Soil Vapor Extraction Specifications and Work Plan

Airport Kwik Stop
Ione, Washington

for
Washington State Department of Ecology

July 18, 2012

GeoEngineers
Earth Science + Technology

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File No. 0504-058-02

July 18, 2012

Prepared for:

Washington State Department of Ecology
Toxics Cleanup Program- Eastern Region Office
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Spokane, Washington 99205

Attention: Doug Ladwig, PG, PHG

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1.0 INTRODUCTION AND SITE HISTORY

1.1. General

The Washington State Department of Ecology (Ecology) is conducting an interim remedial action at the Airport Kwik Stop Site in Ione, Washington. The work will be completed under a Public Works contract. Work generally shall consist of trenching and installation of soil vapor extraction (SVE) piping, valves and manifolds; off-site disposal of contaminated soil at a permitted facility; installation of SVE system equipment, electrical connection of the SVE system, installation of a vapor treatment system, and backfilling with imported fill and re-paving site excavations.

The Airport Kwik Stop previously sold regular and premium gasoline, which was contained in three underground storage tanks (USTs). Records indicate that two tanks were approximately 2,000 gallons, and a third had a capacity of less than 500 gallons. The small UST reportedly last stored gasoline in 1984, and was reportedly emptied. The two larger USTs were reportedly closed in 1989. The Airport Kwik Stop continued to dispense gasoline using above ground storage tanks (ASTs). The ASTs are located behind (west) of the Airport Kwik Stop. In May 2008, a flex pipe beneath the premium fuel dispenser was observed to be spraying gasoline inside the dispenser. The flex pipe was repaired and subsequently, after passing a tightness test, returned to service. The Airport Kwik Stop has not sold petroleum since fall 2008.

Recent assessment activities at the site have documented the presence of petroleum hydrocarbon contamination (gasoline) in soil at the site. The entire site is shown on the Project Overview, Sheet G1.1. Gasoline-range petroleum hydrocarbon (GRPH) contamination in shallow soil extends from less than 2 feet below ground surface (bgs) near the former premium fuel dispenser, to groundwater (about 34 to 38 feet bgs). Concentrations of GRPH in soil samples collected from explorations at the Airport Kwik Stop have ranged from non-detect to 17,200 milligrams per kilogram (mg/kg), with the highest concentrations from samples located nearest the fuel dispensers. Although the USTs were closed, and the ASTs no longer contain gasoline, gasoline contamination in soil continues to leach downward to groundwater, where it is transported laterally downgradient with groundwater flow from the Airport Kwik Stop in both liquid-phase form (product) and dissolved in groundwater.

An SVE pilot test recently was conducted to assess the potential effectiveness of an in-situ remediation system to reduce contaminant concentrations in soil at the site. Two 4-inch polyvinyl chloride (PVC) SVE extraction wells (SVE-1 and SVE-2) and two 2-inch PVC monitoring points (MP-1 and MP-2) were installed to conduct the pilot test and will be utilized in the SVE system. Total hydrocarbons as gasoline were detected in vapor samples collected during the pilot test at concentrations ranging between 14,700 and 16,500 parts per million by volume (ppmv). A summary of vapor analytical results is included in Appendix A; a full copy of the SVE Pilot Test report is available if requested. Total benzene, toluene, ethylbenzene, and xylenes (BTEX) were detected from the vapor samples at concentrations ranging from 3,470 to 3,960 ppmv.

The interim action is being conducted in accordance with the Model Toxics Control Act (WAC 173-340-430). The interim action will reduce the soil contamination identified at the Site; thus reducing the soil and groundwater contamination identified beneath the Site. The action is

necessary to reduce the threat to groundwater, down gradient domestic water wells and the Pend Oreille River.

1.2. Instructions to Contractor

The work to be performed shall include furnishing all labor, materials and equipment necessary for completing work at the Site. All work will be directly contracted by Ecology. Ecology plans to designate GeoEngineers to serve as Ecology's on-site representative (Ecology's Representative). The minimum tasks necessary to complete work include:

- Site preparation such as installing temporary facilities and site controls; erosion and sediment controls; protecting existing utilities.
- Excavate shallow trenches and install piping that connects the SVE wells to the remediation system blowers.
- Dispose petroleum contaminated soil excavated from the trenches at a permitted facility.
- Backfill, compact, grade, and pave the trenches using clean reusable site soil and imported fill.
- Construct a fenced and gated treatment compound.
- Purchase, transport, and install SVE/bioventing (BV) system equipment.
- Subcontract a qualified electrician to provide power to the remediation system including a rented vapor treatment system.
- Subcontract rental of a vapor treatment system (likely a catalytic oxidizer) for a period of time until vapor concentrations decrease to a concentration appropriate for activated carbon filtration.
- Install activated carbon filters for polishing after initial treatment, and for primary treatment following removal of rented oxidizer treatment system.

Other, non-listed tasks might be required to satisfactorily complete the work.

1.3. Requests and Approvals

Any request by the Contractor for approval of items, or proposals for change in the work of whatever nature, shall be submitted in writing to Ecology's Representative. The Contractor shall, at his own expense, make any secondary changes required to incorporate an approved substitute into the project.

Any approvals or change orders shall be issued to the Contractor in writing by Ecology. No verbal agreement or conversation with any officer, agent, or employee of the State shall effect or modify the terms of obligation of this contract.

1.4. Measurement

In measuring all acceptably completed bid items of work, Ecology's Representative will:

- Use United States standard measure;

- Make all measurements as described in this section, unless individual specifications require otherwise;
- Follow methods generally recognized as conforming to good engineering practice;
- Conform to the usual practice of carrying measurements and computations to the proper significant figure or fraction of units for each item; and
- Measure horizontally or vertically (unless otherwise specified).

The terms listed below shall be defined as follows in all measurements under this section:

- "Lump Sum" (when used as an item of payment): complete payment for the work described for that item in the contract. Lump sum payments also may be made based on percent of completion.
- "Ton": 2,000 pounds of weight.
- "Gallon": measurement shall be in U.S. gallons, as measured by the licensed disposal facility at the time of disposal.
- "Linear Foot": measured parallel to the structure's base or foundation, unless the Plans require otherwise.
- "Hour": hourly rate for equipment and personnel, including fees, taxes, and any other incidentals. Prevailing wage rates shall apply for the work in this Contract.

For each item listed below, Ecology's Representative will use the method of measurement described.

- Standard Manufactured Items: measured by the manufacturer's identification gage, unit weight, section dimension, etc. Ecology's Representative will accept manufacturing tolerances set by each industry unless cited specifications require more stringent tolerances.

No measurement will be made for:

- Work performed or materials placed outside lines shown in the Plans or set by Ecology's Representative;
- Materials wasted, used or disposed of in a manner contrary to the contract;
- Rejected materials (including those rejected after placement if the rejection resulted in the Contractor's failure to comply with the contract);
- Hauling and disposing of rejected materials;
- Material remaining on hand after the work is completed; or
- Any other work or material contrary to any contract provision.

2.0 CONTACTS/ROLES

The following provides a listing of parties that will be involved in the remedial actions at the Site including Ecology, regulatory agency and Ecology's Representative. All questions, comments and requests regarding this RFP shall be addressed to Ecology or Ecology's Representative.

2.1. Ecology

Name: Washington State Department of Ecology
Contact: Doug Ladwig
Address: 4601 North Monroe Street, Spokane, Washington 99205
Phone: 509.329.3440
E-mail: DLAD461@ecy.wa.gov

2.2. Owner's Representative

Name: GeoEngineers, Inc.
Contacts: David Lauder – Project Manager/Engineer
Bruce Williams – Principal
Address: 523 East Second Avenue, Spokane, Washington 99202
Phone: 509.363.3125
Fax: 509.363.3126
E-mail: dlauder@geoengineers.com
bwilliams@geoengineers.com

Additional representatives might by retained by Ecology during execution of work as necessary. Ecology's Representative listed above shall be the main point of contact for coordination between the Contractor, other Ecology representatives and Ecology. In these specifications, "Ecology's Representative" is synonymous with "Ecology".

3.0 REFERENCES

All work under the Contract shall be done in accordance with this document and, insofar as they may apply, the most current edition of the following codes, specifications, standards and guides, and others as specified elsewhere in these specifications.

- American Conference of Governmental Industrial Hygienists (ACGIH)
- American Public Works Association (APWA)
- American Society for Testing and Materials (ASTM)
- Environmental Protection Agency (EPA)
- Hazardous Waste Operations (HAZWOPER)
- Model Toxics Control Act (MTCA)
- Manual of Uniform Traffic Control Devices (MUTCD)
- National Institute of Occupational Safety and Health (NIOSH)

- Occupational Safety and Health Administration (OSHA)
- Washington Administrative Code (WAC)
- Washington Department of Occupational Safety and Health (WDOSH)
- Washington Industrial Safety and Health Act (WISHA)
- Washington State Department of Transportation (WSDOT)

4.0 COORDINATION OF OPERATIONS

The Contractor shall conduct their operations in a manner that causes the least possible obstruction and inconvenience to any activities of the surrounding businesses and the public. At its sole expense, the Contractor shall furnish, erect, and maintain temporary fences, vehicular barricades, signs, lights, and cones as may be necessary to provide access to abutting streets and to warn the public and on-site personnel of work in progress. Coordination of all traffic and traffic control devices shall be in accordance with the current MUTCD, WSDOT, and local standards. The Contractor shall coordinate all activities with other contractors in the area when necessary.

5.0 REGULATIONS AND PERMITS

This interim cleanup action is being implemented in accordance with WAC 173-340-430 Interim Actions. WAC 173-340 is known as the MTCA Cleanup Regulations. Relevant regulations for the Site include, but are not necessarily limited to:

General Health and Safety: WAC 296-155 (Safety Standards for Construction); WAC 296-843 (Hazardous Waste Operations (HAZWOPER) regulations); 29 CFR 1910 (Occupational Safety and Health Standards); 29 CFR 1926 (Safety and Health Regulations for Construction); 29 CFR 1910.120 specifies health and safety standards at hazardous waste sites.

Waste Characterization: Waste generated during the remediation will be characterized by the Ecology or Ecology's Representative in accordance with WAC 173-303. The Contractor will not be responsible for costs related to waste characterization, expect where indicated in these specifications.

Solid Waste Management: WAC 173-304 specifies requirements for the proper handling of all solid waste materials. The Contractor will be responsible for complying with these requirements when solid waste is to be transported off of the Site.

Noise Control: Noise will be controlled to meet the requirements of WAC 173-60. WAC 173-60-050 (3) (a) should exempt the project from the requirements of WAC 173-60-040. Work will be conducted in a manner that prevents public disturbance noise between the hours of 7:00 p.m. and 7:00 a.m.

Right-of-Way Obstruction Permits: Due to the proximity of State Highway 31 and the associated right-of-way (ROW), it might be necessary to have access to ROW adjacent to the site. Ecology's Representative will be responsible for obtaining ROW obstruction permits from applicable

jurisdictions. The Contractor shall be responsible for implementing and abiding by the permit requirements including providing and maintaining signage or traffic control required for the execution of the permit. The Contractor shall obtain all the approvals required and provide written approvals to the Ecology's Representative at least 7 days prior to mobilization to the Site.

Air Monitoring: During earthwork activities, the Contractor shall monitor air for dust at several perimeter locations on a daily basis. Action levels for total dust will be set at 5.0 mg/m^3. If this level is attained at any time, additional dust suppression shall be implemented. Monitoring shall continue and if this level cannot be attained, Site operations will be shut down and an evaluation of additional dust suppression techniques and engineering controls will be completed. Ecology's Representative may complete their own air monitoring program. If action levels for total dust are exceeded during air monitoring by Ecology's Representative, the Contractor will be notified, and the Contractor shall immediately implement additional dust suppression. Additionally, the Contractor shall monitor the site boundaries for volatile organic compounds (VOC) in accordance with their approved Health and Safety Plan (HASP). VOC concentrations exceeding the action levels instituted in the HASP will activate the appropriate response as described in the HASP.

The Contractor shall be responsible for preparing a Noise Control and Air Monitoring plan in compliance with the above regulatory requirements and all other applicable codes, permit and inspection requirements of the state and local regulations, and to the satisfaction of Ecology's Representative. The Noise and Air Monitoring Plans shall be incorporated in the required Work Plan submittal. Ecology or Ecology's Representative will review the Contractor's performance in implementing these plans throughout the duration of construction. Ecology or Ecology's Representative will serve as the point of contact for any public or agency comments, concerns, or complaint. Upon receipt and review of comments, concerns, or complaints by Ecology's Representative, Ecology's Representative will identify appropriate measures to address these comments, concerns, or complaints, and the Contractor shall be responsible for implementing the necessary changes to their plans operations to address these comments, concerns, or complaints.

6.0 UTILITIES AND MONITORING WELLS

The Contractor shall be responsible for providing water supply services to the Site for the scope of work specified in this document. A portable water supply will be acceptable provided all applicable health and safety standards are met.

The Contractor will be responsible for providing electrical services, as needed, for the project. The Contractor will be responsible for coordinating permitting, installation, inspection and final energizing of a new 3-phase electrical service to be installed at the location of the treatment system compound. The new electrical service will be metered and setup as a separate utility account with Ecology's contact information listed above.

The Contractor shall be responsible for locating, marking, protecting, and capping all existing Site utilities in accordance with these specifications and all applicable regulations. This includes calling the One-Call telephone number (1800-424-5555) and the Pend Oreille County PUD (509-447-3137). The Contractor also shall utilize a private utility locator to locate private utility lines, including existing product lines at the Site.

In addition to the SVE and monitoring point wells installed for the pilot test, a groundwater monitoring well (MW-8) and air sparge well (AS-1) are located at the Site. Both wells will be protected during construction activities. The Contractor shall be responsible for marking and protecting the wells. The Contractor shall leave a 3-foot buffer around the monitoring wells undisturbed by construction activities. Damage to the wells shall be repaired by the Contractor at their sole expense.

7.0 SAFETY

The Contractor shall be solely and completely responsible for Site conditions and safety during the term of the Contract. This obligation shall include the safety of all persons within or affected by the line of construction, and all private and public property affected by the work.

The Contractor shall prepare a site-specific HASP for review by Ecology's Representative prior to initiating the work. Required submittals relating to health and safety are described in **Section 10.2** and **10.3** of these specifications.

The Contractor shall be fully responsible to comply with all federal OSHA regulations that apply to this Contract.

The Contractor's responsibility shall be continuous and not limited to working hours or days, and shall not cease until Ecology fully accepts the work.

The Contractor shall be responsible for posting signs that comply with federal, state, and local agencies rules and requirements.

The Contractor shall give a "clear and reasonable warning" to its employees and the general public for any workplace or environmental exposure which results from its activities during the course of this project.

The Contractor shall be responsible for furnishing, erecting, and maintaining fences, barriers, lights and signs as necessary for physical security, public safety and safety of its workers. The Contractor shall secure the fencing at the end of each working day.

The Contractor shall store fuel, water and equipment required for the work within the designated Support Zone or in the active construction areas approved by Ecology's Representative.

8.0 PROJECT SUPERVISION

8.1. Contractor's Supervision

The Contractor shall provide the services of a full-time, experienced and qualified construction field superintendent who shall be assigned to the job during the course of the work. The person designated as construction field superintendent shall have direct charge of the work and shall be authorized to accept and execute all orders and directions issued by Ecology's Representative. The construction field superintendent shall be readily available during normal work hours for consultation with Ecology's Representative and be physically on the job Site during Site activities.

The construction field superintendent shall not be removed or replaced during the entire course of the contract work without the written approval of Ecology's Representative.

8.2. Job Site Administration

Ecology's Representative will represent Ecology on the Site.

9.0 SITE WORK

All intrusive/sub-grade Site work described in this contract shall be completed by 40-hour HAZWOPER trained personnel. Supervision of personnel at the Site shall be performed by individuals that have received appropriate Hazardous Waste Site Supervisors training. Work performed by personnel without HAZWOPER training (i.e., electrical subcontractor, equipment delivery personnel, surveyors, etc.) must be performed prior to initiating subgrade work expected to expose contaminated soil or outside an exclusion zone set up by the Contractor.

The attached plan set includes:

- Sheet G1.0 : Cover Sheet – Table of Contents for Plans and maps showing location of Site.
- Sheet G1.1: Project Overview – Summary of project elements; location of site features.
- Sheet G1.2 : Project Overview Photos – Photos showing Site features and conditions.
- Sheet C1.0 : Remediation System Layout – Plan view presentation of SVE/BV wells, proposed conveyance piping and trench layout, and location of treatment system compound.
- Sheet C1.1 : SVE/BV System Piping and Instrumentation Diagram – Presents P&ID of proposed SVE/BV and vapor treatment components.
- Sheet D1.0 : SVE/BV System Details – Presents detailed drawings of specific SVE/BV system components.
- Sheet D1.1 : Construction Details – Presents detailed drawings of general site construction components.

9.1. Mobilization and Demobilization

Mobilization consists of providing all construction equipment, materials and supplies, temporary electrical and fresh water supplies to complete the contract work. Demobilization includes removing all equipment, remaining materials and supplies, and all temporary facilities, and cleanup of the Site at the completion of this contract work as provided in these Specifications.

Mobilization and Demobilization shall be measured as a unit, and paid for on a lump sum basis. Fifty percent of the Mobilization and Demobilization shall be paid upon completion of mobilization and 50 percent upon demobilization.

9.2. Site Preparation

All work shall be performed in accordance with the following specifications except as may be exempted or modified by these contract documents. These specifications are included by

reference, made a part of this Sub-Section and shall control and guide activities where referred to directly, paragraph by paragraph.

- WSDOT/APWA "2012 Standard Specifications for Road, Bridge and Municipal Construction" as amended by the APWA Supplements, hereinafter referred to as the "Standard Specifications".

In conjunction to these standard specifications, the following other specifications and standard plans shall apply to the extent to which they are called out in these Plans and Specifications.

- All other requirements or permits as identified by Pend Oreille County or State of Washington.

The Contractor shall complete the following activities before performing any excavation actions:

1. Clearing and grubbing and installation of temporary facilities and controls;
2. Installation of temporary erosion and sedimentation controls (TESC);
3. Identification of utilities; and
4. Protecting and capping site utilities.

Descriptions of specific tasks relating to these activities are provided below.

9.2.1. Temporary Facilities and Site Controls

The Contractor shall supply all materials, equipment and labor necessary to clear and grub the site of existing vegetation and to install the temporary facilities and controls at the locations indicated in the Plans. The Contractor shall:

1. In consultation with Ecology's Representative, establish a Support Zone for storage, sanitary facilities, hand washing facilities and parking for non-construction vehicles.
2. Provide, maintain and pay for suitable quantity of water service for the activities related to the contract work including dust suppression. Provide potable water and portable restrooms within the designated Support Zone. Provide, maintain and pay for suitable quantity of water service for the activities related to the contract work. Contractor shall attain applicable permits to provide potable water and portable restrooms within the designated Support Zone.
3. Provide and maintain in clean, good working order, an emergency decontamination and eye wash station.
4. Provide portable units for sanitary waste that shall be regularly collected by a licensed sanitary waste management contractor and disposed of in an appropriate manner.
5. Provide all power for operation of Contractor's equipment, or for any other use by the Contractor at the Contractor's expense.
6. In consultation with Ecology's Representative, establish and lay out work zones and establish boundaries, barriers, facilities and controls to ensure that all personnel and equipment exiting the Exclusion Zone shall pass through the Decontamination Zone before entering the Support Zone and before exiting the Site.
7. Be responsible for maintaining construction equipment and machinery on Site and ensuring that equipment is in proper working order. The Contractor shall inspect equipment and

machinery for fluid leaks prior to mobilization on Site. Maintain spill response kits and materials onsite to respond to fuel spills or equipment leaks. The Contractor shall be solely responsible for excavation and disposal of soil contaminated by fluid leaks and spills.

8. Prevent tracking of soil or contaminants onto any public right-of-way or private property during all contract work. During the construction activities, Contractor shall be responsible for all costs associated with removal and/or cleanup of contaminated materials located outside of the Contractor Limits of Work and any damage that may have been caused by the materials.
9. Use an approved construction entrance for ingress/egress to the Site during Site work, unless otherwise approved by Ecology's Representative.
10. Install temporary chain link fencing around the Site such that all equipment and unfinished sub-grade work (trenches, etc.) are within the fence and secured. The Contractor shall furnish and post signs at a spacing no greater than 100 feet warning the general public that the Site contains physical and chemical hazards and that the access is forbidden to unauthorized persons. The Contractor shall furnish all other required signage required by local, state or federal regulations, and/or Ecology's Representative warning the public of construction activities on Site. The Contractor shall provide the posts or supports and erect and maintain the signs in a clean, neat and presentable condition until the necessity for them has ceased. The Contractor shall provide signs as required by a Traffic Control Plan approved by WSDOT. Temporary fencing shall not encroach into the clear zone of Highway 31, the clear zone is located approximately 23 feet from the fog line as depicted on Sheet G1.1.
11. Remove the temporary fencing upon completion of the contract work, upon approval of Ecology's Representative.
12. For work involving the excavation of contaminated materials, the Contractor shall:

    a. Prepare a decontamination pad in the Decontamination Zone on Site within the Exclusion Zone for vehicle and personnel decontamination. The Contractor shall provide facilities to decontaminating vehicles, equipment and personnel prior to leaving the Exclusion Zone.

    b. Provide a drainage and collection system for wastewater generated during decontamination procedures. The wastewater shall be transferred to on-site storage tanks provided by the Contractor. The water collection system shall be approved by Ecology's Representative prior to collection.

9.2.2. Temporary Erosion and Sedimentation Controls (TESC)

Dust control techniques will be implemented for activities that could generate dust in accordance with the Contractor's approved Work Plan and HASP. The Contractor shall comply with applicable Federal, State and local regulations. Dust control can include but is not limited to spraying exposed surfaces with water and repeating as necessary throughout the course of construction. Water applied as dust control shall not leave the Site as surface runoff.

Dust control techniques must be approved by Ecology's Representative prior to application. Routine maintenance of chosen dust control technique is necessary to keep dust to a minimum. Contractor shall coordinate use of possible water sources from public or private sources to provide dust control throughout the contract work. The Contractor is responsible for a use permit and associated expenses, as required. The contractor shall:

1. Keep surrounding roads clean of debris and mud associated with construction vehicles and equipment. Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment removed by sweeping shall be removed and properly disposed of at an approved disposal facility. The pavement shall not be cleaned by washing down the street, except when sweeping is ineffective. Runoff from street washing must be controlled and stabilized on Site. If the entrance and exit to the Site is tracking sediment onto pavement areas, then alternative measures to keep the roads free of sediment must be implemented. Any cost incurred by Ecology for cleaning up litter or mud shall be charged to the Contractor and deducted from funds paid for the Work.
2. Install stormwater controls, such as berms, as needed, within the limits of work area to avoid any stormwater runoff discharge and to avoid any stormwater run-on into the work area. Stormwater controls will be approved by Ecology's Representative prior to placement.
3. Contain decontamination water, and stormwater runoff in excess of natural infiltration within the Exclusion Zone. The decontamination water and excess stormwater runoff shall be collected and stored in on-site water storage tanks and transported off Site for disposal at a facility licensed to dispose of the water. The tanks shall be equipped with readily accessible sampling ports for Ecology's Representative to collect water samples. The Contractor shall be responsible for sampling and adequately characterizing the water to meet the acceptance requirements for disposal at a licensed facility. Water testing information and anticipated disposal method for the water shall be submitted to Ecology's Representative for approval prior to disposal of water.

9.2.3. Measurement and Payment

Temporary facilities and TESC shall include the labor, equipment and materials required to complete work described in this section. Permit fees or work required by permits (such as traffic control and signage) will be included in the Temporary Facilities and TESC line item. All temporary Facilities and TESC requirements shall be measured as a unit, and paid for on a lump sum basis. Seventy-five percent of the Temporary Facilities and TESC bid item shall be paid upon completion of site preparation and 25 percent upon dismantling of temporary facilities.

9.3. Trenching

9.3.1. Excavation, Soil Handling, and Disposal

The Contractor shall supply all materials, equipment and labor necessary to excavate trenches for the SVE piping from the areas indicated on the Plans. Portions of the excavated soil will likely be contaminated with gasoline-range petroleum hydrocarbons, requiring stockpiling and characterization to determine disposal requirements. The Contractor shall:

1. Stake trench boundaries indicated on the Plans prior to excavation and protect and preserve the survey stakes during the work.
2. Remove concrete and asphalt as necessary to excavate trenches to the lines and grades indicated on the Plans. Saw-cut existing concrete and asphalt in order to provide uniform joints upon patching. Concrete and asphalt shall be disposed at a permitted facility in accordance with all applicable regulations.

3. Be solely responsible for excavation slope stability. Excavation work shall be in compliance with applicable OSHA regulations and in accordance with the Contractor's HASP.

4. Control dust emissions and odors during excavation activities in accordance with these specifications and the project HASP. Dust control techniques will be implemented for construction activities that generate large amounts of dust.

5. Perform excavation in a manner that does not disturb or damage existing structures, utilities or other facilities not indicated to be removed including the existing SVE wells, monitoring points, and monitoring wells, unless the removal of such items is shown on the Plans. Damaged facilities shall be repaired or replaced at the Contractor's expense as determined by Ecology or Ecology's Representative.

6. Slope trenches such that condensation within SVE piping will flow back toward the remediation wells. Trenches will be sloped at least 0.5 percent (horizontal to vertical) toward the remediation wells.

7. Support all existing utilities during excavation activities to not cause damage and to protect on-site workers.

8. Stockpile excavated soil in a temporary Stockpile Area approved by Ecology for characterization by Ecology as necessary. Ecology's Representative shall seek pre-approval for soil disposal at a facility permitted to accept petroleum-contaminated soil based on assessment sample results. If additional characterization is required, the Contractor shall assist Ecology's Representative in obtaining soil stockpile samples. If the Contractor elects to dispose contaminated material at a different permitted facility, that facility shall be approved by Ecology's Representative and profiling, including sampling and chemical analysis, shall be at the Contractor's expense. Keep uncontaminated soil separate from contaminated soil. Based on characterization results, load and haul material to the selected landfill facility as directed by Ecology or Ecology's Representative.

9. Carefully load vehicles or containers to prevent site materials from coming in contact with exterior vehicle or container surfaces. The Contractor shall be solely responsible for proper loading and abiding by the load limits and weight limits, for all vehicles leaving the Site. All fines, taxes, penalties or judgments resulting from overweight or improperly loaded vehicles or containers shall be the Contractor's responsibility. Multiple handling of impacted soil shall be at the Contractor's expense. Soil stockpiles shall be placed on a low permeability surface (plastic sheeting or existing pavement), bermed and tarped or otherwise managed by the Contractor to prevent contaminated soil from being mobilized off the site by wind or in precipitation runoff. Berming and tarping of the stockpiles shall be considered as a subsidiary obligation of the Contractor. No separate measurement and payment shall be made for berming, tarping, or other management of the stockpile areas.

10. Prevent cross-contamination of clean areas and cross-contamination of backfill materials and release of contaminated material outside of the Exclusion Zone using methods approved by Ecology or Ecology's Representative. The Contractor shall excavate any cross-contaminated material at the Contractor's expense and as directed by Ecology's Representative.

11. Be responsible for coordination associated with off-site transportation and disposal. Transport and disposal of impacted material in accordance with applicable local, state and federal

regulations shall be the responsibility of the Contractor. The Contractor shall visually inspect and decontaminate the exterior of all vehicles or containers in compliance with all applicable regulations. The Contractor shall have the sole responsibility of coordinating the number of trucks, loading operations and hours of loading and hauling with the disposal facility. The Contractor shall coordinate transportation of impacted material with excavation work to maintain project schedule. Contractor's operations shall be coordinated to minimize standby time and truck-waiting time, and to maximize excavation and hauling production.

12. Deliver contaminated material to an approved disposal facility licensed in accordance with federal, state and/or local regulations, laws and zoning. The Contractor shall be responsible to pay for all fees for waste disposal. Excavated soil is expected to be able to be disposed at a Subtitle D landfill as contaminated but non-hazardous soil. Transportation and disposal as Washington state dangerous waste may be required if benzene concentrations exceed applicable limits.
13. Segregate and stockpile material identified by Ecology's Representative as non-contaminated on site for future use as trench backfill material. No excavated material removed from the trenches will be re-used as backfill without authorization from Ecology's Representative.
14. Submit all completed waste disposal records to Ecology or Ecology's Representative as part of the paperwork necessary for closeout and payment for work done under this contract.
15. Ensure loaded haul trucks follow the approved haul route to the disposal facility and return to the Site. The truck driver shall document the stops, other than traffic controls, in the vehicle logs prepared by the Contractor.
16. Promptly clean up any spills on haul routes, if they occur, with suitable equipment at the Contractor's expense. Keep all routes, public-rights of way and private property free of any Site materials due to the Contractor's operations. All Contractor haul trucks shall be covered per regulation. Decontaminate haul trucks or containers as necessary at an appropriate off-site facility. Costs for decontaminating haul trucks will be at the Contractor's expense.

