Final Work Plan

WSDOT Union Gap Facility Release Investigation
Union Gap, Washington

for

Washington Department of Transportation

July 3, 2023

GeoEngineers

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523 East Second Avenue
Spokane, Washington 99202
509.363.3125

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File No. 0180-429-00

July 3, 2023

Prepared for:

Washington State Department of Transportation
310 Maple Park Avenue
Olympia, Washington 98504

Attention: Matt Cox, Dangerous/Hazardous Waste Compliance Manager

Prepared by:

GeoEngineers, Inc.
523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Justin D. Orr, LG
Geologist

Phil D. Welker, PE
Principal Environmental Engineer

JDO:PDW:ch:mls

GeoEngineers

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1.0 INTRODUCTION

This Work Plan has been prepared to describe the elements of the release investigation assessment to be completed at the Washington State Department of Transportation (WSDOT)—Union Gap Facility (herein referred to as "site") located at 2809 Rudkin Road in Union Gap, Washington, as shown in the attached Vicinity Map, Figure 1. The Washington State Department of Ecology (Ecology) reference numbers for this site include: Facility Site ID (FSID) #541 and Cleanup Site IDs (CSID) #4942 (WSDOT Union Gap District Site) and #16641 (WSDOT Union Gap Sign Shop).

This Work Plan has been prepared by GeoEngineers, Inc. (GeoEngineers) for WSDOT under WSDOT Agreement Number Y-12778. The purpose of this assessment is to determine if contamination related to two historical releases at the site is present in soil, groundwater and soil vapor, and to assess the magnitude of contamination in the impacted media. Data generated from this assessment will support a no further action (NFA) determination or planning potential remedial actions within the defined project area to address ecological and human health risks associated with the contamination.

A Sampling and Analysis Plan (SAP), with a description of field assessment procedures is provided in Appendix A; the Quality Assurance Project Plan (QAPP) and the Health and Safety Plan (HASP) are presented in Appendix B and C, respectively. The Work Plan is organized as follows:

- Site Description and Background—Section 2.0
- Release Investigation Activities—Section 3.0
- Schedule—Section 4.0
- References—Section 5.0

2.0 SITE DESCRIPTION AND BACKGROUND

The WSDOT – Union Gap facility is located at 2809 Rudkin Road in Union Gap, Washington. Limited historical information identifies the site as a WSDOT facility at least to the 1980's. The site is currently occupied by WSDOT maintenance and administration facilities and is developed with multiple structures in use by WSDOT, as well as asphalt parking lots and roads and an unpaved equipment yard. The site is bounded to the north by a vacant lot and commercial properties, to the south by East Ahtanum Road and residential properties, to the east by Highway 82 and the Yakima River, and to the west by Rudkin Road and commercial and residential properties. Site features are shown in Site Plan, Figure 2.

2.1. Previous Investigations

Ecology issued the memorandum: *Comments on the three historical areas of concern (AOC) at the facility* on June 28, 2022, detailing the historical releases at the site, including three underground storage tanks (USTs) decommissioned near the former service station in 1989, two USTs and an aboveground storage tank (AST) removed from the boiler building in 1992, and remediation of a xylene release in the former sign shop building in 2003 and 2004 (Ecology 2022). The historical releases are detailed below.

2.1.1. Former Service Station UST Decommissioning

Three USTs were removed in 1989. The tanks contained gasoline and diesel and were associated with the former service station at the site. A waste oil AST located at the south side of the former service station is mentioned in association with this decommissioning; however, the waste oil AST was not decommissioned.

Analytical results obtained during the decommissioning were reported as total petroleum hydrocarbons (TPH) and not as gasoline or diesel fuel (TPH-Gx or TPH-Dx). One soil sample (soil sample #3) was greater than the generic TPH Model Toxics Control Act (MTCA) cleanup level of 1,500 milligrams per kilogram (mg/kg). Volatile organic compounds (VOCs) were also analyzed and were less than their respective MTCA Method A cleanup levels. Monitoring wells near the USTs were sampled for four quarters following the UST decommissioning; TPH-Gx, TPH-Dx and VOC concentrations were either not detected or were detected below their respective cleanup levels.

Ecology determined that an empirical demonstration shows that groundwater is not impacted by the petroleum release. Ecology requested collection of new soil samples in the vicinity of soil sample #3 near the southwest corner of the maintenance building to confirm if petroleum contamination is still present at the site (Ecology 2022). The release associated with the Former Service Station is designated CSID #4942.

2.1.2. AST/UST Decommissioning

Two USTs and one AST were removed from the boiler building in 1992. Samples collected at the locations of the USTs indicated that a release did not occur, and that further investigation was not warranted. A release at the AST did occur, but Ecology determined that the release did not pose a risk to human health or the environment and did not request further investigation (Ecology 2022).

2.1.3. Former Sign Shop Remediation

A xylene release in the former sign shop building was remediated in 2003 and 2004. The release appeared to be from the surface. Contaminated soil was removed but the excavation did not extend deeper than 5 feet below the surface.

Analytical results obtained during the remediation indicated that total xylenes, ethylbenzene, toluene and gasoline were present in the soil at concentrations greater than their respective cleanup levels. Although contaminated soil was removed, groundwater samples were not collected and xylene concentrations in soil exceeded the MTCA vapor intrusion screening levels. Ecology requested collection of groundwater and sub-slab vapor samples to determine if contaminants from the release have impacted groundwater and to evaluate soil vapor concentrations (Ecology 2022). The release associated with the Former Sign Shop is designated CSID #16641.

3.0 RELEASE INVESTIGATION ACTIVITIES

To assess the potential extent of petroleum-related contamination related to the former ASTs/USTs near the Former Service Station, and xylene contamination near the Former Sign Shop, GeoEngineers plans to advance soil borings, install temporary well points, one permanent monitoring well and soil-slab soil vapor sampling points, collect soil, groundwater and soil gas samples from the borings and temporary wells, and submit the samples for chemical analyses of the above listed analytes.

The tasks described below reflect the scope of the release investigation assessment. The specific tasks conducted for the assessment may change in response to conditions encountered in the field or as additional information is obtained. Adjustments to the tasks listed below will be mutually agreed upon by WSDOT and GeoEngineers and authorized prior to implementation.

Task 01 – Project Scoping and Project Management

- Provide overall project management for the duration of the project, including the development, implementation and execution of project schedules, events, meetings, status updates, resources, reports on progress towards achieving project objectives and submittals of required deliverables for WSDOT review.

Task 02 – Prepare Planning Documents and VCP Applications

- Prepare this combined Work Plan (draft and final) for both sites.
- Complete two applications for Ecology's Voluntary Cleanup Program (VCP). One VCP application will be completed for CSID #4942, and one will be completed for CSID #16641. The applications will be signed and submitted to Ecology by WSDOT.

Task 03 – Site Assessment Field Work and Analytical Analysis

- Coordinate underground utility locating using the State of Washington Utility Notification and a private utility locate company. Per state regulations, GeoEngineers will mobilize to/from the site from Spokane to mark the proposed boring locations prior to initiating the locate request.
- Mobilize to/from Spokane, Washington to conduct the sampling event.
- Conduct the sampling event during a time when the fewest number of WSDOT personnel are present in order to prevent access disruptions into the facility and buildings.
- Conduct the release investigation at the following locations:
- Former Service Station (CSID #4942)
    - Advance three soil borings using sonic drilling techniques in the vicinity of soil sample #3, near the southwest corner of the maintenance building. Soil samples will be collected from 5-foot intervals using a continuous core sampler for field screening and potential chemical analysis. The borings will be advanced to a maximum depth of approximately 20 feet below ground surface (bgs), or until groundwater is encountered, whichever occurs first. Proposed boring locations are shown in Figure 3. Soil samples will be collected per procedures outlined in Appendix A, Sampling and Analysis Plan.
    - Observe and document subsurface soil conditions using a qualified field engineer or geologist. Field screening will consist of visual observation, water sheen testing and headspace vapor measurements using a photoionization detector (PID).
    - Backfill the borings with bentonite clay and complete at the surface with concrete or cold patch asphalt to match the existing ground surface.
- Former Sign Shop (CSID #16641)
    - Advance three soil borings using sonic drilling techniques in the vicinity of the former sign shop, including: one soil boring near the west end of the building, one boring within 50 feet to the south-southwest of the building, and one boring near the south edge of the building. Soil

samples will be collected from 5-foot intervals using a continuous core sampler for field screening. The borings will be advanced to a maximum depth of approximately 20 feet bgs, or until groundwater is encountered, whichever occurs first. Proposed boring locations are shown in Figure 3. Soil samples will be collected per procedures outlined in Appendix A.

  - Observe and document subsurface conditions using a qualified field engineer or geologist. Field screening will consist of visual observation, water sheen testing and headspace vapor measurements using a PID.
  - Temporary well points will be installed for collection of grab groundwater samples. Grab groundwater samples will be collected per procedures outlined in Appendix A.
  - Backfill the borings with bentonite clay and complete at the surface with concrete or cold patch asphalt to match the existing ground surface.
  - The soil boring near the south edge of the building will be completed as a monitoring well. The monitoring well will be installed per procedures outlined in Appendix A. The monitoring well will be completed with a flush-mounted protective steel monument.
  - Conduct groundwater sampling at the newly installed on-site well. Groundwater samples will be collected following procedures outlined in Appendix A.
  - Install two sub-slab Vapor Pins® in the vicinity of the Former Sign Shop and collect sub-slab vapor samples. The proposed sub-slab vapor sample locations are shown in Figure 3. The sub-slab vapor samples will be collected per procedures outlined in Appendix A. Prior to collecting the sub-slab vapor samples, a building survey will be completed to document information that will allow a qualitative assessment of factors that potentially could influence sample quality.

- Submit laboratory samples to a Department of Enterprise/WSDOT-approved, Ecology-accredited laboratory to perform soil, groundwater and soil vapor analytical services.
- Three soil samples and one duplicate sample will be submitted from the Former Service Station area and analyzed for the following potential contaminants:
  - Gasoline-range petroleum hydrocarbons (GRPH) using Northwest Method NWTPH-Gx;
  - Benzene, toluene, ethylbenzene and xylenes (BTEX) using United States Environmental Protection Agency (EPA) Method 8260D; and
  - Diesel- and oil-range petroleum hydrocarbons (DRPH and ORPH, respectively) using Northwest Method NWTPH-Dx.
- Two grab groundwater samples, one monitoring well sample and one duplicate sample from the monitoring well will be submitted from the Former Sign Shop area and analyzed for the following potential contaminants:
  - GRPH using Northwest Method NWTPH-Gx;
  - BTEX using EPA Method 8260D; and
  - DRPH and ORPH using Northwest Method NWTPH-Dx.
- Two sub-slab soil gas samples and one duplicate sample will be submitted from the Former Sign Shop area and analyzed for the following potential contaminants:
  - GRPH using EPA Method TO-3; and
  - VOCs using EPA Method TO-15.

- Drum and label investigation-derived waste (IDW). Analytical data from the soil borings will be used to characterize the IDW. In addition, a sample will be collected and analyzed for Resource Conservation and Recovery Act (RCRA) metals, which is required by most disposal facilities. If necessary, this sample will be further analyzed for leachable metals depending on the results of the initial IDW metals analysis. A qualified contractor will be retained to profile and transport the IDW for disposal at a permitted facility. We assume IDW will be non-hazardous.
- Validate the chemical analytical data received from the laboratory in accordance with EPA guidelines and evaluate the data collected above with respect to Ecology's MTCA cleanup levels.
- Prepare a table and figure(s) comparing soil, groundwater and soil vapor analytical results to the MTCA Method A cleanup levels (soil and groundwater) and Method B screening levels (soil vapor) and provide the table and figure(s) to WSDOT.
- If necessary, make recommendations for additional borings and/or new monitoring wells based on the results obtained from the Site Assessment.

Task 04 – Prepare Two Separate Technical Memorandum Reports for VCP

Prepare two separate technical memorandum reports (draft and final) for submittal for the Former Service Station (CSID #4942) and Former Sign Shop (CSID #16641) to WSDOT and Ecology. These reports will summarize all work conducted as part of this release investigation for CSID #4942 and CSID #16641, respectively. The reports will demonstrate that all objectives and recommendations in the 2022 Ecology Memorandum have been accomplished and provide recommendations for potential additional investigation and evaluation or recommendation for "no further action – cleanup complete." The reports will also include a Terrestrial Ecological Evaluation (TEE) consistent with Model Toxics Control Act (MTCA) requirements (WAC 173-340-7490 through 7494). The MTCA TEE process includes three tiers: Tier 1 (WAC 173-340-7491; Exclusions from a TEE); Tier 2 (WAC 173-340-7492; Simplified TEE); and Tier 3 (WAC 173-340-7493; Site-specific TEE). The TEE will be conducted based on site conditions, habitat and soil contaminant concentrations, with the assumption that only a Tier 1 TEE will be necessary. A VCP Terrestrial Ecological Evaluation Form will also be prepared for the reports and included as an attachment.

