route of entry for the work activities to be conducted at this Site is through direct contact. Exposure is most likely when handling soil and water samples. Inhalation may occur when the soil is disturbed causing respirable and nuisance dust particles to become airborne.

4.3.3 Heavy Metals

Exposure to high concentrations of arsenic can cause dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, and hyper pigmentation of skin. Chronic exposure to arsenic has resulted in lung cancer in humans.

Exposure to lead may cause acute symptoms such as eye irritation, weakness, weight loss, abdominal pain, and anemia. Chronic exposure to lead may result in kidney disease, effects to the reproductive system, blood forming organs, and CNS.

Lead and arsenic are regulated by specific OSHA standards. They are 29 CFR 1910.1025/1926.52 and 29 CFR 1910.1018/1926.1118, respectively. These standards include specific requirements for air monitoring, signs and labels, training and medical surveillance.

Exposure to high concentrations of selenium can cause mucous membrane irritation, coughing, sneezing, shortness of breath, chills, headaches, hypotension, and CNS depression. Chronic exposure to selenium could cause bronchial irritation, gastrointestinal distress, excessive fatigue, and skin discoloration.

Exposure to mercury can cause dizziness, salivation nausea, vomiting, diarrhea, constipation, emotional disturbance, and kidney injury. Chronic exposure to mercury can cause CNS damage.

These metals are at environmental concentrations and are not expected to be at concentrations that exposure symptoms would occur. As with SVOCs, the primary route of exposure is through inhalation of dust particles when soil is disturbed.

4.3.4 Evaluation of Organic Vapor Exposure

Air monitoring reduces the risk of overexposure by indicating when action levels have been exceeded and when PPE must be upgraded or changed. Action Levels for VOCs and associated contingency plans for the work zone are discussed within Section 9 of this HASP.

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

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

4.3.5 Evaluation of Skin Contact and Absorption

Skin contact by contaminants may be controlled by use of proper hygiene practices, PPE, and good housekeeping procedures. The proper PPE (e.g., Tyvek®, gloves, safety glasses) as described in Section 5 will be worn for activities where contact with potential contaminated media or materials are expected.

SDSs for decontamination chemicals and laboratory reagents that may be used on Site are included in **Appendix B**. Specific chemical hazards information from the occupational health sources are summarized in Table 3.

Table 3. Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
PCE	127-18-4	25 ppm	100 ppm TWA 200 ppm C 300 ppm (5 minutes in any 3 hours)	Inhalation, Ingestion, Skin Contact	Irritation, nausea, vomiting, chest pain, difficulty breathing, headache, drowsiness, dizziness, disorientation, loss of coordination, blurred vision, loss of appetite, stomach pain, pain in extremities	Eyes, skin, respiratory system, liver, CNS	A colorless, sweet smelling volatile liquid. FP: NA IP: 9.32 eV LEL: NA UEL: NA VP: 14 mmHg
TCE	79-01-6	200 ppm	100 ppm TWA 200 ppm C 300 ppm (5 minutes in any 3 hours)	Inhalation, Ingestion, Skin Contact	Irritation to eyes, skin, dizziness, fatigue, blurred vision, tremors, nausea, vomiting, drowsiness, headache	Kidneys, CNS, liver, heart, upper respiratory	Colorless liquid with chloroform odor FP: NA IP: 9.45 eV LEL: 8% UEL: 10.5% VP: 58 mmHg
Benzene	71-43-2	0.5 ppm (Skin)	1 ppm TWA 5 ppm STEL	Inhalation Skin Absorption Ingestion Skin Contact	Irritation of eyes, skin, nose, respiratory system, giddiness, headache, nausea; staggering gait, fatigue, anorexia, weakness, dermatitis, bone marrow depression, potential carcinogen	Eyes, skin, CNS, bone marrow, blood	FP: 12º F IP: 9.24 eve LEL: 1.2% UEL:7.8% VP: 75 mm
Portland Cement	65997-15-1	10 µg/m^3 (total) TWA 5 µg/m^3 (resp)	TWA 50 mppcf	Inhalation, Ingestion, Skin and/or Eye Contact	Irritation eyes, skin, nose; cough, expectoration; exertional dyspnea (breathing difficulty), wheezing, chronic bronchitis; dermatitis	Eyes, skin, respiratory system	Gray, odorless powder FP: NA IP: NA LEL: NA UEL: NA VP: 0 mmHg
Vinyl Chloride	75-01-4		TWA 1 ppm C 5 ppm (15 min)	Inhalation, Skin and/or Eye Contact (liquid)	Weakness, exhaustion, abdominal pain, pallor of extremities	Liver, CNS, blood, respiratory, lymphatic	Colorless gas or liquid (below 7 degrees F) with a pleasant odor at high conc. FP: NA IP: 9.99 eve LEL: 3.6% UEL:33.0% VP: 3.3 mm
Chlorobenzene	108-90-7		TWA 75 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; drowsiness, incoordination, CNS depression,	Eyes, skin, respiratory system, CNS, liver	Colorless liquid with almond-like odor. FP: 82º F IP: 9.07 eve LEL: 1.3% UEL:9.6% VP: 9 mm

Table 3. Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data

Abbreviations:

°F = degrees Fahrenheit
ACGIH = American Conference of Industrial Hygienists
A.L. = Action Level
atm = atmosphere
C = ceiling limit, not to be exceeded
CAS # = chemical abstract services number
CNS = Central Nervous System
CTPV = Coal Tar Pitch Volatiles
CVS = Cardiovascular System
eV = electron volt
f/cc = fibers per cubic centimeter
FP = Flash point
GI = Gastro-intestinal
H2S = Hydrogen Sulfide
HCN = Hydrogen Cyanide
hr = hour
IP = Ionization Potential
LEL = Lower explosive limit
mg/m^3 = micrograms per cubic meter
min = minute
mm = millimeter
mmHg = millimeters of mercury
N/A = not applicable
OSHA = Occupational Safety and Health Administration
PAH = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Biphenyls
PEL = Permissible exposure limit
ppm = parts per million
Skin = significant route of exposure
STEL = Short-term exposure limit (15 minutes)
TWA = Time-weighted average (8 hours)
VP = vapor pressure approximately 68°F in mm Hg

4.4 Biological Hazards

4.4.1 Mosquito- Borne Disease – West Nile Virus

West Nile encephalitis is an infection of the brain caused by the West Nile virus, which is transmitted by infected mosquitoes. Following transmission from an infected mosquito, West Nile virus multiplies in the person's blood system and crosses the blood-brain barrier to reach the brain. The virus interferes with normal CNS functioning and causes inflammation of the brain tissue. However, most infections are mild and symptoms include fever, headache, and body aches. More severe infections may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and rarely, death. Persons over the age of 50 have the highest risk of severe disease.

Prevention centers on public health action to control mosquitoes and on individual action to avoid mosquito bites. To avoid being bitten by the mosquitoes that cause the disease, use the following control measures:

If possible, stay inside between dusk and dark. This is when mosquitoes are most active. When outside (between dusk and dark), wear long pants and long-sleeved shirts. Spray exposed skin with an insect repellent, preferably containing DEET.

4.4.2 Wasps and Bees

Wasps (hornets and yellow-jackets) and bees (honeybees and bumblebees) are common insects that may pose a potential hazard to the field team if work is performed during spring, summer, or fall. Bees normally build their nests in the soil. However, they use other natural holes such as abandoned rodent nests or tree hollows. Wasps make a football-shaped, paper-like nest either below or above the ground. Yellow-jackets tend to build their nests in the ground but hornets tend to build their nests in trees and shrubbery. Bees are generally more mild-mannered than wasps and are less likely to sting. Bees can only sting once while wasps sting multiple times because their stinger is barbless. Wasps sting when they feel threatened. By remaining calm and not annoying wasps by swatting, you lessen the chance of being stung.

Wasps and bees inject a venomous fluid under the skin when they sting. The venom causes a painful swelling that may last for several days. If the stinger is still present, carefully remove it with tweezers. Some people may develop an allergic reaction (i.e. anaphylactic shock) to a wasp or bee sting. If such a reaction develops, seek medical attention at once. If a GEI employee is allergic to bees or wasps notify the SSO and if, needed, the location of the epi pen.

4.4.3 Sun Exposure

Employees are encouraged to liberally apply sunscreen, with a minimum sun protection factor (SPF) of 15, when working outdoors to avoid sunburn and potential skin cancer, which is associated with excessive sun exposure to unprotected skin. Additionally, employees should wear safety glasses that offer protection from ultraviolet A and B (UVA/UVB) rays.

5. Personal Protective Equipment

The PPE specified in Table 4 represents PPE selection required by 29 CFR 1910.132, and is based on the Activity Hazard Analysis of Section 4 (Table 2). Specific information on the selection rationale activity can be found in the GEI Health and Safety Manual.

The PPE program addresses elements, such as PPE selection based on Site hazards, use and limitations, donning and doffing procedures, maintenance and storage, decontamination and disposal, training and proper fitting, inspection procedures prior to / during / and after use, evaluation of the effectiveness of the PPE program, and limitations during temperature extremes, heat stress, and other appropriate medical considerations. A summary of PPE for each level of protection is in Table 4.

Table 4. Site-Specific PPE

Task	PPE Level	Site-Specific Requirements	Respirator
Mobilization/Demobilization			
Reconnaissance	D	Hard hat, safety glasses, steel toe/shank safety boot, reflective vest, leather work gloves, hearing protection as needed	D – None
Mobilization/Demobilization of Equipment and Supplies	D	Hard hat, safety glasses, steel toe/shank safety boot, reflective vest, leather work gloves, hearing protection as needed	D – None
Establishment of Site Security, Work Zones, and Staging Area	D	Hard hat, safety glasses, steel toe/shank safety boot, reflective vest, leather work gloves, hearing protection as needed	D – None
Construction			
Drilling, Groundwater Well Installation, Sampling	D	Hard hat, safety glasses, steel toe/shank safety boot with overboot as needed, reflective vest, leather work gloves as needed, nitrile gloves, hearing protection as needed, Tyvek as needed	Level D initially, Level C-If action levels exceeded (see Section 9 of HASP)

Use of Level A or Level B PPE is not anticipated. If conditions indicating the need for Level A or Level B PPE are encountered, personnel will leave the Site and this HASP will be revised with oversight of the CHSO or GEI personnel will not re-enter the Site until conditions allow.

For most work conducted at the site, Level D PPE will include long pants, hard hats, safety glasses with side shields, and steel toe/shank or EH-rated safety boots. When work is conducted in areas where non-aqueous phase liquid (NAPL) anticipated, employees will

wear, at a minimum, modified Level D PPE, which can include Tyvek® coveralls and safety boots with overboots.

5.1 OSHA Requirements for PPE

Personal protective equipment used during the course of this field investigation must meet the following OSHA standards:

Table 5. OSHA Standards for PPE

Type of Protection	Regulation	Source
Eye and Face	29 CFR 1910.133	ANSI Z87.1 1968
Respiratory	29 CFR 1910.134	ANSI Z88.1 1980
Head	29 CFR 1910.135	ANSI Z89.1 1969
Foot	29 CFR 1910.136	ANSI Z41.1 1999 or ASTM F-2412-2005, and ASTM F-2413-2005

CRF = Code of Federal Regulations
ANSI = American National Standards Institute
ASTM = American Society For Testing and Materials

On-site GEI personnel who have the potential to don a respirator must have a valid fit test certification and documentation of medical clearance. The CHSO will maintain such information on file for on-site personnel. The PM will obtain such information from the subcontractor's site supervisor prior to the initiation of such work. Both the respirator and cartridges specified for use in Level C protection must be fit-tested prior to use in accordance with OSHA regulations (29 CFR 1910.134). Air purifying respirators cannot be worn under the following conditions:

- Oxygen deficiency (less than 20.7%).
- Imminent Danger to Life and Health (IDLH) concentrations.
- If contaminant levels exceed designated use concentrations.

6. Key Project Personnel/Responsibilities and Lines of Authority

6.1 GEI Personnel

- Chris Morris — GEI Project Manager
- Mike Quinlan — GEI Site Safety Officer/Field Personnel
- Erik Curran — Field Personnel
- Chis Anastasiou — Field Personnel
- Robin B. DeHate — GEI Corporate Health and Safety Officer
- Steve Hawkins — Regional Health and Safety Officer

The implementation of health and safety at this project location will be the shared responsibility of the PM, the CHSO, the SSO, other GEI personnel implementing the proposed scope of work.

6.1.1 GEI Project Manager

The PM, Chris Morris, is responsible for confirming that the requirements of this HASP are implemented. Some of the PM's specific responsibilities include:

- Conducting and documenting the Project Safety Briefing for GEI project employees and forwarding the signed form (**Appendix D**) to the Health and Safety Committee;
- Verifying that the GEI staff selected to work on this program are sufficiently trained for Site activities;
- Assuring that personnel to whom this HASP applies, including subcontractor personnel, have received a copy of it;
- Providing the CHSO with updated information regarding conditions at the Site and the scope of Site work;
- Providing adequate authority and resources to the on-site SSO to allow for the successful implementation of necessary safety procedures;
- Supporting the decisions made by the SSO and CHSO;
- Maintaining regular communications with the SSO and, if necessary, the CHSO;
- Verifying that the subcontractors selected by GEI to work on this program have completed GEI environmental, health and safety requirements and has been deemed acceptable for the proposed scope of work; and

- Coordinating the activities of GEI subcontractors and confirming that they are aware of the pertinent health and safety requirements for this project.

6.1.2 GEI Corporate Health and Safety Officer

The CHSO, Robin DeHate, is the individual responsible for the review, interpretation, and modification of this HASP. Modifications to this HASP which may result in less stringent precautions cannot be undertaken by the PM or the SSO without the approval of the CHSO. Specific duties of the CHSO include:

- Writing, approving, and amending the HASP for this project;
- Advising the PM and SSO on matters relating to health and safety on this Site;
- Recommending appropriate PPE and safety equipment to protect personnel from potential Site hazards;
- Conducting accident investigations; and
- Maintaining regular contact with the PM and SSO to evaluate Site conditions and new information which might require modifications to the HASP.

6.1.3 GEI Site Safety Officer

GEI field staff are responsible for implementing the safety requirements specified in this HASP. However, one person will serve as the SSO. For this program, Mike Quinlan, will serve as the SSO. The SSO will be on-site during all activities covered by this HASP. The SSO is responsible for enforcing the requirements of this HASP once work begins. The SSO has the authority to immediately correct situations where noncompliance with this HASP is noted and to immediately stop work in cases where an immediate danger is perceived. Some of the SSO's specific responsibilities include:

- Conducting/attending the Project Safety Briefing prior to beginning work, and subsequent safety meetings as necessary;
- Conduct daily Safety Tailgate meeting in accordance with Click here to enter text. requirements (can be combined with "pre-entry") briefing for Site-related work;
- Verifying that personnel to whom this HASP applies have attended and participated in the Project Safety Briefing and subsequent safety meetings that are conducted during the implementation of the program;
- Maintaining a high level of health and safety consciousness among employees implementing the proposed activities;
- Procuring the air monitoring instrumentation required and performing air monitoring for investigative activities;

- Procuring and distributing the PPE and safety equipment needed for this project for GEI employees;
- Verifying that PPE and health and safety equipment used by GEI is in good working order;
- Verifying that the selected contractors are prepared with the correct PPE and safety equipment and supplies;
- Notifying the PM of noncompliance situations and stopping work in the event that an immediate danger situation is perceived;
- Monitoring and controlling the safety performance of personnel within the established restricted areas to confirm that required safety and health procedures are being followed;
- Stopping work in the event that an immediate danger situation is perceived; and
- Reporting accident/incident and preparing accident/incident reports, if necessary.

6.1.4 GEI Field Personnel

GEI field personnel covered by this HASP are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading and signing the HASP in its entirety prior to the start of on-site work;
- Attending and actively participating in the required Project Safety Briefing prior to beginning on-site work and any subsequent safety meetings that are conducted during the implementation of the program;
- Stopping work in the event that an immediate danger situation is perceived;
- Bringing forth any questions or concerns regarding the content of the HASP to the PM or the SSO, prior to the start of work;
- Reporting accidents, injuries, and illnesses, regardless of their severity, to the SSO, CHSO, and HR; and
- Complying with the requirements of this HASP and the requests of the SSO.

6.1.5 Lines of Authority will be as follows:

On Site – GEI will have responsibility for safety of its employees during the work performed at the Site. GEI's field representative will have a cell phone available to contact the appropriate local authorities, in the event of an emergency. GEI's field representative will be available for communication with the GEI PM and with the TD Bank representative.

GEI employees have the authority to stop work activities if an unanticipated hazard is encountered or a potential unsafe condition is observed. The GEI employee should contact the Corporate Health and Safety Officer and the Project Manager to discuss the stop work conditions and potential control methods that can be implemented.

6.2 Subcontractors

GEI has subcontracted the following firms to assist in performing work on this project:

Zebra Technical Services	30 North Prospect Ave., Lynbrook, NY 11563 (516) 596-6300
Delta Geophysics Inc.	738 Front Street, Catasauqua, PA 18032 (610) 231-3701

GEI requires its subcontractors to work in a responsible and safe manner. Subcontractors for this project will be required to develop their own HASP for protection of their employees, but, at a minimum, must adhere to applicable requirements set forth in this HASP.

7. Training Program

7.1 HAZWOPER Training

In accordance with OSHA Standard 29 CFR 1910.120 "Hazardous Waste Operations and Emergency Response" (HAZWOPER) responders will, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations. At a minimum, the training will have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training will not be allowed to work in any Site activities in which they may be exposed to hazards (chemical or physical). Proof of training will be submitted to the PM or his/her representative prior to the start of field activities.

7.2 Annual 8-Hour Refresher Training

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

7.3 Supervisor Training

Personnel acting in a supervisory capacity will have received 8 hours of instruction in addition to the initial 40-hour training. In addition supervisors will have 1 year of field experience and training specific to work activities (i.e., sampling, construction observation, etc.)

7.4 Site-Specific Training

Prior to commencement of field activities, the PM or the SSO will verify GEI field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the Site operations. It will include Site and facility layout, hazards, and emergency services at the Site, and will highlight the provisions contained within this HASP and applicable GEI H&S SOPs (**Appendix E**). This training will be documented on the Project Safety Briefing Form **Appendix D**). The signed form will be forwarded to the Health and Safety Committee at HealthandSafety@geiconsultants.com. In addition, GEI personnel will sign the plan to document that they understand the hazards and control measures presented and agree to comply with the procedures established in the HASP. Personnel that have not received project-specific training will not be allowed on-site.

7.5 On-Site Safety Briefings

Other GEI personnel will be given health and safety briefings daily by the SSO or field representative to assist GEI personnel in safely conducting work activities. The briefing will include GEI subcontractors. The briefings can include information on new operations to be conducted, changes in work practices, or changes in the Site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. Documentation of these briefings will be recorded in the GEI field book, if the project duration is less than 5 days. If the project is longer than 5 days, the Tailgate Safety Briefing Form (**Appendix D**) will be used to document briefings. The meetings will also be an opportunity to periodically update the employees on monitoring results.

7.6 First Aid and CPR

The PM will verify that GEI field staff has current certifications in first aid and Cardiopulmonary Resuscitation (CPR), so that emergency medical treatment is available during field activities. The training will be consistent with the requirements of the American Red Cross Association. GEI employees also attend annual Bloodborne Pathogens training in compliance with OSHA regulations.

8. Medical Surveillance Program

GEI maintains a continuous, corporate, medical surveillance program that includes a plan designed specifically for field personnel engaged in work at sites where hazardous or toxic materials may be present. Robin DeHate is GEI's CHSO and is responsible for the administration and coordination of medical evaluations conducted for GEI's employees at branch office locations. Comprehensive examinations are given to GEI field personnel on an annual or biennial basis (as determined to be appropriate by the CHSO) participating in hazardous waste operations. The medical results of the examinations aid in determining the overall fitness of employees participating in field activities.

Under the CHSO's supervision, field personnel undergo a complete initial physical examination, including a detailed medical and occupational history, before they participate in hazardous waste site investigations. Extensive annual/biennial reexaminations are also performed. Upon completion of these tests, personnel are certified by an occupational health physician as to whether they are fit for field work in general, and fit to use respiratory protection.

If a GEI employee or other project worker shows symptoms of exposure to a hazardous substance and wishes to be rechecked, he/she will be directed to the nearest area hospital or medical facility.

GEI subcontractor personnel that will enter any active waste handling or other active non-"clean" area must certify that they are participating in a medical surveillance program that complies with OSHA regulations for hazardous waste operations (i.e., 29 CFR 1910.120 and 29 CFR 1926.65). Proof of medical clearance will be submitted to the GEI PM or SSO prior to the start of field activities.

9. Site Control Measures

9.1 Buddy System

GEI personnel should be in line-of-site or communication contact with another on-site person. The other on-site person should be aware of his or her role as a "buddy" and be able to provide assistance in the event of an emergency. A copy of this plan will be given to any person acting as a GEI "buddy" for informational purposes.

9.2 Sanitation for Temporary Work Sites

Temporary sanitary facilities including toilets will be available on-site.

9.3 Illumination

Illumination requirements identified by OSHA are directed to work efforts inside buildings and/or during non-daylight hours. Activities planned for the Site are anticipated to occur outside during daylight hours. However, if yard areas are used after dark, they will be equipped with illumination that meets or exceeds requirements specified in OSHA Standard 29 CFR 1926.56 "Illumination." Employees will not work on sites that are not properly lighted.

10. Accident Reporting

GEI will report incidents involving GEI personnel or subcontractor personnel, such as: lost time injuries, injuries requiring medical attention, near miss incidents, fires, fatalities, accidents involving the public, chemical spills and property damage. The report will be made to the PM verbally within 2 hours of the incident. The PM will immediately inform the CHSO and Human Resources of the incident. For incidents involving GEI personnel an Accident Report Form will be completed and submitted to the CHSO and Human Resources within 24 hours of the incident. The Accident/Incident Report Form and the Near Miss Reporting Form can be found in **Appendix D**, on the GEI Health and Safety smartphone app, or on the Health and Safety page of the GEI Intranet. To report subcontractor injuries or incidents, follow the same verbal reporting procedures and submit an email describing the event to the PM and H&S Committee.

10.1 Injury Triage Service

If a GEI employee experiences a work related injury that is not life-threatening, the employee will initiate a call to Medcor Triage at 1-800-775-5866. The injured employee will detail any medical symptoms or complaints which will be evaluated by a Registered Nurse (RN) specially trained to perform telephonic triage. The RN will recommend first aid self-treatment or refer the injured employee for an off-site medical evaluation by a health professional at a clinic within GEI's workers compensation provider network. GEI employees are still required to follow our Accident Reporting procedures as listed above.

11. Decontamination Procedures

11.1 Decontamination Equipment Requirements

The following equipment, if required, should be in sufficient supply to implement decontamination procedures for GEI's equipment.

- Buckets
- Alconox™ detergent concentrate
- Hand pump sprayers
- Long handled soft bristle brushes
- Large sponges
- Cleaning wipes for respirators
- Bench or stool(s)
- Methanol and/or Nitric Acid
- Liquid detergent and paper towels
- Plastic trash bags

The Contractor performing decontamination procedures is responsible for verifying that the above materials, as required for their operation, are in sufficient supply.

12. Supplemental Contingency Plan Procedures

12.1 Hazard Communication Plan

GEI personnel have received hazard communication training as part of their annual health and safety training and new employee health and safety orientation training. Hazardous materials used on the Site will be properly labeled, stored, and handled. SDS will be available to potentially exposed employees.

12.2 Fire

In the event of a fire personnel will evacuate the area. GEI's field representative will contact the local fire department with jurisdiction and report the fire. Notification of evacuation will be made to the PM and the CHSO. The field representative will account for GEI personnel and subcontractor personnel and report their status to the PM.

12.3 Medical Support

In case of minor injuries, on-site care will be administered with the Site first aid kit. For serious injuries, call 911 and request emergency medical assistance. Seriously injured persons should not be moved, unless they are in immediate danger. Notify the PM and the CHSO of the emergency.

Section 1 and Table 1 of this HASP contain detailed emergency information, including directions to the nearest hospital, and a list of emergency services and their telephone numbers. In addition, **Appendix A** includes maps to the hospital and/or occupational health clinic. GEI field personnel will carry a cellular telephone.

12.4 Severe Weather

The contingency plan for severe weather includes reviewing the expected weather to determine if severe weather is in the forecast. Severe weather includes high winds over 30 miles per hour (mph), heavy rains or snow squalls, thunderstorms, tornados, and lightning storms. If severe weather is approaching, the decision to evacuate GEI personnel and subcontractor personnel from the Site will be the responsibility of GEI's field representative. Notification of evacuation will be made to the PM and the CHSO. The field representative will account for GEI personnel and subcontractor personnel and report their status to the PM. If safe, work can resume 30 minutes after the last clap of thunder or flash of lightening.

12.5 Spills or Material Release

If a hazardous waste spill or material release occurs, if safe, the SSO or their representative will immediately assess the magnitude and potential seriousness of the spill or release based on the following:

- SDS for the material spilled or released;
- Source of the release or spillage of hazardous material;
- An estimate of the quantity released and the rate at which it is being released;
- The direction in which the spill or air release is moving;
- Personnel who may be or may have been in contact with the material, or air release, and possible injury or sickness as a result;
- Potential for fire and/or explosion resulting from the situation; and
- Estimates of area under influence of release.

If the spill or release is determined to be within the on-site emergency response capabilities, the SSO will verify implementation of the necessary remedial action. If the release is beyond the capabilities of the Site personnel, personnel will be evacuated from the immediate area and the local fire department will be contacted. The SSO will notify the PM and the CHSO.

12.6 Alcohol and Drug Abuse Prevention

Alcohol and drugs will not be allowed on the work Site. Project personnel under the influence of alcohol or drugs will not be allowed to enter the Site.

13. Health and Safety Plan Sign-Off

GEI personnel conducting site activities will be familiar with the information in this HASP. After reviewing this plan, please sign the copy in the project files, and bring a copy of the plan with you to the Site.

Site Name: BCA & Associates, LLC – 482-486 Sunrise Highway

Investigation: Properly characterize the site for potential environmental impacts from historic onsite dry-cleaning operations

GEI Project No: 1500620

Print Name	Signature
Project Manager: Chris Morris	

Appendix A

Map to Hospital and Occupational Health Clinic

mapquest

Notes

DIRECTIONS FROM JOB SITE TO SOUTH NASSAU COMMUNITIES HOSPITAL

Trip to:

[2300 - 2368] Healthy Way
Oceanside, NY 11572-1503
1.31 miles / 3 minutes

Merrick Rd, Rockville Centre, NY
1157040.657592, -73.653931
(Address is approximate)

Download Free App

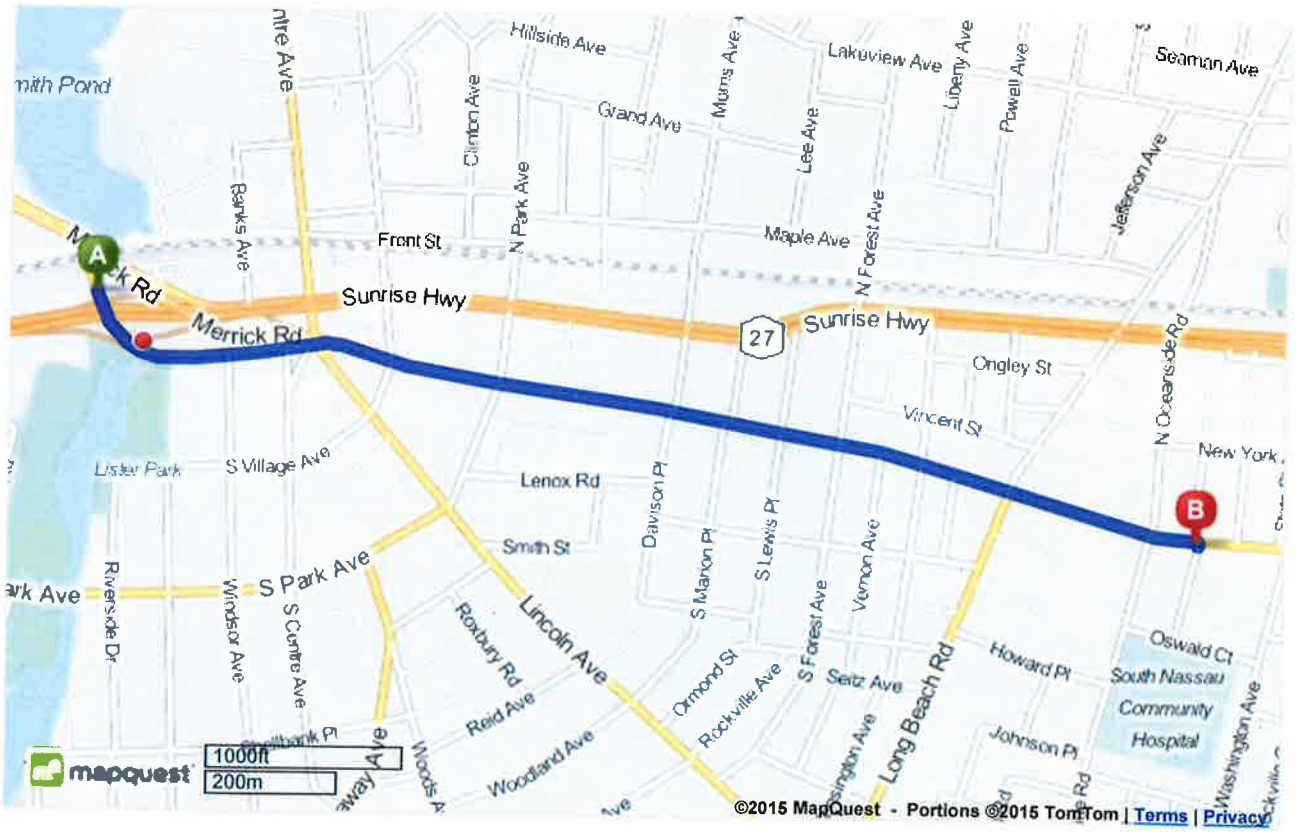
1. Start out going **southeast** on **Merrick Rd** toward **Windsor Ave**. Map — **1.3 Mi** / *1.3 Mi Total*

2. Turn **right** onto **One Healthy Way**. Map — **0.01 Mi** / *1.3 Mi Total*
One Healthy Way is just past Cumberland St
If you reach Chestnut St you've gone a little too far

3. **[2300 - 2368] HEALTHY WAY**. Map
If you reach Oswald Ct you've gone about 0.1 miles too far

[2300 - 2368] Healthy Way, Oceanside, NY 11572-1503

Total Travel Estimate: **1.31 miles - about 3 minutes**



JOB SITE TO NASSAU SOUTH
WALK-IN MEDICAL CARE

Google

Directions from **486 W Sunrise Hwy** to **2710 Long Beach Rd**

486 W Sunrise Hwy
Rockville Centre, NY 11570

1. Head **east** on **NY-27 E** toward **Montauk Ave**

0.2 mi

2. Take the 2nd **right** onto **N Long Beach Rd**

   Destination will be on the right

0.9 mi

2710 Long Beach Rd
Oceanside, NY 11572

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

Appendix B

Safety Data Sheets

MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

ALCONOX

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**ALCONOX®**
CHEMICAL FAMILY NAME:	Detergent.
PRODUCT USE:	Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	Alconox, Inc.
ADDRESS:	30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE:	**TOLL-FREE in USA/Canada** 800-255-3924
	International calls 813-248-0585
BUSINESS PHONE:	914-948-4040
DATE OF PREPARATION:	May 2011
DATE OF LAST REVISION:	February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS

EUROPEAN and (GHS) Hazard Symbols

Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 207-638-8 Index# 011-005-00-2
EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):
Eye Irritant Category 2A

Hazard Statement(s):
H319: Causes serious eye irritation

Precautionary Statement(s):
P260: Do not breath dust/fume/gas/mist/vapors/spray
P264: Wash hands thoroughly after handling
P271: Use only in well ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):
[Xi] Irritant

Risk Phrases:
R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:
S8: Keep container dry
S22: Do not breath dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000.*

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

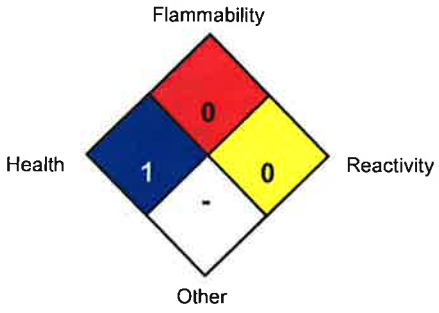
SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable and has no known explosion hazards.
Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m³	5 mg/m³	5 mg/m³
Sodium Carbonate	497-19-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 – 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable
DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.
SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No Data available at this time.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
PACKING GROUP: Not Applicable.
DOT LABEL(S) REQUIRED: Not Applicable
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

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MATERIAL SAFETY DATA SHEET

ALCONOX®

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.

Appendix C

Heat Stress and Cold Stress Guidelines

Heat Stress Guidelines

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

Footnotes:

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

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

3.) Method to Achieve Acclimatization - Moderate work or exercise in hot temperatures during early part of heat season. Adequate salt (mineral) and water intake. Gradually increasing work time in hot temperatures. Avoid alcohol. Normally takes 8 to 14 days to achieve acclimatization. Lost rapidly, if removed from strenuous work (or exercise) in hot temperature for more than approximately 5 days.

Cold Stress Guidelines

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

Appendix D

Forms

Accident/Incident Reporting Form
Near Miss Reporting Form
Tailgate Safety Briefing Form

GEI Consultants

Accident/Incident Report Form

Please complete this form and send it to your Branch Manager, HR and CHSO ***within 24 hours*** of the incident.

SECTION A — ACCIDENT/INCIDENT DETAILS

EMPLOYEE INFORMATION:

Name: _____

Home Address: _____
Street Address City State Zip Code

Contact Information: ( ) _____ ( ) _____
Primary Secondary

Date of Birth: _____

Date of Hire: _____

Branch: _____

Supervisor: _____

OTHER INJURED (IF APPLICABLE):

Name: _____

Home Address: _____
Street Address City State Zip Code

Contact Information: ( ) _____ ( ) _____
Primary Secondary

Date of Birth: _____

Date of Hire: _____

Branch: _____

Supervisor: _____

Date and Time Accident/Incident	Date and Time Reported
____ /____ /____ Month Day Year	____ /____ /____ Month Day Year
____ A.M. ____ P.M.	____ A.M. ____ P.M.

LOCATION OF INCIDENT/ACCIDENT

Project Name: _____

Client and Location: _____

or _____

Office Location: _____

INCIDENT TYPE: (Check All That Applies)

- ☐ **Personal Injury/Illness**
- ☐ **Vehicle Accident**
- ☐ **Property Damage**
- ☐ **Environmental Spill**
- ☐ **Other**

WITNESS INFORMATION

Name: _____

Contact Number: _____

Company: _____

WHAT HAPPENED TO THE INJURED PARTY: ☐ First Aid Administered ☐ Refused Treatment/Transport ☐ Transported to Hospital ☐ Returned to Work ☐ Went Home ☐ Went to Physician ☐ Unknown

Clinic/Hospital or Treating Physician: _____ Phone: _____
Name Street Address City State Zip Code

SECTION B — PERSONAL INJURY

Cause of Injury: _____

Part of Body Injured: _____ Multiple Injuries: ☐ Y ☐ N

Was PPE worn when injured? : ☐ Y ☐ N What PPE was worn? _____

WAS INJURY A RESULT OF THE USE A MOTOR VEHICLE: ☐ **YES** ☐ **NO** **(If yes, complete Section C)**

GEI Consultants

Accident/Incident Report Form

Please complete this form and send it to your Branch Manager, HR and CHSO ***within 24 hours*** of the incident.

SECTION C — AUTO ACCIDENT ONLY

DRIVER/VEHICLE INFORMATION

Name of Insured: _____

Department: _____

Driver's License Number: _____

DOB: ____/____/____ State: _____

Description of Vehicle: License Plate Number: _____

Make: _____ Model: _____ Year:_____ Color:_____

Owner: _____

Name of Other Driver: _____

Driver's License Number: _____

State: _____

Description of Vehicle: License Plate Number: _____

Make: _____ Model:_____ Year:_____ Color:_____

Insurance Carrier: _____

Policy Number: _____Ph. Number:_____

SECTION D — PROPERTY DAMAGE OR CHEMICAL RELEASE ONLY

Type of Damage(s): _____

Cause of Damage(s): _____

Type of Chemical Released (if known): _____

Quantity of Chemical Released: _____

Spill Measures Employed: _____

SECTION E — NATURE OF ACCIDENT/INCIDENT AND EXTENT OF INJURIES/DAMAGES

(Please give a detailed description of what happened. Attach a sketch or picture if applicable)

_____

_____

_____

_____

_____

_____

_____

_____

_____

I hereby certify that the above information is true and correct to my understanding of this accident/incident.

_____ _____

Employee/Preparer's Name **Date and Time**

NEAR MISS REPORT

A near miss is a potential hazard or incident that has not resulted in any personal injury. Unsafe working conditions, unsafe employee work habits, improper use of equipment, or use of malfunctioning equipment have the potential to cause work related injuries. It is everyone's responsibility to report and/or correct these potential accidents/incidents immediately. Please complete this form as a means to report these near-miss situations. Send a copy of the completed form to the Project Manager, Regional Health and Safety Officer and the Corporate Health and Safety Officer.

Location: _____ Site Name: _____

Date: _____ Time: _____ ☐ a.m. ☐ p.m.

Weather conditions, site operations taking place during near miss. _____

Please check all appropriate conditions:

☐ Unsafe Act ☐ Unsafe equipment

☐ Unsafe Condition ☐ Unsafe use of equipment

Description of incident or potential hazard: _____

Employees or sub-contractors involved if applicable._____

Employee Signature _____ Date _____

Print Name _____

NEAR MISS INVESTGATION

Description of the near-miss condition: _____
Causes (primary & contributing) _____
Corrective action taken (Remove the hazard, replace, repair, or retrain in the proper procedures for the task) _____
Actions not yet taken_____

Signed: _____ Date Completed: _____

Print Name
Not completed for the following reason: _____Date:_____

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Daily Safety Briefing and Site Visitor Sign-In

Project Number:	**Project Name:**
[1]Date:	**Time:**
Briefing Conducted by:	**Signature:**

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

TOPICS COVERED (check all those covered):

☐ Accident Reporting Procedures	☐ General PPE Usage	☐ Site Control	☐ Other:
☐ Cellular Phone Charged w/Service	☐ Heat Stress	☐ Site Emergency Procedures	☐ Other:
☐ Changes to the HASP	☐ Hearing Conservation	☐ Slips, Trips, Falls	☐ Other:
☐ Cold Stress	☐ Lockout/Tagout	☐ Traffic Safety	☐ Other:
☐ Confined Space	☐ Personal Hygiene	☐ Other:	☐ Other:
☐ Decon Procedures	☐ Respiratory Protection	☐ Other:	☐ Other:
☐ Exposure Guidelines	☐ Review of Hazards	☐ Other:	☐ Other:

Daily Safety Topic Description:

Personnel Sign-in List

Printed Name	Signature	Company Name	Time-In	Time-Out

[1] This form is applicable for *only* 1 day of site activity.

Appendix E

GEI's Health and Safety SOPs

HS-001 Biological Hazards
HS-002 Bloodborne Pathogens
HS-003 Container Management
HS-004 Driver Safety
HS-007 General Safety Requirements
HS-008 Hand and Power Tools
HS-009 Hazard Identification
HS-010 Inclement Weather
HS-012 Noise Exposure
HS-014 Utility Markout
HS-016 Traffic Hazards
HS-018 Working Around Heavy Equipment
HS-025 Manual Lifting

STANDARD OPERATING PROCEDURES

SOP No. HS-001 Biological Hazards

1.1 Objective

The objective of this standard operating procedure (SOP) is to prevent or limit the potential for GEI personnel to encounter biological hazards during field activities.

1.2 General

This SOP is intended for use by employees engaged in work with the potential for contact with biological hazards such as animals, insects, plants, and sewage. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential for encounters with biological hazards and the control methods to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Health and Safety page of the GEI intranet.

1.2.1 Animals

During some site operations, animals such as stray or domesticated dogs or cats, raccoons, snakes, bears, rats, bats, etc. may be encountered. Employees should use discretion and attempt to avoid contact with animals. If these animals present a problem, efforts will be made to remove these animals from the site by contacting a licensed animal control technician.

1.2.1.1 Rabies

The rabies virus is transmitted through the bite of an infected animal or contact with saliva or brain/nervous system tissue of an infected animal. The rabies virus infects the central nervous system causing disease in the brain. The early symptoms of rabies in people are fever, headache, and general weakness or discomfort. As the disease progresses, more specific symptoms appear and may include insomnia, anxiety, confusion, slight or partial paralysis, excitation, hallucinations, agitation, hypersalivation (increase in saliva), difficulty swallowing, and hydrophobia (fear of water). Death usually occurs within days of the onset of these symptoms.

If you are bitten or think you may be exposed, wash any wounds immediately and thoroughly with soap and water. Then notify the Project Manager and Corporate Health and Safety Officer (CHSO) and go to the hospital emergency room. The doctor, possibly in consultation with the state or local health department, will decide if you need a rabies vaccination. Decisions to start vaccination will be based on your type of exposure and the animal you were exposed to, as well as laboratory and surveillance information for the

geographic area where the exposure occurred. An Accident Report Form should be completed and submitted per GEI's accident reporting procedures.

1.2.2 Insects

Insects, including bees, wasps, hornets, mosquitoes, ticks, spiders, etc may be present at a job site making the chance of a bite/sting possible. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition. Some insect bites can transmit diseases such as Lyme disease or a virus such as West Nile. The following is a list of preventive measures:

- Apply insect repellent prior to performing field work and as often as needed throughout the work shift
- Wear proper protective clothing (work boots, socks and light colored clothing)
- Wear shoes, long pants with bottoms tucked into boots or socks, and a long-sleeved shirt when outdoors for long periods of time, or when many insects are most active (between dawn and dusk).
- When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible
- Field personnel who may have insect allergies should have bee sting allergy medication on site and should provide this information to the Site Safety Officer (SSO) and the CHSO prior to commencing work.
- Field personnel should perform a self-check at the end of the day for ticks.

1.2.3 Tick-borne Diseases

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

Symptoms appear in three stages. First symptoms usually appear from 2 days to a few weeks after a person is bitten by an infected tick. Symptoms usually consist of a ring-like red rash on the skin where the tick was attached. The rash is often bulls-eye like with red around the edges and clear in the center. The rash may be warm, itchy, tender, and/or "doughy." Unfortunately, this rash appears in only 60 to 80 percent of infected persons. An infected person also has flu-like symptoms of a stiff neck, chills, fever, sore throat, headache, fatigue and joint pain. These symptoms often disappear after a few weeks.

The second stage symptoms, which occur weeks to months later include meningitis, severe headache, drooping of the muscles on the face, called Bell's Palsy, encephalitis, numbness, withdrawal and lethargy. These symptoms may last for several weeks to several months. Third stage symptoms, which occur months or years later include arthritis, heart problems, and loss of memory. The third stage symptoms may mimic multiple sclerosis and Alzheimer's disease.

Personnel should check themselves when in areas that could harbor deer ticks, wear light color clothing and visually check themselves and their buddy when coming from wooded or vegetated areas. If a GEI employee has been bitten by a tick, the CHSO should be contacted immediately. An Accident Report form must be completed by the individual in compliance with the Accident Reporting procedure outlined in the Corporate Health and Safety Manual.

From left to right: The deer tick adult female, adult male, nymph, and larva on a centimeter scale.

The tick can be removed by pulling gently at the head with tweezers. If tweezers are not available, cover your fingers with tissue paper and use them to grasp the tick. It is important to grasp the tick as close to the site of attachment and use a firm steady pull to remove it. Wash hands immediately after with soap and water. The affected area should then be disinfected with an antiseptic wipe. All mouth parts must be removed from the skin. If the tick is removed by breaking off the mouth parts, an irritation or infection may occur. Also, the organism that is causing the disease can still enter the body through the skin. The employee will be offered the option for medical treatment by a physician, which typically involves antibiotics. If personnel feel sick or have signs similar to those above, they should notify the SSO and the CHSO immediately.

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

The deer tick can also cause **Babesiosis**, an infection of the parasite Babesia Microti. Symptoms of Baesiosis may not be evident, but may also include fever, fatigue and

hemolytic anemia lasting from several days to several months. Babesiosis is most commonly diagnosed in the elderly or in individuals whose immune systems are compromised.

Ehrlichiosis is a tick-borne disease which can be caused by either of two different organisms. Human monocytic ehrlichiosis (HME) is caused by *Ehrlichia chaffeensis*, which is transmitted by the lone star tick (*Amblyomma americanum*). Human granulocytic anaplasmosis (HGA), previously known as human granulocytic ehrlichiosis (HGE), is caused by *Anaplasma phagocytophilia*, which is transmitted by the deer tick (*Ixodes scapularis*).

In New York State, most cases of ehrlichiosis have been reported on Long Island and in the Hudson Valley. Ehrlichiosis is transmitted by the bite of infected ticks, including the deer tick and the lone star tick. The symptoms of HME and HGE are the same and usually include fever, muscle aches, weakness and headache. Patients may also experience confusion, nausea, vomiting and joint pain. Unlike Lyme disease or Rocky Mountain spotted fever, a rash is not common. Infection usually produces mild to moderately severe illness, with high fever and headache, but may occasionally be life-threatening or even fatal. Symptoms appear one to three weeks after the bite of an infected tick. However, not every exposure results in infection.

Rocky Mountain spotted fever (RMSF) is a tick-borne disease caused by a rickettsia (a microbe that differs somewhat from bacteria and virus). Fewer than 50 cases are reported annually in New York State. In the eastern United States, children are infected most frequently, while in the western United States, disease incidence is highest among adult males. Disease incidence is directly related to exposure to tick-infested habitats or to infested pets. Most of the cases in New York State have occurred on Long Island. RMSF is characterized by a sudden onset of moderate to high fever (which can last for two or three weeks), severe headache, fatigue, deep muscle pain, chills and rash. The rash begins on the legs or arms, may include the soles of the feet or palms of the hands and may spread rapidly to the trunk or rest of the body. Symptoms usually appear within two weeks of the bite of an infected tick.

*(Information on Ehrlichiosis, Babesiosis, and Rocky Mountain Spotted Fever was derived from the New York State Department of Health).

1.2.4 West Nile Virus

West Nile Virus (WNV) is a mosquito-borne infection transmitted through the bite of an infected mosquito. The symptoms of WNV can be asymptomatic (no symptoms) or in more serious cases can lead to West Nile Fever. West Nile Fever can include fever, headache, tiredness, body ache, an occasional rash on the trunk of the body, and swollen lymph glands, In severe cases, people have developed West Nile Encephalitis or

Meningitis which symptoms include fever, headache, neck stiffness, tremors, coma and in some cases death. The incubation period for the disease is usually 2 to 15 days. The symptoms can range from a few days to several weeks. Most mosquitoes are not infected and the chance of infection from a mosquito bite of an on-site employee is very small.

