Work Plan
Supplemental Remedial Investigation

City Parcel Site
Spokane, Washington

for
Washington State Department of Ecology

May 15, 2014

GeoEngineers
Earth Science + Technology

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File No. 0504-047-03

May 15, 2014

Washington State Department of Ecology
Toxics Cleanup Program - Eastern Region Office
4601 North Monroe Street
Spokane, Washington 99205

Attention: Huckleberry Palmer, PE

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ACRONYMS

ASTM	ASTM International
AWQC	Ambient Water Quality Criteia
bgs	below ground surface
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
COC	chain-of-custody
COPC	contaminants of potential concern
CPR	cardiopulmonary resuscitation
dBA	decibels
DOSH	Division of Occupational Safety and Health
DO	Washington State Department of Transportation
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EIM	Environmental Information Management
EPA	United States Environmental Protection Agency
GPS	global positioning system

HASP	Health and Safety Plan
HAZMAT	hazardous materials
HEPA	high efficiency particulate air
HPLC	high performance liquid chromatography
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDW	investigation derived waste
LCS	laboratory control spikes
MDL	method detection limit
MQO	measurement quality objectives
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act
MUTCD	Manual of Uniform Control Devices
NAPL	non-aqueaous phase liquid
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCBs	polychlorinated biphenyls
PEL	permissible exposure limit
PID	photoionization detector
PM	project manager
PPE	personal protection equipment
ppm	parts per million
PQL	practical quantitation limit
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RI	remedial investigation
RPD	relative percent difference
SAIC	Scientific Applications International Corporation
SAP	Sampling and Analysis Plan
SOP	standard operating procedures
SVOC	semivolatile organic compound
TRL	target reporting limit
VOC	volatile organic compound
WAC	Washington Administrative Code

1.0 INTRODUCTION

This Work Plan is submitted pursuant to the Scope of Work and Fee Estimate submitted to Washington State Department of Ecology (Ecology) by GeoEngineers, Inc. (GeoEngineers) to conduct a supplemental remedial investigation (RI) to assess the presence of polychlorinated biphenyls (PCBs), and possibly observe subsequent cleanup actions at the City Parcel site (hereinafter referred to as "site") in Spokane, Washington. The location of this site is shown on the Vicinity Map, Figure 1. The intent of the supplemental RI is to evaluate soil conditions and delineate the extent of soil contamination near the north and west property boundaries of 708 North Cook Street (the address of the former City Parcel delivery service). Following completion of the supplemental RI, Ecology will implement cleanup actions, use the existing Cleanup Action Plan for the City Parcel site, and prepare plans and specifications, if results of RI activities indicate additional remedial excavation work is warranted. GeoEngineers will provide field personnel and drilling equipment for site exploration activities. GeoEngineers will also provide field personnel for cleanup activities, if necessary. Test pit explorations will be completed by a contractor (Contractor) under contract with Ecology. Cleanup activities, if necessary, will be completed by a contactor selected through a public works contract with Ecology.

This Work Plan has been prepared by GeoEngineers for Ecology under Contract Number C1100145 and Work Assignment Number C11145SS. The project Sampling and Analysis Plan (SAP) (Appendix A), the Quality Assurance Project Plan (QAPP) (Appendix B), and the Health and Safety Plan (HASP) (Appendix C) also are presented as part of this Work Plan.

2.0 BACKGROUND

This section presents background information for the site, including soil conditions, historical and current site uses and previous environmental investigations and cleanup actions.

2.1. Property Description

The former City Parcel delivery service site, located at 708 North Cook Street in Spokane, Washington, occupies about 0.65 acres. The site is bounded by a railroad line and East Springfield Avenue on the south, North Cook Street to the west, the City of Spokane Fuel and Wash Facility to the east and Mr. Service, Inc. (commercial cleaning service) to the north. The Site includes the City Parcel property, and portions of the adjacent Mr. Service property to the north, located at 728 North Cook Street, and right-of-way of North Cook Street (owned by the City of Spokane).

2.2. Site History

The City Parcel building was constructed around 1945. The site was previously occupied by Spokane Transformer, Inc. (an electrical repair and recycling business) from 1961 to 1979. Previous soil, sediment and groundwater investigations at the site were completed by the U.S. Environmental Protection Agency (EPA), Ecology & Environmental, Inc. and George Maddox and Associates, Inc. between 1976 and 1987. Scientific Applications International Corporation (SAIC) prepared a Remedial Investigation Report in 2002. Results of these investigations show that past business practices resulted in PCB spills or releases into the site structures and underlying soil.

A cleanup action at the City Parcel Site was conducted in 2009, which included demolition and off-site disposal of the former building, and excavation and off-site disposal of soil contaminated with PCBs. Several soil confirmation samples collected from excavation sidewalls at the City Parcel property boundaries contained PCBs at concentrations greater than applicable Model Toxics Control Act (MTCA) Method A cleanup levels. In particular, soil samples collected at the north site boundary (adjacent to the Mr. Service property) and several soil confirmation samples collected at the west site boundary adjacent to North Cook Street also contained PCBs at concentrations between 20.5 and 149 milligrams per kilogram (mg/kg). The approximate locations of previous confirmation samples exceeding MTCA Method A cleanup levels along the north and west property boundary of 708 North Cook Street are shown in Figure 2, Proposed Explorations and Previous Confirmation Samples Exceeding 1 mg/kg for PCBs. Note that MTCA Method A Industrial cleanup levels were used at the City Parcel property, which are 10 mg/kg for PCBs; MTCA Method A unrestricted land use cleanup levels of 1 mg/kg for PCBs will be used for adjacent properties.

2.3. Geologic and Soil Conditions

Geologic conditions at the site consist of outwash flood gravels, deposited during repeated catastrophic flood events associated with glacial Lake Missoula, which occurred between about 12,000 to 15,000 years ago. Based on groundwater monitoring wells that were previously installed at the site, the outwash gravel deposits extend to depths of at least 60 feet below site grade. Based on remedial excavation activities at the site in 2009, fill also was present at the former City Parcel property (708 North Cook Street), which extended to depths in range of about 1 to 5 feet below site grade.

3.0 SCOPE AND TASKS

Proposed assessment activities under this Work Plan are summarized as follows:

- Explore subsurface conditions using 3 to 4 direct-push soil borings (to depths of about 4 to 8 feet below site grade) and 14 to 17 test pits (to depths of about 4 to 6 feet below site grade) to better define the lateral and vertical extent of PCB contamination in soil within adjoining properties to the north and west of 708 North Cook Street. The approximate locations of the planned exploration activities explorations are shown in Figure 2.
- Collect soil samples continuously during drilling. Perform field screening and collect at least one soil sample from each 4-foot-depth interval from each direct-push boring, and from each 1-foot-depth interval from each test pit during continuous sampling.
- If cleanup actions occur, collect confirmation soil samples from the limits of remedial excavations, coordinate with Ecology and the Contractor regarding confirmation sample results, and need for continued excavation, if necessary.
- Submit soil samples to a qualified analytical laboratory under contract with Ecology for analyses of PCBs using EPA Method 8082.
- During backfilling activities following remedial excavation, conduct in-place density tests of compacted backfill to assess compliance with project specifications.

Sampling procedures will be performed consistent with the SAP (Appendix A). Field work will be performed consistent with the HASP (Appendix C). Assessment activities are defined below.

3.1. Direct-Push Borings

- GeoEngineers will mark boring locations and complete the one-call utility notification process for the direct-push borings. GeoEngineers also will obtain right-of-way permits from the City of Spokane for work conducted within the City right-of-way.
- Drill three to four direct-push borings along the west side of the former City Parcel site (between the property-line fence and the asphalt-paved portion of North Cook Street). The direct-push borings will be advanced to depths of about 6 to 8 feet below current site grade using a limited access direct-push drill rig owned and operated by GeoEngineers. The borings will be advanced near the locations of previous confirmation soil samples containing PCBs at concentrations greater than MTCA Method A unrestricted land use cleanup levels that were collected along the west boundary of the City Parcel site. One to four soil samples will be collected from each boring (depending on recovery). Drilling will be coordinated to coincide with test pit activities.

3.2. Test Pits

- Ecology (or Ecology's contractor) will notify the Call-Before-You-Dig utility notification service before beginning test pit activities. Ecology (or Ecology's contractor) will subcontract a private utility locator to clear explorations located on private property prior to performing test pits. GeoEngineers will coordinate with Ecology to mark test pit locations.
- GeoEngineers will notify the Call-Before-You-Dig utility notification service before beginning direct-push borings. GeoEngineers also will obtain right-of-way permits from the City of Spokane for work conducted within the City right-of-way.
- We anticipate that approximately 14 to 17 test pits will be excavated within the Mr. Service property and the adjacent city of Spokane alley/right-of-way at the approximate locations shown on Figure 2. The actual number and locations of test pits will depend on a number of factors including the locations of underground utilities and site access constraints. Based on remedial excavations at the City Parcel Site, we anticipate the test pits will be excavated to depths of about 4 to 6 feet below existing site grade. We propose the following procedure be used during excavation:
    - Gravel surfacing will be carefully scraped off and stored for reuse as gravel surfacing.
    - Test pits will then be excavated in approximate 1-foot-depth increments. Excavated soil will be placed on plastic sheeting and temporarily stockpiled in separate stockpiles (i.e. soil excavated from 0- to 1-foot-depth will be placed in a small stockpile, soil excavated from 1- to 2-foot-depth will be placed in a separate small stockpile, etc.).
    - Starting below the existing gravel surfacing, soil samples will be collected within each 1-foot-depth increment. Separate samples will be collected within each depth increment from each of the four sidewalls. This sampling interval may be changed during field work depending on time constraints.
    - After completion of each test pit, the contractor will place stockpiled soil back into the excavation. Soil will be placed back into the excavation at the approximate depth

interval from which it was excavated. Each lift will be compacted using a vibrating plate compactor or jumping jack.