- Submit all necessary documentation to Ecology's VCP program on behalf of WSDOT to close each CSID at the site.

4.0 SCHEDULE

Field activities described in this Work Plan are anticipated to occur in the summer of 2023. The anticipated project schedule for each task in order of execution is outlined below. Note that the schedule and duration of each task may be adjusted based on field conditions and contractor availability.

- Utility Locate: A site visit will be made to mark the proposed boring locations for the public utility notification approximately one to two weeks prior to the beginning of drilling activities. A second visit will be made to complete the private utility locate in the vicinity of each boring location; this visit may coincide with the first day of drilling, or may be completed separately prior to the beginning of drilling work.
- Drilling, Monitoring Well Installation and Sub-slab Vapor Sampling: approximately two days are assumed for drilling, monitoring well installation and sub-slab vapor sampling. GeoEngineers will be on

site during this time to direct the driller as needed, log the borings and monitoring well installation, collect soil samples and conduct sub-slab vapor sampling activities.

- Groundwater Sampling: Approximately one day is assumed for sampling the newly installed monitoring well. The well will be sampled at least 72 hours after installation and development.

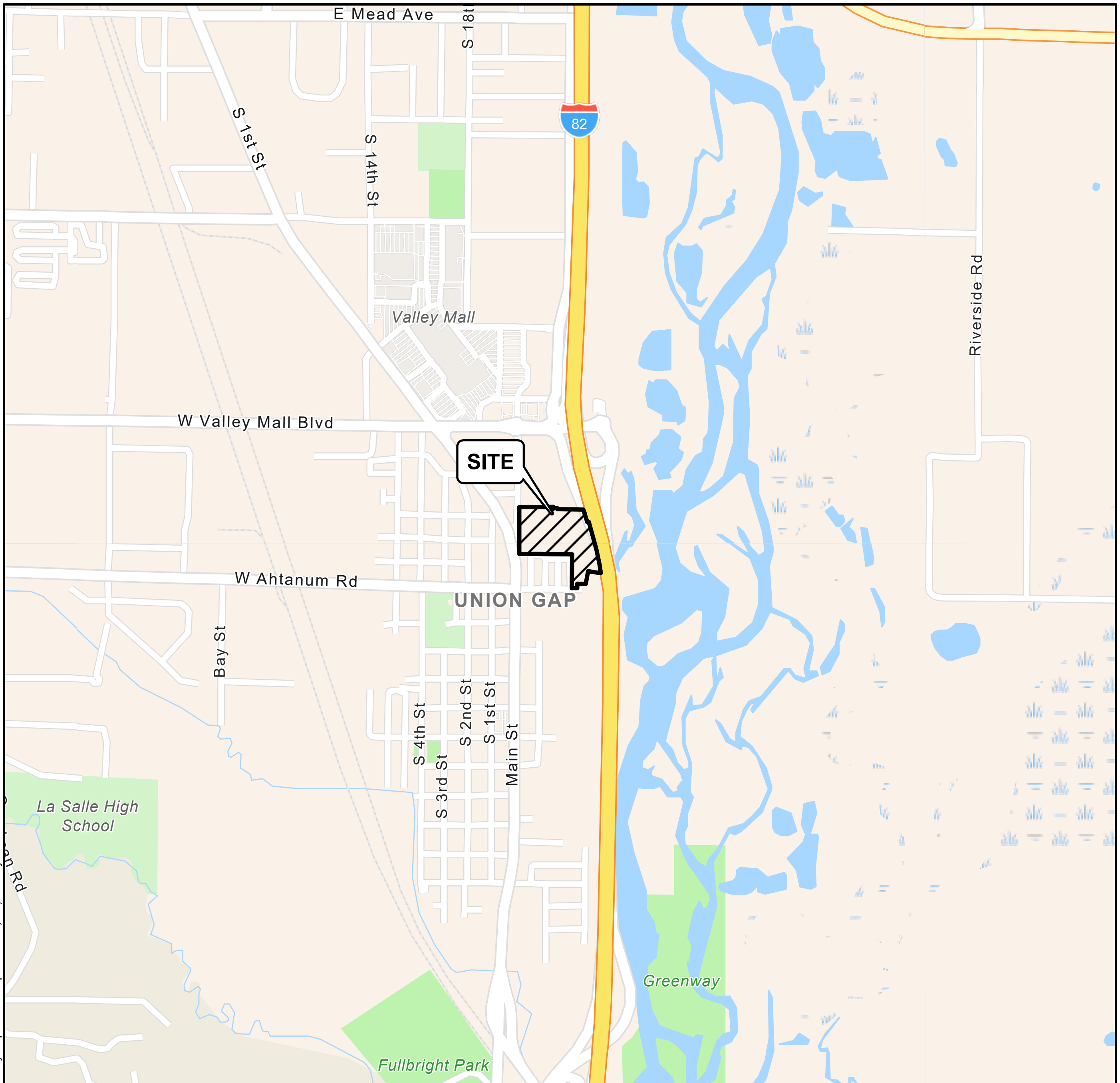
Following the conclusion of field activities and the receipt of laboratory chemical analytical data, GeoEngineers will prepare a table and figure(s) summarizing analytical results and provide the table and figure(s) to WSDOT. Two technical memorandums (for CSID #4942 and CSID #16641, respectively) will be prepared and submitted as described in Section 3.0, Task 04.

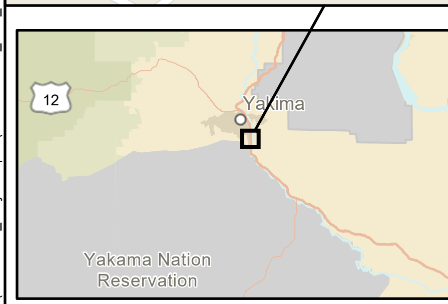
5.0 REFERENCES

Washington Department of Ecology. 2020. “VCP Application Standard and Expedited Processes, Form ECY-020-74.” Revised June 2020.

Washington Department of Ecology. 2022. “Comments on the three historical areas of concern (AOC) at the facility.” June 28, 2022.

FIGURES





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Vicinity Map	
WSDOT - Union Gap Union Gap, Washington	
GeoEngineers	**Figure 1**

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Legend

Approximate Site Location

Figure 3 Detail Map Extents

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Source(s):
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Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

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Site Plan	
WSDOT - Union Gap Union Gap, Washington	
GEOENGINEERS	**Figure 2**

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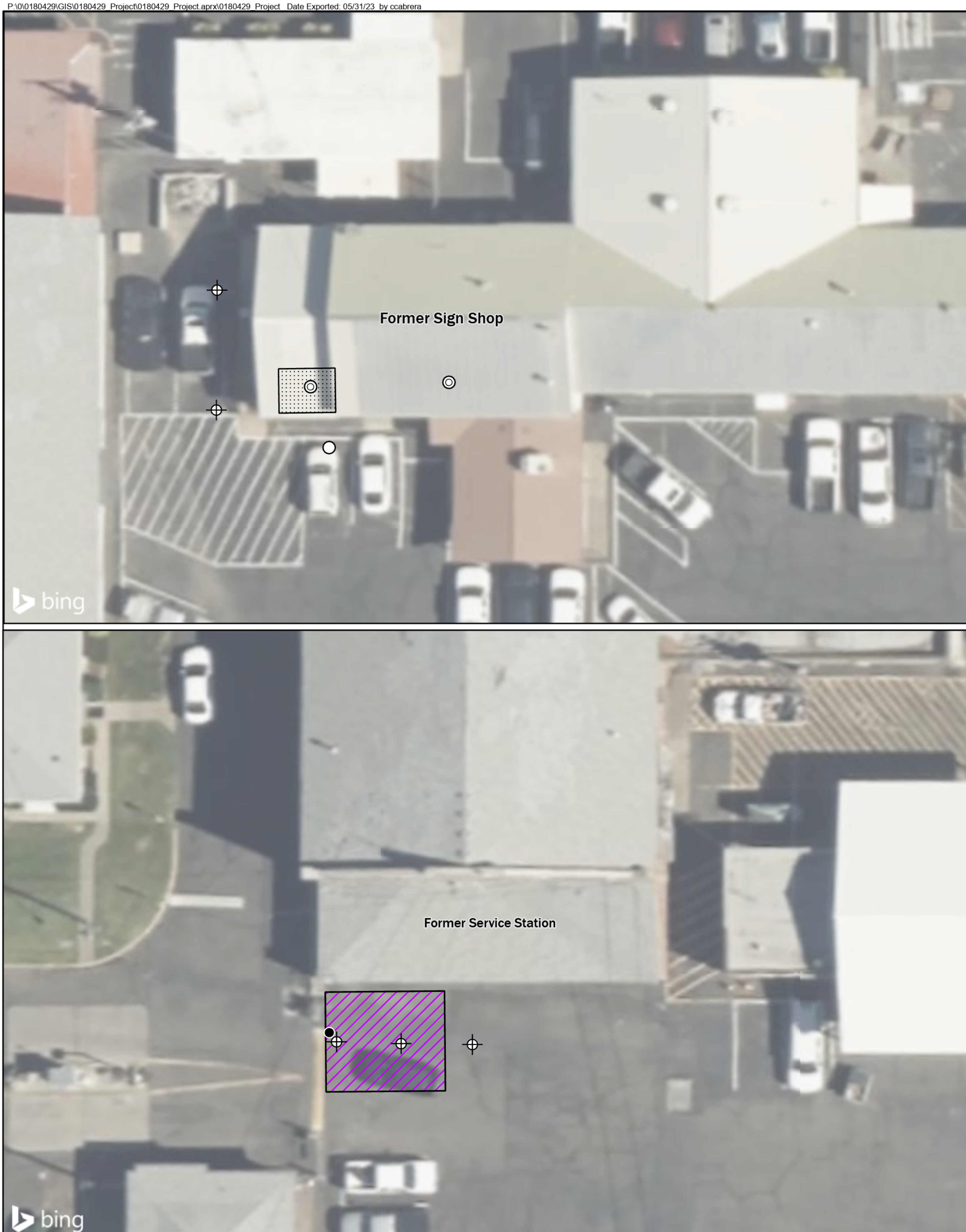

Legend

- Proposed Monitoring Well
- Proposed Soil Boring
- Proposed Sub-Slab Sample
- Soil Sample 3
- 1989 UST Removal Excavation
- 2003 Xylene Release Excavation

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Source(s):
• Bing Imagery

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

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Proposed Exploration Locations

WSDOT - Union Gap
Union Gap, Washington

GEOENGINEERS

Figure 3

APPENDICES

APPENDIX A
Sampling and Analysis Plan

APPENDIX A
SAMPLING AND ANALYSIS PLAN

STANDARD PROCEDURES

This section contains standard procedures for field data collection that are anticipated during the site assessment at the WSDOT – Union Gap (CSID #4942 and CSID #16641) facility in Union Gap, Washington, including the following:

- Collecting soil samples from sonic soil borings;
- Sub-slab vapor pin construction;
- Monitoring well construction;
- Groundwater sampling – grab sampling and monitoring well sampling;
- Soil vapor sampling;
- Field screening methods;
- Decontamination procedures;
- Handling of investigation-derived waste (IDW);
- Sample location control;
- Sample handling and custody requirements;
- Field measurement and observation documentation; and
- Sample identification.

Collecting Soil Samples from Soil Borings

Drilling will be conducted by a State of Washington licensed driller and supervised by a trained GeoEngineers field engineer or geologist. Soil samples will be collected continuously during drilling (sonic) using 5- or 10-foot core barrels and disposable plastic sleeves.

Each boring will be monitored by a GeoEngineers field representative to 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) D2488-17, the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

Soil samples from each sampling interval will be field screened for the presence of contaminants using the procedures described below to determine which sample will be submitted for chemical analysis. Based on field indicators, a minimum of one soil sample from each boring exhibiting the greatest level of contamination, as indicated by field screening, will be submitted for laboratory analysis. If field screening does not indicate the presence of contamination, the sample collected closest to and above the groundwater interface will be submitted for analysis. Additional samples may be submitted, based on field screening results and as approved by the Washington State Department of Transportation (WSDOT).

Soil selected for analysis will be removed from the sampler using a new or decontaminated soil knife, clean nitrile gloves, transferred into a laboratory-prepared container, labeled with a waterproof pen, and placed on “blue ice” or wet ice in a clean plastic-lined cooler. Each sample will be documented on a boring log and chain-of-custody (COC) and will include sample name, sample collection date and time, sample type, sample depth (relative to ground surface), requested analyses and sampler name. Soil samples for VOCs and GRPH analyses will be collected consistent with Environmental Protection Agency (EPA) Method 5035A (EPA 2002) and preserved in accordance with Ecology Implementation Memorandum 5 (Ecology 2004) and EPA (1998).