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

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

Centers for Disease Control and Prevention (CDC) evaluation of information contained in peer-reviewed scientific literature and data available from the Environmental Protection Agency (EPA) has identified several EPA registered products that provide repellent activity sufficient to help people avoid the bites of disease carrying mosquitoes. Products containing these active ingredients typically provide reasonably long-lasting protection:

- **DEET** (Chemical Name: N,N-diethyl-m-toluamide or N,N-diethly-3-methyl-benzamide) 20 to 30 percent DEET
- **Picaridin** (KBR 3023, Chemical Name: 2-(2-hydroxyethyl)-1-piperidinecarboxylic acid 1-methylpropyl ester)
- **Oil of Lemon Eucalyptus** or **PMD** (Chemical Name: para-Menthane-3,8-diol) the synthesized version of oil of lemon eucalyptus
- **IR3535** (Chemical Name: 3-[N-Butyl-N-acetyl]-aminopropionic acid, ethyl ester)
- **Permethrin** (3-Phenoxybenzyl (1RS)-cis,trans-3-(2,2-dichlorovinyl) -2,2-dimethylcyclopropanecarboxylate) - Permethrin kills ticks and can be used on clothing (but not skin)

EPA characterizes the active ingredients DEET and Picaridin as "conventional repellents" and Oil of Lemon Eucalyptus, PMD, and IR3535 as "biopesticide repellents", which are derived from natural materials.

In general, higher concentrations of active ingredient provide longer duration of protection, regardless of the active ingredient, although concentrations above approximately 50 percent do not offer a marked increase in protection time. Products with less than 10 percent active ingredient may offer only limited protection, often from 1 to 2 hours. Products that offer sustained release or controlled release (micro-encapsulated) formulations, even with lower active ingredient concentrations, may provide longer protection times. Regardless of what product you use, if you start to get mosquito bites reapply the repellent according to the label instructions or remove yourself from the area with biting insects if possible.

Clothing and other products can be purchased pre-treated, or products can be treated using EPA-registered products. Permethrin is the only pesticide approved by the EPA for these uses. Permethrin binds tightly to the fabrics, resulting in little loss during washing and minimal transfer to the skin. Permethrin is poorly absorbed through the skin, although sunscreens and other products may increase the rate of skin absorption.

If you decide to use permethrin-treated clothing, consider these tips:

- Read the application instructions carefully and apply the product according to the label directions. Do not over-treat products.
- Permethrin treatments are only intended for use on fabrics; do not apply them directly to the skin or other items.
- Do not apply permethrin to clothing while it is being worn.
- Apply the products outdoors in well ventilated areas that are protected from wind.
- Hang treated fabrics outdoors and allow them to dry completely before wearing them.
- Wash permethrin treated clothing separately from other clothing items.

1.2.5 Plants

The potential for contact with poisonous plants, such as poison ivy, sumac, and oak, exists when performing fieldwork in wooded or boggy areas. These plants can cause allergic reaction when in contact with the leaves or vines.

Poison ivy can be found as vines on tree trunks or as upright bushes. Poison ivy consists of three leaflets with notched edges. Two leaflets form a pair on opposite sides of the stalk, and the third leaflet stands by itself at the tip. Poison ivy is red in the early spring and turns shiny green later in the spring. Poison ivy grows throughout much of North America, including all states east of the Rocky Mountains. It is normally found in

wooded areas, especially along edge areas where the tree line breaks and allows sunshine to filter through. It also grows in exposed rocky areas, open fields and disturbed areas.

Poison sumac can be present in the form of a flat-topped shrub or tree. It has fern-like leaves, which are velvety dark green on top and pale underneath. The branches of immature trees have a velvety "down." Poison sumac has white, "hairy" berry clusters. Poison sumac grows exclusively in very wet or flooded soils, usually in swamps and peat bogs, in the eastern United States.

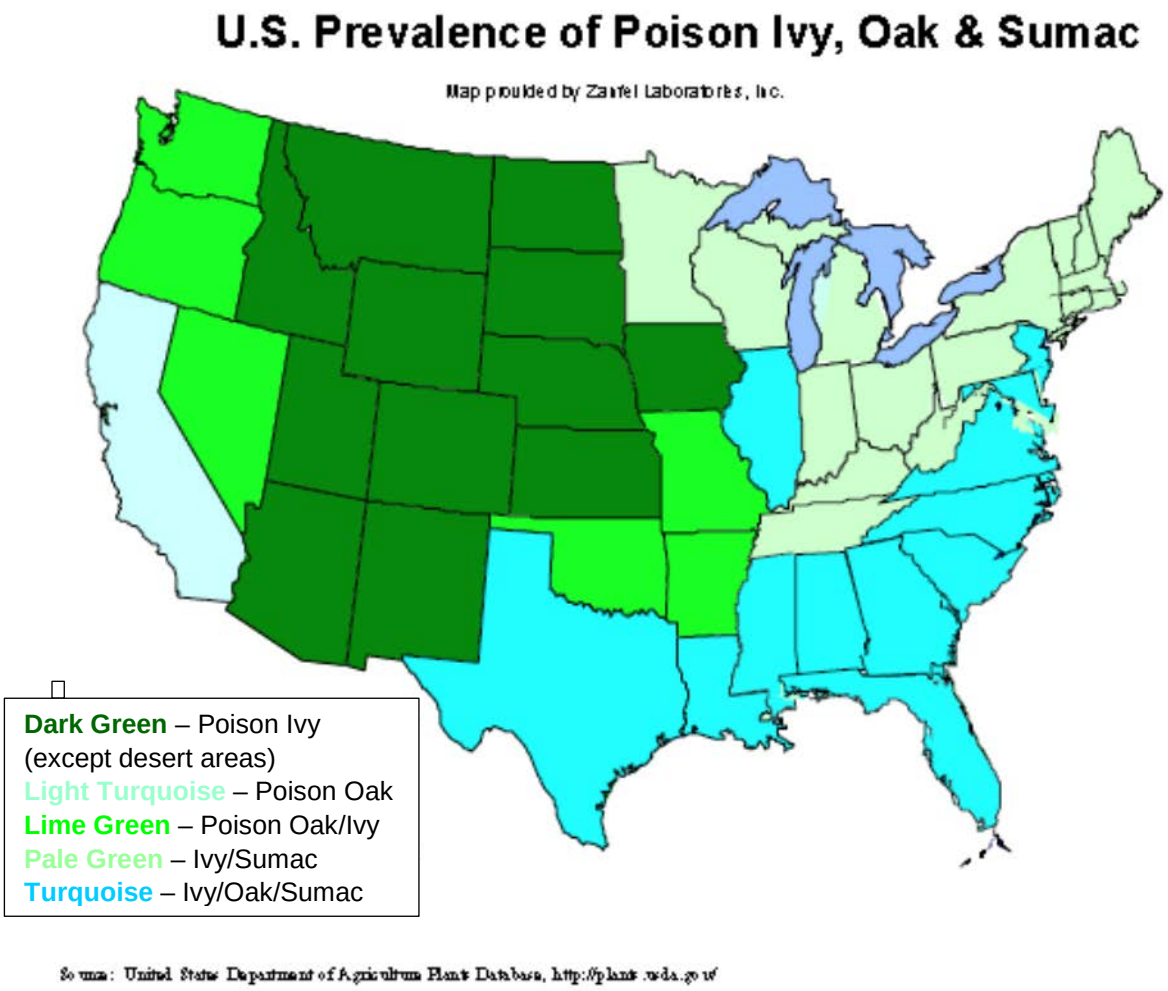
Poison oak can be present as a sparingly branched shrub. Poison oak can grow anywhere in the United States with the exception of Hawaii, Alaska, and some southwest areas that have desert climates. Poison oak is similar to poison ivy in that it has the same leaflet configuration; however, the leaves have slightly deeper notches.

Keep in mind that for each of these plants,

Poison Oak

Poison Ivy

Poison Sumac



To prevent exposure to these poisonous plants:

- Barrier skin creams, such as lotion containing bentoquatum (Tecnu®), may offer some protection prevent the occurrence of exposure symptoms.
- Wear long sleeves, long pants, boots, and gloves.

Contact with poison ivy, sumac, or oak may lead to a skin rash, characterized by reddened, itchy, blistering skin which needs first aid treatment. Susceptible individuals should identify themselves to the SSO or GEI Project Manager. If you believe you have contacted one of these plants:

- Immediately wash skin thoroughly with soap and water, taking care not to touch your face or other body parts.
- Wash exposed clothing separately in hot water with detergent.
- After use, clean tools, and soles of boots with rubbing alcohol or soap and lots of water. Urushiol can remain active on the surface of objects for up to 5 years.

- If a rash occurs, contact the CHSO and complete and submit an Accident Report Form.

1.2.6 Sewage and Bacterial Impacted Sediments

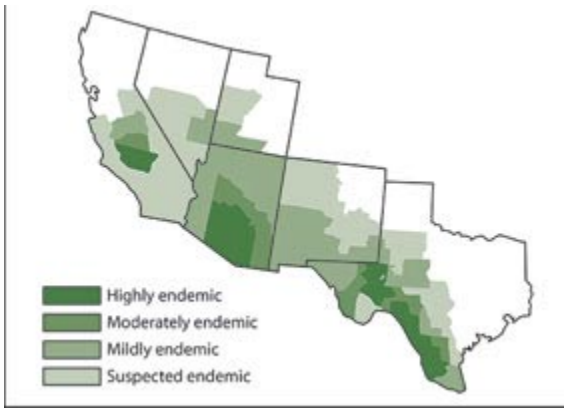
Some project work may be conducted at sites that serve or have served as a combined sewer overflow (CSO) and consequently may have received untreated sanitary sewage from numerous sources. Decomposed sewage can potentially be encountered within sites and their sediments. Sediments could contain soil and marine microorganisms, and bacterium associated with sewage. Many of these bacterium can cause illness through ingestion, direct contact, or the inhalation of a bio-aerosol. Potential respiratory exposure to biological agents can also occur through the inhalation of aerosols produced during sediment handling activities. Personal protective equipment as identified in the site-specific HASP will be worn to minimize potential exposures. Employees will follow the decontamination or disposal procedures identified in the HASP.

1.2.6 Fungal Spores in Soil – Valley Fever

Valley Fever is an illness that usually affects the lungs. It is caused by the fungus Coccidioides immitis that lives in the top 2 to 12 inches of soil in many parts of California. When fungal spores are present, any work activity that disturbs the soil, such as digging, grading or other earth moving operations, or vehicle operation on dirt roads, can cause the spores to become airborne, therefore increasing the risk of Valley Fever. All employees on sites where the fungus is present, and who are exposed to dusty conditions and wind-blown dusts are at increased risk of becoming infected.

Valley Fever fungal spores are too small to be seen, and there is no reliable way to test the soil for spores before working in a particular place. Valley Fever can be found throughout the southwestern United States, parts of Mexico and South America. Some California counties consistently have Valley Fever fungus present in the soil. In these regions Valley Fever is considered endemic. Health departments track the number of cases of Valley Fever illness that occur. This information is used to map illness rates as seen on the figure below.


California county-specific coccidioidomycosis incidence rates, 2011
Merced
Madera
Fresno
Tulare
Kings
San Luis Obispo
Kern
Cases per 100,000 population
0.0
0.1—19.9
20.0—74.9
75.0—304.0
Potentially unreliable rate, relative standard error 23 percent or more
Center for Infectious Diseases - Division of Communicable Disease Control
Infectious Diseases Branch - Surveillance and Statistics Section


Highly endemic
Moderately endemic
Mildly endemic
Suspected endemic

When present, symptoms usually occur between seven to 21 days after breathing in spores, and can include:

- Cough
- Fever
- Chest pain
- Headache
- Muscle aches
- Rash on upper trunk or extremities
- Joint pain in the knees or ankles
- Fatigue

Symptoms of Valley Fever can be mistaken for other diseases such as the flu (influenza) and TB (tuberculosis), so it is important for employees to obtain medical care for an accurate diagnosis and possible treatment.

While there is no vaccine to prevent Valley Fever, the following steps are important to take in order to limit risk:

- Determine if the worksite is in an endemic area. Contact the local health department for more information about the risk in the county GEI is performing work that may disturb soils.
- Prepare work plans and work practices that reduce employee's exposure, which may include:
    - Provide air conditioned cabs for vehicles that generate heavy dust and make sure employees keep windows and vents closed.
    - Suspend work during heavy winds.
- When exposure to dust is unavoidable, provide National Institute for Occupational Safety and Health (NIOSH)-approved respiratory protection with particulate filters rated as N95, N99, N100, P100, or High Efficiency Particulate Air (HEPA). Employers must develop and implement a respiratory protection program in accordance with California's Occupational Safety and Health Administration (Cal/OSHA's) Respiratory Protection standard (8 CCR 5144).
- Take measures to reduce transporting spores off site, such as:
    - Clean tools, equipment, PPE and vehicles before transporting off site.
    - If employee's clothing is likely to be heavily contaminated with dust, provide coveralls and change rooms, and showers where possible.

1.3 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.4 References

http://www.cdc.gov/ncidod/dvbid/westnile/index.htm
http://www.cdc.gov/ncidod/dvbid/westnile/qa/insect_repellent.htm
http://www.epa.gov/pesticides/health/mosquitoes/insectrp.htm
http://www.cdc.gov/niosh/topics/lyme/
Protecting Yourself From Ticks and Mosquitoes, NIOSH Fast Facts, Publication No. 2010-119
http://npic.orst.edu/pest/mosquito/ptc.html

1.5 Attachments

None

1.6 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

STANDARD OPERATING PROCEDURES

SOP No. HS-002 Infectious Materials and Bloodborne Pathogens Exposure Control Plan

1.1 Objective

GEI personnel may come in contact with potentially infectious agents when performing first aid or cardiopulmonary resuscitation (CPR). Employees may also come into contact with these materials when working at certain contaminated sites (i.e., urban sites, discarded contaminated needles or sewer outfall exposures). This standard operating procedure (SOP) has been developed to minimize the potential for exposure to employees who may contact, directly or indirectly, infectious agents.

1.2 General

This SOP is intended for use by employees engaged in work with the potential for contact with infection materials and bloodborne pathogens. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential for encounters with infectious materials or bloodborne pathogens and the control methods to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Health and Safety page of the GEI intranet.

- Universal Precautions (i.e., treat all potentially infectious materials as if it were infected) will be used by GEI employees.

1.3 Exposure Control Plan

1.3.1 Standard Procedures

Sampling of potentially infectious materials will be performed in a manner that minimizes the potential for creating splashes, droplets, or aerosols. Mechanical pipetting devices will be used for manipulating sanitary sewer effluent. Mouth pipetting is prohibited.

The use of glassware or equipment with sharp or pointed edges will be kept at a minimum to reduce the potential of injury that would create a direct route of entry into the body for infectious materials.

Minor cuts, scratches, or other breaks in the skin barrier will be covered prior to the handling of infectious materials. Employees experiencing exudative lesions or weeping dermatitis will refrain from direct contact with infectious materials.

Eating, drinking, smoking, or application of cosmetics is not permitted in areas where potentially infectious materials are handled or sampled.

Employees will wash and disinfect their hands, face, or other potentially contaminated skin surfaces upon completing the handling of infectious or potentially infectious agents or after rendering first aid.

1.3.2 Personal Protective Equipment

Personal Protective Equipment (PPE) will be worn to reduce the potential of exposures to splashes or aerosols. At a minimum, this equipment will include safety glasses and appropriate gloves, but may also require the use of face, respiratory, foot, and full-body protection. Refer to the site-specific Health and Safety Plan for specific PPE requirements.

Gloves used in the handling or sampling of infectious materials will be appropriately disposed of and not reused.

1.3.3 Medical Monitoring

Medical monitoring is required for an employee when a potential workplace exposure has occurred. The employee must notify the Corporate Health and Safety Officer (CHSO) and Human Resources regarding the potential exposure as soon as possible. For infectious agents in which a medically accepted vaccination has been developed (e.g., hepatitis B virus [HBV]) potentially exposed employees will be given the option to receive an inoculation at no cost. Employees who have been exposed will be given the option to receive a confidential medical evaluation at no cost. Required records for exposed employees will be kept confidential.

1.3.4 Training

Employees with a reasonable risk for exposure must attend Bloodborne Pathogen training covering the following topics:

- An explanation of the Occupational Health and Safety Administration (OSHA) bloodborne pathogen standard.
- A general explanation of bloodborne diseases.
- An explanation of the modes of transmission of bloodborne diseases.
- An explanation of the GEI's Bloodborne Pathogen SOP and exposure control plan.
- Appropriate methods for recognizing tasks that involve potential exposure.
- An explanation of the use and limitations of methods to prevent exposure.
- Proper types, use, handling, decontamination, and disposal of PPE.
- The availability of HBV vaccines and the procedures for obtaining a vaccination.
- Appropriate actions to take during an emergency involving bloodborne pathogens.

- Post-exposure procedures.
- An explanation of required signs and labels.

1.4 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.5 Reference

OSHA 29 CFR 1910.1030 - Bloodborne Pathogens.

1.6 Attachments

1.7 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

STANDARD OPERATING PROCEDURES

SOP NO. HS-003 Container Management

1.1 Objective

This standard operating procedure (SOP) has been developed to minimize the potential for injuries to GEI employees performing container and drum handling and sampling, through proper use of engineering and administrative controls, personal protective equipment (PPE), and education.

1.2 General

This SOP is intended for use by employees engaged in work with the management of containers that may contain hazardous substances or contaminated media. The site-specific health and safety plan (HASP) should include a hazard assessment and control methods to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Health and Safety page of the GEI intranet.

Hazardous substances and contaminated media will be handled, transported, labeled, and disposed of in accordance with this paragraph. Drums and containers will meet the appropriate United States Department of Transportation (DOT), Occupational Safety and Health Administration (OSHA), and Environmental Protection Agency (EPA) regulations for the wastes that they contain.

Site operations will be organized to minimize the amount of drum or container movement. Prior to movement of drums or containers, employees exposed to the transfer operation will be notified of the potential hazards associated with the contents of the drums or containers. Unlabeled drums and containers will be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled.

DOT specified salvage drums or containers and suitable quantities of proper absorbent will be kept available and used in areas where spills, leaks, or ruptures may occur. Where spills may occur, a spill containment program, which may be part of the HASP, will be implemented to contain and isolate the entire volume of the hazardous substance being transferred.

1.3 Opening Drums and Containers

The following procedures will be followed in areas where drums or containers are being opened:

- Employees not actually involved in opening drums or containers will be kept a safe distance from the drums or containers being opened.
- If employees must work near or adjacent to drums or containers being opened, a suitable shield that does not interfere with the work operation will be placed between the employee and the drums or containers being opened to protect the employee in case of accidental release.
- GEI employees will not handle or attempt to open bulging containers. Employees will not stand upon or work from drums or containers. GEI will contract with a hazardous waste company to handle, manage, and dispose of a bulging drum.

1.4 Material Handling Equipment

Material handling equipment, such as drum dollies, used to transfer drums and containers will be selected, positioned, and operated to minimize sources of ignition.

1.5 Radioactive Wastes

GEI does not routinely handle or manage radioactive waste. If required to do so for a project, procedures will be approved by the Corporate Health and Safety Officer (CHSO) and Regional Health and Safety Officer (RHSO).

1.6 Shock-Sensitive Wastes

GEI employees will not handle shock-sensitive waste. Shock-sensitive waste or chemicals may explode with friction, movement or heat. Some chemicals are shock-sensitive by nature-, others become shock-sensitive through drying, decomposition, or slow reactions with oxygen, nitrogen, or the container. Some chemicals that are, or can, become shock-sensitive will have that hazard noted in the safety data sheet (SDS).

- Drums and containers containing packaged laboratory wastes will be considered to contain shock-sensitive or explosive materials until they have been characterized. *Caution: Shipping of shock-sensitive wastes may be prohibited under U.S. Department of Transportation regulations. Shippers will refer to 49 CFR 173.21 and 173.50.*

1.7 Laboratory Waste Packs

GEI employees will not handle or open laboratory waste packs.

1.8 Sampling of Drum and Container Contents

Sampling of containers and drums will be done in accordance with a site-specific sampling plan that will be developed in conjunction with a site-specific HASP.

1.9 Staging Areas

Drums and containers will be identified and classified prior to packaging for shipment. Drum or container staging areas will be kept to a minimum number as approved by the client to safely identify and classify materials and prepare them for transport. Staging areas will be provided with adequate access and egress routes. Bulking of hazardous wastes will be permitted only after a thorough characterization of the materials has been completed and approved by the Client. GEI employees will not sign manifests unless a written authorization agreement is in place with the Client.

1.10 Tank and Vault Procedures

GEI employees do not routinely sample vaults and tanks. Entry procedures will be coordinated and approved by the CHSO and RHSO.

1.11 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.12 References

OSHA 1910.120 Hazardous Waste Operations and Emergency Response (j) Handling of Drums and Containers.

1.13 Attachments

None

1.14 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

STANDARD OPERATING PROCEDURE
HS-004 Driver Safety

1.1 Objective

GEI has implemented a Safe Driving Program to encourage safe driving habits and promote the ongoing safety of our staff and the communities where we work. For more information, refer to the Operation of Vehicles section of GEI's Employee Handbook.

This standard operating procedure (SOP) provides requirements and recommendations to minimize the potential risks while operating or riding in a motor vehicle.

1.2 General

GEI employees will adhere to the following requirements when operating a vehicle while conducting business on behalf of GEI. These requirements apply to GEI owned, rental, and personal vehicles used to conduct GEI business:

- Employees must maintain a valid and current driver's license.
- Employees using a personal vehicle for work-related travel must have proper insurance coverage that meets the requirements in the state in which they reside.
- Employees must wear their safety belt while in a moving vehicle.
- Vehicle accidents will be reported in accordance with GEI's accident reporting procedures. .
- Vehicles will be properly maintained and safely operated (refer to GEI's Fleet Maintenance Program).
- Employees will follow safe driving behaviors, which include limiting distractions such as manipulating radios or other equipment that may cause a distraction. Employees should not exceed the posted speed limit and should maintain a safe distance between other vehicles.
- When parking a vehicle at a job site, the employee should position the vehicle in a manner to reduce or eliminate the need to operate the vehicle in reverse. A safety cone should be placed at the rear of the vehicle after parking the vehicle and be removed prior to moving the vehicle. This procedure makes the employee aware of other vehicles, equipment, and structures within the backup radius of the vehicle.

When driving a rental vehicle or GEI vehicle that you are unfamiliar with orient yourself to the vehicle by:

- Walking around the vehicle to observe the condition of the vehicle and hazards that could be within the travel path.
- Becoming familiar with the size of the vehicle.

- Adjusting mirrors (rear and side).
- Becoming familiar with dashboard, center console, and steering controls.
- Locating the turn signals, windshield wipers, lights, emergency flashers, and the heating, air conditioning, and defrost controls.

1.3 Driving Defensively

Driving defensively means not only taking responsibility for yourself and your actions but also keeping an eye on "the other guy." Good defensive drivers may be able to anticipate what the other driver will do next. GEI recommends the following guidelines to help reduce your risks on the road.

Do not start the vehicle until each passenger and their belongings are secured in the vehicle.

- Remember that driving above or below the speed limit can increase the likelihood of a collision.
- If you notice that a car is straddling the center line, weaving, making wide turns, stopping abruptly or responding slowly to traffic signals, the driver may be impaired or using a cellular telephone.
- Avoid an impaired driver by turning right at the nearest corner or exiting at the nearest exit. If it appears that an oncoming car is crossing into your lane, pull over to the roadside, sound the horn and flash your lights.
- Notify the police if you observe motorist who is driving suspiciously.
- Follow the rules of the road. Do not contest the "right of way" or try to race another car during a merge. Be respectful of other motorists.
- Allow large vehicles, including tractor trailers, extra breaking distance, turning radius, and avoid traveling in their blind spots.
- Do not follow too closely. GEI employees should use a "three-second following distance" or a "three-second plus following distance."
- While driving be cautious, aware, and responsible.
- Use extra caution and reduce speed in construction areas and school zones.
- Be aware of pedestrians, bicyclists, and motorcyclists.

1.4 Cellular Phone Use and Other Distractions

Refer to the Human Resources policy on use of cellular telephones while operating a vehicle on company business.

1.5 Drugs and Alcohol

The use of illegal drugs or alcohol is prohibited when driving a vehicle on GEI business. Be aware of the side effects of prescription and over-the-counter medications which can impair an employee’s ability to drive.

1.6 Adverse Driving Conditions

1.6.1 Driving at Night

Vision maybe limited at night due to impairment of the driver's depth perception, color recognition, and peripheral vision. Another factor adding danger to night or early morning driving is fatigue. Drowsiness makes driving more difficult by dulling concentration and slowing reaction time.

Effective measures to minimize these hazards by preparing your car and following guidelines:

- Have your headlights properly aimed. Misaimed headlights blind other drivers and reduce your ability to see the road.
- Alcohol severely impairs your driving ability and acts as a depressant.
- Avoid smoking when you drive. Smoke's nicotine and carbon monoxide hamper night vision.
- Lights will not help the driver see better in early twilight, but they will make it easier for other drivers to see you. Do not overdrive your headlights. You should be able to stop inside the illuminated area. If you do not, you create a blind crash area in front of your vehicle.
- If an oncoming vehicle does not lower beams from high to low, avoid glare by watching the right edge of the road and using it as a steering guide.
- Make frequent stops for light snacks and exercise. If you are too tired to drive, stop in a safe area and get some rest.
- Observe driving safety as soon as the sun goes down. Twilight is one of the most difficult times to drive, because your eyes are constantly changing to adapt to the growing darkness.

1.6.2 Snow/Freezing Conditions

When snow and ice are present, be prepared by following these winter driving safety tips.

1.6.2.1 Prepare the Vehicle Before a Snowstorm

- Check under the hood and take a look at the vehicles cooling system. Make sure the vehicle contains adequate antifreeze and the hoses are in good condition.
- Test heaters and defrosters ahead of time to make sure they are in good working condition.
- Test your windshield wipers and check the condition of your wiper blades. If wipers leave streaks on your windshields, replace the blades.
- It is recommended that a windshield washer/antifreeze solution is used during winter conditions.
- Check your lights and periodically clear them of snow and dirt.
- Car batteries need extra power in cold conditions. Make sure the battery's terminals are clean and cables are secure.

- Keep your gas tank at least half full in the winter to help avoid gas line freeze up.

1.6.2.2 Driving During and After a Snowstorm

- Wear sunglasses to aid in limiting reflection from snow.
- Be aware of blind spots created by snow banks.
- Be extra cautious of pedestrians and other vehicles in intersections.
- Allow extra time for braking and increase the distance between you and the car ahead of you.
- Reduce your speed and do not exceed the posted limit.
- If you start to lose traction take your foot off the gas and gradually reduce your speed. Accelerate slowly once you feel traction is regained.
- If you start to skid, steer in the direction of the skid. Remember, steering can be more important than braking on slippery roads.

1.6.3 Driving In the Rain

To prevent losing control of your car on wet pavement, take these preventive measures.

- Prevent skids by driving slowly and carefully, especially on curves.
- Steer and brake with a light touch.
- When you need to stop or slow, do not brake hard or lock the wheels.
- Maintain mild pressure on the brake pedal.

If you skid, ease your foot off the gas, and carefully steer in the direction you want the front of the car to go. For cars without anti-lock brakes, avoid using your brakes. This procedure, known as "steering into the skid," will bring the back end of the car in line with the front. If your car has anti-lock brake systems (ABS), brake firmly as you "steer into the skid."

Hydroplaning happens when the water in front of your tires builds up faster than your car's weight can push it out of the way. The water pressure causes your car to lose contact with the road surface and slide on a thin layer of water between your tires and the road. At this point, your car can be completely out of contact with the road, and you are in danger of skidding or drifting out of your lane, or even off the road.

To avoid hydroplaning, keep the tires properly inflated and maintain good tread on the tires. If tires need to be replaced on a company vehicle, notify the branch manager or their designee. Slow down when roads are wet, and stay away from puddles. Try to drive in the tire tracks left by the cars in front of you. If you begin to hydroplane, do not brake or turn suddenly. This could throw your car into a skid. Ease your foot off the gas until the car slows and you can feel the road again. If you need to brake, do it gently with light pumping actions. If your car has ABS, then brake normally; the car's computer will mimic a pumping action, when necessary.

If weather conditions worsen to the point where the driver is not comfortable driving, pull the vehicle over to a safe location until conditions improve. Do not drive during severe weather conditions. Do not attempt to drive on roads with standing water or that have been flooded. Find an alternate route if these conditions exist.

1.6.4 Off Road

If operation of a vehicle is required off publicly or privately maintained roads or in situations where four-wheel-drive vehicles are required, the appropriate vehicle for the situation will be used.

1.7 Driver Training

GEI employees are required to complete driver safety training every 3 years. Employees will complete the examination at the end of each module and forward the training certificate to Human Resources.

1.8 Limitations

Follow safety procedures as defined in the site-specific HASP.

1.9 References

National Safety Council
Oklahoma Safety Council
GEI Consultants, Inc. Employee Handbook

1.10 Attachments

1.11 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

STANDARD OPERATING PROCEDURES

HS-007 General Safety Requirements

1.1 Objective

GEI is committed to providing its employees with a safe and healthy work environment. To maintain a safe work environment, GEI has established general safety requirements to promote safe work practices.

1.2 General Health and Safety Training

GEI requires employees to complete Health and Safety Training on an annual basis. Project employees must have completed, at a minimum, GEI's General 4-Hour Health and Safety Training or when required, HAZWOPER training before beginning on-site work activities. In addition, field staff must be current in First Aid and CPR Training. Site-specific safety training will also be completed before beginning work on each project site. Further Health and Safety training requirements can be found in Section 2 of the GEI Health and Safety Manual.

1.3 Tailgate Meetings

Health and Safety tailgate meetings will be conducted by the GEI Project Manager or Site Safety Officer (SSO), and be recorded in the GEI field book or on the GEI daily safety briefing log. Employees on-site will sign the daily safety briefing log to indicate attendance.

1.4 Health and Safety Plans

GEI projects must have a health and safety plan (HASP) before beginning site work. GEI HASP templates are located on the Health and Safety page on the GEI intranet. Specific requirements for HASPs are located in Section 7 of GEI's Health and Safety Manual. After the HASP has been completed, it must be sent to the Corporate Health and Safety Officer (CHSO) and the Regional Health and Safety Officer (RHSO) for review. Project employees must read the HASP and sign the signature page to document that they have read, understood, and will comply with the requirements of the HASP. The site-specific HASP must be kept on-site at all times.

1.5 Personal Protective Equipment

Project-specific personal protective equipment (PPE) will be identified in the HASP based on the hazards present during work tasks. Required PPE must be worn on the project site. More information regarding PPE is located in Section 6 of GEI's Health and Safety Manual.

1.6 Fire Protection and Prevention

The work site should be kept clear of flammable materials and debris. GEI field personnel should know where fire extinguishers are located, and be familiar in the use of the extinguisher. Information on the correct use of a fire extinguisher is included in GEI's general health and safety training. Call 911(or other number identified in the project HASP) in the event of a fire.

1.7 Accident/Incident Reporting

The following accident reporting procedures must be followed:

- Seek medical attention.
- Notify your supervisor.
- Notify CHSO and Human Resources (HR) within two hours of the accident/incident.
- Complete Accident Reporting Form (found on the Health and Safety page of the GEI Intranet or on the GEI App) within **24 hours** and send to the CHSO and Human Resources. Refer to Section 8 of the GEI Health and Safety Manual for more information.

1.8 Near Miss Reporting

GEI employees will complete a near-miss reporting form if a hazardous or unsafe condition or near miss is observed. The near-miss reporting form is located on the Health and Safety page of the GEI Intranet. Refer to Section 8 of the GEI Health and Safety Manual for more information.

1.9 Housekeeping

Work areas, passages, and stairs will be kept clear of debris. Debris will be removed from the project site at regular intervals.

1.10 Illumination

Project sites will be illuminated either with natural or artificial illumination, in compliance with OSHA regulations.

1.11 Sanitation

Hand-washing is an essential form of protection from chemical and biological exposures and illness. GEI employees should wash their hands after performing work tasks and

regularly throughout the day. If soap and water are not available, hand sanitizers and/or wipes should be used.

1.12 Machinery, Tools, Material, and Equipment

Machinery, tools, material, and equipment will be kept in good working condition and will be inspected by a competent person. Unsafe equipment will be identified as unsafe by tagging or locking the controls to render them inoperable. Arrangements will be made to repair or dispose of damaged or unsafe equipment.

1.13 Vehicles

GEI's motor vehicles will be maintained in accordance with the GEI fleet maintenance program. Each GEI-owned vehicle will have a fire extinguisher and first aid kit. Additional fire extinguishers and first aid kits are kept in each GEI office for use in personal or rental vehicles.

1.14 Heavy Equipment

GEI employees will keep a line of sight between them and heavy equipment operators. If a GEI employee needs to communicate with heavy equipment operators, they will use hand signals or direct communication with the operator. GEI employees should not:

- Operate or climb on heavy equipment
- Approach heavy equipment while it is in operation.
- Use cellular telephones when working near operating equipment.

For more information regarding heavy equipment, refer to GEI's SOP HS-018 Heavy Equipment.

1.15 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.16 Attachments

None

1.17 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer

GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

STANDARD OPERATING PROCEDURES

SOP No. HS-008a Non-Powered Hand Tools

1.1 Objective

This SOP is intended for use by employees working with non-powered hand tools. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the hazards associated with the non-powered hand tools that will be used. These hazards should be reviewed during the project safety briefing and documented on the Project Safety Briefing form, found on the Health and Safety page of the GEI intranet.

1.2 General

Misuse of hand tools accounts for the majority of accidents and injuries involving hand tools. Only use a tool for which it was designed for and use the proper tool for the task. Improper maintenance is another leading cause of injuries. Employees using hand tools may be exposed to a number of potentially serious hazards: falling objects, objects fall as a result of contact with tools, objects which are abrasive or splash, harmful dust, fumes mists, vapors, and gases, as well as contact with electrical power sources.

1.2.1 Condition of Tools

All hand tools, whether furnished by GEI or the employee, will be maintained in safe working condition. All hand tools must be inspected before use. Never use a tool if its handle has splinters, burrs, cracks, splits or if the head of the tool is loose. Never use impact tools such as hammers, chisels, punches or steel stakes having mushroomed heads. Tag worn, damaged or defective tools “Out of Service” and do not use them. If the tools cannot be repaired they will be disposed of. GEI does not issue or permit the use of unsafe hand tools.

1.2.2 Personal Protective Equipment

Employees using hand tools will be provided with the personal protective equipment (PPE) necessary to protect them from the hazard of the tool as well as the associated hazards with using the tool. (i.e. projectile debris, dust, etc.). All employees will wear work gloves and safety glasses at a minimum. In addition, face shields and hearing protection may be required. Most hand injures could be avoided with the proper use of PPE. PPE must be maintained in good condition, kept clean and properly stored when not in use. More information regarding PPE is located in Section 6 of GEI’s Corporate Health and Safety Program.

1.2.3 General Safe Practices

Never wear sandals, open-toed or canvas shoes when working with tools. Avoid loose-fitting clothes which might become entangled in a tool. Always remove rings and other jewelry. Make sure your grip and footing are secure when using large tools. Never carry tools up ladders, use a tool belt, hoist or a rope. Use extra caution when using tools at heights – a falling tool could kill a co-worker. Always pass a tool to another person by the handle – never toss it to them. Select ergonomically designed tools for work tasks when movements are repetitive and forceful.

1.3 Non-Power Hand Tools

Non-powered hand tools include anything from axes to wrenches. Even though the tool is powered by human inertia, these injuries often involve sever disabilities.

1.3.1 Knives

Only use a knife with a sharpened blade. Always cut in the direction away from your body. Never use knives having broken or loose handles. Never use knives as screwdrivers, pry bars, or can openers. Never pick up knives by their blades. Always carry knives with their tips points toward the floor. Never carry knives, scissors, or other sharp tools in pockets. Never attempt to catch a falling knife. When not in use, knives should be stored in sheaths. Box cutters will be self-retracting.

1.3.2 Wrenches

Never use wrenches that are bent, cracked or badly chipped, or having loose or broken handles. Discard any wrench with spread or battered jaws, if the handle is bent, or if a wrench has broken or battered points. Never slip a pipe over a single head wrench handle for increased leverage. Never use a shim to make a wrench fit. Pull on a wrench using a slow, steady motion. Do not use push force on a wrench you'll be more likely to lose your balance if the wrench slips.

1.3.3 Screwdrivers

Never use a screwdriver if your hands are wet, oily, or greasy. Always match the size and type of screwdriver blade to fit the head of the screw. Do not hold the work piece against your body while using a screwdriver. Never put your fingers near the tip of a screwdriver when tightening a screw. Never use a screwdriver to make a starting hole for screws. Never use a screwdriver as a chisel, pry bar, or nail puller. When performing electrical work, always use an insulated screwdriver. Never use a screwdriver to test the charge of a battery.

1.3.4 Hammers

Never use a hammer if your hands are oily, greasy or wet. Always check behind you before swinging a hammer. Use a claw hammer for pulling nails. Never strike nails or other objects with the "cheek" of the hammer. Do not strike a hardened steel surface, such as a cold chisel, with a claw hammer. Never strike one hammer against another hammer. Never use a hammer as a wedge or a pry bar.

1.3.5 Pliers

Never use pliers which are cracked, broken, or sprung. Never use pliers as a wrench or a hammer. Do not attempt to force pliers by using a hammer on them. Never slip a pipe over the handles of pliers to increase leverage. When performing electrical work, always use insulated pliers. When using diagonal cutting pliers, shield loose pieces of cut material from flying into the air by using a cloth or your gloved hand.

1.3.6 Snips

Never use snips as a hammer, screwdriver, or pry bar. Always wear safety glasses or safety goggles when using snips to cut materials. Always wear work gloves when cutting materials with snips. Keep the blade aligned by tightening the nut and bolt of the snips. Never use straight cut snips to cut curves. Always use the locking clip on the snips when you have finished using them. Never leave or store snips in the open position.

1.3.7 Hand Saws

Always keep handsaws sharp and free of rust to prevent them from binding or jumping. Never carry a saw by the blade. Always hold the work piece firmly against a work table. Keep control of saws by releasing downward pressure at the end of the stroke. Never use an adjustable blade saw such as a hacksaw, coping saw, keyhole saw or bow saw, if the blade is not taut. Oil saw blades after each use. Never force the saw through the cut as this may cause the saw to buckle or fly out of the groove causing an injury.

1.3.8 Chisels

Only use sharpened chisels. Never use chisels having "mushroomed" striking heads. Whenever possible, hold a chisel by using a tool holder. Clamp small work pieces in a vise and chip towards the stationary jaw of the vise. Chip or cut away from yourself and be sure to keep both hands back in back of the cutting edge. Always wear safety glasses or a face shield.

1.3.9 Vise and Clamps

Never use a vise having worn or broken jaw inserts, or having cracks or fractures in the body of the vise. Position the work piece in the vise so the entire face of the jaw supports the work piece. When clamping a long work piece in a vise, support the far end of the work piece by using an adjustable pipe stand or saw horse. Never slip a pipe over the handle of a vise to gain extra leverage. Never use a C-clamp for hoisting materials. Never use a C-clamp as a permanent fastening device.

1.3.10 Jacks

A manufacture's rated capacity must be clearly marked on all jacks and all jacks must have a stop indicator. Never exceed the capacity of the stop indicator on the jack. Jacks should be lubricated and inspected regularly. When setting up a jack, ensure the base is centered on a firm, level surface. The jack head should also be placed against a level surface. Lift force should be applied evenly. Put a block under the base of the jack when the foundation is not firm. Place a block between the jack cap and load if the cap might slip. Immediately block the load after it is lifted.

1.4 Limitations

Follow safety procedures as defined in the site-specific HASP or in the manufacturer's specifications. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.5 References

OSHA Standards for the Construction Industry, Subpart I
Risk Analytics, LLC Hand Tools Training, 2006

1.6 Attachments

None

1.7 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

STANDARD OPERATING PROCEDURES

SOP No. HS-008b Powered Hand Tools

1.1 Objective

This SOP is intended for use by employees working with powered hand tools. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the hazards associated with the powered hand tools that will be used. These hazards should be reviewed during the project safety briefing and documented on the Project Safety Briefing form, found on the Health and Safety page of the GEI intranet.

1.2 General

Misuse of hand tools accounts for the majority of accidents and injuries involving hand tools. Only operate power tools according the manufacturer's instructions. Employees using power tools may be exposed to a number of potentially serious hazards including hit by flying material from the work piece; hit by a flying part of a broken tool; explosion or fire resulting from sparks from a tool igniting combustible materials; electric shock from a broken tool, frayed or defective power cord, or improper grounding; exposure to harmful dust, fumes mists, vapors, and gases. Hazards are usually caused by misuse, improper maintenance, and complacency.

1.2.1 Condition of Tools

All hand tools, whether furnished by GEI or the employee, will be maintained in safe working condition with regular maintenance. Always inspect each tool, as well as power cords and attachments, for damage before use. Make sure the power is off and locked out before inspecting. Insure the tool guards are in place and functioning. Insure that blades, bits, and other attachments are securely fastened. Tag worn, damaged, or defective tools "Out of Service" and do not use them. If the tools cannot be repaired they will be disposed of properly. GEI does not issue or permit the use of unsafe hand tools.

1.2.2 Personal Protective Equipment

Employees using hand tools will be provided with the personal protective equipment (PPE) necessary to protect them from the hazard of the tool as well as the associated hazards with using the tool. (i.e. projectile debris, dust, etc.). All employees will wear work gloves, steel-toe or composite-toe boots, and safety glasses at a minimum. In addition, face shields and hearing protection may be required. Most hand injures could be avoided with the proper use of PPE. PPE must be maintained in good condition, kept clean and properly stored when not in use. More information regarding PPE is located in Section 6 of GEI's Corporate Health and Safety Program.

1.2.3 General Safe Practices

Never wear sandals, open-toed or canvas shoes when working with tools. Always tie back long hair. Avoid loose-fitting clothes which might become entangled in a tool. Always remove rings and other jewelry. Never use a tool without its guard in place. Make sure your grip and footing are secure when using large tools. Never carry tools up ladders, use a tool belt, hoist, or a rope. Use extra caution when using tools at heights – a falling tool could kill a co-worker. Always pass a tool to another person by the handle – never toss it to them. Select ergonomically designed tools for work tasks when movements are repetitive and forceful. Always make sure observers are at a safe distance. Always secure work with a vice, clamp, or other support. Moving work surfaces can cause the tool to "kick back." Use extra caution when using power tools around flammable materials. Use fire curtains as appropriate and keep a properly charged fire extinguisher within a reasonable distance. Never surprise someone using a power tool.

1.2.4 Guarding

When power tools are designed to accommodate guards, they will be equipped with such guards prior to, and at all times during use. All guards will be in good condition and be adequate to provide protection to the employee. Regulations stipulate that the following parts of a power tool must be guarded: gears, sprockets, chain drives, belts, pulleys, drums, revolving or reciprocating parts, exposed shafts and projecting shaft ends, collars, clutches and couplings.

1.2.5 Safety Switches

Safety switches allow the tool to be turned off quickly. Hand-held power tools must be equipped with a positive on-off, a momentary on-off, or a constant pressure switch. A positive on-off is a standard on-off switch. Platen sanders, disc sanders, scroll saws and grinders with less than 2"-diameter discs may have a standard on-off switch. A momentary on-off can be turned off by a single motion of the same finger or fingers that turn it on. Drills, reciprocating and saber saws, grinders and belt sanders may have a momentary on-off switch. A constant pressure switch shuts off power upon release. Circular saws and chain saws may have a constant pressure switch. Always test switch to insure it is functioning properly.

1.2.6 Blind Operations

A "blind" operation is any circumstance using any type of saw, drill, or other cutting or penetrating tool where you can't see behind what is being cut. When making a blind cut or drilling operation be sure that hidden electrical wiring, water pipes, or any mechanical

hazards are not in the blade path. If wires are present, they must be disconnected at the power source by a qualified person or avoided. Contact with live wires could cause lethal shock or fire. Water pipes should be drained and capped. Always hold the tool by the insulated grasping surfaces.

1.2.7 Kickback

Kickback is a sudden, uncontrolled reaction to a pinched blade, causing the tool to lift up and out of the work piece toward the operator. Misuse, buildup of sap or dirt on the blade, insufficient set, dullness, and unguided cuts, can all cause kickback. Avoid kickback by keeping saw blades sharp, having proper amount of *set* in the teeth, keeping saw blades clean, and support large panels so they will not pinch the blade. Never set a blade deeper than is required to cut the work piece, no more than ¼ inch greater than the thickness of the stock. Release the switch immediately if the blade binds or the saw stalls.

1.2.8 Power Tool Accessories

The choice of a wrong accessory or the incorrect use can result in serious injury. Read and understand the recommendations in the owner/ operators manual for the tool and the accessory literature. Don't use an accessory or attachment unless: the power tool manufacturer recommends its use on their product, the accessory's limitations and specifications match the limitations and specification of the power tool, the use of the accessory does not require the removal of any guards, and you understand the instructions that describe the safe use of the accessory or attachment. Unplug tools before installing, adjusting, and changing any accessory or attachment of any kind.

1.3 Types of Power-Operated Hand Tools

Power tools include electric, pneumatic (air) liquid flue, hydraulic and powder- actuated. Power tools operate at high speeds, so when things go wrong it happens fast.

1.3.1 Electric Power-Operated - Corded

Electric power operated tools that use a cord will either be double-insulated type or have a three-wire cord plugged into a grounded receptacle grounded according to Occupational Safety and Health Administration (OSHA) regulations. A ground fault circuit interrupter (GFCI) will be used between the power operated tool and the power source. Test the GFCI before each use and use a portable GFCI if necessary. Power tools should always be stored in a dry place when not in use. Never use a tool in wet/damp conditions unless designed to be used in such an environment. Never carry power tools by the cord or yank the cord to disconnect it. Always keep tools and cords away from heat, oil, and sharp edges. Always disconnect power tools when not in use and when changing accessories such as blades and bits.

1.3.2 Electric Power-Operated – Battery (Cordless)

Electric power operated tools that run on batteries should be charged in a dry location and away from all combustible materials. Do no operate cordless tools in or near flammable liquids or explosive atmospheres. Motors in these tools may spark and ignite fumes. Always recharge a cordless tool and its battery with its own specified charging unit. Never attempt to recharge a cordless tool in a recharging unit not specifically recommended for that tool. Remove batteries or lock the switch in its "OFF" position before changing accessories, adjusting or cleaning tools. This removes the power supply while hands are in vulnerable locations such as near switches, bits, or blades. Do not store the batter pack in a container with metal objects such as wire, nails, or coins as it could short the battery. Do not expose the battery pack to moisture, frost, or temperature extremes of over 110 degrees Fahrenheit or under – 20 degrees Fahrenheit.

1.3.3 Liquid Fuel Powered Tools

Liquid fuel powered tools will be stopped and turned off while being refueled, serviced, or maintained. Fuel will be transported, handled, and stored in accordance with federal regulations. Safety Data Sheets (SDS) for fuel or chemicals will be accessible during use of the tools. Only use the tool in a well-ventilated area. The carbon monoxide generated can displace or deplete oxygen. Before refilling a fueled powered tool fuel tank, shut down the engine and allow it to cool. Fuel fumes combined with the heat from the tool could explode. Use only Type 1 or Type 2 approved flammable liquid containers. Clean up any spills from the refueling process.

1.3.4 Hydraulic Power Tools

The fluid used in hydraulic powered tools will be fire-resistant and approved for use with the hydraulic powered tool as specified by the manufacturer. The fluid will retain its operating characteristics at the most extreme temperatures to which it will be exposed.

1.3.5 Pneumatic Power Tools

Pneumatic (air) power tools will be properly maintained and operated according to the manufacturer's safe operating procedures. Make sure air hose connections are secure. Use a short wire or positive locking coupler to attach the air hose to the tool. Check hoses regularly for cuts, bulges, and abrasions (tag and replace if defective). Ensure the safety clip for attachments is installed and secure. Ensure the muzzle is in contact with the surface. Never point the tool at anyone. Avoid using on easily penetrated materials unless they are backed by material that will prevent fastener from passing through. Don't drive fasteners into very hard or brittle material that could chip, splatter, or make the fasteners ricochet. Avoid using compressed air for cleaning.