9.3.2. Measurement and Payment

Trenching shall include the labor, equipment and materials to excavate trenches and stockpile soil including all fees, permits, and taxes. Trenching shall be measured and paid on a lump sum basis Berming and tarping of the stockpiles shall be considered as a subsidiary obligation of the Contractor. No separate measurement and payment shall be made for berming, tarping, or other management of the stockpile areas. Protection of and work around utilities is considered to be a part of this work. Additional costs associated with disposing of soil as contaminated or hazardous/dangerous waste will be paid on the basis of tonnage, as determined by load weight tickets from commercial scales in conjunction with waste manifests. Disposal of soil shall include the labor, equipment and materials to load, haul, and dispose of contaminated soil, including all fees, permits and taxes. The estimated quantity of soil requiring disposal is 50 tons. The estimated quantity of soil not requiring off-site disposal at a permitted facility is 50 tons. No additional payment will be made for multiple handling of contaminated material. Saw-cutting will be considered incidental to trench excavation.

9.4. Piping, Wellheads and Manifolds, and Backfill

The Contractor shall supply all materials, equipment and labor necessary to construct SVE/BV wellhead connections, conveyance piping, and manifold. After completing trenching, installation of piping and well connections the Contractor shall set well monuments at each of the eight SVE/BV wells and backfill trenches in accordance with the Plans and Specifications. The contractor shall:

1. Remove existing monuments at wells SVE-1, SVE-2, MP-1, and MP-2.
2. Construct a piping manifold to connect the remediation wells to the blowers. The manifold will be constructed using 4-inch-diameter Schedule 80 PVC. A minimum of 10 linear feet of aboveground pipe will extend from the blower to the manifold to allow for dissipation of heat from the pressurized air. A construction schematic of the blower manifold is shown in Sheet D1.0 of the Plans.
3. Install sample ports and gauges at the locations indicated on the plans.
4. Configure the SVE and bioventing manifold with valves/fittings so that treatment wells can be easily connected or disconnected to the treatment systems. Each well will be capable of being connected to both the SVE and bioventing blower at the system manifold.
5. Install airtight, locking well cap assemblies on each treatment well.
6. Connect the SVE and bioventing air lines to the treatment wells as shown on Sheet D1.0. The piping shall be connected to the wells approximately 3 feet below the ground surface using T-couplers.
7. Set the 12-inch diameter steel monuments for the remediation wells SVE-3 through SVE-6 in concrete after completing the wellhead connections. Contractor shall remove the existing steel monuments for SVE-1, SVE-2, MP-1, and MP-2 and install new 12-inch diameter well monuments after completing the wellhead connections.
8. Construct piping intersections within the trenches using sweeps with a minimum 2-foot radius as depicted on Sheet C1.0.
9. Connect the eight remediation wells (SVE-1 through SVE-6, MP-1, and MP-2) to the blower manifold with 4-inch-diameter Schedule 80 PVC piping. The PVC piping will be placed directly in the trenches (no conduit). The tee fitting for wells MP-1 and MP-2 at the wellhead will connect the 2-inch diameter well piping to the 4-inch diameter trench piping.
10. Construct the SVE system manifold with 4-inch diameter schedule 80 PVC piping. The BV system manifold shall consist of 2-inch schedule 80 PVC piping.
11. Construct all SVE and BV manifold system valves with schedule 80 PVC ball valves rated for 150 psi pressure.
12. Purchase and install all pressure/vacuum gauges, flow indicators, sample ports, and valves as indicated on Sheet C1.1 on the manifold. The Contractor shall install gauges and indicators appropriate for the specified air flow characteristics.
13. Test each PVC airline for tightness after placement in the trench (and before connecting to the well) by applying 10 psi air for 20 minutes. If leaks are detected, the leaks will be located and repaired by the Contractor to Ecology's satisfaction at no additional cost to Ecology.

14. Label remediation piping at the manifold with the corresponding well number.
15. Install all remediation and utility piping per applicable code.
16. Surround pipes with at least 6 inches of pipe bedding material meeting WSDOT standard specification 9-03.12 (3) "Gravel Backfill for Pipe Zone Bedding". Trenches shall be backfilled with either suitable on-site soil or imported structural fill. Imported structural fill shall consist of material meeting WSDOT standard specification 9-03.14(3) for "Common Borrow". Pipe zone bedding and trench backfill shall be compacted to at least 95 percent of maximum dry density based on the ASTM D1557 laboratory procedure.
17. Obtain certification from the borrow source that the imported backfill is not contaminated. If acceptable certification is not provided, proposed borrow sources may be sampled by Ecology's Representative and tested for potential contaminants at the Contractor's expense.
18. Finish trenches that are completed in paved areas will be surfaced with 4 inches of compacted ⅝-inch-minus crushed rock prior to pouring new concrete to match the existing pavement. The new concrete will have minimum 28-day strength of 4,000 psi.

9.4.1. Measurement and Payment

Installation of piping, manifolds, wellhead connections, monuments, and backfill will be paid on a lump sum basis and will includes the parts, labor, equipment, fees and taxes to install the remediation system piping, construct the manifolds and connect them to the remediation system, construct the wellhead connections and monuments, and place and compact backfill. No separate payment will be made for handling backfill from stockpiled trenching spoils or from stockpiles of imported fill materials. Backfill material import and stockpiling will be measured on a per ton basis of imported fill based on the weight tickets provided by the supplier. Concrete patching will be measured and paid based on the area (square-feet) paved and shall include costs for importing, stockpiling, placing and compacting base coarse.

Typical placement of the PVC remediation piping is shown in Sheet D1.0.

9.5. Treatment System Compound

The Contractor shall provide all the labor, equipment, and materials to construct a treatment compound to enclose the remediation system. The compound will be located on the south side of the Airport Kwik Stop building as depicted in Sheet C1.0. The Contractor shall:

1. Construct the compound to accommodate all of the blowers, knockout tank and overflow tank, control systems, piping manifold, vapor treatment systems, and carbon vessels. The compound shall be large enough and the equipment shall be spaced to provide adequate room for monitoring and maintenance activities. A minimum clearance distance of 2 feet shall be maintained between equipment staged in the compound.
2. Clear and remove any weeds and vegetation in the area of the treatment compound.
3. Stage the oxidizer and heat exchanger at a location at least 5 feet from the Kwik Stop building and storage shed to provide equipment access and reduce the potential fire danger caused by excessive heat discharges. The Contractor shall provide additional clearance as recommended by the equipment manufacturer or vendor.

4. Install a prefabricated and insulated storage shed to house the SVE and BV blowers, the knockout and overflow tanks, and the electrical control panel. The Contractor shall maintain a minimum clearance distance of 2 feet between each piece of equipment staged in the shed.
5. Construct or grade a ramp approved by Ecology's Representative at the shed entrance to allow overflow drums to be moved with a drum dolly out of the shed.
6. Place, grade, and compact a ⅝-inch-minus crushed rock pad in at least a 3-inch lift to provide a level pad to place the treatment equipment.
7. Enclosed the compound with a 6-foot tall chain link fence. The fence will include a lockable gate large enough to provide access for removing the oxidizer system and replacing spent carbon and will be fitted with black slats that fade to grey to provide a visual screen for the equipment enclosures.

9.5.1. Measurement and Payment

Construction of the remediation system compound will be paid on a lump sum basis and will include all labor, parts, equipment, fees and taxes.

9.6. Remediation Equipment

The Contractor shall supply all labor, materials and equipment to provide and install the required remediation equipment. Soil vapor concentrations are initially expected to be above cost effective range for treatment by granular activated carbon (GAC) and will require treatment by oxidation during an initial operation period. GAC polishing will be required and shall be placed in-line after the oxidation system. As mass is removed, the extracted soil vapor is expected to reach concentrations amenable to only GAC treatment within a few months. Ecology's Representative shall conduct regular vapor monitoring and shall inform the Contractor when the exchange can occur. The contractor shall be responsible for disconnecting and demobilizing the oxidizer system to treat extracted soil vapor solely using GAC. Details of the remediation operation are described below and shown graphically on Sheet C1.1.

9.6.1. SVE/BV Remediation System

1. The contractor shall purchase, deliver and install the SVE system and connect it directly to the SVE connections on the manifold. Major components of the SVE system shall include:
    a. SVE blower (300 SCFM @ 12-inches vacuum).
    b. SVE Knockout Tank, heat-taped to prevent freezing.
    c. Knockout Tank extraction pump and liquid receiver overflow drum, heat-taped to prevent freezing. The overflow drum will be plumbed to the extraction pump in a manner to be easily interchangeable with replacement drums as the overflow drum reaches capacity.
    d. Pressure/vacuum gauges, flow indicators, temperature gauges, switches, filters, valves for the specified air flow characteristics and other components as shown on Sheet C1.1.
2. The Contractor shall provide and install a temporary rental skid-mounted catalytic oxidizing treatment system designed to connect directly to the extraction manifold described above in **Section 9.4**.

3. The oxidizing treatment system shall include a catalytic oxidizer capable of treating vapor concentrations of gasoline-range hydrocarbons between 16,000 ppmv and 100 ppmv of gasoline-range hydrocarbons at 300 SCFM vapor flow. Dilution may be used to reduce influent concentrations to the system provided extraction flow from each of the eight extraction wells does not fall below 20 SCFM. The oxidizer shall have a destruction efficiency of at least 97 percent for vapor-phase volatile organic compounds.
4. The rental catalytic oxidizer shall be compatible with SVE equipment specified above. If the oxidizer unit contains a built-in blower, the Contractor shall install addition piping, valves, and fittings as needed to bypass the specified SVE blower. The cost of additional piping, valves, and fittings necessary to bypass the SVE blower will be at the Contractor's expense.
5. The Contractor shall consider power requirements of the oxidizing treatment system in the construction of the new electrical service described below in **Section 9.7**. The oxidizing system shall be compatible with the electrical and control systems installed to operate the SVE/BV system. Conditions resulting in the shutdowns of the rental oxidizer unit shall also cause a system wide shutdown to prevent untreated vapors from being freely released to the atmosphere.
6. The Contractor shall provide and install GAC polishing for the effluent stream from the oxidizer unit. GAC polishing will at least consist of two 2000-lb GAC units in series. A heat exchanger or other air chiller as approved by Ecology's Representative shall be installed between the oxidizer unit and the GAC units. The heat exchanger shall reduce the temperature of the oxidizer effluent to less than the maximum manufacturer recommended operating temperature of the GAC polishing units.
7. The Contractor shall install a bypass line directly from the SVE blower outlet to the GAC vessels and install quick disconnects to the oxidizer treatment line piping as depicted on Sheet C1.1.
8. Upon notice from Ecology or Ecology's Representative, the Contractor shall demobilize the oxidizer treatment skid and route the SVE effluent piping to the GAC vessels. The Contractor shall not remove the oxidizer without the approval of Ecology or Ecology's Representative. The Contractor shall demobilize the oxidizer unit within 7 days of notification from Ecology or Ecology's Representative. Oxidizer rental costs incurred, caused by the Contractor's failure to demobilize the oxidizer unit within the specified time, shall be at the Contractor's expense.
9. The Contractor shall subcontract a qualified electrician to disconnect power from the oxidizer and arrange and pay for transportation of the catalytic oxidizer from the site and discontinue rental. The Contractor shall install sample ports at the inlets and outlets of each GAC unit.
10. The contractor shall deliver and install the BV system and connect it directly to the connections on the manifold. Major components of the BV system shall include:
    a. BV blower (100 SCFM @ 12-inches pressure).
    b. Pressure, temperature, and level switches and system shutoff controls.
11. The Contractor shall connect SVE/BV system to electrical service and conduct startup and initial troubleshooting.

12. Achieving successful continuous unattended operation of SVE/BV system for one week will constitute substantial completion of Contract. Continued operation and maintenance of system, including conducting GAC replacement, shall be performed by Ecology.

9.6.2. Measurement and payment

Payment for the construction, mobilization, installation of remediation systems will be as follows:

1. Transportation, installation, three months initial rental period, and demobilization of the oxidation system will be paid for on a lump sum basis for the services provided.
2. Additional rental of oxidation system will be paid on a monthly unit basis for the Contractor's unit price bid.
3. Construction, installation, and testing of the SVE/BV remediation system, including: piping, valves, sample ports, gauges, exhaust stack, control systems, alarms, knockout tank, the overflow tank, pumps, filters, switches, and GAC vessels will be paid for on a lump sum basis for the services provided.

9.7. Electrical Power/Telemetry System

The Contractor shall be responsible for coordinating permitting, installation, inspection and final energizing of a new 3-phase electrical service to be installed at the location of the system compound. The new electrical service will be metered and setup as a separate utility account with Ecology being the account holder. The Contractor shall subcontract a qualified electrician to perform installation of electrical service and to connect remediation equipment to the new service. The electrical connections will be made in accordance with local code. The Contractor shall be responsible for coordinating an electrical inspection by the appropriate local agency prior to startup of the blower. All electrical equipment required to complete remediation construction and operation will be connected to the new 3-phase power supply, including the following major components:

- Remediation blowers,
- System control panel,
- Drum heaters,
- Knockout tank pump,
- Oxidizer and heat exchanger.

The subcontracted electrician shall also be responsible for wiring the control systems for the remediation system. The control panel shall include equipment on/off switches and an emergency shutoff. The electrician shall also install a 110-volt outlet near the control panel for use by Ecology's Representative during operation and maintenance visits. Additionally, the electrician shall connect a high level shut off switch from the knockout tank and overflow tank. A high vacuum shutoff switch and a high pressure shutoff switch shall be connected to the SVE and bioventing blowers, respectively. An additional system shutoff shall be connected to the catalytic oxidizer and heat exchanger such that if internal conditions cause them to shut down, then the other remediation system components also will shut down.

The Contractor (or subcontracted electrician) shall coordinate purchase and installation of a remote telemetry system, including telephone connections that will alert Ecology's Representative if the remediation systems' power is shut down.

9.7.1. Measurement and payment

Payment for the electrician's services will be paid for on a lump sum basis for the services provided.

10.0 SUBMITTALS

10.1. General

The Contractor shall be responsible for providing the required pre-work submittals and post-work submittals as outlined in this section. Health and Safety Plan and Work Plan submittals shall be considered incidental to mobilization/demobilization. Backfill material source identification submittals shall be considered incidental to backfilling.

10.2. Pre-Work Submittals

Before any work has begun on the Site, the Contractor shall submit the following documents listed in Table 1 to Ecology's Representative: Contractor's Health and Safety Plan (HASP) and Contractor's Work Plan. The Work Plan will include a Spill Prevention, Control and Countermeasure Plan (SPCC Plan) for responding to and managing spills and releases of fluids on the site. Compliance with specified work plan submittals is the Contractor's responsibility. Approval of submittals does not release the Contractor from proper installation, compliance with applicable codes and regulations or coordination of work. Ecology's Representative shall review submittals, mark to indicate action taken, and return promptly to the Contractor.

TABLE 1. CONTRACTOR PRE-WORK SUBMITTALS

Submittal	Delivery Schedule
Contractor HASP	10 days before commencing work
Work Plan, including Work Zone Plan	10 days before commencing work
Backfill Material Source Identification	10 days before material delivery

The Contractor shall submit the following Site work related documents during the entire course of the contract work:

1. Contractor Health and Safety Plan: Submit to Ecology's Representative the Contractor's proposed health and safety plan at least ten (10) calendar days before commencement of work. The plan shall include, at a minimum, the necessary components of the Contractor's HASP as outlined in **Section 10.3** of these specifications.
2. Work Plan: Submit to Ecology's Representative a work plan at least ten (10) calendar days before commencement of work. The Work Plan shall cover means and methods for the proposed work. Detailed work plan shall be Site specific. Incomplete plans will not be approved. All construction delay costs related to an incomplete work plan will be at the

Contractor's expense. The work plan shall include, at a minimum, the following information for excavation and contaminated materials handling:

a. Proof that all personnel have completed OSHA 40-hour hazardous waste operations training and have current 8-hour refresher training.

b. Proof that the Contractor's superintendent has completed 8-hour OSHA hazardous waste operations supervisor training.

c. Proof shall be submitted that all required permits and arrangements for transport and disposal of impacted materials at an approved site have been obtained, including proposed haul route, list of proposed waste haulers and vehicles, certifications of waste haulers, and copies of permits or approvals from regulatory agencies, state and local governments.

d. A SPCC Plan.

e. The sequence and schedule of the entire project.

f. Waste manifest forms or permits for transport and disposal impacted materials.

g. Revisions to Work Zone Plan as outlined in **Section 11.4** of these specifications, as necessary.

h. Submittal of the specifications for the proposed remediation equipment including: SVE and bioventing blowers, oxidizer, heat exchanger, and the GAC vessels.

3. Backfill Material Source Identification: Provide information regarding the source of proposed imported backfill materials. Provide documentation/certification that proposed backfill is not contaminated. Suitable documentation includes results of analytical testing of backfill material for U.S. EPA Priority Pollutants to demonstrate that the backfill is free from contamination. Chemical testing on fill shall be performed at a frequency of one sample per every 1,000 tons of backfill material. The sample of material shall be collected at the source of the backfill material and the chemical analysis shall be completed before any material is brought on Site. Alternatively, Ecology's Representative may complete chemical testing at the Contractor's expense. Alternatively, a non-impacted certification may be obtained from the source and provided to Ecology's Representative at least fourteen (14) calendar days before scheduled delivery to the Site. The Contractor also shall provide adequate samples of the proposed materials for laboratory tests (grain-size analysis and compaction) to Ecology's Representative at this time. Ecology's Representative will complete grain-size analysis in accordance with ASTM C 136 and compaction testing in accordance with ASTM D 1557.

10.3. Contractor's Health and Safety Plan

The work includes the requirements for personnel health and safety to ensure adequate worker protection. The Contractor shall, at a minimum, meet all requirements of WAC 296-155, Safety Standards for Construction. Contractor shall also comply with WAC 296-843, which governs hazardous waste operations in Washington State. Hazardous waste operations regulations (including a requirement for 40-hour or 80-hour OSHA hazardous waste training) will apply whenever exposure to hazardous materials is possible. Contractor shall provide the following health and safety documents to Ecology's Representative before the pre-construction conference at least ten (10) days before any equipment, supplies, or staff are mobilized to the Site. The plan

must be Site specific, addressing hazards at the Site. A generic plan or corporate-wide plan is not acceptable. Ecology's Representative may halt or delay operations if Contractor does not provide an acceptable plan before the scheduled start date. An acceptable plan is a plan that meets the local, state, and federal requirements in both the opinion of Ecology's Representative's safety staff, and applicable local state or federal authority. Ecology's Representative reserves the right to require future modifications to the plan to meet requirements of local, state and federal regulations.

The Contractor shall submit the Health and Safety Plan to Ecology's Representative. Ecology's Representative will review the Health and Safety Plan and if any modifications are requested, the Contractor shall submit copies of the modified Health and Safety Plan to Ecology's Representative before beginning Site work.

Contractor shall ensure subcontractors perform their work in accordance with the HASP and all local, state and federal regulations. Ecology's Representative reserves the right to exclude subcontractors, or subcontractor employees who perform work in an unsafe manner or who do not comply with the project health and safety plan. Contractor shall supervise work of subcontractors at all times. Subcontractors shall never perform work without Contractor supervision. Exceptions to this requirement will be considered on a case-by-case basis. At least one Contractor employee shall have current first aid and CPR training while Contractor is on Site.

10.3.1. Contractor's Responsibility for Health and Safety

1. Contractor shall comply with any and all state and local ordinances and regulations.
2. Contractor shall have a duty of responsibility for the health and safety of Contractor's employees, its subcontractors, suppliers, agents, inspectors, visitors, the general public, and any others associated with or interacting with Contractor to provide labor, goods, or other services on the Site.
3. Contractor shall be responsible for emergency response planning and notification, and for actual response to any and all emergencies that may occur during the course of the work.
4. Contractor will convene and lead a safety meeting for all personnel prior to the start of each work day. Topics will include a summary of that day's activities and safety protocol to address site safety issues. Safety meeting topics and attendees will be documented and provided to Ecology's Representative.
5. Contractor is responsible for communicating daily with Ecology's Representative regarding potential health and safety issues and to work with Ecology's Representative to identify and implement appropriate actions to perform project tasks that protect public safety and the safety of project personnel.
6. Contractor is responsible for understanding and acting in accordance with all requirements of this section and the HASP for the Project.
7. Contractor shall designate a dedicated Contractor's Site Safety and Health Officer (SSHO) on the Site during the work who shall, at a minimum, have at least 3 years of experience as a SSHO on projects similar to the Site, and have 40-hour OSHA Hazardous Waste Operations

training and 8-hour OSHA Supervisor training. Tenure of Contractor's SSHO shall be subject to approval by Ecology's Representative, such approval not to be unreasonably withheld.

8. The SSHO shall be present at the Site during all Contractor activities and working hours and shall enforce the requirements of safety for all Contractor personnel on Site at all times. The SSHO shall ensure that all Contractor and its sub-contractor personnel working at the Site, and Contractor visitors, follow the HASP, including wearing the designated level of personal protection equipment (PPE). If the SSHO elects to require a higher level of protection than that specified in the HASP, the extra costs associated with such higher level shall be borne by Contractor, unless such extra costs are approved in advance in writing by Ecology's Representative.
9. Prior to mobilization and continually through the duration of the work, the SSHO shall inspect the Site and document area-specific and worker-specific protection requirements.
10. After mobilization, the SSHO shall monitor activities and shall document the need for additional worker protection as required, based on activities performed and action levels specified in the HASP.
11. The SSHO shall verify that all activities are performed in accordance with the HASP and all federal, state, local, and health and safety standards, regulations, and guidelines.
12. In the event of a health and/or safety risk as determined by the SSHO or other Contractor personnel, or as determined by Ecology's Representative, Contractor shall not proceed with the work until a method for handling the risk has been determined in consultation with Ecology's Representative and implemented. Any health or safety risk resulting in a stoppage of work shall be reported immediately to Ecology's Representative.
13. Contractor shall be responsible for implementing a "Behavior Based Safety" process and provide Site training, observation, and feedback for Contractor personnel employed at the Site.

10.3.2. Contractor's Health and Safety Submittals

Contractor shall prepare and submit a HASP to Ecology's Representative. The Contractor shall follow all applicable local, state, and federal health and safety standards and guidelines implemented through, but not limited to, the DOSH, OSHA, NIOSH, ACGIH, and EPA. Where these are in conflict, the most stringent requirement shall be followed. The following points shall be addressed in the Contractor's HASP:

1. Names of key personnel with contact numbers and alternates responsible for health and safety, including a Contractor Health and Safety Representative and SSHO. Ecology's Representative must approve the SSHO.
2. A Safety Task Analysis Review (STAR) or Job Safety and Hazard Analysis (JSHA) associated with each portion of the Work (i.e., list potential chemical and physical hazards).
3. Employee and sub-contractor training assignments to assure compliance with 29 CFR 1910.120.
4. A requirement that Contractor locate underground utilities (if any) by using "Safe Dig" procedures prior to the start of the work.

5. PPE to be used for each of the Site tasks and operations being conducted, as required by the personal protective equipment program in 29 CFR 1910.120 and 29 CFR 1926.
6. Medical surveillance requirements in accordance with the program in 29 CFR 1910.120.
7. Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used by the Contractor, including methods of maintenance and calibration of monitoring and sampling equipment.
8. Corrective actions and up grading of personnel protection based on monitoring of air, personnel, and environmental sampling, with specific action levels identified.
9. The Site control measures in accordance with the control program required in 29 CFR 1910.120 and 29 CFR 1926.
10. Decontamination procedures in accordance with 29 CFR 1910.120.
11. An emergency response plan meeting federal, state, and local requirements for safe and effective responses to emergencies, including the necessary PPE and other equipment.
12. Explanation of potential emergencies and contingency plan of action, including description of the route to the nearest appropriate hospital, hospital route map, and posting of emergency telephone numbers at the Site.
13. A list of health and safety and emergency equipment available on the Site.
14. A description of engineering controls used to reduce the hazards of equipment operation and exposure to Site hazardous chemicals.
15. Lockout/Tag out where the operation of machinery and/or equipment in which the unexpected energizing on start up or the release of stored energy could cause injury to personnel.
16. Response to vehicular accidents and the possible release of transported materials.

10.3.3. Notifications

Contractor shall notify Ecology's Representative under the following circumstances:

1. Contractor shall immediately verbally report (within 30 minutes) to Ecology's Representative and Ecology the occurrence of any and all health and safety incidents. An Incident Report form or Near Miss Report form, as appropriate, shall be submitted within 48 hours of occurrence of the incident or issue.
2. Contractor shall immediately and fully investigate any such incident or near miss and conduct a root cause analysis, and shall provide to Ecology's Representative, the Contractor's written corrective action plan for such incident within 1 day after the incident occurs.
3. Contractor shall notify Ecology's Representative in writing at least 5 days prior to bringing any hazardous material, equipment, or process to the Site, or using the same on the Site. Contractor shall provide Ecology's Representative with a MSDS for all chemicals brought on to the Site.
4. Contractor shall immediately notify Ecology's Representative in writing of any hazard that Contractor discovers or observes on the Site and corrective measures planned or taken to eliminate or minimize such hazard. Hazard reporting will be completed as a Near Miss Report.

10.3.4. Training Requirements

Contractor shall provide the following training to each worker:

1. Initial 40-hour (or 80-hour where appropriate) OSHA Hazardous Waste Health and Safety training and current annual 8-hour refresher training.
2. Eight-hour OSHA Hazardous Waste Supervisory Training (required for the Contractor's Superintendent or SSHO).
3. Current respiratory fit testing certification.
4. Current CPR and first aid certification for at least one worker assigned to work on the Site.

10.3.5. Work Planning and Meetings

Contractor shall conduct a Daily Health and Safety Meeting prior to beginning work for that day, to address health and safety issues, changing Site conditions, activities and personnel. All Contractor and subcontractor employees working on the Site on that day shall attend the meeting. All meetings shall be documented and attendees shall sign acknowledgement of their presence at the meeting. Daily meetings will include a STAR evaluation of the work to be conducted and to document meeting attendance and discussion points.

Subcontractor personnel who are not in attendance for the Daily Health and Safety Meeting shall be briefed on the meeting notes upon arrival at the Site and prior to commencing their work activities. Employees shall sign acknowledgement of briefings prior to commencing work.

Contractor shall hold and document additional safety meetings at the start of each major task and whenever Site conditions affecting personnel safety change. Any major task undertaken will require the completion of a JSHA.

10.3.6. Engineering Controls

Contractor shall, at a minimum, provide the following engineering controls to reduce the hazards of equipment operation and exposure to Site hazardous materials:

1. Roll over cages for bulldozers, backhoes, loaders, and tractors.
2. Air-conditioned enclosed cabs with air filtering equipment.
3. Back-up alarms for all trucks and moving equipment.
4. Wetting of soil or other means to control dust during the work as described in these specifications, required by applicable regulations, and as indicated in the Contractor's work plans.
5. Decontamination of personnel and equipment in accordance with this Specification.
6. Others as determined to be necessary or prudent by Contractor or as directed by Ecology's Representative.

10.3.7. Monitoring

Contractor shall maintain an air monitoring program and an industrial hygiene program, including the use of proper equipment for air monitoring, calibration records, air monitoring results, and

training personnel to assist the SSHO in these duties. The Contractor should review their industrial hygiene program to insure that site-specific air monitoring procedures are adequate.

Contractor shall perform heat exposure and cold exposure monitoring activities as required by weather conditions.

10.3.8. Personal Protective Equipment (PPE)

The appropriate level of PPE shall be determined by the Contractor for specific tasks as described in the Contractor's HASP. If hazards are identified that require a level of protection greater than Level C, work shall be suspended and Ecology's Representative notified. The Contractor's SSHO, in consultation with Ecology's Representative, shall determine what actions are required prior to restarting work. Contractor shall determine and document the appropriateness of suggested minimum PPE requirements for Contractor's employees and others at the Site.

The following PPE requirements pertain to general site work.

- At a minimum, all personnel and visitors on the Site shall wear Level D PPE, except in Support Zone areas. Level D PPE consists of:
    - Hard hat;
    - Steel-toed boots;
    - Safety glasses with permanent side shields;
    - Work clothes (long pants, shirts with sleeves);
    - Orange reflective safety vests;
    - Work gloves (as required); and
    - Hearing protection (as required to prevent exposure to noise exceeding 85 dB).