- Each test pit location will be resurfaced with crushed gravel surfacing.

The intent of this excavation procedure is to reduce the potential for distributing potentially contaminated soil within a larger soil volume as a consequence of the exploration process.

- Samples will be submitted to a qualified analytical laboratory (under subcontract to Ecology) for analysis of PCBs in accordance with EPA Method 8082. We anticipate that as an initial step, approximately 30 to 40 soil samples will be analyzed. The remainder of the soil samples will be placed on hold pending the results of the initial round of analytical testing. Subsequent rounds of analytical testing might be completed on held samples depending on the results of each previous round. Upon receipt of the sample data from the laboratory, the data will be validated and evaluated for usability in accordance with the QAPP.
- Investigation-Derived Waste (IDW) generated during the RI phase will be temporarily drummed or stockpiled on the City Parcel property, and will be disposed off-site as part of subsequent cleanup activities.

4.0 SCHEDULING AND REPORTING

Drilling/test pit activities are anticipated to take place in May/June 2014. Following completion of field activities and receipt of analytical data, we will prepare draft summary analytical tables, a site plan and exploration logs for Ecology review. If no further cleanup activities are necessary, we will prepare a draft and final report of our site assessment activities. If further cleanup actions are necessary, we will incorporate the results of our initial assessment activities and the results of our assessment activities during cleanup action activities into one report. Cleanup actions, if necessary, are anticipated to occur in summer/fall 2014.

5.0 LIMITATIONS

We have prepared this Work Plan for use by the Washington State Department of Ecology. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this work plan was prepared. No warranty or other conditions express or implied should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc.

6.0 REFERENCES

GeoEngineers, Inc., 2009, "Final Cleanup Action Report, City Parcel Site, Spokane, Washington," GEI File No. 0504-047-02, October 5, 2009.

Model Toxics Control Act, Chapter 70.105D RCW, Publication No. 94-06, Revised November 2013.

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

FIGURES

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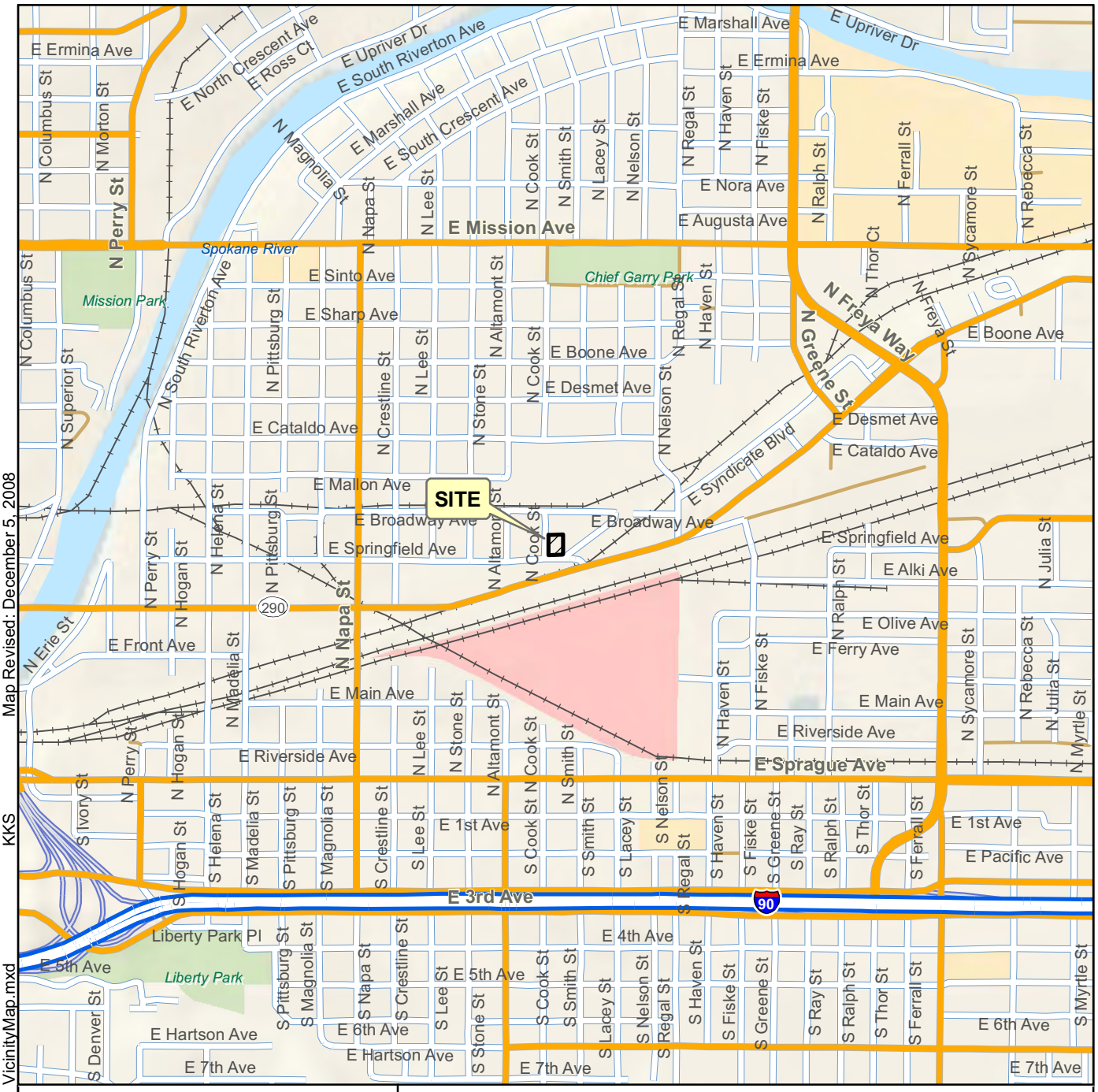

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps, Street Maps 2005

Transverse Mercator, Zone 11 N North, North American Datum 1983
North arrow oriented to grid north

Vicinity Map

City Parcel Site
Spokane, Washington

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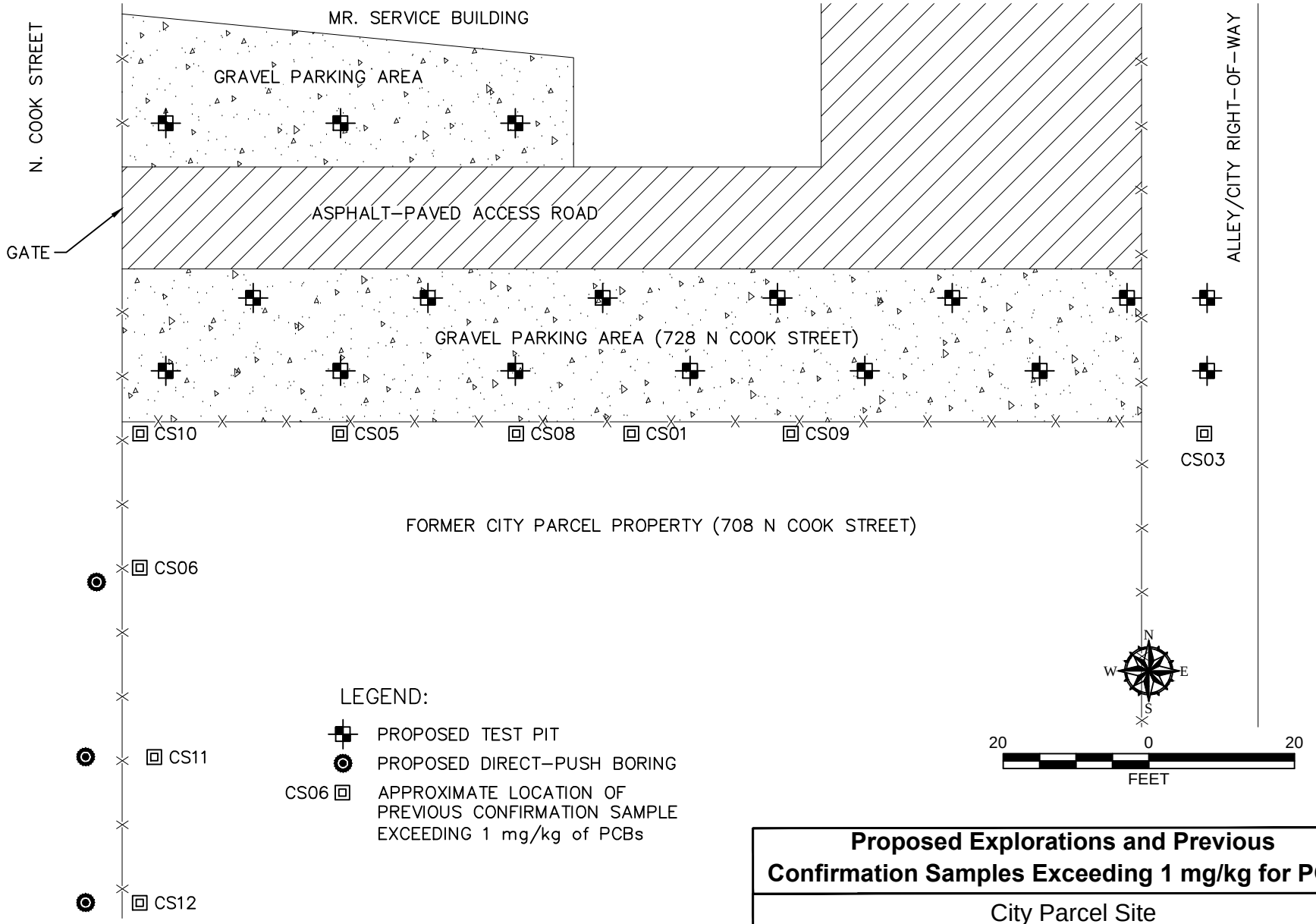
Figure 1