1.3.6 Powder-actuated Tools

Only employees who have been trained in the operation of the particular tool in use will be allowed to operate a power-actuated tool. Never use in an explosive or flammable atmosphere. Never load the tool unless it will be used immediately. Never leave a loaded tool unattended. Never point the tool at anyone. Always keep hands clear of the barrel end. Always select a powder level that will do the work without excessive force. Avoid using on easily penetrated materials unless they are backed by material that will prevent fastener from passing through. Don't drive fasteners into very hard or brittle material that could chip, splatter, or make the fasteners ricochet.

1.4 Powered Hand Tools

1.4.1 Drills

Be sure the trigger switch actuates properly. If equipped with a lock-on, be sure it releases freely. Be sure the chuck is tightly secured to the spindle. Tighten the drill bit securely as prescribed by the manual. Check auxiliary handles, to be sure they are securely installed. Never force a drill, apply only enough pressure to keep the drill bit cutting smoothly. If the drill binds in the work, release the trigger immediately. Unplug the drill from the power source, and then remove the bit from the work piece. Never attempt to free a jammed bit by starting and stopping the drill. Unplug the tool before changing bits, accessories or attachments.

1.4.2 Saws

1.4.2.1 Circular Saws

Always use sharp blades. Dull blades can cause binding, stalling, and possible kickback. Check blades carefully before each use for proper alignment and possible defects. Be sure all cords are out of the blade path and are sufficiently long to freely complete the cut. Clamp materials whenever possible. Never hold a work piece in your hand when sawing.
Set blade depth to no more than 1/4 inch greater than the thickness of the material being cut. Always allow the blade to reach full speed before the work piece is contacted. NEVER overreach and NEVER reach under the saw or work piece. Never use circular saw for cutting logs or roots, trimming trees, or shrubs.

1.4.2.2 Reciprocating Saws

Always use sharp blades. Dull blades cause binding, stalling, and possible kickback. Only use the blade specifically recommended for the job being done. Be sure all cords are out of the blade path and are sufficiently long to freely complete the cut. Position yourself to maintain full control of the tool, and avoid cutting above shoulder height. The work piece

must be clamped securely, and the shoe of the saw held firmly against the work. When making anything other than a through cut, allow the tool to come to a complete stop before removing the blade from the work piece. Remember that the blade and blade clamp may be hot immediately after cutting. Avoid contact until they have cooled.

1.4.2.3 Jig/Saber Saws

Check that the blades are secured in position before plugging in. Make sure the cord is not in the line of cut. Firmly position the tool's base plate/shoe on the work piece before turning on the tool. Keep your hands and fingers well clear of moving parts. After making partial cuts, turn off and remove the blade from the work piece only after the blade has fully stopped. Maintain firm contact between the base and the material being cut, throughout cutting procedures. Remember that the blade and blade clamp may be hot immediately after cutting. Keep your hands away until cooled down and never overreach.

1.4.3 Abrasive Wheels and Tools

1.4.3.1 Sanders

Sanding dust can be highly explosive if the concentration becomes too great. Insure the work area has adequate ventilation. Always use of exhaust type systems or bag collection. Check the power supply to be sure the switch and switch lock are in the "off" position. Always use the appropriate size disk or belt. Use jigs or fixtures to hold your work piece whenever possible. When sanding, always be aware of the cord location.
Never force a sander - the weight of the tool applies adequate pressure. Do not expose the tool to liquids, or to use in wet locations. When adjusting the tracking of the belt, be certain to avoid accidental contact with yourself or other objects.

1.4.3.2 Grinders

Test grinding wheels before mounting by tapping the wheel lightly with a nonmetallic implement. If it produces a ringing sound, it is in good condition. If it sounds dull, replace the wheel, NEVER USE A CRACKED WHEEL. Use only those wheels and discs marked with a rated speed at or above the speed rating on the nameplate of the tool. Never operate a grinder without the proper guards in place. Always allow the wheel to come up to full speed before you contact the work piece. Do not apply excessive pressure to the wheel or disc. Use grinding wheels when working with hard materials, and use rotary files for soft materials such as aluminum, brass, copper and wood. Using grinding wheels on soft materials will excessively load the wheel and could cause the wheel to shatter or disintegrate.

1.4.3.2.1 Power

Grinding machines will be supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operations. Follow manufacturer recommendations for sufficient power supply.

1.4.3.2.2 Guarding

Grinding machines will be equipped with safety guards in conformance with the requirements of the American National Standards Institute (ANSI) B7.1-1970.

1.4.3.3 Routers

Always disconnect the plug from the electrical outlet before changing bits or making any adjustments. Install router bits securely. Make certain that the cutter shaft is engaged in the collet at least 1/2 inch. Always face the cutter blade opening away from your body. The switch should be in the "off " position before plugging into the power outlet. Always allow the motor to reach full speed before feeding the router into the work. Never attempt to remove debris while the router is operating. Secure clamping devices on the work piece before operating router. When removing a router from your work piece, always be very careful not to turn the base and bit toward you.

1.4.4 Woodworking Tools

1.4.4.1 Disconnect Switches

Fixed power driven woodworking tools will be provided with a disconnect switch that can either be locked or tagged in the off position.

1.4.4.2 Speeds

The operating speed will be etched or otherwise permanently marked on all circular saws over 20 inches in diameter or operating at over 10,000 peripheral feet per minute. Saws will not be operated at a speed other than that marked on the blade.

1.4.4.3 Self-feed

Automatic feeding devices will be installed on machines whenever the nature of the work will permit. Feeder attachments will have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points.

1.4.4.4 Guarding

Portable, power-driven circular saws will be equipped with guards above and below the base plate or shoe.

1.4.4.5 Personal Protective Equipment

Project-specific PPE will be identified in the HASP based on the hazards present during work tasks. Required PPE must be worn when operating hand and power tools. More information regarding PPE is located in Section 6 of GEI's Health and Safety Manual

1.4.4.6 Other Requirements

Woodworking tools and machinery will meet other applicable requirements of ANSI 01.1-1961, Safety Code for Woodworking Machinery.

1.4.5 Jacks – Lever and Ratchet, Screw, and Hydraulic

1.4.5.1 General Requirements

The manufacturer's rated capacity will be legibly marked on all jacks and will not be exceeded. All jacks will have a positive stop to prevent over-travel.

1.4.5.2 Blocking

When the working area does not have a solid working surface and it is necessary to provide a firm foundation, the base of the jack will be blocked or cribbed.

1.4.5.3 Operation and Maintenance

Hydraulic jacks exposed to freezing temperatures will be supplied with adequate antifreeze liquid. Jacks will be properly lubricated at regular intervals. Jacks will be thoroughly inspected, if necessary, based upon the service conditions. Repair or replacement parts will be examined for possible defects. Jacks that are out of order will be tagged accordingly, and will not be used until repairs are made. Parts subjected to wear will be inspected on a regular basis and repaired or replaced as needed.

1.5 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection. Read and understand the recommendations in the owner/ operators manual for the tool, and the accessory literature.

1.6 References

OSHA Standards for the Construction Industry, Subpart I
Risk Analytics Power Tool Safety Training, 2006

1.7 Attachments

None

1.8 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

STANDARD OPERATING PROCEDURES

SOP NO. HS-009 Hazardous Substances Management

1.1 Objective

This Standard Operating Procedure (SOP) is intended to outline the steps GEI employees will take to identify potential hazards associated with exposure to hazardous substances, the risks associated with these hazards, and the proper controls to use to minimize exposure. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential for encounters with biological hazards and the control methods to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Health and Safety page of the GEI intranet.

1.2 Hazard Identification

An initial identification of hazards should be done based on a review of available documents including lists of chemicals used on site, analytical data from soil, surface water, groundwater, air, spill history, site history, equipment on site, maps, photos, and a preliminary survey.

1.3 Risk Identification

Once the presence and concentrations of specific hazardous substances and health hazards have been established, the risks associated with these substances will be identified. GEI employees and GEI subcontractors who will be working on the site will be informed of risks that have been identified.

Risks to consider include, but are not limited to:

- Potential exposures exceeding the permissible exposure limits and published exposure levels.
- Potential Immediately to Life and Health (IDLH) Concentrations.
- Potential Skin Absorption and Irritation Sources.
- Potential Eye Irritation Sources.
- Potential hazardous atmospheres, including oxygen deficiency and fire and explosion hazards.

1.4 Engineering Controls, Work Practices, and Personal Protective Equipment for Employee Protection

Engineering controls, work practices, and personnel protective equipment (PPE) for substances regulated in OSHA Subpart Z (Toxic and Hazardous Substances) will be implemented in accordance with this section to protect employees from exposure to hazardous substances and safety and health hazards.

1.4.1 Engineering Controls, Work Practices, and Personal Protective Equipment for Substances Regulated in Subparts G (Occupational Health and Environment Control) and Subpart Z (Toxic and Hazardous Substances)

Engineering controls and work practices will be instituted to reduce and maintain employee exposure at or below the permissible exposure limits for substances regulated by 29 CFR Part 1910.

Engineering controls that may be feasible include the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment. Work practices may include removing non-essential employees from potential exposure during opening of drums, wetting down dusty operations, and positioning employees upwind of potential hazards.

If engineering controls and work practices are not feasible, or not required, a reasonable combination of engineering controls, work practices, and PPE will be used to reduce and maintain at or below the permissible exposure limits or dose limits for substances regulated by 29 CFR Part 1910, Subpart Z.

GEI will not implement a schedule of employee rotation as a means of compliance with permissible exposure limits or dose limits except when there is no other feasible way of complying with the airborne or dermal dose limits for ionizing radiation.

The provisions of 29 CFR, subpart G, Occupational Health and Environment control, will be followed.

1.4.2 Engineering Controls, Work Practices, and Personal Protective Equipment for Substances <u>Not</u> Regulated in Subparts G and Subparts Z

An appropriate combination of engineering controls, work practices, and personal protective equipment will be used to reduce and maintain employee exposure to or below published exposure levels for hazardous substances and health hazards not regulated by 29 CFR Part 1910, Subparts G and Subparts Z. GEI will use published literature and Safety Data Sheet (SDS) as a guide in making the determination of what level of protection is appropriate for hazardous substances and health hazards for which there is no permissible exposure limit or published exposure limit.

1.4.3 Decontamination Procedure

Decontamination procedure(s) will be developed, communicated to employees, and implemented before employees or equipment enter areas on site where potential for exposure to hazardous substances exists. Procedures will be developed to minimize employee contact with hazardous substances or with equipment that has contacted hazardous substances.

GEI employees leaving a contaminated area will be properly decontaminated; contaminated clothing and equipment leaving a contaminated area will be properly disposed of or decontaminated.

Decontamination procedures will be monitored by the site safety officer (SSO) to determine their effectiveness. When such procedures are found to be ineffective, the site safety officer will contact the CHSO and appropriate steps will be taken to correct deficiencies.

1.4.3.1 Location

Decontamination will be performed in areas that will minimize the exposure to employees, equipment, and the environment.

1.4.3.2 Equipment and Solvents

Equipment and solvents used for decontamination will be decontaminated or disposed of properly.

1.4.3.3 Personal Protective Clothing and Equipment

Protective clothing and equipment will be decontaminated, cleaned, laundered, maintained or replaced as needed to maintain their effectiveness.

Employees whose clothing comes in contact with hazardous substances will immediately remove that clothing and rinse the exposed area with water. The clothing will be disposed of or decontaminated before it is removed from the work zone.

1.4.3.4 Commercial Laundries or Cleaning Establishments

Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment will be informed of the potentially harmful effects of exposures to hazardous substances.

1.4.3.5 Showers and Changing Rooms

Where the decontamination procedure indicates a need for regular showers and change rooms outside of a contaminated area, they will be provided and meet the requirements of

29 CFR 1910.141 (Sanitation). If temperature conditions prevent the effective use of water, then other effective means for cleansing will be provided and used.

1.5 Limitations

None

1.6 Attachments

None

1.7 References

OSHA 1910.120 Hazardous Waste Operations and Emergency Response
OSHA 1910 Subpart G Occupational Health and Environment Control
OSHA 1910 Subpart Z Toxic and Hazardous Substances
OSHA 1910.141 General Environmental Controls - Sanitation

1.8 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

STANDARD OPERATING PROCEDURES

SOP No. HS-010 Inclement Weather

1.1 Objective

Inclement weather can affect work activities and pose safety hazards to employees working in these conditions. The following guidelines will be followed when weather conditions become a safety concern.

1.2 General

This standard operating procedure (SOP) is intended for use by employees engaged in work with the potential to be affected by inclement weather. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential for encounters with biological hazards and the control methods to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Health and Safety page of the GEI intranet.

Employees should be aware of local weather conditions and monitor advisories issued by the National Weather Service and other local reporting services. Depending on location and season, storms are capable of producing heavy rain, floods, extreme temperatures, high wind conditions, lighting, tornados, and/or snowfall.

1.2.1 Heavy Rain

If working or driving in a storm use extreme caution. When driving, turn your lights on when the rainfall becomes heavy. Employees should be aware of the following:

- Heavy rain decreases visibility, especially when driving.
- Surfaces and tools become slippery.
- If you are working in the rain and your clothes become wet there is a risk of hypothermia when exposed to winds, even in warm temperatures.
- If the storms are going to produce thunder and/or lightning, leave the work area immediately and move to a safe area.
- Use your best judgment to determine if the rainfall becomes too heavy to continue working safely.

1.2.2 Lightning

Lightning can strike as far as 10 miles from the area where it is raining. That's about the distance you can hear thunder. **If you can hear thunder, you are within striking distance. Seek safe shelter immediately.** This can be within a building or vehicle. Wait 30 minutes after the last clap of thunder or flash of lightning before going outside again.

1.2.3 Flooding

Flooding may occur as a result of heavy rain in a short period of time. Flooding can be particularly acute in canyon areas where dry creek beds can turn into raging rivers from rainfall in distant or higher elevation areas. Be aware of this and your surroundings and move to a safe place if you begin to see signs that flooding may occur. Do not attempt to drive through areas or streets that are flooded. Seek alternate routes. Be particularly cautious at night when flooded areas are difficult to see. Urban flooding can stop traffic and increase the potential for traffic accidents and becoming trapped in vehicles.

1.2.4 Extreme Temperatures

Work activities may take place in extreme heat or cold. Be prepared if these conditions are anticipated. Have the appropriate personal protective equipment (PPE) available, exercise proper fluid intake, and take breaks to prevent heat and cold stress. For more information about these conditions see the heat stress and cold stress programs found in GEI's Health and Safety Manual.

1.2.5 High Wind and Tornados

Tropical storms are described as storms with sustained winds ranging from 39 to 73 miles per hour (mph) and hurricanes produce sustained winds that exceed 74 mph. When winds approach 40 mph (gale force winds) twigs begin to break off of trees and vehicles will veer off of the road. When winds approach **40 mph** or the GEI employee feels unsafe based on the activities being performed, stop work and seek shelter as soon as possible. Blowing or falling debris and overhanging limbs/signs can be a significant hazard. If possible, avoid driving in these conditions; 70 percent of injuries during hurricanes are a result of vehicle accidents. Note that tall or elevated equipment will have manufacturer's safe operating wind speeds defined that could be less than 40 mph. The operator's manual should be consulted prior to operation of the equipment.

A tornado is a violent, dangerous, rotating column of air that is in contact with both the surface of the earth and a cumulonimbus cloud or, in rare cases, the base of a cumulus cloud. The Fujita Scale is used to rate the intensity of a tornado by examining the damage caused by the tornado after it has passed over a man-made structure. Based on the Fujita Scale or F-Scale Numbers begin at F0: 40-72 mph and go to F6: 319-379 mph (F6 is generally theoretical). Nearly three-fourths of tornados are on the weak F0-F1 scale with just over two-thirds of deaths resulting from the violent F4-F5 tornados. If tornado wind

speeds exceed the 40 mph, stop work and seek shelter immediately if a tornado is seen. If a tornado siren is sounded move immediately to safety indoors and then move to a windowless interior space, basement, stair well, or designated fall-out shelter. Windows should not be opened before an oncoming tornado. If there is no shelter available, seat belt yourself into your stationary vehicle or seek a depression or low spot on the land surface.

1.2.6 Snowfall and Ice Conditions

Working in the winter months will result in activities taking place during periods of snowfall or icy conditions. If you are working during or after snow has fallen, dress appropriately for the conditions. Snow and ice can cause working surfaces to become slippery. Clear snow and ice from work areas to prevent slip hazards. Use caution when performing snow or ice removal activities to prevent injuries. Driving in snowy and icy conditions is also hazardous. Reduce speed and use caution if you must drive in these conditions.

If the weather conditions deteriorate and you do not feel safe working in these conditions, stop work, move to a safe indoor location, and contact your Project Manager to let them know the weather, work conditions, and your location.

1.3 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection. Protection extreme weather conditions can best be accomplished if the conditions are anticipated. Monitor local weather conditions prior to starting work.

1.4 References

Center for Disease Control and Prevention – Natural Disasters and Severe Weather
http://www.bt.cdc.gov/disasters/
National Lightning Safety Institute
NOAA, National Weather Service
Office of Climate, Water, and Weather Services

1.5 Attachment

None

1.6 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer

GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

STANDARD OPERATING PROCEDURES

SOP No. HS-012 Noise Exposures

1.1 Objective

Working in loud environments can cause hearing damage and loss if the proper protection is not in place. The following procedures describe methods to mitigate unhealthy noise levels and protect hearing.

1.2 General

This SOP is intended for use by employees engaged in work within loud environments. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential for work in loud environments and the control methods to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Health and Safety page of the GEI intranet.

Prior to working on a project, an Activity Analysis or Job Hazard Analysis will be performed by the Project Manager or their designee to evaluate the potential hazards and identify steps to be taken to protect workers from hazards. If projects involve high levels of noise from such sources as heavy equipment, power tools, pumps, generators, or other noise source employees should take steps to remove the noise exposure. GEI has an established Hearing Conservation Program located in the GEI Health and Safety Manual.

Hearing protection is required if noise levels in a work area are known to be above 85 decibels (dB), which can be measured with a noise meter. When decibel levels are not known, hearing protection is required if you need to raise your voice to talk to someone standing within a normal speaking distance from you.

The first option for employee protection from hazardous noise levels is to remove the hazard by taking away the source of the noise or using engineering controls to reduce the level. If this cannot be accomplished, the next control measure to be used is to remove the employee from the source. This can be done by moving the work area to a quieter location or distancing the employee from the noise source. For example, GEI employees do not need to be standing next to an operating drill rig or other heavy equipment, by distancing themselves from heavy equipment or other noise sources the need for hearing protection can be eliminated. The final option for employee protection is personal protective equipment (PPE). Disposable ear plugs are made available to GEI employees

and are to be used when required. Additional means of hearing protection will be provided, such as ear muffs, if the disposable ear plugs are not adequate.

Employees should be aware of surroundings such as moving equipment, traffic, and other site hazards when wearing hearing protection.

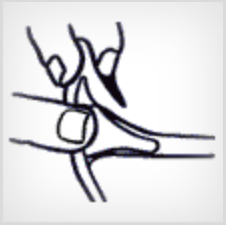
1.3 Proper Use of Hearing Protection

DISPOSABLE EAR PLUG FITTING INSTRUCTIONS

Before fitting any ear plugs, make sure your hands are clean.
Foam ear plugs are disposable and not intended for reuse.

Hold the ear plug between your thumb and forefinger. Roll and compress the entire ear plug to a small, crease-free cylinder. While still rolling, use your other hand to reach over your head and pull up and back on your outer ear. This straightens the ear canal, making way for a snug fit.

Insert the ear plug and hold for 20 to 30 seconds. This allows the ear plug to expand and fill your ear canal.



Test the fit. In a noisy environment, and with earplugs inserted, cup both hands over your ears and release. You should not notice a significant difference in the noise level. If the noise seems to lessen when your hands are cupped over your ears, your ear plugs are not fitted properly. Remove and refit following instructions.

Always remove ear plugs slowly, twisting them to break the seal. If you remove them too quickly, you could damage your ear drum.

REUSABLE EAR PLUG FITTING INSTRUCTIONS

Before fitting any ear plugs, make sure your hands are clean. Reach around your head and pull up and back on your outer ear. This straightens out the ear canal, making way for a snug fit.

Reusable ear plugs should be inspected and cleaned often in soapy water. If they become hard, torn, or deformed they should be replaced.

Hold the stem end of the ear plug and insert it well inside your ear canal until you feel it sealing and the fit is comfortable.

Test the fit. In a noisy environment, and with ear plugs inserted, cup both hands over your ears and release. You should not notice a significant difference in the noise level. If the noise seems to lessen when your hands are cupped over your ears, your ear plugs are not fitted properly. Remove and refit following instructions.

Always remove ear plugs slowly, twisting them to break the seal. If you remove them too quickly, you could damage your ear drum.

1.4 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.5 References

OHSA 29 CFR 1910.95 – Occupational Noise Exposure
OHSA 29 CFR 1926.101 – Hearing Protection
Texas American Safety Company (TASCO)

1.6 Attachment

None

1.7 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

STANDARD OPERATING PROCEDURE

SOP HS-014 Utility Mark-out

1.1 Objective

This standard operating procedure (SOP) provides guidance for utility mark-out procedures related to drilling, excavation, or other sub-surface or intrusive activities to avoid injury to GEI employees or property damage. This SOP is applicable when GEI is responsible for its operation or our subcontractor's operation for utility mark-out.

Clients or local agencies may have additional requirements or procedures for the marking of utilities. If local utility mark-out procedures differ from those described within this SOP, applicable state or municipal regulations should be followed.

1.2 General

- This SOP is intended for use by employees engaged in work with sub-surface or intrusive activities. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential for subsurface hazards and the control methods to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Health and Safety page of the GEI intranet.
- The contractor or GEI employee visits the site and marks out each exploration area with white paint, flags, or stakes. Mark-outs will be performed wearing required PPE, including eye protection when using spray paint to perform the mark-out.
- Exploration locations should be marked out with sample identification number(s) and type of sample (e.g., boring, test-pit, or monitoring well).
- The contractor compiles information about the work areas on a request form specified by the state utility mark-out program and provides this information to the mark-out program call center with a phone call or electronic submittal. Work area location maps can be sent to the utility mark-out program to clarify locations.
- The mark-out program customer service representative will provide a mark-out ticket number and a list of utilities notified upon receipt of the request information. This information will be recorded on the GEI documentation form or in other project documents.

- If known, the contractor will also notify non-member utility operators (such as apartment complexes, commercial complexes, railroads with communication cables, etc.).
- Utility companies or their sub-contractors will only mark-out, or clear, utilities under their responsibility. Generally, this means that they will only mark-out utilities within the public right-of-way up to private property boundaries. Information needed to determine the location of utilities on private properties will be requested from the property owner. This may include available property drawings or as-built figures. If this information is not available, additional non-intrusive surveys of the property may be required by a private utility locator to find underground utilities by using techniques, including ground penetrating radar (GPR).
- American Public Works Association (APWA) Uniform Color Code For Marking Underground Utility Lines are:

    1. **White** – Proposed Excavation
    2. **Pink** – Temporary Survey Markings
    3. **Red** – Electric Power Lines, Cables, Conduit and Lighting Cables
    4. **Yellow** – Gas, Oil, Steam, Petroleum, and Gaseous Material
    5. **Orange** – Communications, Alarm, Signal Lines, Cables or Conduit
    6. **Blue** – Water
    7. **Purple** – Radioactive Materials
    8. **Green** – Sanitary and Storm Sewers and Drain Lines

- Before the intrusive work activities begin, the contractor will verify that each utility company has completed a utility location for the work area or the location has been cleared by a private locator and record this on the mark-out request information sheet.
- A visual survey of the project area will be done prior to the start of intrusive activities. This visual inspection will be done to identify signs, manholes, utility boxes, or other evidence of an underground utility is present and has been considered.
- The contractor can begin work on the scheduled work date and time if the utility operators have responded, taking care to find and preserve markings that have been made.
- Completed clearance documentation will be located on the excavation site during excavation activities and kept in project files.
- When excavating near a buried utility, observe the approximate location around that utility.

- If exposing a utility, proper support and protection must be provided so that the utility will not be damaged.
- If the excavation work requires significant spans of the utility to be exposed, it is the contractor's responsibility to support them (to prevent sagging or collapse) as needed. Contact the utility operator for support, guidance, or assistance.
- When the excavation is complete, provide proper backfill for utilities that have been exposed.

- Take care not to damage the conduit or protective coating of a utility. If the contractor damages this, leave the damaged utility exposed and immediately call the utility owner.
- If a gas line is contacted, the contractor must notify police, fire, and emergency personnel, and evacuate employees according to the site evacuation procedures. No attempt should be made to tamper with or correct the damaged utility.
- If the contractor/consultant needs to dig within the approximate location of a combustible, hazardous fluid, or gas line (natural gas, propane or gasoline), soft digging is required (hand digging, vacuum extraction) to a maximum depth of five feet. The approximate location is defined as 24 inches on either side of the designated center line of the utility if the diameter is not provided or 24 inches from each outside edge if the diameter is provided.

1.3 Limitations

- Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection.
- Mark-out notification time usually does not include holidays. Make sure holidays are considered and mark-out time is scheduled accordingly. Under no circumstances are intrusive activities allowed to be performed prior to the required mark-out.
- Do not use white paint if precipitation is eminent. Consider using stakes if snow is predicted.

1.4 References

Reference the website for the "Call Before You Dig – 811" for the utility mark-out agency for the state you working in prior to site work. If you have issues locating the appropriate agency, contact the Health and Safety Committee for assistance.

1.5 Attachment

Attachment A – Standard Utility Color Codes
Attachment B – GEI Utility Clearance Documentation Form

1.6 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

COLOR CODE FOR UTILITY MARKING

(BASED ON 'THE AMERICAN PUBLIC WORKS ASSOCIATION' RECOMMENDATIONS AND THE ANSI STANDARD Z-53.1 FOR SAFETY COLORS)

UTILITY	COLOR
PROPOSED EXCAVATION	WHITE
ELECTRIC POWER LINES, CABLES, CONDUIT AND LIGHTING CABLES	RED
POTABLE WATER	BLUE
STEAM, CONDENSATE, GAS OR OIL COMPRESSED AIR	YELLOW
TELECOMMUNICATIONS, ALARM OR SIGNAL LINES, CABLES OR CONDUIT	ORANGE
TEMPORARY SURVEY MARKINGS	PINK
SEWER AND STORM DRAINS	GREEN
CHILLED WATER, RECLAIMED WATER, IRRIGATION AND SLURRY LINES	PURPLE
OTHER	LIGHT BLUE

1.0/4902e011.pdf (12/2004)

Utility Clearance Documentation

Client: _____

Project: _____

Site: _____

Excavation/Drilling Location ID: _____

Excavator/Driller: _____

GEI PM: _____

GEI Field Team Leader: _____

Utility Drawings Reviewed: _____

Provided By: _____

Reviewed By: _____

Utility Clearance Call Date: _____

Utility Clearance Received back from (list utilities): _____

Completed By (Company): _____ Date: _____

GEI Staff Responsible for Oversight: _____

Metal Detector Survey (yes/no): _____

Drilling Location Cleared by: _____

Contractor: _____ Date: _____

GEI Staff Responsible for Oversight: _____

Private Location Clearance Required (yes/no): _____

Contractor: _____ Date: _____

Methods used for utility location (i.e. GPR, electronic pipe location) _____

GEI Staff Responsible for Oversight: _____

Hand clearing Performed: _____ Date: _____

Contractor: _____

GEI Staff Responsible for Oversight: _____

Notes: _____

Based upon the best available information, appropriate utility clearance procedures were performed for the invasive work specified. If client ordered/site specific deviations from existing GEI utility clearance procedures exist, they are approved by the client signature below.

Client Signature (Optional): _____ Date: _____

GEI, Inc. Representative: _____ Date: _____

STANDARD OPERATING PROCEDURES

SOP No. HS-016 Traffic Hazard Management

1.1 Objective

The objective of this standard operating procedure (SOP) is to prevent or limit the potential for GEI personnel to encounter traffic hazards during field activities.

1.2 General

This SOP is intended for use by employees engaged in work with the potential for traffic hazards. The site-specific health and safety plan (HASP) should include a hazard assessment for the project that identifies the potential for exposure to traffic hazards and the control methods to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Health and Safety page of the GEI intranet.

1.3 Traffic Hazard Management

Traffic Hazard Management is the process of identifying and managing the potential risks associated with the movement of traffic through, around, or past a work area. This Traffic Hazard Management SOP is designed to assist employees in identifying and managing these hazards. Work areas should be as safe as possible. It is the responsibility of GEI employees to follow the Traffic Hazard Management plan and adhere to these safety standards. Safety is not negotiable.

Under no circumstances are GEI employees permitted to commence work in a situation that they feel puts their health and safety, or the health and safety of others, at risk.

Major risk factors for work site Traffic Hazard Management include:

- The speed of traffic past or through a work site.
- The clearance between moving traffic, workers, vehicles and equipment, and over-head power lines.
- Traffic volume and vehicle composition.
- Nature and conditions at the work site and approaches to the work site.
- Other factors such as the time of day, sight distance, weather, presence of pedestrians, or cyclists, and the type of work being carried out.

- Other hazards in proximity to the work site (e.g., power lines, open excavations) that may have conflicting measures needing to be considered when developing the plan.

1.4 Site Preparation

The following management measures will be considered whenever working in traffic areas. In addition, remain aware of the amount of traffic around the working area. The work space should be large enough for the job to be completed safely. Check permit, traffic control plans, and flagger/police detail requirements for the local jurisdiction. Perform routine checks of the work zone to make sure there are adequate levels of protection.

1.4.1 Warning Cones and Warning Signs

GEI employees will comply with the Department of Transportation's (DOT) Manual on Uniformed Traffic Control Devices (MUTCD) and/or state regulations for temporary traffic barriers (cones, barriers) and sign placement when required for working in traffic areas. Clearly define the work site by placing traffic barriers around the work space to indicate the space that is needed to safely perform the work. The traffic barrier will help make the work site more visible to other workers and moving vehicles. Place traffic barriers to give yourself adequate space to work, so equipment is not outside the space. OSHA suggests placing the first warning sign at a distance calculated to be 4 to 8 times (in feet) the speed limit (in MPH).

1.4.2 Adequate Light

Requirements for night conditions and work areas with poor visibility are similar to day requirements; however there are a number of additional things to consider, such as visibility of the work site to advancing traffic and sufficient lighting. OSHA requires lighting for workers on foot and equipment operators to be at least 5 foot-candles or greater.

Visibility of the work area can be increased by employing the following measures:

- Using parked vehicles hazard and flashing lights.
- Wearing reflective safety vest that is in good condition.
- Providing adequate lighting to illuminate the work area. This lighting should be positioned so that there is no glare to approaching drivers.
- Placing advance warning signs and cones with retro reflective stripes so that they are visible to road users.

1.4.3 Distance from the Nearest Traffic Lane

Work areas located along roadsides will have a minimum clearance as defined by DOT's MUTCD and/or state or local DOT regulations for cone and sign placement.

1.4.4 PPE

The proper personal protective equipment (PPE), as outlined in the project HASP, will be worn when appropriate. The color/type of safety vest will comply with site regulations.

1.5 Equipment Operation

Vehicles and heavy equipment operators should use a spotter when possible if it is necessary to drive in reverse to reduce risk of collision with oncoming traffic. If it is necessary to drive against the flow of traffic make sure this area is within the work zone and properly blocked off from oncoming traffic.

1.6 Pedestrian Safety

When working near pedestrian traffic, a safe walkway will be established. Refer to local regulations when establishing pedestrian walkways.

1.7 Limitations

Follow safety procedures as defined in the site-specific HASP, federal DOT, and local jurisdictions. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.8 References

DOT's Manual on Uniformed Traffic Control Devices (2009 Edition)
https://www.osha.gov/SLTC/etools/hurricane/work-zone.html

1.9 Attachments

None

1.10 Contact

GEI Corporate Health and Safety Officer
GEI East-North Regional Health and Safety Officer
GEI East-South Regional Health and Safety Officer
GEI Mid-West Regional Health and Safety Officer

GEI Western Regional Health and Safety Officer

STANDARD OPERATING PROCEDURES

SOP No. HS-018 Working Around Heavy Equipment

1.1 Objective

The objective of this standard operating procedure (SOP) is to prevent or limit the physical hazards when working around heavy equipment for GEI personnel.

1.2 General

This SOP is intended for use by employees engaged in work with the potential for working near heavy equipment. The site-specific health and safety plan (HASP) should include a hazard assessment for the project for working near heavy equipment to be implemented by GEI employees. These hazards should be reviewed in the project safety briefing and documented on the Project Safety Briefing form, found on the Health and Safety page of the GEI intranet.

1.3 Heavy Equipment

Heavy equipment (excavators, backhoes, drill rigs, etc.), can present many physical hazards that can result in serious injury or death if the proper safety precautions are not followed. The following is a list of precautions to be aware of when working around heavy equipment:

- Wear appropriate personal protective equipment (PPE), including a reflective, high-visibility safety vest.
- Always keep your distance from moving vehicles.
- Do not assume the vehicle operator knows where you are or where you are going. Make sure to make eye contact and receive acknowledgement of your presence with the operator. Avoid working near heavy equipment, but if unavoidable, communicate your location with the heavy equipment operators. If using hand signals, discuss the signals with the equipment operator prior to starting work.
- Watch for moving equipment. Construction sites can have a lot of activity and vehicles may be moving closer than you may think.
- Do not rely on back-up or other alarms. They may not be working or you may not hear them with the noise of other activities taking place in the area.
- Stay out of the swing radius of cranes, excavators, or other equipment that swings or rotates.
- Do not walk beside a moving vehicle, the vehicle may turn, slip, or the load may shift causing the vehicle to go off course.

- Do not ride on the outside of a moving vehicle.
- Always stay out from under a suspended load on cranes or hoists, even if it means taking the long way around.
- Do not walk behind a piece of equipment that is backing up. The operator may not see you.
- If working next to heavy equipment is unavoidable, be aware of the hazards including pinch points and moving parts. Use a spotter to watch the work area for moving equipment.
- If necessary, ask the operator to stop equipment operation to perform your work tasks.
- Verify the location and operation of emergency shut-off devices on the equipment.
- Be aware of the fuels and chemicals associated with the equipment. Have a spill prevention and response plan in place that includes the appropriate containment materials (i.e., spill kit).
- Do not wear loose fitting clothing when working around moving equipment (i.e., drill rig augers).
- Do not operate heavy equipment.
- Do not use cellular telephones near operating equipment.

1.4 Limitations

Follow safety procedures as defined in the site-specific HASP. Appropriate PPE must be worn correctly to provide the intended level of protection.

1.5 References

OSHA 29 CFR 1926.600 – Subpart O; Motor Vehicles, Mechanized Equipment, and Marine Operations.
www.*toolboxtopics.com*/Construction
Caterpillar Safety – http://safety.cat.com/

1.6 Attachment

None

1.7 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

STANDARD OPERATING PROCEDURES

SOP No. HS-025 Manual Lifting

1.1 Objective

The purpose of the GEI Consultants, Inc. (GEI) Manual Lifting SOP is to identify and reduce potential work-related musculoskeletal disorder (WMSD) hazards. The SOP is intended to comply with state regulations and safe work practices developed by the Occupational Safety and Health Administration (OSHA). Modifications to meet these requirements will be made to this program as changing laws or regulations dictate.

1.2 General

The following Safe Lifting guidelines will be followed by GEI employees involved in manual lifting activities:

- Before manual lifting is performed, a hazard assessment must be completed. The assessment must consider size, bulk, and weight of the object(s), if mechanical lifting equipment is required, if two-man lift is required, whether vision is obscured while carrying and the walking surface and path where the object is to be carried.
- Get a co-worker to help if equipment or other item is too heavy to lift.
- If possible, use powered equipment instead of manually lifting heavy materials. Lifting equipment such as dollies, hand trucks, lift-assist devices, jacks, or carts can be provided for employees.
- Reduce lifts from shoulder height and from floor height by repositioning the shelf or bin.
- Make sure walkways are clear of tripping hazards before moving materials.
- Use your legs and keep your back in a natural position while lifting. Keep the load close to your torso.

- Test the load to be lifted to estimate its weight, size, and bulk and to determine the proper lifting method.

- Do not twist while carrying a load. Instead, shift your feet and take small steps in the direction you want to turn.
- Make sure there are appropriately marked and sufficiently safe clearances for aisles and at loading docks or passageways where mechanical-handling equipment is used.
- Properly stack loose or unboxed materials which might fall from a pile by blocking, interlocking, or limiting the height of the pile to prevent falling hazards.
- Bags, containers, bundles, etc. should be stored in tiers that are stacked, blocked, interlocked, and limited in height so that they are stable and secure to prevent sliding or collapse.
- Storage areas should be kept free from accumulation of materials that could lead to tripping, fire, or explosion.
- Work methods and stations should be designed to minimize the distance between the person and the object being handled.

Supervision must periodically evaluate work areas and employees' work techniques to assess the potential for and prevention of injuries. New operations should be evaluated to engineer out hazards before work processes are implemented.

1.3 Injury Reporting

Injuries experienced during manual lifting activities should receive prompt medical attention. If a GEI employee suffers an injury on the job, he/she is to report the injury to their immediate supervisor within 2 hours of the incident. The supervisor will immediately notify the CSHO and Director of Human Resources.

After verbal notification has been made, an Incident and Accident Report Form is to be completed by the employee and/or Project Manager and submitted to Human Resources and the CHSO within 24 hours of its occurrence. This form is available on the Health and Safety site on the GEI Intranet.

Upon notification from a Branch or Office Manager, Human Resources, and/or the receipt of the Incident and Accident Report Form, the CHSO and/or the RHSO will conduct an investigation and evaluation of the incident and the incident response. Information received will be analyzed for the hazards and risk factors associated with the incident. The CHSO will then recommend (as necessary) engineering controls, PPE, training or other appropriate measures to minimize the potential for future musculoskeletal injuries. The CHSO/RHSO will develop educational information based on lessons learned for distribution to GEI employees.

1.4 Training

Training will include general principles of ergonomics, correct maul lifting training to avoid musculoskeletal injuries, recognition of hazards and injuries, procedures for reporting hazardous conditions, and methods and procedures for early reporting of injuries.

1.5 Ergonomic Evaluation Process

1.5.1 Requesting an Evaluation

An evaluation can be requested by the employee if they have concerns about their workstation, tasks, or are experiencing discomfort while working. The employee can request an evaluation by directly contacting their supervisor, Branch Manager, RHSO, HR or the CHSO via email. The Branch Manager will be notified of the requested evaluation. The Coordinator will send the Worksheet to the employee, who will complete it and return it to the Coordinator. The Coordinator will review the Worksheet and suggest modifications to the employee. If these modifications do not resolve the issue, the Coordinator will then schedule an in-person evaluation with the employee. If an employee is experiencing discomfort at their workstation and a request for an evaluation has been made, the evaluation will occur as soon as possible to assist the employee. If the Coordinator is not available another Coordinator will be assigned the evaluation.

Coordinators will be trained to treat the information obtained during the evaluation as confidential. If there are concerns the employee does not wish to discuss with the Coordinator due to their personal nature, a representative from HR will be designated to assist with the evaluation.

1.5.2 Job Hazard Analysis

Once the evaluation has been scheduled, the Coordinator will meet with the employee at their workstation and conduct the interview and review their work area. The Ergonomic Evaluation Checklist will help guide the Coordinator through a series of questions to help evaluate the potential ergonomic safety concerns. The evaluation is designed to be a conversation between the employee and Coordinator to help develop an open dialog. During the evaluation the Coordinator will identify ergonomic risk factors and implement immediate corrective actions, if possible. In many cases, simple adjustments can be made to the work station using existing equipment. Ergonomic work practices including “ergo breaks” and stretching can also be recommended.

1.5.3 Corrective Actions

During the evaluation the Coordinator may suggest adjustments that can be made to the existing work station. The employee will be encouraged to adopt the suggestions but ultimately has the choice to accept and implement them. Once the evaluation has been completed, the Coordinator will review the evaluation and if there are concerns, they will evaluate them with the HSC. Once the HSC has discussed the evaluation and developed corrective actions, they will be documented on the Checklist. The corrective actions will be shared with the employee and the Branch Manager. Prior to equipment purchases, approval will be authorized by the local branch manager.

Broken equipment will be taken out of service, properly disposed of and replaced. If improper equipment is being used, the proper equipment will be obtained or purchased with approval. If the employee's workspace presents a hazardous condition (fire hazards, trip hazards, noise exposure, etc.) the hazard will be corrected, if possible, or the employee will be moved to a safe workspace. If the equipment being used is not an appropriate fit for the employee, a suggestion will be made in the evaluation report to obtain or purchase the equipment that fits the employee properly.

If a repetitive task is identified, options will be discussed with the Branch Manager, the HSC and/or other appropriate personnel to evaluate whether the task can be altered to facilitate a safer condition. Many times accelerated deadlines, apprehension, or lack of options cause an employee to believe they don't have a choice and will just push through to complete the task potentially causing an ergonomic injury. These types of situations need to be recognized and corrected. A proactive approach by both the Branch Manager and employee should be instituted to prevent or anticipate these situations so that the correct equipment, additional employees or better planning can be incorporated while still meeting the deadline.

The organization of the workspace is also an important ergonomic factor. Items should be placed so that frequently used equipment is within arm's reach and located on the correct side of the body for which that equipment is used to prevent unnecessary twisting or reaching. Having adequate space to complete tasks is necessary but may not be achieved if piles and unnecessary items occupy the space. The Coordinator can suggest how to take advantage of tools and organizational skills to free up space.

Other areas of concern may be outside factors that occur away from the office. If the employee conducts field work, the tasks should be completed with ergonomics in mind.

A separate evaluation of these tasks may be conducted to determine if a different process or equipment may be used to reduce any unnecessary pressure or fatigue to the employee's body. At times when employees have permission to work from home or use their GEI computers at home, in hotels while traveling, in an environment that is not ergonomically correct, employees will be encouraged to adopt the ergonomic recommendations they learn at work.

Employee's hobbies can also pose ergonomic risks. Hobbies that involve repetitive motions, prolonged postures, vibration, excessive force/overexertion and adverse environmental factors may cause ergonomic injuries that can be aggravated at work.

During the interview process, the Coordinator will try to identify these risks and discuss techniques to help alleviate discomfort and minimize additional injury. It will be up to the employee to modify anon-related work risks.

If an employee is experiencing discomfort, efforts will be made to alleviate the discomfort while at work. For example, if an employee has a physical injury that occurred outside of work that requires them to keep their leg elevated, the employee can work with their Coordinator to determine a solution. This may involve temporarily modifying their workstation or transferring to another workstation. Healthy work practices and generally good health are keys to staying comfortable at work too. Regular stretch breaks, good posture, vision check-ups, good sleep habits and maintaining a healthy weight are factors in creating a comfortable work environment. If a physical non-work related problem persists and impedes the employee from being effective at work, suggestions may be made to see a personal physician for further advice.

1.5.4 Reporting and Follow-up

Once the evaluation has been completed and the Coordinator's suggestions have been implemented, the Coordinator will document the findings on the Checklist and an evaluation report will be completed and submitted to the employee, the evaluated employee's Branch Manager, and the CHSO. Then a follow-up will be conducted by the Coordinator to evaluate whether the adjustments were successful. The timeline for follow-up will be based on the adjustments suggested and employed. If new equipment is installed, the Coordinator will follow-up after the equipment has been installed and the employee has had time to adjust to it. If an injury has been identified, the Coordinator will notify the Branch Manager and CHSO immediately following the evaluation. This will confirm on-going management of the injury.

During the follow-up evaluation the Coordinator will make visits to the employee's workstation and assess visually and through interviews determine how the changes have been received. Each of these follow-ups will be documented on the Checklist. If during the follow-up a re-adjustment or different equipment is needed, the reevaluation process will continue until the employee is comfortable.

1.6 Limitations

Follow safety procedures for manual lifting.

1.7 References

OSHA Technical Manual (OTM), Section VII: Chapter 1 - Back Disorders And Injuries

1.8 Attachments

None

1.9 Contact

GEI Corporate Health & Safety Officer
GEI East – North Regional Health & Safety Officer
GEI East – South Regional Health & Safety Officer
GEI Central Regional Health & Safety Officer
GEI West Regional Region Health & Safety Officer

Appendix B

Community Air Monitoring Plan

Appendix G
New York State Department of Health
Community Air Monitoring Plan

Overview

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 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 DEC/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, particularly if wind direction changes. 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.

1. 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.

2. 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.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) 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.

1. 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.

2. 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.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

Special Requirements for Work within 20 Feet of Potentially Exposed Individuals or Structures:

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1ppm, monitoring should occur within the occupied structure(s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.

  If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.

- Depending upon the nature of contamination and remedial activities, other parameters (e.g. explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

Appendix C

Vacuum Influence Calculations

Appendix C
Vacuum Influence Calculations
Interim Remedial Measure Work Plan
486 Sunrise Highway
Rockville Centre, New York

VEP-1		
Distance	***Vacuum***	
ft	***in-H2O***	***Pascals***
0.0	10.00	2490.9
6.0	4.84	1205.6
8.5	1.85	460.8
8.5	1.73	430.9
15.5	0.50	124.5
16.0	1.35	336.3
24.0	0.10	24.9

VEP-2		
Distance	***Vacuum***	
ft	***in-H2O***	***Pascals***
0.0	10.00	2490.9
9.0	4.35	1083.5
9.0	1.28	318.8
10.0	2.32	577.9
13.0	1.03	256.6
17.0	0.61	151.9
18.0	0.50	124.5
20.0	0.30	74.7
21.0	0.24	59.8
30.0	0.08	19.9
37.0	0.03	7.5

VEP-3		
Distance	***Vacuum***	
ft	in-H2O	Pascals
0.0	10.00	2490.9
5.0	0.26	64.8
10.0	0.09	22.4
10.0	0.16	39.9
18.0	0.00	0.0
20.0	0.03	7.5
20.0	0.06	14.9

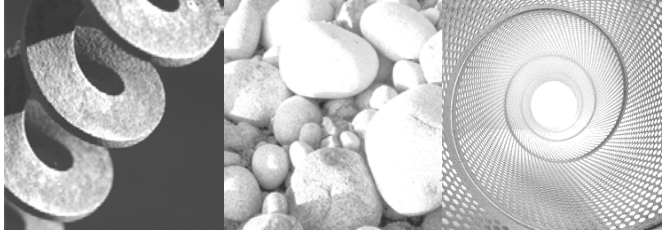
VEP-1 + VEP-2 Data		
Distance	***Vacuum***	
ft	***in-H2O***	***Pascals***
0.0	10.00	2490.9
0.0	10.00	2490.9
6.0	4.84	1205.6
8.5	1.85	460.8
8.5	1.73	430.9
9.0	4.35	1083.5
9.0	1.28	318.8
10.0	2.32	577.9
13.0	1.03	256.6
15.5	0.50	124.5
16.0	1.35	336.3
17.0	0.61	151.9
18.0	0.50	124.5
20.0	0.30	74.7
21.0	0.24	59.8
24.0	0.10	24.9
30.0	0.08	19.9
37.0	0.03	7.5

Calculated Influence		
Distance	***Vacuum***	
ft	***in-H2O***	***Pascals***
0	4.00	996.4
1	3.38	843.1
2	2.86	713.4
3	2.42	603.7
4	2.05	510.9
5	1.74	432.3
6	1.47	365.8
7	1.24	309.5
8	1.05	261.9
9	0.89	221.7
10	0.75	187.6
11	0.64	158.7
12	0.54	134.3
13	0.46	113.6
14	0.39	96.2
15	0.33	81.4
16	0.28	68.9
17	0.23	58.3
18	0.20	49.3
19	0.17	41.7
20	0.14	35.3
21	0.12	29.9
22	0.10	25.3
23	0.09	21.4
24	0.07	18.1
25	0.06	15.3
26	0.05	13.0
27	0.04	11.0
28	0.04	9.3
29	0.03	7.9
30	0.03	6.6
31	0.02	5.6
32	0.02	4.8
33	0.02	4.0
34	0.01	3.4
35	0.01	2.9
36	0.01	2.4
37	0.01	2.1
38	0.01	1.7
39	0.01	1.5
40	0.01	1.3

Highlighted Row += Approximate Target
Radius per SSDS Point (~30')

Appendix D

Quality Assurance Project Plan



GEI Consultants

Consulting
Engineers and
Scientists

Quality Assurance Project Plan

486 Sunrise Highway
Rockville Centre, New York
NYSDEC BCP Site No. C130220

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July 2016
Project: 1500620

Christopher, Project Manager

Gary A. Rozmus, P.E.
Program Manager

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Tables

Appendices

Abbreviations and Acronyms

%R	Percent Recovery
ASP	Analytical Service Protocol
CAS	Chemical Abstracts Service
CHMM	Certified Hazardous Materials Manager
CLP	Contract Laboratory Protocol
COC	Chain Of Custody
DER	Division of Environmental Remedial
DQO	Data Quality Objective
DO	Dissolved Oxygen
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
FSP	Field Sampling Plan
GEI	GEI Consultants, Inc., P.C.
LCS	Labortory Control Sample
mg/kg	Milligrams per Kilogram
MDL	Method Detection Limit
MPH	Master of Public Health
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NYCRR	New York Code, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	Oxidation Reductioin Potential
PAH	Polycyclic Aromatic Hydrocarbon
PDIWP	Pre-design Investigation Work Plan
PID	Photoionization Detector
PM	Project Manager
PQL	Practical Quantification Limit
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RIWP	Remedial Investigation Work Plan
RL	Reporting Limit
RPD	Relative Percent Difference

RSD	Relative Standard Deviation
SD	Standard Deviation
SVOC	Semivolatile Organic Compound
TIC	Tentatively Identified Compounds
$\mu g/m^3$	Micrograms per Cubic Meter
UN	United Nations
USDOT	United States Department of Transporation
UST	Underground Storage Tank
VOC	Volatile Organic Compound

Quality Assurance Glossary

"Alteration" means altering a sample collected for analysis in any way other than by adding a preservative, such as nitric acid to lower pH. Examples of alteration include, but are not limited to: filtering, settling and decanting, centrifuging and decanting, and acid extracting.