Sampling equipment will be decontaminated between each sampling attempt as described in the Decontamination Procedures Section. The sample coolers will be delivered to the analytical laboratory under standard COC procedures described in the QAPP (Appendix B).

Sub-Slab Vapor Pin Construction

Two sub-slab Vapor Pins® will be installed within the Former Sign Shop (CSID #16641) building concrete slab according to the manufacturer’s instructions. This will include drilling a hole through the building slab. The Vapor Pin® will then be hammered into the hole drilled in the slab.

Monitoring Well Construction

The soil boring advanced near the south side of the Former Sign Shop (CSID #16641) building will be completed as a monitoring well in accordance with Chapter 173-160 WAC, Minimum Standards for Construction and Maintenance of Wells. Monitoring well installation records will be submitted in accordance with these standards. GeoEngineers’ field representative will observe and document the monitoring well installation, including maintaining a detailed log of the well construction materials, depths of materials and depth of the well. Well construction details will be recorded on a monitoring well construction log.

The groundwater well will have an approximately 5-foot screened interval, with at least 1 foot of screen above the observed depth to groundwater level. The monitoring well will be constructed using a 2-inch-diameter, schedule 40 polyvinyl chloride (PVC) well casing and well screens.

The monitoring well will be completed with a bentonite seal and a flush-mounted monument. A lockable cap will be installed at the top of the PVC well casing. A concrete surface-seal will be placed around the monument at the ground surface to divert surface water away from the monitoring well location.

The monitoring well will be developed to remove water introduced into the well during drilling (if any), stabilize the filter pack and formation materials surrounding the well screen, and restore the hydraulic connection between the well screen and the surrounding soil. The depth to water in the monitoring well will be measured prior to development. The total depth of the well also will be measured and recorded. The monitoring well will be developed by pumping, surging, bailing or a combination of these methods after construction. Development of each well will continue until the water is as free of sediment as practicable with respect to the composition of the subsurface materials within the screened interval. The removal rate and amount of groundwater removed will be recorded during well development procedures. Water generated during development will be drummed, labeled and stored in a safe location on site until chemical analytical results are obtained. After development, wells will be allowed to equilibrate a minimum of 72 hours prior to sampling.

The horizontal location and relative elevation of the monitoring well will be surveyed by GeoEngineers. A fixed location (such as a fire hydrant or lamp post base) will be assigned an arbitrary elevation of 100.00. The ground surface and top of well casing of the well will be surveyed relative to this fixed location to quantitatively understand relative groundwater elevation to the ground surface. A survey reference mark will be established on the north side of the monitoring well casing as a reference for measuring groundwater elevations and at the fixed location.

Groundwater Sampling

Groundwater will be collected as a grab sample from the soil borings and newly constructed monitoring well near the Former Sign Shop (CSID #16641) location.

Grab Sampling

Grab samples from groundwater in the soil borings near the Former Sign Shop will be collected and analyzed in the field as described below. Depth to groundwater relative to the ground surface will be measured to the nearest 0.01 foot using an electronic interface probe and recorded in the field notes. The interface probe will be decontaminated with Liquinox® solution wash and a distilled water rinse prior to use in each boring.

Following depth to groundwater measurement, a groundwater sample will be collected from the open boring consistent with the EPA's low-flow groundwater sampling procedure, as described in EPA (2017) and Puls and Barcelona (1996). Dedicated tubing and a peristaltic pump will be used for groundwater purging and sampling. During purging activities, water quality parameters, including pH, temperature, conductivity, dissolved oxygen (DO), oxygen-reduction potential (ORP) and turbidity, will be measured using a multi-parameter meter equipped with a flow-through cell. Each boring will be purged until turbidity is stable for three consecutive readings, or for a maximum of 30 minutes, whichever occurs first, before collecting the sample. Stability is defined as the following:

- Turbidity: +/- 10% NTUs (when turbidity is greater than 10 NTUs)

Samples will not be collected from the boring if it has measurable free product. Field water quality measurements and depth-to-water measurements will be recorded on a Well Purging-Field Water Quality Measurement Form. Groundwater samples will be transferred in the field to laboratory-prepared sample containers and kept cool during transport to the testing laboratory. COC procedures will be observed from the time of sample collection to delivery to the testing laboratory consistent with the QAPP.

Monitoring Well Sampling

A groundwater sample will be collected from the newly-installed monitoring well and analyzed as described below. Depth to groundwater relative to the top of the PVC well casing will be measured to the nearest 0.01 foot using an electronic interface probe and recorded in the field notes. The interface probe will be decontaminated with Liquinox® solution wash and a distilled water rinse prior to use in each monitoring well.

Following depth to groundwater measurement, a groundwater sample will be collected from the open boring consistent with the EPA's low-flow groundwater sampling procedure, as described in EPA (2017) and Puls and Barcelona (1996). Dedicated tubing and a peristaltic pump will be used for groundwater purging and sampling. During purging activities, water quality parameters, including pH, temperature, conductivity, DO, ORP and turbidity, will be measured using a multi-parameter meter equipped with a flow-through cell. Each boring will be purged until parameters stabilize, or a maximum of 30 minutes, whichever occurs first, before collecting the sample. Stability is defined as the following:

- pH: +/- 0.1 pH units
- Conductivity: +/- 3% mS/cm
- ORP: +/- 10 mV
- Turbidity: +/- 10% NTUs (when turbidity is greater than 10 NTUs)
- DO: +/- 0.3 mg/L
- Temperature: +/- 3% degrees Celsius

Samples will not be collected from the monitoring well if it has measurable free product. Field water quality measurements and depth-to-water measurements will be recorded on a Well Purging-Field Water Quality Measurement Form. Groundwater samples will be transferred in the field to laboratory-prepared sample containers and kept cool during transport to the testing laboratory. COC procedures will be observed from the time of sample collection to delivery to the testing laboratory consistent with the QAPP.

Soil Vapor Sampling

The sub-slab vapor sample points will be collected as described below. Prior to sampling, indoor air conditions will be noted, including taking and recording a manometer reading and coordinating and confirming Heating, Ventilation and Air Conditioning (HVAC) system operational status with WSDOT at the time of sample collection. Before collecting any samples, each vapor sample location will be leak tested using a helium shroud. Teflon™ or Tygon® tubing will be connected to the sample port and a portable air pump will be attached the end of the tubing. The sample point will be purged using the portable air pump for 1 minute and the pump exhaust will be monitored for helium during purging using a helium detector. If helium is detected in the pump exhaust, the leak will be repaired, and the port will be resampled before a Summa cannister is connected to the sample line.

If helium is not detected in the exhaust port, a 1-liter Summa canister fitted with a flow controller will be attached to the Teflon™ or Tygon® tubing and the summa canister will be placed inside the helium shroud. The flow controllers will be set to approximately 200 milliliters per min (ml/min) by the analytical laboratory. Valves on the cannister will be opened and air from the sampling port will be drawn into the cannister. Air will be drawn for about 5 minutes until the cannister is filled, but before atmospheric pressure is reached. The flow controller will automatically stop the flow of air before atmospheric pressure is reached. The samples will be submitted to the laboratory for analysis of GRPH using Northwest Method TO-3 and VOCs using EPA Method TO-15. GeoEngineers will request below reporting limit/calibration curve, estimated concentration “method detection limit” reporting from the selected laboratory.

Consistent with Ecology’s VI Guidance, soil vapor samples will not be obtained during or immediately after a significant rain event. For the purposes of this Work Plan, a significant rain event is defined as ½-inch or greater during the preceding 24-hour period (DTSC 2012).

Field Screening Methods

Field screening methods will be used to select samples for laboratory chemical analysis.

A GeoEngineers field representative will perform visual and physical field screening tests on soil samples and record the observations on the field boring log and in the field notebook. Field screening results will be used to aid in the selection of soil samples for laboratory chemical analysis. The sample from each boring showing the highest likelihood of contamination, based on field screening, will be selected for laboratory analysis. The remaining samples may be submitted to the laboratory and held, pending the results of the samples submitted for analysis.

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

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

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

Water sheen testing equipment will be disposable or decontaminated before field screening each sample using a Liquinox® soap solution with a water rinse. Used testing equipment and/or decontamination water will be stored on-site in a labeled Department of Transportation (DOT)-approved drum pending disposal with other IDW.

Headspace vapor screening involves placing a soil sample into a sealed plastic bag and measuring the airspace VOC vapor concentrations in parts per million (ppm) with a PID. Once a soil sample is placed in a sealed plastic bag with air space, the bag is shaken to expose the soil to the air trapped in the bag. The probe of the PID, calibrated to isobutylene following the manufacturer's instructions, is inserted into a small opening in the bag seal and the VOC concentration is measured. The PID typically is designed to quantify VOC vapor concentrations in the range between 1 ppm and 2,000 ppm with an accuracy of ±10 percent of the reading, and between 2,000 ppm and 5,000 ppm with an accuracy of ±20 percent of the reading.

Decontamination Procedures

The objective of the decontamination procedures described herein is to minimize the potential for cross-contamination between sample locations. A designated decontamination area will be established for decontamination of drilling equipment and reusable sampling equipment. Drilling equipment will be cleaned by water jetting using high-pressure/low-volume cleaning equipment.

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

1. Brush equipment with a nylon brush to remove large particulate matter.
2. Wash with non-phosphate detergent solution (Liquinox® and potable tap water).
3. Rinse with distilled water.

Handling of IDW

IDW, which consists mainly of drill cuttings and decontamination/purge water, typically will be placed in DOT-approved 55-gallon drums. Each drum will be labeled with the project name, generator, general contents, generated date, and GeoEngineers and WSDOT contact information. The drummed IDW will be stored on site at a location approved by the site owner pending analysis and disposal.

Disposable items, such as sample tubing, disposable bailers, bailer line, gloves and protective overalls, paper towels, etc., will be placed in plastic bags after use and deposited in trash receptacles for disposal.

Sample Location Control

Horizontal sample control will be maintained throughout the project. Horizontal control will be established using measuring tapes or a hand-held global positioning system (GPS) meter accurate to approximately ±15 lateral feet. Boring locations also will be established by measuring their distance relative to permanent site features.

Sample Handling and Custody Requirements

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

Field Measurements and Observations Documentation

Field measurements and observations will be recorded in a project field notebook. Daily field logs will be dated, and pages will be consecutively numbered. Entries will be recorded directly and legibly in the daily field 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 project field notebook:

- Purpose and location of investigation;
- Location of activity;
- Site or sampling area sketch showing sample locations and distances to fixed reference points;
- Date and time of sampling;
- Type of sample (matrix);
- Designation as a discrete or composite sample;
- Sample identification number (should match with what is on jar and COC);
- Soil sample top and bottom depth (bgs);
- Sample preservation (if any);
- Sampling equipment used;

- Field measurements and screening observations (e.g., odor, color, staining, sheens, etc.);
- Field conditions that are pertinent to the integrity of the samples (e.g., weather conditions, performance of the sampling equipment, sample depth control, sample disturbance, etc.);
- Relevant comments regarding field activities; and
- Shipping arrangements (including overnight air bill number, if applicable) and receiving laboratory.

Information will be recorded in the project field notebook with enough detail so that field activities can be reconstructed without reliance on personnel memory. 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;
- Weather conditions including barometric pressure, precipitation and wind speed, obtained from the nearest weather station (Yakima Air Terminal); and
- Calibration readings for any equipment used and equipment model and serial number.

Sample Identification

Sample identification is important to provide concise data management and to quickly determine sample location and date when comparing multiple samples. Soil samples for each site will adhere to the following general format:

Location ID (Depth). For example, a soil sample collected at the WSDOT – Union Gap site at boring location B-1 at a depth interval of 5 to 6 feet shall be labeled as B1 (5-6).

Grab groundwater samples will have the following general format:

Location ID-Date. For example, groundwater sampled from boring location B-1 at the WSDOT – Union Gap site on July 1, 2023, will be labeled as B1-070123.

Groundwater sampled from the monitoring well will be labelled similarly, with the well number replacing the location number. Following the example above, groundwater sampled from MW-1 will be labelled as MW1-070123.

Soil vapor point (SVP) samples will have the following general format:

Point ID-Date. For example, soil vapor sampled from soil vapor point SVP-1 at the WSDOT – Union Gap site on July 2, 2023, will be labeled as SVP1-070123.

REFERENCES

ASTM D2488. 2017. Standard Practice for Description and Identification of Soils (Visual-Manual Procedures). 2017.

Department of Toxic Substances Control. 2012. "Advisory Active Soil Gas Investigation. Department of Toxic Substances Control, California Environmental Protection Agency. Los Angeles Regional Water Quality Control Board. San Francisco Regional Water Quality Control Board." April 2012.