Contractor shall furnish and maintain materials and equipment for the health and safety of Contractor employees, its subcontractors, suppliers, and visitor personnel. Contractor shall provide all required Health and Safety equipment, first aid equipment, tools, monitoring equipment, PPE and ancillary equipment and methods required to ensure workers health and safety and to comply with the HASP. Ecology's Representative will furnish PPE and monitoring for Ecology's Representative's employees.

- If additional protection consisting of Level C PPE is required during work, Level C PPE will include protection from organic compounds and consist of Level D protection with the following additions:
    - Air purifying respirator, half-face or full-face (depending on required protection factor) with organic vapor/High Efficiency Particulate Air Cartridges meeting NIOSH/Mine Safety and Health Administration Specifications;
    - Disposable poly-coated chemically protective coveralls;
    - Disposable chemically resistant outer gloves (nitrile);
    - Disposable chemically resistant inner gloves (nitrile); and
    - Chemically resistant, steel-toed, and steel-shanked boots (PVC, neoprene, or nitrile), or outer booties.

In most cases, Level C will be the maximum allowed level of PPE; however, Level B may be allowed provided that personnel are properly trained/certified and exposure levels are below IDLH conditions. The criteria that determine the required level of PPE are outlined in Ecology's Representative's HASP.

10.3.9. Other Health and Safety Equipment

The Contractor is required to have the following equipment available on the Site for the health and safety of subcontractors, sub-subcontractors, suppliers and visitors:

1. Air monitoring instruments, including (but not limited to):
    a. Dust particulate meter.
2. First aid kits.
    a. Fire suppression equipment (appropriate to location and type of flammable materials present).
    b. OSHA-approved emergency eyewash facilities.
    c. Personnel decontamination facilities and equipment.
    d. Other equipment or supplies as determined to be necessary or prudent by subcontractor or Ecology's Representative.
    e. Flammable liquids storage cabinet.
    f. Fall protection equipment, as necessary.

10.3.10. Evaluation of Performance

Contractor shall routinely conduct internal safety audits on the work to verify work is being performed in accordance with the Contractor's HASP. The focus of these routine audits will be on compliance with OSHA and local occupational safety regulations.

Contractor shall conduct routine behavioral observations and provide immediate feedback during work activities to promote safe behavior of Contractor employees and subcontractor employees.

10.4. Work Zone Plan

The Contractor shall prepare a project-specific Work Zone Plan. The plan shall locate an Exclusion Zone, a Decontamination Zone and a Support Zone, as applicable. The Exclusion Zone shall contain only the activities necessary for the completion of hazardous work. The plan shall document decontamination procedures containing, at a minimum, the following information:

1. Decontamination methods and equipment that will be used.
2. Procedures to prevent contamination of clean areas.
3. Methods and procedures to minimize worker contact with contaminants during removal of personal protective clothing and equipment.
4. Procedures for decontamination of vehicles leaving the Site.
5. Procedures for disposal of clothing and equipment that is not completely decontaminated.

6. Procedures for the collection, treatment, and disposal of all decontamination water, sludge and wastes.

A proposed Site layout plan is provided in the Plans (Sheet G1.1). Access to the Exclusion Zone during working hours shall be controlled by the Contractor through a designated access point.

The Contractor shall submit the Work Zone Plan as part of the submittals for the other work plans, as necessary.

10.5. Post-Work Submittals

The contractor shall submit the following documents during, and/or following the course of the work. These submittals will be part of the paperwork necessary for closeout and payment for work done under this contract.

Wastewater Disposal Manifest: Submit to Ecology's Representative two (2) written copies of the wastewater disposal manifest obtained from the receiving treatment facility within thirty (30) days after disposal at that facility.

Disposal Records: Submit to Ecology's Representative two (2) written copies of waste disposal records, including all manifests (or bills of lading) for any materials transported off site; weigh scale tickets for disposed materials and/or for imported material; and any permits that required signoff by appropriate agency officials within thirty (30) days after disposal.

Backfill Material Weight Tickets: Submit to Ecology's Representative (2) written copies of backfill material weigh scale tickets within thirty (30) days of material delivery.

TABLE 2. COST PROPOSAL FORM AIRPORT KWIK STOP IONE, WASHINGTON

Item	Task	Estimated Quantity[1]	Units	Unit Cost	Extended
BASE SCOPE OF WORK					
1	Mobilization/Demobilization	1	LS		
2	Temporary Facilities/TESC	1	LS		
3	Trenching	1	LS		
3a	Contaminated Soil Disposal (non-dangerous waste)	50	Tons		
4	Wellhead, Piping, Manifold Construction, and Trench Backfill	1	LS		
5	Import Pipe Bedding	32	Tons		
5a	Import Common Borrow	18	Tons		
6	Concrete/Patching	400	SF		
7	Treatment System Compound Construction	1	LS		
8	Remediation Equipment	-	-	-	-
8a	Extraction/Oxidizing System Delivery, Installation, 3-month operation	1	LS		
8b	SVE/BV system construction, delivery, installation and startup	1	LS		
9	Electrical service installation and system connection	1	LS		
CONTINGENCY ITEMS					
10	Extraction/Oxidizing System Continued Operation	3	Months		
11	Additional Disposal Charge for Dangerous Waste	30	Tons		
		Construction Cost Subtotal			
		Washington State Sales Tax at 8.6 Percent			
		Total (numbers)			
		Total (written)			
Contractor Name _____					
Contractor Authorized Signature _____					

Notes:

[1] Estimated quantities are not a guaranteed minimum.

LS = Lump Sum Ton = English Ton (2,000 lbs)

LF = Linear Feet SF = Square Feet

GAL = Gallon

FIGURES

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WASHINGTON STATE DEPARTMENT OF ECOLOGY

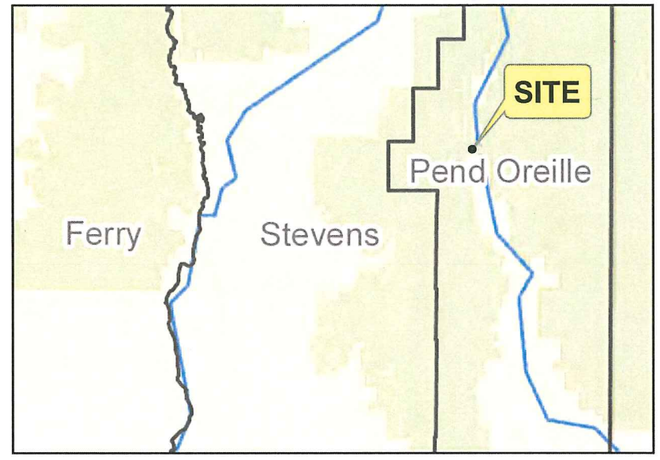
AIRPORT KWIK STOP SITE INTERIM CLEANUP ACTION

SECTION 7, TOWNSHIP 37N, RANGE 43E

VICINITY MAP
SCALE: 1"=2000'

GRAPHIC SCALE
2000 0 2000
FEET

No.	SHEET TITLE
G1.0	COVER SHEET
G1.1	PROJECT OVERVIEW
G1.2	PROJECT OVERVIEW PHOTOS
C1.0	REMEDIATION SYSTEM LAYOUT
C1.1	SVE/BV SYSTEM PIPING AND INSTRUMENTATION DIAGRAM
D1.0	SVE/BV SYSTEM DETAILS
D1.1	CONSTRUCTION DETAILS



LOCATION MAP
SCALE: N.T.S.

IONE WASHINGTON
(LAT. 48° 02' 38"N LONG. 122° 46' 01"W)

NOTES:

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE.
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT. GEOENGINEERS, INC. CANNOT GUARANTEE THE ACCURACY AND CONTENT OF ELECTRONIC FILES. THE MASTER FILE IS STORED BY GEOENGINEERS, INC. AND WILL SERVE AS THE OFFICIAL RECORD OF THIS COMMUNICATION.

REFERENCE:

Reference: ESRI Data & Maps, Street Maps 2008.

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7/18/12

CONTRACT DRAWINGS

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COVER SHEET

DRAWN:	TJM	PROJECT NO.:	50405802
DESIGN:	CLB	SCALE:	N.T.S.
CHECKED:	DRL	DATE:	7/18/12

SHEET NO.
G1.0

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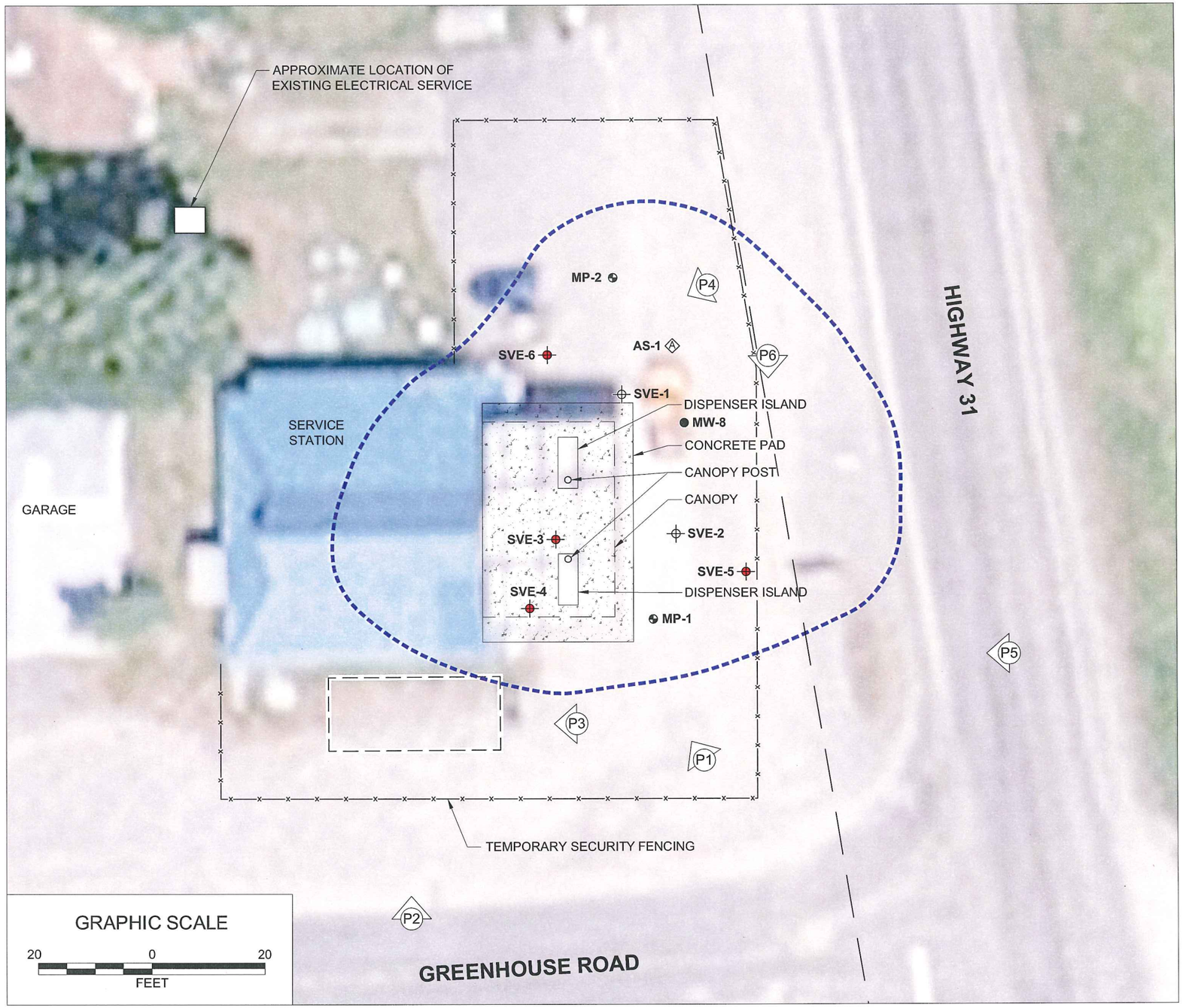

GRAPHIC SCALE

20 0 20

FEET

OVERVIEW PLAN

SCALE: 1"=20'

N

PROJECT SUMMARY

- INSTALL NECESSARY TEMPORARY CONTROLS AND FEATURES FOR HEALTH AND SAFETY, EROSION CONTROL, SITE SECURITY, AND TO MEET PERMIT REQUIREMENTS.
- INSTALL SOIL VAPOR EXTRACTION/BIOVENTING CONVEYANCE PIPING FROM EXISTING AND PROPOSED NEW WELLS TO THE REMEDIATION SYSTEM COMPOUND LOCATION AT SOUTH SIDE OF KWIK-STOP BUILDING. NEW WELLS TO BE INSTALLED BY OTHERS PRIOR TO CONTRACTOR MOBILIZATION.
- INSTALLATION OF CONVEYANCE PIPING WILL REQUIRE DISPOSAL OF CONTAMINATED SOIL REMOVED DURING TRENCHING. BASED ON BENZENE CONCENTRATIONS, SOIL MAY REQUIRE DISPOSAL AS DANGEROUS/HAZARDOUS WASTE IN ACCORDANCE WITH WASHINGTON STATE AND FEDERAL WASTE TRANSPORTATION AND DISPOSAL RULES.
- INSTALL NEW 3-PHASE ELECTRICAL SERVICE FOR PROPOSED TREATMENT SYSTEM.
- CONSTRUCT, TRANSPORT TO SITE, AND INSTALL SKID-MOUNTED COMBINED SVE/BV REMEDIATION SYSTEM DESIGNED TO PROVIDE A TOTAL SVE FLOW OF 300 SCFM AT 12 INCHES OF WATER AND A TOTAL BV INJECTION FLOW OF 100 SCFM AT 12 INCHES OF WATER.
- CONSTRUCT A MANIFOLD TO ALLOW EACH CONVEYANCE PIPE FROM THE SVE/BV WELLS TO BE CAPABLE OF BEING ISOLATED FOR EITHER SVE OR BV OPERATION.
- INSTALL TEMPORARY THERMAL OR CATALYTIC OXIDATION VAPOR TREATMENT SYSTEM TO TREAT VAPOR DURING INITIAL 3-MONTHS OF OPERATION DUE TO HIGH CONCENTRATIONS OF GASOLINE OBSERVED IN VAPOR DURING PILOT TESTING.
- INSTALL TWO VAPOR PHASE GRANULAR ACTIVATED CARBON TREATMENT VESSELS IN SERIES TO TREAT EXTRACTED VAPOR AFTER THE INITIAL OXIDATION SYSTEM AS A POLISHING UNIT. INSTALL A HEAT EXCHANGER BETWEEN THE OXIDIZER AND CARBON VESSELS.
- CONSTRUCT FENCED, LOCKABLE TREATMENT COMPOUND TO ENCLOSE ALL ABOVE-GROUND TREATMENT COMPONENTS.
- CLEAR ZONE DISTANCE IS 23 FEET FROM THE FOG LINE. CONTRACTOR SHALL KEEP ALL EQUIPMENT, VEHICLES AND FENCING OUT OF CLEAR ZONE.

LEGEND

MW-8	Approximate Location of Existing Monitoring Well
MP-1	Approximate Location of Existing 2" SVE/BV Well
AS-1	Approximate Location of Existing Air Sparge Pilot Well
SVE-1	Approximate Location of Existing 4" SVE/BV Well
SVE-3	Approximate Location of Proposed 4" SVE/BV Well (to be installed by others)
	Approximate Location of Proposed Temporary Remedial Treatment System
	Estimated Limits of Vadose Zone Petroleum Hydrocarbon Contamination
P3	Direction of Photograph / Photograph Number (See Sheet G1.2)
	Approximate Location of Temporary Security Fencing
	Clear Zone

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PROJECT OVERVIEW

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DESIGN:	CLB	SCALE:	1"=20'
CHECKED:	DRL	DATE:	7/18/12
SHEET NO.			G1.1

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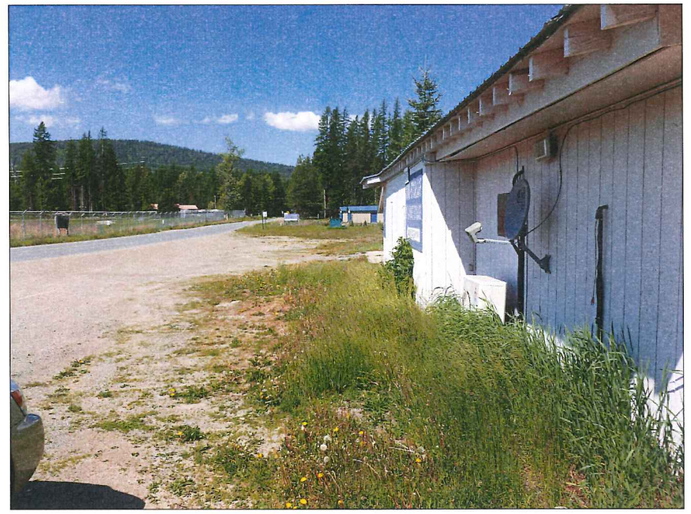
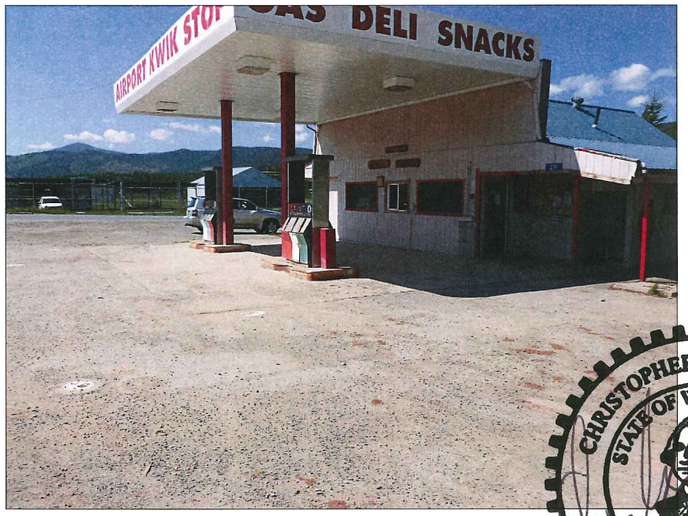
P-1 VIEW OF AIRPORT KWIK STOP FACILITY FROM THE SOUTHEAST.

P-2 VIEW OF AIRPORT KWIK STOP FACILITY FROM THE SOUTH.



P-3 VIEW OF SOUTH EXTERIOR WALL OF AIRPORT KWIK STOP FACILITY FROM THE EAST. PROPOSED LOCATION OF TREATMENT COMPOUND.



P-4 VIEW OF AIRPORT KWIK STOP FACILITY FROM THE NORTHEAST.

P-5 VIEW OF AIRPORT KWIK STOP FACILITY FROM THE EAST.

P-6 VIEW OF EAST PORTION OF AIRPORT KWIK STOP FACILITY FROM THE NORTH.

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PROJECT OVERVIEW PHOTOS

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DESIGN:	CLB	SCALE:	N.T.S.
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SHEET NO.			G1.2

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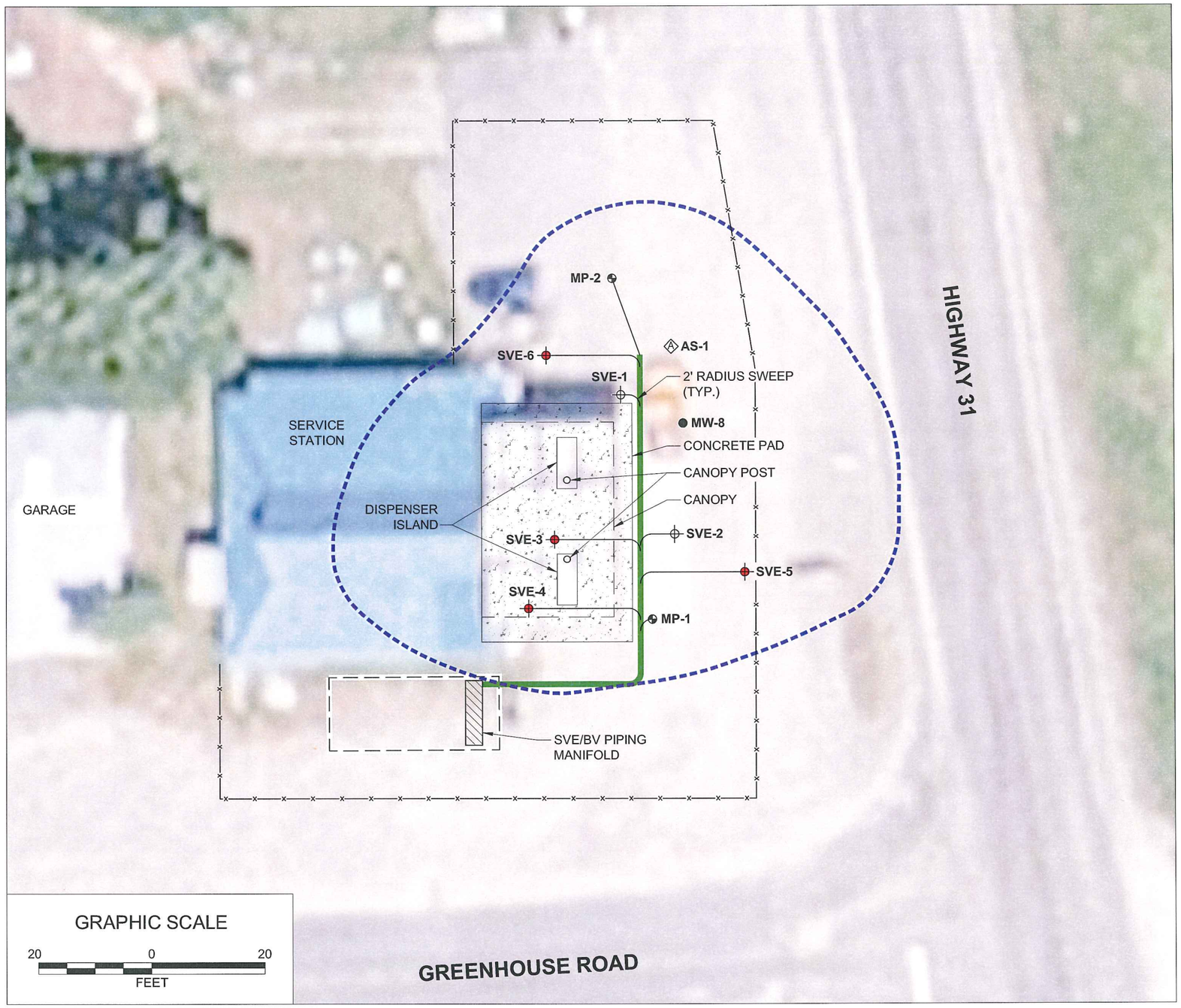

GRAPHIC SCALE

20 0 20

FEET

OVERVIEW PLAN

SCALE: 1"=20'

N

NOTES

1. TRENCHES WILL BE SLOPED DOWN (0.5 % HORIZONTAL TO VERTICAL) TOWARD THE WELLS TO DRAIN CONDENSATION AWAY FROM THE REMEDIATION EQUIPMENT.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING, MARKING, AND PROTECTING UNDERGROUND UTILITIES AND PRODUCT PIPING.
3. THE CONTRACTOR SHALL INSTALL TEMPORARY EROSION AND SEDIMENT CONTROLS AS NECESSARY AND AS DIRECTED BY ECOLOGY'S REPRESENTATIVE.
4. THE CONTRACTOR SHALL INSTALL AND MAINTAIN TRAFFIC CONTROL IN ACCORDANCE WITH APPLICABLE PERMITS OBTAINED BY ECOLOGY'S REPRESENTATIVE.
5. THE CONTRACTOR SHALL MAINTAIN AND PROTECT EXISTING MONITORING WELL AND PILOT TEST WELL MW-8 AND AS-1 FROM DAMAGE. DAMAGE TO MW-8 OR AS-1 WILL BE PAID FOR SOLELY AT THE CONTRACTOR'S EXPENSE AS DETERMINED BY ECOLOGY'S REPRESENTATIVE.

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LEGEND

MW-8 ●	Approximate Location of Existing Monitoring Well
MP-1 ⊕	Approximate Location of Existing 2" SVE/BV Well
AS-1 Ⓐ	Approximate Location of Existing Air Sparge Pilot Well
SVE-1 ⊕	Approximate Location of Existing 4" SVE/BV Well
SVE-3 ⊕	Approximate Location of Proposed 4" SVE/BV Well (to be installed by others)
	Approximate Location of Proposed Temporary Remedial Treatment System
	Estimated Limits of Vadose Zone Petroleum Hydrocarbon Contamination
	Single 4-inch Diameter PVC Pipe Trenched from Extraction Well
	Multiple Extraction Pipes Trenched to Treatment Compound
	Approximate Location of Temporary Security Fencing and Potential Erosion Control Silt Fence

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REMEDIATION SYSTEM LAYOUT

DRAWN: TJM	PROJECT NO.: 50405802
DESIGN: CLB	SCALE: 1"=20'
CHECKED: DRL	DATE: 7/18/12
SHEET NO.	C1.0

CONTRACT DRAWINGS

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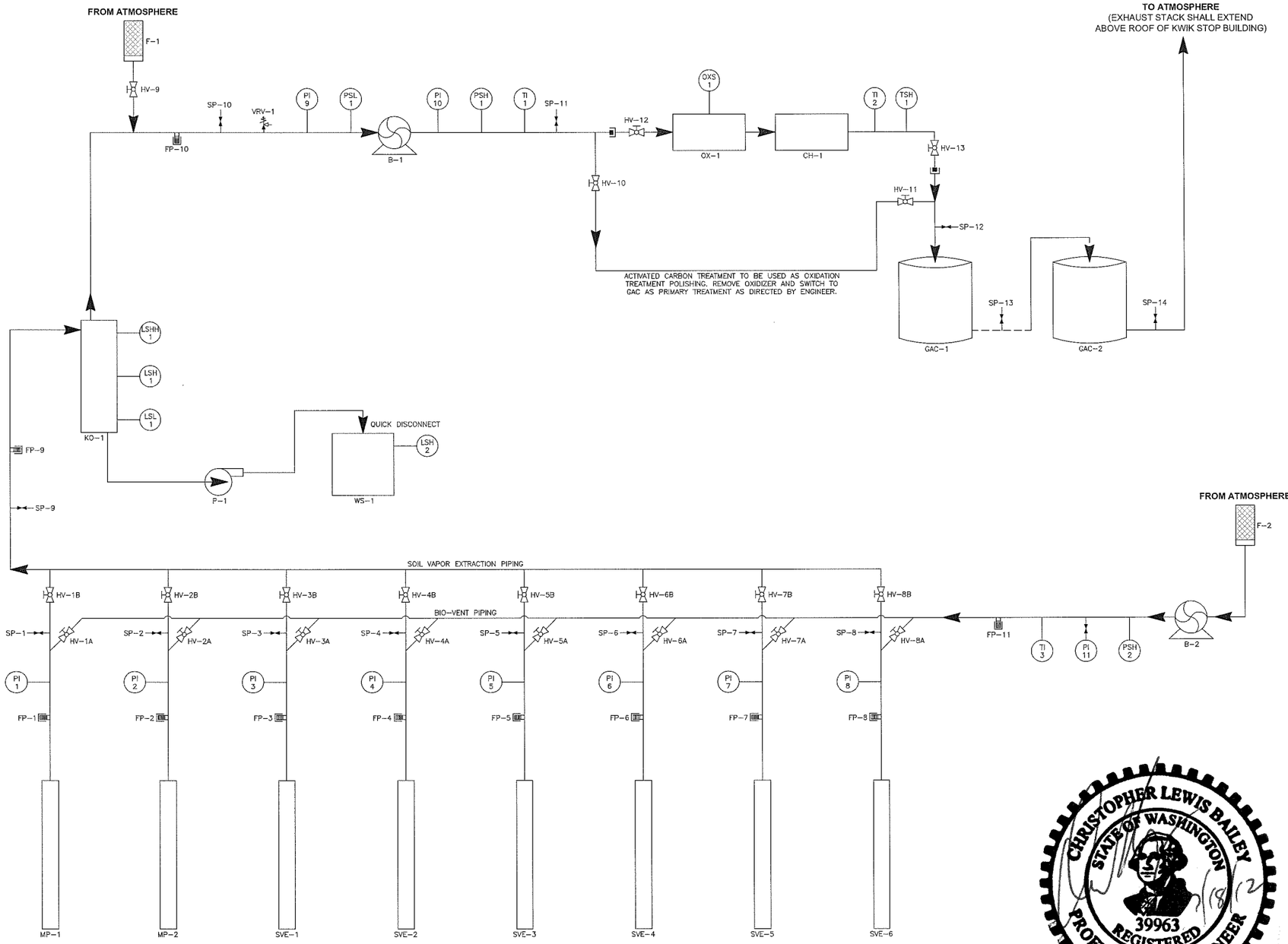