Office: SPOK Path: P:\0\0504047\GIS\0504004700_Fig1_VicinityMap.mxd KKS Map Revised: December 5, 2008



Proposed Explorations and Previous Confirmation Samples Exceeding 1 mg/kg for PCBs

City Parcel Site
Spokane, Washington

GeoEngineers

Figure 2

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.

APPENDICES

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APPENDIX A
Sampling and Analysis Plan

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1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) has been prepared for the supplemental remedial investigation (RI) and possible subsequent cleanup actions at the City Parcel Site (Site) located at 708 North Cook Street in Spokane, Washington. This SAP serves as the primary guide for standard operating procedures (SOPs) for field verification soil sampling activities. The scope of the project includes completing 3 to 4 direct push borings and 14 to 17 test pits along the previous northern and western excavation boundaries of the Site, and well as confirmation soil sampling during possible subsequent cleanup actions.

2.0 GENERAL SITE CHARACTERIZATION PROCEDURES

This section contains standard procedures for field data collection that are anticipated during the supplemental remedial investigation and cleanup actions including the following:

- Collecting Soil Samples from Explorations;
- Field Screening;
- Decontamination Procedures;
- Handling of Investigation-Derived Waste (IDW);
- Sample Handling;
- Sample Location Control;
- Sampling and Analytical Methods;
- Sample Handling and Custody Requirements;
- Field Measurements and Observations Documentation; and
- Data Management and Documentation.

2.1. Collecting Soil Samples from RI Phase Explorations

2.1.1. Direct-Push

Soil explorations will be advanced by a licensed driller using direct-push drilling techniques.

Continuous soil samples are collected using 4-foot-long, 2-inch-diameter acrylic sleeves. Each boring will be continuously monitored by a field representative who will observe and classify the soil encountered, and prepare a detailed log of each boring. Soil encountered in the borings will be classified in the field in general accordance with ASTM International (ASTM) D 2488, the Standard Practice for Classification of Soils, Visual-Manual Procedure.

Samples will be collected using either a decontaminated soil knife or new, clean nitrile gloves. Samples will be collected from selected intervals and placed in laboratory-supplied containers and labeled with a unique, sequential identification number. Each sample container will be securely capped and placed in a cooler with ice immediately upon collection. Chain-of-custody procedures

will be observed during transport of the soil samples. Sampling equipment will be decontaminated between each sampling attempt (see "Section 3.3" for decontamination procedures).

2.1.2. Test Pits

Test pits will be completed using a backhoe. The field representative will visually classify the soils in accordance with ASTM Method D 2488 and record soil descriptions and other relevant field screening details (e.g., staining, sheen, debris, odors, etc.) in the field log. Field screening procedures are presented below.

Samples will be collected by GeoEngineers field personnel using a clean stainless steel spoon/trowel or directly by hand using a fresh and clean pair of nitrile gloves either from the backhoe bucket or from the excavated surfaces. Samples will be obtained from an area of soil that the surface of the backhoe has not touched. Collected samples will be transferred into clean sample containers provided by the analytical laboratory and labeled with a unique, sequential identification number. Each sample container will be securely capped and placed in a cooler with ice immediately upon collection. Sampling equipment (if used) will be decontaminated prior to sample collection at each location (see "Section 3.3" for decontamination procedures).

2.2. Collecting Confirmation Soil Samples During Cleanup Actions

2.2.1. Sampling Objective

Confirmation sampling will be completed at the limits of excavations during cleanup actions to confirm that cleanup has been achieved in accordance with the compliance monitoring requirements in Washington Administrative Code (WAC) 173-340-745 and WAC 173-340-740(7).

2.2.2. Sampling Procedures

Samples will be collected by GeoEngineers field personnel using a clean stainless steel spoon/trowel or directly by hand using a fresh and clean pair of nitrile gloves either from the backhoe bucket or from the excavated surfaces. Samples will be obtained from an area of soil that the surface of the backhoe has not touched. Collected samples will be transferred into clean sample containers provided by the analytical laboratory and labeled with a unique, sequential identification number. Each sample container will be securely capped and placed in a cooler with ice immediately upon collection. Sampling equipment (if used) will be decontaminated prior to sample collection at each location (see "Section 3.3" for decontamination procedures).

2.2.3. Sampling Locations

GeoEngineers will collect representative soil samples from sidewall and excavation bottoms during cleanup actions. Sidewalls and excavation bottoms will be sampled separately. Preliminary, for excavation bottom sampling, one discrete grab sample will be collected per approximately 150-square-foot area (30 feet by 5 feet) or fraction thereof. Preliminarily, for excavation sidewall sampling, samples will be collected every 900 square feet or every 30 lineal feet of sidewall, whichever is more frequent. These sampling frequencies might be adjusted depending on the results of the RI phase, to meet the minimum number of samples necessary to calculate the true mean of the contaminant concentrations in excavated areas for comparison with the respective MTCA cleanup concentration.

One grab sample will be collected from the center of each area. Additional grab samples will be collected from near areas of previously identified hot spots, including near the locations of previous sidewall confirmation samples with concentrations greater than applicable MTCA cleanup levels.

- Excavation bottom confirmation samples will be labeled using the following format:
  - CB-2014-Sample Number
- Excavation sidewall confirmation samples will be labeled using the following format:
  - CS-2014-Sample Number

Sample locations will be estimated as accurately as possible, given the conditions present in the field at the time of sampling. The target accuracy for sample locations is sub-meter. Sample locations will be measured by taping from known site features. A hand-held global-positioning system (GPS) device also will be used to map sample locations and limits of remedial excavations, where accessible to field personnel and where the sample point can be logged by the GPS device.

2.3. Field Screening

The potential presence of volatile organics contamination in soil samples will be evaluated using field screening techniques. Field screening results will be recorded on the field logs and the results will be used as a general guideline to delineate areas of possible contamination. In addition, screening results will be used as a basis for selecting soil samples for chemical analysis. The following screening methods will be used: (1) visual screening; (2) water sheen screening; and (3) headspace vapor screening.

2.3.1. Visual Screening

The soil will be observed for unusual color and/or staining indicative of possible contamination.

2.3.2. Water Sheen Screening

Water sheen screening involves placing a portion of the soil sample in a pan containing distilled water, and observing the water surface for signs of sheen. This is a relatively sensitive, qualitative field screening method that can help identify the presence or absence of petroleum hydrocarbons and other non-aqueous phase liquid (NAPL) contaminants, sometimes at concentrations lower than regulatory cleanup guidelines. The following sheen classifications will be used:

Classification	Identifier	Description
No Sheen	(NS)	No visible sheen on the water surface.
Slight Sheen	(SS)	Light, colorless, dull sheen; spotty to globular; spread is irregular, not rapid; sheen dissipates rapidly; areas of no sheen remain.
Moderate Sheen	(MS)	Light to heavy sheen; may have some color/iridescence; globular to stringy; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface.
Heavy Sheen	(HS)	Heavy sheen with color/iridescence; stringy; spread is rapid; entire water surface may be covered with sheen; sheen flows off the sample.