Washington State Department of Ecology. 2009. "Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action." Publication No. 09-09-047. March 2022.

Puls, R. W. and M.J. Barcelona. 1996. "Low-flow (Minimal Drawdown) Ground-water Sampling Procedures." EPA Ground Water Issue. April. p.1-9. 1996.

U.S. Environmental Protection Agency. 2017. Region 1, "Low Stress (Low-Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells." EPA SOP No. GW4, Revision No. 4., September 19, 2017.

U.S. Environmental Protection Agency. 1998. "Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW_846)." Revision 5, April 1998.

U.S. Environmental Protection Agency. 2002. Method 5035A (SW-846). Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples. Draft Revision 1. Washington, D.C. July 2002.

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

APPENDIX B
Quality Assurance Project Plan

APPENDIX B
QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) was developed to guide laboratory analyses for soil, groundwater and vapor samples collected as part of the assessment conducted for the Washington State Department of Transportation (WSDOT) at the WSDOT – Union Gap (CSID #4942 and CSID #16641) facility under Agreement Y-12778. The QAPP presents the objectives, procedures, organization, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve data quality goals established for the projects. This QAPP is based on Washington State Department of Ecology (Ecology) guidelines (Ecology 2016) and the United States Environmental Protection Agency (EPA) Requirements for Quality Assurance Project Plans (EPA 2001) and related guidelines (EPA 2002).

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

PROJECT ORGANIZATION AND RESPONSIBILITY

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

Project Leadership and Management

The Project Manager's (PM) duties consist of providing concise technical work statements for project tasks, selecting project team members, determining subcontractor participation, establishing budgets and schedules, adhering to budgets and schedules, providing technical oversight, and providing overall production and review of project deliverables. Justin Orr, Licensed Geologist (LG) is the PM for activities at the site. The Principal-in-Charge, Phil Welker, Professional Engineer (PE), is responsible to WSDOT for fulfilling contractual and administrative control of the project.

Field Coordinator

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

- Provides technical direction to the field staff;
- Develops schedules and allocates resources for field tasks;
- Coordinates data collection activities to be consistent with information requirements;
- Supervises the compilation of field data and laboratory analytical results;
- Assures that data are correctly and completely reported;
- Implements and oversees field sampling in accordance with project plans;
- Supervises field personnel;
- Coordinates work with on-site subcontractors;

- Schedules sample shipment, if necessary, with the analytical laboratory;
- Monitors that appropriate sampling, testing and measurement procedures are followed;
- Coordinates the transfer of field data, sample tracking forms, and log books to the PM for data reduction and validation; and
- Participates in QA corrective actions, as required.

The Field Coordinator for each work assignment will be drawn from our pool of experienced staff since fieldwork will be conducted concurrently at multiple sites. Staff that will serve as Field Coordinator could include Bryce Hanson and Justin Orr.

QA Leader

The GeoEngineers QA Leader is under the direction of Justin Orr and Phil Welker, who are responsible for the project's overall QA. The QA Leader is responsible for coordinating QA/QC activities as they relate to the acquisition of field data. Denell Warren 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; and
- Monitors subcontractor compliance with data quality requirements.

Laboratory Management

The Ecology-accredited subcontracted laboratories (OnSite Environmental, Inc ([OnSite] of Redmond, Washington and Eurofins Air Toxics [Eurofins] of Folsom, California) conducting sample 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 Laboratories' QA Coordinators (David Baumeister [OnSite] and Monica Tran [Eurofins]) administer their respective Laboratory QA Plans and are responsible for QC. Specific responsibilities of this position include:

- Ensures implementation of the QA Plan;
- Serves as the laboratory point of contact;
- Activates corrective action for out-of-control events;
- Issues the final laboratory QA/QC report;
- Administers QA sample analysis;

- Complies with the specifications established in the project plans as related to laboratory services; and
- Participates in QA audits and compliance inspections.

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, comparability and completeness (PARCC), 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 Tables B-1 (soil), B-2 (groundwater) and B-3 (vapor) and are discussed below.

Analytes and Matrices of Concern

Samples of soil and/or groundwater will be collected from six sonic explorations during the assessment. Samples of soil vapor will be collected from up to two sub-slab vapor points. Tables B-4 (soil), B-5 (groundwater) and B-6 (vapor) summarize the analyses to be performed at the site for soil, groundwater and vapor, respectively.

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 contaminants of potential concern (COPCs) at the site is presented in Tables B-1, B-2 and B-3 for soil, groundwater and vapor, respectively. These reporting limits were obtained from OnSite, the Ecology-accredited lab that will be analyzing the samples. Other criteria include State of Washington (WAC 173-201) water quality criteria 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-1 through 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.

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 and field duplicate comparisons for water samples. 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 2017a,b) that address criteria exceedances and courses of action. Relative percent difference goals for this effort are no greater than 30 percent in groundwater, 40 percent in soil, and 25 percent in vapor for all analyses, unless the duplicate sample values are within 5 times the reporting limit. In this case, the absolute difference is used instead of the RPD. The absolute difference control limit is equal to the lowest reporting limit of the two samples for water, two times the lowest reporting limit of the two samples for soil and the lowest reporting limit of the two samples for vapor.

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 2017a,b) that address criteria exceedances and courses of action. Accuracy criteria for surrogate spikes, MS and laboratory control spikes (LCS) are found in Tables B-1 through B-3 of this QAPP.

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 Work Plan 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 number 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.

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 Tables B-4 through B-6.

Blanks

According to the *National Functional Guidelines for Organic Data Review* (EPA 2017b), "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.

SAMPLE COLLECTION, HANDLING AND CUSTODY

Sampling procedures are provided in Section 3 and Appendix A of this Work Plan.

Sampling Equipment Decontamination

Sampling equipment decontamination procedures are described in Appendix A of the Work Plan.

Sample Containers and Labeling

The Field Coordinator will establish field protocol to manage field sample collection, handling and documentation. Soil, groundwater and vapor samples obtained during this study will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Tables B-4 through B-6.

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

- Project name and number;
- Sample name, which will include a reference to depth if appropriate; and
- Date and time of collection.

The sample collection activities will be noted in the field log books. The Field Coordinator will monitor consistency between the Work Plan, sample containers/labels, field log books and the chain-of-custody (COC).

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 achieve and maintain a sample temperature of 4 degrees Celsius (within plus/minus 2 degrees Celsius). Holding times will be observed during sample storage. Holding times for the project analyses are summarized in Tables B-4 through B-6.

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 from a remote location for analysis will be transported by a commercial express mailing service on an overnight basis or returning field personnel. The Field Coordinator will monitor that the shipping container (cooler) has been properly secured using clear packing 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 wrapped with bubble wrap or other protective material before being placed in coolers. Trip blanks will be included in coolers with groundwater samples.

Chain-of-Custody Records

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

- Project name and number;
- Sample identification number;
- Date and time of sampling;
- Sample matrix (soil, 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 sealed 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.

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 analyst’s name or initial, time and date.

CALIBRATION PROCEDURES

Field Instrumentation

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

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

Laboratory Instrumentation

For analytical chemistry, calibration procedures will be performed in general accordance with the methods cited and laboratory SOPs. Calibration documentation will be retained at the laboratory and readily available for a period of 6 months.

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 electronic data deliverable (EDD) formats will be established by GeoEngineers, Inc., with the contract laboratory. Final results will be sent to the PM.

Chromatograms will be provided for samples analyzed by Northwest Methods NWTPH-Gx. The laboratory will ensure the full heights of all peaks appear on the chromatograms and the same horizontal time scale is used to allow for comparisons to other chromatograms.

INTERNAL QC

Table B-7 summarizes the types and frequency of QC samples to be collected during the site characterization, including both field QC and laboratory QC samples.

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 (VOCs) and potable water used in drilling activities.

Field Duplicates

In addition to replicating 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. Analysis of duplicates tests both the precision and consistency of laboratory analytical procedures and methods, and the consistency of the sampling techniques used by field personnel.

One field duplicate will be collected during each groundwater sampling event, including groundwater samples collected from direct-push borings. The duplicate sample will be analyzed for the COPCs specified for the given well.

Trip Blanks

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

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

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."

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.

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 compound may interfere with accurate quantitation of another analyte. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix affects cannot be determined due to dilution and/or high levels of related substances in the sample. A MS is evaluated by spiking a known amount of one or more of the target analytes ideally at a concentration of 5 to 10 times higher than the sample result. A percent recovery is calculated by subtracting the sample result from the spike result, dividing by the spiked amount and multiplying by 100.

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

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.

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.

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.

DATA REDUCTION AND ASSESSMENT PROCEDURES

Data Reduction

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

Field Measurement Evaluation

Field data will be reviewed at the end of each day by following the QC checks outlined below and procedures in the Work Plan. 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.

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 will not be evaluated because even a well-mixed sample is not entirely homogenous due to sampling procedures, soil conditions and contaminant transport mechanisms. Grab groundwater duplicate samples are also highly variable because of sampling procedures and borehole conditions and are therefore not reliable measures of precision.

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.

REFERENCES

U.S. Environmental Protection Agency. 2001. EPA Requirements for Quality Assurance Project Plans. EPA QA/R-5. EPA/240/B-01/003. Office of Environmental Information, Washington, D.C. March 2001.

U.S. Environmental Protection Agency. 2002. Guidance for Quality Assurance Project Plans. EPA QA/G-5. EPA/240/R-02/009. Office of Environmental Information, Washington, D.C. December 2002.

U.S. Environmental Protection Agency. 2017a. National Functional Guidelines for Inorganic Superfund Methods Data Review. 540-R-2017-001. Office of Superfund Remediation and Technology Innovation. Washington, D.C. January 2017.

U.S. Environmental Protection Agency. 2017b. National Functional Guidelines for Organic Superfund Methods Data Review. Office of Superfund Remediation and Technology Innovation. Washington, D.C. 540-R-2017-002. January 2017.

Washington State Department of Ecology. 2016. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. Publication No. 04-03-030. July 2004 (revised December 2016).

Table B-1

Soil Measurement Quality Objective and Target Reporting Limits

WSDOT - Union Gap Facility

Union Gap, Washington

Analyte	Method	MDL (mg/kg)	PQL (mg/kg)	LCS/LCSD Lower	LCS/LCSD Upper	LCS/LCSD RPD	MS/MSD Lower	MS/MSD Upper	MS/MSD RPD	MTCA Method A Cleanup Level (mg/kg)
VOCs										
Benzene	EPA 8260D	0.000152	0.001	81	122	15	60	140	25	0.03
Toluene	EPA 8260D	0.000171	0.005	83	120	15	60	140	25	7
Ethylbenzene	EPA 8260D	0.000120	0.001	80	120	15	60	140	25	6
m, p-Xylene	EPA 8260D	0.000284	0.002	80	119	15	60	140	25	NE
o-Xylene	EPA 8260D	0.000131	0.001	80	120	15	60	140	25	NE
Xylene (Total)	EPA 8260D	Derived as sum of m, o and p isomers								9
Metals										
Arsenic	EPA 6010D	--	10	80	120	20	75	125	20	20
Barium	EPA 6010D	--	2.5	80	120	20	75	125	20	NE
Cadmium	EPA 6010D	--	0.5	80	120	20	75	125	20	2
Chromium (total)	EPA 6010D	--	0.5	80	120	20	75	125	20	2,000
Lead	EPA 6010D	--	5	80	120	20	75	125	20	250
Selenium	EPA 6010D	--	10	80	120	20	75	125	20	NE
Silver	EPA 6010D	--	1	80	120	20	75	125	20	NE
Mercury	EPA 7470A	0.000696	0.25	80	120	20	75	125	20	2
TPH										
Gasoline Range Organics	NWTPH-Gx	0.000298	0.005	65	126	n/a	--	--	--	100 / 30[1]
Diesel Range Organics	NWTPH-Dx	6.14	25	58	123	n/a	--	--	--	2,000
Residual Oil Range Organics	NWTPH-Dx	12.0	50	58	123	n/a	--	--	--	2,000

Notes:

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

Practical quantitation limits (PQLs) based on information provided by OnSite Environmental.

mg/kg = milligrams per kilogram; NE = Not established; VOCs = volatile organic compounds; TPH = total petroleum hydrocarbons; EPA = United States Environmental Protection Agency;

MDL = method detection limit; LCS = laboratory control spike; LCSD = laboratory control spike duplicate; MS = matrix spike; MSD = matrix spike duplicate; RPD = relative percent difference;

MTCA = Model Toxics Control Act.