LEGEND

HV-XX	Ball Valve (Schedule 80 PVC)
VRV-XX	Vacuum Relief Valve
SP-XX	Sample Port
PI X	Pressure Indicator
TI X	Temperature Indicator
LSX XX	Level Switch
PSX XX	Pressure Switch
FP-XX	Flow Monitoring Point
	Quick Disconnect

CONTROLS

LSHH 1	Level Switch High-High Shuts Down System
LSH 1	Level Switch High Activates P-1
LSL 1	Level Switch Low Deactivates P-1
LSH 2	Level Switch High Shuts Down System
PSL 1	Pressure Switch Low Shuts Down System
PSH 1	Pressure Switch High Shuts Down System
PSH 2	Pressure Switch High Shuts Down System
TSH 1	Temperature Switch High Shuts Down System
OXS 1	Oxidation System Shut Down Shuts Down Extraction (System Dependent)

EQUIPMENT LIST

MP-1/2	2-inch Diameter SVE/BV Well
SVE-1 through SVE-6	4-inch Diameter SVE/BV Well
KO-1	SVE Knockout Drum
P-1	SVE Knockout Drum Pump, 5 gpm
WS-1	Knockout Drum Water Storage Tank, 55-gallon Drum
F-1/F-2	10 Micron Polyester Air Filter/Silencer
B-1	Regenerative Vacuum Extraction Blower (Min. 300 SCFM @ 12" H_20)
B-2	Regenerative Biovent Blower 100 SCFM @ 12" H_20
OX-1	Oxidizer Gas Treatment System, 300 SCFM
CH-1	Oxidizer Effluent Chiller
GAC-1/GAC-2	2,000 lb Vapor Phase GAC Vessel

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SVE/BV SYSTEM PIPING AND INSTRUMENTATION DIAGRAM

DRAWN:	TJM	PROJECT NO.:	50405802
DESIGN:	CLB	SCALE:	N.T.S.
CHECKED:	DRL	DATE:	7/18/12
SHEET NO.			C1.1

CONTRACT DRAWINGS

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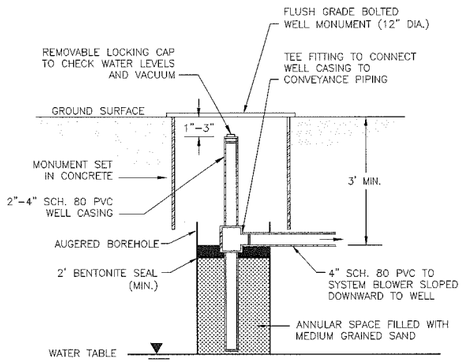
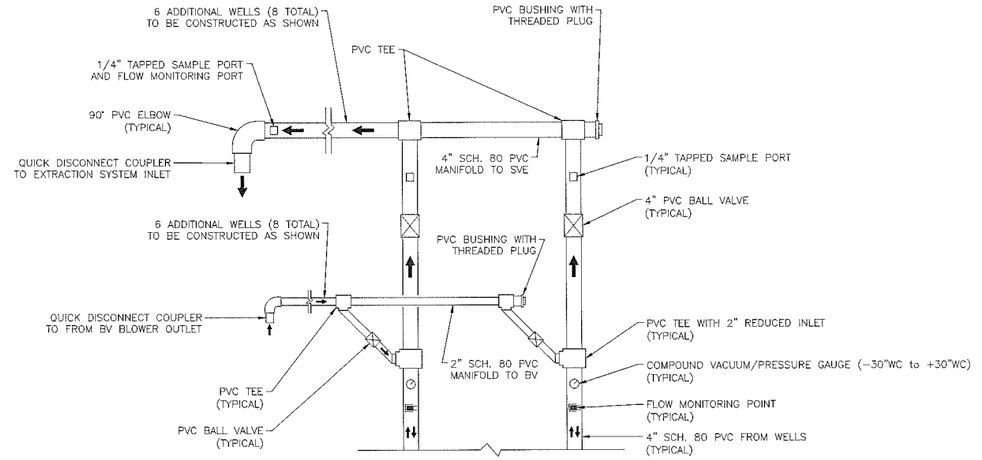


DETAIL 1: VAPOR EXTRACTION WELLS TYPICAL CROSS-SECTION

NOT TO SCALE

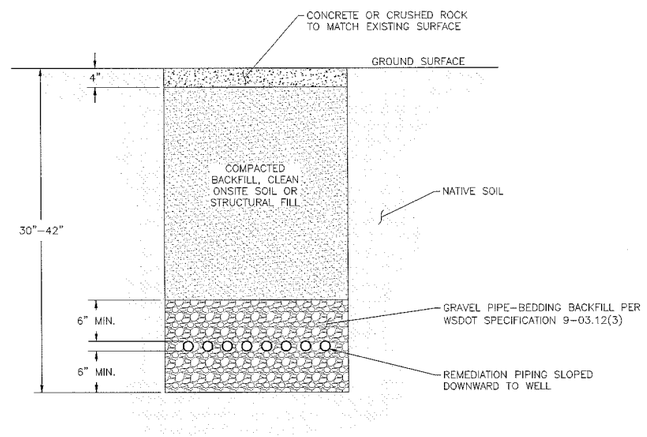
NOTE:
1. WELLS MP–1 AND MP–2 ARE CONSTRUCTED WITH 2–INCH DIAMETER PVC PIPING.



DETAIL 2: VAPOR EXTRACTION/BIOVENTING SYSTEM SCHEMATIC MANIFOLD DETAILS

NOT TO SCALE

NOTE:
1. ALL SVE/BV MANIFOLD COMPONENTS (PIPES, VALVES, AND FITTINGS) SHALL BE CONSTRUCTED USING 4–INCH DIAMTER (SVE) OR 2–INCH DIAMETER (BV) SCHEDULE 80 PVC.

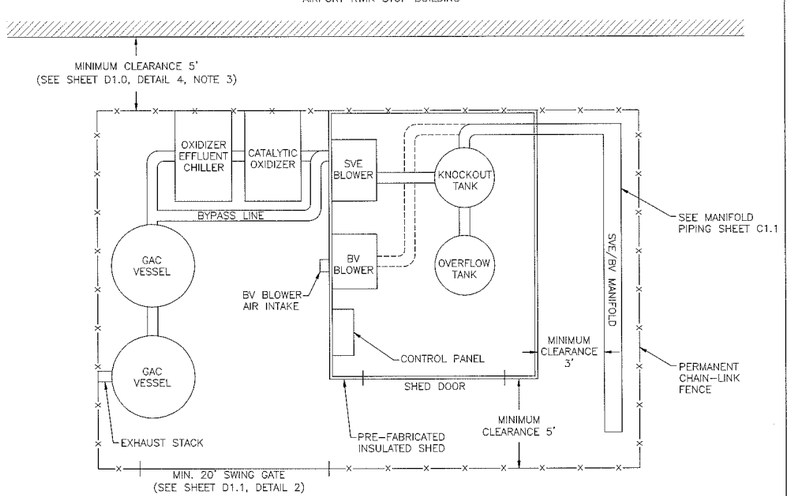


DETAIL 3: TRENCH CROSS-SECTION (TYPICAL)

NOT TO SCALE

NOTES

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE.
2. SVE/BV WELLS MP-1 AND MP-2 ARE EXISTING 2-INCH DIAMETER MONITORING POINTS THAT WILL REQUIRE REMOVING EXISTING WELL MONUMENT AND RETROFITTING TO COMPLETE CONSTRUCTION SHOWN ON DETAIL 1.
3. SVE/BV WELLS SVE-1 AND SVE-2 ARE EXISTING 4-INCH DIAMETER SVE WELLS THAT WILL REQUIRE REMOVING EXISTING MONUMENT AND RETROFITTING TO COMPLETE CONSTRUCTION SHOWN ON DETAIL 1.
4. SVE/BV WELLS SVE-3 THROUGH SVE-6 ARE PROPOSED WELLS TO BE COMPLETED BY OTHERS IMMEDIATELY PRIOR TO THIS PROJECT. WELLS WILL NOT BE COMPLETED WITH A MONUMENT TO ALLOW CONNECTION TO CONVEYANCE PIPING WITHOUT RETROFITTING. CONTRACTOR WILL BE REQUIRED TO SUPPLY AND INSTALL MONUMENTS FOR WELLS SVE-3 THROUGH SVE-6.
5. THIS FIGURE IS FOR INFORMATIONAL PURPOSES ONLY. IT IS INTENDED TO ASSIST IN THE IDENTIFICATION OF FEATURES DISCUSSED IN A RELATED DOCUMENT. DATA WERE COMPILED FROM SOURCES AS LISTED IN THIS FIGURE. THE DATA SOURCES DO NOT GUARANTEE THESE DATA ARE ACCURATE OR COMPLETE. THERE MAY HAVE BEEN UPDATES TO THE DATA SINCE THE PUBLICATION OF THIS FIGURE. THIS FIGURE IS A COPY OF A MASTER DOCUMENT. THE MASTER HARD COPY IS STORED BY GEOENGINEERS, INC. AND WILL SERVE AS THE OFFICIAL DOCUMENT OF RECORD.



DETAIL 4: TYPICAL TREATMENT COMPOUND LAYOUT

NOT TO SCALE

NOTES:
1. THE CONTRACTOR CAN SUBMIT ALTERNATE COMPOUND LAYOUTS. THE CONTRACTOR SHALL SUBMIT THEIR PROPOSED LAYOUT TO ECOLOGY'S REPRESENTATIVE BEFORE BEGINNING CONSTRUCTION.
2. THE CONTRACTOR SHALL LEAVE A MINIMUM 2 FEET OF CLEARANCE BETWEEN PIECES OF EQUIPMENT INSTALLED IN THE COMPOUND.
3. THE MINIMUM CLEARANCE BETWEEN THE OXIDIZER/CHILLER AND THE ADJACENT BUILDING WILL MEET MANUFACTURER RECOMMENDATIONS.

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SVE/BV SYSTEM DETAILS

DRAWN:	TJM	PROJECT NO.:	50405802
DESIGN:	CLB	SCALE:	N.T.S.
CHECKED:	DRL	DATE:	7/18/12

SHEET NO.

D1.0

CONTRACT DRAWINGS

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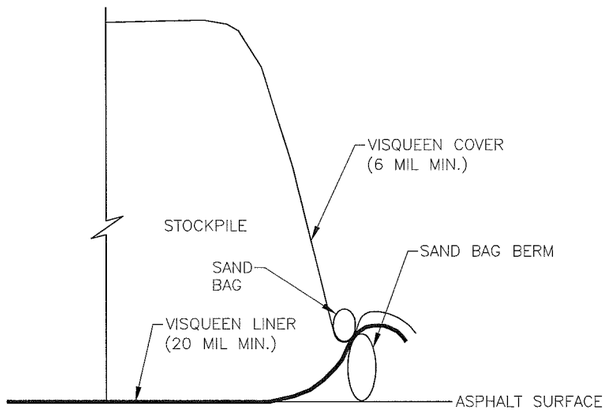
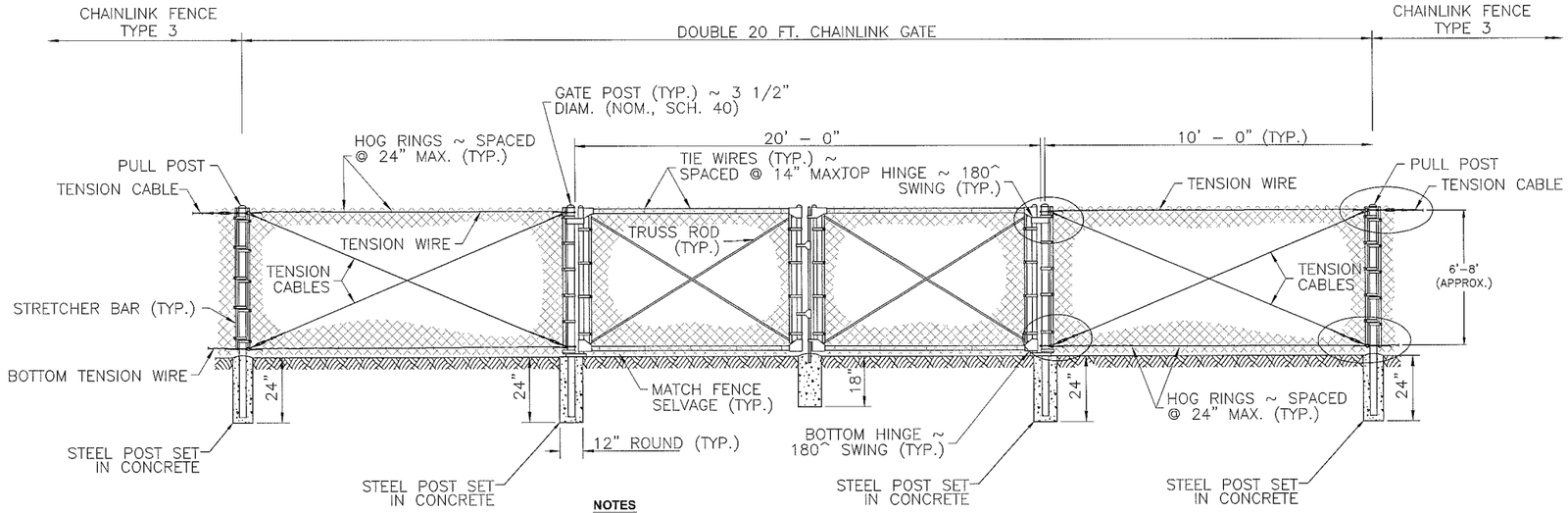


STOCKPILE DETAIL NOTE

1. IF CONTRACTOR OPERATIONS INCLUDE STOCKPILING OF CLEAN OR CONTAMINATED MATERIAL, THE MATERIAL SHALL BE PLACED ON A MINIMUM 20 MIL LINER AND COVERED WITH A MINIMUM 6 MIL COVER.

DETAIL 1: STOCKPILE

NOT TO SCALE

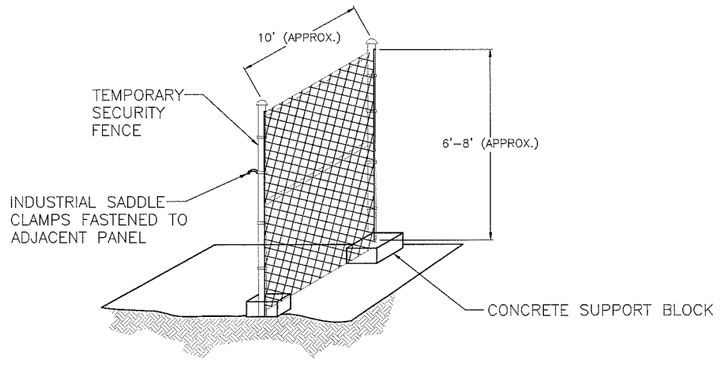


NOTES

1. REFER TO WSDOT STANDARD SPECIFICATION 8-12.3(1)E FOR CONSTRUCTION DETAILS.
2. NO PAINTING OR PROTECTIVE COATING WILL BE REQUIRED FOR FENCING INSTALLATION.

DETAIL 2: TREATMENT COMPOUND CHAINLINK FENCE AND DOUBLE SWING GATE

NOT TO SCALE



DETAIL 3: TEMPORARY SECURITY CHAIN LINK FENCE (DURING CONSTRUCTION ONLY)

NOT TO SCALE

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CONSTRUCTION DETAILS

DRAWN:	TJM	PROJECT NO.:	50405802
DESIGN:	CLB	SCALE:	N.T.S.
CHECKED:	DRL	DATE:	7/18/12
SHEET NO.			D1.1

CONTRACT DRAWINGS

APPENDICES

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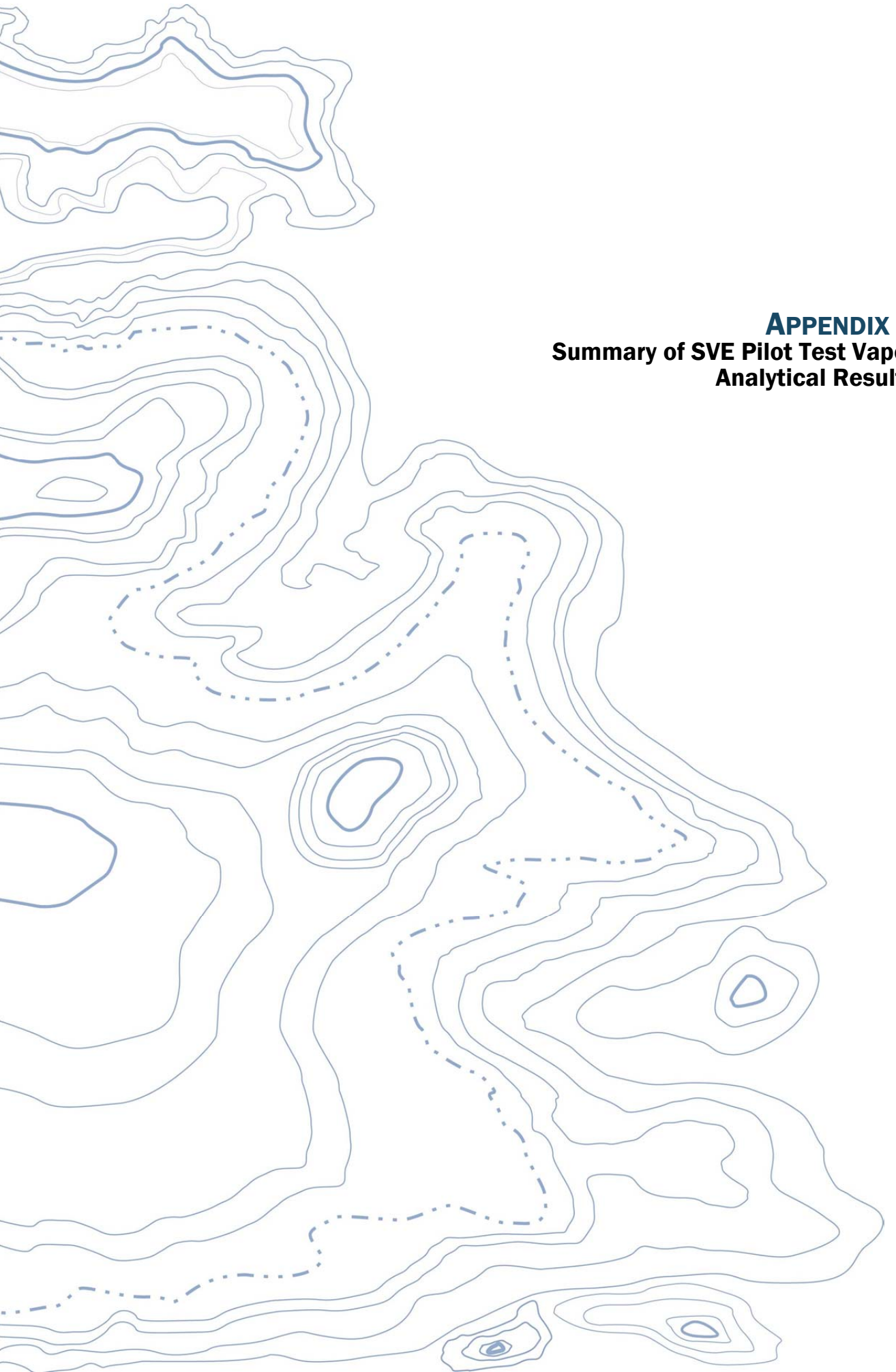

APPENDIX A
Summary of SVE Pilot Test Vapor Analytical Results

Table A-1

Vapor Sample Analytical Results

Airport Kwik Stop
Ione, Washington

		Sample ID	SVE-1-050812	SVE-2-050812
		Date Sampled	5/8/2012	5/8/2012
TO-15 (µg/m^3)	Benzene		5,870,000	5,150,000
	Cyclohexane		13,800,000	12,700,000
	Ethanol		82,000	<11,600
	Ethylbenzene		1,400,000	1,340,000
	4-Ethyltoluene		117,000	187,000
	n-Heptane		3,720,000	3,130,000
	n-Hexane		5,610,000	4,990,000
	Toluene		9,360,000	8,840,000
	1,2,4-Trimethylbenzene		199,000	356,000
	1,3,5-Trimethylbenzene		80,800	149,000
	m&p-Xylene		4,390,000	4,510,000
	o-Xylene		1,350,000	1,490,000
TO-3 Air (ppmv)	Benzene		870	677
	BTEX (Total)		3,960	3,470
	Ethylbenzene		107	102
	n-Hexane		730	641
	Methyl-tert-butyl ether		274	243
	THC as Gas		16,500	14,700
	Toluene		2,510	2,180
	1,2,4-Trimethylbenzene		<14.9	22.9
	1,3,5-Trimethylbenzene		<14.9	<14.9
	Xylene (Total)		473	516
	m&p-Xylene		370	396
	o-Xylene		103	121

https://projects.geoengineers.com/sites/0050405802/Final/SVE Specifications and Work Plan/[Table A-1 Ione Vapor Chemistry.xlsx]Chemistry

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May 25, 2012

Dave Lauder
GeoEngineers
523 E 2nd Ave
Spokane, WA 99202

RE: Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Dear Dave Lauder:
Enclosed are the analytical results for sample(s) received by the laboratory on May 14, 2012. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Carolynne Trout

Carolynne Trout for
Carol Davy
carol.davy@pacelabs.com
Project Manager

Enclosures

cc: Scott Lathen, GeoEngineeers

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CERTIFICATIONS

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Minnesota Certification IDs
1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
EPA Region 8 Certification #: Pace
Florida/NELAP Certification #: E87605
Georgia Certification #: 959
Idaho Certification #: MN00064
Illinois Certification #: 200011
Iowa Certification #: 368
Kansas Certification #: E-10167
Louisiana Certification #: 03086
Louisiana Certification #: LA080009
Maine Certification #: 2007029
Maryland Certification #: 322
Michigan DEQ Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT CERT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New Mexico Certification #: Pace
New York Certification #: 11647
North Carolina Certification #: 530
North Dakota Certification #: R-036
North Dakota Certification #: R-036A
Ohio VAP Certification #: CL101
Oklahoma Certification #: D9921
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Tennessee Certification #: 02818
Texas Certification #: T104704192
Washington Certification #: C754
Wisconsin Certification #: 999407970

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SAMPLE SUMMARY

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10192130001	**SVE-1-050812**	Air	05/08/12 11:45	05/14/12 09:33
10192130002	**SVE-2-050812**	Air	05/08/12 15:44	05/14/12 09:33

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SAMPLE ANALYTE COUNT

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Lab ID	Sample ID	Method	Analysts	Analytes Reported
10192130001	**SVE-1-050812**	TO-15	DR1	61
		TO-3 Air	RTP	12
10192130002	**SVE-2-050812**	TO-15	DR1	61
		TO-3 Air	RTP	12

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PROJECT NARRATIVE

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Method: **TO-15**
Description: TO15 MSV AIR
Client: GeoEngineeers
Date: May 25, 2012

General Information:
2 samples were analyzed for TO-15. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

QC Batch: AIR/14964

SS: This analyte did not meet the secondary source verification criteria for the initial calibration. The reported result should be considered an estimated value.

- LCS (Lab ID: 1204106)
  - 4-Ethyltoluene
  - 4-Methyl-2-pentanone (MIBK)
  - Acetone
  - Ethanol
  - Naphthalene
- SVE-1-050812 (Lab ID: 10192130001)
  - 4-Ethyltoluene
  - Ethanol
- SVE-2-050812 (Lab ID: 10192130002)
  - 4-Ethyltoluene

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

QC Batch: AIR/14964

CH: The continuing calibration for this compound is outside of Pace Analytical acceptance limits. The results may be biased high.

- LCS (Lab ID: 1204106)
  - Hexachloro-1,3-butadiene
  - Naphthalene

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

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PROJECT NARRATIVE

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Method: **TO-15**
Description: TO15 MSV AIR
Client: GeoEngineeers
Date: May 25, 2012

QC Batch: AIR/14964

L3: Analyte recovery in the laboratory control sample (LCS) exceeded QC limits. Analyte presence below reporting limits in associated samples. Results unaffected by high bias.

- LCS (Lab ID: 1204106)
  - Hexachloro-1,3-butadiene

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

Sample Comments:

A3: This result is reported from a serial dilution

- SVE-1-050812 (Lab ID: 10192130001)
- SVE-2-050812 (Lab ID: 10192130002)

Analyte Comments:

QC Batch: AIR/14964

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- DUP (Lab ID: 1204995)
  - Tetrachloroethene
- SVE-1-050812 (Lab ID: 10192130001)
  - Benzene
  - Cyclohexane
  - n-Hexane
  - Toluene
- SVE-2-050812 (Lab ID: 10192130002)
  - Benzene
  - Cyclohexane
  - n-Hexane
  - Toluene

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PROJECT NARRATIVE

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Method: **TO-3 Air**
Description: TO3 GCV AIR BTEX CAN
Client: GeoEngineeers
Date: May 25, 2012

General Information:
2 samples were analyzed for TO-3 Air. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

Sample Comments:

A3: This result is reported from a serial dilution
- SVE-1-050812 (Lab ID: 10192130001)
- SVE-2-050812 (Lab ID: 10192130002)

Analyte Comments:

QC Batch: AIR/14952

E: Analyte concentration exceeded the calibration range. The reported result is estimated.
- SVE-1-050812 (Lab ID: 10192130001)
  - THC as Gas
  - Toluene

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PROJECT NARRATIVE

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Method: **TO-3 Air**
Description: TO3 GCV AIR BTEX CAN
Client: GeoEngineeers
Date: May 25, 2012

Analyte Comments:

QC Batch: AIR/14952

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- SVE-2-050812 (Lab ID: 10192130002)
  - Toluene

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Sample: SVE-1-050812 **Lab ID: 10192130001** Collected: 05/08/12 11:45 Received: 05/14/12 09:33 Matrix: Air

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15								
Acetone	ND	ug/m3	14600	7320	30515.		05/25/12 01:24	67-64-1	
Benzene	**5870000**	ug/m3	9920	4880	30515.		05/25/12 01:24	71-43-2	E
Benzyl chloride	ND	ug/m3	32000	16000	30515.		05/25/12 01:24	100-44-7	
Bromodichloromethane	ND	ug/m3	41500	5400	30515.		05/25/12 01:24	75-27-4	
Bromoform	ND	ug/m3	64100	32000	30515.		05/25/12 01:24	75-25-2	
Bromomethane	ND	ug/m3	24100	5520	30515.		05/25/12 01:24	74-83-9	
1,3-Butadiene	ND	ug/m3	13700	6870	30515.		05/25/12 01:24	106-99-0	
2-Butanone (MEK)	ND	ug/m3	18300	4760	30515.		05/25/12 01:24	78-93-3	
Carbon disulfide	ND	ug/m3	19200	9670	30515.		05/25/12 01:24	75-15-0	
Carbon tetrachloride	ND	ug/m3	19500	9760	30515.		05/25/12 01:24	56-23-5	
Chlorobenzene	ND	ug/m3	28700	14300	30515.		05/25/12 01:24	108-90-7	
Chloroethane	ND	ug/m3	16500	8240	30515.		05/25/12 01:24	75-00-3	
Chloroform	ND	ug/m3	30200	15200	30515.		05/25/12 01:24	67-66-3	
Chloromethane	ND	ug/m3	12800	6410	30515.		05/25/12 01:24	74-87-3	
Cyclohexane	**13800000**	ug/m3	20800	11000	30515.		05/25/12 01:24	110-82-7	E
Dibromochloromethane	ND	ug/m3	52800	26400	30515.		05/25/12 01:24	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	47600	23800	30515.		05/25/12 01:24	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	37200	18600	30515.		05/25/12 01:24	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	37200	18600	30515.		05/25/12 01:24	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	37200	18600	30515.		05/25/12 01:24	106-46-7	
Dichlorodifluoromethane	ND	ug/m3	30800	15400	30515.		05/25/12 01:24	75-71-8	
1,1-Dichloroethane	ND	ug/m3	25000	12500	30515.		05/25/12 01:24	75-34-3	
1,2-Dichloroethane	ND	ug/m3	12500	6410	30515.		05/25/12 01:24	107-06-2	
1,1-Dichloroethene	ND	ug/m3	24700	12300	30515.		05/25/12 01:24	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	24700	4670	30515.		05/25/12 01:24	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	24700	12400	30515.		05/25/12 01:24	156-60-5	
1,2-Dichloropropane	ND	ug/m3	28700	14300	30515.		05/25/12 01:24	78-87-5	
cis-1,3-Dichloropropene	ND	ug/m3	28100	3390	30515.		05/25/12 01:24	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	28100	14000	30515.		05/25/12 01:24	10061-02-6	
Dichlorotetrafluoroethane	ND	ug/m3	43300	6500	30515.		05/25/12 01:24	76-14-2	
Ethanol	**82000**	ug/m3	11600	5860	30515.		05/25/12 01:24	64-17-5	SS
Ethyl acetate	ND	ug/m3	22300	11000	30515.		05/25/12 01:24	141-78-6	
Ethylbenzene	**1400000**	ug/m3	26900	3630	30515.		05/25/12 01:24	100-41-4	
4-Ethyltoluene	**117000**	ug/m3	30500	15300	30515.		05/25/12 01:24	622-96-8	SS
n-Heptane	**3720000**	ug/m3	25300	12700	30515.		05/25/12 01:24	142-82-5	
Hexachloro-1,3-butadiene	ND	ug/m3	67100	33600	30515.		05/25/12 01:24	87-68-3	
n-Hexane	**5610000**	ug/m3	22000	11000	30515.		05/25/12 01:24	110-54-3	E
2-Hexanone	ND	ug/m3	25300	12700	30515.		05/25/12 01:24	591-78-6	
Methylene Chloride	ND	ug/m3	21700	10800	30515.		05/25/12 01:24	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	25300	12700	30515.		05/25/12 01:24	108-10-1	
Methyl-tert-butyl ether	ND	ug/m3	22300	2690	30515.		05/25/12 01:24	1634-04-4	
Naphthalene	ND	ug/m3	32700	16300	30515.		05/25/12 01:24	91-20-3	
2-Propanol	ND	ug/m3	76300	14100	30515.		05/25/12 01:24	67-63-0	
Propylene	ND	ug/m3	10700	5340	30515.		05/25/12 01:24	115-07-1	
Styrene	ND	ug/m3	26500	13200	30515.		05/25/12 01:24	100-42-5	
1,1,2,2-Tetrachloroethane	ND	ug/m3	21300	5740	30515.		05/25/12 01:24	79-34-5	