"Analytical Services Protocol" or "ASP" means the New York State Department of Environmental Conservation's (NYSDEC's) compendium of approved United States Environmental Protection Agency (EPA) and NYSDEC laboratory methods for sample preparation and analysis and data handling procedures.

"Correlation Sample" means a sample taken, when using a field-testing technology, to be analyzed by an Environmental Laboratory Accreditation Program (ELAP)-certified laboratory to determine the correlation between the laboratory and field analytical results.

"Confirmatory Sample" means a sample taken after remedial action is expected to be complete to verify that the cleanup requirements have been met. This term has the same meaning as "post remediation sample."

"Contract laboratory program" or "CLP" means a program of chemical analytical services developed by the EPA to support the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

"Data Usability Summary Report, (DUSR)" is a document that provides a thorough evaluation of the analytical data to determine whether the data, as presented, meets the site/project specific criteria for data quality and use.

"Effective solubility" means the theoretical aqueous solubility of an organic constituent in groundwater that is in chemical equilibrium with a separate phase mixed product (product containing several organic chemicals). The effective solubility of a particular organic chemical can be estimated by multiplying its mole fraction in the product mixture by its pure phase solubility.

"Environmental Laboratory Accreditation Program" or "ELAP" means a program conducted by the New York State Department of Health (NYSDOH), which certifies environmental laboratories through onsite inspections and evaluation of principles of credentials and proficiency testing.

"Filtration" means the filtering of a groundwater or surface water sample, collected for metals analysis, at the time of collection and prior to preservation. Filtering includes, but is not limited to, the use of any membrane, fabric, paper or other filter medium, irrespective of pore size, to remove particulates from suspension.

"**Final delineation sample**" means a sample taken as an endpoint sample, used to make a decision regarding the extent of contamination at a site, which is to be analyzed by an ELAP-certified laboratory.

"Intermediate Sample" means a sample taken during the investigation process that will be followed by another sampling event to confirm that remediation was successful or to confirm that the extent of contamination has been defined to below a level of concern.

"Method detection limit" or "MDL" means the minimum concentration of a substance that can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the analyte.

"Minimum reporting limit" means the lowest concentration at which an analyte can be detected and which can be reported with a reasonable degree of accuracy. It is the lowest concentration that can be measured, a lab-specific number, developed from minimum detection limits, and is also referred to as the practical quantitation limit (PQL).

"Nephelometric Turbidity Unit" or "NTU" is the unit by which turbidity in a sample is measured.

"Non-targeted compound" means a compound detected in a sample using a specific analytical method that is not a targeted compound, a surrogate compound, a system monitoring compound, or an internal standard compound.

"Practical quantitation level" or "PQL" means the lowest quantitation level of a given analyte that can be reliably achieved among laboratories within the specified limits of precision and accuracy of a given analytical method during routine laboratory operating conditions.

"Preservation" means preventing the degradation of a sample due to precipitation, biological action, or other physical/chemical processes between the time of sample collection and analysis. The most common examples involve refrigeration at 4 degrees Celsius and

lowering sample pH by the addition of acid to keep dissolved metals in solution or to reduce the biodegradation of dissolved organic analytes.

"PAH" means polycyclic aromatic hydrocarbon as defined by USEPA Method 8270.

"Quality assurance" or "QA" means the total integrated program for assuring the reliability of monitoring and measurement data, which includes a system for integrating the quality planning, quality assessment, and quality improvement efforts to meet data end-use requirements.

"Quality assurance project plan" or "QAPP" means a document, which presents in specific terms the policies, organization, objectives, functional activities, and specific quality assurance/quality control activities designed to achieve the data quality goals or objectives of a specific project or operation.

"Quality control" or "QC" means the routine application of procedures for attaining prescribed standards of performance in the monitoring and measurement process.

"Semi-volatile organic compound" or "SVOC" means compounds amenable to analysis by extraction of the sample with an organic solvent. For the purposes of this section, semi-volatiles are those target compound list compounds identified in the statement of work in the current version of the EPA Contract Laboratory Program.

"Target analyte list" or "TAL" means the list of inorganic compounds/elements designated for analysis as contained in the version of the EPA Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration in effect as of the date on which the laboratory is performing the analysis. For the purpose of this Project Plan, a Target Analyte List scan means the analysis of a sample for Target Analyte List compounds/ elements.

"Targeted compound" means a hazardous substance, hazardous waste, or pollutant for which a specific analytical method is designed to detect that potential contaminant both qualitatively and quantitatively.

"Target compound list plus 30" or "TCL+30" means the list of organic compounds designated for analysis (TCL) as contained in the version of the EPA "Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration" in effect as of the date on which the laboratory is performing the analysis, and up to 30 non-targeted organic compounds (plus 30) as detected by gas chromatography/mass spectroscopy (GC/MS) analysis. For the purposes of this Project Plan, a Target Compound

List+30 scan means the analysis of a sample for Target Compound List compounds and up to 10 non-targeted volatile organic compounds and up to 20 non-targeted semi-volatile organic compounds using GC/MS analytical methods. Non-targeted compound criteria should be pursuant to the version of the EPA "Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration" in effect as of the date on which the laboratory is performing the analysis.

"Tentatively identified compound or TIC" means a chemical compound that is not on the target compound list but is detected in a sample analyzed by a GC/MS analytical method. TICs are only possible with methods using mass spectrometry as the detection technique. The compound is tentatively identified using a mass spectral instrumental electronic library search and the concentration of the compound estimated.

"Unknown compound" means a non-targeted compound which cannot be tentatively identified. Based on the analytical method used, the estimated concentration of the unknown compound may or may not be determined.

"Volatile organic compounds" or "VOC" means organic compounds amenable to analysis by the purge and trap technique. For the purposes of this Project Plan, analysis of volatile organics means the analysis of a sample for either those priority pollutants listed as amenable for analysis using EPA method 624 or those target compounds identified as volatiles in the version of the EPA "Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration" in effect as of the date on which the laboratory is performing the analysis.

"**Waste oil"** means used and/or reprocessed engine lubricating oil and/or any other used oil, including but not limited to: fuel oil, engine oil, gear oil, cutting oil, transmission fluid, oil storage tank residue, animal oil, and vegetable oil, which has not subsequently been refined.

"Well development" means the application of energy to a newly installed well to establish a good hydraulic connection between the well and the surrounding formation. During development, fine-grained formation material that may have infiltrated the sand pack and/or well during installation is removed, allowing water from the formation to enter the well without becoming turbid and unrepresentative of groundwater in the formation.

1. Purpose

GEI Consultants, Inc., P.C. (GEI) has prepared this Quality Assurance Project Plan (QAPP) to address analytical sampling at the site known as 486 Sunrise Highway, Rockville Centre (the site). The QAPP is a companion document and attachment to the *Pre-design Investigation Work Plan (PDIWP)*. The QAPP presents the project scope and goals, organization, objectives, sample handling procedures, and Quality Assurance Quality Control (QA/QC) procedures associated with the site.

Furthermore, this QAPP identifies project responsibilities, prescribes guidance, and specifications to make certain that:

- Samples are identified and controlled through sample tracking systems and chain-of-custody (COC) protocols.
- Field and laboratory analytical results are valid and usable by adherence to established protocols and procedures.
- All aspects of the investigation, from field to laboratory are documented to provide data that are technically sound and legally defensible.

The requirements of this QAPP apply to all contractor activities as appropriate for their respective tasks.

This QAPP was prepared based upon guidance provided by the United States Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC) including:

- *DER-10, Technical Guidance for Site Investigation and Remediation.* New York State Department of Environmental Conservation. *May 3, 2010.*
- *Analytical Service Protocol,* New York State Department of Environmental Conservation. *July 2005.*
- *US EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA QA/R-5, March 2001).*
- *Guidance for Quality Assurance Project Plans (EPA QA/G-5, December 2002).*

2. Project Goals and Objectives

A PDIWP has been developed to develop a remedial plan, if necessary, for petroleum-related impacts that may be associated with onsite underground storage tanks (USTs) or other identified anomalies. The PDIWP program currently includes:

- Soil borings
- Soil field screening
- Soil analytical sampling

Groundwater samples are not currently included in the sampling plan, but may be added if necessary.

3. Project Organization and Responsibility

GEI is responsible for the implementation of the scope of work associated with the RIWP, including the supervision of contractors, field activities, and the evaluation and interpretation of data. GEI will perform the sampling activities and coordinate submittal of samples to testing laboratories. The project organization and key personnel for GEI are listed below:

GEI is responsible for the implementation of the scope of work associated with the Remedial Investigation Work Plan (RIWP), including the supervision of contractors, field activities, and the evaluation and interpretation of data. GEI will perform the sampling activities and coordinate submittal of samples to testing laboratories. The project organization and key personnel for GEI are listed below:

In-House Consultant: Errol Kitt
Program Manager: Gary Rozmus
Project Manager: Christopher Morris
Field Team Leader: Michael Quinlan
Quality Assurance Officer: Jaimie Wargo
GEI Corporate Health & Safety Officer: Robin B. DeHate, Master of Public Health (MPH), PhD(c), Certified Hazardous Materials Manager (CHMM)
Data Manager: Brian Skelly

The primary responsibilities of each of these personnel are described in the following table.

Key Project Personnel and Responsibilities		
Position	**GEI Personnel**	**Areas of Responsibilities**
In-House Consultant	Errol S. Kitt	• Provide strategic guidance of project activities • Client contact regarding strategic issues • Review of project deliverables
Program Manager	Gary Rozmus	• Overall program oversight • Project management • Project schedule • Client contact regarding project related issues • Personnel and resource management • Review of project submittals • Budgeting
Project Manager	Christopher Morris	• Client contact regarding project related issues • Coordination of contractors

		• Technical development and implementation of RIWP and related documents • Personnel and resource management • Preparation and review of project submittals • Budgeting
Field Team Leader	Michael Quinlan	• Client contact regarding project related issues on day to day basis as part of field operations • Coordination of contractors • Implementation of RIWP and Field Sampling • Plan personnel and resource management • Preparation of project submittals
Quality Assurance Officer	Jaimie Wargo	• QA/QC for sampling and laboratory performance
Data Manager	Brian Skelly	• Manage raw data from the laboratory • Maintain copies of COCs in the project file

Phoenix Environmental Laboratories, Inc. (Phoenix), located in Manchester, Connecticut, has been selected to perform the following standard analytical chemistry parameters for soil, soil vapor, and groundwater samples including:

- Volatile Organic Compounds (VOCs) per EPA Method 8260
- Semi-Volatile Organic Compounds (SVOCs) per EPA Method 8270

Phoenix's relevant certifications are summarized in the following table.

Phoenix's Certifications		
Location	**Responsible Agency**	**Certification**
New York	New York State Department of Health	Environmental Laboratory Approval Program (ELAP) for potable water/non-potable water, solid and hazardous waste Contract Laboratory Protocol (CLP)
	New York State Department of Conservation	July 2005 Analytical Service Protocol (ASP)
United States	United States Environmental Protection Agency	CLP-Lab: 11301

Table 1 provides a summary of soil analyses, **Table 2** provides a summary of groundwater analyses. **Table 3** provides a summary of quality assurance samples, holding times, and analysis for each media.

4. Quality Assurance Objectives

This section establishes the QA objectives for measurements that are critical to the project. The QA objectives are developed for relevant data quality indicators. These indicators include the method detection limit (MDL), reporting limit (RL), precision, accuracy, completeness, representativeness, and comparability. The data quality objectives (DQOs) are based on project requirements and ensure: (1) that the data generated during the project are of known quality and (2) that the quality is acceptable to achieve the project's technical objectives.

Quantitation Limits are laboratory-specific and reflect those values achievable by the laboratory performing the analyses. However, in order to ensure that the analytical methodologies are capable of achieving the DQOs, measurement performance criteria have been set for the analytical measurements in terms of accuracy, precision, and completeness. The analytical methods to be used at this site will provide a level of data quality and can be used to evaluate potential impacts to soil, soil vapor, and groundwater compared to New York State Standards, Criteria and Guidance values, and for purposes of risk assessment.

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting which will provide results that are scientifically valid, and the levels of which are sufficient to meet DQOs. Specific procedures for sampling, chain of custody, laboratory instruments calibration, laboratory analysis, reporting of data, internal quality control, and corrective action are described in other sections of the QAPP.

The data quality indicators are presented in subsections 4.1 through 4.6. Procedures to assess the data quality indicators are given below in Section 13.

Table 4 and **Table 5** provide the RLs, MDLs and the DQO's for soil and groundwater samples, respectively. The DQOs for soil samples for this project include minimum RLs specified within the 2005 NYSDEC ASP, as well as unrestricted use criteria listed in 6 New York Codes, Rules and Regulations (NYCRR) Part 375. The DQOs for soil vapor samples for this project include minimum RLs specified within the 2005 NYSDEC ASP PER PACE. The DQOs for groundwater samples for this project include minimum RLs specified within the 2005 NYSDEC ASP, as well as GA groundwater criteria listed in the Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.

Table 6 and Table 7 provide the precision and accuracy DQOs for soil and groundwater samples, respectively.

4.1 Required Quantification Limit

The required quantification limit is the quantitative analytical level for individual analytes needed to make decisions relative to the objectives of the project. Quantitative limits may be expressed as the MDL or some quantitative level defined in terms relative to the program. It should be noted that there is some ambiguity in the definitions and use of terms that define quantification limits. The MDL presented herein is a well-defined and accepted entity, although attainable only under ideal laboratory conditions.

Method Detection Limit: The MDL is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. MDL is determined from analysis of a sample in a given matrix type containing the analyte.

Practical Quantitation Limit: The practical quantitation limit (PQL) (also referred to as the reporting limit [RL]) is the concentration in the sample that corresponds to the lowest concentration standard of the calibration curve.

Table 6 and **Table 7** provide the reporting limits and the DQOs for soil and groundwater samples, respectively.

4.2 Accuracy

Accuracy is the closeness of agreement between an observed value and an accepted reference value. The difference between the observed value and the reference value includes components of both systematic error (bias) and random error.

Accuracy in the field is assessed through the adherence to all field instrument calibration procedures, sample handling, preservation, and holding time requirements, and through the collection of equipment blanks prior to the collection of samples for each type of equipment being used (e.g., sample liners, drilling shoe, or stainless–steel sampling implements).

The laboratory will assess the overall accuracy of their instruments and analytical methods (independent of sample or matrix effects) through the measurement of “standards,” materials of accepted reference value. Accuracy will vary from analysis to analysis because of individual sample and matrix effects. In an individual analysis, accuracy will be measured in terms of blank results, the percent recovery (%R) of surrogate compounds in organic

analyses, or %R of spiked compounds in matrix spikes (MSs), matrix spike duplicates (MSDs) and/or laboratory control samples (LCSs). This gives an indication of expected recovery for analytes tending to behave chemically like the spiked or surrogate compounds.

4.3 Precision

Precision is the agreement among a set of replicate measurements without consideration of the "true" or accurate value: i.e., variability between measurements of the same material for the same analyte. In environmental sampling, precision is the result of field sampling and analytical factors. Precision in the laboratory is easier to measure and control than precision in the field. Replicate laboratory analyses of the same sample provide information on analytical precision; replicate field samples provide data on overall measurement precision. The difference between the overall measurement precision and the analytical precision is attributed to sampling precision. Precision is measured in a variety of ways including statistically, such as calculating variance or standard deviation. The difference between the overall measurement precision and the analytical precision is attributed to sampling precision.

Precision in the field is assessed through the collection and measurement of field duplicates. Field duplicates will be collected at a frequency of one per twenty investigative samples per matrix per analytical parameter, with the exception of the waste characterization parameters. Precision will be measured through the calculation of relative percent differences (RPD) as described in subsection 13.2. The resulting information will be used to assess sampling and analytical variability. Duplicate samples are described below in subsection 5.1.3. **Table 3** summarizes the number of duplicates per media sampled.

Precision in the laboratory is assessed through the calculation of RPD for duplicate samples. For organic analyses, laboratory precision will be assessed through the analysis of MS/MSD samples and field duplicates. For the inorganic analyses, laboratory precision will be assessed through the analysis of matrix duplicate pairs and field duplicate pairs. MS/MSD samples or matrix duplicate pairs will be performed at a frequency of one per twenty primary samples per matrix. Duplicate samples are described in subsection 5.1.3. **Table 3** summarizes the number of duplicates per media sampled.

4.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. "Normal conditions" are defined as the conditions expected if the sampling plan was implemented as planned. The objective for completeness is a sufficient amount of valid data to achieve a

predetermined statistical level of confidence. Critical samples must be identified and plans must be formulated to secure requisite valid data for these samples.

Field completeness is a measure of the amount of 1) valid measurements obtained from all the measurements taken in the project and 2) valid samples collected. The field completeness objective is greater than 90 percent.

Laboratory completeness is a measure of the amount of valid measurements obtained from all valid samples submitted to the laboratory. The laboratory completeness objective is greater than 95 percent.

To ensure that these percentages are met, materials for crucial parameters will be retained if re-sampling is required and strict adherence to holding times will be required.

4.5 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which data accurately and precisely represents either a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. To ensure representativeness, the sampling locations have been selected to provide coverage over a wide area and to highlight potential trends in the data.

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that any future work plans are followed and that proper sampling, sample handling, and sample preservation techniques are used.

Representativeness in the laboratory is ensured by using the proper analytical procedures, appropriate methods, and meeting sample-holding times.

4.6 Comparability

Comparability is a qualitative parameter that expresses the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the RIWP is followed and that proper sampling techniques are used. Maximization of comparability with previous data sets is expected because the sampling design and field protocols are consistent with those previously used.

Comparability is dependent on the use of recognized USEPA or equivalent analytical methods and the reporting of data in standardized units. To facilitate data comparison, the data-reporting format as presented below will be used:

- Conventions (units reported as): for solids (weight/unit weight [i.e., mg/kg]); for liquids (weight/unit volume [i.e., µg/L]); for air (weight/unit volume [i.e., $\mu g/m^3$]).
- Use common chemical name with corresponding chemical abstracts service (CAS) code.
- Report all data for soils on a dry-weight basis.

5. Sampling Plan

Environmental sampling will include subsurface soil sampling. Direct push drilling (Geoprobe®) will be the preferred method for obtaining subsurface soil samples. Groundwater samples, if necessary, will be collected utilizing low-flow sampling methods. Sampling methods and procedures are presented in **Appendix C** of the PDIWP.

5.1 Sample Type, Location, and Frequency

5.1.1 Subsurface Soil Samples

Subsurface soil samples will be collected using the Geoprobe® drilling method. The depth, location and number of soil borings will be specified in a job specific Work Plan. Soil samples will be collected and submitted for laboratory analysis in general accordance with the PDIWP and Field Sampling Plan (FSP). A summary of typical subsurface soil sample naming analysis is located in **Table 1**.

5.1.2 Groundwater Samples

Groundwater samples will be collected and submitted for laboratory analysis in general accordance with the RIWP. Water quality parameters including temperature, pH, turbidity, salinity, dissolved oxygen (DO), oxidation reduction potential (ORP), and specific conductance, will be collected prior to laboratory analysis. A summary of groundwater samples and analysis is depicted in **Table 2**.

5.1.3 Field QC Sample Collection

Field QC samples are used to monitor the reproducibility and representativeness of field sampling activities. The field QC samples are handled, transported and analyzed in the same manner as the associated field samples. Field QC samples will include equipment blanks, trip blanks, field duplicates and MS/MSDs. The quantity, field QC sample type and analysis is detailed in **Table 3**.

Equipment Blank Samples are used to monitor the adequacy of decontamination procedures and possible sources of contamination such as potential laboratory methodologies. Equipment blanks will consist of laboratory-supplied, distilled or de-ionized water and will be used to check for potential contamination of the equipment which may cause sample contamination. Equipment blanks will be collected by routing the distilled water through a decontaminated piece of sampling equipment or disposable sampling equipment into

laboratory supplied bottles. Non-dedicated field equipment will be decontaminated as specified below in subsection 5.3. Equipment blanks will be submitted to the laboratory at a frequency of one per 20 samples per matrix per type of equipment being used per parameter. Equipment blanks will not be completed for waste characterization sampling activities.

Trip Blank Samples will consist of analyte free water and will be prepared by the laboratory. Trip blanks are used to assess the potential for VOC contamination of samples due to contaminant migration during sample shipment and storage. Trip blanks will be transported to the project location unopened, stored with the site characterization samples, and kept closed until analyzed by the laboratory. Trip blanks will be submitted to the laboratory at a frequency of one per cooler which contains samples submitted for VOC analysis.

Field Duplicate Samples, also referred to as blind duplicate samples, are two samples that are submitted from the same interval using the same sample procedures. Field duplicates will be used to assess the sampling and analytical reproducibility. Both samples are collected utilizing the same methods and are submitted for the same laboratory analysis however different sample identification numbers are used. Field duplicates will be submitted at a frequency of one per 20 samples for all matrices and all parameters. Field duplicates will not be completed for waste characterization sampling activities.

MS/MSD Samples are two additional aliquots of the same sample submitted for the same parameters as the original sample. However, the additional aliquots are spiked with the compounds of concern. Matrix spikes provide information about the effect of the sample matrix on the measurement methodology. MS/MSDs will be submitted at a frequency of one per 20 investigative samples per matrix for organic and inorganic parameters. MS/MSDs will not be completed for waste characterization sampling activities.

Refer to **Table 67** for a summary of QC sample preservation and container requirements.

5.2 Data Deliverables and Data Usability Summary Report

A Category B data deliverable will be obtained for all sample analyses. The Data Deliverable, identified in subdivision (a) above, plus related QA/QC information and documentation consisting of:

- a Sample Delivery Group Narrative;
- contract Lab Sample Information sheets;
- DEC Data Package Summary Forms;
- chain-of-custody forms; and,
- test analyses results (including tentatively identified compounds for analysis of

- calibration standards;
- surrogate recoveries;
- blank results;
- spike recoveries;
- duplicate results;
- confirmation (lab check/QC) samples;
- internal standard area and retention time summary;
- chromatograms;
- raw data files; and
- other specific information as described in the most current DEC ASP.

Following the receipt of the DEC Category B Data Deliverable, aData Usability Summary Report (DUSR) will be prepared The DUSR provides a thorough evaluation of analytical data with the primary objective to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and data use. The DUSR will be prepared by an experienced environmental scientist, who is fully capable of conducting a full data validation.

The DUSR is developed by reviewing and evaluating the analytical data package. In order for the DUSR to be acceptable, during the course of this review the following questions applicable to the analysis being reviewed must be answered in the affirmative.

- 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?

Once the data package has been reviewed and the above questions asked and answered the DUSR proceeds to describe the samples and the analytical parameters, including data

deficiencies, analytical protocol deviations and quality control problems are identified and their effect on the data is discussed.

5.3 Sample Preservation and Containerization

The analytical laboratory will supply the sample containers for the chemical samples. These containers will be cleaned by the manufacturer to meet or exceed all analyte specifications established in the latest USEPA's Specifications and Guidance for Contaminant-Free Sample Containers. Certificates of analysis are provided with each bottle lot and maintained on file to document conformance to USEPA specifications. The containers will be pre-preserved, where appropriate. Sample preservation and containerization details are outlined in **Table 3**.

5.4 Equipment Decontamination

All non-dedicated sampling equipment shall be cleaned between each use in the following manner:

- Wash/scrub with a biodegradable degreaser ("Simple Green") if there is oily residue on equipment surface.
- Tap water rinse.
- Wash and scrub with Alconox (or non-phosphate soap) and water mixture.
- Tap water rinse.
- Equipment will be wrapped in polyethylene plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location, where appropriate.

The drilling equipment will be decontaminated by steam cleaning or equivalent.

Decontamination fluids will be containerized into United States Department of Transportation (USDOT)/UN-approved 55-gallon drums or containment vessels and will be characterized and disposed of by an approved disposal facility.

6. Documentation and COC

6.1 Sample Collection Documentation

6.1.1 Field Notes

Field notes documenting field activities will be maintained in a field notebook in general accordance with the FSP. Field logbooks will provide the means of recording the chronology of data collection activities performed during the investigation. The logbook will be a bound notebook with water-resistant pages. Logbook entries will be dated, legible, and contain accurate and inclusive documentation of the activity. No erasures or obliterations of field notes will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark, which is signed and dated by the sampler. The correction shall be written adjacent to the error.

Field logbooks will be reviewed at regular intervals by the field team leader, site manager, and project manager for completeness and representativeness. When necessary, logbooks will be supported by daily activity reports.

6.1.2 Chain-of-Custody Records

Sample custody is discussed in detail below in subsection 6.2. COC records are initiated by the samplers in the field. The field portion of the custody documentation should include:

- The project name
- Signature(s) of sampler (s) responsible for sample custody
- Sample ID number
- Date and time of collection
- Whether the sample is grab or composite
- Names of individuals involved in sampling
- Air bill or other shipping number (if applicable)

On a regular basis (daily or on such a basis that all holding times will be met), samples will be transferred to the custody of the respective laboratories, via third-party commercial carriers or via laboratory courier service. Sample packaging and shipping procedures, and

field COC procedures are described below in subsection 6.2.1 of this Plan. Sample receipt and log-in procedures at the laboratory are described below in subsection 6.2.2 of this Plan.

6.1.3 Sample Labeling

Each sample will be labeled with a pre-printed adhesive label using indelible ink. The label should include the date and time of collection, sampler's initials, tests to be performed, preservative (if applicable), and a unique identification. The following identification scheme will be used:

PRIMARY SAMPLES TYPES	QA/QC SAMPLE TYPES
SOIL SAMPLES	**FIELD BLANKS**
Boring -ID (SAMPLE DEPTH-FEET)	SAMPLE-ID [DATE]
SB-01 (10-15)	SS-FB-033110
GROUNDWATER SAMPLES	**MATRIX SPIKE/DUP**
Monitoring Well-ID	SAMPLE [ID] [DEPTH] [EITHER MS OR MSD]
MW-01S	SS-01 (10-15) MS/MSD
	TRIP BLANKS
	SAMPLE-ID [DATE]
	TB-033110
	BLIND DUPLICATES
	SAMPLE-ID [XX] [DATE]
	SS-XX-033110

This sample label contains the authoritative information for the sample. Inconsistencies with other documents will be settled in favor of the vial or container label unless otherwise corrected in writing from the field personnel collecting samples or the Data Manager and/or the Project QA Officer.

6.1.4 Sample Handling

Samples will be handled in general accordance with the FSP.

6.2 Sample Custody

The COC provides a record of the custody of any environmental field sample from the time of collection to the delivery to the laboratory. Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files.

A sample is under a person's custody if:

- The item is in the actual possession of a person
- The item is in the view of the person after being in actual possession of the person
- The item was in the actual physical possession of the person and is locked up to prevent tampering
- The item is in a designated and identified secure area

6.2.1 Field Custody Procedures

Samples will be collected following the sampling procedures indicated in the FSP. A summary of samples and collection methods are provided above in Section 5 of this QAPP. Documentation of sample collection is described above in subsection 6.1. Sample COC and packaging procedures are summarized below. These procedures will ensure that the samples will arrive at the laboratory with the COC intact.

- The field sampler is personally responsible for the care and custody of the samples until they are transferred or dispatched properly. Field procedures have been designed such that as few people as possible will handle the samples.
- All bottles will be identified using sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. The sample numbering system is presented above in subsection 6.1.3.
- Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions.
- Samples will be accompanied by a completed COC form. The sample numbers and locations will be listed on the COC form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the sampler to another person, to a mobile laboratory, and to the laboratory facility.
- All shipments will be accompanied by the COC record identifying the contents. The original record will accompany the shipment, and copies will be retained by the sampler and provided to the data manager and placed in the project files.
- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the cooler and covered with clear plastic tape after being signed by field personnel.
- If the samples are sent by common carrier, the air bill will be used. Air bills will be retained as part of the permanent documentation. Commercial carriers are not

required to sign off on the custody forms since the custody forms will be sealed inside the sample cooler and the custody seals will remain intact.

- Samples remain in the custody of the sampler until transfer of custody is completed. This consists of delivery of samples to the laboratory sample custodian, and signature of the laboratory sample custodian on COC document as receiving the samples and signature of sampler as relinquishing samples.

6.2.2 Laboratory Custody Procedures

After accepting custody of the shipping containers, the laboratory will document the receipt of the shipping containers by signing the COC record. The laboratory will:

- Examine the shipping containers to verify that the custody tape is intact;
- Examine all sample containers for damage;
- Determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the COC records;
- Compare samples received against those listed on the COC;
- Verify that sample holding times have not been exceeded;
- Examine all shipping records for accuracy and completeness;
- Determine sample pH (if applicable) and record on COC forms;
- Sign and date the COC immediately (if shipment is accepted) and attach the air bill;
- Note any problems associated with the coolers and/or samples on the cooler receipt form and notify the laboratory project manager, who will be responsible for contacting the GEI data manager;
- Attach laboratory sample container labels with unique laboratory identification and test; and
- Place the samples in the proper laboratory storage.

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory tracking system. At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory), type of sample, required tests, date and time of laboratory receipt of samples, and field ID provided by field personnel.
- The completed COC, air bills, and any additional documentation will be placed in the project file.

7. Calibration Procedure

7.1 Field Instruments

Field instruments will be calibrated according to the manufacturer's specifications. Air monitoring instruments will be calibrated to a known reference gas standard and ambient air outside the work zone. Calibration will be completed daily. If concentrations of VOCs are encountered above the reference gas standard, the soil screening photoionization detector (PID) may be calibrated or re-checked against the reference gas standard. Water quality meters will be calibrated with known reference solutions. All calibration procedures performed will be documented in the field logbook and will include the date/time of calibration, name of person performing the calibration, reference standard used, and the readings. The following equipment may be used during sampling activities.

Subsurface Soil Sampling Activities:

- RAE Systems MiniRAE 2000 (PID) with 10.6 eV lamp or equivalent.
- MIE pDR 1200 with cyclone and pump [particulate monitor] or equivalent.

Groundwater Sampling Activities:

- Horiba U22 or equivalent.

7.2 Laboratory Instruments

Calibration procedures for a specific laboratory instrument will consist of initial calibrations, initial calibration verifications, and/or continuing calibration verification. Detailed descriptions of the calibration procedures for a specific laboratory instrument are included in the laboratory's quality assurance plan, which describe the calibration procedures, their frequency, acceptance criteria, and the conditions that will require recalibration.

The laboratory quality plan for York Analytical Laboratory is located in **Appendix A**.

8. Sample Preparation and Analytical Procedures

Analytical samples will be collected in general accordance with the FSP and as specified in the PDIWP. **Table 1** and **Table 2** provide sample collection matrices for soil and groundwater.

9. Data Reduction, Validation, and Reporting

Appropriate QC measures will be used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in this project. Complete data packages suitable for data validation to support the generation of a Data Usability Summary Report (DUSR) according to NYSDEC requirements will be provided by the project data validator. Data Management will be performed under the direction of Jaimie Wargo, Senior Technician – Data Management.

9.1 Field Data Evaluation

Measurements and sample collection information will be transcribed directly into the field logbook or onto standardized forms. If errors are made, results will be legibly crossed out, initialed and dated by the person recording the data, and corrected in a space adjacent to the original (erroneous) entry. Reviews of the field records by the field team leader, site manager, and project manager will ensure that:

- Logbooks and standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.
- Records are legible and in accordance with good record keeping procedures, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.
- Sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in the FSP and Work Plan, and that any deviations were documented and approved by the appropriate personnel.

9.2 Analytical Data Validation

Laboratory deliverables will consist of an original hard copy data package that is in general accordance with NYSDEC ASP Category B data deliverable requirements when validation is requested.

10. Internal Quality Control

Laboratory and field quality internal control checks will be used to ensure the data quality objectives. At a minimum, this will include:

- Matrix spike and/or matrix spike duplicate samples
- Matrix duplicate analyses
- Laboratory control spike samples
- Instrument calibrations
- Instrument tunes for VOC 8260B analyses
- Method and/or instrument blanks
- Surrogate spikes for organic analyses
- Internal standard spikes for VOC 8260B analyses
- Detection limit determination and confirmation by analysis of low-level calibration standard

Field quality control samples, as identified in **Table 3**, will include:

- Equipment blanks as outlined
- Field duplicate samples as outlined
- Trip blanks as outlined
- MS/MSDs as outlined

11. Performance and System Audits

Audits are an independent means of: 1) evaluating the operation or capability of a measurement system, and 2) documenting the use of QC procedures designed to generate data of known and acceptable quality.

Field audits may be completed to assess sample collection protocols, determine the integrity of COC procedures, and evaluate sample documentation and data handling procedures. Field audits may be scheduled by the QA officer, Project Manager (PM), site manager or in-house consultant, at their discretion. Written records of audits and any recommendations for corrective action will be submitted to the PM.

The QA officer is the interface between management and project activities in matters of project quality. The QA officer will review the implementation of the QAPP. Reviews will be conducted at the completion of field activities and will include the results of any audits and an evaluation of the data quality.

12. Preventative Maintenance

Preventative maintenance will be performed on field equipment in accordance with the manufacturer's recommendations. Preventative maintenance to rented field equipment will be provided by equipment vendor, U.S Environmental Rental Corporation, Pine Environmental Services, or other selected vendors.

Laboratory equipment calibration and maintenance procedures are specified in Phoenix's laboratory quality manual provided in **Appendix A**.

13. Specific Procedures to Assess Data Quality Indicators

QC analyses conducted as a part of the testing program will provide a quantitative quality assessment of the data generated and their adherence to the data quality indicators. The data quality indicators ensure that the quality assurance objectives for the project are met.

13.1 Detection Limits

13.1.1 Method Detection Limit

The MDL is defined as follows for all measurements:

MDL = (t[n-1,1-a=0.99]) x (s)

where: s = standard deviation of the replicate analysis,
t(n-1, 1-a=0.99) = student's t-value for a one-sided,
99 percent confidence level and a standard deviation
estimate with n-1 degrees of freedom

The MDLs calculated by the laboratory are determined under ideal conditions. MDLs for environmental samples are dependent on the sample aliquot, the matrix, the concentration of analyte, and interference present in the matrix, the percent of moisture, dilution factor, etc. The MDL for each sample analysis will be adjusted accordingly.

13.1.2 *Reporting Limit*

The RL is the concentration of an analyte in the sample that corresponds to the lowest concentration standard of the calibration curve. As with the MDLs, the RLs are dependent on the sample aliquot, the final sample volume, the percent of moisture, dilution factor, etc.

The RL is determined as follows:

$$RL = \frac{Lowest\ conc.\ std\ (ng)}{Volume\ injected\ (uL)} \ x \ \frac{Sample\ aliquot\ (mL\ or\ g)}{Final\ volume\ (mL)} \ x\ DF\ x \frac{100}{(100 - \%M)}$$

where:
DF = dilution factor, including all dilutions or lost samples not accounted for in a sample aliquot/final volume ratio
%M = percent moisture for solid samples.

13.2 Precision

Variability will be expressed in terms of the RPD when only two data points exist. The RPD is calculated as:

$$RPD = \frac{(Larger\ Value - Smaller\ Value)}{[(Larger\ Value + Smaller\ Value)/2]} \ x\ 100\%$$

For data sets greater than two points, the percent relative standard deviation (percent RSD) is used as the precision measurement. It is defined by the equation:

$$Percent\ RSD = \frac{Standard\ Deviation}{Mean} \ x\ 100\%$$

Standard deviation (SD) is calculated as follows:

$$SD = \sqrt{\sum_{i=1}^{n} \frac{(y_i - y)^2}{n - 1}}$$

where: SD = standard deviation
yi = measured value of the ith replicate
y = mean of replicate measurements
n = number of replicates

For measurements such as pH, where the absolute variation is more appropriate, precision is usually reported as the absolute range (D) of duplicate measurements:

D = | first measurement - second measurement |

or as the absolute standard deviation previously given. RPD, %RSD, and D are independent of the error of the analyses and reflect only the degree to which the measurements agree with each other, not the degree to which they agree with the true value for the parameter measured.

13.3 Accuracy

Accuracy is related to the bias in a measurement system. Accuracy describes the degree of agreement of a measurement with a true value. Accuracy will be expressed as percent recovery for each matrix spike analyte by using the following equation:

$$\%\ Recovery = \frac{Css - Cus}{Csa}\ X\ 100\%$$

where: Css = measured concentration in spiked sample
Cus = measured concentration in unspiked sample
Csa = known concentration added to the sample

Accuracy for a measurement such as pH is expressed as bias in the analysis of a standard reference sample according to the equation:

$$Bias = pH_m - pH_t$$

where: pH_m = measured pH
pH_t = the true pH of the standard reference sample

13.4 Completeness

Data completeness is a measure of the amount of usable data resulting from a measurement effort. For this program, completeness will be defined as the percentage of valid data obtained compared to the total number of measurements necessary to achieve our required statistical level of confidence for each test. The confidence level is based on the total number of samples.

Data completeness is calculated as:

$$Completeness = \frac{Number\ of\ valid\ data\ points}{Number\ of\ data\ points\ necessary\ for\ confidence\ level} x\ 100\%$$

The completeness goal is to generate a sufficient amount of valid data. It is anticipated that 95 percent of the data will be complete. Data validation criteria discussed in Section 9 of this QAPP will be used to determine data completeness. Any data deficiencies and their effect on project goals will be evaluated in the DUSR.

13.5 Representativeness

Representativeness is a qualitative statement that expresses the extent to which the sample accurately and precisely represents the characteristics of interest of the study. Representativeness is primarily concerned with the proper design of the sampling program and is best ensured by proper selection of sampling locations and the taking of a sufficient number of samples. It is addressed by describing the sampling techniques, the matrices sampled, and the rationale for the selection of sampling locations, which are discussed in the FSP and RIWP.

13.6 Comparability

Comparability is a qualitative parameter expressing the confidence that one set of data can be compared to another. Comparability is possible only when standardized sampling and analytical procedures are used.

14. Corrective Action

If unacceptable conditions are identified as a result of audits or are observed during field sampling and analysis, the PM, Field Team Leader, and QA officer will document the condition and initiate corrective procedures. The specific condition or problem will be identified, its cause will be determined, and appropriate action will be implemented.

The entire sampling program will be under the direction of the PM and QA officer. The emphasis in this program is on preventing problems by identifying potential errors, discrepancies, and gaps in the data collection, laboratory analysis, and interpretation process. Any problems identified will be promptly resolved. Likewise, follow-up corrective action is always an option in the event that preventative corrective actions are not effective.

The acceptance limits for the sampling and analyses to be conducted in this program will be those stated in the method or defined by other means in the Work Plan and FSP. Corrective actions are likely to be immediate in nature and most often will be implemented by the contracted laboratory analyst or the PM. The corrective action will usually involve recalculation, reanalysis, or repeating a sample run.

14.1 Immediate Corrective Action

Corrective action in the field may be needed when the sample requirements are changed (i.e., more/less samples, sampling locations other than those specified in the Work Plan), or when sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. The field team may identify the need for corrective action. The Field Team Leader, Site Manager, and PM will approve the corrective action and notify the QA officer. The PM and QA officer will approve the corrective measure. The Field Team Leader and Site Manager will ensure that the corrective measure is implemented by the field team.

Corrective actions will be implemented and documented in the field record book. Documentation will include:

- A description of the circumstances that initiated the corrective action
- The action taken in response
- The final resolution
- Any necessary approvals

Corrective action in the laboratory will be completed in accordance with the quality assurance procedures located in **Appendix A**. Any corrective actions completed by the laboratory will be documented in both the laboratory's corrective action files, and the narrative data report sent from the laboratory to the PM. If the corrective action does not rectify the situation, the laboratory will contact the PM, who will determine the action to be taken and inform the appropriate personnel.

If potential problems are not solved as an immediate corrective action, the contractor will apply formalized long-term corrective action if necessary.

Tables

Table 1. Soil Field Sampling Matrix
486 Sunrise Highway
Rockville Centre, New York

Typical Sample I.D.	SAMPLE SELECTION RATIONALE: 1. Soil samples in the vicinity of the USTs or anomalies will be collected from the most impacted interval (not to exceed two feet), or just above the groundwater interface if no impacts are identified. One sample will be collected in the vicinity of each UST/anomaly					Analysis	
	Sample Number						
	Number Samples Proposed	Number Samples Collected	Date Collected	Heaviest Impacted Zone (if Present)	Water Table Interface	VOCs (EPA Method 8260B)	SVOCs (EPA Method 8270)
Subsurface Soil							
B-XX	6					X	X

Notes:
USTs - Underground Storage Tanks
VOCs - Volatile Organic Compounds (CP-51 list)
SVOCs - Semivolatile Organic Compounds (CP-51 list)
EPA - Environmental Protection Agency
Samples will be analyzed in accordance with the Field Sampling Plan

Table 2. Groundwater Field Sampling Matrix
486 Sunrise Highway
Rockville Centre, New York

Sample I.D.	Sample Location	SAMPLE SELECTION RATIONALE: 1. Groundwater Sample locations and depth intervals, if necessary will be determined during field activities in consultation with NYSDEC.				Water Quality Measurements							Analysis		
		Sample Number			Sample Zone	pH	Specific Conductance	Temperature	Oxidation Reduction Potential (ORP)	Turbidity	Salinity	Dissolved Oxygen	VOCs (EPA Method 8260B)	SVOCs (EPA Method 8270)	TAL Metals (EPA Method 6010B/7470A)
		Number Samples Proposed	Number Samples Collected	Date Collected	Water Table										
Monitoring Well Sample Locations															
MW-XX	*	*				X*	X*	X*	X*	X*	X*	X*	X*	X*	X*

Notes:

NYSDEC - New York State Department of Environmental Conservation
VOCs - Volatile Organic Compounds (CP-51 list)
SVOCs - Semi-volatile Organic Compounds (CP-51 list)
TAL - Target Analyte List
EPA - Environmental Protection Agency
Samples will be collected in accordance with the Field Sampling Plan
*: No samples are currently proposed. Samples will be collected if necessary

Table 3. Analytical Methods/Quality Assurance Summary Table
486 Sunrise Highway
Rockville Centre, New York

Media	Number of Primary Samples	QA/QC Samples				Total Number of Samples	Analytical Parameters	Method	Preservative	Holding Time	Container
		TB	FB[1]	DUP	MS/MSD						
Shallow Subsurface Soil	TBD	1/Cooler	1/20	1/20	1/20	TBD	VOCs	8260B	Cool to 4°C	14 days for extraction, 40 days for analysis	3-40 mL vials (2 with stir bars) + 2 - 1 oz jars
	TBD	1/Cooler	1/20	1/20	1/20	TBD	SVOCs	8270C	Cool to 4°C	14 days for extraction, 40 days for analysis	2-oz jar
Groundwater	TBD	1/Cooler	1/20	1/20	1/20	TBD	VOCs	8260B	pH<2 with HCl, Cool to 4°C	14 days for extraction, 40 days for analysis	(2) 40 mL VOA vials w/HCL
	TBD	1/Cooler	1/20	1/20	1/20	TBD	SVOCs	8270C	Cool to 4°C	7 days for extraction, 40 days for analysis	(2) Liter amber glass

Notes:
VOCs - Volatile organic compounds
SVOCs - Semivolatile organic compounds
°C- Degrees Celsius
L - Liter
oz. - Ounce
mL - Milliliter
TBD - To be Determined

Table 4. Chemical Parameters, Reporting Limits and Data Quality Objectives for Soil Samples
486 Sunrise Highway
Rockville Centre, New York

Analyte	DQO's		York Analytical	
	ASP 2005	CP-51 Soil Cleanup Level		
	CRQL	SCO	MDL	RL
Volatile Organic Compounds (µg/Kg) via Method 8260 C				
1,2,4-Trimethylbenzene	10	3,600	2.5	5
1,3,5-Trimethylbenzene	10	8,400	2.5	5
Benzene	10	60	2.5	5
Ethylbenzene	10	1,000	2.5	5
Isopropylbenzene	10	2,300	2.5	5
Methyl t-butyl ether (MTBE)	10	930	2.5	5
Naphthalene	10	12,000	2.5	10
n-Butylbenzene	10	12,000	2.5	5
n-Propylbenzene	10	3,900	2.5	5
p-Isopropyltoluene	10	10,000	2.5	5
sec-Butylbenzene	10	11,000	2.5	5
tert-Butylbenzene	10	5,900	2.5	5
Toluene	10	700	2.5	5
Total Xylenes	10	260	7.5	15
Semivolatile Organic Compounds (µg/Kg) via Method 8270 D				
Acenaphthene	330	20,000	21	42
Acenaphthylene	330	100,000	21	42
Anthracene	330	100,000	21	42
Benz(a)anthracene	330	1,000	21	42
Benzo(a)pyrene	330	1,000	21	42
Benzo(b)fluoranthene	330	1,000	21	42
Benzo(ghi)perylene	330	100,000	21	42
Benzo(k)fluoranthene	330	800	21	42
Chrysene	330	1,000	21	42
Dibenz(a,h)anthracene	330	330	21	42
Fluoranthene	330	100,000	21	42
Fluorene	330	30,000	21	42
Indeno(1,2,3-cd)pyrene	330	500	21	42
Naphthalene	330	12,000	21	42
Phenanthrene	330	100,000	21	42
Pyrene	330	100,000	21	42

Notes:

ASP - Analytical Service Protocol

CRQL - Contract Required Quantification Limit

µg/Kg - micrograms per kilogram

RL - Reporting Limits

MDL - Method Detection Limit

DQO - Data Quality Objectives

SCO - Site Cleanup Objective

1 - DQOs are based on NYSDEC CP-51 Table 2 7 3 Soil Cleanup Levels

2 - RLs and MDLs are based on York Analytical's Reporting Limits and Method Detection limits as of February 2016.