2.3.3. Headspace Vapor Screening

This is a semi-quantitative field screening method that can help identify the presence or absence of volatile organic compounds (VOCs) in soil samples. A portion of the soil sample will be placed in a resealable plastic bag. The bag will be sealed capturing air in the bag. The bag is then shaken gently to expose the soil to the air trapped in the bag. The bag will remain closed for approximately 5 minutes at ambient temperature before the headspace vapors are measured. Vapors present within the sample bag's headspace will be measured by inserting the probe of a photoionization detector (PID) through a small opening in the bag, taking care not to clog the probe with soil. The maximum PID reading (in parts per million [ppm]) and the ambient air temperature will be recorded on the field log for each sample. The PID will be calibrated to 100 ppm isobutylene each day prior to soil sampling. No soil sample used for headspace screening will be submitted to the laboratory for chemical analysis.

2.4. Performance Sampling During Cleanup Actions

2.4.1. Sampling Objective

If cleanup actions occur, GeoEngineers will provide on-site observation during remedial excavation activities to reduce the potential for off-site releases of dust.

2.4.2. Sampling Locations

Air will be monitored at project boundaries.

2.4.3. Sampling Procedures

GeoEngineers on-site representative will record daily activities and inform the contractor of any dust-generating events which exceed applicable regulations in accordance with WAC 173-470. GeoEngineers also will conduct air monitoring during remedial excavation activities using a portable hand-held particulate meter (Haz-Dust HD-1100 or equivalent). GeoEngineers will immediately notify the contractor and require corrective action if particulate readings for dust exceed 5 milligrams per cubic meter to ensure that air-borne PCB levels are below permissible exposure limits (PELs).

2.5. Decontamination Procedures

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.

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.

2.6. Handling of Investigation-Derived Waste

IDW, which will mainly consist of drill cuttings and decontamination/purge water, will be placed in DOT-approved 55-gallon drums. Each drum will be labeled with the project name, general contents and date. The drummed IDW will be stored on the former City Parcel property at 708 North Cook Street pending analysis and disposal.

Incidental waste generated during sampling activities includes items such as gloves, plastic sheeting, paper towels and similar expended and discarded field supplies. These materials will be disposed of in a local trash receptacle or county disposal facility.

2.7. Sample Handling

Sample handling procedures, including labeling, container and preservation requirements and holding times are described in the QAPP (Appendix B).

2.8. Sample Location Control

Horizontal control will be established either by GeoEngineers using measuring tapes and a hand-held GPS device.

2.9. Sampling and Analytical Methods

Field sampling methods, including quality control (QC) and maintenance of field instrumentation, for soil and groundwater sampling will be conducted in accordance with the QAPP.

Analytical tests will be conducted in accordance with the QAPP. During laboratory procurement, 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, to the extent possible.

2.10. 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.

2.11. Field Measurements and Observations Documentation

Field measurements and observations will be recorded in project logs. 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, time and duration of each activity;
- Sample number identification;
- Sample number and volume;
- Sample transporting procedures;
- Field measurements made;
- Calibration records for field instruments;
- Visitors to site;
- Relevant comments regarding field activities; and
- 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.

2.12. 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 QC checks and sample results. Data logs and packages that are anticipated to be generated during the investigation 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 EDD will be compatible with Earthsoft EQUIS environmental data management software, and will include the following minimum data requirements in unique cells within the EDD:

- Sample identification;
- The reported concentration;
- The method reporting limit;
- Any flags assigned by the laboratory;
- The sampling date and time; and
- The Chemical Abstracts Service (CAS) registry number.

Upon receipt of the analytical data, the EDD will be uploaded to an EQUIS 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. The EDD data will be submitted to Ecology's EIM system.

3.0 QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance/quality control (QA/QC) procedures and standards that will be implemented during supplemental RI activities are presented in the QAPP (Appendix B). The purpose of this document is to describe analysis and quality control procedures that will be implemented to produce chemical and field data that are representative, valid and accurate for use in evaluating the cleanup action alternatives.

APPENDIX B
Quality Assurance Project Plan

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LIST OF TABLES

1.0 INTRODUCTION

This document presents the Quality Assurance Project Plan (QAPP) for the environmental sampling activities to be completed as part of the City Parcel Site (Site) Supplemental Remedial Investigation. The Site is located at 708 North Cook Street in Spokane, Washington. This QAPP is to be used in conjunction with the Sampling Analysis Plan (SAP) which is presented as Appendix A of the Supplemental Remedial Investigation (RI) Work Plan (Work Plan; GeoEngineers, 2014). The information contained in this QAPP is based on information available at the time of preparation. This QAPP may be updated as additional information becomes available.

GeoEngineers prepared this QAPP in general accordance with the requirements of 40 CFR 300.415(b)(4)(ii), EPA's Requirements for Quality Assurance Project Plans (EPA, 2001) and EPA's Guidance for Quality Assurance Project Plans (EPA, 2002).

2.0 BACKGROUND

The City Parcel building was constructed around 1945. The site is currently a vacant lot, and was previously occupied by Spokane Transformer, Inc. (an electrical repair and recycling business) from 1961 to 1979. Previous soil, sediment and groundwater investigations at the site were completed by the U.S. Environmental Protection Agency (EPA), Ecology & Environmental, Inc. and George Maddox and Associates, Inc. between 1976 and 1987. SAIC completed a Remedial Investigation Report in 2002. Results of these investigations show that past business practices resulted in polychlorinated biphenyl (PCB) spills or releases into the site structures and underlying soil.

GeoEngineers previously conducted a cleanup action at the City Parcel Site in 2009, which included excavation and off-site disposal of soil contaminated with PCB. Several soil confirmation samples collected from excavation sidewalls at the City Parcel property boundaries contained PCBs at concentrations greater than applicable Model Toxics Control Act (MTCA) Method A cleanup levels. In particular, two soil samples collected at the north site boundary (adjacent to the Mr. Service property) and several soil confirmation samples collected at the west site boundary adjacent to North Cook Street (which is owned by the City of Spokane) also contained PCBs at concentrations between 20.5 and 1,220 milligrams per kilogram (mg/kg). Note that MTCA Method A Industrial cleanup levels were used at the City Parcel property, which are 10 mg/kg for PCBs; it is probable that the MTCA Method A unrestricted land use cleanup levels of 1 mg/kg for PCBs will be used for adjacent properties.

3.0 PROJECT MANAGEMENT AND ORGANIZATION

The project management and organization elements of the QAPP, as detailed below, address the basic area of project management including the roles and responsibilities of the participants, the project description, quality objectives and criteria, special training/certification and documents and records.

3.1. Project Organization and Responsibilities

Key individuals and positions providing quality assurance (QA) and quality control (QC) are summarized in the following table. A description of the responsibilities, lines of authority and communication for the key individuals and positions providing QA and QC is presented in "Sections 3.1.1 through 3.1.7." This element of the plan ensures that the each key project participant has a defined role.

Project Role	Name Organization	Telephone Email Address
City Parcel Site Project Manager	Huckleberry Palmer	509.329.3433
Technical Project Manager	Dave Lauder GeoEngineers	509.363.3125 dlauder@geoengineers.com 523 E Second Ave Spokane, Washington
Health and Safety Manger	Wayne Adams GeoEngineers	206.239.3253 wadams@geoengineers.com 1101 Fawcett Avenue, Suite 200 Tacoma, Washington 98402
Quality Assurance Leader	Mark Lybeer GeoEngineers	206.278.2674 mlybeer@geoengineers.com 600 Stewart Street, Suite 1700 Seattle, Washington 98101
Laboratory Project Manager	Randee Decker Test America	509.924.9200 randee.decker@testamericainc.com 11922 E 1st Avenue Spokane, WA 99206

3.1.1. City Parcel Site Project Manager

The City Parcel Site Project Manager's duties consist of implementing the project approach and tasks, overseeing the project team members during performance of project tasks.

The Technical 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, 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.

The Project Manager will lead the field sampling effort for the project, serving as the direct point of contact and ensures that the appropriate sampling containers, chain-of-custody (COC) forms and

field sampling gear including personal protective equipment (PPE) are available. In addition the Project Manager will provide the following:

- 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.
- Supervises field personnel.
- Coordinates work with on-site subcontractors.
- Monitors that appropriate sampling, testing and measurement procedures are followed.
- Participates in QA corrective actions as required.

3.1.2. Technical/Field Staff

Technical/Field Staff have the primary responsibility for duties involve field data collection and documentation. Technical/Field Staff are responsible for:

- Understanding and following the QAPP and SAP.
- Checking all equipment and supplies in advance of field operations.
- Ensuring that samples are properly collected, preserved, labeled, packaged and shipped.
- Ensuring that all field data are carefully recorded and preserved according to the QAPP and SAP.
- Following chain-of-custody procedures and standard operating procedures when they are required.

3.1.3. Quality Assurance 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.

3.1.4. Health and Safety Manager

The Health and Safety Manager will oversee implementation of health and safety programs and verify that work on the project proceeds in accordance with the site-specific HASP.

3.1.5. Laboratory Project Manager

The analytical laboratory that is conducting chemical analyses for this project is 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 by the laboratory.

3.2. Health and Safety

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

The Field Staff will conduct a tailgate safety meeting each morning before beginning field activities. The Field Staff 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.

4.0 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 B-1 and are discussed below.