Table B-2

Groundwater Measurement Quality Objective and Target Reporting Limits

WSDOT - Union Gap Facility

Union Gap, Washington

Analyte	Method	MDL (µg/L)	PQL (µg/L)	LCS/LCSD Lower	LCS/LCSD Upper	LCS/LCSD RPD	MS/MSD Lower	MS/MSD Upper	MS/MSD RPD	MTCA Method A Cleanup Level (µg/L)
VOCs										
Benzene	EPA 8260D	0.152	1.0	81	124	16	74	128	18	5
Toluene	EPA 8260D	0.171	5.1	83	118	18	77	121	17	1,000
Ethylbenzene	EPA 8260D	0.120	1.0	80	124	15	81	126	20	700
m, p-Xylene	EPA 8260D	0.284	2.0	80	124	15	81	128	21	NE
o-Xylene	EPA 8260D	0.131	1.0	80	124	15	82	127	20	NE
Xylene (Total)	EPA 8260D	Derived as sum of m, o and p isomers								1,000
TPH										
Gasoline Range Organics	NWTPH-Gx	5.09	100	65	122	30	--	--	--	1,000/800[1]
Diesel Range Organics	NWTPH-Dx	0.0343	0.20	53	126	n/a	--	--	--	500
Residual Oil Range Organics	NWTPH-Dx	0.0817	0.20	53	126	n/a	--	--	--	500

Notes:

[1]MTCA Method A cleanup level for gasoline-range petroleum hydrocarbons is 1,000 µg/L if benzene is not detected and the total concentrations of ethylbenzene, toluene and xylenes are less than 1 percent of the gasoline mixture; otherwise the cleanup level is 800 µg/L.

Practical quantitation limits (PQLs) based on information provided by OnSite Environmental.

µg/L = micrograms per liter; NE = Not established; DUP = duplicate; MCL = maximum contaminant level; MTCA = Model Toxics Control Act; MDL = method detection limit; LCS = laboratory control spike; LCSD = laboratory control spike duplicate; MS = matrix spike; MSD = matrix spike duplicate; RPD = relative percent difference; EPA = United States Environmental Protection Agency; VOCs = volatile organic compounds; TPH = total petroleum hydrocarbons

Table B-3

Soil Vapor Measurement Quality Objective and Target Reporting Limits

WSDOT - Union Gap Facility

Union Gap, Washington

				LCS/LCSD			MTCA Method B Sub-Slab Soil Gas Screening Level ($\mu g/m^3$)
Analyte	**Method**	**MDL ($\mu g/m^3$)**	**PQL ($\mu g/m^3$)**	**Lower**	**Upper**	**RPD**	
VOCs							
Benzene	EPA TO-15	0.77	3.5	70	130	25	11
Toluene	EPA TO-15	1.1	8.3	70	130	25	76,000
Ethylbenzene	EPA TO-15	1.1	4.8	70	130	25	15,000
m,p-Xylene	EPA TO-15	1.7	5	70	130	25	NE
o-Xylene	EPA TO-15	0.88	4.8	70	130	25	NE
Xylene (total)	EPA TO-15	Derived as sum of m, o and p isomers					1,500
Gasoline Range Organics	EPA TO-3	--	0.025	75	150	25	1,500

Notes:

Practical quantitation limits (PQLs) based on information provided by Eurofins Air Toxics.

$\mu g/m^3$ = micrograms per cubic meter; NE = Not established; MDL = method detection limit; LCS = laboratory control spike;

LCSD = laboratory control spike duplicate; RPD = relative percent difference; EPA = United States Environmental Protection Agency;

VOCs = volatile organic compounds; MTCA = Model Toxics Control Act; MTCA = Washington State Model Toxics Control Act

Table B-4

Soil Test Methods, Sample Containers, Preservation and Holding Time[1]

WSDOT - Union Gap Facility

Union Gap, Washington

Analysis	Matrix	Method	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times
VOCs	Soil	EPA 8260D	10 g	2 pre-weighed 40 mL VOA vials preserved with MeOH; 4 oz jar (for dry-weight correction)	MeOH; <Cool 6°C	14 days from collection to analysis
Metals	Soil	EPA 6000/7000 Series	10 g	4 oz jar	NA	180 days; 28 days for mercury
GRPH	Soil	NWTPH-Gx	10 g	2 pre-weighed 40 mL VOA vials preserved with MeOH; 4 oz jar (for dry-weight correction)	MeOH; Cool <6°C	14 days from collection to analysis
DRPH and ORPH	Soil	NTPH-Dx	30 g	4 oz jar	<Cool 6°C	14 days from collection; 40 days from extraction

Notes:

[1]Holding times are based on elapsed time from date of collection.

VOCs = volatile organic compounds; MeOH = Methanol; VOA = volatile organic analysis; g = gram; oz = ounce; C = Celsius; GRPH = gasoline-range petroleum hydrocarbons;

EPA = Environmental Protection Agency

Table B-5

Water Test Methods, Sample Containers, Preservation and Holding Time[1]

WSDOT - Union Gap Facility

Union Gap, Washington

Analysis	Matrix	Method	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times
VOCs	Soil	EPA 8260D	40 ml	2 - 40 mL VOA vials preserved with HCL;	HCL; <Cool 6°C	14 days
GRPH	Soil	NWTPH-Gx	40 ml	2 - 40 mL VOA vials preserved with HCL;	HCL; <Cool 6°C	14 days
DRPH and ORPH	Soil	NTPH-Dx	1000 ml	2 - 500ml glass amber	HCL; <Cool 6°C	14 days from collection; 40 days from extraction

Notes:

[1]Holding times are based on elapsed time from date of collection.

VOC = volatile organic compound; VOA = volatile organic analysis; HCl = hydrochloric acid; mL = milliliters; C = Celsius; EPA = United States Environmental Protection Agency

GRPH = gasoline-range petroleum hydrocarbons; DRPH = diesel-range petroleum hydrocarbons; ORPH = oil-range petroleum hydrocarbons

Table B-6

Soil Vapor Test Methods, Sample Containers, Preservation and Holding Time[1]

WSDOT - Union Gap Facility

Union Gap, Washington

Analysis	Matrix	Method	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times
VOCs	Air	EPA TO-15	1 L	Summa Canister	None	28 days
Gasoline Range Organics	Air	EPA TO-3	1 L	Summa Canister	None	28 days

Notes:

[1]Holding times are based on elapsed time from date of collection.

VOC = volatile organic compound; L = liter; EPA = Environmental Protection Agency

Table B-7

Quality Control Samples Type and Frequency

WSDOT - Union Gap Facility

Union Gap, Washington

Parameter	Field QC		Laboratory QC			
	Field Duplicate	Trip Blanks	Method Blanks	LCS	MS / MSD	Lab Duplicates
VOCs	1 per groundwater event	1 per soil event and 1 per water event	1/batch	1/batch	1/batch	1/batch
GRPH	1 per groundwater event	1 per soil event and 1 per water event	1/batch	1/batch	1/batch	1/batch

Notes:

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

QC = quality control; VOCs = volatile organic compounds; GRPH = gasoline-range petroleum hydrocarbons

LCS = Laboratory control sample; MS = Matrix spike sample; MSD = Matrix spike duplicate sample

APPENDIX C
Health and Safety Plan

APPENDIX C
GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
WSDOT – UNION GAP FACILITY
FILE NO. 0180-429-00

This Health and Safety Plan (HASP) is to be used in conjunction with the GeoEngineers, Inc. (GeoEngineers) Safety Programs. Together, the written GeoEngineers' safety programs and this HASP constitute the site safety plan for this subject site. This HASP is required by the Hazardous Waste Operations and Emergency Response (HAZWOPER) regulation (29 CFR 1910.120) when performing mandatory or voluntary clean-up operations and initial investigations conducted to determine the presence or absence of hazardous substances unless the employer can demonstrate that the work does not involve employee exposure to safety and health hazards from hazardous substances at the site. This HASP is to be used by GeoEngineers personnel on this site and must be available on site, as well as in the project Safety folder on SharePoint.

Standard HASPs will have to be reviewed and approved at least by the GeoEngineers Project Manager and the Site Safety Officer. The Project Manager will need to send an email to GeoEngineers Health and Safety Manager indicating the availability of the final copy of the approved standard HASP on SharePoint for review and/or reference.

All HASPs and/or Habitat Conservation Plans (HCPs) are to be used in conjunction with current standards and policies outlined in the GeoEngineers Health and Safety Programs.

Liability Clause: *If requested by subcontractors, this site HASP may be provided for informational purposes only. In this case, Form 1 of this HASP shall be signed by the subcontractor. Please be advised that this site-specific HASP 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 HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.*

1.0 GENERAL PROJECT INFORMATION

Project Name:	USDOT – Union Gap Facility Release Investigation Assessments
Project Number:	0180-429-00
Type of Project:	Sonic Drilling Site Assessment
Start/Completion:	May 2023 / March 2024
Subcontractors:	Utilities Plus, AEC, OnSite Environmental, Eurofins Air Toxics
Client:	Washington State Department of Transportation

Chain of Command	Title	Name	Telephone Numbers (O & C)
1	**Current Property Owner (c/o WSDOT Project Manager)**	Matt Cox	O: 360.819.3446
2	**Principal-in-Charge**	Phil Welker	O: 253.203.0039 C: 916.605.8010
3	**Health and Safety Manager (HSM)**	Lucas Miller	O: 509.209.2830 C: 270.978.6222
4	**Health and Safety Specialist (HSS)**	Connor Jordan	O: 253.722.2426 C: 530.210.5462
6	**Project Manager (PM)**	Justin Orr	O: 509.570.0779 C: 406.890.1310
7	**Site Safety Officer (SSO)**	Justin Orr Bryce Hanson	See above C: 360.269.3237
8	**Field Personnel**	Justin Orr Bryce Hanson	See above See above
10	**Subcontractor(s)**	Utilities Plus AEC Onsite Environmental Eurofins Air Toxics	509.985.4355 360.577.9194 425.883.3881 800.985.5955

1.1. Functional Responsibility

Health and Safety Manager (HSM)

GeoEngineers' Health and Safety Manager (HSM) is responsible for implementing and promoting employee participation in the company Health and Safety Program. The HSM has overall responsibility for the general health and safety of GeoEngineers personnel. The HSM issues directives, advisories and information regarding health and safety to the technical staff. Additionally, the HSM has the authority to audit on-site compliance with HASPs, suspend work or modify work practices for safety reasons, and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others.

Health and Safety Specialist (HSS)

GeoEngineers' Health and Safety Specialist (HSS) is a designated safety specialist. The HSS provides technical support to the PM and Site Safety Officer (SSO) to ensure that GeoEngineers staff are following GeoEngineers safety program and safe work practices during site activities. The HSS works with the PM and SSO to ensure the subcontractors' crews are following the site general HASPs, the activity's HASP/Job Hazard Analyses (JHAs) and safe work practices. The HSS may periodically go on-site to perform safety observations and mentor on-site personnel on safety behavior practices. Additionally, the HSS has the authority to suspend work or modify work practices for safety reasons and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others. The HSS shall keep the PM and HSM informed of the project's health- and safety-related matters, as necessary.

Project Manager (PM)

A PM is assigned to manage the activities of various projects and is responsible to the principal-in-charge of the project. The PM has the responsibility of ensuring the safety of all GeoEngineers personnel on job sites. The PM is responsible for assessing the hazards present at a job site and incorporating the appropriate safety measures for field staff protection into the field briefing and/or Site Safety Plan. He or she is also responsible for assuring that appropriate HASPs are developed. The PM will provide a summary of chemical analysis to personnel completing the HASP. PMs shall also see that their project budgets consider health and safety costs. The PM shall keep the HSM and HSS or HSC informed of the project's health- and safety-related matters, as necessary. The PM shall designate the project Site Safety Officer (SSO) and help the SSO implement the specifications of the HASP. The PM is responsible for communicating information in site safety plans and checklists to appropriate field personnel. Additionally, the PM and SSO shall hold a site safety briefing before any field activities begin. The PM is responsible for transmitting health and safety information to the Site Safety Officer (SSO) when appropriate.

Site Safety Officer/HAZWOPER (SSO)

The SSO will have the on-site responsibility and authority to modify and stop work, or remove GeoEngineers personnel from the site if working conditions change that may affect on-site and off-site health and safety. The SSO will be the main contact for any on-site emergency situation. The SSO is First Aid and Cardio-Pulmonary Resuscitation (CPR) qualified and has current Hazardous Waste Operations and Emergency Response (HAZWOPER) training when working at hazardous waste sites. The SSO is responsible for implementing and enforcing the project safety program and safe work practices during site activities. The SSO shall conduct daily safety meetings, perform air monitoring as required, conduct site safety inspections as required, coordinate emergency medical care, and ensure personnel are wearing the appropriate personal protective equipment (PPE). The SSO shall have advanced fieldwork experience and shall be familiar with health and safety requirements specific to the project. The SSO has the authority to suspend site activities if unsafe conditions are reported or observed.