Table 5. Chemical Parameters, Reporting Limits and Data Quality Objectives for Groundwater Samples
486 Sunrise Highway
Rockville Centre, New York

Analyte	DQO's		York Analytical	
	ASP 2005	NY AWQS GA [1]		
	CRQL	H(WS)	MDL	RL
Volatile Organic Compounds (µg/L) via Method 8260 C				
1,2,4-Trimethylbenzene	10	3,600	0.20	0.5
1,3,5-Trimethylbenzene	10	8,400	0.20	0.5
Benzene	10	60	0.20	0.5
Ethylbenzene	10	1,000	0.20	0.5
Isopropylbenzene	10	2,300	0.20	0.5
Methyl t-butyl ether (MTBE)	10	930	0.20	0.5
Naphthalene	10	12,000	1.0	2.0
n-Butylbenzene	10	12,000	0.20	0.5
n-Propylbenzene	10	3,900	0.20	0.5
p-Isopropyltoluene	10	10,000	0.20	0.5
sec-Butylbenzene	10	11,000	0.20	0.5
tert-Butylbenzene	10	5,900	0.20	0.5
Toluene	10	700	0.20	0.5
Total Xylenes	10	260	0.60	1.5
Semivolatile Organic Compounds (µg/L) via Method 8270 D				
Acenaphthene	10	20*	0.050	0.050
Acenaphthylene	10	NE	0.050	0.050
Anthracene	10	50*	0.050	0.050
Benz(a)anthracene	10	0.002*	0.050	0.050
Benzo(a)pyrene	10	ND	0.050	0.050
Benzo(b)fluoranthene	10	0.002*	0.050	0.050
Benzo(ghi)perylene	10	NE	0.050	0.050
Benzo(k)fluoranthene	10	0.002*	0.050	0.050
Chrysene	10	0.002*	0.050	0.050
Dibenz(a,h)anthracene	10	NE	0.050	0.050
Fluoranthene	10	50*	0.050	0.050
Fluorene	10	50*	0.050	0.050
Indeno(1,2,3-cd)pyrene	10	0.002*	0.050	0.050
Naphthalene	10	10**	0.050	0.050
Phenanthrene	10	50*	0.050	0.050
Pyrene	10	50*	0.050	0.050

Notes:

* = Guidance Value

µg/L - micrograms per Liter

ASP - Analytical Service Protocol

CRQL - Contract Required Quantification Limit

NY AWQS - New York Ambient Water Quality Standards

RL - Reporting Limit

MDL - Method Detection Limit

DQO - Data Quality Objectives

1 - DQOs are based on TOGS Ambient Water Quality Standards and Guidance Values and Groundwater

2 - RLs and MDLs are based on York Analytical's Reporting Limits and Method Detection limits as of February 2016.

Table 6. Quality Control Limits Percision and Accuracy for Soil Samples
486 Sunrise Highway
Rockville Centre, New York

Soil QC Limits								
Method	**Analysis**	**Analyte**	**Surrogate %**	**Duplicate**	**Matrix Spike %**	**MSRPD**	**LCS %**	**LCSRPD**
Volatiles Organics								
EPA 8260C	Volatile Organics, CP-51	1,2,4-Trimethylbenzene	-		10-170	242	84-125	30
EPA 8260C	Volatile Organics, CP-51	1,3,5-Trimethylbenzene	-		10-150	62	82-126	30
EPA 8260C	Volatile Organics, CP-51	Benzene	-		43-139	64	77-127	30
EPA 8260C	Volatile Organics, CP-51	Ethyl Benzene	-		11-158	42	84-125	30
EPA 8260C	Volatile Organics, CP-51	Isopropylbenzene	-		10-162	57	81-127	30
EPA 8260C	Volatile Organics, CP-51	Methyl tert-butyl ether (MTBE)	-		42-152	47	74-131	30
EPA 8260C	Volatile Organics, CP-51	Naphthalene	-		10-158	95	86-141	30
EPA 8260C	Volatile Organics, CP-51	n-Butylbenzene	-		10-162	96	80-130	30
EPA 8260C	Volatile Organics, CP-51	n-Propylbenzene	-		10-155	56	74-136	30
EPA 8260C	Volatile Organics, CP-51	o-Xylene	-		10-158	51	83-123	30
EPA 8260C	Volatile Organics, CP-51	p- & m- Xylenes	-		10-156	47	82-128	30
EPA 8260C	Volatile Organics, CP-51	p-Isopropyltoluene	-		10-147	60	85-125	30
EPA 8260C	Volatile Organics, CP-51	sec-Butylbenzene	-		10-157	56	83-125	30
EPA 8260C	Volatile Organics, CP-51	tert-Butylbenzene	-		10-160	79	80-127	30
EPA 8260C	Volatile Organics, CP-51	Toluene	-		21-160	50	85-121	30
EPA 8260C	Volatile Organics, CP-51	Xylenes, Total	-		-		-	
EPA 8260C	Volatile Organics, CP-51	1,2-Dichloroethane-d4	77-125		-		-	
EPA 8260C	Volatile Organics, CP-51	p-Bromofluorobenzene	85-120		-		-	
EPA 8260C	Volatile Organics, CP-51	Toluene-d8	76-130		-	-	-	
Semi-Volatile Organics								
EPA 8270D	Semi-Volatiles, CP-51	Acenaphthene	-		13-133	30	17-124	30
EPA 8270D	Semi-Volatiles, CP-51	Acenaphthylene	-		25-125	30	16-124	30
EPA 8270D	Semi-Volatiles, CP-51	Anthracene	-		27-128	30	24-124	30
EPA 8270D	Semi-Volatiles, CP-51	Benzo(a)anthracene	-		20-147	30	25-134	30
EPA 8270D	Semi-Volatiles, CP-51	Benzo(a)pyrene	-		18-153	30	29-144	30
EPA 8270D	Semi-Volatiles, CP-51	Benzo(b)fluoranthene	-		10-163	30	20-151	30
EPA 8270D	Semi-Volatiles, CP-51	Benzo(g,h,i)perylene	-		10-157	30	10-153	30
EPA 8270D	Semi-Volatiles, CP-51	Benzo(k)fluoranthene	-		10-157	30	10-148	30
EPA 8270D	Semi-Volatiles, CP-51	Chrysene	-		18-133	30	24-116	30
EPA 8270D	Semi-Volatiles, CP-51	Dibenzo(a,h)anthracene	-		10-146	30	17-147	30
EPA 8270D	Semi-Volatiles, CP-51	Fluoranthene	-		10-155	30	36-125	30
EPA 8270D	Semi-Volatiles, CP-51	Fluorene	-		12-150	30	16-130	30
EPA 8270D	Semi-Volatiles, CP-51	Indeno(1,2,3-cd)pyrene	-		10-155	30	10-155	30
EPA 8270D	Semi-Volatiles, CP-51	Naphthalene	-		15-132	30	20-121	30
EPA 8270D	Semi-Volatiles, CP-51	Phenanthrene	-		10-151	30	24-123	30
EPA 8270D	Semi-Volatiles, CP-51	Pyrene	-		13-148	30	24-132	30
EPA 8270D	Semi-Volatiles, CP-51	Nitrobenzene-d5	22-108		-		-	
EPA 8270D	Semi-Volatiles, CP-51	2-Fluorobiphenyl	21-113		-		-	
EPA 8270D	Semi-Volatiles, CP-51	Terphenyl-d14	24-116		-		-	

Notes:

(a) Matrix spike only
(b) Laboratory duplicate RPD
MSRPD - Matrix Spike Relative Percent Difference
LCS - Laboratory Control Sample
LCSRPD - Laboratory Control Sample Relative Percent Difference
NA - Not Applicable
VOCs - volatile organic compounds
SVOCs - semivolatile organic compounds

Table 7. Quality Control Limits Percision and Accuracy for Groundwater Samples
486 Sunrise Highway
Rockville Centre, New York

Aqueous QC Limits									
Method	**Analysis**	**Matrix**	**Analyte**	**Surrogate %**	**Duplicate**	**Matrix Spike %**	**MSRPD**	**LCS %**	**LCSRPD**
Volatiles Organics									
EPA 8260C	Volatile Organics, CP-51	Water	Benzene	-		38-155	30	85-126	30
EPA 8260C	Volatile Organics, CP-51	Water	Ethyl Benzene	-		72-128	30	80-131	30
EPA 8260C	Volatile Organics, CP-51	Water	Toluene	-		76-123	30	80-127	30
EPA 8260C	Volatile Organics, CP-51	Water	o-Xylene	-		69-126	30	78-130	30
EPA 8260C	Volatile Organics, CP-51	Water	p- & m- Xylenes	-		67-130	30	77-133	30
EPA 8260C	Volatile Organics, CP-51	Water	Isopropylbenzene	-		66-139	30	76-140	30
EPA 8260C	Volatile Organics, CP-51	Water	n-Propylbenzene	-		66-134	30	78-133	30
EPA 8260C	Volatile Organics, CP-51	Water	p-Isopropyltoluene	-		64-137	30	81-136	30
EPA 8260C	Volatile Organics, CP-51	Water	1,2,4-Trimethylbenzene	-		72-129	30	82-132	30
EPA 8260C	Volatile Organics, CP-51	Water	1,3,5-Trimethylbenzene	-		69-126	30	80-131	30
EPA 8260C	Volatile Organics, CP-51	Water	n-Butylbenzene	-		61-138	30	79-132	30
EPA 8260C	Volatile Organics, CP-51	Water	sec-Butylbenzene	-		53-155	30	79-137	30
EPA 8260C	Volatile Organics, CP-51	Water	tert-Butylbenzene	-		65-139	30	77-138	30
EPA 8260C	Volatile Organics, CP-51	Water	Naphthalene	-		39-158	30	70-147	30
EPA 8260C	Volatile Organics, CP-51	Water	Methyl tert-butyl ether (MTBE)	-		75-128	30	76-135	30
EPA 8260C	Volatile Organics, CP-51	Water	Xylenes, Total	-		-		-	
EPA 8260C	Volatile Organics, CP-51	Water	1,2-Dichloroethane-d4	69-130		-		-	
EPA 8260C	Volatile Organics, CP-51	Water	p-Bromofluorobenzene	79-122		-		-	
EPA 8260C	Volatile Organics, CP-51	Water	Toluene-d8	81-117		-		-	
Semi-Volatile Organics									
EPA 8270D	Semi-Volatiles, CP-51	Water	Acenaphthene	-		17-132	20	24-114	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Acenaphthylene	-		13-124	20	26-112	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Anthracene	-		40-105	20	35-114	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Benzo(a)anthracene	-		23-141	20	38-127	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Benzo(a)pyrene	-		46-118	20	30-146	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Benzo(b)fluoranthene	-		22-133	20	36-145	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Benzo(g,h,i)perylene	-		10-126	20	10-163	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Benzo(k)fluoranthene	-		18-152	20	16-149	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Chrysene	-		30-127	20	33-120	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Dibenzo(a,h)anthracene	-		10-131	20	10-149	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Fluoranthene	-		29-123	20	33-126	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Fluorene	-		20-133	20	28-117	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Indeno(1,2,3-cd)pyrene	-		10-130	20	10-150	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Naphthalene	-		26-104	20	30-99	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Phenanthrene	-		29-121	20	31-112	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Pyrene	-		34-129	20	42-125	20
EPA 8270D	Semi-Volatiles, CP-51	Water	Nitrobenzene-d5	12-96		-		-	
EPA 8270D	Semi-Volatiles, CP-51	Water	2-Fluorobiphenyl	16-84		-		-	
EPA 8270D	Semi-Volatiles, CP-51	Water	Terphenyl-d14	15-106		-		-	

Notes:

[(a)] Matrix spike only

[(b)] Laboratory duplicate RPD

MSRPD - Matrix Spike Relative Percent Difference

LCS - Laboratory Control Sample

LCSRPD - Laboratory Control Sample Relative Percent Difference

NA - Not Applicable

VOCs - volatile organic compounds

SVOCs - semivolatile organic compounds

Appendix A

Phoenix Environmental Laboratories, Inc. Quality Manual and Certifications (electronic only)

Phoenix Environmental Laboratories, Inc.

Quality Manual

Document Control No.: 16-0202-1
Date Issued: 02/02/16

Controlled Copy on Ivory Paper

Table of Contents

1.0 Quality Manual Identification Form

Document Title:	Quality Manual Phoenix Environmental Laboratories, Inc.
Document Control Number:	16-0202-1
Organization Title:	Phoenix Environmental Laboratories, Inc.
Address:	587 E. Middle Turnpike Manchester, CT 06040
Responsible Official:	Phyllis Shiller
Title:	Laboratory Director
Phone:	(860) 645-1102
Quality Assurance Officer:	Kathleen Cressia
Title:	Director of Quality Assurance
Phone:	(860) 645-1102

Manual Coverage: Environmental Laboratories Including:

- Project Planning and Control
- Glassware Preparation and Laboratory Supplies
- Sample Receipt and Control
- Sample Extraction and Preparation Laboratory
- Inorganic Laboratory
- GC/MS Laboratory
- GC Laboratory
- Data Entry and Report Preparation
- Data Technical Review
- Customer Inquiry
- Quality Assurance

Concurrences

(1) Name: Kathleen Cressia
Title: Quality Assurance Officer

Signature: Kathleen Cressia

Date: 02/02/16

(2) Name: Phyllis Shiller
Title: Laboratory Director

Signature: Phyllis Shiller

Date: 02/02/16

2.0 Introduction

Phoenix Environmental Laboratories, Incorporated is committed to providing the highest quality laboratory services and data available. All laboratory analyses are performed in full compliance within applicable State, or Federal Quality Control guidelines. The Quality Assurance (QA) program and Quality Control (QC) procedures are defined by the Quality Manual and the Laboratory Standard Operating Procedure (SOP) Manual. The QA program meets or exceeds EPA recommended guidelines with quality control samples accounting for at least 20% of the total number of samples analyzed. Data from the analysis of these samples can be used to update control limits, or in the case of projects with defined control limits, the data serves to demonstrate the overall lab performance. Data which exceed control limits are considered suspicious and shall initiate specific actions as defined in this Manual and the SOP Manual. The Quality Assurance Office ensures that facilities, equipment, personnel, methods, records, and Quality Control procedures are in conformance with Phoenix Environmental Standard Operating Procedures (SOPs) as well as with applicable EPA Quality Control guidelines.

Each laboratory project is monitored through application of a QA/QC program, which includes the following elements:

- Centralized Project files
- Written Standard Operating Procedures
- Rigorous Chain-of-Custody procedures
- Documentation of nonconformance events and corrective actions taken
- Quality Control of data is assessed by analysis of reference samples, spiked samples, duplicates and surrogate spikes
- Periodic inspections of projects in progress
- Frequent equipment calibration and maintenance inspections
- Archiving of project records under controlled access

3.0 Quality Assurance Policy Statement

Statement of Authority and Responsibility

This document is the Quality Assurance Manual for Phoenix Environmental Laboratories, Incorporated. This Manual describes the activities necessary to meet or exceed the data quality objectives of Phoenix Environmental Laboratories, Inc.'s clients.

The management of Phoenix Environmental Laboratories, Incorporated is dedicated to the quality assurance program described in this Manual, and procedures as defined in the SOP manual. Each Director, and Supervisor as well as their staff members, as assigned in accordance with this Manual, are obligated to comply with its stated requirements, responsibilities, and objectives.

The Quality Assurance Program shall be maintained and expanded or modified as necessary to ensure all reportable data are of uncompromising quality.

The Quality Assurance Officer is responsible for the contents of the Manual and is committed to assuring that the stated requirements are met.

Kathleen Cressia — 02/02/16
Kathleen Cressia
Quality Assurance Officer
Date

Phyllis Shiller — 02/02/16
Phyllis Shiller
Laboratory Director
Date

4.0 Quality Assurance Management

4.1 Introduction

The management of the Quality Assurance Unit at Phoenix Environmental Laboratories, Incorporated is headed by the Director of Quality Assurance. The Quality Assurance Unit is independent of the data generating and Project Management groups and reports directly to the Board of Directors of the Company through the General Manager.

4.2 Assignment of Responsibilities

The Quality Assurance Office operates independently of the data generating areas for which they have quality assurance oversight. The Quality Assurance Director reports directly to the Corporate Management.

The goal of the Quality Assurance Program is to assure that data generated by Phoenix Environmental Laboratories, Incorporated is of the highest quality available. To reach this goal the program seeks to develop policies and procedures to monitor, maintain and improve data quality, and maintain the necessary documentation of laboratory performance. A listing of Quality Assurance personnel responsibilities is detailed below.

Director of Quality Assurance

The Director of Quality Assurance has the responsibility for the development and administration of the Quality Assurance Program. This effort is supported by the Laboratory Director and Assistant Laboratory Director.

Additionally, the Director of Quality Assurance's duties include:

- Preparation of written documents defining Quality Assurance and Quality Control Procedures.
- Maintaining current knowledge of approved methods and other regulatory requirements.
- Serving as a liaison to regulatory agencies in Quality Assurance matters.
- Reviewing Nonconformance Reports and corrective actions to assure that operations have been appropriately corrected.
- Employee training in Quality Control procedures and Quality Assurance practices.
- Preparation of reports of lab inspections and data reviews for the QA office and the Laboratory Director.

- Reviewing and approving performance evaluation sample results prior to submission to regulatory agencies.
- Assistance in preparation, review and approval of SOPs.
- Maintaining copies of all current procedures.
- Scheduling and performance of quality audits.
- Performance of inspections of lab operations and records to assess compliance with SOPs and contract requirements.
- Informing management of the status of the Quality Assurance Program.
- Continually assessing the Quality Assurance Program

.

The Director of Quality Assurance has the final authority to stop or change any incorrect or improper sampling or analytical procedure to assure data quality.

Quality Assurance Specialists

In addition to the Director of Quality Assurance, the Quality Assurance Office consists of technical specialists who have the responsibility and authority to monitor all phases of laboratory operations. Their functions include:

- Preparing and submitting blind QC check samples to the lab and evaluating lab performance.
- Reviewing the outcome of QC samples on a routine basis to assure that control limits are being met and internal SOPs for control chart analyses are followed.
- Immediately notifying the QA office of nonconformance events.
- Ensuring that all standards are traceable to NBS or EPA provided materials.

Quality Control Staff

An analytical quality control program is conducted to ensure the production of valid data. The QA office supervises the analytical Quality Control Program and interacts with the project staff in determining corrective action procedures. Duties of the Quality Control Staff include:

- Maintenance quality control charts for each area of the laboratory.
- Preparation of current tabular results of control charts.
- Posting of these control chart tables at each instrument and/or bench.

Laboratory Management

The laboratory management has the responsibility for directing that the laboratory sections follow the Quality Assurance Program. This obligation is met through the following steps:

- Recruiting, hiring, and training of suitably qualified personnel.
- Allocation of sufficient resources including staff, time, materials and equipment to complete required tasks.
- Integration of Quality Control measures into the Job Descriptions of laboratory personnel so that each employee is responsible for the quality of the work they produce.
- Effective response to corrective action requirements identified by the Quality Assurance Office.
- Assignment of Standard Operating Procedure development as required by Quality Assurance.
- Review and approval of SOPs.
- Evaluation of the lab performance of policies outlined in this manual including the ethics policy, the conflict of interest policy, and the client confidentiality policy. Review of the labworks audit trail is one of the mechanisms to these evaluate these policies.

Laboratory Section Supervisors

Laboratory Section Supervisors are an integral part of the implementation of the Quality Assurance Program. Each Supervisor is responsible for the quality of the data generated by their group. All activities performed in the lab section must comply with the internal Standard Operating Procedures and individual contract requirements. It is the responsibility of the Section Supervisor to train analytical personnel, prepare and update SOPs for each operation, and instruct analysts to perform QC checks at the appropriate intervals. The Section Supervisor reviews data and assures that all QC criteria for each data set have been met before releasing results for reporting. Additionally, it is the responsibility of the Section Supervisor to document nonconformance events and corrective action taken.

Chemists and Lab Technicians

It is the responsibility of the individual analysts to follow the appropriate methods, documenting their activities and results concisely, and implementing the QC checks as required by the contract and/or the Standard Operating Procedures. The analysts are expected to produce data of measurable quality and, therefore, must evaluate the outcome of QC samples as part of the regular analytical procedure. Individual analysts, as the first line of quality control, must identify quality problems and initiate a Nonconformance Report.

Coverage during Absence

In the absence of the QA Director, the QA specialists with assistance from the Lab Director cover the duties of the QA Director. In the absence of the Lab Director, the Assistant Laboratory Director with assistance from the QA Director covers the duties of the Lab Director.

4.3 Communications

The Quality Assurance Office communicates with other laboratory sections in two predominant methods, by regular staff meetings and by memorandum or report.

Management Meetings are held regularly between the Laboratory Directors, Project Managers, Laboratory Management, and the Director of Quality Assurance. In addition to production planning, marketing efforts, and laboratory management issues, Quality Assurance concerns are discussed. This forum provides immediate access to responsible individuals for the resolution of Quality Assurance concerns. Decisions made are documented in memoranda following the meeting.

Reports are issued to document findings of audits, inspections, and data reviews performed by the Quality Assurance Office. Findings and recommendations are documented in a report issued by Quality Assurance. Reports are issued to supervisors responsible for the work reviewed, and to management. The Supervisor responds to each of the findings and documents corrective actions. The report is then circulated to management for review. Quality Assurance verifies that corrective actions have been implemented and then files the report in Quality Assurance Office files.

Memoranda are generally issued to communicate results of Performance Testing (P.T.) studies or interlaboratory studies, to document problems brought to the attention of Quality Assurance, and as a form of written communication to keep laboratory staff and management informed of activities related to Quality Assurance.

In addition, reports are issued to the President and Laboratory Section Supervisors/Directors to summarize activities of the Quality Assurance Office. Quality Assurance Audit Reports and Corrective Action Reports are other forms of written communication between laboratory staff, management and the Quality Assurance Office.

4.4 Document Control

Quality Assurance Reports are maintained in locked file cabinets which are separate from other study records. Quality Assurance records are often direct and forthright in addressing problems and to allow these records to become public knowledge would hinder the performance of the Quality Assurance Office. Thus, these records are considered most confidential and are not available for inspection by persons outside the company.

Procedures described in Section 1.4.1 of the Quality Assurance Handbook for Air Pollution Measurement Systems. Volume I (EPA-600/9-76-005) and Chapter 3 of the Manual for the Certification of Laboratories Analyzing Drinking Water 5th edition, January 2005 are used in the publication of this Quality Manual and the laboratory's Standard Operating Procedure Manual.

Original copies of Standard Operating Procedure documents are maintained in the Quality Assurance Office. All SOPs are available to all employees in PDF format in the Phoenix LIMS system. SOP distribution lists are maintained by the Quality Assurance Office for those departments that also keep a hard copy SOP Manual.

Document control of this Quality Assurance Manual is basically the same as that described for the SOP documentation described above. A current and historical file system, distribution list, and limited copies of the document are used in the production of the Quality Manual to maintain its integrity. The Quality Manual is printed on Ivory paper and the current version is always available in electronic format in the LIMS system for all employees.

4.5 Quality Assurance Program Assessment

The Director of Quality Assurance and the staff of the Quality Assurance Office conduct periodic assessments of the total Quality Assurance Program. Based upon these assessments, and an annual review of the Quality Manual, an annual written status report of Quality Assurance activities and progress is presented during the annual management review meeting. This report is used to define areas of focus for the coming year and will determine changes required in the Quality Manual. This report shall include such information as:

A. Status of or changes to the Quality Manual.

B. Status of Quality Assurance Project Plans (QAPjP), if any.

C. Measures of Data Quality.

D. Significant Quality Assurance problems, accomplishments, and recommendations.

E. Results of Performance Audits.

F. Results of Systems Audits.

G. Status of Quality Assurance requirements for contracts.

H. Summary of Quality Assurance Training.

5.0 Personnel Qualifications

5.1 Introduction

Phoenix Environmental Laboratories has over 50 employees within the Laboratory with the scientific and technical expertise needed to serve the analytical needs of our clients. These employees have been chosen based upon their education, training and experience to ensure that Phoenix Environmental Laboratories Incorporated can perform their assigned tasks and successfully follow their chosen career paths.

Phoenix Environmental Laboratories, Incorporated provides its employees with opportunities for continuing education and training so that our employees may grow with the company. The benefits of supplying continuing education, training, and on the job experience are not only for the individual employee. The company benefits also, since it profits by the stability of the work force and internal promotion of its employees. Finally, the benefits to the clients are that they may have confidence in the precise and accurate performance of contracted analyses.

5.2 Qualifications

Phoenix Environmental Laboratories, Incorporated has minimum education and experience qualifications for all job categories within the laboratory. In-house training programs and policies augment these basic education and experience requirements by supplying additional information about technical subjects, safety, corporate policy, quality assurance, ethics, and supervisory and managerial techniques.

For each position, critical educational requirements, specialized training requirements, and experience have been identified. Documentation of personnel qualifications training, and experience is accomplished through the use of an Employee Training and Experience Record system. The Employee Training and Experience Files are maintained and reviewed by the Quality Assurance Office. The files contain Training forms, Job Description forms, Capability forms, and any Training and Experience Update forms that may be necessary. Additional items which may be included are copies of company resumes, copies of training certificates, or professional certifications, and any other documentation of training or educational course work.

Personnel resumes are attached as Appendix A: Resumes of Laboratory Personnel. A Laboratory Organizational Chart is attached as Appendix C.

5.3 Training

New employees are trained on a one-on-one basis with their supervisor or assigned individual. Training is initiated by discussion of applicable SOP and method documents for a particular analysis. The procedures are then demonstrated by the trainer, to be repeated by the new employee, on a set of trial samples. Results of the trainee's analysis, and an appraisal of techniques used are reviewed by the trainer. Successful results and suitable techniques are to be the basis for the qualification of an analyst in a particular procedure. Failure in either of these areas must result in additional one-on-one training. Until the trainer is convinced of the ability of the new employee, and the new employee has completed an acceptable demonstration of capabilities, the new employee may not perform analysis on client supplied samples.

After initial training, an employee's performance is monitored by their supervisor for compliance with quality, production and safety goals.

Documentation of employee training procedures is accomplished through the Employees Training and Experience files as described in Section 5.2. These training records are maintained by the Quality Assurance Office. Additionally, training is routinely performed upon the introduction of new instruments into the laboratory. Generally, these courses are provided by the instrument manufacturer who issues training certificates upon successful completion of the course. Copies of such certificates are to be placed in the employees' qualifications file.

Training is also presented in the form of seminars given to explain new methods, techniques, and procedures. These courses generally are given by senior level personnel for the benefit of those with less experience. These courses are also documented and included in the employees' qualification files.

Each employee is trained under the Federal Right-to-Know statute. We believe that employees well trained in safety issues, working in a safe environment produce a better quality product.

5.4 Data Integrity/Ethics Policy

Phoenix Environmental Laboratories, Inc. is committed to maintaining high ethical standards. This is accomplished by promoting a highly trained and motivated staff. All personnel are urged to discuss any problem or uncertainty that may have an effect on data quality. All personnel can report data integrity issues to management, confidentially and outside of the chain of command, without concern of exposure. As part of the training process, each employee is educated in the ethical and legal aspects of the analysis performed and should be confident about their responsibility for ensuring data integrity and ethical conduct in the workplace. Employees complete Ethics Training annually.

Compromising standards for any purpose is unacceptable at Phoenix Labs. Any employee found to misrepresent analytical data would be disciplined up to termination. If merited, outside authorities will be notified.

Data integrity is defined as a state that exists when information is predictably related to its source and has been processed in an authorized manner.

Any data manipulation to misrepresent quality control will be considered fraud by Phoenix Environmental and will result in immediate employee dismissal.

The following practices are not tolerated by Phoenix and will result in termination:

- Time travel (reporting the analysis date incorrectly to meet the sample holding time),
- Manual integration of chromatography (not following accepted criteria) for the sole purpose of meeting QC criteria,
- Modifying a reported method without permission of the client to cut costs, save time, etc.,
- Using white out or obliterating data (The only approved method for an analyst to correct data is single line cross out with initials and date),
- Falsifying data.

5.5 CONFLICT OF INTEREST POLICY

Phoenix Environmental Laboratories, Inc. ensures that its personnel are free from any commercial, financial, and other undue pressures which may adversely affect the quality of their work; by emphasizing that potential conflicts of interest can occur.

The company has a stringent policy not to profit from any potential conflict. All personnel are urged to notify management of any known or suspected conflict. All potential conflicts are completely divulged to clients and regulatory authorities.

6.0 Facilities, Equipment and Services

6.1 Introduction

Phoenix Environmental Laboratories, Incorporated is located in Manchester Connecticut, east of Hartford CT. The facility encompasses approximately 10,000 square feet, which includes the laboratories, data processing, copy areas, and administrative offices. All entrances to the facility are locked and alarmed after hours. Supplemental security is provided by a contracted security service. Members of the staff escort visitors while in the facility.

Laboratory Safety is a important aspect of Phoenix Environmental Laboratory. The Phoenix Safety Manual is located in the general area along side the chemical MSDS volumes. The Safety program at Phoenix includes:

The role of the safety committee
The chemical hygiene Plan
The Right to Know SOP
The Hazardous Chemical Handling SOP
The Emergency Evacuation Plan
Safety Equipment Procedures

The entire facility is provided with a sprinkler system for fire protection. Additionally, there are fire extinguishers throughout the building and emergency showers, fire blankets, and eyewash stations in the laboratories.

The laboratory has a full complement of instrumentation and support equipment such as fume hoods, refrigerators, freezers, ovens, a deionized and reverse osmosis water systems, etc.

All instruments are maintained by trained employees, and by manufacturer service personnel, in some cases working under service contract for critical equipment. Instrument logbooks are maintained for each individual instrument in each of the laboratories.

A complete listing of instrumentation and equipment may be found in the Laboratory Capabilities Statement (Appendix B).

6.2 Laboratory Facilities

The analytical laboratories adjoin the administrative offices in order to provide close interaction between management and the analytical staff. Figure 1 presents a floor plan of the facility, Laboratory environmental aspects that could affect the quality of data generated are discussed below.

- **Environmental Control**

  The facility is divided into numerous laboratory and office areas each with its own requirements for airflow, exhaust, and equipment cooling. The entire facility is served by two large central HVAC units equipped with carbon filters to minimize contamination. These units are maintained by a local HVAC contractor by service agreement. Filters on the units are replaced on a quarterly basis to reduce dust and pollen infiltration into the facility. Temperature is maintained between 68" and 72" F to prevent temperature induced artifacts in the data obtained from the instrumentation. Laboratory hoods are required to have a face velocity of at least 100 linear feet per minute flow at all points across the hood face. Facility Maintenance is responsible for performing semi-annual compliance checks for all laboratory hoods. General housekeeping is provided by full-time in-house personnel. Wet mopping of all laboratory tile floors is performed regularly to provide for additional dust control. All labs and office areas are adequately lighted with fluorescent-type lighting. Emergency battery powered lighting is installed in all areas in the event of total power failure.

- **Electrical Power**

  Power is supplied to the facility via underground cable by Northeast Utilities. Service capacity is 1000 amperes at 208 volts. Three-stage surge and spike suppression equipment is employed on instrumentation sensitive to this type of power problem.

- **Laboratory Utilities**

  The laboratory benches are supplied with electrical power, compressed air, vacuum, hot and cold water, and deionized reagent water utilities, where needed. Compressed air and vacuum systems are maintained by the Facilities Maintenance. An electric water heater supplies hot water.

  There is located within the laboratory a deionized water system. The system utilizes a filter unit, anion, cation and mixed bed ion-exchange resin tanks for deionization, along with activated carbon tanks for organic contamination removal. There is also a reverse osmosis system. These systems are maintained by their contractors. The laboratory water is checked monthly for bacteria, volatiles, metals, and other inorganics. The conductivity and pH of the laboratory water is checked daily with a calibrated conductivity/pH meter.

- **Laboratory Facility Safety Engineering**

  Laboratory Safety is taken as a serious responsibility. To that end the laboratory has special solvent storage and waste storage areas.

  - Solvent supplies are stored in a large flammable solvent storage locker. Bulk solvents are stored here while small quantities of solvents for immediate use are stored in flammable solvent lockers beneath the laboratory hoods. Corrosive liquids are stored separately in corrosive liquid storage lockers.

- Waste solvents are placed in waste solvent containers for transfer to 55-gallon DOT 17H closed head drums for the accumulation and storage of laboratory wastes prior to shipment. Waste samples are generally handled as labpacks and are sent to a licensed facility for incineration.

- The entire facility is provided with a sprinkler system for fire protection. The building is equipped with dry chemical, carbon dioxide, and Halon fire extinguishers strategically placed throughout the laboratory and office areas. All laboratories are equipped with eye wash stations and drench-type safety showers. Safety glasses are issued to each employee for use in the laboratory.

- **Laboratory Areas**

  - **Shipping and Receiving/Sample Control**

    The Shipping and Receiving/Sample Control area is located immediately adjacent to the Extractions and Preparations Laboratory. The Shipping and Receiving portion of the space encompasses approximately 140 square feet of floor space. The Sample Control area encompasses approximately 250 square feet in addition to the space taken by a large walk-in refrigerator used for the storage of environmental samples. Samples arriving are inspected and entered into the laboratory sample control system at the computer entry work station. Adequate bench space is provided for the unpacking and inspection of samples upon receipt at the laboratory.

- **Walk-in Refrigeration System**

  A walk-in refrigeration system for the storage of environmental samples is located adjacent to the Sample Control area. The walk-in encompasses approximately 2500 cubic feet of storage space and the temperature is controlled to 4°C ± 2.0°C with continuous temperature sampling and monitoring devices. The temperatures are taken every 30 seconds and automatically stored into the laboratory LIMS system. The unit is maintained by the Sample Control Supervisor to maintain strict controlled access and chain-of-custody at all times.

- **Volatile Freezer**

  A temperature controlled freezer is located in the Organics Laboratory for storing EnCore and DI water preserved low level vials for Volatile analysis.

- **Extractions and Preparations Laboratory**

  The Extractions and Preparations Laboratory has nearly 2500 square feet of floor space and is equipped with several large laboratory fume hoods, steam baths for Zymark apparatus, approximately 120 linear feet of bench space, and adequate storage cabinet space necessary to process thousands of samples per month. Additional equipment in the lab includes TCLP extraction equipment including zero headspace extractors (ZHEs), Continuous liquid-liquid extractors, Soxhlet extractors, block digestors, a vacuum system, a laboratory shaker, a six-horn sonicator, a chilled water source for use with reflux equipment, Accelerated Solvent Extractors (ASEs), and analytical balances.

- **Metals Analysis Laboratory**

  The Metals Analysis Laboratory is over 1000 square feet in size. There is approximately 60 linear feet of open laboratory bench space for use in inorganic analysis. The room is equipped with special air extractors for the atomic absorption spectrophotometers and the ICPs located in the room.

The AA Spectrophotometers are Perkin-Elmer AA Analyst 600 Spectrophotometers with autosamplers and data systems which are used for Graphite Furnace Atomic Absorption (GFAA). A PSA Mercury Millennium System with a cold vapor detector is used for mercury analysis. Two Spectro Axial Simultaneous ICP with Autosamplers, are also used for metals analyses.

- **Inorganic Analysis Laboratory**

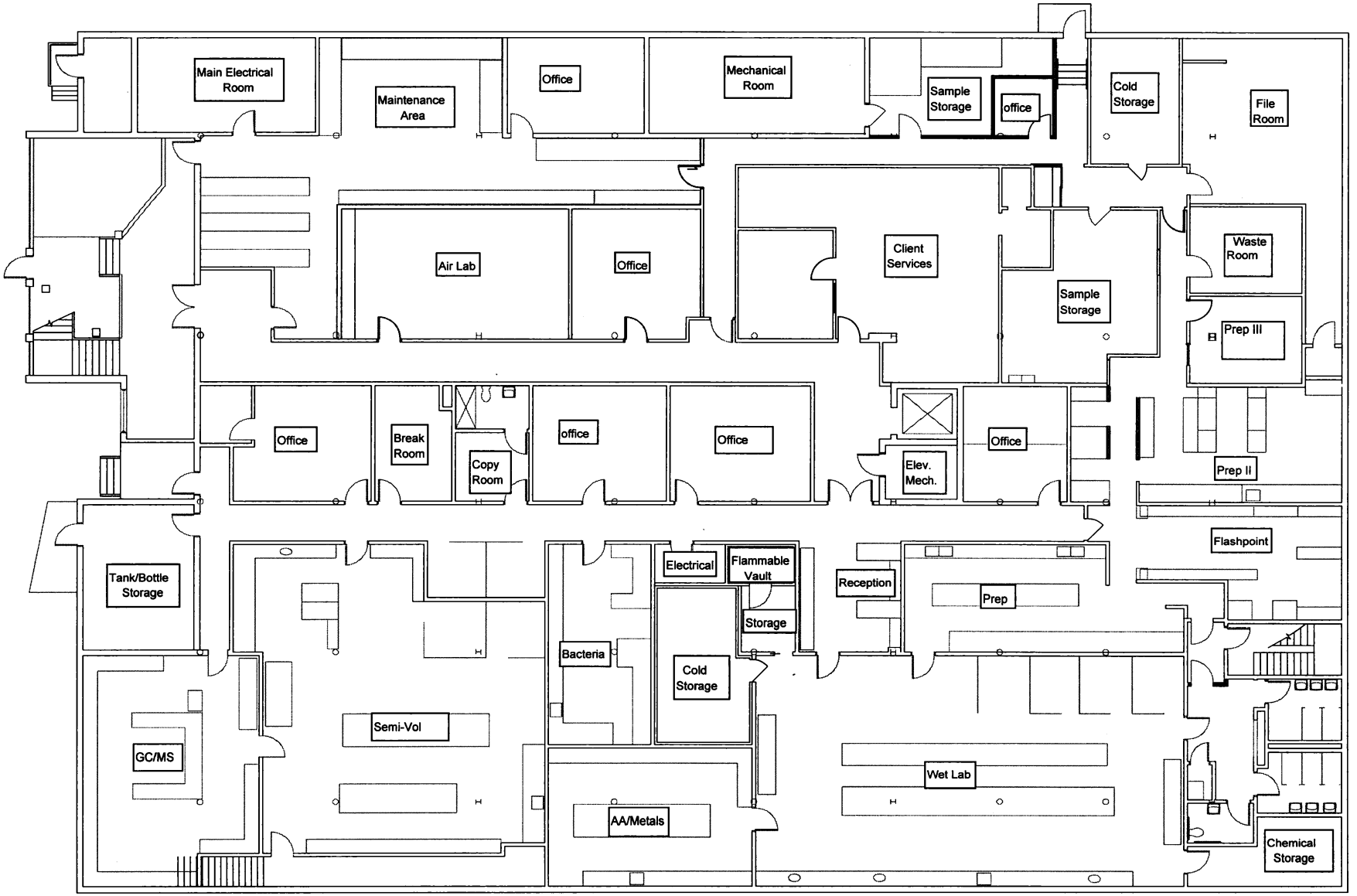
The Inorganic Analysis Laboratory is over 2000 square feet in size. There is approximately 200 linear feet of open laboratory bench space for use in inorganic analysis. Equipment includes a GE and an Elementar TOC analyzers with autosamplers, Lachat QuikChem autoanalyzers for automated spectrometry, Dionex 120 Ion Chromatographs, and a Man-Tec automated titration system. Additional equipment includes ovens, analytical balances, classical chemistry apparatuses, UV spectrophotometers, flash point apparatuses, and ion-selective electrode equipment.

- **Bacteriological Analysis Laboratory**

The Bacteriological Analysis Laboratory is over 250 square feet in size. There is approximately 30 linear feet of open laboratory bench space for use in analysis. Equipment includes four large BOD incubators, an autoclave, a long-wave ultraviolet visualization device, water baths, dry incubators and numerous pieces of miscellaneous equipment for the preparation and storage of sterile media and cultures.

- **Organic Analysis Laboratories**

  The Organic Analysis Laboratories have over 2200 square feet of floor space dedicated to organic laboratory instrumentation plus a repair area of over 100 square feet used to make instrument repairs and store spare parts. All volatile analyses are segregated into one of the laboratories to prevent the possibility of solvent cross-contamination. This area also has positive airflow to prevent the influx of vapors. The general features of the organic laboratories include several small hoods for use when spiking standard materials into sample extracts and for the preparation of standards; refrigerators and freezers for the storage of samples and samples extracts, and for the storage of standard materials and solutions; ovens; a Hewlett Packard HPLC Chromatograph; Perkin Elmer and Agilent Gas Chromatographs (GCs) and accessory detectors, autosamplers, headspace samplers and data systems; Hewlett-Packard (Agilent) Gas Chromatograph/Mass Spectrometer (GC/MS) instruments.



Phoenix Environmental Floor Plan

6.3 Instrument Maintenance

In an effort to reduce unexpected instrument failure, ensure reliable and accurate data generation, and control the costs associated with, non-routine maintenance and down time the laboratory has implemented a preventative maintenance system. Routine preventative maintenance is performed as suggested by the manufacturer. When it is found that maintenance is required more often or that additional maintenance is required these procedures are added to the Standard Operating Procedure.

Each instrument has a maintenance logbook that describes the routine inspection, cleaning, maintenance, testing, calibration, and/or standardization. Written records are maintained to document all inspection, preventative and non- routine maintenance, test, calibration and/or standardization procedures. The records include date, description of activity and actual findings, the name of the person performing the operation and a statement as to whether the maintenance operations were routine or unscheduled. Non-routine repairs performed as a result of equipment malfunction are documented in the instrument logbook to show the nature of the problem, when the problem was discovered and remedial actions taken. Repairs made by the manufacturers instrument repair technicians are also documented and the service reports filed in the instrument logbook.

The Quality Assurance Office monitors equipment maintenance and calibration through inspections of instruments and logbooks. Deviations are communicated to the Section Director via memoranda or report. Service contracts have been obtained for most instrumentation identified as vital by management i.e., GC, GC/MS, AA (furnace) and ICP instrumentation. For other equipment, factory service can be arranged, on a time and materials basis, usually within 24 hours.

Preventative/Routine Maintenance Schedule for Organics:

Gas Chromatography

- ECD detector baked out at 450 degrees C for 12 hours quarterly or when mV reading exceeds 15.
- NPD detector bead changed quarterly or as needed.
- FID detector assembly cleaned with solvent quarterly or as needed.
- Injector septum replaced weekly or per every 250 injections.

- Injector liners inspected weekly and replaced as needed.

Gas Chromatography/Mass Spectometry- Volatiles
- Clean source quarterly or if method performance criteria fails.
- Change Tekmar 3000 concentrator trap monthly or as needed.
- Change Tekmar 3000 concentrator MCS loop every 2 months for drinking water, otherwise change quarterly or as needed.
- Replace soil purge needle on autosampler every 2 months.
- Bake Tekmar 3000 concentrator trap daily for 30 minutes.

Semivolatiles
- Clean source monthly or if method performance criteria fails.
- Change liner and clip column daily.

Preventative/Routine Maintenance for Inorganics:

Atomic Absorption Spectrophotometer
- Change graphite tubes weekly or as needed.
- Clean graphite tubes daily with methanol.
- Trim capillary tubing daily or as needed.
- Replace contact rings monthly or as needed.
- Replace lamps as needed.

ICP
- Check tubing daily and replace every 2 days.
- Clean torch daily.
- Check and clean nebulizer daily.
- Clean chilling water quarterly.
- Replace air filters quarterly or as needed.
- Preventative Maintenance yearly by manufacturer.

General Preventative/Routine Maintenance:
- Balances- Calibrate daily with class "s" weights. Reference weights are certified annually.
- Refrigerators/Freezers- Temperatures taken daily with calibrated thermometers. Thermometers are calibrated annually. Reference thermometers are certified every three years.

6.4 Laboratory Materials Procurement and Tracking

The LIMS system stores ordered reagents, standards, and supplies for tracking purposes. The standards certificate of Analysis (COA) are scanned and linked to each standard used. Dilutions of standards are also traced in the LIMS system from ordered "stock". The expiration dates of the stock as well as the prepared standard are tracked. The amount and identity of each stock as well as the final volume and concentration of the prepared standard is recorded electronically.

Each chemical purchased for laboratory use is ordered by specifying the grade required for the intended use. Persons who place the orders are not permitted to make any substitutions without authorization from the Section Director. This restriction is intended to avoid inadvertent purchase of materials of substandard quality. The grades typically used include the following:

Technical	used for cleaning or non-quantitative purposes.
Purified	used for some qualitative analytical work where purity is not critical and specific contamination is noted to be absent.
ACS Reagent	used for analytical work.
Spectrograde	used in IR, AA, and UV applications.
Pesticide Grade	used for pesticide determinations and other GC applications
Primary Standard	used for preparation of standards, calibration, quality control, and standardization.

Standards for organic compounds are typically obtained as concentrated solutions from a commercial source. Metals standards are obtained from commercial sources as 1,000 or 10,000 ppm certified solutions. Standard materials for inorganic parameters are typically primary standard grade, when available, or analytical grade. Independent quality control standards are obtained from commercial sources. Quality Control standards must not be from the same lot as materials used for calibration. Typically, different commercial sources are used.

All reagents, acids, solvents, standards and other chemicals are dated upon receipt by the receiving department, and when opened by the technician.
All stock, prepared standards, reagents, and prepared reagents have the vendor expiration date, the date opened, and the laboratory expiration (which is the

earliest of either the vendor expiration or the expiration from date opened defined in the LIMS setup for each department. All stock, prepared standards, reagent, supplies, and prepared reagents are discarded before the expiration date.

As part of the laboratory inspections performed by the Quality Assurance Office reagents, acids, solvents, standards, and other chemicals in the laboratory are checked for expiration date.

Solvents are stored in a large flammable storage locker in accordance with laboratory safety requirements. Individual bottles of solvents are kept in the flammable storage cabinets under the laboratory hoods. Acids are kept in a safety cabinet for corrosives and in corrosives storage cabinets under fume hoods. Dry chemicals are stored on designated shelves at ambient temperature. Organic compound standards are stored in several freezers or areas within refrigerators, which are dedicated to standards only. Standards for inorganic compound analysis are stored within a dedicated standard refrigerator and those for metals analysis are stored at room temperature in cabinets.

To control quality of purchased chemicals, the oldest supply is used before a new bottle is opened ("first in, first out"). Analysts are responsible for checking appearance of the chemical prior to use to assure that the physical state of the material is correct. Purity and stability of reagents are monitored by performing blank determinations and Quality Control samples along with analytical batches. Additionally, each manufacturer's lot of solvent is checked for potential contaminants by pre-screening the solvent through the appropriate method.

7.0 Data Generation

7.1 Standard Operating Procedures

Standard Operating Procedures (SOPs) are utilized by Phoenix Environmental Laboratories, Incorporated to define exact routines to be followed in each section. There are SOP documents covering all aspects of the laboratory operation, from sample receipt and analytical methodology through data review and archiving. The entire SOP Manual is available for review during client visits.

Each SOP document is individually reviewed and approved. A Document Control System has been designed for SOP documentation and a historical file is maintained. SOPs are identified by a SOP numbering and revision identification system administered by Quality Assurance. Once approved by signature, an effective date is assigned to the document. Distribution of new SOP documents and retirement of old documents is the responsibility of the Quality Assurance Office. Obsolete documents are maintained in a historical file where they are marked obsolete and the date of replacement noted. Standard Operating Procedure documents are reviewed at least annually to determine if updating is required.