4.1. Analytes and Matrices of Concern

Samples of soil and groundwater will be collected during site characterization activities. Tables B-2 and B-3 in the QAPP summarize the analyses to be performed at the site for soil and groundwater, respectively.

4.2. 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 Tables B-2 and B-3 for soil and groundwater, respectively. These reporting limits were obtained from an Ecology-certified laboratory (TestAmerica Laboratories, Spokane, Washington). Other criteria include State of Washington Model Toxics Control Act (MTCA) Methods A/B cleanup levels (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 Tables B-2 and B-3 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.

4.3. Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicate or split samples, replicate analyses and duplicate spiked environmental samples (matrix spike duplicates). The closer the measured values are to each other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample comparisons of various matrices. This value is calculated by:

$$RPD\,(\%) = \frac{|D_1 - D_2|}{(D_1 + D_2)/2}\ X\ 100,$$

Where

D_1 = Concentration of analyte in sample.

D_2 = Concentration of analyte in duplicate sample.

The calculation applies to split samples, replicate analyses, duplicate spiked environmental samples (matrix spike duplicates), and laboratory control duplicates. The RPD will be calculated for samples and compared to the applicable criteria. Precision can also be expressed as the percent difference (%D) between replicate analyses. 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. Relative percent difference goals for this effort is 30 percent in groundwater and 40 percent in soil for all analyses, unless the duplicate sample values are within 5 times the reporting limit.

4.4. 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 value 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 B-1 of this QAPP.

4.5. 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.

4.6. 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 B-3.

4.7. 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.

5.0 SAMPLE COLLECTION, HANDLING AND CUSTODY

5.1. 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.

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.

5.2. Sample Containers and Labeling

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

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

- Project name and number;
- A unique, sequential 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 form.

5.3. Sample Storage

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 B-3.

5.4. Sample Shipment

The 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. Trip blanks will be included in coolers with groundwater samples.

5.5. 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;
- Unique sample identification number;
- Date and time of sampling;
- Sample matrix (soil, water, etc.) and number of containers from each sampling point, including preservatives used;
- Depth of subsurface soil sample;
- Analyses to be performed;
- Names of sampling personnel and transfer of custody acknowledgment spaces; and
- 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.

5.6. 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.

5.7. 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 water);
- 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); and
- 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; and
- 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.

6.0 CALIBRATION PROCEDURES

6.1. 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.

A photo-ionization detector (PID) will be used to measure headspace vapors. The PID 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.

6.2. 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 6 months.

7.0 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.

8.0 INTERNAL QC

Table B-4 summarizes the types and frequency of QC samples to be collected during the site characterization, including both field QC and Laboratory QC samples.

8.1. Field QC

Field QC samples serve as a control and check mechanism to monitor the consistency of sampling methods and the influence of off-site factors on environmental samples. Off-site factors include airborne volatile organic compounds and potable water used in drilling activities.

8.1.1. Field Duplicates

In addition to replicate analyses performed in the laboratory, field duplicates also serve as measures for precision. Under ideal field conditions, field duplicates (referred to as splits), are created when a volume of the sample matrix is thoroughly mixed, placed in separate containers, and identified as different samples. This tests both the precision and consistency of laboratory analytical procedures and methods, and the consistency of the sampling techniques used by field personnel. However, because of the inherent variability with soil samples, field duplicates will not be collected.

8.1.2. Trip Blanks

Trip blanks accompany groundwater sample containers used for VOC analyses during shipment and sampling periods. Trip blanks will be analyzed for VOCs on a one per cooler basis.

8.2. 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; and
- Surrogate spikes.

8.2.1. 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."

8.2.2. 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.

8.2.3. 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 are 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.

8.2.4. 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.

8.2.5. 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.

8.2.6. 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.

9.0 DATA REDUCTION AND ASSESSMENT PROCEDURES

9.1. 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.

9.2. Field Measurement Evaluation

Field data will be reviewed at the end of field activities 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; and
- 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.

9.3. 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.

9.4. 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; and
- 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.

10.0 REFERENCES

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.

Table B-1

Measurement Quality Objectives - Soil

City Parcel Site

Spokane, Washington

Laboratory Analysis	Reference Method	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]
Polychlorinated Biphenyls (PCB)	EPA 8082	63.1%-147%	50.6%-145%	27.9%-154% (soil)	≤40% (MS) ≤40% (Dup)	No Data

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 and 1X the MRL for waters.

MS/MSD = Matrix Spike/Matrix Spike Duplicate

RPD = Relative Percent Difference

Table B-2

Methods of Analysis and Practical Quantitation Limits - Soil

City Parcel Site

Spokane, Washington

Analyte	Analytical Method	Practical Quantitation Limit (mg/kg)	MTCA Method A Cleanup Level[1] (mg/kg)
Semi-Volatile Organic Compounds (SVOC) and Polychlorinated Biphenyls (PCB)			
PCBs	EPA 8082	0.050	1

Notes:

[1]MTCA Method A Industrial cleanup levels were used at the City Parcel property, which are 10 mg/kg for PCBs; MTCA Method A unrestricted land use cleanup levels of 1 mg/kg for PCBs will be used for adjacent properties.

EPA = Environmental Protection Agency

MTCA = Washington State Model Toxics Control Act

PCBs = polychlorinated biphenyls

mg/kg = milligrams per kilogram

Table B-3

Test Methods, Sample Containers, Preservation and Holding Time

City Parcel Site

Spokane, Washington

Analysis	Method	Soil				Groundwater			
		Minimum Sample Size	Sample Containers	Sample Preservation	Holding Time	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Time
PCBs	EPA 8082	100 g	4 or 8 oz glass wide-mouth with Teflon-lined lid	Cool 4°C	1 year from collection	1 L	1 liter amber glass with Teflon-lined lid	Cool 4°C	1 year from collection

Notes:

Holding Times are based on elapsed time from date of collection.

* For both soil and water the Gx and BTEX can be combined and do not require separate containers.

PCBs = Polychlorinated Biphenyls

EPA = Environmental Protection Agency

oz = ounce; mL = milliliter; L = liter; g = gram

https://projects.geoengineers.com/sites/0050404703/Draft/Work Plan/[City Parcel QAPP Tables.xls]Table B-3

Table B-4

Quality Control Samples - Type and Frequency

City Parcel Site

Spokane, Washington

Parameter	Field QC		Laboratory QC			
	Field Duplicates	Trip Blanks	Method Blanks	LCS	MS / MSD	Lab Duplicates
PCBs	None	NA	1/batch	1/batch	1/batch	NA

Note:

An analytical lot or batch is defined as a group of samples taken through a preparation procedure and sharing a method blank, LCS, and MS/ MSD (or MS and lab duplicate).

No more than 20 field samples can be contained in one batch.

LCS = Laboratory control sample

MS = Matrix spike sample

MSD = Matrix spike duplicate sample

PCBs = Polychlorinated biphenyls

APPENDIX C
Health and Safety Plan

Table of Contents

Health and Safety Plan

City Parcel Site
Spokane, Washington

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.

1.0 GENERAL PROJECT INFORMATION

Project Name:	City Parcel Site, Spokane, Washington
Project Number:	0504-047-03
Type of Project:	Supplemental remedial investigation and possible subsequent cleanup actions. Field activities to be performed by GeoEngineers' field staff includes soil sampling and assessment.
Start/Completion:	June 2014 / Fall 2014
Subcontractors:	None. RI phase contracted services (test pit explorations analytical laboratory) will be contracted directly with Ecology. Cleanup action activities, if necessary, will be completed by a contractor under a public works contract with Ecology.

2.0 WORK PLAN

Soil assessment activities are planned for City Parcel Site as part of the supplemental remedial investigation (RI), and possibly cleanup actions (remedial excavation and off-site disposal of contaminated soil). The objectives of the supplemental RI are discussed in the Supplemental Remedial Investigation Work Plan (GeoEngineers, 2014). The RI is being conducted by the Washington State Department of Ecology (Ecology) in accordance with WAC 173-340-430 to address polychlorinated biphenyl (PCB)-contaminated soil along the north and west property boundaries of 708 North Cook Street, which was identified during previous cleanup action activities at the site in 2009.

Detailed Proposed assessment activities are presented in the Work Plan, and summarized as follows:

- Complete direct-push soil borings observe excavation of test pits.
- Collect soil samples from borings and test pits.
- Submit soil samples for laboratory analysis for PCBs.
- Observe excavation during subsequent cleanup actions, if necessary.
- Collect confirmation soil samples from the bottom and sidewalls of remedial excavations.
- Complete density testing of imported backfill soil following remedial excavation activities.

2.1. Property Description

The City Parcel site is located at 708 North Cook Street in Spokane, Washington and occupies about 0.65 acres. The site is bounded by a railroad line and East Springfield Avenue on the south, North Cook Street to the west, City of Spokane property to the east and Mr. Service, Inc. (commercial cleaning service) to the north. RI phase test pits will be excavated within the property at 728 North Cook Street, to the north of the former City Parcel property. Direct-push borings will be drilled within the right-of-way of North Cook Street, to the west of the former City Parcel property.