Duties of the SSO include the following:

- Implementing the HASP in the field and monitoring staff compliance with its guidelines.
- Ensuring that all GeoEngineers field personnel have met the training and medical examination requirements. Advising other contractor employees of these requirements.
- Maintaining adequate and functioning safety supplies and equipment at the site.
- Setting up work zones, markers, signs and security systems, if necessary.
- Performing or supervising air quality measurements. Communicating information on these measurements to GeoEngineers field staff and subcontractor personnel.
- Lead the pre-entry briefing (at the beginning of the site activities) and the site safety meetings (daily and/or weekly), with onsite personnel. These meetings should include a discussion of emergency response, site communications and site hazards associated with the planned activities.
- Communicating health and safety requirements and site hazards to field personnel, subcontractors and contractor employees, and site visitors.
- Directing personnel to wear PPE and guiding compliance with all health and safety practices in the field.

- Consulting with the PM regarding new or unanticipated site conditions, including emergency response activities. If monitoring detects concentrations of potentially hazardous substances at or above the established exposure limits, notify/consult with the PM. Consult with the PM, the HSC or HSS, and the HSM regarding new or unanticipated site conditions, including emergency response activities. If field monitoring indicates concentrations of potentially hazardous substances at or above the established exposure limits, the HSM must be notified, and corrective action taken.
- Documenting all site accidents, injuries, illnesses and unsafe activities or conditions and/or near misses, and reporting them to the PM, HSC or HSC and the HSM as soon as practical, but no later than the end of the day.
- Directing decontamination operations of equipment and personnel.

Field Employees

All employees working on site that have the potential of coming in contact with hazardous substances or chemical, biological and/or physical hazards are responsible for participating in the health and safety program and complying with the site-specific health and safety plans. These employees are required to:

- Read, participate and be familiar with the GeoEngineers health and safety programs located in SharePoint. Attend applicable specific safety training.
- Notify the SSO that when there is need to stop work to address an unsafe situation.
- Comply with the HASP and acknowledge understanding of the plan discussed during the health and safety pre-entry briefing.
- Review applicable Job Hazard Analysis (JHAs) prior to starting a new activity and follow the recommended critical actions to mitigate hazards.
- Perform Task Safety Analysis (TSA) at the beginning of a new task, before changing tasks, when conditions changes and after a near miss or incident.
- Report to the SSO, PM or HSM any unsafe conditions and all facts pertaining to near misses, incidents or accidents that could result in physical injury or exposure to hazardous materials and/or equipment damage.
- Participate in health and safety training, including initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) course, annual 8-hour HAZWOPER refresher, and First Aid/cardiopulmonary resuscitation (CPR) training.
- Participate in the medical surveillance program, if applicable.
- Schedule and take a respirator fit test annually.
- Any field employee working on site may stop work if the employee believes the work is unsafe.

Contractors Under GeoEngineers Supervision

GeoEngineers will hire contractors for this project? Yes ☒ No ☐

Contractors working on the site directly for the Client will have their own Health and Safety Plans or Job Hazard Analysis. Sub-contractors working on the site under GeoEngineers supervision that have the potential of coming in contact with hazardous substances or chemical, biological and/or physical hazards shall have their own health and safety programs and safety plan that is generally consistent with the requirements of this HASP.

Contractor Name		Predicted start/end dates
1. Utilities Plus, LLC		6/1 – 7/31/2023
Contractor Scope Summary:	Private utility locating	
2. Anderson Environmental Consulting, LLC		6/1 – 7/31/2023
Contractor Scope Summary:	Sonic drilling	
3. OnSite Environmental, Inc.		6/1 – 7/31/2023
Contractor Scope Summary:	Laboratory analysis	
3. Eurofins Air Toxics		6/1 – 7/31/2023
Contractor Scope Summary:	Laboratory analysis	

1.2. GeoEngineers Field Personnel Qualifications and Readiness Status

Name of Employee on Site	Level of HAZWOPER Training (24-hr/40-hr)	Date of last 8-Hr Refresher Training	Last First Aid/ CPR Training Date
Justin Orr	40-hr	1/20/2023	11/1/2022
Bryce Hanson	40-hr	3/8/2023	11/1/2022

1.3. Personnel Medical Surveillance

Field personnel on this job site are ☐; are not ☒ entered in a GeoEngineers provided medical surveillance program.

2.0 WORK SITE

2.1. Site Description

The WSDOT – Union Gap facility is located at 2809 Rudkin Road in Union Gap, Washington. Limited historical information identifies the site as a WSDOT facility at least to the 1980s. The site is currently occupied by WSDOT maintenance and administration facilities and is developed with multiple structures in use by WSDOT, asphalt parking lots and roads and an unpaved equipment yard. The site is bounded to the north by a vacant lot and commercial properties, to the south by East Ahtanum Road and residential properties, to the east by Highway 82 and the Yakima River, and to the west by Rudkin Road, commercial and residential properties. Site features are shown in Site Plan, Figure 2.

2.2. Site Map

Refer to the Site Plan, Figure 2, included with the Work Plan for the site layout and work areas.

2.3. Site History

Ecology issued the memorandum: *Comments on the three historical areas of concern (AOC) at the facility* on June 28, 2022, detailing the historical releases at the site, including three underground storage tanks (USTs) decommissioned near the former service station in 1989, two USTs and an aboveground storage tank (AST) removed from the boiler building in 1992, and remediation of a xylene release in the former sign shop building in 2003 and 2004. The historical releases are detailed below (Ecology 2022).

However, the samples collected at the locations of the USTs indicated that a release had not occurred, and that further investigation is not warranted. A release at the AST did occur, but Ecology determined that the release does not pose a risk to human health or the environment and did not request further investigation (Ecology 2022).

2.4. Previous Investigations

2.4.1. Former Service Station UST Decommissioning

Three USTs were removed in 1989. The tanks contained gasoline and diesel and were associated with the former service station at the site. A waste oil AST located at the south side of the former service station is mentioned in association with this decommissioning; however, the waste oil AST was not decommissioned.

Analytical results obtained during the decommissioning were reported as total petroleum hydrocarbons (TPH) and not as TPH-Gx or TPH-Dx. One soil sample (soil sample #3) was greater than the generic TPH Model Toxics Control Act (MTCA) cleanup level of 1,500 milligrams per kilogram (mg/kg). Volatile organic compounds (VOCs) were also analyzed and were less than their respective MTCA Method A cleanup levels. Monitoring wells near the USTs were sampled for four quarters following the UST decommissioning; TPH-Gx, TPH-Dx and VOC concentrations were either not detected or were detected below their respective cleanup levels.

Ecology determined that an empirical demonstration shows that groundwater is not impacted by the petroleum release. Ecology requested collection of new soil samples in the vicinity of soil sample #3 near the southwest corner of the maintenance building to confirm if petroleum contamination is still present at the site (Ecology 2022).

The release associated with the Former Service Station is designated CSID #4942.

2.4.2. AST/UST Decommissioning

Two USTs and one AST were removed from the boiler building in 1992. Samples collected at the locations of the USTs indicated that a release had not occurred, and that further investigation is not warranted. A release at the AST did occur, but Ecology determined that the release does not pose a risk to human health or the environment and did not request further investigation (Ecology 2022).

2.4.3. Former Sign Shop Remediation

A xylene release in the former sign shop building was remediated in 2003 and 2004. The release appeared to be from the surface. Contaminated soil was removed but the excavation did not extend deeper than 5 feet below the surface.

Analytical results obtained during the remediation indicated that total xylenes, ethylbenzene, toluene and gasoline were present in the soil at concentrations greater than their respective cleanup levels. Although contaminated soil was removed, groundwater samples were not collected and xylene concentrations in soil exceeded the MTCA vapor intrusion screening levels. Ecology requested collection of groundwater and sub-slab vapor samples to determine if contaminants from the release have impacted groundwater and to evaluate soil vapor concentrations (Ecology 2022).

The release associated with the Former Sign Shop is designated CSID #16641.

2.4.4. Previous Investigation Contaminants Data - Worst Case Concentrations

Key Study (Name/Company/Date (year))	Main Contaminants of Concern (TPH, VOCs, PAHs, Metals, PCBs, PFAS etc.)	Media (soil, groundwater, sediments, air) /Maximum Concentration Levels (units)
Ecology 2022	VOCs, petroleum hydrocarbons	Exceed MTCA Method A CULs

3.0 GEOENGINEERS SCOPE OF WORK

3.1. Summary of Project Scope

To assess the potential extent of petroleum-related contamination related to the former ASTs/USTs near the Former Service Station, and xylene contamination near the Former Sign Shop, we plan to advance soil borings, install temporary well points, one permanent monitoring well and soil-slab soil vapor sampling points, collect soil, groundwater and soil gas samples from the borings and temporary wells, and submit the samples for chemical analyses of the above listed analytes.

3.2. Primary Field Tasks

Indicate the primary field tasks to be completed during the scope of this project. Refer back to this table for development of hazard mitigation strategies in the sections that follow.

3.2.1. Primary Field Tasks to be Performed by GeoEngineers

Task No.	Primary Field Task		Predicted start/end dates
1	Exploratory Borings and Soil Sampling		6/1 – 7/31/2023
	Task Description:	Advance six borings to approximately 20 feet bgs using sonic drilling techniques. Soil will be field screened and sampled for BTEX and gasoline-, diesel- and oil-range petroleum hydrocarbons (GRPH, DRPH and ORPH, respectively). If groundwater is encountered, grab groundwater samples will be collected.	
2	Monitoring Well Installation		6/1 – 7/31/2023
	Task Description:	One soil boring will be completed as a 2-inch-diameter groundwater well using Schedule-40 PVC with 0.01 factory slotted screen and completed with a flush-mounted protective steel monument.	
3	Monitoring Well Development		6/1 – 7/31/2023
	Task Description:	The monitoring well will be developed following the applicable standards.	
4	Groundwater depth gauging		6/1 – 7/31/2023
	Task Description:	Groundwater depth readings will be obtained before well development and before sampling.	
6	Groundwater Sampling		6/1 – 7/31/2023
	Task Description:	Grab groundwater and the monitoring well will be sampled using low-flow techniques.	
7	Soil Vapor Measurements and/or Sampling		6/1 – 7/31/2023
	Task Description:	two sub-slab soil vapor points will be installed and sampled following the applicable standards.	

4.0 HAZARD ANALYSIS

From within the Primary Field Tasks (3.2.1 above), identify activities which may pose an elevated risk to worker's health. A list of activities that GeoEngineers recognizes as Elevated Risk Activities (ERA) are included in the dropdowns in table below. If this project has ERA that are not present there, they are to be added. Each ERA triggers the completion of a separate ERA Job Hazard Analysis (Form 3).

4.1. General Safe Work Practices

- Utility check: there may be site-specific procedures for preventing drilling or digging into utilities. Add these procedures to the standard GeoEngineers utility check list. Implement additional utilities clearance activities, if deemed necessary (typically if disturbing drilling work is within 2, 5 and/or 10 feet of underground utilities, for Lower, Medium and Higher Risks, respectively)
- Lifting hazards: use proper techniques, mechanical devices where appropriate.
- Terrain obstacles: Terrain could be soft, and activities will be conducted to minimize lawn damage and the potential for vehicles to get stuck.
- Personnel will wear high-visibility vests for increased visibility by vehicle and equipment operators.
- At the beginning of the day conduct a tail gate safety meeting discussing the jobs, the hazards, exclusion zone(s) surrounding work area(s), utilities clearance and actions that will be taken to prevent injury and reduce risk. Discuss "Stop Work Authority" as it applies to each site member. Discuss appropriate PPE including high visibility clothing such as reflective vests. Discuss Competent Person's responsibilities and support of excavation (SOE) protective system(s) and potential de-watering.

4.2. Elevated Risk Activities

Does this project have Elevated Risk Activities? Yes ☐ or No ☒

Elevated Risk Activities	Associated Primary Field Task(s)	Separate ERA JHA Completed?

Each JHA describes the activity being performed in a helpful chronological order, the inherent risks and their specific control measures. They must be completed before the activity begins and must be updated if any aspect is revised. Any single project may have multiple ERA JHAs.

4.3. General Hazard Review

The Primary Field Tasks (excluding the previously identified ERA) identified in Section 3.2.1 are to be included in the following Primary Field Task Hazard Analysis Tables. The Tables list the commonly encountered field hazards for the work we do at GeoEngineers. Hazards are divided into three categories: (A) Chemical, (B) Biological, (C) Physical. Add others, as necessary. Review each of your Primary Field Tasks (Section 3.2.1) and indicate which Tasks possess the hazards listed. Once assigned, the review is narrowed by focusing on only those hazards present on this site and how to avoid and/or mitigate them. If some hazards listed are not applicable, they can be removed from the Table. The final Table should include only those hazards and mitigations that are relevant to this project and associated activities.