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ANALYTICAL RESULTS

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Sample: SVE-1-050812 **Lab ID: 10192130001** Collected: 05/08/12 11:45 Received: 05/14/12 09:33 Matrix: Air

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15								
Tetrachloroethene	ND	ug/m3	21000	10400	30515.		05/25/12 01:24	127-18-4	
Tetrahydrofuran	ND	ug/m3	18300	9150	30515.		05/25/12 01:24	109-99-9	
Toluene	**9360000**	ug/m3	23500	11700	30515.		05/25/12 01:24	108-88-3	E
1,2,4-Trichlorobenzene	ND	ug/m3	30200	15100	30515.		05/25/12 01:24	120-82-1	
1,1,1-Trichloroethane	ND	ug/m3	33900	16800	30515.		05/25/12 01:24	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	16800	8540	30515.		05/25/12 01:24	79-00-5	
Trichloroethene	ND	ug/m3	16800	8540	30515.		05/25/12 01:24	79-01-6	
Trichlorofluoromethane	ND	ug/m3	34800	6770	30515.		05/25/12 01:24	75-69-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	48800	24400	30515.		05/25/12 01:24	76-13-1	
1,2,4-Trimethylbenzene	**199000**	ug/m3	30500	15300	30515.		05/25/12 01:24	95-63-6	
1,3,5-Trimethylbenzene	**80800**	ug/m3	30500	3970	30515.		05/25/12 01:24	108-67-8	
Vinyl acetate	ND	ug/m3	21700	10800	30515.		05/25/12 01:24	108-05-4	
Vinyl chloride	ND	ug/m3	7930	3970	30515.		05/25/12 01:24	75-01-4	
m&p-Xylene	**4390000**	ug/m3	53700	26900	30515.		05/25/12 01:24	179601-23-1	
o-Xylene	**1350000**	ug/m3	26900	3910	30515.		05/25/12 01:24	95-47-6	
TO3 GCV AIR BTEX CAN	Analytical Method: TO-3 Air								
Benzene	**870**	ppmv	14.9	2.8	149		05/23/12 09:27	71-43-2	
BTEX (Total)	**3960**	ppmv	89.4	41.7	149		05/23/12 09:27		
Ethylbenzene	**107**	ppmv	14.9	2.2	149		05/23/12 09:27	100-41-4	
n-Hexane	**730**	ppmv	14.9	2.8	149		05/23/12 09:27	110-54-3	
Methyl-tert-butyl ether	**274**	ppmv	14.9	3.1	149		05/23/12 09:27	1634-04-4	
THC as Gas	**16500**	ppmv	149	34.3	149		05/23/12 09:27		E
Toluene	**2510**	ppmv	14.9	2.7	149		05/23/12 09:27	108-88-3	E
1,2,4-Trimethylbenzene	ND	ppmv	14.9	4.2	149		05/23/12 09:27	95-63-6	
1,3,5-Trimethylbenzene	ND	ppmv	14.9	4.0	149		05/23/12 09:27	108-67-8	
Xylene (Total)	**473**	ppmv	44.7	7.6	149		05/23/12 09:27	1330-20-7	
m&p-Xylene	**370**	ppmv	29.8	5.1	149		05/23/12 09:27	179601-23-1	
o-Xylene	**103**	ppmv	14.9	2.5	149		05/23/12 09:27	95-47-6	

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ANALYTICAL RESULTS

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Sample: SVE-2-050812 **Lab ID: 10192130002** Collected: 05/08/12 15:44 Received: 05/14/12 09:33 Matrix: Air

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15								
Acetone	ND	ug/m3	14600	7320	30515.		05/25/12 01:53	67-64-1	
Benzene	**5150000**	ug/m3	9920	4880	30515.		05/25/12 01:53	71-43-2	E
Benzyl chloride	ND	ug/m3	32000	16000	30515.		05/25/12 01:53	100-44-7	
Bromodichloromethane	ND	ug/m3	41500	5400	30515.		05/25/12 01:53	75-27-4	
Bromoform	ND	ug/m3	64100	32000	30515.		05/25/12 01:53	75-25-2	
Bromomethane	ND	ug/m3	24100	5520	30515.		05/25/12 01:53	74-83-9	
1,3-Butadiene	ND	ug/m3	13700	6870	30515.		05/25/12 01:53	106-99-0	
2-Butanone (MEK)	ND	ug/m3	18300	4760	30515.		05/25/12 01:53	78-93-3	
Carbon disulfide	ND	ug/m3	19200	9670	30515.		05/25/12 01:53	75-15-0	
Carbon tetrachloride	ND	ug/m3	19500	9760	30515.		05/25/12 01:53	56-23-5	
Chlorobenzene	ND	ug/m3	28700	14300	30515.		05/25/12 01:53	108-90-7	
Chloroethane	ND	ug/m3	16500	8240	30515.		05/25/12 01:53	75-00-3	
Chloroform	ND	ug/m3	30200	15200	30515.		05/25/12 01:53	67-66-3	
Chloromethane	ND	ug/m3	12800	6410	30515.		05/25/12 01:53	74-87-3	
Cyclohexane	**12700000**	ug/m3	20800	11000	30515.		05/25/12 01:53	110-82-7	E
Dibromochloromethane	ND	ug/m3	52800	26400	30515.		05/25/12 01:53	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	47600	23800	30515.		05/25/12 01:53	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	37200	18600	30515.		05/25/12 01:53	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	37200	18600	30515.		05/25/12 01:53	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	37200	18600	30515.		05/25/12 01:53	106-46-7	
Dichlorodifluoromethane	ND	ug/m3	30800	15400	30515.		05/25/12 01:53	75-71-8	
1,1-Dichloroethane	ND	ug/m3	25000	12500	30515.		05/25/12 01:53	75-34-3	
1,2-Dichloroethane	ND	ug/m3	12500	6410	30515.		05/25/12 01:53	107-06-2	
1,1-Dichloroethene	ND	ug/m3	24700	12300	30515.		05/25/12 01:53	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	24700	4670	30515.		05/25/12 01:53	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	24700	12400	30515.		05/25/12 01:53	156-60-5	
1,2-Dichloropropane	ND	ug/m3	28700	14300	30515.		05/25/12 01:53	78-87-5	
cis-1,3-Dichloropropene	ND	ug/m3	28100	3390	30515.		05/25/12 01:53	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	28100	14000	30515.		05/25/12 01:53	10061-02-6	
Dichlorotetrafluoroethane	ND	ug/m3	43300	6500	30515.		05/25/12 01:53	76-14-2	
Ethanol	ND	ug/m3	11600	5860	30515.		05/25/12 01:53	64-17-5	
Ethyl acetate	ND	ug/m3	22300	11000	30515.		05/25/12 01:53	141-78-6	
Ethylbenzene	**1340000**	ug/m3	26900	3630	30515.		05/25/12 01:53	100-41-4	
4-Ethyltoluene	**187000**	ug/m3	30500	15300	30515.		05/25/12 01:53	622-96-8	SS
n-Heptane	**3130000**	ug/m3	25300	12700	30515.		05/25/12 01:53	142-82-5	
Hexachloro-1,3-butadiene	ND	ug/m3	67100	33600	30515.		05/25/12 01:53	87-68-3	
n-Hexane	**4990000**	ug/m3	22000	11000	30515.		05/25/12 01:53	110-54-3	E
2-Hexanone	ND	ug/m3	25300	12700	30515.		05/25/12 01:53	591-78-6	
Methylene Chloride	ND	ug/m3	21700	10800	30515.		05/25/12 01:53	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	25300	12700	30515.		05/25/12 01:53	108-10-1	
Methyl-tert-butyl ether	ND	ug/m3	22300	2690	30515.		05/25/12 01:53	1634-04-4	
Naphthalene	ND	ug/m3	32700	16300	30515.		05/25/12 01:53	91-20-3	
2-Propanol	ND	ug/m3	76300	14100	30515.		05/25/12 01:53	67-63-0	
Propylene	ND	ug/m3	10700	5340	30515.		05/25/12 01:53	115-07-1	
Styrene	ND	ug/m3	26500	13200	30515.		05/25/12 01:53	100-42-5	
1,1,2,2-Tetrachloroethane	ND	ug/m3	21300	5740	30515.		05/25/12 01:53	79-34-5	

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ANALYTICAL RESULTS

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Sample: SVE-2-050812 **Lab ID: 10192130002** Collected: 05/08/12 15:44 Received: 05/14/12 09:33 Matrix: Air

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15								
Tetrachloroethene	ND	ug/m3	21000	10400	30515.		05/25/12 01:53	127-18-4	
Tetrahydrofuran	ND	ug/m3	18300	9150	30515.		05/25/12 01:53	109-99-9	
Toluene	**8840000**	ug/m3	23500	11700	30515.		05/25/12 01:53	108-88-3	E
1,2,4-Trichlorobenzene	ND	ug/m3	30200	15100	30515.		05/25/12 01:53	120-82-1	
1,1,1-Trichloroethane	ND	ug/m3	33900	16800	30515.		05/25/12 01:53	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	16800	8540	30515.		05/25/12 01:53	79-00-5	
Trichloroethene	ND	ug/m3	16800	8540	30515.		05/25/12 01:53	79-01-6	
Trichlorofluoromethane	ND	ug/m3	34800	6770	30515.		05/25/12 01:53	75-69-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	48800	24400	30515.		05/25/12 01:53	76-13-1	
1,2,4-Trimethylbenzene	**356000**	ug/m3	30500	15300	30515.		05/25/12 01:53	95-63-6	
1,3,5-Trimethylbenzene	**149000**	ug/m3	30500	3970	30515.		05/25/12 01:53	108-67-8	
Vinyl acetate	ND	ug/m3	21700	10800	30515.		05/25/12 01:53	108-05-4	
Vinyl chloride	ND	ug/m3	7930	3970	30515.		05/25/12 01:53	75-01-4	
m&p-Xylene	**4510000**	ug/m3	53700	26900	30515.		05/25/12 01:53	179601-23-1	
o-Xylene	**1490000**	ug/m3	26900	3910	30515.		05/25/12 01:53	95-47-6	
TO3 GCV AIR BTEX CAN	Analytical Method: TO-3 Air								
Benzene	**677**	ppmv	14.9	2.8	149		05/23/12 09:47	71-43-2	
BTEX (Total)	**3470**	ppmv	89.4	41.7	149		05/23/12 09:47		
Ethylbenzene	**102**	ppmv	14.9	2.2	149		05/23/12 09:47	100-41-4	
n-Hexane	**641**	ppmv	14.9	2.8	149		05/23/12 09:47	110-54-3	
Methyl-tert-butyl ether	**243**	ppmv	14.9	3.1	149		05/23/12 09:47	1634-04-4	
THC as Gas	**14700**	ppmv	149	34.3	149		05/23/12 09:47		
Toluene	**2180**	ppmv	14.9	2.7	149		05/23/12 09:47	108-88-3	E
1,2,4-Trimethylbenzene	**22.9**	ppmv	14.9	4.2	149		05/23/12 09:47	95-63-6	
1,3,5-Trimethylbenzene	ND	ppmv	14.9	4.0	149		05/23/12 09:47	108-67-8	
Xylene (Total)	**516**	ppmv	44.7	7.6	149		05/23/12 09:47	1330-20-7	
m&p-Xylene	**395**	ppmv	29.8	5.1	149		05/23/12 09:47	179601-23-1	
o-Xylene	**121**	ppmv	14.9	2.5	149		05/23/12 09:47	95-47-6	

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QUALITY CONTROL DATA

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

QC Batch: AIR/14964 Analysis Method: TO-15
QC Batch Method: TO-15 Analysis Description: TO15 MSV AIR Low Level
Associated Lab Samples: 10192130001, 10192130002

METHOD BLANK: 1204105 Matrix: Air
Associated Lab Samples: 10192130001, 10192130002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1-Trichloroethane	ug/m3	ND	1.1	05/24/12 12:32	
1,1,2,2-Tetrachloroethane	ug/m3	ND	0.70	05/24/12 12:32	
1,1,2-Trichloroethane	ug/m3	ND	0.55	05/24/12 12:32	
1,1,2-Trichlorotrifluoroethane	ug/m3	ND	1.6	05/24/12 12:32	
1,1-Dichloroethane	ug/m3	ND	0.82	05/24/12 12:32	
1,1-Dichloroethene	ug/m3	ND	0.81	05/24/12 12:32	
1,2,4-Trichlorobenzene	ug/m3	ND	0.99	05/24/12 12:32	
1,2,4-Trimethylbenzene	ug/m3	ND	1.0	05/24/12 12:32	
1,2-Dibromoethane (EDB)	ug/m3	ND	1.6	05/24/12 12:32	
1,2-Dichlorobenzene	ug/m3	ND	1.2	05/24/12 12:32	
1,2-Dichloroethane	ug/m3	ND	0.41	05/24/12 12:32	
1,2-Dichloropropane	ug/m3	ND	0.94	05/24/12 12:32	
1,3,5-Trimethylbenzene	ug/m3	ND	1.0	05/24/12 12:32	
1,3-Butadiene	ug/m3	ND	0.45	05/24/12 12:32	
1,3-Dichlorobenzene	ug/m3	ND	1.2	05/24/12 12:32	
1,4-Dichlorobenzene	ug/m3	ND	1.2	05/24/12 12:32	
2-Butanone (MEK)	ug/m3	ND	0.60	05/24/12 12:32	
2-Hexanone	ug/m3	ND	0.83	05/24/12 12:32	
2-Propanol	ug/m3	ND	2.5	05/24/12 12:32	
4-Ethyltoluene	ug/m3	ND	1.0	05/24/12 12:32	
4-Methyl-2-pentanone (MIBK)	ug/m3	ND	0.83	05/24/12 12:32	
Acetone	ug/m3	ND	0.48	05/24/12 12:32	
Benzene	ug/m3	ND	0.32	05/24/12 12:32	
Benzyl chloride	ug/m3	ND	1.0	05/24/12 12:32	
Bromodichloromethane	ug/m3	ND	1.4	05/24/12 12:32	
Bromoform	ug/m3	ND	2.1	05/24/12 12:32	
Bromomethane	ug/m3	ND	0.79	05/24/12 12:32	
Carbon disulfide	ug/m3	ND	0.63	05/24/12 12:32	
Carbon tetrachloride	ug/m3	ND	0.64	05/24/12 12:32	
Chlorobenzene	ug/m3	ND	0.94	05/24/12 12:32	
Chloroethane	ug/m3	ND	0.54	05/24/12 12:32	
Chloroform	ug/m3	ND	0.99	05/24/12 12:32	
Chloromethane	ug/m3	ND	0.42	05/24/12 12:32	
cis-1,2-Dichloroethene	ug/m3	ND	0.81	05/24/12 12:32	
cis-1,3-Dichloropropene	ug/m3	ND	0.92	05/24/12 12:32	
Cyclohexane	ug/m3	ND	0.68	05/24/12 12:32	
Dibromochloromethane	ug/m3	ND	1.7	05/24/12 12:32	
Dichlorodifluoromethane	ug/m3	ND	1.0	05/24/12 12:32	
Dichlorotetrafluoroethane	ug/m3	ND	1.4	05/24/12 12:32	
Ethanol	ug/m3	ND	0.38	05/24/12 12:32	
Ethyl acetate	ug/m3	ND	0.73	05/24/12 12:32	
Ethylbenzene	ug/m3	ND	0.88	05/24/12 12:32	
Hexachloro-1,3-butadiene	ug/m3	ND	2.2	05/24/12 12:32	

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QUALITY CONTROL DATA

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

METHOD BLANK: 1204105 Matrix: Air

Associated Lab Samples: 10192130001, 10192130002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
m&p-Xylene	ug/m3	ND	1.8	05/24/12 12:32	
Methyl-tert-butyl ether	ug/m3	ND	0.73	05/24/12 12:32	
Methylene Chloride	ug/m3	ND	0.71	05/24/12 12:32	
n-Heptane	ug/m3	ND	0.83	05/24/12 12:32	
n-Hexane	ug/m3	ND	0.72	05/24/12 12:32	
Naphthalene	ug/m3	ND	1.1	05/24/12 12:32	
o-Xylene	ug/m3	ND	0.88	05/24/12 12:32	
Propylene	ug/m3	ND	0.35	05/24/12 12:32	
Styrene	ug/m3	ND	0.87	05/24/12 12:32	
Tetrachloroethene	ug/m3	ND	0.69	05/24/12 12:32	
Tetrahydrofuran	ug/m3	ND	0.60	05/24/12 12:32	
Toluene	ug/m3	ND	0.77	05/24/12 12:32	
trans-1,2-Dichloroethene	ug/m3	ND	0.81	05/24/12 12:32	
trans-1,3-Dichloropropene	ug/m3	ND	0.92	05/24/12 12:32	
Trichloroethene	ug/m3	ND	0.55	05/24/12 12:32	
Trichlorofluoromethane	ug/m3	ND	1.1	05/24/12 12:32	
Vinyl acetate	ug/m3	ND	0.71	05/24/12 12:32	
Vinyl chloride	ug/m3	ND	0.26	05/24/12 12:32	

LABORATORY CONTROL SAMPLE: 1204106

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1-Trichloroethane	ug/m3	55.5	47.4	85	72-129	
1,1,2,2-Tetrachloroethane	ug/m3	69.8	64.3	92	73-131	
1,1,2-Trichloroethane	ug/m3	55.5	48.0	86	71-128	
1,1,2-Trichlorotrifluoroethane	ug/m3	77.9	67.0	86	65-132	
1,1-Dichloroethane	ug/m3	41.2	44.4	108	67-132	
1,1-Dichloroethene	ug/m3	40.3	36.3	90	68-134	
1,2,4-Trichlorobenzene	ug/m3	75.5	96.9	128	48-150	
1,2,4-Trimethylbenzene	ug/m3	50	50.4	101	72-127	
1,2-Dibromoethane (EDB)	ug/m3	78.1	74.6	96	75-130	
1,2-Dichlorobenzene	ug/m3	61.2	48.5	79	71-132	
1,2-Dichloroethane	ug/m3	41.2	35.7	87	70-131	
1,2-Dichloropropane	ug/m3	47	43.6	93	73-130	
1,3,5-Trimethylbenzene	ug/m3	50	51.2	102	70-133	
1,3-Butadiene	ug/m3	22.5	21.9	97	69-132	
1,3-Dichlorobenzene	ug/m3	61.2	64.9	106	71-128	
1,4-Dichlorobenzene	ug/m3	61.2	56.2	92	72-131	
2-Butanone (MEK)	ug/m3	30	28.9	96	69-131	
2-Hexanone	ug/m3	41.7	41.2	99	71-134	
2-Propanol	ug/m3	25	19.8	79	72-132	
4-Ethyltoluene	ug/m3	50	51.6	103	71-129	SS
4-Methyl-2-pentanone (MIBK)	ug/m3	41.7	39.4	95	69-135	SS
Acetone	ug/m3	24.2	24.6	102	61-139	SS
Benzene	ug/m3	32.5	32.9	101	69-134	

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

LABORATORY CONTROL SAMPLE: 1204106

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzyl chloride	ug/m3	52.5	56.0	107	70-129	
Bromodichloromethane	ug/m3	68.2	60.5	89	71-130	
Bromoform	ug/m3	105	102	97	70-130	
Bromomethane	ug/m3	39.5	33.6	85	69-125	
Carbon disulfide	ug/m3	31.7	26.1	82	66-131	
Carbon tetrachloride	ug/m3	64	53.1	83	68-128	
Chlorobenzene	ug/m3	46.8	41.1	88	75-128	
Chloroethane	ug/m3	26.8	24.3	90	66-131	
Chloroform	ug/m3	49.7	44.0	89	68-132	
Chloromethane	ug/m3	21	18.9	90	60-139	
cis-1,2-Dichloroethene	ug/m3	40.3	40.7	101	73-130	
cis-1,3-Dichloropropene	ug/m3	46.2	48.1	104	74-134	
Cyclohexane	ug/m3	35	33.1	95	67-136	
Dibromochloromethane	ug/m3	86.6	80.6	93	69-131	
Dichlorodifluoromethane	ug/m3	50.3	43.3	86	67-131	
Dichlorotetrafluoroethane	ug/m3	71.1	61.7	87	66-130	
Ethanol	ug/m3	19.2	19.0	99	69-131	SS
Ethyl acetate	ug/m3	36.6	35.5	97	71-131	
Ethylbenzene	ug/m3	44.2	45.8	104	69-139	
Hexachloro-1,3-butadiene	ug/m3	108	221	204	41-150	CH,L3
m&p-Xylene	ug/m3	88.3	98.6	112	66-137	
Methyl-tert-butyl ether	ug/m3	36.7	38.3	104	70-132	
Methylene Chloride	ug/m3	35.3	30.4	86	73-134	
n-Heptane	ug/m3	41.7	38.4	92	70-134	
n-Hexane	ug/m3	35.8	33.7	94	65-133	
Naphthalene	ug/m3	53.3	71.4	134	57-150	CH,SS
o-Xylene	ug/m3	44.2	44.7	101	69-138	
Propylene	ug/m3	17.5	20.6	118	70-134	
Styrene	ug/m3	43.3	43.1	100	72-132	
Tetrachloroethene	ug/m3	69	64.1	93	70-130	
Tetrahydrofuran	ug/m3	30	28.9	96	74-128	
Toluene	ug/m3	38.3	35.9	94	71-132	
trans-1,2-Dichloroethene	ug/m3	40.3	34.9	87	72-128	
trans-1,3-Dichloropropene	ug/m3	46.2	46.1	100	73-130	
Trichloroethene	ug/m3	54.6	49.8	91	72-131	
Trichlorofluoromethane	ug/m3	57.1	66.1	116	66-129	
Vinyl acetate	ug/m3	35.8	34.2	96	71-131	
Vinyl chloride	ug/m3	26	23.5	90	70-131	

SAMPLE DUPLICATE: 1204995

Parameter	Units	10192932002 Result	Dup Result	RPD	Max RPD	Qualifiers
1,1,1-Trichloroethane	ug/m3		1.9	10	25	
1,1,2,2-Tetrachloroethane	ug/m3		ND		25	
1,1,2-Trichloroethane	ug/m3		ND		25	
1,1,2-Trichlorotrifluoroethane	ug/m3		ND		25	
1,1-Dichloroethane	ug/m3		ND		25	

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QUALITY CONTROL DATA

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

SAMPLE DUPLICATE: 1204995

Parameter	Units	10192932002 Result	Dup Result	RPD	Max RPD	Qualifiers
1,1-Dichloroethene	ug/m3		ND		25	
1,2,4-Trichlorobenzene	ug/m3		ND		25	
1,2,4-Trimethylbenzene	ug/m3		ND		25	
1,2-Dibromoethane (EDB)	ug/m3		ND		25	
1,2-Dichlorobenzene	ug/m3		ND		25	
1,2-Dichloroethane	ug/m3		ND		25	
1,2-Dichloropropane	ug/m3		ND		25	
1,3,5-Trimethylbenzene	ug/m3		ND		25	
1,3-Butadiene	ug/m3		ND		25	
1,3-Dichlorobenzene	ug/m3		ND		25	
1,4-Dichlorobenzene	ug/m3		ND		25	
2-Butanone (MEK)	ug/m3		3.1	4	25	
2-Hexanone	ug/m3		ND		25	
2-Propanol	ug/m3		1.1J		25	
4-Ethyltoluene	ug/m3		ND		25	
4-Methyl-2-pentanone (MIBK)	ug/m3		ND		25	
Acetone	ug/m3		9.2	1	25	
Benzene	ug/m3		ND		25	
Benzyl chloride	ug/m3		ND		25	
Bromodichloromethane	ug/m3		ND		25	
Bromoform	ug/m3		ND		25	
Bromomethane	ug/m3		ND		25	
Carbon disulfide	ug/m3		ND		25	
Carbon tetrachloride	ug/m3		ND		25	
Chlorobenzene	ug/m3		ND		25	
Chloroethane	ug/m3		ND		25	
Chloroform	ug/m3		ND		25	
Chloromethane	ug/m3		ND		25	
cis-1,2-Dichloroethene	ug/m3		ND		25	
cis-1,3-Dichloropropene	ug/m3		ND		25	
Cyclohexane	ug/m3		ND		25	
Dibromochloromethane	ug/m3		ND		25	
Dichlorodifluoromethane	ug/m3		1.9	4	25	
Dichlorotetrafluoroethane	ug/m3		ND		25	
Ethanol	ug/m3		ND		25	
Ethyl acetate	ug/m3		ND		25	
Ethylbenzene	ug/m3		ND		25	
Hexachloro-1,3-butadiene	ug/m3		ND		25	
m&p-Xylene	ug/m3		ND		25	
Methyl-tert-butyl ether	ug/m3		ND		25	
Methylene Chloride	ug/m3		ND		25	
n-Heptane	ug/m3		ND		25	
n-Hexane	ug/m3		1.4	8	25	
Naphthalene	ug/m3		ND		25	
o-Xylene	ug/m3		ND		25	
Propylene	ug/m3		ND		25	
Styrene	ug/m3		ND		25	
Tetrachloroethene	ug/m3		546			E

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

SAMPLE DUPLICATE: 1204995

Parameter	Units	10192932002 Result	Dup Result	RPD	Max RPD	Qualifiers
Tetrahydrofuran	ug/m3		ND		25	
Toluene	ug/m3		ND		25	
trans-1,2-Dichloroethene	ug/m3		ND		25	
trans-1,3-Dichloropropene	ug/m3		ND		25	
Trichloroethene	ug/m3		4.3	14	25	
Trichlorofluoromethane	ug/m3		ND		25	
Vinyl acetate	ug/m3		ND		25	
Vinyl chloride	ug/m3		ND		25	

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QUALITY CONTROL DATA

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

QC Batch: AIR/14952 Analysis Method: TO-3 Air
QC Batch Method: TO-3 Air Analysis Description: TO3 GCV AIR BTEX CAN
Associated Lab Samples: 10192130001, 10192130002

METHOD BLANK: 1202638 Matrix: Air
Associated Lab Samples: 10192130001, 10192130002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ppmv	ND	0.10	05/23/12 09:07	
1,3,5-Trimethylbenzene	ppmv	ND	0.10	05/23/12 09:07	
Benzene	ppmv	ND	0.10	05/23/12 09:07	
BTEX (Total)	ppmv	ND	0.60	05/23/12 09:07	
Ethylbenzene	ppmv	ND	0.10	05/23/12 09:07	
m&p-Xylene	ppmv	ND	0.20	05/23/12 09:07	
Methyl-tert-butyl ether	ppmv	ND	0.10	05/23/12 09:07	
n-Hexane	ppmv	ND	0.10	05/23/12 09:07	
o-Xylene	ppmv	ND	0.10	05/23/12 09:07	
THC as Gas	ppmv	ND	1.0	05/23/12 09:07	
Toluene	ppmv	ND	0.10	05/23/12 09:07	
Xylene (Total)	ppmv	ND	0.30	05/23/12 09:07	

LABORATORY CONTROL SAMPLE & LCSD: 1202639 1202640

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
1,2,4-Trimethylbenzene	ppmv	1	0.89	0.81	89	81	70-130	9	30	
1,3,5-Trimethylbenzene	ppmv	1	0.89	0.78	89	78	70-130	12	30	
Benzene	ppmv	1	0.89	0.86	89	86	70-130	3	30	
BTEX (Total)	ppmv		5.7	5.2				9	30	
Ethylbenzene	ppmv	1	0.95	0.87	95	87	70-130	9	30	
m&p-Xylene	ppmv	2	1.9	1.7	97	86	70-130	11	30	
Methyl-tert-butyl ether	ppmv	1	0.74	0.73	74	73	70-130	1	30	
n-Hexane	ppmv	1	0.89	0.86	89	86	70-130	3	30	
o-Xylene	ppmv	1	0.96	0.86	96	86	70-130	11	30	
THC as Gas	ppmv	10	9.2	8.5	92	85	70-130	7	30	
Toluene	ppmv	1	0.95	0.88	95	88	70-130	7	30	
Xylene (Total)	ppmv	3	2.9	2.6	97	86	70-130	11	30	

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www.pacelabs.com

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

SAMPLE QUALIFIERS

Sample: 10192130001

[1] This result is reported from a serial dilution

Sample: 10192130002

[1] This result is reported from a serial dilution

ANALYTE QUALIFIERS

CH	The continuing calibration for this compound is outside of Pace Analytical acceptance limits. The results may be biased high.
E	Analyte concentration exceeded the calibration range. The reported result is estimated.
L3	Analyte recovery in the laboratory control sample (LCS) exceeded QC limits. Analyte presence below reporting limits in associated samples. Results unaffected by high bias.
SS	This analyte did not meet the secondary source verification criteria for the initial calibration. The reported result should be considered an estimated value.