SOP documents may be initiated by any staff member. The proposed document is submitted to the Quality Assurance Office, which, after review, circulates the draft document to lab management for comments. The draft document and management comments are returned to the originator for resolution. The revised document is then circulated by the Quality Assurance Office for approval signatures. Each SOP must be signed by the originator, as well as the Section Supervisor, QA Officer or Director.

All SOP documents are scanned and available to all employees in electronic format in the LIMS system. Original SOP Manuals are controlled by the QA department.

The Quality Assurance Office has a critical role in the establishment and maintenance of the SOP documentation program. The Quality Assurance Office prepares or assists others in the preparation of many SOP documents. The Quality Assurance Office is responsible for the circulation and review of draft SOPs, for maintenance of the SOP document control system, including the historical file, and electronic versions in the LIMS.

All laboratory employees are responsible for reading, understanding and following SOPs particular to their job function. To document this, employees are required to sign a SOP Review Sheet, which states that they have read and understand SOPs particular to their job function. These forms are kept in the original SOP manuals, maintained by the Quality Assurance Office.

Appendix D of this document contains the Table of Contents of the SOP manual.

7.2 Sample Chain-of-Custody

All incoming samples are delivered to the Sample Control office for inspection, log-in, and storage. Immediately upon receipt, the sample set is unpacked and checked versus the chain-of-custody sheet. It is the responsibility of the Sample Coordinator to sign for laboratory custody upon receipt.

The Sample Control inspection of the samples include the following checks:

- Custody seal status
- Sample container integrity
- Holding temperature at time of receipt
- Type of container (plastic or glass)
- Addition of preservation to sample if chemical preservation is required
- Volume of sample
- Sample identity and collection information

The Sample Acceptance Policy details the procedures for inspection of samples upon receipt and the EPA requirements concerning sample preservation and holding times. The client is notified if the samples do not meet the guidelines for sample identification, holding time or preservation. Procedures utilized in the logging of samples are detailed in a separate SOP document.

The result of the incoming sample inspection is noted on the Chain of Custody Form. The temperature of samples and coolant information is also noted on the chain of custody. The pH of preserved containers is recorded in the electronic Sample Preservation record.

Samples are assigned a unique, sequential number during the logging process. Individual sample labels are generated for each sample that reflects the Phoenix sample number. Reporting requirements and criteria should also be recorded on the Chain of Custody by the client and they are logged in accordingly.

The samples are stored in secure sample storage areas by Sample Control. Distribution of samples within the laboratory is monitored by the LIMS. Each analyst logs start time and end time with every use of the sample or sample extract.

Commercial samples are kept for at least 30 days from the time the samples are received. After 30 days the samples are disposed of unless otherwise specified by the client. Extracts of samples submitted for organic analysis will be retained for a period of 30 to 90 days after data submission.

7.3 Sample Management

Phoenix Environmental Laboratories, Inc. uses five techniques as part of its complete sample management program:

- Computerized sample login including printing of Sample Receipts for verification of analyses requested.
- Database printouts of assignments and work backlogs.
- Centralized LIMS input or data transfer of all analytical results and comments regarding any problems encountered during analysis.
- Validation and generation of the final analytical report for transmission to the client in either hard copy or electronic form.
- Archiving of all reports and raw analytical results on a hard disk for storage and potential future retrieval if required.

In section 7.2 of the Quality Manual, the Chain of Custody (COC) Form was discussed as the location where results of the incoming sample inspection are recorded. After this step, a copy of the chain of custody and any field paperwork or client paperwork, which arrived with samples, is sent to the Client Services group. Client Services compares the information submitted with that in its own files to assure that the sample set agrees with work arranged via previous communication. Client Services then records the test codes required for each sample if not previously established. Special instructions to the lab regarding report due date, sample preparation, QC requirements, criteria and reporting requirements or special handling required are also recorded by Client Services.

Sample Control enters the client information, sample identification and test codes into the database. Each set of samples, which are received from a client at the same time, is assigned to a *Login Group.*

After log-in on the Phoenix Laboratory Information Management System (LIMS), *Sample Receipt Forms* are generated from the database. These receipts are checked against the original chain of custody for accuracy.

Departmental, work assignment sheets (backlog reports) are generated by the Section Managers. The LIMS system has been programmed to create a separate backlog for each department or analysis. The backlog contains essential information such as Sample Identification, test required, collection date to comply with EPA holding times, and date results are due to the client.

Each supervisor is responsible for assigning analytical batches for processing by analysis. The analyst then creates a batch, or a listing of samples to be analyzed. The Phoenix LIMS generates batches by holding time and due date, and includes the quality control samples and any special sample instructions. As each test is completed, the majority by data transfer, the LIMS database is updated to close out the test.

The data is then validated and cross-checked for accuracy and conformance with parameter limits, history, and inter-parameter correlations. The final analytical report is then generated for review by the project manager, along with the quality assurance department or Laboratory Directors before transmittal to the client. Preliminary results (before final data validation and review) may be sent to the client as a Sample Progress Report. This preliminary report clearly indicates that the data is of a preliminary nature and subject to review and revision.

After the final data report is submitted to the client in electronic or hard copy form, the final report and raw analytical data is archived on a hard disk for storage and potential future review. See Section 8.3 of this Manual for storage information.

7.4 Additional Procedural and Calibration Requirements to Achieve Quality Assurance Objectives

7.4.1 Organics

Sample Preparation

A minimum of three surrogate standards is added to each organic sample requiring GC/MS analysis for volatile, and acid and base neutral extractables. For pesticide analysis, two surrogates are added and for herbicide analysis, one surrogate is added. These surrogate compounds are quantitatively analyzed in the GC/MS or GC phase. Historical records, in the form of laboratory control charts, are maintained on the percent recovery of surrogate compounds for each sample. These records form the statistical basis upon which preparation techniques are monitored. Surrogate recoveries must meet acceptance criteria before the analytical data will be released. In some instances, the sample matrix may produce interferences that adversely affect recoveries. These interferences must be confirmed by a repreparation and reanalysis of the samples. Affected data are qualified in the report.

A method blank per matrix is prepared at a frequency of at least one for every twenty samples processed for each analysis requested or daily, whichever is greater. The purpose of the method blank is to ensure that contaminants are not introduced by the glassware, reagents, personnel, and sample preparation or sample analysis environment.

Standards

Calibration standards are traceable to the National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS). Commercial sources of standards and reagents are checked for purity against a second source standard.

All standards prepared for use throughout the organic laboratory are assigned a unique identification number. The standard number is entered in a bound Standards Notebook with all information regarding the preparation of that standard, i.e., date, technician, name of each compound and amount used, final volume, expiration date and solvent used. All stock standard containers are labeled with the standard's identification number and name, lot number, code, manufacturer, date prepared and expiration date.

The instrument response obtained for each compound in a newly prepared standard is compared to the response obtained from the previous standard. The two standards must agree within $\pm$ 15% for all but a few compounds recognized as being chromatographably atypical or the new standard may not be used until the discrepancy has been resolved.

Gas Chromatography/Mass Spectrometer (GC/MS)

The Gas Chromatograph/Mass Spectrometer analyses are an integral part of the analytical services provided by Phoenix Environmental Laboratories, Incorporated. The analyses involve very sophisticated instrumentation, which is operated by a highly trained staff. To assure that the results are of the highest quality, a rigorous program of calibration and quality assurance has been established.

Prior to the utilization of the instrumentation, the instrument performance is adjusted to assure that all manufacturer and method's performance criteria are met. The instrument's performance is monitored, recorded and when appropriate charted in control charts. The instrument is continually monitored and is adjusted on an as-needed basis (specified in the Standard Operating Procedures).

Tuning

On a daily basis, the mass spectrometer is adjusted to meet the method defined tune criteria, using FC-43. Bromofluorobenzene (BFB) or Decafluorotriphenylphosphine (DFTPP) is then used to confirm that the instrument meets these criteria. The BFB ion abundance criteria are outlined within the particular methods and must be satisfied for all volatile organic analyses. The DFTPP ion abundance criteria are outlined within the applicable methods and must be satisfied for all semi-volatile organic analyses. After the tuning criteria are confirmed, the instrument is calibrated for the analyses of interest.

Calibration

The analytical procedure followed for analyses of both volatile and semivolatile organic compounds involves an initial calibration of the instrument. The SOP of each analytical method details the criteria of the calibration curve. This calibration is performed using multiple concentrations of standards. The validity of the calibration is then confirmed using an NIST traceable standard mix containing known concentrations of each analyte. On a daily basis, the instrument calibration is confirmed to be unchanged by analysis of a single standard. The SOP of each analytical method details the criteria of the calibration curve.

Blanks

After calibration, a method blank is analyzed to demonstrate that the system is free of any of the analytes of interest. The method blank consists of organic free water for volatile analyses and an extraction blank for semi-volatile analyses. After demonstration that the system is free of contamination, sample analyses are begun. Maximum allowable levels of contamination are up to the method detection limit for most organic compounds and up to 10X the Contract Required Detection Limit (CRDL) for common laboratory contaminants as defined in the EPA Statement of Work.

Gas Chromatography (GC)

Pesticide, Herbicide and Polychlorinated Biphenyl (PCB) analyses are performed using a gas chromatograph equipped with the appropriate detectors. These analyses often are performed on complex matrices that require an experienced staff for the interpretation of the results. The analysts also must determine the clean-up requirements needed for each individual sample.

Prior to all analyses, the elution time and elution order for each analyte of interest is determined. They are determined by analyses of several standards over a seventy-two (72) hour period. These analyses also define the retention time window. This window is calculated by multiplying the standard deviation of the retention times by a factor of three (3).

Calibration

The instrument is calibrated by analysis of a standard mixture that contains the analytes of interest. The number of standards and their concentration are method specific, but all assure an accurate determination of the concentration of an analyte in the sample. The instrument's sensitivity is adjusted so that all standards are integratable and are also within the instruments linear response range. On a daily basis, and after every twenty samples, the instrument calibration is confirmed to be unchanged by analysis of a single standard. The SOP of each analytical method details the criteria of the calibration curve and the continuing calibration check samples.

Blanks

After calibration, a method blank is analyzed to demonstrate that the system is free of any of the analytes of interest. The method blank consists of an extraction blank for pesticide, herbicide and PCB analyses. After demonstration that the system is free of contamination, sample analyses are begun.

7.4.2 Metals

The analyses performed on the ICP, GFAA and AAS instrumentation are an extremely important part of the analytical services provided by Phoenix Environmental Laboratories, Incorporated. The analyses involve very sophisticated instrumentation, which is operated by a highly trained staff. To assure that the results from this phase of the operation are of the highest quality, a rigorous program of calibration and quality assurance has been established.

Prior to the utilization of the instrumentation, the instrument performance is adjusted to assure that all manufacturer's and accrediting body's performance criteria are met. The instrument's performance is monitored, recorded and when appropriate charted in control charts (specified in the Standard Operating Procedures).

Standards

Calibration standards are traceable to the National Institute of Standards and Technology. Commercial sources of standards and reagents are checked for purity against a second source standard. All standards prepared for use throughout the laboratory are assigned a unique identification number. The standard number is entered in a bound Standards Notebook with all information regarding the preparation of that standard, i.e., date, technician, name of each compound and amount used, final volume, and concentration of acid in the diluent used. All stock standard containers are labeled with the standard's identification number and name, date prepared and expiration date.

Calibration of GFAA, AAS and ICP Systems

Instruments are calibrated each time an analytical run of less than twelve hours is set up. Calibration standards are prepared by diluting the stock metal solutions at the time of analysis. Source identification and analysis date are recorded on the analysts run log cover sheet, which is attached to the analytical data and stored electronically.

The calibration standards are be prepared using the same type of acid or combination of acids as in the sample extracts. Calibration standards are prepared fresh daily for cold vapor and furnace methods. Calibration standards are prepared at least weekly for ICP methods. The calibration curve consists of a blank and at least three calibration standards in the appropriate range

Quality Control Requirements

The quality control program within the metals department consists of analysis and evaluation of various samples. Each QC sample analyzed reflects the conditions of analysis of all associated analytical samples. The duration of analysis, rinses and other related operations that may affect the QC measured result may not be applied to the QC to a greater extent than the extent applied to the associated analytical samples. For instance, the difference in time between a CV analysis and the blank immediately following it as well as the difference in time between the CV and the analytical sample immediately preceding it may not exceed the lowest difference in time between any two consecutive analytical samples associated with the CV. The requirements of each are detailed in the standard operating procedure (SOP).

Calibration Verification Standard

Immediately after calibration and every ten samples, a standard at the midpoint range of the calibration is analyzed and evaluated for each analyte. When measurements exceed the control limits criteria, the analysis for that analyte is terminated. Samples are accepted only when bracketed by acceptable CV standards.

Calibration Blank Standard

After each CV standard, a standard blank is analyzed and evaluated. The purpose of the calibration blank is to determine the effect of instrument drift at the level near the reporting limit.

Laboratory Control Standard (LCS)

After calibration, a LCS standard is analyzed and evaluated for each analyte. The LCS is a certified solution provided by a source independent from the calibration standards. Sample analytes are accepted only when the LCS meets the acceptance criteria.

Fortified Blank/Blank Spike/Preparation LCS

Aqueous and solid Laboratory Control Samples (LCS) are analyzed for each analyte using the same sample preparations and analytical methods as the samples being analyzed. The aqueous LCS solution is obtained by spiking a preparation blank with a spiking solution prepared by the metals department from certified materials. One LCS is prepared and analyzed for every batch samples digested. The control limits are defined by internal control charts or by method SOP. If any analyte exceeds criteria, the analysis will be terminated, the problem corrected and the samples associated with that LCS re-digested and re-analyzed.

Preparation Blank

At least one matrix matched preparation blank to be processed through each sample preparation and analysis procedure must be prepared and analyzed with every sample batch. This blank is reported for each sample batch, if required, and used in all analyses to ascertain whether sample concentrations reflect contamination in the following manner,

A If the absolute value of the concentration of the blank is less than or equal to the method requirements (see individual SOP), no contamination of the sample results is suspected.

B If any analyte concentration in the blank is above the method requirements, the lowest concentration of that analyte in the associated samples must be 10x the blank concentration. Otherwise, all samples associated with that blank must be redigested and reanalyzed for that analyte. The sample concentration is not to be corrected for the blank value.

Interference Check Sample

An Interference Check Sample (ICSAB) is analyzed daily to verify the accuracy of the inter-element corrections. The control limits for this sample are 80-120% of true value.

Spike Sample Analysis

The spike sample analysis is designed to provide information about the effect of the sample matrix on the digestion and measurement methodology. The spike is added before the digestion steps. At least one spike sample analysis is performed on each group of samples of a similar matrix type (i.e., water, soil) or for each sample batch.

If the spike analysis is performed on the same sample that is chosen for the duplicate sample analysis, spike calculations are performed using the results of the sample designated as the "original sample". The average of the duplicate results cannot be used for the purpose of determining percent recovery. Samples identified as field blanks should not be used for spiked sample analysis. The same spiking solution is used for the matrix spike as the blank spike. If two analytical methods are used to obtain the reported values for the same element within a Sample Batch (i.e., ICP, GFAA), spike samples must be run by each method used.

The spike recovery is reported in the Quality Control Sample Section of the LIMS. This sample can be included in the client report if required. In-house limits are produced from control charts.

For ASP-like analyses, if the spike recovery is not at or within the limits of 75-125%, the data of all samples received associated with that spike sample and determined by the same analytical method shall be noted in the report. An exception to this rule is granted in situations where the sample concentration exceeds the spike concentration by a factor of four or more. In such an event, the data shall be reported unflagged even if the percent recovery does not meet the 75-125% recovery criteria.

Duplicate Sample Analysis

One duplicate sample is analyzed from each group of samples of a similar matrix type (i.e., water, soil) or for each sample batch.

Samples identified as field blanks should not be used for duplicate sample analysis. If two analytical methods are used to obtain the reported value for the same element for a Sample Batch (i.e., ICP, GFAA), duplicate samples must be run by each method used.

The relative percent differences (RPD) for each component are calculated as follows:

$$RPD = \frac{S-D}{(S+D)/2} \times 100$$

Where, RPD = Relative Percent Difference
S = First Sample Value (original)
D = Second Sample Value (duplicate)

The RPD is reported in the Quality Control Sample Section of the LIMS. This sample can be included in the client report if required.

Instrument Detection Limit Determination (for ASP-like analyses)

The instrument detection limits in *ug*/L shall be determined for each instrument used at a frequency of at least annually, and must meet the method requirements.

The Instrument Detection Limits (in *ug*/L) shall be determined by multiplying by 3 the average of the standard deviations obtained on three non-consecutive days from the analysis of a standard solution (each analyte in reagent water) at a concentration 3x-5x the instrument manufacturer's suggested IDL, with seven consecutive measurements per day. Each measurement must be performed as though it were a separate analytical sample (i.e., each measurement must be followed by a rinse and/or any other procedure normally performed between the analysis of separate samples). IDL's must be determined and reported for each wavelength used in the analysis of the samples.

The most recently determined IDL for an instrument are used as the IDL for that instrument. If the instrument is adjusted in any way that may affect the IDL, the IDL for that instrument must be redetermined and the results submitted for use as the established IDL for that instrument. Instrument detection limits are retained and are available for inspection.

Demonstration of Capability/Performance

Method Detection limits are determined for each instrument for each analyte at least annually following the procedure described in 40 CFR 136 Appendix B.

Linearity of calibration is determined by evaluation of the calibration curve. The correlation coefficient must be 0.9975 or greater. The highest standard must agree within 5% of the true value.

Quality control samples from a source different than the calibration standards are used to verify the calibration standards.

Accuracy and Precision Studies are performed at least yearly where required. Four standards at or near the mid-point of the working range are analyzed and evaluated.

7.4.3 Classical Chemistry

The analyses performed by the classical chemistry department are an extremely important part of the analytical services provided by Phoenix Environmental Laboratories, Incorporated. The analyses, which are performed by a highly trained staff, are the most varied in the laboratory. To assure that the results from this phase of the operation are of the highest quality, a rigorous program of calibration and quality assurance has been established

Standards

Calibration standards are traceable to the National Institute of Standards and Technology. Commercial sources of standards and reagents are checked for purity against a second source standard. All standards prepared are assigned a unique identification number. The standard number is entered in a bound Standards Notebook with all information regarding the preparation of that standard, i.e., date, technician, name of each compound and amount used, final volume, and expiration date. All stock standard containers are labeled with the standard's identification number and name, date prepared and expiration date.

Demonstration of Capability/Performance

Method Detection limits are determined for each instrument for each analyte at least annually following the procedure described in 40 CFR 136 Appendix B.

Accuracy and Precision Studies are performed at least yearly where required. Four standards at or near the mid-point of the working range are analyzed and evaluated.

Laboratory Control Standard (LCS)

A LCS is analyzed and evaluated for each batch of samples. The LCS is obtained from certified source independent from the calibration standards. The acceptance criteria are determined by in house control charts. The LCS is reported in the LIMS and is available for the client report if required.

Preparation Blank

A preparation blank, consisting of deionized distilled water processed through each sample preparation and analysis procedure is prepared and analyzed with every sample batch. This blank is reported for each sample batch, if required, and used in all analyses to ascertain whether sample concentrations reflect contamination.

Spike Sample Analysis

The spike sample analysis is designed to provide information about the effect of the sample matrix on the distillation/digestion and measurement methodology. The spike is added before the digestion or distillation steps. At least one spike sample analysis is performed on each group of samples of a similar matrix type (i.e., water, soil) or for each sample batch.

If the spike analysis is performed on the same sample that is chosen for the duplicate sample analysis, spike calculations must be performed using the results of the sample designated as the "original sample". The average of the duplicate results cannot be used for the purpose of determining percent recovery.

The spike recovery is reported in the Quality Control Sample Section of the LIMS. This sample can be included in the client report.

Duplicate Sample Analysis

One duplicate sample is analyzed from each group of samples of a similar matrix type (i.e., water, soil) or for each sample batch.

Samples identified as field blanks should not be used for duplicate sample analysis.

The relative percent differences (RPD) for each component are calculated as follows:

$$RPD = \frac{S-D}{(S+D)/2} \times 100$$

Where, RPD = Relative Percent Difference
S = First Sample Value (original)
D = Second Sample Value (duplicate)

The RPD is reported in the Quality Control Sample Section of the LIMS. This sample can be included in the client report if required.

7.4.4 Bacteria Department

The bacteria department analyzes samples for the presence of coliform (total, fecal and e.coli), Fecal Streptococcus, and Enterococcus. In addition, a Heterotrophic plate count provides an enumeration of all forms of bacteria. These analyses are an important part of the analytical services provided by Phoenix Environmental Laboratories, Incorporated. These analyses are performed by a highly trained staff utilizing a rigorous quality assurance program.

Preparation of Culture Media

The culture media used at Phoenix are either prepared from dehydrated material or purchased ready to use. Preparation of media is recorded in the Media Prep Logbook, and media are given a batch number for each time it is prepared. Prepared media is recorded in the Bacteria Chemicals Receipt Logbook and in the Media Preparation Logbook.

Negative and Positive Control

Coliform Analysis

Coliform bacteria are Gram negative, non-spore-forming rod-shaped bacteria that ferment glucose at 35°C. Each batch and lot of media is then tested to verify amenability to Coliform growth and inability to grow other bacteria. The Gram positive bacterium (P.aeroginosa) is used as the negative control, as it will not grow on coliform media. Two species of coliform bacteria are used to verify amenability (positive control) to the media: K.pneumonea, and E.coli.

Fecal Coliform Analysis
Fecal coliforms are bacteria that fulfil the definition of a Coliform, yet are able to sustain growth at elevated temperatures (thermo-tolerant coliforms). E.coli are fecal coliforms, and are used as the positive control test organism for the culture media. K.pnuemonea, not considered a fecal coliform because it is absent in the lower digestive tract of mammals, is used as a negative control, yet may exhibit growth because it is somewhat thermo-tolerant. P.aeroginosa is used as the negative control for the culture media.

E. Coli Analysis
E.coli is a fecal coliform that is determined biochemically, rather than by increasing the temperature. K.pneumonea is used as the negative control, and E.coli is used as the positive control when testing the culture media.

Standard Plate Count Analysis
Standard Plate Counts (Heterotrophic Plate Counts) are the enumeration of all forms of bacteria. Unlike the culture medium for Coliforms (which has a Gram Positive inhibitor), the Standard Plate Count culture medium will allow growth of many kinds of organisms. S.aureus is used as a positive control to verify the lack of inhibition present in the media.

Enterococcus Analysis
Enterococci are a sub-group of fecal streptococci. The most common bacterium in this group is Enterococcus Faecalis, which is used as a positive control. E.coli is used as the negative control, and is used with the positive control when testing the culture media.

Blanks

Aliquots of sterile buffered water are run at the beginning and end of each batch of membrane filtration. They are incubated as samples, and are checked for growth. The blanks demonstrate the sterility of the glassware used throughout the filtration process. The initial blank demonstrates that the glassware was clean when the batch was begun, and the final blank demonstrates that the glassware was clean when the batch was completed. Batches of greater than 10 samples require blanks that are performed mid-way. When the blanks come back with no growth, it can be assumed that the cleaning between sample filtration was sufficient to remove residue from the previous samples. If any of the blanks come back with growth, this assumption does not hold, and all of the results must be thrown out.
Blanks for methods that do not involve membrane filtration (like multiple tube fermentation, and sample plating) require only one blank, done at the end of the batch of samples. For these methods, it is necessary to demonstrate the sterility of the work area at the time of the testing. If the final blank is shown to have no growth, then it can be assumed that the work area was sterile at the end of the batch and therefore was sterile throughout the run. If the final blank comes back with growth, this assumption does not hold, and the results must be thrown out.

General Equipment

Incubators and waterbaths are monitored to ensure they maintain constant temperatures within the acceptable guidelines. The sterilization apparatus is tested routinely, with a heat resistant strain of spore, to ensure proper sterilization.

7.5 Determination of Detection and Quantitation Limits

Two types of detection limits are routinely determined at Phoenix Environmental Laboratories, Incorporated, the Instrument Detection Limit and the Method Detection Limit. An instrument Detection Limit (IDL) is defined as the smallest signal above background noise which is reliably detected. A Method Detection Limit (MDL) is the minimum concentration that can be measured with 99 percent confidence that the analyte is greater than zero. The MDL's are determined from analysis of spiked blank waters and soils.

Instrument Detection Limits are measured primarily for metals analyzed by Graphite Furnace Atomic Absorption spectrophotometry (GFAA), Cold Vapor Atomic Absorption spectrophotometry (CV), and Inductively Coupled Plasma (ICP). The IDL should be determined when new equipment is acquired, after major instrument repairs, and when required by specific contracts. The IDL is obtained by the following procedure:

A standard is prepared at 3-5 times the level of the estimated detection limit.

On 3 non-consecutive days, 7 consecutive measurements on the standard are obtained. The standard is treated as a sample, with rinses or blanks run between each replicate.

The average of the daily standard deviation is multiplied by three to obtain the IDL.

Method Detection Limits are measured for all tests employed at Phoenix Environmental Laboratories, Incorporated. The procedure is defined in 40 CFR Part 136, Appendix B (Federal Register, October 26, 1984). The procedure is outlined below:

a) An estimate of the detection limit is made.

b) A minimum of seven replicates of blank water or soil are spiked at a level 2 to 5 times the estimated detection limit.

c) The spiked samples are processed through every step of the analytical method.

d) The standard deviation for the seven samples is multiplied by 3.143 (students t value at 99% confidence at N-1 degrees of freedom) to obtain the MDL.

The Practical Quantitation Limit (PQL) is the lowest calibration standard calculated using sample preparation conditions and the percent solids. The MDL study verifies the capability of the laboratory to detect the compounds at the practical quantitation limit.

7.6 Determination of inter-element correction factors

On an annual basis, inter-element correction factors are determined for ICP analysis. This measure determines the potential false analyte signals caused by the presence of high levels of certain commonly occurring elements found in environmental samples. A 1000 ppm standard containing one element is analyzed for all the elements. The software of the instrument allows for the correction value to be subtracted from the interfered analysis.

7.7 Table of Methods

Wet Chemistry	
Acidity	SM2310B
Alkalinity	SM2320B
Ammonia/TKN	EPA 350.1/351.1
BOD/cBOD	SM5210B
Bromide	SM4500BrB EPA300.0 SW9056
Chloride	SM4500CL E EPA300.0 SW9056
Chlorine	SM4500CL G
Chlorine Demand	SM2350B
COD	SM5220 D
Color	SM2120 B
Conductivity	SM2510 B
Cyanide	EPA335.4 SM4500CN SW9010
DO electrode	SM4500 O G
DO titration	SM4500 O C
Flashpoint	SW1010
Fluoride	EPA300.0
Hardness by Calculation	EPA200.7
Hexavalent Chromium soil	SW3060A
Hexavalent Chromium water (wm)	SM3500Cr D
Surfactants (MBAS)	SM5540 C
Nitrate	SM353.2 EPA300.0 SW9056
Nitrite	EPA353.2 EPA300.0 SW9056
Odor	SM2150 B
Oil & Grease	EPA1664 / SW9071B

Table of Methods (cont.)

Paint Filter Liquid Test	SW9095
pH and Corrosivity	SM4500H B SW9040 SW9045
Phenols	EPA420.4
Phosphorus	SM4500P E
Reactivity	SW7.3
Salinity	SM.250B
SPLP Extraction	SW 1312
Solids, Dissolved	SM2540 C
Solids, Fixed & Volatile	SM2540E
Solids, Suspended	SM2540 D
Solids, Total	SM2540 B
Sulfate	SM4500D EPA300.0 SW9056
Sulfide, Total	SW9030A
Sulfite	EPA377.1
TCLP Extraction	SW1311
TKN block digestion	EPA.351.2
TOC soil (sm)	SW9060
TOC water (wm)	SM5310C
Turbidity (NTU)	SM2130 B
Bacteria	
E. coli MF	EPA1103.1/SM9222G
Enterococcus MF	EPA1600 / Enterolert
Fecal coliform MF	SM9222D
Fecal coliform MPN	SM9221C
Fecal Streptococcus MF	SM9230C
Standard Plate Count	SM9215B
Total coliform DW	SM9223B
Total coliform MF	SM9222B
Total coliform/E.Coli MPN	SM9223B
Metals	
Mercury by Cold Vapor	EPA245.1 SW7470 SW7471

Metals (continued)	
Metals by GFAA	EPA200.9, SM3113 SW 7000 series
Metals by ICP	EPA 200.7 EPA 200.5 SW 6010
Organic Instrumentation	
EDB, DBCP in Drinking Water	EPA 504.1
Carbamates	EPA 531.2
Glyphosate	EPA 547
Diquat, Paraquat	EPA 549.2
Extractable Total Petroleum HC	CTETPH
PCB	EPA608 SW8082
Pesticide (NPD)	EPA507 SW8141
Pesticide (ECD)	EPA 508 EPA 608 SW 8081
Haloacetic Acids	EPA552.2
Herbicide	EPA 515.3 SW 8151
VOA by GC	EPA 601/602 SW8021
VOA by GC/MS	EPA524.1 EPA 624 SW8260
SVOA by GC/MS	EPA525.2, EPA525.3 EPA625 SW8270
1,4-Dioxane	EPA-600/4-79-020
PCB in air	EPA TO-10
Volatiles in air	EPA TO-14 EPA TO-15 NJ LL TO-15

EPA: "Methods for chemical Analysis of Water and Wastes", EPA, Environmental Monitoring Systems Laboratory –Cincinnati (EMSL-CI), EPA-600/4-79-020, 1983
40CFR Part 136. Revised July 1, 1998.
"Method for the determination of Organic Compounds in Drinking Water", EPA, Office of Research and development – Washington, EPA/600/4-88/039.
SM: "Standard Methods for the Examination of Water and Wastewater", American Public Health Association.
SW: "Test Methods for Evaluating Solid Waste", EPA SW-846 Third Edition 1986

8.0 Data Processing

8.1 Collection

Accuracy and completeness of data records are essential in maintaining the quality of laboratory results. Ink is used for all entries. All entries are signed and dated. Corrections are made with a single line through the error, a description of the reason for the change, initials, and date.

Data records are maintained for all transfers and processing of each sample from the time the sample is received until the results are reported and the sample is disposed of. The records kept for receipt, log-in, and sample custody have been discussed in Sections 7.3 and 7.4. Preparation of standard solutions is documented in bound notebooks. Each stock material and solution is assigned a number, which is referenced in the preparation log. Prepared organic solution numbers are recorded on the analysis data sheets. In metals analysis, most solutions are prepared fresh daily and the source and identification information is recorded on the data sheets. The standard solution preparation log contains entries regarding the source material, which includes:

- Compound name
- Purity
- Manufacturer and lot number
- Date received
- Concentration, if in solution form
- Solvent, when appropriate
- Date consumed or disposed of.
- Expiration date
- Solution identification number

The solution preparation is documented by the following information:

- Compound identification
- Source material (by number)
- Assigned solution number
- Date prepared
- Quantity weighed out or measured by volume
- Final volume after preparation
- Solvent used
- Final concentration
- Expiration date
- Date disposed of

Data for inorganic (nonmetal) analyses are recorded in bound notebooks or LIMS batching logs assigned to each test. The required information for each analysis includes, but is not limited to: the analytical procedure; any procedure changes required; sample number; raw analytical data; standard solutions used; preparation of reagents when appropriate; signature and date. If an instrument printout is obtained for the analyses, the printouts are signed, dated and retained. The printout is inserted in the notebook if size permits. Otherwise the printout is filed in a separate file with a cross-reference recorded in the lab notebook and on the printout.

For metals analysis, a digestion log is maintained in the LIMS batching program. The digestion is documented by record of internal sample number, Client ID, analysis required or method quantity and identity of spiking solution used, initial sample volume final sample volume, initials of technician and date.

Printouts of results are obtained for graphite furnace, and cold vapor analysis. A Run log cover page is prepared to reference the analysis date, instrument identification, Sample ID, concentration corrected final results (for Cold Vapor), identity of QC or spiked samples, percent recovery obtained, and any comments. This run log is attached the instrument's data system printout. Each data set is filed in the metals department. All ICP analytical information and results are stored in the LIMS database.

Data for organic extractions are recorded in the LIMS batching program. All details regarding the extraction are recorded. The data includes the following entries: extraction method; sample matrix, extraction date; surrogate spiking solution number and concentration; matrix spiking solution numbers and concentration; Sample identification number; sample amount; quantity of surrogate and matrix spike added; final extract volume; extract storage location and signature of chemist.

Analytical data from the GC and GC/MS instruments is generated by the computer data system. Data outputs include identification of the sample, identifications of compounds retention times, and comparisons to standards. Outputs are in tabular form (retention times, areas, mass listings, etc.) and in graphic form (chromatograms, TICs, etc.). Outputs are in a standard format specified for each analysis type. Data produced are compared to information concerning the sample history, sample preservation, QC Data, etc., to judge the validity of the results.

8.2 Data Review and Validation

Phoenix Environmental Laboratories, Incorporated performs data review and validation studies on all data packages generated. Data validation is the process whereby data are accepted or rejected based upon defined criteria. Information concerning the sample history, sample preparation, Quality Control data and other factors are used in the judgement of the validity of the results. A Quality Control Audit Report is generated daily and reviewed by the Laboratory Director, Quality Control Officer and Supervisors. This computerized report compares data against current Quality Control limits, historical data information, and client specified permit exceedences among other parameters. Quality Control information is judged against set criteria to accept or reject data. Criteria used to accept or reject data are dependent upon the methodology, the client's requirements, and the eventual use of the data. All quality control parameters including method blanks, surrogate spikes, matrix spikes and duplicates, sample duplicates, laboratory control samples (QCs), field blanks, trip blanks and storage blanks must meet acceptance criteria. Where applicable, sample flags or qualifier codes shall be used to qualify data. Either the supervisor or a second analyst of equal or higher experience and responsibility reviews data. This review ensures that the following requirements have been appropriately met:

Organic Section

The analyst and Supervisor review data to ensure the laboratory provides the following where appropriate:

- Calculates the recoveries of surrogate spikes and verifies that criteria are not exceeded:
- Verifies that there are no contaminants in associated blanks outside acceptable limits;
- Compares samples and duplicates for precision in data results;

- Reviews surrogate and spike recovery data to make sure they are within quality acceptance limits;
- Verifies calibration performance for acceptability;
- Reviews and verifies instrument tuning; and
- Reviews internal standard areas of response for acceptability.
- For GC analysis, the compounds identified fell within the daily retention time window. (The daily retention time window is defined as the absolute retention time of a mid-level standard + 3 standard deviations. The standard deviation is obtained from an initial check of 3 injections of standards within a 72-hour period.)

Upon meeting all technical criteria the sample data file is then reviewed by the Organic Team Leader to:

- Verify that holding time criteria have been met;
- Ensure surrogate recovery section has been completed and acceptance limits are not exceeded;
- Ensure that all analyte compounds have been properly recorded;
- Ensure accuracy of calculations on compound quantities; and
- Ensure confirmation by GC/MS has been performed and spectra are included.

The reviewer examines the entire sample data file to ensure that all data transcription and documentation included meet customer requirements. The Organic Team Leader performs a final technical review to verify that the completed package conforms to all Quality Control criteria.

Upon completion of review, the sample data files are forwarded to the Project Manager for final review and compilation of the entire data package.

All Other Sections

- Verify that holding time criteria have been met;
- Calibration met or exceeded a correlation coefficient of 0.9975.
- Standards in the calibration curve cover the expected concentration ranges of the samples including the detection limit. All sample results fell within the range of the standard curve.
- Initial and continuing calibration verification checks met the acceptance criteria defined in the method SOP.
- Method blanks were processed with each analytical batch and were acceptable.
- Results of duplicate samples and matrix spike duplicates were within the laboratory or contract-established precision control limits.
- Matrix spike recovery was within acceptable control limits (as defined by internal control charts).
- Laboratory control samples were analyzed according to frequency specified in the SOP or contract and the results obtained were within control limits.
- Calculations have been accurately performed.
- Data for the analyses provide a complete audit trail. Data notebooks and data sheets correctly reference the analytical method, the standard solutions used, internal numbers, original data values, sample results in correct units, calculation formula for all conversions, signature of the analyst, and date. Instrument printouts must identify the person responsible for the data generation and the date of the run.

The supervisor or other data reviewer signs the data sheet to document approval. If the complete review was performed by someone other than the supervisor, a spot check is performed by the supervisor. The supervisor checks a minimum of 10% of the data. No data may be reported without supervisor approval evidenced by signature on the data page. The Laboratory Director performs a final technical review to verify that the completed package conforms to all Quality Control criteria.

The reviewed data is entered or data transferred into the LIMS by either the analyst or the supervisor. For ASP-like deliverables, a tabulation of results is prepared by the supervisor or analyst and placed in the central project file. The tabulation is transcribed into the report format by assigned report writers. The report and complete project file go to the Section Manager for final check.

The Laboratory Director's review covers the following points:

- Transcriptions are checked for accuracy and use of appropriate units.
- QC data are reviewed to assure that internal specification and contract requirements have been met.
- Nonconformance reports, if any, are reviewed for completion of corrective action and impact upon results. Information contained in the nonconformance report may need to be included in the project narrative.
- Results make sense compared to historical information about the site and results for other parameters tested at the same time.

Upon completion of review, the reports are forwarded to the Project Manager for final review and compilation of the entire data package. A copy of the signed report package is retained in the project file for archiving.

8.3 Report Information and Storage

Laboratory reports shall include:

- A cover page, which lists the states in which current certification are held, along with the laboratory identification number for that state.
- The results of specific analysis of samples with corresponding surrogate recoveries, where applicable, date and time of analysis, and analytical methods used.
- The results of batch or site specific quality control associated with specific samples and analysis, which includes blanks, laboratory control samples, matrix duplicates and matrix spikes.
- The Chain of Custody and any correspondence regarding the samples received on Chain of Custody.
- Parameters where certification is not available or not held in a certain state and/or by NELAC will be notated on the report.
- Samples that represent potable water are reported with their corresponding state or Federal Maximum Contaminant Levels (MCL). Clients are notified of MCL exceedance within 24 hours of the lab obtaining valid data. Sub-contract laboratories are notified of this requirement in writing, when utilized.
- Samples that are subcontracted are clearly marked as such, and the subcontract labs certification number is noted on the report.

Data notebooks, instrument printouts, sample chain-of-custody logs, files, and contracts are retained for a period of 12 years. If contract requirements deviate from this procedure, the contract-specified holding time is followed.

Equipment usage and calibration logs that are not study-specific are kept for a minimum of 12 years. Original SOPs, current and outdated, are permanently archived.

Most of the laboratory operations are part of the LIMS system; the prep, distillation, and analytical runs are stored electronically. These analyses are transferred from these electronic files into the result tables of the LIMS system. Once all the results are entered, the final data report is generated, reviewed and released to the client through the laboratory website. All versions of the final report and any electronic deliverables are stored on the client server drive (Y). All of these electronic drives containing all of the files are backed-up nightly and stored on ioSafe disaster proof external hard drives. Once per week an encrypted copy is taken offsite and stored in a remote safe.

For the few analyses and operations that are not yet stored electronically, hard copy logbooks and hard copy printouts of raw analytical data or supporting documents are archived by instrument, analysis or department and stored in a secure offsite facility. The facility can only be accessed by PEL employees that have signed an access log, which is kept in the control of the Operations Manager. A description of what is being retrieved from the storage area is recorded. The employee is then responsible for returning the data and signing that is has been returned.

Should the laboratory change ownership or go out of business, records will still be retained for the period of time specified above.

8.4 Transcription

Transcription is a potential source of error. Therefore, all transcriptions are checked by a second person.

Two types of transcriptions are most common:

- Transcription of a value from a chromatogram or instrument printout to a data sheet for further calculation of a result. This transfer is checked by the data reviewer's supervisor prior to release of results.

- Transcription in the report preparation and typing stage. The Laboratory Director checks this step or assigns this task to someone other than the preparer of the report.

8.5 Data Reduction

Data reduction includes all processes that change either the form of expression or quantity of data values. The size or dimensionality of the data set is reduced.

To validate all reduction operations, all calculations or manipulations of data are recorded in the data. A description of the formula used must be provided.

Phoenix Environmental Laboratories, Incorporated uses computers, computer data systems, and microprocessor controlled instrumentation to reduce raw data to final form, such as:

- HP Environquant GC & GC/MS Data processing system (includes EPA/NIST Mass Spectral Database)
- Perkin Elmer Turbochrom 4 Data system operating on personal computers
- Perkin Elmer AA Analyst 600 & WinLab Data system
- PSA Millennium Mercury Avalon Data System
- Spectro ICP Micro Evolution and Smart Analyzer Data Systems
- HP Chem Station GC/MS Data System
- IC Peak Net Data System

Calculation of results is performed by these systems based on standard curve responses and is printed with each sample response and/or summarized in tabular form at the end of each analysis set.

When data calculations using linear regression are performed with calculators, the correlation coefficient, slope, and y-intercept values are recorded in the data.

The procedure for correct use of significant figures and rounding of numbers is defined in a SOP. The rounding rules cited in the USEPA Handbook of Analytical Quality Control in Water and Waste Water Laboratories are followed for all manual rounding of numbers.

9.0 Data Quality Assessment

9.1 Introduction - Definition of Terms

Accuracy

Accuracy is defined as the degree of agreement of a measurement, X with an accepted true value, T. Two types of accuracy check samples are used, Laboratory Control Samples (Blank Spike) and the Matrix Spike. The formula used to calculate accuracy for the Laboratory Control Sample is:

$$\text{Accuracy} = (A/B) \times 100$$

Where A = Concentration measured
and B = Concentration spiked

which is the same formula as is used for percent recovery. For calculating accuracy in Matrix Spike analysis, a correction for background concentration found in the unspiked sample must be made. The formula is:

$$\text{Accuracy} = ((A - B)/C) \times 100$$

Where A = Spiked Concentration Measured
B = Unspiked Concentration Measured
and C = Concentration Spiked

Precision

Precision is a measure of the mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Analysis precision is assessed through comparison of duplicate samples or duplicate matrix spike samples.

The term expressing precision is Relative Percent Difference (RPD) and is calculated as follows:

$$RPD = ((A_1 - A_2)/((A_1 + A_2)/ 2))X\ 100$$

Where $A_1 = Rep_1$
and $A_2 = Rep_2$

where Rep_1 and Rep_2 are replicate analyses of the same sample. and,

$$RPD = (\backslash\ MS- MSD\ ) /((MS + MSD)/ 2))X\ 100$$

Where MS = the Matrix Spike sample result
and MSD = the Matrix Spike Duplicate Result

where the Matrix Spike and Matrix Spike Duplicate analyses are performed upon the same sample.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental or process condition.

Field sampling operations have a major impact on data representativeness. Factors including site selection, sampling tools, equipment cleaning procedures, sample preservation, and many others must be considered. Similarly, laboratory operations could impact representativeness if there were day-to-day fluctuations. Accuracy and precision results of the daily quality control samples provide a measure of representativeness associated with laboratory operations.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected under correct normal conditions. To maximize completeness of laboratory analysis, it is essential to have a sufficient quantity of each sample to provide for original and repeat analyses should the original analysis fail to meet acceptance criteria. Our goal for completeness is 100%.

Comparability

Comparability expresses the confidence with which one data set can be compared with another. This indicator of quality is enhanced at Phoenix Environmental Laboratories, Incorporated by the following controls:

- Standardized EPA approved methodology for sample preservation, holding and analysis.
- Consistent reporting units for each parameter in similar matrices.
- NIST traceable standards when available.
- Frequent analysis of QC samples.
- Participation in interlaboratory performance evaluation studies.

9.2 Methods for Attaining Quality Control Requirements

Quality Control Samples

Data quality is evaluated by the performance of Quality Control (QC) sample analysis, including:

- Method Blanks
- Surrogate Spikes
- Matrix Spikes and Duplicates
- Sample Duplicate Analysis
- Laboratory Control Samples (LCS) and Laboratory Control Sample Duplicates
- Calibration Check Samples
- Field Blank Samples
- Trip Blank Samples
- Storage Blank Samples

The particular types and frequency of QC samples processed with production samples are determined by the requirements of the client. Most common needs are those presented in the various EPA Methods, EPA SW-846, New York Analytical Services Protocol (ASP), state requirements, project requirements, customer requirements, and those requirements specified in our SOPs.

Information obtained from the above listed Quality Control samples is used to assess the quality of the data generated and is useful in identifying problems in the sampling process, in the shipment of samples, in the storage of samples, in the analysis of samples and even help in identifying problems in the analysis of the samples caused by the samples themselves. Specifically:

Method Blanks

A method blank is defined as a volume of deionized laboratory water, or in some cases a purified solid matrix carried through the entire analytical process. Data obtained from these samples indicate possible contamination in the samples picked up during the analytical process.

Surrogate Spikes

Samples are spiked with a surrogate to monitor the preparation and analysis processes of the samples. If the surrogate material(s) are not recovered in sufficient quantity from the sample the preparation and/or analysis of the sample is suspect. In the processes that surrogates are used, they are spiked into all samples including blanks. Data from the analysis of surrogates is used to construct control charts. Tables containing the in house control limits are updated by the Quality Assurance department regularly and are located at the bench for the analyst's use.

Matrix Spikes and Matrix Spike Duplicates

Matrix Spike and Matrix Spike Duplicate analysis are performed to evaluate the effect of the sample matrix upon the methodology and the precision of the method with the particular matrix. If Matrix spike compounds are not adequately recovered or vary in recovery between duplicates some measure of matrix interference is suspected. Data from the analysis of matrix spikes is used to construct control charts. Tables containing the in house control limits are updated by the Quality Assurance department regularly and are located at the bench for the analyst's use.

Sample Duplicate Analysis

Sample duplicate analysis is used to assess sample preparation and analytical method precision.

Laboratory Control Samples (LCS) and Laboratory Control Sample Duplicates (LCSD)

Laboratory Quality Control Samples are used to assess the laboratories ability to perform an analytical method and to what level of precision. Data from the analysis of the LCS/LCSD is used to construct control charts. Tables containing the in house control limits are updated by the Quality Assurance department regularly and are located at the bench for the analyst's use

Calibration Check Samples

A Calibration Check Sample is used as a method of determining the accuracy of an instrument's calibration. If the source of the material is the same as that used for the calibration, a second check sample is also analyzed which is from a second source and of known quality and concentration. Each procedure details the acceptance limits.

Field Blank Samples

Analysis of field blank samples can give some measure of information into the possibility of contamination of samples occurring in the field during the sampling process.

Trip Blank Samples

Trip blank sample analysis is used to determine if sample contamination may have occurred during transit of the samples.

Storage Blank (Refrigerator Blank) Samples

Storage blank (Refrigerator Blank) sample analysis is used to determine if sample contamination may have occurred during the storage of the samples once they reach our laboratory facility.

Blind Quality Control Samples

The Quality Assurance Office periodically formulates blind samples for submission to the laboratory for analysis. The samples are produced by the QA Office from standard materials or from EPA ampules. Sample sets usually contain blanks, and replicates of known concentration. Analysis of the data produced from these sample are used to assess quality of data produced by the laboratory, particularly laboratory precision and accuracy.

Quality Control Charts

The QC requirements for accuracy and precision are mandated by the method and of course the clients' needs and the regulatory authority under which the work is being performed. Control Charts allow the laboratory to establish in house limits based on historical data as recommended in the Federal Register. The quality assurance department continually updates control charts based on current data points. The mean value, the warning limits and the control limits are determined for each chart.

Warning and control limits are based upon the following formula:

Upper Control Limit (UCL) = X + 3s
Upper Warning Limit (UWL) = X + 2s
Lower Warning Limit (LWL) = X - 2s
Lower Control Limit (LCL) = X - 3s

Where:
X = Mean Percent Recovery
s = Standard Deviation

Client uncertainty data is calculated using the warning limits from our control charts.