4.4. Primary Field Task Hazard Analysis

Primary Field Tasks	
# 1	Chemical, Physical
# 2	Chemical, Physical
# 3	Chemical, Physical
# 4	Chemical, Physical
# 5	Chemical, Physical
# 6	Chemical, Physical
# 7	Chemical, Physical

Task Hazard Recognition – evaluate primary field tasks for hazards					
Chemical Hazards	**Task #s**	**Biological Hazards**	**Task #s**	**Physical Hazards**	**Task #s**
Dermal Exposure Potential	all			Heavy Equipment	1/2
				Noise	all
				Heat Exposure Risk	all
				Cold Exposure Risk	all
				Trip/Fall Hazards	all

Hazard Details and Controls - include those items checked above		
Chemical Hazards		
Hazard	**When/How Exposure May Occur**	**Critical Actions to Mitigate Hazards**
Known or Expected Human Carcinogens	Anytime during drilling or sampling activities, especially when handling soil or groundwater	Where gloves when handling potentially contaminated media Wash hands prior to leaving site and/or eating or drinking
Dermal Exposure Potential	Anytime during drilling or sampling activities, especially when handling soil or groundwater	Where gloves when handling potentially contaminated media

Biological Hazards		
Hazard	**When/How Exposure May Occur**	**Critical Actions to Mitigate Hazards**

Physical Hazard		
Hazard	**When/How Exposure May Occur**	**Critical Actions to Mitigate Hazards**
Heavy Equipment	During drilling operations. When approaching to obtain soil sample from core.	Maintain communication with the drillers/helpers. Check before approaching drill rig.
Noise	During drilling operations. When approaching to obtain soil sample from core.	Wear hearing protection during drilling activities.
Heat Exposure Risk	Work days may be hot	Take breaks and monitor hydration. Know the symptoms of heat stress/exhaustion/stroke
Cold Exposure Risk	Work days may be cold	Dress in layers. Take breaks when necessary.

PPE	Task #s	Equipment	Task #s	Tools	Task #s
☒ Hard Hat	1/2	☐ Safety Beacons		☒ Cell Phone/Satellite	All
☒ Eye Protection	All	☒ First Aid Kit	All	☒ Digital Camera	All
☒ Hearing Protection	1/2	☒ Fire Extinguisher	All	☐Radio/Spare Batteries	
☒ Gloves	All	☒ Sunglasses/Sunscreen	All	☐ Flashlight	
☒ High Visibility Vest	All	☐ Drinking Water		☒ Hands Tools	All
☒ Steel Toe Boots	All	☐ Survival Gear		☐ Other	
☐ Face Shield		☒ Eye Wash Kit	All	☐	
☐		☐ Other		☐	

4.5. Chemical Hazards

The following table is a summary of the chemicals known to be historically or currently present on the site and their associated occupational exposure limits (OEL). Once Table 4.4.1 is filled out, highlight which of the identified exposure limits will be utilized on this project. GeoEngineers typically uses the most conservative (lowest) of the limits published for the protection of its' workers. Chemicals without published limits should be discussed with the Health and Safety Department.

4.5.1. Summary of Chemical Hazard Exposure Limits

Chemical Compound/CAS #	Primary Field Task or Elevated Risk Activity With Potential Exposures	OSHA Permissible Exposure Limit (PEL)	Applicable* State OSHA Plan (PEL)	ACGIH Exposure Limits (TLV and/or TWA)	NIOSH Exposure Limits (REL and/or IDLH)
Gasoline	All	None established by OSHA	PEL: 300 ppm STEL: 500 ppm	TWA: 300 ppm STEL: 500 ppm	

Chemical Compound/CAS #	Primary Field Task or Elevated Risk Activity With Potential Exposures	OSHA Permisible Exposure Limit (PEL)	Applicable* State OSHA Plan (PEL)	ACGIH Exposure Limits (TLV and/or TWA)	NIOSH Exposure Limits (REL and/or IDLH)
Diesel	All	None established by OSHA		TLV-TWA = 100 mg/m^3	
Benzene	All	PEL: 1 ppm STEL: 5 ppm	TWA: 1 ppm STEL: 5 ppm	TLV-TWA: 0.5 ppm TLV-STEL: 2.5 ppm	TWA 0.1 ppm STEL= 1 ppm
Toluene	All	PEL: 200 ppm	PEL: 100 ppm STEL: 150 ppm	TLV-TWA: 20 ppm	TWA: 100 ppm
Ethylbenzene	All	PEL: 100 ppm	PEL 100 ppm STEL: 125 ppm	TLV-TWA: 100 ppm TLV-STEL 125 ppm	REL: 100 ppm IDLH: 800 ppm
Xylenes	All	PEL: 100 ppm	PEL: 100 ppm STEL: 150 ppm	STEL: 100 ppm	TWA: 100 ppm

Notes:

*If a State has established a PEL more restrictive than the OSHA limits, then the applicable State limit becomes the legal limit.
IDLH = immediately dangerous to life or health
OSHA = Occupational Safety and Health Administration
ACGIH = American Conference of Governmental Industrial Hygienists
NIOSH = National Institute of Occupational Safety & Health
mg/m^3 = milligrams per cubic meter (dust or particulate conc.)
TWA = time-weighted average (Over 8 hrs.), basis of most exposure limits
PEL = permissible exposure limit, legally enforceable
TLV = threshold limit value (over 8 hrs.)
REL= recommended exposure limit (over 10 hrs.)
STEL = short-term exposure limit (15 min)
Ceiling (C) – concentration never to be exceeded
ppm = parts per million (vapor conc.)

4.5.2. Descriptive Summaries of Chemicals Present

For those chemicals on site either historically or currently, complete the following table. For chemicals without a direct pathway for exposure or those cleaned or removed from the site in previous site activities, indicate these conditions or actions. Most of our projects are shorter in duration. In these instances, it is more relevant to provide the acute symptoms of exposure rather than the chronic. Discuss the difference with the Health and Safety Department if unsure.

Chemical Compound	Physical Characteristics of Chemical	Acute ☒ and/or Chronic ☒ Symptoms of Exposure
Gasoline	Clear liquid with a characteristic odor. Motor fuel, motor spirits, natural gasoline. A complex mixture of volatile hydrocarbons (paraffins, cycloparaffins and aromatics)	Irritation eyes, skin, mucous membrane; dermatitis, headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred-speech, confusion, convulsions; chemical pneumonitis (aspiration liquid)
Diesel	black liquid with a characteristic odor	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; and headache, and dermatitis
Benzene	organic chemical compound that is colorless and highly flammable liquid with a sweet smell, and is partially responsible for the aroma of gasoline	Irritated eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]
Toluene	colorless, water-insoluble liquid with the smell associated with paint thinners.	Fatigue, weakness, dizziness, headaches, eye and nose irritation, anxiety
Ethylbenzene	highly flammable, colorless liquid with an odor similar to that of gasoline	Eye and mucous membrane irritation, respiratory irritation, dermatitis
Xylenes	colorless, flammable, slightly greasy liquid	Nausea, headaches, dizziness, weakness, irritability, confusion, loss of balance, sleepiness, loss of consciousness, death
Naphthalene	White crystalline solid with a characteristic odor	Destruction of red blood cells, confusion, nausea, diarrhea, blood in urine, jaundice
Where and how exposure may occur:	Handling potentially contaminated media while logging soil or purging groundwater and while collecting soil and groundwater samples	

5.0 AIR MONITORING PLAN

6.0 OTHER PERSONAL PROTECTIVE EQUIPMENT

The appropriate personal protective equipment (PPE) will be selected on a daily or task-specific basis. These PPE selections will be communicated to field personnel during the pre-work briefing before the start of site operations.

Gloves	Clothing
☒ Nitrile ☐ Latex ☐ Liners ☒ Cold Weather	☒ High-vis Vest ☐ Tyvek ☐ Saranex ☐ Snake Chaps
☐ Leather ☒ General Construction Gloves ☐ Cut resistant/Kevlar ☐ Rubber ☐ Other	☐ Fire Retardant Clothing ☒ Long Pants ☒ Rain gear ☐ Long Sleeve Shirt ☐ Other

Gloves	Clothing
Head	**Eye & Face**
☒ Hard Hat ☐ Climbing Helmut ☐ Sunhat	☒ Safety Glasses ☐ Face Shield ☐ Goggles ☐ Sunglasses
Hearing Protection	**Feet**
☒ Ear Plugs ☐ Earmuffs ☐ Flanges	☒ Safety Toe Work Boot/Shoe ☐ Safety Toe Rubber Boot ☐ Hiking Boot ☐ Hip Wader ☐ Chest Wader

6.1. Personal Protective Equipment Inspections

PPE ensemble shall be selected daily or before each separate task to provide protection against known or anticipated hazards. To obtain maximum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE.

7.0 SITE CONTROL PLAN

7.1. Traffic or Vehicle Access Control Plans

Will vehicles, heavy equipment and/or pedestrian traffic be controlled on this site? Yes ☐ No ☒.

7.2 Site Work Zones

Exclusion zones will be established within approximately 10 to 15 feet around each working area. Only persons with the appropriate training will enter this perimeter while work is being conducted in these exclusion zones.

In addition, an exclusion zone, contamination reduction zone and support zone should be established when the project involves significant chemical contamination and potential of for exposure to contaminants to on-site personnel. Passage through zones or out of the site should be consistent with the level of decontamination required.

Decontamination, at a minimum, should include removing and disposing of PPE when exiting the exclusion zone and washing your hands. Decontamination may also consist of removing outer protective gloves and washing soiled boots and gloves using bucket and brush provided on site in the contamination reduction zone. If needed, inner gloves will then be removed, and hands and face will be washed in either a portable wash station or a bathroom facility at the site. Employees will perform decontamination procedures and wash before eating, drinking or leaving the site.

The contamination reduction zone, at a minimum, should consist of garbage bags into which used PPE should be disposed. Personnel should wash their hands before eating or leaving the reduction zone.

Drinking, eating, smoking and phone use are not allowed in the Exclusion and Reduction Zones.

A site control / site layout map was included in Section 2.2. Yes ☒ or No ☐.

7.1.1. Work Zone Parameters and Decontamination Procedures

Zone	Size/Location of Zone	Steps Required to Enter	Steps Required to Exit
Exclusion	15 feet around current boring	1. Level D PPE and nitrile gloves 2. Eye contact with driller	1. Discard nitrile gloves, make sure boots are clean
Reduction	Trash bags	1. Throw away disposable PPE and sampling equipment	1. Wash hands
Support Zone	Site area more than 15 feet from current boring	1. Notify SSO	1. Notify SSO

Equipment or tools operated or maintained by GeoEngineers on a contaminated site may need to undergo decontamination procedures as they travel through site work zones. The following table summarizes the steps needed to safely move these items through zones.

7.1.2. Work Zone Parameters for Equipment or Tools

Zone	Steps Required to Enter	Steps Required to Exit
Exclusion		Knock large debris off equipment near the borehole
Reduction	Large debris has been removed from equipment	Decontaminate equipment per instructions in the Work Plan
Support Zone		

7.3 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.

7.4 Site Communication Plan

Communication Equipment	Location Used	Phone #s/Channels
Cell phones	Site	See contact information (Section 1.0)

Positive communications (within sight and hearing distance or via radio) should be maintained between workers on site, with the pair remaining in proximity to assist each other in case of emergencies. The field team should prearrange other emergency signals for communication when voice communication becomes impaired (including cases of dropped cell phone or radio breakdown) and an agreed upon location for an emergency assembly area.

All personnel from GeoEngineers and subcontractor(s) should be made aware of safety features during the safety tailgate meeting (drill rig shutoff switch, location of fire extinguishers, cell phone numbers, etc.).

On-site personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus. (drilling rig, CPT unit and/or excavator) only when they are certain the operator has indicated it is safe to do so. ("Show My Hands Technique" or another agreed sign language).

7.2. Investigative Derived Waste (IDW) Disposal or Storage

IDW Type	Action
Drilling Tailings/Cores	☒ On site, pending analysis and further action
	☐ Secured (list method):
	☐ Other (describe destination, responsible parties):
Well Water	☒ On site, pending analysis and further action
	☐ Secured (list method):
	☐ Other (describe destination, responsible parties):
PPE	☐ On site, pending analysis and further action
	☐ Secured (list method):
	☒ Other (describe destination, responsible parties): placed in black contractor bags and disposed in trash receptacle

7.3. Spill Containment Plans

Will spill containment contingencies be needed on this project? Yes ☐ or No ☒

7.4. Sampling, Managing and Handling Drums and Containers

Will there be drums or sealed containers on site during this project? Yes ☒ or No ☐

Drums and containers used during the investigation and/or cleanup activities shall meet the appropriate Department of Transportation (DOT), OSHA, U.S. Environmental Protection Agency (EPA) and applicable state regulations for the waste that they contain. Site operations shall be organized to minimize the number of drums or other containers on-site temporary storage and 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. Personnel involved with the coordination of the drum or container's off-site disposal shall ensure that the off-site disposal facility is approved by the GeoEngineers Project manager and the Client.