2.2. Site History

Detailed information describing the Site including its known history, current uses, existing property features, soil, groundwater and sediment conditions, and a summary of previous environmental investigations completed at the Site is presented in the Work Plan.

2.3. List of Field Activities

Check the activities to be completed (or possibly completed) during the project:

X	Site reconnaissance	X	Field Screening of Soil Samples
X	Exploratory Borings	X	Soil Vapor Measurements
X	Construction Monitoring		Groundwater Sampling
	Surveying		Groundwater Depth and Free Product Measurement
X	Test Pit Exploration		Product Sample Collection
	Monitoring Well Installation	X	Soil Testing
	Monitoring Well Development	X	Remedial Excavation
X	Soil Sample Collection	X	Grading
	Remediation System Monitoring		Restoration

3.0 LIST OF FIELD PERSONNEL AND TRAINING

Name of Employee On Site	Level of HAZWOPER Training (24-/40-hr)	Date of 8-Hr Refresher Training	Date of HAZWOPER Supervisor Training	First Aid/ Cardiopulmonary Resuscitation (CPR)	Date of Other Trainings	Date of Respirator Fit Test
Chelsea Voss	40-hr	NA	NA	Current		Current
Josh Lee	40-hr	3/17/14	NA	Current		Current
Katie Hall	40-hr	2/26/13	Na	Current		Current
Ethan Donahue	40-hr	NA	NA	Current		Current

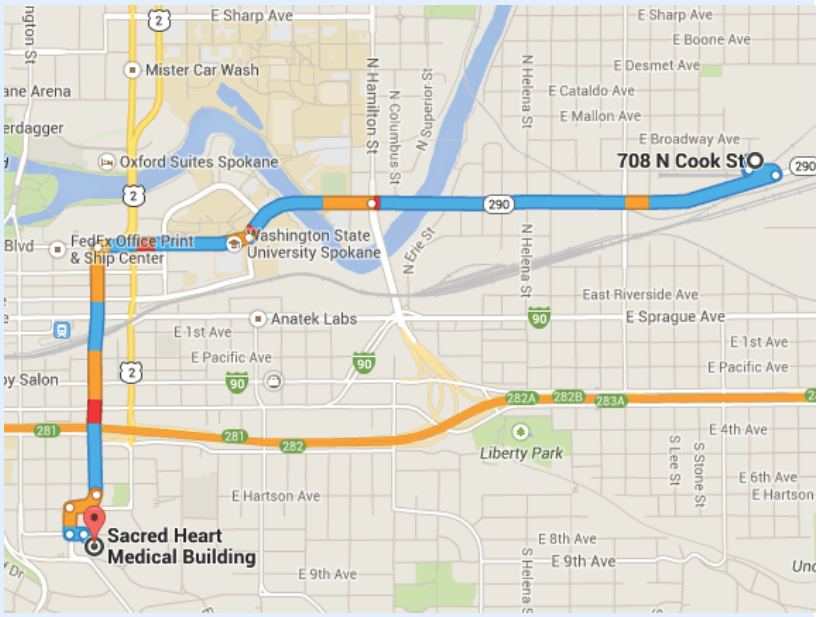
4.0 CHAIN OF COMMAND

Chain of Command	Title	Name	Telephone Numbers
1	Project Manager	Dave Lauder	(o) 509.363.3125 (c) 509.879.3824
2	Health and Safety Program Manager	Wayne Adams	(o) 253.383.4940 (c) 253.350.4387
3	HAZWOPER Supervisor	Bruce Williams	(o) 509.363.3125 (c) 509.954.6614
4	Site Safety and Health Supervisor*	Scott Lathen	(o) 509.363.3125 (c) 509.251.5239
5	Field Representative	Josh Lee Katie Hall Chelsea Voss Ethan Donahue	(c) 406.239.7810 (c) 509.768.3579 (c) 425.327.9591 (c) 509.280.5318
N/A	Ecology Representative	Huckleberry Palmer	(o) 509.329.3433
N/A	Ecology Subcontractor(s) RI Phase-Sandry Construction	Jeff Heeter	(o) 509.535.4789 (c) 509.828.3868
N/A	Current Owner(s) Former City Parcel (708 N Cook St) Mr. Service (728 N. Cook St) N. Cook St. ROW	 Gisselberg, P & M A Hammon, J. & C. City of Spokane	

***Site Safety and Health Supervisor --** The individual present at a hazardous waste Site responsible to the employer and who has the authority and knowledge necessary to establish the Site-specific health and safety plan and verify compliance with applicable safety and health requirements.

GeoEngineers' employees often do not have stop work authority on projects controlled by other contractors; however, any GeoEngineers employee, regardless of job title, working in the field will be responsible for contacting the Project Manager if they observe practices on the job site that are serious safety violations that are not under their control. They will document the unsafe practices and will contact the site supervisor as identified by the client. If no one is on site, the Project Manager, once notified, will contact the client. This action establishes GeoEngineers' commitment to site health and safety on all job sites as our duty of care to the public, contractors and clients.

5.0 EMERGANCY INFORMATION

Hospital Name and Address:	Sacred Heart Medical Center 101 W 8th Avenue Spokane, Washington 99202
Phone Numbers (Hospital ER):	Phone: 509.474.3131
Distance:	3.0 miles
1. Head south on N Cook Street to E Springfield Avenue, turn left onto E Springfield Avenue 2. Take E Springfield Avenue to E Trent Avenue/WA-290 3. Turn right onto E Trent Avenue/WA-290 4. WA-290 becomes E Spokane Falls Blvd 5. Continue onto E Spokane Falls Blvd 6. Turn right to stay on E Spokane Falls Blvd 7. Turn left onto S Browne St 8. Turn right onto 7th Avenue 9. Take the 1st left onto S McClellan St 10. Turn left onto W 8th Avenue 11. Destination is on the right	
Ambulance:	9.1.1
Poison Control:	800.222.1222
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.

6.0 STANDARD EMERGENCY PROCEDURES

- **Get help**
  - Send another worker to phone 9-1-1 (if necessary)
  - As soon as feasible, notify GeoEngineers' Project Manager
- **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

7.0 HAZARD ANALYSIS

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.

7.1. Physical Hazards

X	Drill rigs
X	Backhoe
X	Trackhoe/Trucks
X	Utilities/Utility Locate
X	Front End Loader
X	Excavations/trenching (1.5H:1V slopes for Type C soil)
	Shored/braced excavation if greater than 4 feet of depth
X	Overhead hazards/power lines
X	Tripping/puncture hazards (debris on-site, steep slopes or pits)
X	Unusual traffic hazard – Truck and Trailer traffic
X	Heat/Cold, Humidity
X	Utilities/utility locate

- 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.
- Traffic control devices (signage) will be placed in accordance with a traffic control plan developed in accordance with the Manual of Uniform Traffic Control Devices (MUTCD).
- Field personnel will be aware 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 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.
- Overhead Power Line Clearance Safety: Working equipment around overhead power lines requires distance and a spotter. Before a job begins, check with the contractor to confirm that they have checked with the utility company to find out voltage in lines. Check with the contractor regarding the contractor's plans for working around overhead power lines.
- Keep a safe distance from energized parts, which is a minimum of 10 feet for 50 kilovolts (kV) and under. The minimum distance will be more for higher voltages (above 50kV). The only exception is for trained and qualified electrical workers using insulated tools designed for high voltage lines.
- Don't operate equipment around overhead power lines unless you are authorized and trained to do so. If an object (scaffolds, crane, etc.) must be moved in the area of overhead power lines, appoint a competent worker whose sole responsibility is to observe the clearance between the power lines and the object. Warn others if the minimum distance is not maintained.
- Never touch an overhead line if it has been brought down by machinery or has fallen. Never assume lines are dead. When a machine is in contact with an overhead line, DO NOT allow anyone to come near or touch the machine. Stay away from the machine and summon outside assistance. Never touch a person who is in contact with a live power line.
- If you are in a vehicle that is in contact with an overhead power line, DON'T LEAVE THE VEHICLE. As long as you stay inside and avoid touching metal on the vehicle, you may avoid an electrical hazard. If you need to get out to summon help or because of fire, jump out without touching any wires or the machine, keep your feet together, and hop to safety.
- When mechanical equipment is being operated near overhead power lines, employees standing on the ground may not contact the equipment unless it is located so that the required clearance cannot be violated even at the maximum reach of the equipment.
- When working near overhead power lines, the use of nonconductive wooden or fiberglass ladders is recommended. Aluminum ladders and metal scaffolds or frames are efficient conductors of electricity.
- Avoid storing materials under or near overhead power lines.