All QC sample results are tabulated immediately following analysis and compared to the in-house limits, the contract-mandated, the method-mandated, or client project-mandated control limits for precision and accuracy. Out-of-control results are cause for immediate generation of a Nonconformance report as described in Section 9.5 and possible re-extraction and/or re-analysis.

An analysis may be considered out of control whenever, as a minimum, any one of the following conditions is demonstrated by a control chart used to monitor that analysis.

- Any one point is outside of the control limits.
- Any three consecutive points are outside the warning limits.
- Any eight consecutive points are on the same side of the plotted mean.
- Any six consecutive points are such that each point is larger (or smaller) than its immediate predecessor.
- Any obvious cyclic pattern is seen in the data points.

Policy

The management and staff of Phoenix Environmental Laboratories, Incorporated makes every effort to generate data of the highest quality possible and continues to apply state-of-the-art analytical methodologies to ensure that our data continues to be of the best quality available anywhere.

Phoenix Environmental Laboratories, Incorporated makes every attempt to produce and deliver analytical data which has been demonstrated to meet contract-, method-, or client-required quality control acceptance criteria. Should anomalies occur in the processing and/or analysis of samples, which affect that objective, they are documented in the data and/or described in the report narrative.

9.3 Data Quality Objectives and Analytical Data Quality Levels

In the planning of projects for the investigation of environmental contaminants, Data Quality Objectives (DQOs) are established. Data Quality Objectives are qualitative and quantitative statements which specify the quality of data required to support decisions during remedial response activities. DQOs are applicable to all data collection activities including those performed for preliminary assessments/site investigations, remedial investigations, feasibility studies, remedial design, and remedial actions.
The level of quality and detail will naturally vary depending upon the intended use of the data. Therefore, a number of data quality reporting levels are available.

Phoenix Standard Report

A standard report includes the Sample Chain of Custody, the analytical results for the required analytes, along with reporting units, date analyzed and analyst's initials. It also includes a Quality Control section where batch QC is reported for Blank analysis, Laboratory Control Samples, Sample Duplicates and Matrix Spikes. If certain criterion is requested, a Sample Criteria Exceedance Report is also generated.

Phoenix Standard Report with General, CT-RCP, and MA-MCP Narration

This is a standard report, as above, with a Laboratory Quality Assurance Quality Control Reasonable Confidence Protocol (RCP) Narration and Checklist for Connecticut samples or Quality Control Requirements and Performance Standards in Support of Response Actions under the Massachusetts Contingency Plan (MCP) Checklist and Narration for Massachusetts samples.

Enhanced Phoenix Report – Full Data Packages

The Full Data Packages include a Phoenix Standard Report with a full data summary, which includes the following:

ASP B and Army Corps Data Packages

Organics:

- Surrogate recovery summary
- QC recovery summary
- Analytical sequence summary
- Instrument tuning logs
- Internal standard and retention time summary
- Project sample, blank sample, and QC sample raw data
- Calibration data
- Injection logs

Inorganic:

- Project sample results
- Calibration results
- Blank results
- Interference checks
- QC results
- Laboratory duplicate results
- ICP serial dilution results
- Instrument run logs
- All applicable raw data

New Jersey Reduced Deliverables Data Package

Provides a Full Data Package as above, but does not include calibration raw data for organics or instrument run logs and raw data for inorganics.

10.0 Corrective Action

10. 1 Introduction

The Quality Assurance Office is responsible for conducting periodic inspections (audits) of the quality systems, data generation, and support systems of the laboratory. The purpose of the internal audit is to assist management in identifying and correcting deficiencies and to reinforce acceptable practices. This ensures that services meet the requirements of the Laboratory Quality Manual as well as the requirements of the client.

These inspections help to ensure that the policies of the laboratory for production of high quality data are being followed, including laboratory standard operating procedures, instrument procedures, sample preparation procedures and data review policies. If discrepancies are found, corrective action is taken. Two types of audits are in place: Systems and Performance Audits. Additionally, there are routine data audits, independent audits, and audits for subcontracted services.

10.2 System Audits

A Systems Audit is an inspection and review of an entire data-generation and support system. Quality-related activities are reviewed, assessed, and compared against the Quality Assurance Program requirements for compliance. The audit includes the evaluation of personnel, facilities, Standard Operating Procedures (SOPs), and records. Systems Audits generally follow performance audits (usually by state or EPA auditors, required for certification and contract awards), and may be instituted as part of corrective action monitoring programs.

Systems Audits may also focus on a single area or aspect of laboratory operations. These inspections may consist of an in-process inspection of a particular analytical procedure, review of data books or logbooks for compliance to SOPs, or an inspection of the laboratory facility. These audits may be performed at any time at the discretion of the Quality Assurance Manager. Management may also direct the initiation of an audit for cause.

Systems Audits are documented in the form of an Audit Report. The Audit Report describes any findings of the audit, recommendations to correct the finding and identifies the person or persons responsible for correction implementation. A two-column format is used for the Audit Report where the left column is used to document responses by the responsible parties. A copy of the Audit Report is maintained in a chronological file while the original document is circulated to the Laboratory Supervisor, Laboratory Manager and the Laboratory Director. Once circulation is completed and all items are responded to, the Audit Report is filed by Quality Assurance. Follow-up audits will be performed to verify correction implementation. Audit Reports are considered confidential documents and shall not be shown to or discussed with those outside the company without the express consent of the Director of Laboratories and the Quality Assurance Manager.

If deficiencies are observed during a performance audit, the Quality Assurance Manager evaluates the audit report and initiates a follow-up Systems Audit, with emphasis on actions necessary to correct the deficiencies. A Corrective Action Report is completed, detailing all remedial actions to be taken, and issued to the Director of Laboratories and the Laboratory Manager for approval. If corrective action cannot be taken immediately, the anticipated date of action is provided. Once approved, the report is forwarded to the performance auditing agency or client.

Many of the objectives of a routine Systems Audit are similar to those a client or independent auditor would hope to accomplish during an On-Site Laboratory Evaluation and Data Audit. These goals include ensuring that:

- Necessary quality control (including corrective action measurement) is being applied,
- Adequate facilities and equipment are available to perform the client's required scope-of-work,
- Personnel are qualified to perform the assigned tasks,
- Complete documentation is available, including sample Chain-of-Custody,
- Proper analytical methodology is being applied,
- Acceptable data handling techniques are being used,
- Corrective actions identified in any previous on-site visits have been implemented, and
- The Laboratory Management continues to demonstrate a commitment to quality.

These objectives may be documented by completing a Laboratory Evaluation Checklist. In response to performance audits, any corrective actions taken are noted with reference to the auditor's deficiency report and the Standard Operating Procedure. Should a quantitative or qualitative error be noted in a Data Audit, a blind Performance Evaluation (PE) sample may be entered into the system to test affected parameters. Additionally, Laboratory Proficiency Tests may be scheduled if method performance is in question. Specifics of these two programs are outlined in the following sections.

10.3 Performance Audits

A performance audit is a planned independent check of the operation of a measurement system to obtain a quantitative measure of the quality of the data generated. In practice, this involves analysis of standard reference samples or materials that are certified as to their chemical composition or physical characteristics.

The Quality Assurance Office prepares and submits performance testing (PT) samples to the laboratory periodically. The fact that the samples are PT samples is not revealed to analysts or supervisors. These blind samples provide a check on all operations performed in the lab, including bottle preparation, sample holding, extraction, analysis, data validation, and reporting. The blind PE samples are prepared from EPA reference materials. Findings reported by the laboratory are compiled into a summary report by the assigned QA Specialist and issued to the Director of Quality Assurance and Laboratory Directors. Unacceptable results require investigation by the Laboratory Director, documentation of corrective action by the Laboratory Director, and follow-up review by the Quality Assurance Office.

10.4 Audits of Subcontractors

Analysis performed by subcontractors must conform to Phoenix Environmental Laboratories' Quality Control requirements. Subcontractors must meet the requirements of the Phoenix Environmental Laboratories' Quality Assurance Program or have in place an equivalent program of their own. Potential subcontractors will be reviewed by the Phoenix Environmental Laboratories for suitability.

The Quality Assurance Office will evaluate the Quality Assurance Program of the subcontractor through review of the laboratory's written Quality Manual, the Quality Assurance Project Plan (where applicable), Quality Control SOPs, typical SOPs, and latest applicable USEPA Performance Evaluation or NELAC Performance Testing Study results. If the results are not available, Phoenix Environmental Laboratories may submit blind PE samples to the subcontractor. An on-site audit of the facility will be performed as deemed necessary by the Laboratory Director or Director of Quality Assurance.

10.5 Nonconformance Event Corrective Action and Documentation

Documentation of analytical problems and corrective action taken is an essential part of the data record. Identification, implementation, and monitoring for the actions that could have prevented the analytical problem provide a method for improving the quality of laboratory performance. A Nonconformance report sheet (Figure 1) has been designed to record problems, corrective actions, impact on analytical results, and suggested preventive actions for the future.

The Nonconformance Report must show complete background information about the event, including date and shift; analysis and phase; the client name; the sample identification number; and a description of the event that occurred. The report further includes the corrective action taken; indication of the status of the system; an assessment of impact on analytical results; and suggestions for preventive action.

The Nonconformance Report should be initiated by the person experiencing or noticing the discrepancy and completed by his or her supervisor. For example, the initiator may provide the description of the event and corrective action taken; the supervisor adds the impact and preventive action.

Copies of the completed reports should be distributed to the Project Manager, the Laboratory Section Director, and the Director of Quality Assurance. If the event has caused any impact on the analytical results, the Project Manager will meet with the Quality Assurance or Laboratory Director and then communicate with the client, either personally or through the Client Services group. If the impact on analytical results affects drinking water potability or MCL exceedances (such as bacteria, or nitrate/nitrite), the client will be notified immediately (within 24 hours). Client notification of other issues will be made in a reasonable time frame, and usually within three to five working days.

The Laboratory Director should check that corrective action has been appropriate, confirm analytical impact, and ensure the implementation and monitoring of preventive action.

The Director of Quality Assurance should review the Nonconformance Reports for follow-up action. On a regular basis, the Director of Quality Assurance will meet with Project Managers and Laboratory management to evaluate corrective action and preventive action effectiveness. All effective preventive action will be documented for all appropriate laboratory sections. Supervisors of each area will be responsible for any SOP revision needed to reflect these preventive actions.

Initial preventive action plans, which prove to be ineffective, will cause a team to be formed to identify the root cause of the problem and the effective preventive action. This team will be led by the supervisor of the area where the initial nonconformance occurred and at least one member of the Quality Assurance Unit and management. Progress of this team and monitoring of the effectiveness of preventive action will be documented by the team leader and by the Director of Quality Assurance.

Figure 1
Nonconformance Report

Document #:

Phoenix Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040
Tel. (860) 645-1102 Fax (860) 645-0823

Date Closed:

Corrective / Preventive Action Log

BASIS:	DESCRIPTION:	METHOD:
☐ Audit ☐ Complaint ☐ PT Failure ☐ Deficiency ☐ QC Failure ☐ SOP Departure ☐ Prevention		

DATA:
Type:
Samples:

RECORDED BY: DATE:

ROOT CAUSE: / PURPOSE:

INVESTIGATED BY: DATE:

POTENTIAL CORRECTIVE / PREVENTIVE ACTIONS:

RECOMMENDED BY: DATE:

ACTIONS PERFORMED:

Disposition of Data:
☐ Reanalyzed
☐ Rejected
☐ Qualified
☐ Recalled

PERFORMED BY: DATE:

FOLLOW-UP ACTIVITIES:

ASSESSED BY: DATE:

Closed by
Date Closed:

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11.0 Client Complaint Policy

In order to best meet the needs of our clients, Phoenix Environmental Laboratories has implemented a procedure for the prompt handling of client complaints. The project manager summarizes the nature of the complaint in their logbook located in the Client Services Department.

If the complaint includes a request for re-analysis or re-evaluation of the data, the complaint and a printout of the error report is provided to the QA/QC department and to the section supervisor. This is recorded in the logbook. If a non-conformance event is uncovered as a result of the re-analysis or re-evaluation, a non-conformance or error report is generated.

Whether a non-conformance or error report is generated or not, the Client Services Department responds promptly (usually within 24hours) to the Client.

12.0 Client Confidentiality

Confidentiality is an important aspect of the service that Phoenix Environmental Laboratories provides our clients.

All material containing client's analytical results, project specific information, and invoice information is considered strictly confidential. Reports containing any of this information are provided only to the client or his/her designee as provided on the chain of custody.

Additional requests for information are provided only after verbal authorization by the client.

13.0 Implementation Requirement and Schedule

The Quality Assurance Manual shall become fully effective on the first day of October 1995. Any questions regarding implementation should be addressed to the Director of Quality Assurance or the Laboratory Director.

14.0 References

Regulations

40 CFR 136.3e	Required containers, preservation techniques, and holding times
40 CFR 136	Guidelines establishing test procedures for the analysis of pollutants under the Clean Water Act
40 CFR 136 Appendix A	Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater
40 CFR 136 Appendix B	Definition and Procedures for the Determination of the Method Detection Limit – Revision 1.11
40 CFR 136 Appendix C	Inductively Coupled Plasma - Atomic Emission Spectrophotometer Method for Trace Element Analysis of Water and Wastes Method 200.7
40 CFR 141	National Primary Drinking Water Regulations
40 CFR 143	National Secondary Drinking Water Regulations
40CFR160	Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), Good Laboratory Practice Standards, Final Rule

Manuals

EPA 600/4-79-020	Method for Chemical Analysis of Water and Wastes (1983)
EPA 600/4-79-012	Quality Assurance Handbook for Analytical Quality Control In Water and Wastewater Laboratories (1979)
EPA 600/R-94-111	Methods for the Determination of Metals in Environmental Samples - Supplement I (May 1994)

EPA 600/R-93/100	Methods for the Determination of Inorganic Substances in Environmental Samples (August 1993)
EPA 600/4-88/039	Methods for the Determination of Organic Compounds in Drinking Water (Rev July 1991)
EPA 600/4-90/020	Methods for the Determination of Organic Compounds in Drinking Water Supplement I, (July 1990)
EPA 600/R-92/129	Methods for the Determination of Organic Compounds in Drinking Water Supplement II (August 1992)
EPA 600/R-95/131	Methods for the Determination of Organic Compounds in Drinking Water Supplement III (August 1995)
EPA 540/G-87/003	Data Quality Objectives for Remedial Response Activities, Development Process
EPA 540/G-87/004	Data Quality Objectives for Remedial Response Activities, Example Scenario: RI/FS Activities at a Site with Contaminated Soils and Groundwater.
EPA 815-B-97-001	Manual for the Certification of Laboratories Analyzing Drinking Water 4th edition (March 1997)
SW-846	Test Methods for Evaluating Solid Wastes, Third Edition (Final Update III, December 1996)
Standard Methods	Standard Methods for the Examination of Water and Wastes, 22nd Edition, American Public Health Association.
QAMS 004/80	Guidelines and Specifications for Preparing Quality Manuals, USEPA Office of Monitoring System and Quality Assurance, September 20, 1980

QAMS 005/80	Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, USEPA Office of Monitoring System and Quality Assurance, December 29, 1980
NEESA 20.2-047B	Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program, June 1988
USATHAMA PAM 11-41	U.S. Army Toxic and Hazardous Materials Agency, Quality Assurance Program, January 1990.
	Drinking Water Regulations and Health Advisories by Office of Drinking Water USEPA, April, 1990

Phoenix Environmental Laboratories, Incorporated

Quality Manual

Appendix A

Resumes of Key Personnel

Controlled Copy on Ivory Paper

THE PEOPLE OF PHOENIX ENVIRONMENTAL LABORATORIES, INC.
Technical Staff Education and Experience

Phyllis Shiller
Laboratory Director

Responsibilities:	Technical Director of Laboratory Operations and Services. Manages laboratory personnel and staffing. Responsible for laboratory scheduling and maintenance of high sample throughput. Provides client interface and management of special projects, technical issues and regulatory matters. Works with QA/QC Manager to ensure all aspects of corporate quality control program are strictly adhered to.
Education:	University of Rhode Island B.S. Chemistry, 1986
Experience:	Thirty years of environmental laboratory experience, including positions as QA/QC Director, Inorganic, ICP/GFAA Specialist, Inorganic Manager of a large (CLP) laboratory, Operations Manager, and Laboratory Director.

Bobbi Aloisa
Vice President

Responsibilities:	Management of Client Services Operation. Provides client interface with laboratory. Responsible for scheduling report deadlines with the client. Responsible for the generation of reports including progress reports, final reports, and electronic deliverables. Provides second level of review for all reports. Provides immediate review of incoming projects for completeness. Manages program that furthers the laboratory's ability to achieve consistent high levels of performance and quality.
Education:	Manchester Community Technical College A.S. Science, 1994
Experience:	Twenty-three years of environmental laboratory experience.

Greg Lawrence
Assistant Laboratory Director

Education:	University of Hartford, Hartford, CT Masters Business Administration, 1988 Keene State College, Keene, NH B.S. Chemistry, 1982
Experience:	Thirty-five years of environmental laboratory experience, including the position of Laboratory Director since 1985. Background in Organic Instrumentation, AA Spectrometry and Quality Control.

Kathleen Cressia
QA/QC Officer
Microbiology Laboratory Director

Education:	Western Connecticut State University, Danbury, CT B.A. Earth Science/Biology, 1985
Experience:	Thirty years of environmental laboratory experience, including positions as Laboratory Director, Laboratory Operations Manager, QA/QC Manager, Director of Microbiology, Inorganic Manager, and Wet Chemistry Section Leader for a CLP Laboratory.

Peter LaBarre
Database Administrator

Education:	Eastern Connecticut State University, Willimantic, CT B.S. Computer Science, 1990
Experience:	Ten years of Laboratory Information Systems support.

Maryam Taylor
QC Specialist / Project Manager

Education:	Nizam College, India B.S. Chemistry, 1978
Experience:	Twenty-two years of experience in the environmental laboratory field including GC/MS analyst, Organics Department Manager and Project Manager.

Jonathon Carlson
QC Specialist / Project Manager

Education:	Western Connecticut State University B.S. Meteorology, 2003
Experience:	Thirteen years environmental laboratory experience.

Ethan Lee
QC Specialist / Project Manager

Education:	Duquesne University, Pittsburgh, PA M.S. Environmental Science & Management, 2002 Houghton College, Houghton, NY B.S. Biology, Chemistry minor, 1999
Experience:	Twelve years environmental laboratory data validation experience.

Raman Makol
Organics Department Manager
Team Leader

Education:	Guru Nanak Dev University, India M.S. Chemistry, 1986 Guru Nanak Dev University, India B.S., Chemistry, 1984
Experience:	Twenty-six years of analytical and environmental laboratory experience as an analyst and R&D Specialist.

Keith Aloisa
Organics Department Manager
Team Leader

Education:	Quinnipiac College, Hamden, CT B.S. Chemistry, 1993
Experience:	Twenty-two years of experience in the environmental laboratory field including Organic manager and QA Specialist.

Harry Mullin
GC/MS Analyst

Education:	Providence College, Providence, RI B.S. Biology, 1986
Experience:	Thirty years experience in the environmental laboratory field including Organic Laboratory Manager.

Damien Drobinski
GC/MS Analyst

Education:	Central Connecticut State University, New Britain, CT B.S. Biology, Chemistry minor, 2001
Experience:	Fifteen years experience in the environmental laboratory field.

Ashraf Sheikh
GC/MS Analyst

Education:	South Gujarat University – Surat, India B.S. Chemistry, 1990
Experience:	Seventeen years of experience in the environmental field.

Michael Hahn
GC Analyst

Education:	University of Connecticut- Biological Sciences Embry-Riddle Aeronautical University- Avionics Engineering
Experience:	Twenty-six years of environmental laboratory experience.

Brian Bilodeau
GC Analyst

Education:	University of Massachusetts, Amherst, MA B.S. Biochemistry, minor Chemistry, Microbiology, 2008
Experience:	Eight years of environmental laboratory experience.

Jeffery Bucko
GC Analyst

Education:	Eastern Connecticut State University B.A. History, 1991
Experience:	Twenty-two years experience in the analytical laboratory field.

Adam Werner
GC Analyst

Education:	University of Connecticut, Storrs, CT B.S. Molecular & Cellular Biology, 2011
Experience:	Eight years experience in the analytical laboratory field.

Carol Eddy
GC Analyst

Education: Catholic University of America, Washington D.C.
B.A. Biochemistry, 2009

Experience: Four years of environmental laboratory experience.

Lauren Muirhead
Sample Preparation Analyst / GC Analyst

Education: Bay Path College, Longmeadow, MA
B.S. Forensic Science 2010, M.S. Forensic Science 2012

Experience: Five years of environmental laboratory experience.

Emily Kolominskaya
ICP Analyst

Education: Pharmaceutical College, Zhitomir, Ukraine
Associates Degree in Pharmacology, 1978

Experience: Thirty-six years of environmental laboratory experience.

Laura Kinnin
ICP Analyst

Education: Bridgewater State College
B.S. Chemistry/Geology 2006

Experience: Fiftteen years of environmental laboratory experience.

Richard E. Schweitzer
GFAA Analyst

Experience: Twenty-nine years of experience in analytical and environmental laboratories. Twenty-two years metals analyses experience.

Tina Hall
ICP/GFAA Analyst

Education:	Hood College, Fredrick, MD B.A. Biology 1995
Experience:	Nineteen years of environmental laboratory experience.

Rashmi Makol
Microbiology Analyst / Team Leader

Education:	Kurukeshtra University, India B.S. Chemistry
Experience:	Seventeen years of environmental microbiology laboratory experience.

Rimanatou Samuels
Microbiology/ Inorganic Analyst

Education:	University of Louisiana, Monroe, LA B.S. Biology, minor Chemistry, 2010
Experience:	Four years of environmental laboratory experience.

Eric Geyer
Inorganic Team Leader

Education:	University of Connecticut, Storrs, CT B.S. Natural Resources, 1997
Experience:	Nineteen years of environmental laboratory experience.

Kandi Della Bella
Inorganic & Microbiology Analyst

Education:	Saint Joseph College B.S. Natural Science, 1996 M.S. Biology, 2007
Experience:	Nine years of environmental laboratory experience.

Greg Danielewski
Inorganic Analyst

Education:	Capital Community Technical College, Hartford, CT Assoc. Chemical Engineering Technology, 1993
Experience:	Twenty-three years of environmental laboratory experience.

William McKernan
Inorganic Analyst

Education:	Southern Connecticut State College B.S. Earth Science, 1975 M.S. Earth Science, 1980
Experience:	Twelve years of environmental laboratory experience.

Cynde Langille
Inorganic Analyst

Education:	Manchester Community College A.S. Chemistry, 1999
Experience:	Fifteen years of environmental laboratory experience.

Matt Fijolek
Inorganic Analyst

Education:	University of New England B.S. Marine Biology
Experience:	Eleven years of environmental laboratory experience.

Jean Rawlings
Inorganic Analyst

Education:	Bucknell University, Lewisburg, PA B.S. Biology 1995
Experience:	Thirteen years environmental laboratory experience.

Brian Sheriden
Inorganic Analyst

Education:	University of Connecticut B.S. Biology/English, 2001
Experience:	Ten years of environmental laboratory experience.

Dustin Harrison
Inorganic Analyst

Experience:	Thirteen years of environmental laboratory experience.

Robert Reynolds
Inorganic Analyst

Education:	University of Connecticut, Storrs, CT B.S. Environmental Science, 2011
Experience:	Four years of environmental laboratory experience.

Mike Arsenault
Inorganic Analyst

Education:	Central Connecticut State University, New Britain, CT B.S. Earth Science, 2009
Experience:	Four years of environmental laboratory experience.

Kristina Hagelin
Inorganic Analyst

Education: University of Maine, Orono, ME
B.S. Marine Science, 2012

Experience: Three years of environmental laboratory experience.

Dina Montagna
Sample Prep Day Supervisor

Education: Springfield College, Springfield, MA
B.S. Biology/Chemistry, 1999

Experience: Seventeen years of environmental laboratory experience.

Tara Banning
Sample Prep Evening Supervisor

Education: University of Connecticut
B.S. Biology, 2007

Experience: Eight years of environmental laboratory experience.

Kate Dunfield
Sample Preparation Analyst

Education: Central Connecticut State University
B.S. Biology, 2005

Experience: Twelve years of environmental laboratory experience.

Anvarhusen Sheikh
Sample Preparation Analyst

Education: Polytechnic Institute, Valsad Gujarat India
A.S. Chemical Engineering, 1983

Experience: Sixteen years of environmental laboratory experience

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Thomas Cowles
Sample Preparation Analyst

Education:	University of Connecticut, Storrs, Connecticut Currently attending
Experience:	Five years of environmental laboratory experience.

Kevin Kelman
Sample Preparation Analyst

Education:	Gateway College, Meriden, CT A.S. Business Management 2004 Manchester Community College, Manchester, CT Environmental Science- currently enrolled
Experience:	Five years of environmental laboratory experience.

Jamie Duff
Sample Preparation Analyst

Education:	Eastern Connecticut State University, Willimantic, CT B.S. Environmental Earth Science, 2010
Experience:	Four years of environmental laboratory experience.

Mary Ingram
Sample Preparation Analyst

Education:	University of Connecticut, Storrs, Connecticut B.S. Animal Science, 2010
Experience:	Three years of environmental laboratory experience.

Audrey Ozga
Sample Preparation Analyst

Education:	University of Connecticut, Storrs, Connecticut Biology- currently attending
Experience:	Six years of environmental laboratory experience.

Caleb Githinji
Sample Preparation Analyst

Education:	Manchester Community College, Manchester, CT A.S. Liberal Arts, 2012 University of Connecticut, currently enrolled
Experience:	Three years environmental laboratory experience.

Lisa Luchini
Sample Preparation Analyst

Education:	Central Connecticut State Universtiy M.S. Biomolecular Science, 2010 B.S. Biomolecular Science, 2005
Experience:	Two years of environmental laboratory experience.

Heather Byrnie
Sample Preparation Analyst

Education:	Northeastern University, Boston, MA B.S. Biology, 2013
Experience:	Three years of environmental laboratory experience.

Amanda Campelli
Sample Preparation Analyst

Education: University of Connecticut, Storrs, CT
B.S. Environmental Science, 2013

Experience: Three years of environmental laboratory experience.

Christopher Bailey
Sample Preparation / Inorganic Analyst

Education: University of New Haven, West Haven, CT
B.S. Forensic Science, 2011

Experience: Three years of environmental laboratory experience.

Saadia Chudary
Sample Preparation Analyst

Education: Central Connecticut State University, New Britain, CT
B.S. Biomolecular Science, 2013
M.S. Biomolecular Science, 2015

Experience: Three years of environmental laboratory experience.

James Karabetsos
Sample Preparation Analyst

Education: University of New Haven, West Haven, CT
B.S. Biology / Forensic Science, 2013

Experience: Two years of environmental laboratory experience.

Rachel Colby-Butcher
Sample Preparation Analyst

Education:	University of New England, Biddeford, ME B.S. Biology, minor Chemistry, 2009
Experience:	Two years of environmental laboratory experience.

Derek Werner
Sample Preparation Analyst

Education:	Eastern Connecticut State University, Willimantic, CT B.S. Biology, 2014
Experience:	Two years of environmental laboratory experience.

Juliannie Cerda
Sample Preparation Analyst

Education:	Inter American University of Puerto Rico B.S. Chemistry, 2009
Experience:	Two years of environmental laboratory experience.

Mary Tran
Sample Preparation Analyst

Education:	Central Connecticut State University, New Britain, CT B.S. Biology, 2015
Experience:	Two years of environmental laboratory experience.

Phoenix Environmental Laboratories, Incorporated

Quality Manual

Appendix B

Equipment List, Laboratory Overview & Certifications

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PHOENIX ENVIRONMENTAL LABORATORIES, INC.
Major Equipment List

Organics GC

14 - Perkin Elmer Autosystem with dual Electron Capture Detectors.

1 - Markelov HS 9000 Headspace Analyzer with Perkin Elmer Autosystem with F10.

1 - Perkin Elmer Autosystem with Nitrogen Phosphorus Detector.

7 - Perkin Elmer Autosystem with Flame Ionization Detectors.

1 - Agilent 7890A Autosystem with PID and FID detectors, Centurion autosampler and Tekmar 3000 Purge and Trap concentrator.

10 - PE Nelson 970 Data Interfaces.

5 - PE Nelson 600 Series Link Interfaces.

8 - PE Nelson Turbochrom 4.1 Data System.

Organics GC/MS

2 - Agilent 5973 MSD with 6890 GC, Arcon 8100 Autosampler, two Tekmar 3000 Purge and Trap concentrators, PT2 switching valve box, HP Chemstation and Enviroquant software.

1 - Agilent 5973 MSD with 6890 GC, Centurion autosampler, Tekmar 3000 Purge and Trap concentrator. HP Chemstation and Enviroquant software.

1 - Hewlett Packard 5972 MSD with 5890 GC, Arcon 5100 autosampler, Tekmar 3000 Purge and Trap concentrator, HP Chemstation and Enviroquant software.

1 - Agilent 5975 MSD with 7890 GC, Centurion autosampler, two Encon Evolution Purge and Trap concentrators.

2 - Agilent 5972 MSD with 5890 GC, 7673 Injector, HP Chemstation and Enviroquant software.

4 - Agilent 5973 MSD with 6890 GC, 7683 injector, HP

	Chemstation and Enviroquant software Semivolatiles. 1 - Agilent 5975 MSD with GC, 7683B injector, HP Chemstation and Enviroquant software Semivolatiles. 1 - Agilent 5973 MSD with 6890 GC, Arcon 8100 autosampler, two EST Encon Purge and Trap concentrators, PT2 switching valve box.
Organics HPLC	2 - Hewlett Packard 1090 Series II HPLC with Diode Array Detectors, (DAD), HP programable autosampler, Pickering 8100 Post Column Derivatization unit, and HP Flouresence Detector.
Air Laboratory	1 - Agilent 5975 with 7890 GC and HP Chemstation 1 - Entech 7100AR Cryogenic concentrator- cold trap dehydration 1 - Entech 7500A minican Autosampler with 9 auxillary positions. 1 - Entech 3100A canister cleaner accompanied with Thermoscience oven 1 - Entech 4600A Dynamic Dilutor
Organics TOC	1 - GE Sievers InnovOx Lab TOC Analyzer with Sievers 900 Autosampler 1 - Elementar Liqui-TOC Analyzer with 53 position Autosampler
Metals	1 - Spectro Blue 37 Channel Simultaneous Axial Plasma ICP Spectrometer with Autosampler and Smart Analyzer software 1 - Spectro Arcos 37 Channel Simultaneous Axial Plasma ICP Spectrometer with Autosampler & Smart Analyzer software Perkin Elmer NexION 350X ICP Mass Spectrometer

	2 -	Perkin Elmer AAnalyst 600 Atomic Absorption Spectrophotometer (AA) with graphite furnace, Zeeman background & AS 800 Autosampler
	1 -	PSA Mercury Millennium System with autosampler and mercury cold vapor detector.

Prep Department	2 -	UTC Vacuum Solid Phase Extractor Manifolds
	48-	Liquid/Liquid Extraction Systems
	7 -	Buchi Synacore Concentration Systems with V-855 Vacuum Controllers
	11-	Zymark TurboVap II Automated Sample Concentration Workstations (6 and 24 position)
	2 -	Precision Scientific 8 Position Water Baths
	1 -	Vacuum and Pressure Filtration System, 11 positions
	2 -	Branson DHA1000 Ultrasonic Cleaners
	2 -	VWR 250D Ultrasonic Cleaners
	25-	Millipore Zero Headspace Extraction Chambers
	3 -	Millipore TCLP Rotary Extractors ZHE, 12 positions
	2 -	Multi Position TCLP Rotation Extraction Systems
	8 -	Dionex ASE200 Accelerated Solvent Extractors
	25-	Radley Manual Soxhlet Extractors- 5 position
	1 -	Questron Vulcan 84 AutoBlock Digester
	5 -	Environmental Express HotBlocks Digesters, 54 Position
	1 -	Milestone Ethos UP Microwave Digester
	1 -	IEC Centra-8 Centrifuge

3 - Tekmar TM600-2 Dual Horn Sonic Disruptors

6 - Mettler PB802S/PB1502S/PB3002 Balances

1 - Mettler Analytical AE240 Balance

1 - PlasLabs 863-CG Dessicator

1 - Blue M DC336F Oven

1 - VWR 1300U Oven

1 - GCA/Precision Scientific Gravity Convection Oven

2 - GlasCol 3D Separatory Funnel Shaker, 8 position

1 - GlasCol 3D Separatory Funnel Shaker, 4 position

Wet Lab

1 - Lachat Quikchem 8000 Dual Channel Wet Chem Autoanalyzer with 360 Position Autosampler.

1 - Lachat Quikchem 8500 Four Channel Wet Chem Autoanalyzer with 360 Position Autosampler.

1 - HACH DR5000 Spectrophotometer

1 - Pall Cascada Ultra Pure DI Water Systems

2 - YSI 33 Salinity, Conductance, Turbidity Meter

3 - VWR 2020 BOD Incubators, High Volume

3 - VWR 2030 BOD Incubators, High Volume

1 - YSI 52 Oxygen Meter (BOD)

1 - VWR 8000 pH meter

4 - Precision Scientific Pensky-Martens Flash Point Testers

1 - Labline DuoVac 1520 Vacuum Drying Oven

1 - Beckman ϕ 12 Meter (Fluoride/Chloride)

1 - Orion 162 Conductivity Meter

1 - Man-Tech GX271 Liquid Handler (pH, Alkalinity, Conductivity, Turbidity)

2 - Mettler XS-104 Analytical Electronic Balance

1 - Mettler PB5001-5 Analytical Electronic Balance

3 - LabCrest Midi Distillation Systems, 10 position

3 - AIM 500 Automated Block Digestors, 28 position

1 - Dionex DX120 Ion Chromatograph with Autosampler

1 - Dionex ICS2000 Ion Chromatograph with Autosampler

2 - Beckman DU640 Spectrophotometer

1 - Thermolyne 48000 Furnace

1 - Thermolyne 1300 Furnace

1 - Hach COD reactor, 25 position

2 - Horizon SpeedVap II 9000 Solvent Evaporation System

1 - Hach 2100AN Turbidimeter

1 - VWR 750HT Ultrasonic Cleaner

1 - GlasCol 3D Separatory Funnel Shaker, 8 position

1 - CAI SmartBlock 226 COD Digester, 100 position

1 - Hydro System Reverse Osmosis 500 gallon water system

Microbiology

1 - Baush & Lomb and Spencer Microscope

3 - GCA Precision Coliform Incubator Bath

1 - Precision Gravity Convention Incubator

1 - Market Forge Sterilmatic Autoclave

1 - Vacuum Filtration System, 3 position

1 - Elconap Incubator Bacteriological Incubator

1 - Blue M Stabil-Therm Bacteriological Incubator

1 - Reihert-Juns Quebec Darkfield Colony Counter

1 - Spectroline EA-160 UV light (366 nm)

1 - American UV Company UV box (254 nm)

1 - IDEXX Quanti-Tray Sealer

PHOENIX ENVIRONMENTAL LABORATORIES, INC.

GENERAL INFORMATION & CONDITIONS

HOURS OF OPERATION/PRIOR NOTIFICATION

Hours of Operation: Sample receiving hours are 7:00 a.m. to 7:00 p.m. Monday through Friday; and 9:00 a.m. to 1:00 p.m. on Saturdays. Laboratory operation hours are 6:00 a.m. to 11:00 p.m. Monday through Friday and a limited Saturday schedule. Prior notification is required for delivery of emergency samples.

SAMPLE PICKUP

Phoenix Environmental Laboratories, Inc. offers courier service throughout our service area of Connecticut, New York, Massachusetts, Rhode Island, Vermont, Maine and New Hampshire. Pickups should be scheduled 24 hours in advance. Please contact Phoenix Client Services for sample pickup or emergency response.

TURNAROUND TIMES

Phoenix Environmental Laboratories, Inc. shall make its best effort at meeting all client specified turnaround times. Phoenix shall not however be liable for late delivery of services except as provided by written agreement prior to sample receipt.

SURCHARGE FOR EXPEDITED WORK

Normal turnaround is 5 working days. Results required in less than five working days are assessed a surcharge for accelerated turnaround. Please contact the Sales Department for available turnaround times and applicable charges.

EXPEDITED WORK/RUSH PROJECTS

A computer generated progress report or verbal results will be made available within the agreed time period with the written report available within (1) day following the progress report. Client requirements for "same day" written reports must be approved prior to sample delivery.

DUE DATE

Due date is defined as the date of analysis completion with verbal or computer generated sample progress reports results available "same day" for expedited rush work. Completed written reports are available by 5 p.m. the following day and are mailed first class, U.S. Postal Service.

SAMPLE RECEIPT

Samples must be received at Phoenix before 3:00 p.m. to be considered as received on that day. Samples received after 3:00 p.m. shall be considered as having been received on the next working day for purposes of calculating turnaround time. Phoenix Environmental Laboratories, Inc. reserves the right to reject samples deemed unsuitable.

SAMPLE HOLDING TIME/PRESERVATION

Customers must deliver all samples to Phoenix within holding time or where short holding times are not required, a maximum of two days from sample collection. It is the client's responsibility to assure that all samples are preserved and delivered in accordance with published protocol.

DOCUMENTATION

All samples submitted to Phoenix Environmental Laboratories, Inc. must be accompanied with a completed Chain-of-Custody form.

SAMPLE DISPOSAL/STORAGE

Phoenix will responsibly dispose of most unused samples, while reserving the right to return unused samples to the client. Please consult our sample custodian at time of delivery for additional information. Sample storage will not extend past 30 days from final report date except by previous arrangement.

SUBCONTRACTED SAMPLES

A limited number of analysis such as radionuclides are subcontracted to licensed laboratories, which Phoenix maintains a contractual agreement. Subcontracted samples maybe subject to extended turnaround times.

RECORD RETENTION

Phoenix shall retain all pertinent records for a period of seven (7) years from sample receipt. There may be a minimal charge for the retrieval of these records from archives, should a client request this service.

CERTIFICATIONS

Phoenix Environmental Laboratories, Inc. participates, on an annual basis in many different certification and proficiency programs. Some states extend reciprocal certification to Phoenix Environmental Laboratories, Inc.

Phoenix Environmental Laboratories Inc. holds certifications in the following states:

Connecticut (Lab. Registration #PH-0618)

Maine (Lab. Registration #CT-007)

Massachusetts (Lab. Registration #MA-CT007)

New Hampshire (Lab. Registration #2136 and #2058)

New York / NELAC (Lab. Registration #11301)

New Jersey (Lab. Registration #CT003)

Rhode Island (Lab. Registration #63)

Vermont (Lab. Registration #VT11301)

Pennsylvania (Lab. Registration #68-03530)

Phoenix Environmental Laboratories, Incorporated

Quality Manual

Appendix C

Organizational Chart

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Phoenix Environmental Laboratory Staff
October 2015

Phyllis Shiller
Laboratory Director

Kathleen M. Cressia
QA/QC Director

Greg Lawrence
Assistant Lab Director

Client Services Department

- Bobbi Aloisa, Vice President/Manager
- Linda Chapman, Client Services Rep.
- Loreen Fay, Client Services Rep.
- Deb Lawrie, Client Services Rep.
- Shannon Wilhelm, Lims
- Lori Bryda, Lims
- Monica Pellerin, Sample Custodian
- Christine Paradise, Sample Custodian
- Sarah Bell, Report Generation
- Lisa Arnold, Client Services Assistant
- Taylor Farnsworth, Sample Custodian

Organic Department

- Raman Makol, GC/MS Team Leader
- Keith Aloisa, GC/MS Team Leader
- Jeffrey Bucko, GC Analyst
- Adam Werner, GC Analyst
- Carol Eddy, GC Analyst
- Brian Bilodeau, GC Analyst
- Ashraf Sheikh, GC/MS Analyst
- Harry Mullin, GC/MS Analyst
- Damien Drobinski, GC/MS Analyst
- Michael Hahn, GC/MS Analyst
- Lauren Muirhead, GC/MS Analyst
- Heather Byrnie, GC/MS Assistant
- Caleb Githinji, GC/MS Assistant
- Rachel Colby-Bucher, GC/MS Assistant

Sample Preparation Department

- Dina Montagna, Day Supervisor
- Kate Burnie, Analyst
- Mary Ingram, Analyst
- Lisa Luchini, Analyst
- Tara Banning, Evening Supervisor
- Anvarhusen Sheikh, Analyst
- Audrey Ozga, Analyst
- Tom Cowles, Analyst
- Jamie Duff, Analyst
- Amanda Campelli, Analyst
- Saadia Chudary, Analyst
- James Karabetsos, Analyst
- Derek Werner, Analyst
- Juliannie Cerda, Analyst
- Mary Tran, Analyst

Microbiology Department

- Kathleen Cressia, Micro Lab Director
- Rashmi Makol, Micro Team Leader
- Rimanatou Samuels, Analyst
- Kandi Della Bella, Analyst
- Christopher Bailey, Analyst

Metals Department

- Laura Kinnin, ICP Analyst
- Richard Schweitzer, AA Analyst
- Emilya Kolominskaya, ICP Analyst
- Tina Hall, Analyst

Classical Chemistry

- Eric Geyer, Team Leader
- Greg Danielewski, Analyst
- Kandi Della Bella, Analyst
- William McKernan, Analyst
- Matt Fijolek, Analyst
- Cynde Langille, Analyst
- Jean Rawling, Analyst
- Mike Arsenault, Analyst
- Brian Sheriden, Analyst
- Dustin Harrison, Analyst
- Robert Reynolds, Analyst
- Kristina Hagelin, Analyst
- Kevin Kelman, Analyst
- Christine Lacaria, Analyst

Phoenix Environmental Laboratories, Incorporated

Quality Manual

Appendix D

Standard Operating Procedure Table of Contents

Controlled Copy on Ivory Paper

SOP No.	SOP Title/Comment	Dist. #	Previous Version	Current Version	Date Finalized	Location
Sampling						
101.0	Drinking Water Sampling Procedure		3 (12/3/09)	4	10/28/2015	
102.5035	Soil Prep for VOA 8260		1 (12/11/00)	2	6/11/2012	MDB
103.0	Sample Acceptance Policy		1 (10/21/08)	2	2/16/2015	
104.Temp	Temperature		0 (4/19/05)	1	6/6/2007	
105.5030	Water Prep for VOA 8260			1	7/25/2013	MDB
121.0	Sample Container Preservation	1	8 (10/9/12)	8.1	3/18/2015	
Sample Preparation						
203.SONC	Sonication Extractions		9 (5/3/12)	10	10/27/2014	
204.552.2	Haloacetic Acids		7 (5/1/13)	8	11/4/2014	
205.TMD.DISS	Metals Digestion-Dissolved		4 (4/12/06)	5	6/11/2007	
206.paint filter	Paint filter free liquids test		1 (12/12/11)	2	6/21/2012	MDB
208.EPH	Extractable Petroleum Hydrocarbons		5 (11/30/06)	6	2/15/2013	
212.507	NPD Pest. Ext. of Drinking Water		4 (5/1/13)	4.1	7/30/2015	
213.508	Pesticide Ext. of Drinking Water		3 (5/1/13)	3.1	1/21/2015	
214.515.3	Herbicide Ext of Drinking Water		4 (5/1/13)	5	12/2/2013	
216.525.2	Liquid-solid extraction SVOA		5 (5/12/11)	6	4/2/2015	
217.Sep Herb	Herbicide ext by methylation		4 (8/3/09)	4.1	1/21/2015	
219.TMD.dw	Metals Digestion Drinking Water		4 (6/11/13)	5	9/9/2014	MDB
220.Form	Formaldehyde		2 (10/17/13)	3	3/26/2014	
224.TMD.wm	Metals Digestion Wastewater Matrix		9.1 (2/10/15)	9.2	4/23/2015	
225.2340B	Hardness by Calculation		1 (4/2/1999)	2	12/20/2007	
226.wastedilutions	Waste dilutions for oil matrix		4.1 (2/13/15)	4.2	4/22/2015	
231.TMD.sm	Metals Digestion in Soils/Wastes		6 (3/4/11)	6.1	4/1/2015	
234.%sol	% Solids		1 (3/22/00)	2	4/11/2006	
235.ASE-SM	Soil Extraction by PFE		9 (10/22/14)	9.1	4/16/2015	
236.HGSM	Mercury digestion (soil matrix)		3 (10/15/09)	3.1	1/13/2015	
237.HGWM	Mercury digestion (water matrix)		4 (12/29/10)	5	4/23/2014	
238.TMD.3051A	Microwave digestion metals SM/Oils		2.1 (11/5/15)	2.2	11/19/2015	
239.sepext	Separatory extractions (water matrix)		5 (10/4/13)	6	10/3/2014	
240.liq/liq	Continuous liquid-liquid extraction		11 (3/5/12)	12	10/21/2014	MDB
242.TCLP	Toxicity Characteristic Leaching		1.1 (12/4/14)	1.2	4/3/2015	
243.SPLP	Synthetic Precipitation Leaching		0 (11/15/01)	1	1/21/2010	
245.SepSIM	Separatory extraction WM SIM		0 (11/29/2004)	1	1/11/2006	
246.sox Wipes	Soxhlet extraction of wipes		2 (2/15/11)	3	11/12/2013	
247.Soncherb	Sonication Ext for Herbicides		4 (11/5/10)	5	2/1/2012	MDB
248.EPTOX	Extraction Procedure Toxicity			O	4/20/2005	
249.Sonc tune	Ultrasonic Probe Tune		0 (4/1/05)	1	8/1/2007	
250.ASE care	ASE cell cleaning procedure		3 (6/9/14)	4	12/31/2014	
251.Soxhlet	Soxhlet Extraction procedure		3 (2/14/11)	4	11/12/2013	
253.Baking Chem	Baking Chemicals			O	7/7/2008	
255.ASE-SM SV-SIM	Semivolatiles in Soil by SIM			O	3/19/2009	
258.ZHE Clean	ZHE Cleaning Procedure	1		O	1/3/2011	
259.PUFsoxhlet	Soxhlet Extraction for PCB Air-PUF		1 (8/19/11)	2	11/12/2013	
260.HgDW	Mercury digestion (drinking water)			O	8/11/2015	
261.525.3	Preparatory SPE 525.3			O	9/3/2015	
262.TMD.3020A	Metals Digestion GFAA			1	11/13/2015	