Drums or containers and suitable quantities of proper absorbent shall be kept available and used where spills, leaks or rupturing 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.

7.5. Sanitation

Field staff and subcontractors must go off site to access sanitation facilities or may use the on-site building restroom.

7.6. Lighting

Work is anticipated to be performed during daylight hours. Work may extend slightly into the evening provided adequate lighting is used (e.g., portable flood lights).

8.0 EMERGENCY RESPONSE

For each potential site emergency indicate what site-specific procedures you will implement to address the occurrence.

Emergency Event	Response Plan
Medical	Get injured personnel to the hospital. If life-threatening, call 911.

8.1. General Response Guidance

- If any member of the field crew experiences any adverse exposure symptoms while on site or an injury, the entire field crew should immediately halt work and act according to the instructions provided by the SSO.
- 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.
- As soon as feasible, notify GeoEngineers' PM and follow the GeoEngineers' Incident Reporting and Investigation Program, and Health and Safety Injury Management Procedures Flowchart (see copy attached to this HASP).
- If an accident occurs, the Site Safety Officer and the injured person are to complete, within 24 hours, an Incident Report (Form 4) for submittal to the PM, the HSPM, and HR. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

Hospital Name and Address: **Yakima Valley Memorial**
2811 Tieton Dr, Yakima, WA

Phone Numbers (Hospital ER): 509.575.8000

Distance: 5.5 miles

Route to Hospital:

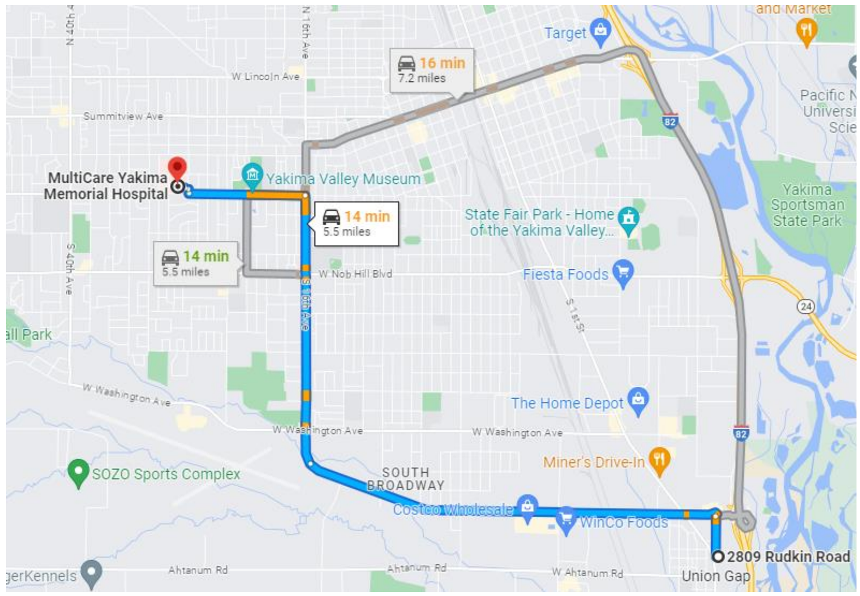
Head west on Rudkin Rd for 0.3 mi. To the traffic circle.

At the traffic circle, take the 3rd exit onto E Valley Mall Blvd. And proceed for 2.7 mi.

Continue onto S 16th Ave and proceed for 1.7 mi.

Turn left onto W Tieton Dr. The hospital will be on the right in 0.7 mi.

Map to Hospital:



Ambulance: 9-1-1

Poison Control: Seattle (206) 253-2121; Other (800) 732-6985

Police: 9-1-1

Fire: 9-1-1

Location of Nearest Telephone: Cell phones are carried by field personnel. Check connectivity at work site location.

Nearest Fire Extinguisher: Located in the GeoEngineers vehicle on site.

Nearest First-Aid Kit: Located in the GeoEngineers vehicle on site.

Standard Emergency Procedures

Get help

- Send another worker to phone 9-1-1 (if necessary)
- As soon as feasible, notify the GeoEngineers' Project Manager and/or GeoEngineers' HSM and follow the GeoEngineers' Incident Reporting and Investigation Program, and Health and Safety Injury Management Procedures Flowchart (see copy attached to this HASP).

Reduce risk to injured person

- Turn off equipment.
- Move person from injury location to safer area (if in life-threatening situation only).
- Keep the person warm.
- Perform CPR (if necessary).

Transport injured person to medical treatment facility (if necessary)

- By ambulance (if necessary) or GeoEngineers vehicle.
- Stay with the person at the medical facility.
- Keep GeoEngineers Project Manager apprised of situation and notify Human Resources Manager of situation
- Accidents involving injuries requiring professional medical attention must be reported within one hour of occurrence to the Safety Officer.
- First aid cases not involving professional medical attention must be reported within 24 hours after occurrence.
- Incidents involving property damage must be reported within 24 hours of occurrence.
- After hours illnesses must be reported within 24 hours (i.e., flu, rashes).

9.0 DOCUMENTATION TO BE COMPLETED FOR HAZWOPER PROJECTS

- PM Checklist
- Daily Field Log
- FORM 1—Health and Safety Pre-Entry Briefing and Acknowledgment of Site Health and Safety Plan for use by employees, subcontractors and visitors
- FORM 2—Safety Meeting Record
- FORM 3—Elevated Risk Job Hazard Analyses (ERA-JHA) Form (as needed)
- FORM 4—Near Miss Form (as needed)
- FORM 4—Incident Report Form (as needed)
- FORM 5—Direct Reading Instrument Monitoring Log (as needed)

10.0 APPROVALS - HASP FOR WSDOT – UNION GAP FACILITY

NOTE: THIS HASP IS NOT CONSIDERED APPROVED OR ACTIVE UNTIL AT LEAST LINES 1 THROUGH 2 HAVE BEEN SIGNED by the designated personnel. For HASPs with elevated risk tasks including but not limited to confined spaces, working over water, hazardous atmospheres, chemical hazards, extreme weather conditions, fall protection/rope access, or respirator usage the Health and Safety Team must review and sign lines 3 and 4. The Health and Safety Team may review other JHAs/HASPs as they have time upon request and will sign lines 3 and/or 4.

1. Plan Prepared by

Signature Date

2. Project Manager Plan Approval

PM Signature Date

3. Health and Safety Specialist or Consultant

HSS or HSC Signature Date

4. Health and Safety Manager

HSM Signature Date

5. GeoEngineers Laboratory Manager

GLM Signature Date

ATTACHMENTS:

Form 1: HEALTH AND SAFETY PRE-ENTRY BRIEFING AND ACKNOWLEDGEMENT

Form 2: SITE SAFETY MEETING RECORD (Daily or weekly)

Form 3: ELEVATED RISK ACTIVITY JHA FORM

Form 4: NEAR MISS OR INCIDENT REPORT FORM

FORM 1
HEALTH AND SAFETY PRE-ENTRY BRIEFING AND ACKNOWLEDGEMENT

FOR GEOENGINEERS' EMPLOYEES, SUBCONTRACTORS AND VISITORS
WSDOT – Union Gap Facility, 2809 Rudkin Rd, Union Gap, Washington
File No. 0180-429-00

Inform GeoEngineers employees, contractors and subcontractors or their representatives about:

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

Conduct safety pre-entry briefing meeting with GeoEngineers on-site employees, contractors and subcontractors, or their representatives as follows:

- A pre-entry briefing before any site activity is started.
- Additional briefings, as needed, to make sure that the Site-specific HASP is followed, especially prior to starting new activities and/or when new on-site personnel is planning to work at the site.
- Make sure all employees (GeoEngineers, contractors, subcontractors and equipment/material delivery companies) 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 site activities and hazards.
- All personnel participating in this project must receive "initial" health and safety orientation. Thereafter, brief daily or weekly tailgate safety meetings will be held as deemed necessary by the SSO.
- The orientation and the tailgate safety meetings shall include a discussion of emergency response, site communications and site hazards associated with the planned activities and activities performed concurrently by others at the site in the vicinity of the working areas.
- Have all personnel attending the pre-entry briefing meeting sign Form 2 of the HASP.

(All of GeoEngineers' Site workers shall complete this Form 1, which should remain attached to the HASP and be filed with other project documentation). Please be advised that this site-specific HASP 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 HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

I hereby verify that a copy of the current HASP 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	Company	Signature	Date

FORM 1 (CONT.)
HEALTH AND SAFETY PRE-ENTRY BRIEFING AND ACKNOWLEDGEMENT

WSDOT – Union Gap Facility, 2809 Rudkin Rd, Union Gap, Washington
File No. 0180-429-00

Print Name	Company	Signature	Date

FORM 2
SITE SAFETY MEETING RECORD (DAILY OR WEEKLY)

WSDOT – Union Gap Facility, 2809 Rudkin Rd, Union Gap, Washington
File No. 0180-429-00

Site Safety meetings should include a discussion of emergency response, site communications and site hazards associated with the planned activities. Site safety meetings should be completed prior implementing site activities at a minimum in the beginning of each day and/or at a minimum weekly for similar activities performed over consecutive days.

- Use in conjunction with the HASP Hazard Review and ERA Job Hazard Analyses (JHA) Form 3 to help identify hazards with the planned activities and activities performed concurrently by others at the site in the vicinity of the working areas.

Date: ______________________________ **Site Safety Officer (SSO):** ____________________________________

Topics: ____

____

Attendees:

Print Name	**Company**	**Signature**

FORM 3
ELEVATED RISK ACTIVITY JHA FORM

WSDOT – Union Gap Facility, 2809 Rudkin Rd, Union Gap, Washington

This ERA JHA Form is to be used when the project's Principal Field Tasks (Section 4.1) include elevated risk activities. Complete a separate ERA JHA for each identified elevated risk activity. Add activities manually if not included in drop down. Activity Phases may include staging/set-up/initiation/operations/shutdown/clean-up or others specific to this project. If all phases of this activity have the same controls, indicate this by including all applicable phase names in single row.

Elevated Risk Activity:	Choose an item.		
Written by:	**Position/Title:**	**Reviewed by:**	**Position/Title:**

Required Planning Actions <u>Prior</u> to Arriving on Site:	
1.	2.
3.	4.
5.	6.

Activity Phase	**How Risk May Occur**	**Phase Based Hazard Mitigations**
Set-up	Unfamiliar locations, congestion, unpaved roads, Mechanical Failure, Flat Tires Vehicle Fire, Exhaust Leaks, Vehicle Collision, Internal Projectiles	Actions
		• Test equipment • Reset starter • Clear road of fallen trees
		PPE
		•
		Equipment
		•
		Tools
		•
Operations - Shut-down - Cleanup	Slipping into waste water pond from shore	Actions
		•
		PPE
		•
		Equipment
		•
		Tools
		•

Communication Plan			
Activity Phase	Mode Communication During Task Phase	Frequency of Communication	Related Reference Material or Plan
Set-up	Cellular Phone	Continuous	Action Level Table
Operations		Every 4 hours	River Map

FORM 4
NEAR MISS OR INCIDENT REPORT FORM

WSDOT – Union Gap Facility
File No. 0180-429-00

Electronic Version Available at: https://safety.geoengineers.com/nearmisses/new or https://safety.geoengineers.com/incidents/new

NEAR MISS

Near Miss Date

Reported By

Location

Location Type

Incident Details

How did the incident happen?

What led to the Near Miss occurring? (Contributing factors, constraints, the setting, behaviors, etc.)

What is the most important thing you learned from this Near Miss that others could learn from?

INCIDENT REPORT

Basic Information

Incident Date

Reported By

Location

Location Type

Business Unit

Office Information

Project Manager

Group Leader

Office Manager

Other Emails

Incident Type (more than one OK)

_____ Injury

_____ Vehicle

_____ Utility Strike

_____ Damaged Property

_____ Stolen Equipment

Incident Details

What happened? Describe how the incident occurred. Where the employee was located at the time of the incident.

Project Number (if project related)

Date & Time employee started working

Date & Time supervisor notified

Supervisor Name

Notified Project Manager/PA ___ Yes ___ No

Client Notified ___ Yes ___ No

Supervisor Comments (Optional. These are usually filled out later.)

Supervisor Comments Date

Project Manager Comments (Optional. These are usually filled out later.)

Project Manager Comments Date

Health and Safety Comments (Optional. These are usually filled out later.)

Health & Safety Rep Name

Health & Safety Comments Date

Corrective Action (Optional. These are usually filled out later.)

GeoEngineers