- Personnel entry into unshored or unsloped excavations deeper than 4 feet is not allowed. Any trenching and shoring requirements will follow guidelines established in WAC 296-155, the Washington State Construction Standards or OSHA 1926.651 Excavation Requirements. In the event that a worker is required to enter an excavation deeper than 4 feet, a trench box or other acceptable shoring will be employed or the side walls of the excavation will be sloped according to the soil type and guidelines as outlined in Division of Occupational Safety and Health/Occupational Safety and Health Administration (DOSH/OSHA) regulations. If the shoring/sloping deviates from that outlined in the WAC, it will be designed and stamped by a PE. Prior to entry, personnel will conduct air monitoring as described later in this plan. All hazardous encumbrances and excavated material will be stockpiled at least 2 feet from the edge of a trench or open pit. If concentrations of volatile gases accumulate within an open trench or excavation, the means of entering shall adhere to confined space entry and air monitoring procedures outlined under the air monitoring recommendations in this Plan and/or the GeoEngineers Health and Safety Program.
- Personnel will avoid tripping hazards, steep slopes, pits and other hazardous encumbrances. If it becomes necessary to work near potentially hazardous fall areas, appropriate fall protection measures will be implemented by the Site Safety and Health Supervisor in accordance with OSHA/DOSH regulations and the GeoEngineers Health and Safety Program.
- Cold stress control measures will be implemented according to the GeoEngineers Health and Safety Program to prevent frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature). Heated break areas and warm beverages shall be available during periods of cold weather.
- Heat stress control measures required for this Site will be implemented according to GeoEngineers Health and Safety Program with water provided on-site.
- Excessive levels of noise (exceeding 85 dBA) are anticipated during drilling. Personnel potentially exposed will wear ear plugs or muffs with a noise reduction rating of at least 25 dBA whenever it becomes difficult to carry on a conversation 3 feet away from a co-worker or whenever noise levels become bothersome. (Increasing the distance from the source will decrease the noise level noticeably.)

7.2. 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)
X	Other (specify): Dust control

7.3. Chemical Hazards

CHEMICAL HAZARDS (POTENTIALLY PRESENT AT SITE)

Substance	Pathways
Polychlorinated biphenyls (PCBs)	Airborne Dust/Soil/Water

SPECIFIC CHEMICAL HAZARDS AND EXPOSURES (POTENTIALLY PRESENT AT SITE)

Compound/ Description	Exposure Limits	Exposure Routes	Symptoms/Health Effects
PCBs	OSHA PEL 0.5 mg/m^3 TLV 0.5 mg/m^3 NIOSH REL 0.001 mg/m^3 IDLH 5 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, chloracne; liver damage; reproductive effects; potential occupational carcinogen

Notes:
IDLH = immediately dangerous to life or health
NIOSH = National Institute for Occupational Safety and Health
OSHA = Occupational Safety and Health Administration
PEL = permissible exposure limit
REL = recommended exposure level
TLV = threshold limit value (over 10 hrs.)
mg/m^3 = milligrams per cubic meter

Sample handling, packaging, and processing: Skin contact with contaminated media and preservative acids. Wear modified Level D PPE.

Decontamination of equipment: Inhalation or eye contact or skin contact with airborne mists or vapors, or contaminated liquids. Wear safety glasses; decontaminate clothing and skin prior to eating, drinking or other hand to mouth contact.

7.4. Biological Hazards and Procedures

Y/N	Hazard	Procedures
N	Poison Ivy or other vegetation	
Y	Insects or snakes	Hard hat, gloves and long sleeve shirt
N	Used hypodermic needles or other infectious Hazards	Do not pick up or contact
	Others:	

7.5. 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)

8.0 AIR MONITORING PLAN

Work upwind if at all possible. Coordinate with contractor during cleanup actions so that contractor provides sufficient dust control operations.

Check instrumentation to be used:	
X	Photoionization Detector (PID)
	Other (i.e., detector tubes): _____
Check monitoring frequency/locations and type (specify: work space, borehole, breathing zone):	
	At least twice daily at perimeter of site
	15 minutes
	30 minutes
X	Hourly (in breathing zone during excavations, drilling, sampling)

If excavation activities generate visible dust, the Site Safety and Health Supervisor will be notified immediately to assess the need for air monitoring and lab analysis for inhalable and respirable particulates.

AIR MONITORING ACTION LEVELS

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; 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 Remedial Actions	PID	Start of shift; prior to excavation entry; 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 Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes	> 25 ppm in breathing zone	Stop work and evacuate the area. Contact Health and Safety Manager for guidance.
Combustible Atmosphere	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes	>10% LEL or >1,000 ppm	Depends on contaminant. The PEL is usually exceeded before the lower explosive limit (LEL).
Combustible Atmosphere	Environmental Remedial Actions	PID or 4-gas meter	Start of shift; prior to excavation entry; every 30 to 60 minutes	>10% LEL or >1,000 ppm	Stop work and evacuate the Site. Contact Health and Safety Manager for guidance.

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Oxygen Deficient/ Enriched Atmosphere	Environmental Remedial Actions Confined Spaces	Oxygen meter or 4-gas meter	Start of shift; prior to excavation entry; every 30 to 60 minutes	<19.5>23.5%	Continue work if inside range. If outside range, evacuate area and contact Health and Safety Manager.

9.0 SITE CONTROL PLAN

The site control plan minimizes employee exposure to hazardous substances and includes the following.

9.1. Traffic or Vehicle Access Control Plans

The Site is bounded by North Cook Street to the west and East Springfield Avenue to the south. Traffic related to construction vehicles including trucks and trailers entering and exiting the Site will be controlled by contractor with the help of signs, cones and/or flagger, as appropriate.

9.2. Site Work Zones

Site work zones include exploration locations, construction staging areas, soil stockpiling areas and remedial excavation areas. In general, hot zones/exclusion zones will be located around each exploration or excavation. Only persons with the appropriate training will enter this perimeter while work is being conducted there.

A contamination reduction zone will be established just outside the exclusion zone for the decontamination of sampling equipment. Care will be taken to prevent the spread of contamination. Equipment and personnel decontamination are discussed in the following sections, and the following types of equipment will be available to perform these activities:

- Scrub brushes;
- Spray rinse applicator;
- Plastic garbage bags; and
- Container of Alconox/water solution and Alconox powder.

METHOD OF DELINEATION/EXCLUDING NON-SITE PERSONNEL

	Fence
	Survey Tape
X	Traffic Cones
	Other

The Contractor will be responsible for establishing exclusion zones and contaminant reduction zones during cleanup actions.

9.3. 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.

9.4. 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.

9.5. Decontamination Procedures

Sampling equipment will be decontaminated using wet decontamination procedures:

- Wash and scrub equipment with Alconox/Liquinox and tap water solution
- Rinse with tap water
- Rinse with distilled water
- Repeat entire procedure or any parts of the procedure as necessary

In addition to wet decontamination procedures, other measures will be taken to prevent cross-contamination. These measures include changing out disposable gloves between each

sampling location, using fresh paper towels at each sample location, and maintaining a clean work area. Downhole drilling equipment will be decontaminated using a hot-water, high-pressure washer. Decontamination water will be stored on-site in 55-gallon drums.

9.6. Waste Disposal or Storage

Incidental waste generated during sampling activities includes items such as gloves, plastic sheeting, paper towels and similar expended and discarded field supplies. These materials will be disposed of in a local trash receptacle or county disposal facility.

Soil cuttings and excess soil remaining from test pits will be temporarily stored in 55-gallon drums or stockpiled on the City Parcel property for subsequent off-site disposal. Stockpiled soil will be placed on top of heavy plastic (minimum 6-mil-thick) sheeting. Stockpiled soil also will be covered with plastic.

10.0 PERSONAL PROTECTIVE EQUIPMENT

PPE will consist of standard Level D equipment. 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)
X	Rubber boots (if wet conditions)
	Life Jackets (for work near/over water)
Gloves (specify):	
X	Nitrile
X	Latex

	Liners
	Leather
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:	
	Level D
	Level C (respirators with organic vapor/HEPA or P100 filters)

10.1. Personal Protective Equipment 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.

10.2. Respirator Selection, Use and Maintenance

If respirators are required, Site personnel shall be trained before use on the proper use, maintenance and limitations of respirators. Additionally, they must be medically qualified to wear a respiratory protection in accordance with 29 CFR 1910.134. Site personnel who will use a tight-fitting respirator must have passed a qualitative or quantitative fit test conducted in accordance with an OSHA-accepted fit test protocol. Fit testing must be repeated annually or whenever a new type of respirator is used. Respirators will be stored in a protective container.

10.2.1. Respirator Cartridges

If Site personnel are required to wear air-purifying respirators, the appropriate cartridges shall be selected to protect personnel from known or anticipated Site contaminants. The respirator/cartridge combination shall be certified and approved by the National Institute for

Occupational Safety and Health (NIOSH). A cartridge change-out schedule shall be developed based on known Site contaminants, anticipated contaminant concentrations and data supplied by the cartridge manufacturer related to the absorption capacity of the cartridge for specific contaminants. Site personnel shall be made aware of the cartridge change-out schedule prior to the initiation of Site activities. Site personnel shall also be instructed to change respirator cartridges if they detect increased resistance during inhalation or detect vapor breakthrough by smell, taste or feel, although breakthrough is not an acceptable method of determining the change-out schedule.