SOP No.	SOP Title/Comment	Dist. #	Previous Version	Current Version	Date Finalized	Location
Wet Chemistry						
301.IC.DX120	Ion Chromatography DX120		5 (4/25/13)	5.1	2/11/2015	
302.Lachat	Lachat Autoanalyzer		3 (1/26/05)	4	3/12/2007	
303.2310B	Acidity		1 (9/9/09)	1.1	12/18/2014	
304.4500NH3 G	Ammonia/TKN		8 (4/30/09)	8.1	2/6/2015	
305.2320B	Alkalinity		5 (2/24/05)	6	6/11/2007	
306.5210B	BOD/cBOD		8 (1/27/14)	8.1	11/24/2014	
307.4500CL G	Chlorine		2 (3/16/00)	3	9/9/2009	
308.2510 B	Conductivity		4 (8/2/07)	5	6/21/2012	
309.335.4/4500CN	Cyanide-Total, Amenable & Free		10 (4/25/13)	10.1	2/3/2015	
310.2120 B	Color		3 (5/24/12)	4	2/5/2015	MDB
311.5220 D	COD		3 (7/5/07)	4	7/19/2012	
312.4500 O G	DO electrode		1 (4/5/99)	2	9/8/2009	
313.1010	Flashpoint		3 (7/13/09)	4	8/2/2012	
315.3060A	Hexavalent Chromium soil (sm)		6 (3/24/14)	7	7/24/2014	
315.3500 Cr B	Hexavalent Chromium water (wm)		4.1 (12/11/14)	4.2	3/31/2015	
316.5540 C	MBAS		2 (8/7/07)	2.1	12/19/2014	
317.2150 B	Odor		5 (11/13/12)	6	9/20/2013	
318.1664	Oil & Grease		7 (2/20/13)	8	1/29/2014	
319.SM4500H+B	pH and Corrosivity		4 (9/24/07)	5	4/7/2011	
320.420/9066	Phenols		5 (5/10/12)	5.1	2/3/2015	
321.4500P E	Phosphorus		4 (5/8/09)	5	1/6/2014	
322.React	Reactivity		1 (4/15/99)	2	9/10/2009	
323.2540 C	Solids, Dissolved		2 (4/11/06)	3	11/10/2009	
324.2540 D	Solids, Suspended		4 (1/15/10)	5	1/15/2014	
325.2540 B	Solids, Total		2 (11/10/09)	3	1/15/2010	
326.9030	Sulfide, Total (distil followed by Titr.)		1 (3/25/99)	2	5/10/2012	
327.5310C GE	TOC water- GE		1 (5/1/12)	1.1	2/5/2015	
330.2130 B	Turbidity (NTU)		2 (7/19/2002)	3	12/27/2006	
331.2540E	Solids, Fixed & Volatile		1 (4/5/99)	2	12/1/2014	
332.2350B	Chlorine Demand		1 (4/5/99)	2	3/22/2000	
336.353.2	Nitrate by Lachat		3 (2/22/07)	3.1	2/12/2015	
339.377.1	Sulfite			O	5/5/2000	
340.2520 B	Salinity		1 (7/1/03)	2	3/22/2006	
341.SO4grav	Sulfate, gravimetric		1 (4/5/99)	2	4/2/2001	
343.4500-S2 D	Sulfide, Total (colormetric)		5 (5/10/12)	6	4/1/2015	
344.TOCSM	TOC soil (sm)		1 (3/15/05)	2	4/8/2011	
345.FI2	Fluoride by electrode		3 (4/25/13)	3.1	2/4/2015	
346.4500Cl-E	Chloride Automated Ferricyanide		2 (9/22/04)	3	2/28/2007	
347.VFA	Volatile Fatty Acids		1 (1/13/03)	2	10/4/2011	
352.CO2	Free Carbon Dioxide			O	11/30/2005	
353.AVS/SEM	Acid Volatile Sulfide/SEM metals			O	11/6/2004	
354.cyanate	Cyanate by NH3 probe			1	2/16/2007	
355.OP Lachat	Orthophosphate Lachat			1	2/23/2007	
356.5910B	UV-254		2 (5/20/09)	3	5/12/2012	
357.2540F	Settleable Solids			O	6/21/2007	
358.MetalsDW	Phoenix Metals DW procedure		O (8/14/07)	1	4/26/2013	
359.4500CN WAD	Weak & Dissociable Cyanide			O	10/31/2007	
360.PCT	PC Titrator (pH, Alk, Cond, Turb)		1 (7/30/09)	2	6/21/2012	
361.SpecGrav	Specific Gravity			O	5/11/2011	

SOP No.	SOP Title/Comment	Dist. #	Previous Version	Current Version	Date Finalized	Location
362.9071B	Oil & Grease in Soil / Solids		O (12/15/14)	1	4/7/2015	
Bacteria						
401.E.Coli MF	E.coli MF	1	6 (8/13/07)	7	3/18/2009	
402.Entero	Enterococcus MF	1	9 (1/26/12)	10	5/16/2012	
403.9222D	Fecal coliform MF	1	5 (3/18/09)	5.1	12/3/2014	
404.Fecal MPN	Fecal coliform MPN	1	archived	3	7/18/2012	
405.9230A	Fecal Streptococcus MF	1	2 (3/28/05)	3	3/20/2009	
406.9215B	Heterotrophic Plate Count	1	7 (3/18/09)	8	6/28/2012	
407.9223B	Total coliform DW by Colilert	1	6 (3/16/12)	7	4/27/2012	MDB
408.9222B	Total coliform MF	1	7 (1/3/08)	8	3/18/2009	
410.TColiQ/EColiQ	Total coliform Colilert MPN	1	O (3/11/09	1	7/20/2012	
411.Enterolert	Enterococcus MPN	1	1 (8/25/14)	1.1	1/23/2015	
450	Disposal of sample cultures	1	3 (5/14/07)	4	5/6/2009	
451	Cleaning of UV equipment	1	0 (6/21/01)	1	3/20/2009	
452	Autoclave sterility check	1	4 (3/18/09)	5	3/26/2012	MDB
454	Air Monitoring	1	0 (6/25/01)	1	5/8/2009	
457	UV Box Check	1	1 (5/14/07)	2	5/6/2009	
458	InHouse DI Water Monitoring	1		O	12/28/2009	
Metals						
501	Metals by GFAA		6.1 (7/29/15)	6.2	11/13/2015	
503	Mercury by CV		8 (4/25/13)	8.1	7/30/2015	
505	Metals by ICP Arcos		6 (8/27/13)	7	9/17/2014	
506	Metals by ICP Blue		1 (8/6/14)	1.1	7/29/2015	
Organic Instrumentation						
601.8270/625	SVOA by GC/MS		12 (10/3/14)	12.1	12/15/2014	
602.624	VOA by GC/MS		8 (10/29/14)	8.1	4/21/2015	
603.552.2	Haloacetic Acids		7 (11/4/14)	8	2/17/2015	MDB
605.CTETPH	CT ETPH by GC/FID		4 (9/16/14)	5	10/22/2014	
611.504/8011	EDB, DBCP		8.1 (11/21/14)	8.2	7/29/2015	
612.507	Pesticide in Drinking Water (NPD)		7 (10/22/14)	7.1	7/30/2015	
613.508	Pesticide in Drinking Water (ECD)		4 (5/01/13)	5	10/1/2014	
614.515.3	Herbicide in drinking Water		8 (4/2/14)	9	10/22/2014	
617.531.2	Carbamates by HPLC		5 (11/3/14) MDB	5.1	7/30/2015	
619.EPH	EPH by GC/MS		2 (11/30/06)	3	4/11/2011	
620.VPH	VPH by GC/MS		3 (11/2/09)	4	4/26/2011	
621.608/8081	PCB/Pest by GC		5 (5/22/12)	6	9/25/2014	
622.8082/608	PCB by GC		9 (7/21/14)	10	10/22/2014	
626.8141	OP Pesticides		2 (8/6/13)	2.1	11/13/2014	
627.8151	Herbicides		7 (3/15/13)	8	10/22/2014	
630.680	PCB's by 680		3 (6/6/02)	4	6/9/2011	
632.525.2	525.2		4 (5/2/13)	5	10/30/2014	
633.Glycol	Glycols		4 (7/25/13)	4.1	11/21/2014	
634.DRO	Diesel Range Organics		5 (10/22/14)	5.1	2/4/2015	
635.GRO	Gasoline Range Organics		5 (11/12/13)	5.1	2/5/2015	
640.NJ TPH	NJ QAM-025		O (7/2/07)	1	6/26/2015	
642.FORM	Formaldehyde HPLC		2 (1/5/12)	3	3/26/2014	
643.Alcohol	Alcohols FID headspace		3 (12/14/11)	4	7/25/2013	

SOP No.	SOP Title/Comment	Dist. #	Previous Version	Current Version	Date Finalized	Location
644.SV-SIM	SVOA by Selective Ion Monitoring		2 (5/11/11)	3	11/3/2014	
645.TO14-15	VOCs in Air		4 (2/1/13)	5	11/3/2014	
646.1,4-dioxane	1,4-Dioxane SPE 8270 SIM		1 (10/25/11)	2	9/18/2014	
647.NJLLTO-15	NJ Low Level TO-15 Air		3 (1/4/13)	4	3/11/2013	
651.524.2	Volatiles in DW by 524.2 5mL		2 (10/31/14)	3	2/3/2015	MDB
652.NJEPH	New Jersey EPH			1	12/26/2012	
653.8260C	VOA by GC/MS		1 (5/3/13)	2	11/3/2014	MDB
654.549.2	Diquat & Paraquat		O (12/22/14)	1	3/17/2015	
655.547	Glyphosate by 547			O	5/7/2015	
656.525.3	525.3			O	9/3/2015	
General						
701	Glassware Cleaning	2	1 (2/19/99)	2	8/17/2011	
702	Laboratory Nonconformance		1 (7/23/99)	2	12/5/2012	
703	General Waste Disposal	1	1(7/7/04)	2	12/3/2009	
704	Final Report Review		1 (2/13/01)	2	12/6/2012	
705	Significant Figures and Rounding			1	9/11/2000	
706	Eliminating Transcription/Calc Errors			O	11/20/2002	
707	Transmission of Test Results			O	1/4/2002	
708	Avoid Deterioration/Damage			O	1/4/2002	
709	Raw Data Review			1	12/9/2002	
710	Sample Log-in	1	1 (2/12/01)	2	8/24/2012	
711	Purchasing			O	1/24/2005	
712	Decon sampling equipment	1		O	12/15/2006	
713	SOP update procedure	0	O (4/4/11)	1	11/4/2014	
714	Manual Integration Policy		Draft (3/20/15)	O	12/10/2015	
Safety						
801	Employee Right to Know	1	1 (8/21/00)	2	12/8/2009	
802	Emergency Evacuation Plan	1		1	6/10/2004	
803	Laboratory Hood	1		1	8/22/2000	
804	Safety Committee	1	1 (8/22/00)	2	7/9/2003	
805	Hazardous Chemical Procedures	1		1	1/8/2003	
806	Laboratory Safety Equipment	1	1 (7/7/04)	2	6/2/2006	
807	Chemical Hygeine Plan	1	2 (2/11/10)	3	3/25/2013	
808	Spill Control Procedures				Draft	
809	First Aid Procedures	1		1	9/13/2000	

Appendix B

Data Validator Qualifications

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

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CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

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All approved analytes are listed below:

Bacteriology	
Coliform, Total / E. coli (Qualitative)	SM 18-22 9222A,B,C (-97)/40 CFR 141. SM 18-22 9223B (-97) (Colilert)
E. coli (Enumeration)	SM 18-22 9222A,B,C (-97)/40 CFR 141. SM 18-22 9223B (-97) (Colilert)
Enterococci	Enterolert EPA 1600
Heterotrophic Plate Count	SM 18-22 9215B (-00)
Chlorinated Acids	
2,4,5-TP (Silvex)	EPA 515.3
2,4-D	EPA 515.3
Dalapon	EPA 515.3
Dicamba	EPA 515.3
Dinoseb	EPA 515.3
Pentachlorophenol	EPA 515.3
Picloram	EPA 515.3
Disinfection By-products	
Bromochloroacetic acid	EPA 552.2
Dibromoacetic acid	EPA 552.2
Dichloroacetic acid	EPA 552.2
Monobromoacetic acid	EPA 552.2
Monochloroacetic acid	EPA 552.2
Trichloroacetic acid	EPA 552.2
Fuel Additives	
Methyl tert-butyl ether	EPA 524.2
Fuel Additives	
Naphthalene	EPA 524.2
Metals I	
Arsenic, Total	SM 18-19,21-22 3113B (-99,-04) EPA 200.9 Rev. 2.2
Barium, Total	EPA 200.7 Rev. 4.4
Cadmium, Total	EPA 200.7 Rev. 4.4
Chromium, Total	EPA 200.7 Rev. 4.4
Copper, Total	EPA 200.5 EPA 200.7 Rev. 4.4
Iron, Total	EPA 200.7 Rev. 4.4
Lead, Total	EPA 200.5 SM 18-19,21-22 3113B (-99,-04) EPA 200.9 Rev. 2.2
Manganese, Total	EPA 200.7 Rev. 4.4
Mercury, Total	EPA 245.1 Rev. 3.0
Selenium, Total	SM 18-19,21-22 3113B (-99,-04) EPA 200.9 Rev. 2.2
Silver, Total	EPA 200.7 Rev. 4.4
Zinc, Total	EPA 200.7 Rev. 4.4
Metals II	
Aluminum, Total	EPA 200.7 Rev. 4.4
Antimony, Total	SM 18-19,21-22 3113B (-99,-04) EPA 200.9 Rev. 2.2
Beryllium, Total	EPA 200.7 Rev. 4.4
Molybdenum, Total	EPA 200.7 Rev. 4.4

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Metals II	
Nickel, Total	EPA 200.7 Rev. 4.4
Thallium, Total	SM 18-19,21-22 3113B (-99,-04)
	EPA 200.9 Rev. 2.2
Vanadium, Total	EPA 200.7 Rev. 4.4
Metals III	
Boron, Total	EPA 200.7 Rev. 4.4
Calcium, Total	EPA 200.7 Rev. 4.4
Magnesium, Total	EPA 200.7 Rev. 4.4
Potassium, Total	EPA 200.7 Rev. 4.4
Sodium, Total	EPA 200.7 Rev. 4.4
Methylcarbamate Pesticides	
3-Hydroxy Carbofuran	EPA 531.2
Aldicarb	EPA 531.2
Aldicarb Sulfone	EPA 531.2
Aldicarb Sulfoxide	EPA 531.2
Carbaryl	EPA 531.2
Carbofuran	EPA 531.2
Methomyl	EPA 531.2
Oxamyl	EPA 531.2
Microextractibles	
1,2-Dibromo-3-chloropropane	EPA 504.1
1,2-Dibromoethane	EPA 504.1
Miscellaneous	
Benzo(a)pyrene	EPA 525.3
Miscellaneous	
Benzo(a)pyrene	EPA 525.2
Bis(2-ethylhexyl) phthalate	EPA 525.3
	EPA 525.2
Di (2-ethylhexyl) adipate	EPA 525.3
	EPA 525.2
Diquat	EPA 549.2
Glyphosate	EPA 547
Hexachlorobenzene	EPA 508
Hexachlorocyclopentadiene	EPA 508
Odor	SM 18-22 2150B (-97)
Organic Carbon, Dissolved	SM 21-22 5310C (-00)
Organic Carbon, Total	SM 21-22 5310C (-00)
Surfactant (MBAS)	SM 18-22 5540C (-00)
Turbidity	SM 18-22 2130 B (-01)
UV 254	SM 19-22 5910B (-00)
Non-Metals	
Alkalinity	SM 18-22 2320B (-97)
Calcium Hardness	EPA 200.7 Rev. 4.4
Chloride	EPA 300.0 Rev. 2.1
	SM 21-22 4500-Cl- E (-97)
Color	SM 18-22 2120B (-01)
Cyanide	EPA 335.4 Rev. 1.0
Fluoride, Total	EPA 300.0 Rev. 2.1
	SM 18-22 4500-F C (-97)
Nitrate (as N)	EPA 353.2 Rev. 2.0

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Non-Metals	
Nitrate (as N)	EPA 300.0 Rev. 2.1
Nitrite (as N)	EPA 353.2 Rev. 2.0
	EPA 300.0 Rev. 2.1
Orthophosphate (as P)	SM 18-22 4500-P F (-99)
	SM 18-22 4500-P E (-99)
Solids, Total Dissolved	SM 18-22 2540C (-97)
Specific Conductance	SM 18-22 2510B (-97)
Sulfate (as SO4)	EPA 300.0 Rev. 2.1
	SM 18-22 4500-SO4 D (-97)
Organohalide Pesticides	
Alachlor	EPA 507
Aldrin	EPA 508
Atrazine	EPA 507
Butachlor	EPA 507
Chlordane Total	EPA 508
Dieldrin	EPA 508
Endrin	EPA 508
Heptachlor	EPA 508
Heptachlor epoxide	EPA 508
Lindane	EPA 508
Methoxychlor	EPA 508
Metolachlor	EPA 507
Metribuzin	EPA 507
Propachlor	EPA 508
Simazine	EPA 507
Organohalide Pesticides	
Toxaphene	EPA 508
Polychlorinated Biphenyls	
PCB Screen	EPA 508
Trihalomethanes	
Bromodichloromethane	EPA 524.2
Bromoform	EPA 524.2
Chloroform	EPA 524.2
Dibromochloromethane	EPA 524.2
Total Trihalomethanes	EPA 524.2
Volatile Aromatics	
1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2
1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2-Chlorotoluene	EPA 524.2
4-Chlorotoluene	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Chlorobenzene	EPA 524.2
Ethyl benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2

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Volatile Aromatics

Isopropylbenzene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
p-Isopropyltoluene (P-Cymene)	EPA 524.2
sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
tert-Butylbenzene	EPA 524.2
Toluene	EPA 524.2
Total Xylenes	EPA 524.2

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2
1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2
2,2-Dichloropropane	EPA 524.2
Bromochloromethane	EPA 524.2
Bromomethane	EPA 524.2
Carbon tetrachloride	EPA 524.2

Volatile Halocarbons

Chloroethane	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2
cis-1,3-Dichloropropene	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Methylene chloride	EPA 524.2
Tetrachloroethene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2
Trichloroethene	EPA 524.2
Trichlorofluoromethane	EPA 524.2
Vinyl chloride	EPA 524.2

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260C
	EPA 624
Acrylonitrile	EPA 8260C
	EPA 624
Amines	
1,2-Diphenylhydrazine	EPA 8270D
2-Nitroaniline	EPA 8270D
3-Nitroaniline	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
Aniline	EPA 625
	EPA 8270D
Carbazole	EPA 625
	EPA 8270D
Pyridine	EPA 625
	EPA 8270D
Bacteriology	
Coliform, Fecal	SM 9222D-97
Coliform, Total	SM 9222B-97
E. coli (Enumeration)	SM 9222G-94,-97
	Colilert
	SM 9223B-04 (Colilert)
Enterococci	Enterolert
	EPA 1600
Heterotrophic Plate Count	SM 18-21 9215B

Benzidines	
3,3'-Dichlorobenzidine	EPA 625
	EPA 8270D
Benzidine	EPA 625
	EPA 8270D
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
	EPA 608
4,4'-DDE	EPA 8081B
	EPA 608
4,4'-DDT	EPA 8081B
	EPA 608
Aldrin	EPA 8081B
	EPA 608
alpha-BHC	EPA 8081B
	EPA 608
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 8081B
	EPA 608
Chlordane Total	EPA 8081B
	EPA 608
delta-BHC	EPA 8081B
	EPA 608
Dieldrin	EPA 8081B
	EPA 608
Endosulfan I	EPA 8081B

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Chlorinated Hydrocarbon Pesticides

Endosulfan I	EPA 608
Endosulfan II	EPA 8081B
	EPA 608
Endosulfan sulfate	EPA 8081B
	EPA 608
Endrin	EPA 8081B
	EPA 608
Endrin aldehyde	EPA 8081B
	EPA 608
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
	EPA 608
Heptachlor epoxide	EPA 8081B
	EPA 608
Lindane	EPA 8081B
	EPA 608
Methoxychlor	EPA 8081B
	EPA 608
PCNB	EPA 8270D
Toxaphene	EPA 8081B
	EPA 608

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D

Chlorinated Hydrocarbons

1,2,4-Trichlorobenzene	EPA 625
	EPA 8270D
2-Chloronaphthalene	EPA 625
	EPA 8270D
Hexachlorobenzene	EPA 625
	EPA 8270D
Hexachlorobutadiene	EPA 625
	EPA 8270D
Hexachlorocyclopentadiene	EPA 625
	EPA 8270D
Hexachloroethane	EPA 625
	EPA 8270D

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A

Demand

Biochemical Oxygen Demand	SM 5210B-01,-11
Carbonaceous BOD	SM 5210B-01,-11
Chemical Oxygen Demand	SM 5220D-97,-11

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Fuel Oxygenates	
Di-isopropyl ether	EPA 8260C
Ethanol	EPA 8260C
	EPA 8015D
	EPA 8015C
Methyl tert-butyl ether	EPA 8260C
tert-amyl alcohol	EPA 8260C
tert-amyl methyl ether (TAME)	EPA 8260C
tert-butyl alcohol	EPA 8260C
tert-butyl ethyl ether (ETBE)	EPA 8260C
Haloethers	
2,2'-Oxybis(1-chloropropane)	EPA 625
	EPA 8270D
4-Bromophenylphenyl ether	EPA 625
	EPA 8270D
4-Chlorophenylphenyl ether	EPA 625
	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 625
	EPA 8270D
Bis(2-chloroethyl)ether	EPA 625
	EPA 8270D
Low Level Halocarbons	
1,2-Dibromo-3-chloropropane, Low Level	EPA 8011
1,2-Dibromoethane, Low Level	EPA 8011

Low Level Polynuclear Aromatics	
Acenaphthene Low Level	EPA 8270D SIM
Acenaphthylene Low Level	EPA 8270D SIM
Anthracene Low Level	EPA 8270D SIM
Benzo(a)anthracene Low Level	EPA 8270D SIM
Benzo(a)pyrene Low Level	EPA 8270D SIM
Benzo(b)fluoranthene Low Level	EPA 8270D SIM
Benzo(g,h,i)perylene Low Level	EPA 8270D SIM
Benzo(k)fluoranthene Low Level	EPA 8270D SIM
Chrysene Low Level	EPA 8270D SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270D SIM
Fluoranthene Low Level	EPA 8270D SIM
Fluorene Low Level	EPA 8270D SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D SIM
Naphthalene Low Level	EPA 8270D SIM
Phenanthrene Low Level	EPA 8270D SIM
Pyrene Low Level	EPA 8270D SIM
Metals I	
Barium, Total	EPA 200.7 Rev. 4.4
	EPA 6010C
Cadmium, Total	EPA 200.7 Rev. 4.4
	EPA 6010C
	EPA 7010
	SM 3113B-04
Calcium, Total	EPA 200.7 Rev. 4.4
	EPA 6010C

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CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Metals I		Metals II	
Chromium, Total	EPA 200.7 Rev. 4.4	Aluminum, Total	EPA 200.7 Rev. 4.4
	EPA 6010C		EPA 6010C
Copper, Total	EPA 200.7 Rev. 4.4	Antimony, Total	EPA 200.7 Rev. 4.4
	EPA 6010C		EPA 6010C
Iron, Total	EPA 200.7 Rev. 4.4		EPA 7010
	EPA 6010C		SM 3113B-04
Lead, Total	EPA 200.7 Rev. 4.4	Arsenic, Total	EPA 200.7 Rev. 4.4
	EPA 6010C		EPA 6010C
	EPA 7010		EPA 7010
	SM 3113B-04		SM 3113B-04
Magnesium, Total	EPA 200.7 Rev. 4.4	Beryllium, Total	EPA 200.7 Rev. 4.4
	EPA 6010C		EPA 6010C
Manganese, Total	EPA 200.7 Rev. 4.4	Chromium VI	EPA 7196A
	EPA 6010C		SM 3500-Cr B-09,-11
Nickel, Total	EPA 200.7 Rev. 4.4	Mercury, Total	EPA 245.1 Rev. 3.0
	EPA 6010C		EPA 7470A
Potassium, Total	EPA 200.7 Rev. 4.4	Selenium, Total	EPA 200.7 Rev. 4.4
	EPA 6010C		EPA 6010C
Silver, Total	EPA 200.7 Rev. 4.4		EPA 7010
	EPA 6010C		SM 3113B-04
	EPA 7010	Vanadium, Total	EPA 200.7 Rev. 4.4
	SM 3113B-04		EPA 6010C
Sodium, Total	EPA 200.7 Rev. 4.4	Zinc, Total	EPA 200.7 Rev. 4.4
	EPA 6010C		EPA 6010C
Strontium, Total	EPA 200.7 Rev. 4.4		
	EPA 6010C		

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WADSWORTH CENTER

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Metals III	
Cobalt, Total	EPA 200.7 Rev. 4.4
	EPA 6010C
Gold, Total	EPA 200.7 Rev. 4.4
Molybdenum, Total	EPA 200.7 Rev. 4.4
	EPA 6010C
Thallium, Total	EPA 200.7 Rev. 4.4
	EPA 6010C
	EPA 7010
	SM 3113B-04
	EPA 200.9 Rev. 2.2
Tin, Total	EPA 200.7 Rev. 4.4
	EPA 6010C
Titanium, Total	EPA 200.7 Rev. 4.4
	EPA 6010C
Mineral	
Acidity	SM 2310B-97,-11
Alkalinity	SM 2320B-97,-11
Calcium Hardness	EPA 200.7 Rev. 4.4
Chloride	EPA 300.0 Rev. 2.1
	SM 4500-Cl- E-97,-11
Hardness, Total	EPA 200.7 Rev. 4.4
Sulfate (as SO4)	EPA 300.0 Rev. 2.1
	SM 4500-SO4 D-97,-11
Miscellaneous	
Boron, Total	EPA 200.7 Rev. 4.4

Miscellaneous	
Boron, Total	EPA 6010C
Bromide	EPA 300.0 Rev. 2.1
Color	SM 2120B-01,-11
Cyanide, Total	EPA 335.4 Rev. 1.0
	EPA 9012B
Formaldehyde	EPA 8315A
Oil and Grease Total Recoverable (HEM)	EPA 1664A
	EPA 1664B
	EPA 9070A (Solvent:Hexane)
Organic Carbon, Total	SM 5310C-00,-11
Phenols	EPA 420.4 Rev. 1.0
Specific Conductance	SM 2510B-97,-11
Sulfide (as S)	SM 4500-S2- D-00,-11
Surfactant (MBAS)	SM 5540C-00,-11
Total Petroleum Hydrocarbons	EPA 1664A
Turbidity	SM 2130 B-01,-11
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 625
	EPA 8270D
2,6-Dinitrotoluene	EPA 625
	EPA 8270D
Isophorone	EPA 625
	EPA 8270D
Nitrobenzene	EPA 625
	EPA 8270D

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Nitrosoamines	
N-Nitrosodimethylamine	EPA 625
	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 625
	EPA 8270D
N-Nitrosodiphenylamine	EPA 625
	EPA 8270D
Nutrient	
Ammonia (as N)	EPA 350.1 Rev. 2.0
Kjeldahl Nitrogen, Total	EPA 351.1 Rev. 1978
Nitrate (as N)	EPA 353.2 Rev. 2.0
	EPA 300.0 Rev. 2.1
Nitrite (as N)	EPA 353.2 Rev. 2.0
	EPA 300.0 Rev. 2.1
Orthophosphate (as P)	SM 4500-P F-99,-11
	SM 4500-P E-99,-11
Phosphorus, Total	EPA 200.7 Rev. 4.4
	SM 4500-P E-99,-11
Organophosphate Pesticides	
Atrazine	EPA 8141B
	EPA 8270D
Azinphos methyl	EPA 8141B
Diazinon	EPA 8141B
Disulfoton	EPA 8141B
Malathion	EPA 8141B
Parathion ethyl	EPA 8270D
Organophosphate Pesticides	
Simazine	EPA 8141B
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
	EPA 8015C
Gasoline Range Organics	EPA 8015D
	EPA 8015C
Phthalate Esters	
Benzyl butyl phthalate	EPA 625
	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 625
	EPA 8270D
Diethyl phthalate	EPA 625
	EPA 8270D
Dimethyl phthalate	EPA 625
	EPA 8270D
Di-n-butyl phthalate	EPA 625
	EPA 8270D
Di-n-octyl phthalate	EPA 625
	EPA 8270D
Polychlorinated Biphenyls	
PCB-1016	EPA 8082A
	EPA 608
PCB-1221	EPA 8082A
	EPA 608

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Polychlorinated Biphenyls	
PCB-1232	EPA 8082A
	EPA 608
PCB-1242	EPA 8082A
	EPA 608
PCB-1248	EPA 8082A
	EPA 608
PCB-1254	EPA 8082A
	EPA 608
PCB-1260	EPA 8082A
	EPA 608
PCB-1262	EPA 8082A
PCB-1268	EPA 8082A
Polynuclear Aromatics	
Acenaphthene	EPA 625
	EPA 8270D
Acenaphthylene	EPA 625
	EPA 8270D
Anthracene	EPA 625
	EPA 8270D
Benzo(a)anthracene	EPA 625
	EPA 8270D
Benzo(a)pyrene	EPA 625
	EPA 8270D
Benzo(b)fluoranthene	EPA 625
	EPA 8270D
Polynuclear Aromatics	
Benzo(ghi)perylene	EPA 625
	EPA 8270D
Benzo(k)fluoranthene	EPA 625
	EPA 8270D
Chrysene	EPA 625
	EPA 8270D
Dibenzo(a,h)anthracene	EPA 625
	EPA 8270D
Fluoranthene	EPA 625
	EPA 8270D
Fluorene	EPA 625
	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 625
	EPA 8270D
Naphthalene	EPA 625
	EPA 8270D
Phenanthrene	EPA 625
	EPA 8270D
Pyrene	EPA 625
	EPA 8270D
Priority Pollutant Phenols	
2,3,4,6 Tetrachlorophenol	EPA 8270D
2,4,5-Trichlorophenol	EPA 625
	EPA 8270D
2,4,6-Trichlorophenol	EPA 625

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Priority Pollutant Phenols	
2,4,6-Trichlorophenol	EPA 8270D
2,4-Dichlorophenol	EPA 625
	EPA 8270D
2,4-Dimethylphenol	EPA 625
	EPA 8270D
2,4-Dinitrophenol	EPA 625
	EPA 8270D
2-Chlorophenol	EPA 625
	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 625
	EPA 8270D
2-Methylphenol	EPA 625
	EPA 8270D
2-Nitrophenol	EPA 625
	EPA 8270D
3-Methylphenol	EPA 8270D
4-Chloro-3-methylphenol	EPA 625
	EPA 8270D
4-Methylphenol	EPA 625
	EPA 8270D
4-Nitrophenol	EPA 625
	EPA 8270D
Cresols, Total	EPA 625
	EPA 8270D
Pentachlorophenol	EPA 625
	EPA 8270D
Priority Pollutant Phenols	
Phenol	EPA 625
	EPA 8270D
Residue	
Settleable Solids	SM 2540 F-97,-11
Solids, Total	SM 2540 B-97,-11
Solids, Total Dissolved	SM 2540 C-97,-11
Solids, Total Suspended	SM 2540 D-97,-11
Solids, Volatile	SM 2540 E-97,-11
Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D
Acetophenone	EPA 8270D
alpha-Terpineol	EPA 625
Benzaldehyde	EPA 8270D
Benzoic Acid	EPA 8270D
Benzyl alcohol	EPA 8270D
Caprolactam	EPA 8270D
Dibenzofuran	EPA 8270D
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260C

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All approved analytes are listed below:

Volatile Aromatics	
1,2-Dichlorobenzene	EPA 8260C
	EPA 624
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 8260C
	EPA 624
1,4-Dichlorobenzene	EPA 8260C
	EPA 624
2-Chlorotoluene	EPA 8260C
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260C
	EPA 624
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 8260C
	EPA 624
Ethyl benzene	EPA 8260C
	EPA 624
Isopropylbenzene	EPA 8260C
m/p-Xylenes	EPA 8260C
	EPA 624
Naphthalene, Volatile	EPA 8260C
n-Butylbenzene	EPA 8260C
n-Propylbenzene	EPA 8260C
o-Xylene	EPA 8260C
	EPA 624
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C

Volatile Aromatics	
Styrene	EPA 8260C
	EPA 624
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260C
	EPA 624
Total Xylenes	EPA 8260C
	EPA 624
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260C
1,1,1-Trichloroethane	EPA 8260C
	EPA 624
1,1,2,2-Tetrachloroethane	EPA 8260C
	EPA 624
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C
1,1,2-Trichloroethane	EPA 8260C
	EPA 624
1,1-Dichloroethane	EPA 8260C
	EPA 624
1,1-Dichloroethene	EPA 8260C
	EPA 624
1,1-Dichloropropene	EPA 8260C
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloroethane	EPA 8260C

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Volatile Halocarbons	
1,2-Dichloroethane	EPA 624
1,2-Dichloropropane	EPA 8260C
	EPA 624
1,3-Dichloropropane	EPA 8260C
2,2-Dichloropropane	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260C
	EPA 624
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 8260C
	EPA 624
Bromoform	EPA 8260C
	EPA 624
Bromomethane	EPA 8260C
	EPA 624
Carbon tetrachloride	EPA 8260C
	EPA 624
Chloroethane	EPA 624
Chloroform	EPA 8260C
	EPA 624
Chloromethane	EPA 8260C
	EPA 624
cis-1,2-Dichloroethene	EPA 8260C
	EPA 624
cis-1,3-Dichloropropene	EPA 8260C
	EPA 624
Dibromochloromethane	EPA 8260C

Volatile Halocarbons	
Dibromochloromethane	EPA 624
Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260C
	EPA 624
Hexachlorobutadiene, Volatile	EPA 8260C
Methyl iodide	EPA 8260C
Methylene chloride	EPA 8260C
	EPA 624
Tetrachloroethene	EPA 8260C
	EPA 624
trans-1,2-Dichloroethene	EPA 8260C
	EPA 624
trans-1,3-Dichloropropene	EPA 8260C
	EPA 624
trans-1,4-Dichloro-2-butene	EPA 8260C
Trichloroethene	EPA 8260C
	EPA 624
Trichlorofluoromethane	EPA 8260C
	EPA 624
Vinyl chloride	EPA 8260C
	EPA 624
Volatiles Organics	
1,4-Dioxane	EPA 8260C
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C

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All approved analytes are listed below:

Volatiles Organics

4-Methyl-2-Pentanone	EPA 8260C
Acetone	EPA 8260C
Carbon Disulfide	EPA 8260C
Cyclohexane	EPA 8260C
Di-ethyl ether	EPA 8260C
Ethylene Glycol	EPA 8015D
	EPA 8015C
Isobutyl alcohol	EPA 8015D
	EPA 8015C
Methyl acetate	EPA 8260C
Methyl cyclohexane	EPA 8260C
Vinyl acetate	EPA 8260C

Sample Preparation Methods

SM 4500-P B(5)-99,-11
EPA 5030C
SM 4500-CN B or C-99,-11
EPA 3010A
EPA 3005A
EPA 3510C
EPA 3520C
EPA 3020A
SM 4500-NH3 B-97,-11
EPA 9010C

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ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved subcategories and/or analytes are listed below:

Volatile Halocarbons

Chloroethane	EPA 8260C

Serial No.: 54214

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260C
Acrylonitrile	EPA 8260C
Amines	
1,2-Diphenylhydrazine	EPA 8270D
2-Nitroaniline	EPA 8270D
3-Nitroaniline	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
Aniline	EPA 8270D
Carbazole	EPA 8270D
Benzidines	
3,3'-Dichlorobenzidine	EPA 8270D
Benzidine	EPA 8270D
Characteristic Testing	
Corrosivity	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B

Chlorinated Hydrocarbon Pesticides	
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270D
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
Pentachloronitrobenzene	EPA 8270D
Simazine	EPA 8141B
Toxaphene	EPA 8081B
Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D

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Chlorinated Hydrocarbons

1,2,4-Trichlorobenzene	EPA 8270D
2-Chloronaphthalene	EPA 8270D
Hexachlorobenzene	EPA 8270D
Hexachlorobutadiene	EPA 8270D
Hexachlorocyclopentadiene	EPA 8270D
Hexachloroethane	EPA 8270D

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
MCPA	EPA 8151A
MCPP	EPA 8151A
Pentachlorophenol	EPA 8151A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270D
4-Bromophenylphenyl ether	EPA 8270D
4-Chlorophenylphenyl ether	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 8270D
Bis(2-chloroethyl)ether	EPA 8270D

Low Level Polynuclear Aromatic Hydrocarbons

Acenaphthene Low Level	EPA 8270D SIM
Acenaphthylene Low Level	EPA 8270D SIM
Anthracene Low Level	EPA 8270D SIM
Benzo(a)anthracene Low Level	EPA 8270D SIM
Benzo(a)pyrene Low Level	EPA 8270D SIM
Benzo(b)fluoranthene Low Level	EPA 8270D SIM
Benzo(g,h,i)perylene Low Level	EPA 8270D SIM
Benzo(k)fluoranthene Low Level	EPA 8270D SIM
Chrysene Low Level	EPA 8270D SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270D SIM
Fluoranthene Low Level	EPA 8270D SIM
Fluorene Low Level	EPA 8270D SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D SIM
Naphthalene Low Level	EPA 8270D SIM
Phenanthrene Low Level	EPA 8270D SIM
Pyrene Low Level	EPA 8270D SIM

Metals I

Barium, Total	EPA 6010C
Cadmium, Total	EPA 6010C
Calcium, Total	EPA 6010C
Chromium, Total	EPA 6010C
Copper, Total	EPA 6010C
Iron, Total	EPA 6010C
Lead, Total	EPA 6010C
Magnesium, Total	EPA 6010C

Serial No.: 54215

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Metals I	
Manganese, Total	EPA 6010C
Nickel, Total	EPA 6010C
Potassium, Total	EPA 6010C
Silver, Total	EPA 6010C
Sodium, Total	EPA 6010C
Strontium, Total	EPA 6010C
Metals II	
Aluminum, Total	EPA 6010C
Antimony, Total	EPA 6010C
	EPA 7010
Arsenic, Total	EPA 6010C
Beryllium, Total	EPA 6010C
Chromium VI	EPA 7196A
Mercury, Total	EPA 7471B
Selenium, Total	EPA 6010C
Vanadium, Total	EPA 6010C
Zinc, Total	EPA 6010C
Metals III	
Cobalt, Total	EPA 6010C
Molybdenum, Total	EPA 6010C
Thallium, Total	EPA 6010C
	EPA 7010
Tin, Total	EPA 6010C
Titanium, Total	EPA 6010C

Minerals	
Bromide	EPA 9056A
Chloride	EPA 9056A
Fluoride, Total	EPA 9056A
Sulfate (as SO4)	EPA 9056A
Miscellaneous	
Boron, Total	EPA 6010C
Cyanide, Total	EPA 9012B
Formaldehyde	EPA 8315A
Organic Carbon, Total	Lloyd Kahn Method
	EPA 9060A
Phenols	EPA 9065
	EPA 9066
Specific Conductance	EPA 9050A
Sulfide (as S)	EPA 9034
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 8270D
2,6-Dinitrotoluene	EPA 8270D
Isophorone	EPA 8270D
Nitrobenzene	EPA 8270D
Pyridine	EPA 8270D
Nitrosoamines	
N-Nitrosodimethylamine	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 8270D
N-Nitrosodiphenylamine	EPA 8270D

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Nutrients	
Nitrate (as N)	EPA 9056A
Nitrite (as N)	EPA 9056A
Organophosphate Pesticides	
Azinphos methyl	EPA 8141B
Diazinon	EPA 8141B
Disulfoton	EPA 8141B
Malathion	EPA 8141B
Parathion ethyl	EPA 8270D
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
	EPA 8015C
Gasoline Range Organics	EPA 8015D
	EPA 8015C
Oil and Grease Total Recoverable (HEM)	EPA 9071B (Solvent:Hexane)
Phthalate Esters	
Benzyl butyl phthalate	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 8270D
Diethyl phthalate	EPA 8270D
Dimethyl phthalate	EPA 8270D
Di-n-butyl phthalate	EPA 8270D
Di-n-octyl phthalate	EPA 8270D
Polychlorinated Biphenyls	
PCB-1016	EPA 8082A
PCB-1221	EPA 8082A

Polychlorinated Biphenyls	
PCB-1232	EPA 8082A
PCB-1242	EPA 8082A
PCB-1248	EPA 8082A
PCB-1254	EPA 8082A
PCB-1260	EPA 8082A
PCB-1262	EPA 8082A
PCB-1268	EPA 8082A
PCBs in Oil	EPA-600/4-81-045
Polynuclear Aromatic Hydrocarbons	
Acenaphthene	EPA 8270D
Acenaphthylene	EPA 8270D
Anthracene	EPA 8270D
Benzo(a)anthracene	EPA 8270D
Benzo(a)pyrene	EPA 8270D
Benzo(b)fluoranthene	EPA 8270D
Benzo(ghi)perylene	EPA 8270D
Benzo(k)fluoranthene	EPA 8270D
Chrysene	EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270D
Fluoranthene	EPA 8270D
Fluorene	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 8270D
Naphthalene	EPA 8270D
Phenanthrene	EPA 8270D
Pyrene	EPA 8270D

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Priority Pollutant Phenols	
2,3,4,6 Tetrachlorophenol	EPA 8270D
2,4,5-Trichlorophenol	EPA 8270D
2,4,6-Trichlorophenol	EPA 8270D
2,4-Dichlorophenol	EPA 8270D
2,4-Dimethylphenol	EPA 8270D
2,4-Dinitrophenol	EPA 8270D
2-Chlorophenol	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 8270D
2-Methylphenol	EPA 8270D
2-Nitrophenol	EPA 8270D
3-Methylphenol	EPA 8270D
4-Chloro-3-methylphenol	EPA 8270D
4-Methylphenol	EPA 8270D
4-Nitrophenol	EPA 8270D
Pentachlorophenol	EPA 8270D
Phenol	EPA 8270D
Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D
Acetophenone	EPA 8270D
Benzaldehyde	EPA 8270D
Benzyl alcohol	EPA 8270D

Semi-Volatile Organics	
Caprolactam	EPA 8270D
Dibenzofuran	EPA 8270D
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260C
1,2-Dichlorobenzene	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 8260C
1,4-Dichlorobenzene	EPA 8260C
2-Chlorotoluene	EPA 8260C
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260C
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 8260C
Ethyl benzene	EPA 8260C
Isopropylbenzene	EPA 8260C
m/p-Xylenes	EPA 8260C
Naphthalene, Volatile	EPA 8260C
n-Butylbenzene	EPA 8260C
n-Propylbenzene	EPA 8260C
o-Xylene	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C
Styrene	EPA 8260C
tert-Butylbenzene	EPA 8260C

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All approved analytes are listed below:

Volatile Aromatics	
Toluene	EPA 8260C
Total Xylenes	EPA 8260C
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260C
1,1,1-Trichloroethane	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C
1,1,2-Trichloroethane	EPA 8260C
1,1-Dichloroethane	EPA 8260C
1,1-Dichloroethene	EPA 8260C
1,1-Dichloropropene	EPA 8260C
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloroethane	EPA 8260C
1,2-Dichloropropane	EPA 8260C
1,3-Dichloropropane	EPA 8260C
2,2-Dichloropropane	EPA 8260C
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 8260C
Bromoform	EPA 8260C
Bromomethane	EPA 8260C
Carbon tetrachloride	EPA 8260C
Chloroethane	EPA 8260C
Chloroform	EPA 8260C
Volatile Halocarbons	
Chloromethane	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260C
Dibromochloromethane	EPA 8260C
Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260C
Methylene chloride	EPA 8260C
Tetrachloroethene	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260C
trans-1,4-Dichloro-2-butene	EPA 8260C
Trichloroethene	EPA 8260C
Trichlorofluoromethane	EPA 8260C
Vinyl chloride	EPA 8260C
Volatile Organics	
1,4-Dioxane	EPA 8260C
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260C
Acetone	EPA 8260C
Carbon Disulfide	EPA 8260C
Cyclohexane	EPA 8260C
Ethylene Glycol	EPA 8260C
	EPA 8015D

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All approved analytes are listed below:

Volatile Organics

Methyl acetate	EPA 8260C
Methyl cyclohexane	EPA 8260C
Methyl tert-butyl ether	EPA 8260C
tert-butyl alcohol	EPA 8260C

Sample Preparation Methods

EPA 5035A-L
EPA 5035A-H
EPA 3580A
EPA 9030B
EPA 3050B
EPA 3550C
EPA 3540C
EPA 3545A
EPA 3051A
EPA 5021A
EPA 3060A
EPA 9010C

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ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Lead in Dust Wipes	EPA 6010C
Lead in Paint	EPA 6010C

Sample Preparation Methods

	EPA 3050B
	EPA 3051A

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All approved analytes are listed below:

Acrylates	
Acrylonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA TO-14A
	EPA TO-15
Hexachlorobutadiene	EPA TO-14A
	EPA TO-15
Hexachloroethane	EPA TO-14A
	EPA TO-15
Metals I	
Lead, Total	EPA 7010
Polychlorinated Biphenyls	
PCBs and Aroclors	EPA TO-10A
Polynuclear Aromatics	
Naphthalene	EPA TO-15
Purgeable Aromatics	
1,2,4-Trimethylbenzene	EPA TO-14A
	EPA TO-15
1,2-Dichlorobenzene	EPA TO-14A
	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-14A
	EPA TO-15
1,3-Dichlorobenzene	EPA TO-14A

Purgeable Aromatics	
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-14A
	EPA TO-15
2-Chlorotoluene	EPA TO-15
Benzene	EPA TO-14A
	EPA TO-15
Chlorobenzene	EPA TO-14A
	EPA TO-15
Ethyl benzene	EPA TO-14A
	EPA TO-15
Isopropylbenzene	EPA TO-15
m/p-Xylenes	EPA TO-15
o-Xylene	EPA TO-15
Styrene	EPA TO-14A
	EPA TO-15
Toluene	EPA TO-14A
	EPA TO-15
Total Xylenes	EPA TO-14A
	EPA TO-15
Purgeable Halocarbons	
1,1,1-Trichloroethane	EPA TO-14A
	EPA TO-15
1,1,2,2-Tetrachloroethane	EPA TO-14A
	EPA TO-15
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA TO-14A

Serial No.: 54217

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

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Purgeable Halocarbons	
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-14A
	EPA TO-15
1,1-Dichloroethane	EPA TO-14A
	EPA TO-15
1,1-Dichloroethene	EPA TO-14A
	EPA TO-15
1,2-Dibromo-3-chloropropane	EPA TO-14A
	EPA TO-15
1,2-Dibromoethane	EPA TO-14A
	EPA TO-15
1,2-Dichloroethane	EPA TO-14A
	EPA TO-15
1,2-Dichloropropane	EPA TO-14A
	EPA TO-15
3-Chloropropene (Allyl chloride)	EPA TO-15
Bromodichloromethane	EPA TO-14A
	EPA TO-15
Bromoform	EPA TO-15
Bromomethane	EPA TO-14A
	EPA TO-15
Carbon tetrachloride	EPA TO-14A
	EPA TO-15
Chloroethane	EPA TO-14A
	EPA TO-15
Chloroform	EPA TO-14A

Purgeable Halocarbons	
Chloroform	EPA TO-15
Chloromethane	EPA TO-14A
	EPA TO-15
cis-1,2-Dichloroethene	EPA TO-14A
	EPA TO-15
cis-1,3-Dichloropropene	EPA TO-14A
	EPA TO-15
Dibromochloromethane	EPA TO-15
Dichlorodifluoromethane	EPA TO-14A
	EPA TO-15
Methylene chloride	EPA TO-14A
	EPA TO-15
Tetrachloroethene	EPA TO-14A
	EPA TO-15
trans-1,2-Dichloroethene	EPA TO-14A
	EPA TO-15
trans-1,3-Dichloropropene	EPA TO-14A
	EPA TO-15
Trichloroethene	EPA TO-14A
	EPA TO-15
Trichlorofluoromethane	EPA TO-14A
	EPA TO-15
Vinyl bromide	EPA TO-15
Vinyl chloride	EPA TO-14A
	EPA TO-15

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Volatile Chlorinated Organics	
Benzyl chloride	EPA TO-14A
	EPA TO-15
Volatile Organics	
1,2-Dichlorotetrafluoroethane	EPA TO-14A
	EPA TO-15
1,3-Butadiene	EPA TO-14A
	EPA TO-15
1,4-Dioxane	EPA TO-15
2,2,4-Trimethylpentane	EPA TO-15
2-Butanone (Methylethyl ketone)	EPA TO-15
4-Methyl-2-Pentanone	EPA TO-15
Acetone	EPA TO-15
Carbon Disulfide	EPA TO-15
Cyclohexane	EPA TO-15
Hexane	EPA TO-15
Isopropanol	EPA TO-15
Methyl tert-butyl ether	EPA TO-15
n-Heptane	EPA TO-15
tert-butyl alcohol	EPA TO-15

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