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Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 0504-058-02 Ionc
Pace Project No.: 10192130

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10192130001	**SVE-1-050812**	TO-15	AIR/14964		
10192130002	**SVE-2-050812**	TO-15	AIR/14964		
10192130001	**SVE-1-050812**	TO-3 Air	AIR/14952		
10192130002	**SVE-2-050812**	TO-3 Air	AIR/14952		

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AIR: CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

10192130

08084

Page: 1 of 1

Section A Required Client Information:

Company: GeoEngineers
Address: 523 E 2nd Ave
Spokane WA 99202
Email To: dlauder@geoengineers.com
Phone: 509-363-3125 Fax: 509-363-3126
Requested Due Date/TAT: Standard

Section B Required Project Information:

Report To: Dave Lauder
Copy To: Scott Lathen
Purchase Order No.:
Project Name: Ione
Project Number: 0504-058-02

Section C Invoice Information:

Attention: Dave Lauder
Company Name: GeoEngineers
Address: 523 E 2nd Ave, Spokane WA 99202
Pace Quote Reference:
Pace Project Manager/Sales Rep.
Pace Profile #: 36920

Program: ☐ UST ☐ Superfund ☐ Emissions ☐ Clean Air Act ☐ Voluntary Clean Up ☐ Dry Clean ☐ RCRA ☒ Other

Location of Sampling by State: WA

Reporting Units: ug/m³ ☒ mg/m³ ☐ PPBV ☐ PPMV ☐ Other

Report Level II. ☐ III. ☐ IV. ☐ Other ☐

*Section D Required Client Information

AIR SAMPLE ID
Sample IDs MUST BE UNIQUE

Valid Media Codes

MEDIA	CODE
Tedlar Bag	TB
1 Liter Summa Can	1LC
6 Liter Summa Can	6LC
Low Volume Puff	LVP
High Volume Puff	HVP
Other	PM10

ITEM #	Sample ID	MEDIA CODE	PID Reading (Client only)	COLLECTED COMPOSITE START / END / GRAB DATE	COLLECTED TIME	COMPOSITE - DATE	COMPOSITE - TIME	Canister Pressure (Initial Field - psig)	Canister Pressure (Final Field - psig)	Summa Can Number	Flow Control Number	Method: PM10	3C: Fixed Gas (%)	TO-3	TO-3M (Methane)	TO-4 (PCBs)	TO-13 (PAH)	TO-14	TO-15	TO15 Short List*	Pace Lab ID
1	SVE-1-050812	6LC		5/8/12	1145			-30	-5	1609				X				X			001
2	SVE-2-050812	6LC		5/8/12	1244			-30	-5	1477				X				X			002
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

Comments :

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
S Lathen / GeoEngineers	5/10/12	1200	[signature]	5.14.12	0933

SAMPLE CONDITIONS

	Temp In °C	Received on Ice	Custody Sealed Cooler	Samples Intact
	cool	Y/N	Y/N	Y/N
		Y/N	Y/N	Y/N
		Y/N	Y/N	Y/N
		Y/N	Y/N	Y/N

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Scott Lathen

SIGNATURE of SAMPLER: [signature] DATE Signed (MM / DD / YY): 05/10/12

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ORIGINAL

Pace Analytical	Document Name: Air Sample Condition Upon Recipt	Document Revised: 12Apr2012 Page 1 of 1
	Document Number: F-MN-A-106-rev.03	Issuing Authority: Pace Minnesota Quality Office

AIR Sample Condition Upon Receipt

Client Name: GeoEngineers Project # 1019213C

Courier: [X] Fed Ex [ ] UPS [ ] USPS [ ] Client [ ] Commercial [ ] Pace Other ____

Custody Seal on Cooler/Box Present: [ ] yes [X] no Seals intact [ ] yes [X] no

Packing Material: [ ] Bubble Wrap [ ] Bubble Bags [ ] Foam [X] None [ ] Other ____

Optional
Proj. Due Date:
Proj. Name:

Temperature (TO17 and TO13 samples only): ____
Temp should be above freezing to 6°C

Tracking #: 8006 6034 7232

Comments:

Date and Initials of person examining contents: 5-14-12

Chain of Custody Present:	[X] Yes [ ] No [ ] N/A	1.
Chain of Custody Filled Out:	[X] Yes [ ] No [ ] N/A	2.
Chain of Custody Relinquished:	[X] Yes [ ] No [ ] N/A	3.
Sampler Name & Signature on COC:	[X] Yes [ ] No [ ] N/A	4.
Samples Arrived within Hold Time:	[X] Yes [ ] No [ ] N/A	5.
Short Hold Time Analysis (<72hr):	[ ] Yes [X] No [ ] N/A	6.
Rush Turn Around Time Requested:	[ ] Yes [X] No [ ] N/A	7.
Sufficient Volume:	[X] Yes [ ] No [ ] N/A	8.
Correct Containers Used:	[X] Yes [ ] No [ ] N/A	9.
-Pace Containers Used:	[X] Yes [ ] No [ ] N/A	
Containers Intact:	[X] Yes [ ] No [ ] N/A	10.
Media: 2 Cans		11.
Sample Labels match COC:	[X] Yes [ ] No [ ] N/A	12.
Samples Received:		

Canisters		Flow Controllers		Stand Alone G	
Sample Number	Can ID	Sample Number	Can ID	Sample Number	Can ID
SVE1-050812	Pace 1609				
SVE2-050812	Pace 1477				

Client Notification/ Resolution: Field Data Required? Y / N

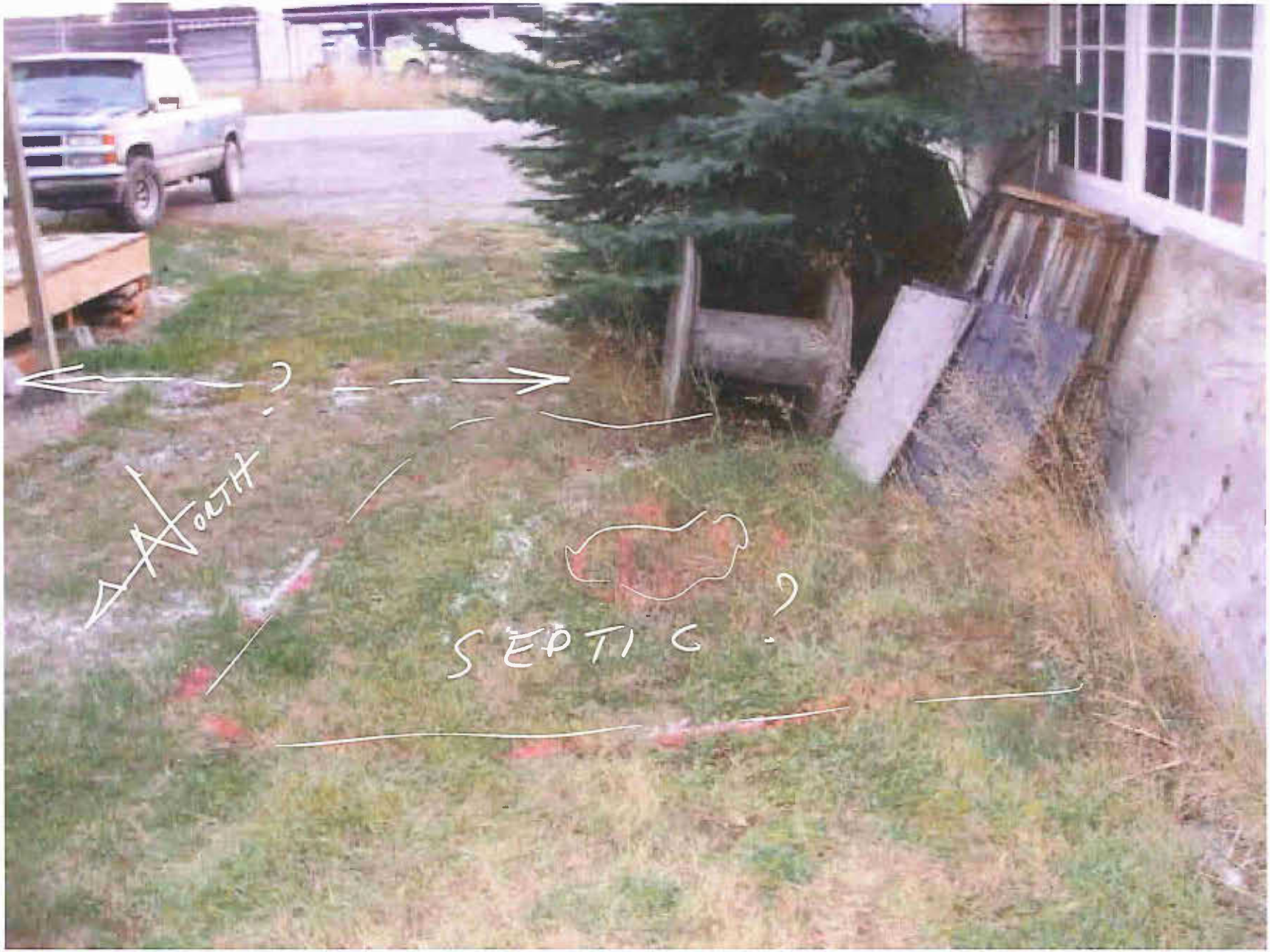
Person Contacted: ____ Date/Time: ____

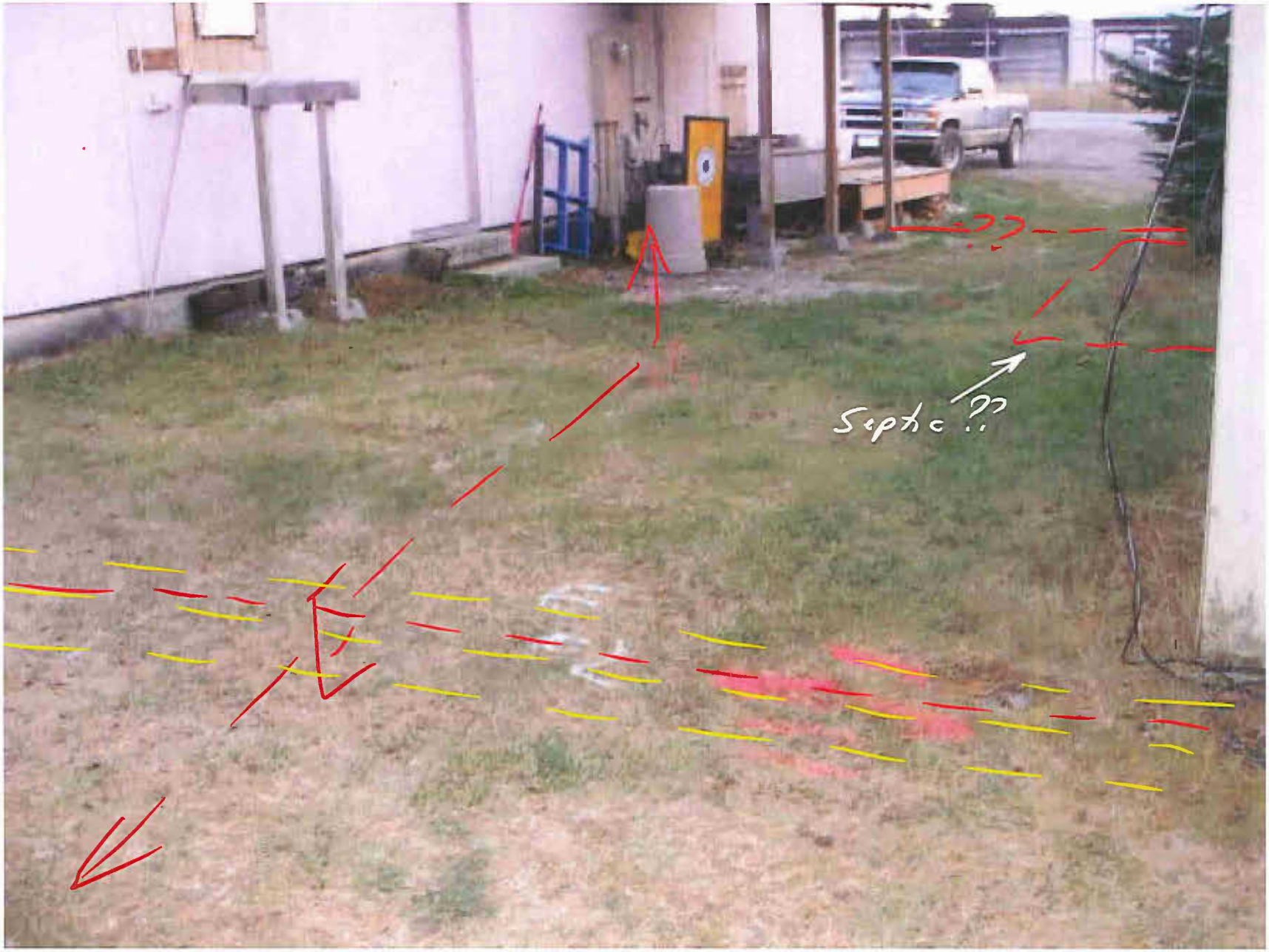
Comments/ Resolution: ____

Project Manager Review: [signature] Date: 5-15-12

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

APPENDIX B
Utility Location Photo Log


?
SOUTH
SEPTIC
?

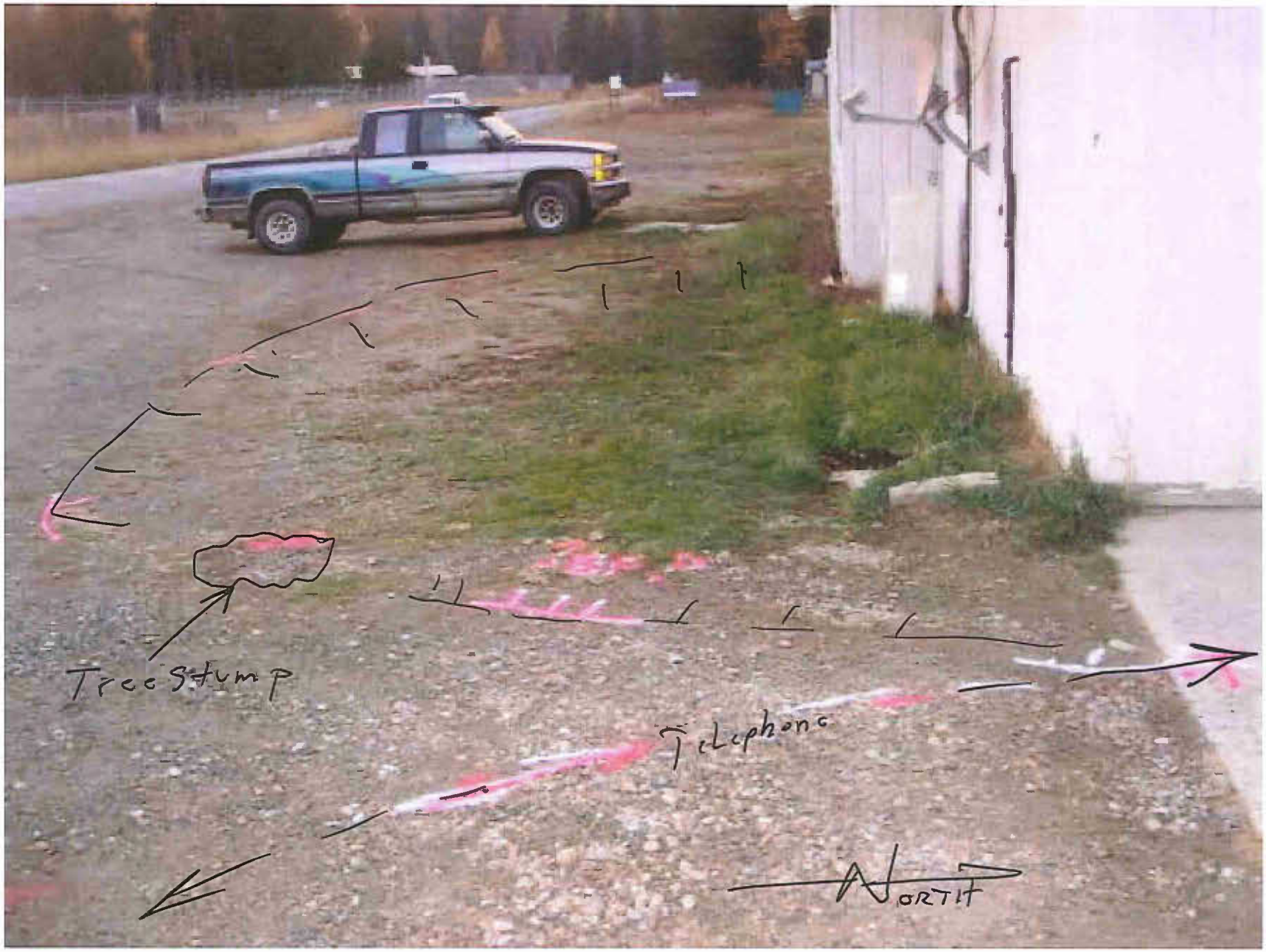

??
Septic ??


SEPTIC
TANK


SEPTIC TANKS
METAL ANOMALIES

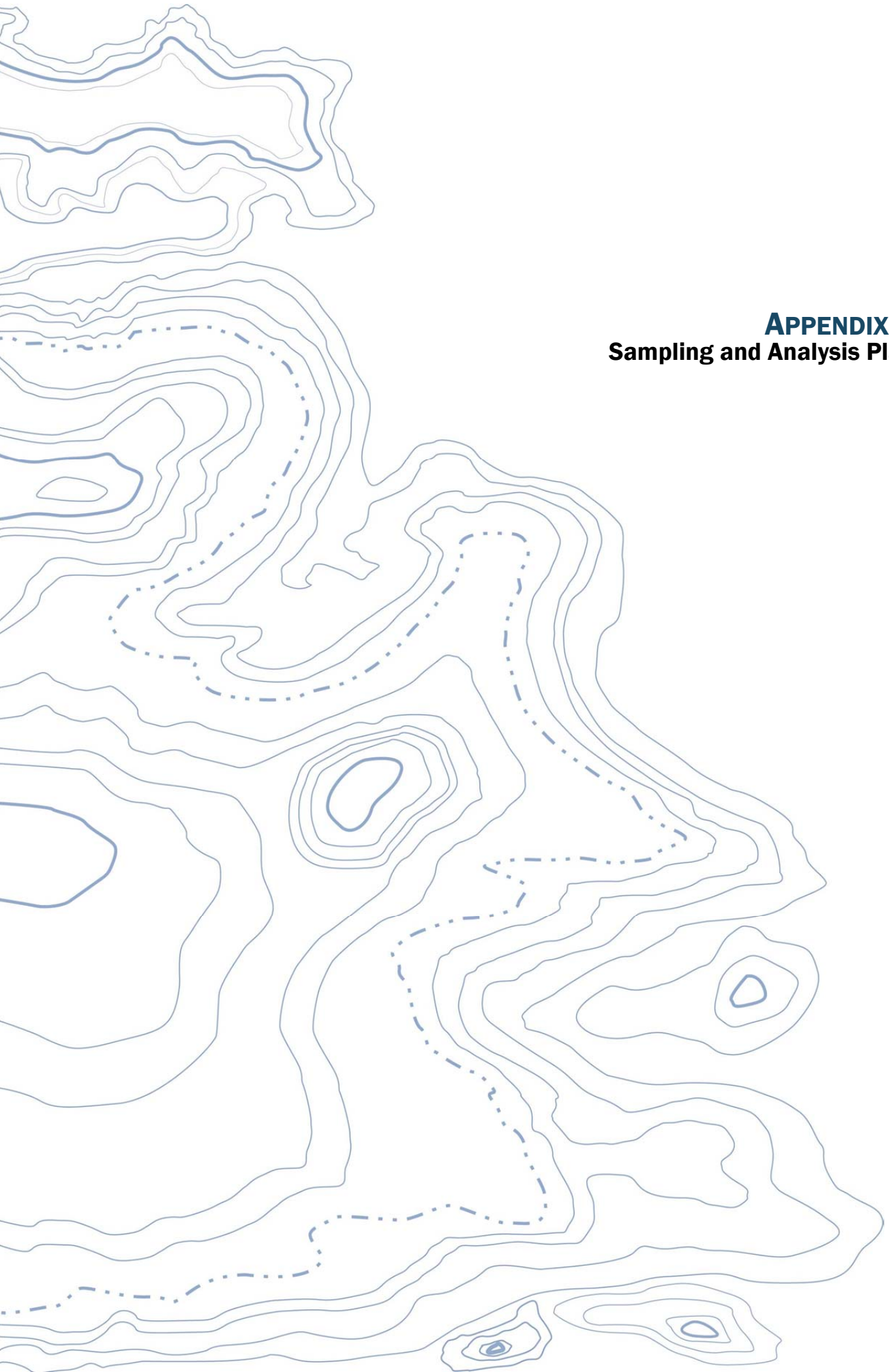

METAL DEBRIS?
UNKNOWN CONDUCTIVE
ANOMALY
? ? ?
ASPHALT


unknown
pipe segment


Tree Stump
Telephone
NORTH

GEO ENGINEERS / ULS - GEOMARKOUT
mwb 10-11 NOV 11

GEOPHYSICAL SURVEY
AIRPORT QUICKSTOP, ISSAQUAH



APPENDIX C
Sampling and Analysis Plan

APPENDIX C
SAMPLING AND ANALYSIS PLAN

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) presents the proposed scope-of-work to conduct soil sampling in conjunction with the installation of the soil vapor extraction (SVE) and bioventing (BV) remediation system at the Airport Kwik Stop site (herein designated as the site) located in Ione, Washington. The project scope includes installing remediation equipment, constructing a piping manifold, trenching through potentially contaminated soil to lay SVE/BV piping, connecting the remediation wells to the piping manifold, and installing vapor treatment. Trenching spoils will be sampled to profile the soil for potential reuse as backfill or for off-site disposal at a permitted facility. After system installation, vapor samples will be collected regularly from the SVE system to assess the contaminant removal effectiveness and to confirm the vapor treatment effectiveness. The SVE/BV remediation systems will be installed under an interim action in accordance with regulations in the Model Toxics Control Act (WAC 173-340-430). The interim action will reduce the soil contamination identified at the site; thus reducing the soil and groundwater contamination identified beneath the site. The action is necessary to reduce the threat to groundwater, down gradient domestic water wells and the Pend Oreille River.

This SAP has been prepared by GeoEngineers for the Washington State Department of Ecology (Ecology). The project Quality Assurance Project Plan (QAPP) is presented as Appendix D. Included in this SAP are general guidelines with the following sections:

- Scope and Tasks - **Section 2.0**
- Sampling Procedures – **Section 3.0**
- Data Validation and Usability – **Section 4.0**

2.0 SCOPE AND TASKS

Proposed interim action tasks requiring sampling activities are summarized as follows:

2.1. SVE/BV System Installation

- Install four new SVE wells using hollow-stem auger drilling techniques.
- Observe and document SVE remedial system installation. The activities of the selected contractor will include trenching from eight wells (SVE-1 through SVE-6, MP-1, and MP-2) to the treatment compound, connecting 4-inch-diameter piping from the wells to the treatment compound (2-inch diameter piping from wells MP-1 and MP-2), backfilling the trenches and reconstructing the disturbed surfaces, disposing excess soil (including contaminated soil), purchasing and installing treatment compound components (blowers, moisture knockout tanks, overflow tank, valves, and gauges), constructing and installing a manifold to allow each well to operate in SVE and bioventing mode, installing temporary vapor treatment components (a catalytic oxidizer), installing carbon scrub units, obtaining electrical permits, coordinating

electrical connection, installing a fence around the compound, and starting the remedial system. We assume that two samples of excavated soil will be obtained and submitted to a certified analytical laboratory for gasoline-range petroleum hydrocarbons (GRPH) using Northwest Method NWTPH-Gx, benzene, ethylbenzene, toluene and xylenes (BTEX) compounds, volatile organic compounds (VOCs) using EPA 8260 Methods and toxic characteristic leaching procedure (TCLP) for benzene and metals using EPA 8260/6020 methods. We also assume the samples will be analyzed on an accelerated turn-around-time in order to accommodate the construction schedule. The purpose of the analytical testing will be for waste characterization purposes for soil disposal.

- Start the remedial system and monitor for an 8-hour period. Monitoring will include measuring air flow in each line and through the entire system, pressure and vacuum in each line, and moisture accumulation. In addition, volatile organic compounds (VOCs) will be measured using a photoionization detector at each SVE line and the combined SVE system and the entire system before and after treatment. The valves on the system will be modified to optimize removal efficiency.
- Collect a vapor sample (using a Summa canister) from the combined SVE system prior to treatment and submit to a certified laboratory for analysis of total petroleum hydrocarbons as gasoline and VOCs using EPA Method TO-15. Effluent vapor samples also will be collected from the carbon vessels.
- Prepare as-built plans and an Operations and Maintenance (O&M) plan. As part of plan preparation, we will subcontract a licensed surveyor to survey locations of system components.

2.2. Operations and Maintenance

- Conduct frequent operations and maintenance visits: weekly for the first month of operation, twice per month for the next three months, and monthly until the end of the contract period (June 30, 2013). During each visit, monitoring and sampling activities will be identical to those listed above (in system startup).
- Conduct routine equipment maintenance activities to keep equipment in proper working conditions.
- Include four extra (unplanned) site visits in the event the remedial system shuts down.
- Coordinate, observe and document carbon change out (removal of spent carbon and replacement with fresh carbon).

Data quality objectives, special training/certification, and documentation will conform to the requirements of the QAPP (Appendix C). Project tasks are divided into work tasks as detailed below.

3.0 ASSESSMENT PROCEDURES

This section contains standard procedures for field data collection that are anticipated during the soil and vapor sampling including the following:

- Collecting soil samples from trenching spoils;

- Field screening methods;
- Decontamination procedures;
- Collecting vapor treatment influent and effluent samples; and
- Sample location control.

3.1. Collecting Soil Samples from Trenching Spoils

Trenches will be excavated to place piping connecting the SVE wellheads to the remediation system manifold. Total excavation is estimated to be 100 tons. We estimate about half of the soil excavated will contain gasoline-range petroleum hydrocarbons (GRPH) and BTEX compounds at concentrations greater than Washington State Model Toxics Control Act (MTCA) Method A cleanup levels and will require disposal at a permitted facility. During trenching, soil will be field screened using the procedures described below. Soil with field screening evidence of contamination will be segregated and stockpiled for disposal characterization. Stockpiles will be lined, bermed, and covered to reduce contaminant migration. If pre-approval for disposal based on assessment sample results cannot be obtained, characterization samples will be collected from the stockpiled soil to profile the material for disposal. One 3-point composite sample will be collected for every 100 tons of soil stockpiled. Samples will be composited in the field by mixing three approximately equal portions of soil from discrete locations in a clean plastic bag.

Soil samples will be collected using new, clean nitrile gloves, and transferred into a laboratory-prepared container, labeled with a water proof pen, and placed on "blue ice" or double bagged wet ice in a clean plastic lined cooler. Each sample will be documented on a field sample data sheet (FSDS) including sample name, sample collection date and time, sample type, sample depth, requested analytical methods, and sampler name. Soil samples for volatile organic compound analyses (e.g. BTEX) will be collected consistent with EPA Method 5035A and preserved in accordance with Ecology Memorandum 5 (Ecology, 2004) and EPA (1998).