10.2.2. Respirator Inspection and Cleaning

The Site Safety and Health Supervisor shall periodically (weekly) inspect respirators at the project Site. Site personnel shall inspect respirators prior to each use in accordance with the manufacturer's instructions. In addition, Site personnel wearing a tight-fitting respirator shall perform a positive and negative pressure user seal check each time the respirator is donned, to ensure proper fit and function. User seal checks shall be performed in accordance with the GeoEngineers respiratory protection program or the respirator manufacturer's instructions.

10.2.3. Facial Hair and Corrective Lenses

Site personnel with facial hair that interferes with the sealing surface of a respirator shall not be permitted to wear respiratory protection or work in areas where respiratory protection is required. Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the sealing surface of the respirator. Site personnel requiring corrective lenses will be provided with spectacle inserts designed for use with full-face respirators. Contact lenses should not be worn with respiratory protection.

11.0 ADDITIONAL ELEMENTS

11.1. Cold Stress Prevention

Working in cold environments presents many hazards to Site personnel and can result in frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature).

The combination of wind and cold temperatures increases the degree of cold stress experienced by Site personnel. Site personnel shall be trained on the signs and symptoms of cold-related illnesses, how the human body adapts to cold environments, and how to prevent the onset of cold-related illnesses. Heated break areas and warm beverages shall be provided during periods of cold weather.

Disorder	Symptoms	Signs	Causes	First Aid
Hypothermia	Chills; pain in extremities; fatigue or drowsiness.	Euphoria; slow, weak pulse; slurred speech: collapse; shivering; unconsciousness; body temperature < 95f (35c).	Excessive exposure, exhaustion or dehydration, subnormal tolerance, drug/alcohol abuse.	Move to warm area and remove wet clothing. Modest external warming (external hear packs, etc.). Drink warm, sweet fluids if conscious. Transport to hospital.
Frostbite	Burning sensation at first. Coldness, numbness, tingling.	Skin color white or grayish yellow to reddish violet to black. Blisters. Response to touch depends on depth of freezing.	Exposure to cold, vascular disease.	Move to warm area and remove wet clothing. External warming (warm water). Drink warm, sweet fluids if conscious. Transport to hospital.
Frostnip	Possible itching or pain.	Skin color white.	Exposure to cold (above freezing) and dampness.	Similar to frostbite.
Trench Foot	Severe pain; tingling, itching.	Edema; blisters; response to touch depends on depth of freezing.	Exposure to cold (above freezing) and dampness.	Similar to frostbite.

11.2. Heat Stress Prevention

State and federal OSHA regulations provide specific requirements for handling employee exposure to heat stress. GeoEngineers' program complies with these requirements and will be implemented in all areas where heat stress is identified as a potential health issue.

General requirements for preventing heat stress apply to outdoor work environments from May 1 through September 30, annually, only when employees are exposed to outdoor heat at or above an applicable temperature listed in the table below. To determine which temperature applies to each worksite, select the temperature associated with the general type of clothing or personal protective equipment (PPE) each employee is required to wear.

HEAT STRESS

Type of Clothing	Outdoor Temperature Action Levels (Degrees Fahrenheit)
Non-breathing 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 the table above, Project Managers 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.

Heat-Related Illness	Symptoms	First Aid
Heat Fatigue	Weakness; impaired motor skills; reduced ability to concentrate.	Take a short break in a cooler area. Pushing yourself to work through the condition can lead to a more serious illness.
Heat Cramps	Painful muscle spasms caused by salt imbalances in the body because of sweating.	Drinking carbohydrate electrolyte replacement liquids may not eliminate the pain, but helps during recovery. Prevent by drinking a small cup of water every 15 to 20 minutes – even if you aren't thirsty.
Heat Rash	Irritation, especially where skin is wet with sweat or clothing is tight. Can lead to infection.	Move to cooler area. Wash and change clothing.
Heat Collapse	A person suddenly faints. Happens when the brain doesn't get enough oxygen because the blood has pooled in the victim's arms or legs.	Remove the victim to a cooler area to lie down during recovery. Do not give liquids to an unconscious person.
Heat Exhaustion	Headache, nausea, dizziness, thirst and giddiness. Can lead to vomiting and/or fainting. Victim has pale, clammy (moist) skin.	Remove victim to a cool, shaded area. Give water if the victim is alert and not nauseated. Don't leave the person alone. Cool the victim with a spray mist or wet cloth. If the person does not feel better in a few minutes, call for emergency help.
Heat Stroke	Victim has dry, pale skin (no sweating) or hot, red skin (looks like a sunburn) and is confused. Victim may have seizures and pass out.	Call for emergency help. Remove the victim to lie down in a cool, shaded area. Don't leave the person alone. If the victim is alert and not nauseated, give water. Cool the person. Place ice packs under the arm pits and in groin area.

11.3. 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.

11.4. Personnel Medical Surveillance

GeoEngineers' employees are not in a medical surveillance program because they do not fall into the category of "Employees Covered" in OSHA 1910.120(f)(2), which states a medical surveillance program is required for the following employees:

1. All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year.
2. All employees who wear a respirator for 30 days or more a year or as required by state and federal regulations.
3. All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and Members of HAZMAT teams.

11.5. Sampling, Managing and Handling Drums and Containers

Containers used during the supplemental RI shall meet the appropriate Department of Transportation (DOT), OSHA and U.S. Environmental Protection Agency (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.

11.5.1. Spill Containment Plans (Drum and Container Handling)

Drums will be fitted with secure lids to limit the potential for spills. A spill containment plan will be prepared if required by the client.

11.6. Entry Procedures for Tanks or Vaults (Confined Spaces)

N/A

11.7. Sanitation

Field staff and subcontractors during the RI Phase must go off site to access sanitation facilities. On-site sanitation facilities might be provided by the contractor during possible subsequent cleanup actions.

11.8. Lighting

Field work will be generally conducted during daylight hours; artificial lighting is not anticipated to be necessary.

11.9. Excavation, Trenching and Shoring

All employees working on project sites where there is an excavation greater than 4 feet in depth shall be trained in excavation safety and shall utilize safe procedures. OSHA designates a 5-foot-depth for instituting excavation safety procedures; however GeoEngineers will use the more conservative depth of 4 feet as specified by states such as Washington, Oregon and California. This program is for the protection of employees while working in excavations; however, employees should not enter excavations if there is an alternative.

GeoEngineers' employees often do not have stop work authority on projects controlled by other contractors. However, any GeoEngineers employee, regardless of job title, working in the field will be responsible for contacting the Project Manager if they observe practices on the job Site that are serious safety violations that are not under their control. They will document the unsafe practices and will contact the Site safety coordinator as identified by the client. If no one is on-site, the Project Manager, once notified, will contact the client. This action establishes GeoEngineers' commitment to Site health and safety on all job Sites as our duty of care to the public, contractors and clients.

GeoEngineers is responsible for its subcontractors and will also be providing inspections and corrections of any work that subcontractors perform around excavations.

12.0 DOCUMENTATION TO BE COMPLETED FOR HAZWOPER PROJECTS

The following forms are required for Hazardous Waste Operations and Emergency Response (HAZWOPER) projects:

- Field Log
- Health and safety pre-entry briefing acknowledgment (Form B-1)

- Health and Safety Plan acknowledgment by GeoEngineers' employees (Form B-2)
- Contractor's Health and Safety Plan Disclaimer (Form B-3)
- Conditional forms available at GeoEngineers' office: Accident Report

The Field Log 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.).

13.0 APPROVALS

1. Plan Prepared	Signature	Date
2. Plan Approval	PM Signature	Date
3. Health & Safety Officer	Wayne Adams Health & Safety Program Manager	Date

FORM A-1
HEALTH AND SAFETY PRE-ENTRY BRIEFING
CITY PARCEL SITE, SPOKANE, WASHINGTON
FILE NO. 0504-047-03

Inform employees, contractors and subcontractors or their representatives about:

- The nature, level and degree of exposure to hazardous substances they're likely to encounter;
- All Site-related emergency response procedures; and
- Any identified potential fire, explosion, health, safety or other hazards.

Conduct briefings for employees, contractors and subcontractors, or their representatives as follows:

- A pre-entry briefing before any Site activity is started; and
- Additional briefings, as needed, to make sure that the Site-specific HASP is followed.

Make sure all employees working on the Site are informed of any risks identified and trained on how to protect themselves and other workers against the Site hazards and risks.

Update all information to reflect current sight activities and hazards.

All personnel participating in this project must receive initial health and safety orientation. Thereafter, brief tailgate safety meetings will be held as deemed necessary by the Site Safety and Health Supervisor.

The orientation and the tailgate safety meetings shall include a discussion of emergency response, Site communications and Site hazards.

Company Employee

Date	Topics	Attendee	Name	Initials

FORM A-2
SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT
CITY PARCEL SITE, SPOKANE, WASHINGTON
FILE NO. 0504-047-03

(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 A-3
SUBCONTRACTOR AND SITE VISITOR SITE SAFETY FORM
CITY PARCEL SITE, SPOKANE, WASHINGTON
FILE NO. 0504-047-03

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**

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Please let us know by visiting **www. geoengineers.com/feedback**.

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