Sampling equipment will be decontaminated between each sampling attempt as described in **Section 4.6**. The sample coolers will be delivered to the analytical laboratory under standard chain-of-custody procedures described in the QAPP.

3.2. Field Screening Methods

A GeoEngineers field representative will perform field screening tests on soil samples collected from stockpiled contaminated soil for waste characterization purposes. Field screening results will be used to aid in the selection of soil samples for chemical analysis.

Screening methods will include: (1) visual examination; (2) water sheen screening; and (3) headspace vapor screening using a PID. Visual screening consists of inspecting the soil for discoloration indicative of the presence of petroleum-impacted material in the sample.

Water sheen screening involves placing soil in water and observing the water surface for signs of sheen. Sheen classifications are as follows:

- **No Sheen (NS)** No visible sheen on the water surface;

- **Slight Sheen (SS)** Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly. Natural organic matter in the soil might produce a slight sheen;
- **Moderate Sheen (MS)** Light to heavy sheen; might have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on water surface; and
- **Heavy Sheen (HS)** Heavy sheen with color/iridescence; spread is rapid; entire water surface might be covered with sheen.

Headspace vapor screening involves inserting a soil sample into a sealed plastic bag and measuring the airspace volatile organic compounds (VOC) vapor concentrations in parts per million (ppm) with a PID. Once a soil sample is placed in a sealed plastic bag with air space, the bag is shaken to expose the soil to the air trapped in the bag. The probe of the PID, calibrated to isobutylene following the manufacturer's instructions, is inserted into a small opening in the bag seal and the measurement is collected. The PID typically is designed to quantify VOC vapor concentrations in the range between 1 ppm and 2,000 ppm with an accuracy of 10 percent of the reading and between 2,000 ppm and 10,000 ppm with an accuracy of 20 percent of the reading.

Field screening results are site specific. The results vary with temperature, soil type, type of contaminant, and soil moisture content. Water sheen testing equipment will be disposable or decontaminated before field screening each sample using a Liquinox® soap solution with a water rinse. Used testing equipment and/or decontamination water will be stored on-site in a labeled Washington State Department of Transportation (DOT)-approved drum pending disposal with IDW.

3.3. Vapor Monitoring and Sampling

After startup of the SVE/BV remediation system, regular monitoring and vapor sampling will be conducted to assess the overall effectiveness of the remediation system, measure contaminant removal rates, and the effluent vapor treatment efficiency. Monitoring and vapor sampling will be conducted weekly for the first month after startup, twice per month during the next three months, and monthly after four months until the end of June 2013.

Monitoring will consist of measuring VOCs using a photoionization detector from sample ports on the SVE manifold for each well. VOC measurements also will be collected from the combined flow at sample ports located prior to the oxidizer and at the carbon vessel effluent. Pressure/vacuum, flow, and temperature will be measured using gauges installed in the system piping or using portable equipment at the sample ports. Vapor samples will be collected from a sample port located upstream of the vapor treatment systems (catalytic oxidizers and carbon vessels) from the combined SVE flows. A second sample will be collected from the carbon vessel effluent.

Samples will be collected using laboratory supplied Summa canisters and submitted for VOC analysis using EPA Method TO-15. New disposable tubing will be used to connect the summa canisters to the sample ports for each sample.

3.4. Decontamination Procedures

The objective of the decontamination procedures described herein is to minimize the potential for cross-contamination between sample locations.

A designated decontamination area will be established for decontamination of drilling equipment and reusable sampling equipment. Equipment will be cleaned by water jetting using high-pressure/low-volume cleaning equipment.

Sampling equipment will be decontaminated in accordance with the following procedures before each sampling attempt or measurement.

1. Brush equipment with a nylon brush to remove large particulate matter.
2. Rinse with potable tap water.
3. Wash with non-phosphate detergent solution (Liquinox® and potable tap water).
4. Rinse with potable tap water.
5. Rinse with distilled water.
6. Replace the pump bladder and discharge tubing.

3.5. Soil Stockpile Management

Stockpiled contaminated soil will be placed on a plastic liner and covered with plastic to reduce contaminant migration from the site. Soil berms of non-contaminated soil will be constructed around soil stockpiles to further reduce contaminant migration potential.

3.6. Sampling And Analytical Methods

Soil and vapor field sampling methods, including quality control (QC) and maintenance of field instrumentation, will generally adhere to the requirements of the QAPP. Analytical method requirements also will adhere to the QAPP. During laboratory procurement and coordination, analytical method reporting limits for each proposed analysis will be compared to the reporting limits listed in the QAPP to ensure that data generated will be sufficient for assessment purposes.

3.7. Sample Handling And Custody Requirements

Samples will be handled in accordance with the QAPP. A complete discussion of the sample identification and custody procedures is provided in the QAPP.

3.8. Field Measurements And Observations Documentation

Field measurements and observations will be recorded in a project field notebook. Daily logs will be dated, and pages will be consecutively numbered. Entries will be recorded directly and legibly in the daily log and signed and dated by the person conducting the work. If changes are made, the changes will not obscure the previous entry, and the changes will be signed and dated. At a minimum, the following data will be recorded in the log book:

- Purpose of activity
- Location of activity
- Description of sampling reference point(s)
- Date and time of activity
- Sample number identification

- Soil sample top and bottom depth (bgs)
- Sample number and volume
- Sample transporting procedures
- Field measurements and screening observations
- Calibration records for field instruments
- Visitors to site
- Relevant comments regarding field activities
- Signatures of responsible personnel

Sufficient information will be recorded in the log book so that field activities can be reconstructed without reliance on personnel memory.

3.9. Data Management And Documentation

Data logs and data report packages will be located in the project file system in GeoEngineers' Spokane, Washington office. Data reports will be available in both hard copy and electronic formats. Laboratory data reports will include internal laboratory quality control checks and sample results. Data logs and packages that are anticipated to be generated during interim action activities include laboratory data report packages, boring logs, field sampling data sheets, and chain-of-custody forms.

Analytical data will be supplied to GeoEngineers in both electronic data deliverable (EDD) format and hard copy format. The hard copy will serve as the official record of laboratory results. The EDDs will contain only data reported in the hard copy reports (e.g. only reportable results).

Upon receipt of the analytical data, the EDD will be uploaded to a project database and reduced into summary tables for each group of analytes and media. Upon completion of the summary tables, the accuracy of the data reduction will be verified using the hard copy of the data received from the laboratory. Any exceptions will be noted and corrections will be made.

4.0 DATA VALIDATION AND USABILITY

Upon receipt of the sample data from the laboratory, the data will be validated and evaluated for usability in accordance with the QAPP.

5.0 REFERENCES

Puls, R.W. and Barcelona, M.J., Low-flow (minimal drawdown) ground-water sampling procedures: EPA Ground Water Issue, April 1996, p.1-9.

U.S. Environmental Protection Agency (EPA), Region 1, Low stress (low-flow) purging and sampling procedure for the collection of ground water samples from monitoring wells. EPA SOP No. GW 0001, Revision No. 2, July 30, 1996.

U.S. Environmental Protection Agency (EPA), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846),", Revision 5, April 1998.

Washington State Department of Ecology, "Collecting and Preparing Soil Samples for VOC Analysis.", 2004.

APPENDIX D
Quality Assurance Project Plan

APPENDIX D
QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) was developed for interim action activities at the Site, located near the intersection of State Route 31 and Greenhouse and Dewitt Roads, south of Ione, Washington. The interim action is being conducted to reduce vadose contaminant concentrations to protect human health and the environment. Sampling procedures are outlined in the SAP included as Appendix C of the work plan. The QAPP serves as the primary guide for the integration of quality assurance (QA) and quality control (QC) functions into interim action activities. The QAPP presents the objectives, procedures, organization, functional activities, and specific QA and QC activities designed to achieve data quality goals established for the project. This QAPP is based on guidelines specified in WAC 173, Chapter 173-340-820 and the EPA Requirements for Quality Assurance Project Plans (EPA, 2004b).

Throughout the project, environmental measurements will be conducted to produce data that are scientifically valid, of known and acceptable quality, and meet established objectives. QA/QC procedures will be implemented so that precision, accuracy, representativeness, completeness, and comparability (PARCC) of data generated meet the specified data quality objectives.

1.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Descriptions of the responsibilities, lines of authority and communication for the key positions to QA/QC are provided below. This organization facilitates the efficient production of project work, allows for an independent quality review, and permits resolution of QA issues before submittal.

1.1. Project Leadership and Management

The Project Manager's (PM) duties consist of providing concise technical work statements for project tasks, selecting project team members, determining subcontractor participation, establishing budgets and schedules, adhering to budgets and schedules, providing technical oversight, and providing overall production and review of project deliverables. David Lauder, Professional Engineer (PE) is the PM for activities at the Sites. The Principal-in-Charge is responsible to Ecology for fulfilling contractual and administrative control of the project. Bruce Williams is the Principal-in Charge.

1.2. Field Coordinator

The Field Coordinator is responsible for the daily management of activities in the field. Specific responsibilities include the following:

- Provides technical direction to the field staff.
- Develops schedules and allocates resources for field tasks.
- Coordinates data collection activities to be consistent with information requirements.
- Supervises the compilation of field data and laboratory analytical results.
- Assures that data are correctly and completely reported.

- Implements and oversees field sampling in accordance with project plans.
- Supervises field personnel.
- Coordinates work with on-site subcontractors.
- Schedules sample shipment with the analytical laboratory.
- Monitors that appropriate sampling, testing, and measurement procedures are followed.
- Coordinates the transfer of field data, sample tracking forms, and log books to the PM for data reduction and validation.
- Participates in QA corrective actions as required.

The Field Coordinators for interim action activities at the site are Katie Hall and/or Scott Lathen.

1.3. QA Leader

The GeoEngineers project QA Leader is under the direction of David Lauder and Bruce Williams, who are responsible for the project's overall QA. The Project QA Leader is responsible for coordinating QA/QC activities as they relate to the acquisition of field data. Mark Lybeer is the QA Leader. The QA Leader has the following responsibilities:

- Serves as the official contact for laboratory data QA concerns.
- Responds to laboratory data, QA needs, resolves issues, and answers requests for guidance and assistance.
- Reviews the implementation of the QAPP and the adequacy of the data generated from a quality perspective.
- Maintains the authority to implement corrective actions as necessary.
- Reviews and approves the laboratory QA Plan.
- Evaluates the laboratory's final QA report for any condition that adversely impacts data generation.
- Ensures that appropriate sampling, testing, and analysis procedures are followed and that correct QC checks are implemented.
- Monitors subcontractor compliance with data quality requirements.

1.4. Laboratory Management

The subcontracted laboratories conducting sample analyses for this project are required to obtain approval from the QA Leader before the initiation of sample analysis to assure that the laboratory QA plan complies with the project QA objectives. The Laboratory's QA Coordinator administers the Laboratory QA Plan and is responsible for QC. Specific responsibilities of this position include:

- Ensure implementation of the QA Plan.
- Serve as the laboratory point of contact.
- Activate corrective action for out-of-control events.
- Issue the final QA/QC report.

- Administer QA sample analysis.
- Comply with the specifications established in the project plans as related to laboratory services.
- Participate in QA audits and compliance inspections.

The chemical analytical laboratory QA Coordinator will be determined after an Ecology-accredited laboratory is chosen.

1.5. Health and Safety

A site-specific HASP will be used for site characterization field activities and is presented in Appendix D. The Field Coordinator will be responsible for implementing the HASP during sampling activities. The PM will discuss health and safety issues with the Field Coordinator on a routine basis during the completion of field activities.

The Field Coordinator will conduct a tailgate safety meeting each morning before beginning daily field activities. The Field Coordinator will terminate any work activities that do not comply with the HASP. Companies providing services for this project on a subcontracted basis will be responsible for developing and implementing their own HASP. GeoEngineers will review subcontractor HASPs before commencement of their work at the site.

2.0 DATA QUALITY OBJECTIVES

The QA objective for technical data is to collect environmental monitoring data of known, acceptable, and documentable quality. The QA objectives established for the project are:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis, and data reporting that will facilitate consistency and thoroughness of data generated.
- Achieve the acceptable level of confidence and quality required so that data generated are scientifically valid and of known and documented quality. This will be performed by establishing criteria for precision, accuracy, representativeness, completeness, and comparability, and by testing data against these criteria.

The sampling design, field procedures, laboratory procedures, and QC procedures are set up to provide high-quality data for use in this project. Specific data quality factors that may affect data usability include quantitative factors (precision, bias, accuracy, completeness, and reporting limits) and qualitative factors (representativeness and comparability). The measurement quality objectives (MQO) associated with these data quality factors are summarized in Table D-1 and are discussed below.

2.1. Analytes and Matrices of Concern

Samples of soil and vapor will be collected during the interim action. Tables D-2 and D-3 summarize the analyses to be performed at the Site for soil and vapor.

2.2. Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Individual instruments often can detect but not accurately quantify compounds at concentrations lower than the MDL, referred to as the instrument detection limit (IDL). Although results reported near the MDL or IDL provide insight to site conditions, QA dictates that analytical methods achieve a consistently reliable level of detection known as the practical quantitation limit (PQL). The contract laboratory will provide numerical results for all analytes and report them as detected above the PQL or undetected at the PQL.

Achieving a stated detection limit for a given analyte is helpful in providing statistically useful data. Intended data uses, such as comparison to numerical criteria or risk assessments, typically dictate specific project target reporting limits (TRLs) necessary to fulfill stated objectives. The PQL for site COPCs are presented in Table D-2 for soil. Vapor volatile organic compound MDLs are presented in Table D-3. These reporting limits were obtained from Ecology-certified laboratories (Anatek Labs, Spokane, Washington and Pace Analytical, Minneapolis, Minnesota). Other criteria include State of Washington (WAC 173-201) and federal Ambient Water Quality Criteria (AWQC). The analytical methods and processes selected will provide PQLs less than the TRLs under ideal conditions. However, the reporting limits in Table D-2 are considered targets because several factors may influence final detection limits. First, moisture and other physical conditions of soil affect detection limits. Second, analytical procedures may require sample dilutions or other practices to accurately quantify a particular analyte at concentrations above the range of the instrument. The effect is that other analytes could be reported as undetected but at a value much higher than a specified TRL. Data users must be aware that high non-detect values, although correctly reported, can bias statistical summaries and careful interpretation is required to correctly characterize site conditions.

2.3. Accuracy

Accuracy is a measure of bias in the analytic process. The closer the measurement value is to the true value, the greater the accuracy. This measure is defined as the difference between the reported values versus the actual value and is often measured with the addition of a known compound to a sample. The amount of known compound reported in the sample, or percent recovery, assists in determining the performance of the analytical system in correctly quantifying the compounds of interest. Since most environmental data collected represent one point spatially and temporally rather than an average of values, accuracy plays a greater role than precision in assessing the results. In general, if the percent recovery is low, non-detect results may indicate that compounds of interest are not present when in fact these compounds are present. Detected compounds may be biased low or reported at a value less than actual environmental conditions. The reverse is true when recoveries are high. Non-detect values are considered accurate while detected results may be higher than the true value.

Accuracy will be expressed as the percent recovery of a surrogate compound (also known as "system monitoring compound"), a matrix spike (MS) result, or from a standard reference material where:

$$Recovery\,(\%) = \frac{Sample\ Result}{Spike\ Amount}\ X\ 100$$

Persons performing the evaluation must review one or more pertinent documents (EPA October 1999; EPA October 2004a) that address criteria exceedances and courses of action. Accuracy criteria for surrogate spikes, MS, and laboratory control spikes (LCS) are found in Table D-1 of this QAPP.

2.4. Representativeness, Completeness and Comparability

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. The determination of the representativeness of the data will be performed by completing the following:

- Comparing actual sampling procedures to those delineated within the SAP and this QAPP.
- Comparing analytical results of field duplicates to determine the variations in the analytical results.
- Invalidating non-representative data or identifying data to be classified as questionable or qualitative. Only representative data will be used in subsequent data reduction, validation, and reporting activities.

Completeness establishes whether a sufficient amount of valid measurements were obtained to meet project objectives. The number of samples and results expected establishes the comparative basis for completeness. Completeness goals are 90 percent useable data for samples/analyses planned. If the completeness goal is not achieved an evaluation will be made to determine if the data are adequate to meet study objectives.

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to determine overall usefulness of data sets, following the determination of both precision and accuracy.

2.5. Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Some analytical methods specify a holding time for analysis only. For many methods, holding times may be extended by sample preservation techniques in the field. If a sample exceeds a holding time, then the results may be biased low. For example, if the extraction holding time for volatile analysis of soil sample is exceeded, then the possibility exists that some of the organic constituents have volatilized from the sample or degraded. Results for that analysis will be qualified as estimated to indicate that the reported results may be lower than actual site conditions. Holding times are presented in Table D-4.

2.6. Blanks

According to the *National Functional Guidelines for Organic Data Review* (EPA 1999), "The purpose of laboratory (or field) blank analysis is to determine the existence and magnitude of contamination resulting from laboratory (or field) activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks, instrument blanks, trip blanks, and equipment blanks)." Trip blanks are placed with samples during shipment; method blanks are created during sample preparation and follow samples throughout the analysis process.

Analytical results for blanks will be interpreted in general accordance with *National Functional Guidelines for Organic Data Review* and professional judgment.

3.0 SAMPLE COLLECTION, HANDLING AND CUSTODY

3.1. Sampling Equipment Decontamination

The objective of the decontamination procedure is to minimize the potential for cross-contamination between sample locations.

A designated decontamination area will be established for decontamination of drilling equipment and reusable sampling equipment. Drilling equipment will be cleaned using high-pressure/low-volume cleaning equipment.

Soil sampling equipment will be decontaminated in accordance with the following procedures before each sampling attempt or measurement.

Brush equipment with a nylon brush to remove large particulate matter.

1. Rinse with potable tap water.
2. Wash with non-phosphate detergent solution (Liquinox® and potable tap water).
3. Rinse with potable tap water.
4. Rinse with distilled water.

3.2. Sample Containers and Labeling

The Field Coordinator will establish field protocol to manage field sample collection, handling, and documentation. Soil samples obtained during interim action activities will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Table D-4.

Sample containers will be labeled with the following information at the time of collection:

- project name and number;
- sample name, which will include a reference to depth if appropriate; and
- date and time of collection.

The sample collection activities will be noted in the field log books. The Field Coordinator will monitor consistency between the SAP, sample containers/labels, field log books, and the COC.

3.3. Sample Storage

Soil samples will be placed in a cooler with “blue ice” or double-bagged “wet ice” immediately after they are collected. The objective of the cold storage will be to attain a sample temperature of 4 degrees Celsius. Holding times will be observed during sample storage. Holding times for the project analyses are summarized in Table D-4.

Vapor samples will be stored in a padded shipping box at room temperature.

3.4. Sample Shipment

Soil samples will be transported and delivered to the analytical laboratory in the coolers. Field personnel will transport and hand-deliver samples that are being submitted to a local laboratory for analysis. Samples that are being submitted to an out-of-town laboratory for analysis will be transported by a commercial express mailing service on an overnight basis. The Field Coordinator will monitor that the shipping container (cooler) has been properly secured using clear plastic tape and custody seals.

Measures will be implemented to minimize the potential for sample breakage, which includes packaging materials and placing sample bottles in the cooler in a manner intended to minimize damage. Sample bottles will be appropriately wrapped with bubble wrap or other protective material before being place in coolers.

3.5. COC Records

Field personnel are responsible for the security of samples from the time the samples are taken until the samples have been received by the shipper or laboratory. A COC form will be completed at the end of each field day for samples being shipped to the laboratory. Information to be included on the COC form includes:

- Project name and number.
- Sample identification number.
- Date and time of sampling.
- Sample matrix (soil, vapor, etc.) and number of containers from each sampling point, including preservatives used.
- Analyses to be performed.
- Names of sampling personnel and transfer of custody acknowledgment spaces.
- Shipping information including shipping container number.

The original COC record will be signed by a member of the field team and bear a unique tracking number. Field personnel shall retain carbon copies and place the original and remaining copies in a plastic bag, placed within the cooler or taped to the inside lid of the cooler before sealing the container for shipment. This record will accompany the samples during transit by carrier to the laboratory.

3.6. Laboratory Custody Procedures

The laboratory will follow their standard operating procedures (SOPs) to document sample handling from time of receipt (sample log-in) to reporting. Documentation will include at a minimum, the analysts name or initial, time, and date.

3.7. Field Documentation

Field documentation provides important information about potential problems or special circumstances surrounding sample collection. Field personnel will maintain daily field logs while on-site. The field logs will be prepared on field report forms or in a bound logbook. Entries in the

field logs and associated sample documentation forms will be made in waterproof ink, and corrections will consist of line-out deletions that are initialed and dated. Individual logbooks will become part of the project files at the conclusion of the site characterization field explorations.

At a minimum, the following information will be recorded during the collection of each sample:

- Sample location and description.
- Site or sampling area sketch showing sample location and measured distances.
- Sampler's name(s).
- Date and time of sample collection.
- Designation of sample as composite or discrete.
- Type of sample (soil or vapor).
- Type of sampling equipment used.
- Field instrument readings.
- Field observations and details that are pertinent to the integrity/condition of the samples (e.g., weather conditions, performance of the sampling equipment, sample depth control, sample disturbance, etc.).
- Preliminary sample descriptions (e.g., lithologies, noticeable odors, colors, field-screening results).
- Sample preservation.
- Shipping arrangements (overnight air bill number).
- Name of recipient laboratory.

In addition to the sampling information, the following specific information also will be recorded in the field log for each day of sampling:

- Team members and their responsibilities.
- Time of arrival/entry on Site and time of Site departure.
- Other personnel present at the Site.
- Summary of pertinent meetings or discussions with regulatory agency or contractor personnel.
- Deviations from sampling plans, Site safety plans, and QAPP procedures.
- Changes in personnel and responsibilities with reasons for the changes.
- Levels of safety protection.
- Calibration readings for any equipment used and equipment model and serial number.

The handling, use, and maintenance of field log books are the field coordinator's responsibilities.

4.0 CALIBRATION PROCEDURES

4.1. Field Instrumentation

Equipment and instrumentation calibration facilitates accurate and reliable field measurements. Field and laboratory equipment used on the project will be calibrated and adjusted in general accordance with the manufacturer's recommendations. Methods and intervals of calibration and maintenance will be based on the type of equipment, stability characteristics, required accuracy, intended use, and environmental conditions. The basic calibration frequencies are described below.

The PID or flame-ionization detector (FID) used for vapor measurements will be calibrated daily, if required (based on the model used), for site safety monitoring purposes in general accordance with the manufacturer's specifications. If daily calibration is not required for a specific PID model, calibration of the PID will be checked to make sure it is up to date. The calibration results will be recorded in the field logbook.

4.2. Laboratory Instrumentation

For analytical chemistry, calibration procedures will be performed in general accordance with the methods cited and laboratory standard operating procedures. Calibration documentation will be retained at the laboratory and readily available for a period of six months.

5.0 DATA REPORTING AND LABORATORY DELIVERABLES

Laboratories will report data in formatted hardcopy and digital form. Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the field sample identification, the laboratory identification, reporting units, qualifiers, analytical method, analyte tested, analytical result, extraction and analysis dates, and detection limit (PQL only). Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues. Laboratory EDD will be established by GeoEngineers, Inc., with the contract laboratory. Final results will be sent to the PM.

The laboratory will assure that the full heights of all peaks appear on the chromatograms and that the same horizontal time scale is used to allow for comparisons to other chromatograms.

6.0 INTERNAL QC

6.1. Laboratory QC

Laboratory QC procedures will be evaluated through a formal data validation process. The analytical laboratory will follow standard method procedures that include specified QC monitoring requirements. These requirements will vary by method but generally include:

- method blanks
- internal standards
- calibrations

- MS/matrix spike duplicates MSD)
- LCS/laboratory control spike duplicates (LCSD)
- laboratory replicates or duplicates
- surrogate spikes

6.1.1. Laboratory Blanks

Laboratory procedures employ the use of several types of blanks but the most commonly used blank for QA/QC assessments are method blanks. Method blanks are laboratory QC samples that consist of either a soil like material having undergone a contaminant destruction process or high performance liquid chromatography (HPLC) water. Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. Method blanks are particularly useful during volatiles analysis since VOCs can be transported in the laboratory through the vapor phase. If a substance is found in the method blank then one (or more) of the following occurred:

- Measurement apparatus or containers were not properly cleaned and contained contaminants.
- Reagents used in the process were contaminated with a substance(s) of interest.
- Contaminated analytical equipment was not properly cleaned.
- Volatile substances in the air with high solubility or affinities toward the sample matrix contaminated the samples during preparation or analysis.

It is difficult to determine which of the above scenarios took place if blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. Given method blank results, validation rules assist in determining which substances in samples are considered "real," and which ones are attributable to the analytical process. Furthermore, the guidelines state, ". . . there may be instances where little or no contamination was present in the associated blank, but qualification of the sample is deemed necessary. Contamination introduced through dilution water is one example."

6.1.2. Calibrations

Several types of calibrations are used, depending on the method, to determine whether the methodology is 'in control' by verifying the linearity of the calibration curve and to assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations, and continuing calibration verification.

6.1.3. MS/MSD

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. For example, extreme pH affects the results of semivolatile organic compounds (SVOCs). Or, the presence of a particular compound may interfere with accurate quantitation of another analyte. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix affects cannot be determined due to dilution and/or high levels of related substances in the sample. A MS is evaluated by spiking a known amount of one or more of the target analytes ideally at a concentration of 5 to 10 times higher than the sample result. A percent recovery is calculated by

subtracting the sample result from the spike result, dividing by the spiked amount, and multiplying by 100.

The samples for the MS and MSD analyses should be collected from a boring or sampling location that is believed to exhibit low-level contamination. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to determine the presence of matrix interferences, which can best be achieved with low levels of contaminants. Additional sample volume will be collected for these analyses. This MS/MSD sample will be a composite to achieve a level of representativeness and reproducibility in the data.

6.1.4. LCS/LCSD

Also known as blanks spikes, LCSs are similar to MSs in that a known amount of one or more of the target analytes are spiked into a prepared media and a percent recovery of the spiked substances are calculated. The primary difference between a MS and LCS is that the LCS media is considered "clean" or contaminant free. For example, HPLC water is typically used for LCS water analyses. The purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance, and analyst performance. LCS data must be reviewed in context with other controls to determine if out-of-control events occur.

6.1.5. Laboratory Replicates/Duplicates

Laboratories often utilize MS/MSDs, LCS/LCSDs, and/or replicates to assess precision. Replicates are a second analysis of a field collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process, but most commonly occur as a second analysis on the extracted media.

6.1.6. Surrogate Spikes

The purposes of using a surrogate are to verify the accuracy of the instrument being used and extraction procedures. Surrogates are substances similar to, but not one of, the target analytes. A known concentration of surrogate is added to the sample and passed through the instrument, noting the surrogate recovery. Each surrogate used has an acceptable range of percent recovery. If a surrogate recovery is low, sample results may be biased low and depending on the recovery value, a possibility of false negatives may exist. Conversely, when recoveries are above the specified range of acceptance a possibility of false positives exist, although non-detected results are considered accurate.

7.0 DATA REDUCTION AND ASSESSMENT PROCEDURES

7.1. Data Reduction

Data reduction involves the conversion or transcription of field and analytical data to a useable format. The laboratory personnel will reduce the analytical data for review by the QA Leader and PM.

7.2. Field Measurement Evaluation

Field data will be reviewed at the end of each day by following the QC checks outlined below and procedures in the SAP. Field data documentation will be checked against the applicable criteria as follows:

- Sample collection information.
- Field instrumentation and calibration.
- Sample collection protocol.
- Sample containers, preservation and volume.
- Field QC samples collected at the frequency specified.
- Sample documentation and COC protocols.
- Sample shipment.

Cooler receipt forms and sample condition forms provided by the laboratory will be reviewed for out-of-control incidents. The final report will contain what effects, if any, an incident has on data quality. Sample collection information will be reviewed for correctness before inclusion in a final report.

7.3. Field QC Evaluation

A field QC evaluation will be conducted by reviewing field log books and daily reports, discussing field activities with staff, and reviewing field QC samples (trip blanks and field duplicates). Trip blanks will be evaluated using the same criteria as method blanks.

Precision for field duplicate soil samples will not be evaluated because even a well-mixed sample is not entirely homogenous due to sampling procedures, soil conditions, and contaminant transport mechanisms.

7.4. Laboratory Data QC Evaluation

The laboratory data assessment will consist of a formal review of the following QC parameters:

- Holding times
- Method blanks
- MS/MSD
- LCS/LCSD
- Surrogate spikes
- Replicates

In addition to these QC mechanisms, other documentation such as cooler receipt forms and case narratives will be reviewed to fully evaluate laboratory QA/QC.

8.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 1998. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). Revision 5. April.

U.S. Environmental Protection Agency (EPA). 1999. Contract Laboratory Program National Functional Guidelines for Organic Data Review. 540/R-99/008.

U.S. Environmental Protection Agency (EPA). 2004a. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. 540/R-04/004.

U.S. Environmental Protection Agency (EPA). 2004b. EPA Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. EPA 04-03-030.

Washington State Department of Ecology (Ecology), 1997. Analytical Methods for Petroleum Hydrocarbons. Publication No. ECY 97-602. June.

Table D-1

Measurement Quality Objectives

Airport Kwik Stop
Ione, Washington

		Check Standard (LCS) %R Limits[2,3]		Matrix Spike (MS) %R Limits[3]	Surrogate Standards (SS) %R Limits [1,2,3]	MS Duplicate Samples or Lab Duplicate RPD Limits[4]		Field Duplicate Samples RPD Limits[4]	
Laboratory Analysis	Reference Method	Soil	Vapor	Soil	Soil/Vapor	Soil	Vapor	Soil	Vapor
Gasoline-range Petroleum Hydrocarbons	Ecology NWTPH-Gx/ EPA TO15	70%-130%	NA	70%-130%	70%-130%	≤20%	NA	≤20%	NA
VOCs	EPA 8260	70%-130%	41%-150%	70%-130%	70%-130%	≤20%	25%	≤20%	25%
Metals	EPA 6000/7000 Series	80%-120%	NA	75%-125%	75%-130%	≤20%	NA	≤35%	NA

Notes:

Method numbers refer to EPA SW-846 Analytical Methods or Washington State Department of Ecology (Ecology) recommended analytical methods.

[1] Individual surrogate recoveries are compound specific

[2] Recovery Ranges are estimates. Actual ranges will be provided by the laboratory when contracted.

[3] Percent Recovery Limits are expressed as ranges based on laboratory control limits. Limits will vary for individual analytes

[4] RPD control limits are only applicable if the concentration are greater than 5 times the method reporting limit (MRL). For results less than 5 times the MRL, the difference between the sample and duplicate must be less than 2X the MRL for soils.

VOCs = Volatile Organic Compounds

LCS = Laboratory Control Sample; MS/MSD = Matrix Spike/Matrix Spike Duplicate; EPA = Environmental Protection Agency; RPD = Relative Percent Difference; NA = Not Applicable

https://projects.geoengineers.com/sites/0050405802/Final/SVE Specifications and Work Plan/[Appendix D Tables.xlsx]Table D-1

Table D-2

Methods of Analysis and Practical Quantitation Limits (Soil)

Airport Kwik Stop
Ione, Washington

Analyte	Analytical Method	Practical Quantitation Limit (mg/kg)	MTCA Method A Cleanup Level (mg/kg)
Total Petroleum Hydrocarbons			
TPH-Gasoline Range	NWTPH-Gx	2.5	100/30[1]
Volatile Organic Compounds			
Benzene	EPA 8260	0.0125	0.03
Toluene	EPA 8260	0.0125	7
Ethylbenzene	EPA 8260	0.0125	6
M+P Xylene	EPA 8260	0.0375	9[2]
O-Xylene	EPA 8260	0.0375	9[2]
Methyl T-Butyl Ether (MTBE)	EPA 8260	0.0125	0.1
1,2-Dichloroethane (EDC)	EPA 8260	0.0125	
1,2-Dibromoethane (EDB)	EPA 8260/8260B-SIM	0.0125/0.002	0.005
Naphthalene	EPA 8260	0.0125	5
Metals			
Lead	EPA 6010	0.001	250

Notes:

[1] MTCA Method A cleanup level for gasoline-range hydrocarbons is 100 mg/kg if benzene is not detected and the total concentration of ethylenzene, toluene and xylenes are less than 1 percent of the gasoline mixture; otherwise the cleanup level is 30 mg/kg.

[2] Cleanup level for total xylenes

EPA = Envionmental Protection Agency
mg/kg = milligrams per kilogram

https://projects.geoengineers.com/sites/0050405802/Final/SVE Specifications and Work Plan/[Appendix D Tables.xlsx]Table D-2

Table D-3

Methods of Analysis and Target Reporting Limits (Vapor)

Airport Kwik Stop
Ione, Washington

Analyte1	Method Detection Limit[2] ($\mu g/m^3$)	Method Detection Limit[2] (ppbv)
1,1,1-Trichloroethane	0.100	0.555
1,1,2,2-Tetrachloroethane	0.027	0.188
1,1,2-Trichloroethane	0.100	0.275
1,1,2-Trichlorotrifluoroethane	0.100	0.800
1,1-Dichloroethane	0.100	0.412
1,1-Dichloroethene	0.100	0.403
1,2,4-Trichlorobenzene	0.100	0.495
1,2,4-Trimethylbenzene	0.100	0.500
1,2-Dibromoethane	0.100	0.780
1,2-Dichlorobenzene	0.100	0.610
1,2-Dichloroethane	0.050	0.210
1,2-Dichloropropane	0.100	0.470
1,3,5-Trimethylbenzene	0.026	0.130
1,3-Butadiene	0.100	0.225
1,3-Dichlorobenzene	0.100	0.610
1,4-Dichlorobenzene	0.100	0.610
2-Butanone (MEK)	0.052	0.156
2-Hexanone	0.100	0.415
2-Propanol	0.037	0.463
4-Ethyltoluene	0.100	0.500
4-Methyl-2-pentanone (MIBK)	0.100	0.415
Acetone	0.100	0.241
Benzene	0.050	0.163
Benzyl Chloride	0.100	0.525
Bromodichloromethane	0.026	0.177
Bromoform	0.100	1.051
Bromomethane	0.046	0.181
Carbon Disulfide	0.100	0.317
Carbon tetrachloride	0.050	0.320
Chlorobenzene	0.100	0.468
Chloroethane	0.100	0.268
Chloroform	0.100	0.497
Chloromethane	0.100	0.210
cis-1,2-Dichloroethene	0.038	0.153
cis-1,3-Dichloropropene	0.024	0.111
Cyclohexane	0.100	0.340
Dibromochloromethane	0.100	0.866
Dichlorodifluoromethane	0.100	0.505
Dichlorotetrafluoroethane	0.030	0.213
Ethanol	0.100	0.192
Ethyl Acetate	0.098	0.359
Ethyl Benzene	0.027	0.119
Hexachlorobutadiene	0.100	1.100
m&p-Xylene	0.200	0.880
Methyl Tert Butyl Ether	0.024	0.088
Methylene chloride	0.100	0.353

Naphthalene	0.100	0.533
n-Heptane	0.100	0.415
n-Hexane	0.100	0.360
o-Xylene	0.029	0.128
Propylene	0.100	0.175
Styrene	0.100	0.433
Tetrachloroethene	0.050	0.345
Tetrahydrofuran	0.100	0.300
Toluene	0.100	0.385
trans-1,2-dichloroethene	0.100	0.405
trans-1,3-Dichloropropene	0.100	0.460
Trichloroethene	0.050	0.275
Trichlorofluoromethane	0.039	0.222
Vinyl Acetate	0.100	0.355
Vinyl chloride	0.050	0.130

Notes:

[1] Analysis performed using EPA TO15

[2] Method Detection Limit (MDL) based on information provided by Pace Analytical.

EPA = Environmental Protection Agency

$\mu g/m^3$ = micrograms per cubic meter; ppbv = parts per billion by volume

/projects.geoengineers.com/sites/0050405802/Final/SVE Specifications and Work Plan/[Appendix D Tables.xlsx]Table D-3

Table D-4

Test Methods, Sample Containers, Preservation and Holding Time

Airport Kwik Stop
Ione, Washington

		Soil				Vapor			
Analysis	**Method**	**Minimum Sample Size**	**Sample Containers**	**Sample Preservation**	**Holding Times**	**Minimum Sample Size**	**Sample Containers**	**Sample Preservation**	**Holding Times**
Gasoline-Range Hydrocarbons	NWTPH-Gx	100 g	8 or 16 oz amber glass wide-mouth with Teflon-lined lid	Cool 4°C	14 days to extraction, 28 days from extraction to analysis	NA	NA	NA	NA
VOCs	EPA 8260/ EPA TO15	100 g	4 or 8 oz glass widemouth with Teflon-lined lid and 5035 kit with methanol preserved vial and two dry vials	Cool 4°C	48 hours to freeze samples in laboratory then 14 days	6 L	1 - 6 L Canister	Room Temperature	30 days
Metals	EPA 6000/7000 Series	100 g	4 or 8 oz glass widemouth with Teflon-lined lid	Cool 4°C	180 days	NA	NA	NA	NA

Notes:

Holding Times are based on elapsed time from date of collection
VOCs = Volatile organic compounds (to include naphthalene, ethylene dibromide (EDB), 1,2-dichloroethane (EDC), and methyl tert butyl ether (MTBE).
EPA = Environmental Protection Agency
oz = ounce; L = liter; g = grams

https://projects.geoengineers.com/sites/0050405802/Final/SVE Specifications and Work Plan/[Appendix D Tables.xlsx]Table D-4

APPENDIX E
Health and Safety Plan

APPENDIX E
HEALTH AND SAFETY PLAN

GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
Airport Kwik Stop Project
File No. 0504-058-02

This HASP is to be used in conjunction with the GeoEngineers Safety Program Manual. Together, the written safety programs and this HASP constitute the site safety plan for this site. This plan is to be used by GeoEngineers personnel on this site and must be available on-site. If the work entails potential exposures to other substances or unusual situations, additional safety and health information will be included, and the plan will need to be approved by the GeoEngineers Health and Safety Manager. All plans are to be used in conjunction with current standards and policies outlined in the GeoEngineers Health and Safety Program Manual.

Liability Clause: If requested by subcontractors, this site safety plan may be provided for informational purposes only. In this case, Form C-3 shall be signed by the subcontractor. Please be advised that this Site Safety Plan is intended for use by GeoEngineers Employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this Site Safety Plan. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by them.

GENERAL PROJECT INFORMATION

Project Name:	*Airport Kwik Stop*
Project Number:	0504-058-02
Type of Project:	Interim Action
Start/Completion:	November 1, 2011 through June 30, 2012
Subcontractors:	drillers, surveyors, analytical laboratory, remediation contractor, transporters

WORK PLAN

The interim action consists of installing a soil vapor extraction/bioventing (SVE/BV) remediation system. Components of the interim action include:

- Install four additional SVE wells;
- Construct a treatment system compound and piping manifold;

- Install remediation equipment;
- Excavate piping trenches and connect SVE/BV wells to the piping manifold;
- Dispose contaminated trenching spoils at a permitted facility;
- Install vapor effluent treatment equipment (catalytic oxidizer and granular activated carbon vessels); and
- Conduct regular operations and maintenance visits and vapor sampling.

List of Field Activities

Check the activities to be completed during the project

	Site reconnaissance	X	Field Screening of Soil Samples
X	Exploratory Borings	X	Vapor Measurements
X	Construction Monitoring		Groundwater Sampling
	Monitoring Well Installation	X	Soil Stockpile Testing
	Monitoring Well Development		Remedial Excavation
	Soil Sample Collection		UST Removal Monitoring
	Remedial Pilot tests		Geophysical Survey

LIST OF FIELD PERSONNEL AND TRAINING

Name of Employee on Site	Level of HAZWOPER Training (24-/40-hour)	Date of 8-Hour Refresher Training	Date of HAZWOPER Supervisor Training	First Aid/ CPR	Date of Other Trainings	Date of Respirator Fit Test
Scott Lathen	5/21/07	Feb. 2012				2/18/11
Kevin Randall	4/1/07	Feb. 2012		2012		
Katie Hall	2011	Feb. 2012		2012		March 2012

Notes:
CPR – cardiopulmonary resuscitation
HAZWOPER – hazardous waste operations and emergency response

Chain of Command	Title	Name	Telephone Numbers
1	Project Manager	Dave Lauder	509.363.3125
2	HAZWOPER Supervisor	Bruce Williams	509.363.3125
3	Field Engineer/Geologist	Scott Lathen	509.251.5239
		Katie Hall	509.768.3579
4	Site Safety and Health Supervisor	Scott Lathen	509.251.5239
5	Client Assigned Site Supervisor		

6	Health and Safety Program Manager	Wayne Adams	253-383-4940
N/A	Subcontractor(s)	TBD	
	Current Owner		

EMERGENCY INFORMATION

Hospital Name and Address:

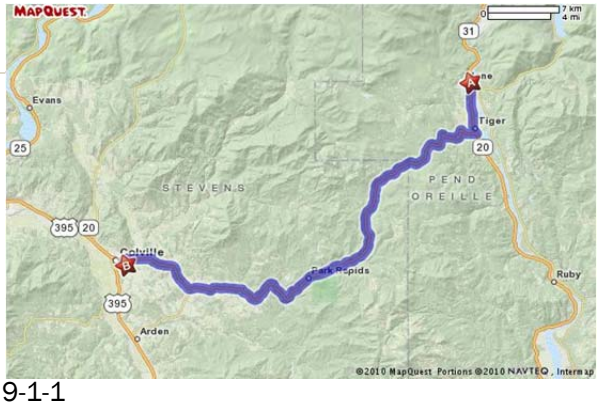
Mount Carmel Hospital
982 E Columbia
Colville, WA 99114
(509) 685-510

Phone Numbers (Hospital ER): Phone: **(509) 685-5100**

Distance:

Route to Hospital:

Start out going West on Main Street Toward N 1st Ave
Turn **LEFT** onto **S 2ND AVE / WA-31**.
Continue to follow **WA-31**.
Turn right on WA-20
Turn left onto N Alder Street
Turn right onto E Birch Ave
Turn Left onto E Columbia Ave
Arrive 982 E Columbia Avenue on right



Ambulance: 9-1-1
Poison Control: Other (800) 732-6985
Police: 9-1-1
Fire: 9-1-1
Location of Nearest Telephone: Cell phones are carried by field personnel.
Nearest Fire Extinguisher: Located in the GeoEngineers vehicle on-site.
Nearest First-Aid Kit: Located in the GeoEngineers vehicle on-site.

Standard Emergency Procedures

Get help

- send another worker to phone 9-1-1 (if necessary)
- as soon as feasible, notify GeoEngineers' PM

Reduce risk to injured person

- turn off equipment
- move person from injury location (if in life-threatening situation only)
- keep person warm
- perform CPR (if necessary)

Transport injured person to medical treatment facility (if necessary)

- by ambulance (if necessary) or GeoEngineers vehicle
- stay with person at medical facility
- keep GeoEngineers manager apprised of situation and notify Human Resources Manager of situation

HAZARD ANALYSIS

- Total petroleum hydrocarbons, gasoline, diesel, volatile organic hydrocarbons, and lead
- Drill rig/ heavy equipment operation hazards

Note: A hazard assessment will be completed at every site prior to beginning field activities. Updates will be included in the daily log. This list is a summary of hazards listed on the form.

Physical Hazards

X	Excavation equipment
X	Utilities/ utility locate
X	Drill Rigs

- Utility checklist will be completed as required for the location to prevent drilling into utilities.
- Work areas will be marked with reflective cones, barricades and/or caution tape. High-visibility vests will be worn by on-site personnel to ensure they can be seen by vehicle and equipment operators.
- Field personnel will be aware at all times of the location and motion of heavy equipment in the area of work to ensure a safe distance between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus. Personnel will approach operating heavy equipment only when they are certain the operator has indicated that it is safe to do so through hand signal or other acceptable means.
- Heavy equipment and/or vehicles used on this site will not work within 20 feet of overhead utility lines without first ensuring that the lines are not energized. This distance may be reduced to 10 feet depending on the client and the use of a safety watch. Note: If it is later determined that overhead lines are a hazard on this job site a copy the overhead lines safety section from the HASP Supplemental document will be attached.
- Personnel will avoid tripping hazards, steep slopes, pits and other hazardous encumbrances. If it becomes necessary to work within 6 feet of the edge of a pit, slope or other potentially hazardous area, appropriate fall protection measures will be implemented by the Site Safety and Health Supervisor in accordance with OSHA/Division of Occupational Safety and Health (DOSH) regulations and the GeoEngineers Health and Safety Program.

- Heat stress control measures required for this site will be implemented according to GeoEngineers Health and Safety Program with water provided on-site.

Engineering Controls

X Trench shoring (1:1 slope for Type B Soils)

X Location work spaces upwind/wind direction monitoring

X Other soil covers (as needed)

_____ Other (specify) _____

Chemical Hazards

Chemical Hazards (Potentially Present at Site)

Substance	Pathways
Aromatic hydrocarbons (benzene, ethylbenzene, toluene, xylenes [BETX])	ingestion, inhalation, and direct contact
Gasoline	ingestion, inhalation, and direct contact

Specific Chemical Hazards and Exposures (Potentially Present at Site)

Compound/ Description	Exposure Limits/IDLH	Exposure Routes	Symptoms/Health Effects
Benzene	OSHA PEL 1 ppm Short term: 5 ppm ACGIH PEL 0.5 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritated eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]
Gasoline (Unleaded) — clear liquid with a characteristic odor	PEL 300 ppm TLV 300 ppm STEL 500 ppm	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; headache; dermatitis

Notes:

IDLH = immediately dangerous to life or health
OSHA = Occupational Safety and Health Administration
ACGIH = American Conference of Governmental Industrial Hygienists
mg/m^3 = milligrams per cubic meter
TWA = time-weighted average (Over 8 hrs.)
PEL = permissible exposure limit
TLV = threshold limit value (over 10 hrs)
STEL = short-term exposure limit (15 min)
ppm = parts per million

Biological Hazards and Procedures

Y/N	Hazard	Procedures
	Poison Ivy or other vegetation	
X	Insects or snakes	Work gloves and long sleeve shirt
X	Used hypodermic needs or other infectious hazards	Do not pick up or contact
	Others:	

Additional Hazards

Update in Daily Report. Include evaluation of:

- *Physical Hazards* (excavations and shoring, equipment, traffic, tripping, heat stress, cold stress and others)
- *Chemical Hazards* (odors, spills, free product, airborne particulates and others present)
- *Biological Hazards* (snakes, spiders, other animals, discarded needles, poison ivy, pollen, bees/wasps and others present)

AIR MONITORING PLAN

Work upwind if at all possible.

Check instrumentation to be used:

X Photoionization Detector (PID)

CHECK MONITORING FREQUENCY/LOCATIONS AND TYPE (SPECIFY: WORK SPACE, BOREHOLE, BREATHING ZONE):

15 minutes – continuous during soil disturbance activities or handling samples

30 minutes – continuous during soil disturbance activities or handling samples

X Hourly (in breathing zone during excavations, drilling, sampling)

Additional personal air monitoring for specific chemical exposure:

Action levels:

- The workspace will be monitored using a PID. These instruments must be properly maintained, calibrated and charged (refer to the instrument manuals for details). Zero this meter in the same relative humidity as the area in which it will be used and allow at least a 10-minute warm-up prior to zeroing. Do not zero in a contaminated area. The PID can be tuned to read chemicals specifically if there are not multiple contaminants on-site. It can be tuned to detect one chemical with the response factor entered into the equipment, but the PID picks up all VOCs present. The ionization potential (IP) of the chemical has to be less than the PID lamp

(11.7 / 10.6eV), and the PID does not detect methane. The ppm readout on the instrument is relative to the IP of isobutylene (calibration gas), so conversion must be made in order to estimate ppm of the chemical on-site.

AIR MONITORING ACTION LEVELS

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Organic Vapors	Environmental Exploration Actions	PID	Start of shift; every 30 to 60 minutes and in event of odors	Background to 5 ppm in breathing zone	Use Level D or Modified Level D PPE
Organic Vapors	Environmental Exploration Actions	PID	Start of shift; every 30 to 60 minutes and in event of odors	5 to 25 ppm in breathing zone	Upgrade to Level C PPE
Organic Vapors	Environmental Exploration Actions	PID	Start of shift; every 30 to 60 minutes	> 25 ppm in breathing zone	Stop work and evacuate the area. Contact Health and Safety Manager for guidance.

Notes:
PID – photoionization detector
PPE – personal protective equipment
ppm – parts per million

SITE CONTROL PLAN

Work zones will be considered to be within 50 feet of the drill rig. The remediation installation contractor shall establish work zones during interim action activities. Employees should work upwind of the machinery if possible. To the extent practicable, use the buddy system. Do not approach heavy equipment unless you are sure the operator sees you and has indicated it is safe to approach. All personnel from GeoEngineers and subcontractor(s) should be made aware of safety features during each morning's safety tailgate meeting (drill rig shutoff switch, location of fire extinguishers, cell phone numbers etc.). For medical assistance, see Section 3.0 above.

A contamination reduction zone should be established for personnel before leaving the site or before breaking for lunches etc. The zone should consist of garbage bags into which used PPE should be disposed. Personnel should wash hands at the site before eating or leaving the site.

Traffic or Vehicle Access Control Plans

Site personnel will be instructed to stop and look both ways before exiting the site and entering the access road.

Buddy System

Personnel on-site should use the buddy system (pairs), particularly whenever communication is restricted. If only one GeoEngineers employee is on-site, a buddy system can be arranged with subcontractor/contractor personnel. If this is not possible, periodic communication should be established between field personnel at GeoEngineers office. Field personnel should inform PM before leaving site.

Site Communication Plan

Positive communications (within sight and hearing distance or via radio) should be maintained between pairs on-site, with the pair remaining in proximity to assist each other in case of emergencies. The team should prearrange hand signals or other emergency signals for communication when voice communication becomes impaired (including cases of lack of radios or radio breakdown). In these instances, you should consider suspending work until communication can be restored; if not, the following are some examples for communication:

1. Hand gripping throat: Out of air, can't breathe.
2. Gripping partner's wrist or placing both hands around waist: Leave area immediately, no debate.
3. Hands on top of head: Need assistance.
4. Thumbs up: Okay, I'm all right: or I understand.
5. Thumbs down: No, negative.

Decontamination Procedures

Decontamination consists of removing outer protective Tyvek clothing, if required, and washing soiled boots and gloves using bucket and brush provided on-site in the contamination reduction zone. Inner gloves will then be removed, and respirator, if required, hands and face will be washed in either a portable wash station or a bathroom facility in the support zone. Employees will perform decontamination procedures and wash prior to eating, drinking or leaving the site.

Waste Disposal or Storage

PPE disposal (specify): Used PPE to be placed in on-site drums pending characterization and disposal.

Drill cutting/excavated sediment disposal or storage:

X On-site, pending analysis and further action

_____ Secured (list method) _____

_____ Other (describe destination, responsible parties): _____

PERSONAL PROTECTIVE EQUIPMENT

After the initial and/or daily hazard assessment has been completed the appropriate protective PPE will be selected to ensure worker safety. Task-specific levels of PPE shall be reviewed with field personnel during the pre-work briefing conducted prior to the start of site operations. Task-specific levels of PPE shall be reviewed with field personnel during the pre-work briefing conducted prior to the start of site operations.

Site activities include handling and sampling solid subsurface material (material may potentially be saturated with groundwater). Depth-to-groundwater measurements will be performed as well. Site hazards include potential exposure to hazardous materials, and physical hazards such as trips/falls, heavy equipment, and exposure.

Air monitoring will be conducted to determine the level of respiratory protection.

- Half-face combination organic vapor/high efficiency particulate air (HEPA) or P100 cartridge respirators will be available on-site to be used as necessary. P100 cartridges are to be used only if PID measurements are below the site action limit. P100 cartridges are used for protection against dust, metals and asbestos, while the combination organic vapor/HEPA cartridges are protective against both dust and vapor. Ensure that the PID or TLV will detect the chemicals of concern on-site.
- Level D PPE unless a higher level of protection is required will be worn at all times on the site. Potentially exposed personnel will wash gloves, hands, face and other pertinent items to prevent hand-to-mouth contact. This will be done prior to hand-to-mouth activities including eating, smoking, etc.
- Adequate personnel and equipment decontamination will be used to decrease potential ingestion and inhalation.

Check applicable personal protection gear to be used:

X	Hardhat (if overhead hazards, or client requests)
X	Steel-toed boots (if crushing hazards are a potential or if client requests)
X	Safety glasses (if dust, particles, or other hazards are present or client requests)
X	Hearing protection (if it is difficult to carry on a conversation 3 feet away)
	Rubber boots (if wet conditions)

Gloves (specify):

X	Nitrile

Protective clothing:

_____	**Tyvek (if dry conditions are encountered, Tyvek is sufficient)**
_____	Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue)
X	Cotton
X	Rain gear (as needed)
X	Layered warm clothing (as needed)

Inhalation hazard protection:

X	Level D
_____	Level C (respirators with organic vapor/HEPA or P100 filters)

8.1 PPE Inspections

PPE clothing ensembles designated for use during site activities shall be selected to provide protection against known or anticipated hazards. However, no protective garment, glove or boot is entirely chemical-resistant, nor does any PPE provide protection against all types of hazards. To obtain optimum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE. This training shall include the following:

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.

TABLE 1. HEAT STRESS

Type of Clothing	Outdoor Temperature Action Levels
Nonbreathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°
All other clothing	89°

Keeping workers hydrated in a hot outdoor environment requires that more water be provided than at other times of the year. GeoEngineers is prepared to supply at least one quart of drinking water per employee per hour. When employee exposure is at or above an applicable temperature listed in Table 1, PMs shall ensure that:

- A sufficient quantity of drinking water is readily accessible to employees at all times; and

- All employees have the opportunity to drink at least one quart of drinking water per hour.

Emergency Response

- Personnel on-site should use the "buddy system" (pairs).
- Visual contact should be maintained between "pairs" on-site, with the team remaining in proximity to assist each other in case of emergencies.
- If any member of the field crew experiences any adverse exposure symptoms while on-site, the entire field crew should immediately halt work and act according to the instructions provided by the Site Safety and Health Supervisor.
- Wind indicators visible to all on-site personnel should be provided by the Site Safety and Health Supervisor to indicate possible routes for upwind escape. Alternatively, the Site Safety and Health Supervisor may ask on-site personnel to observe the wind direction periodically during site activities.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the PM, and reevaluation of the hazard and the level of protection required.
- If an accident occurs, the Site Safety and Health Supervisor and the injured person are to complete, within 24 hours, an Accident Report for submittal to the PM, the Health and Safety Program Manager and Human Resources. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

Sampling, Managing and Handling Drums and Containers

Drums and containers shall meet the appropriate DOT, OSHA and EPA regulations for the waste that they contain. Site operations shall be organized to minimize the amount of drum or container movement. When practicable, drums and containers shall be inspected and their integrity shall be ensured before they are moved. Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. Before drums or containers are moved, all employees involved in the transfer operation shall be warned of the potential hazards associated with the contents.

Drums or containers and suitable quantities of proper absorbent shall be kept available and used where spills, leaks or rupture may occur. Where major spills may occur, a spill containment program shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred. Fire extinguishing equipment shall be on hand and ready for use to control incipient fires.

DOCUMENTATION TO BE COMPLETED FOR HAZWOPER PROJECTS

The following forms are required for HAZWOPER projects:

- Field Log
- Health and Safety Plan acknowledgment by GeoEngineers employees (Form C-2)
- Contractors Health and Safety Plan Disclaimer (Form C-3)

- Conditional forms available at GeoEngineers office: Accident Report

NOTE: The Field Report is to contain the following information:

- Updates on hazard assessments, field decisions, conversations with subcontractors, client or other parties, etc.;
- Air monitoring/calibration results, including: personnel, locations monitored, activity at the time of monitoring, etc.;
- Actions taken;
- Action level for upgrading PPE and rationale; and
- Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).

APPROVALS

1. Plan Prepared

Signature	Date

2. Plan Approval

PM Signature	Date

3. Health & Safety Officer

Wayne Adams Health & Safety Program Manager	Date

FORM E-2
SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT
IONE AIRPORT KWIK STOP
FILE NO. 0504-058-02

(All GeoEngineers' Site workers shall complete this form, which should remain attached to the Safety Plan and filed with other project documentation).

I hereby verify that a copy of the current Safety Plan has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on Site. I agree to comply with all required, specified safety regulations and procedures.

Print Name Signature Date

FORM E-3
SUBCONTRACTOR AND SITE VISITOR SITE SAFETY FORM
IONE AIRPORT KWIK STOP
FILE NO. 0504-058-02

I verify that a copy of the current Site Safety Plan has been provided by GeoEngineers, Inc. to inform me of the hazardous substances on Site and to provide safety procedures and protocols that will be used by GeoEngineers' staff at the Site. By signing below, I agree that the safety of my employees is the responsibility of the undersigned company.

Print Name	Signature	Firm	Date

Have we delivered World Class Client Service?
Please let us know by visiting **www. geoengineers.com/feedback**.

GeoEngineers