FINAL
SUPPLEMENTAL REMEDIAL INVESTIGATION WORK PLAN – PHASE 5
ADDENDUM - 1
CHELAN CHEVRON – CLEANUP SITE ID: 6660
232 East Woodin Avenue
Chelan, Washington

September 24, 2020

Prepared for:
Washington State Department of Ecology
1250 West Alder Street
Union Gap, Washington 98903

Prepared by:
Leidos, Inc.
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Bothell, Washington 98011

On Behalf of:
Resource Environmental, LLC
925 Salida Del Sol Drive
Paso Robles, California 93446

leidos

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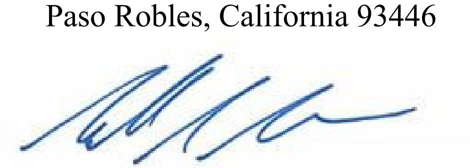

Russell S. Shropshire, PE
Principal Engineer

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1. INTRODUCTION AND OBJECTIVES

Leidos, Inc. (Leidos), has prepared this work plan addendum on behalf of Resource Environmental, LLC (RELLC), an environmental service provider to Chevron Environmental Management and Real Estate Company (Chevron), for Supplemental Remedial Investigation (SRI) activities to be conducted at the Chelan Chevron site (the Site), located at 232 East Woodin Avenue in Chelan, Washington (Figure 1). SRI activities for the Site are being performed pursuant to the terms of Agreed Order No. DE 10629, which was entered into by Chevron and the Washington State Department of Ecology (Ecology) in June 2014.

The purpose of this addendum is to document proposed modifications to the SRI Work Plan – Phase 5 (SRI-5 Work Plan) that was previously submitted for the Site by Arcadis on June 16, 2020 (Arcadis, 2020a), and which was approved by Ecology on June 24. Under the modified scope of work proposed by Leidos, the SRI-5 activities would include the following investigation tasks:

1. Evaluation of hydraulic conductivity using UVOST-HP technology;
2. LNAPL sampling;
3. Installation of pressure transducers;
4. Shallow soil investigation on the property at 221 E. Woodin Avenue;
5. Soil vapor investigation; and
6. Shallow soil investigations in the vicinity of monitoring wells MW-21 and MW-27.

Additional details regarding proposed modifications, objectives, and methods for each task are presented in the following sections.

2. EVALUATION OF HYDRAULIC CONDUCTIVITY USING UVOST-HP TECHNOLOGY

The SRI-5 Work Plan (Arcadis, 2020a) proposed completion of soil borings at 12 to 14 locations throughout the Site using equipment developed by Dakota Technologies, Inc. (Dakota Technologies) that combines their ultra-violet optical screening tool and hydraulic profiling technologies (UVOST-HP). The UVOST-HP equipment is advanced into the subsurface by a direct-push drill rig, and allows simultaneous collection of real-time data regarding LNAPL delineation and hydraulic conductivity in adjacent soils. The goal of this investigation task, as previously proposed, was to further characterize light non-aqueous phase liquid (LNAPL) distribution (both vertically and laterally), develop a greater overall understanding of hydraulic conductivity throughout the Site and to identify intervals of greater hydraulic conductivity that may potentially serve as pathways for mobile and/or migrating LNAPL.

Although Leidos acknowledges the potential benefits of the UVOST-HP investigation as previously proposed, we also identified concerns about the value of the investigation, relative to its cost and the complexity of implementation at the Chelan Chevron site. This position is based on our experience using UVOST at the Site in 2016. In our experience, the logistical complexity of implementing the UVOST technology at the Site (i.e., pre-selection of boring locations and preparing each location by air-knife clearance and sonic drilling) virtually negates the benefit of in-field decision making that is possible using the real-time data provided by this technology. In addition, use of the UVOST-HP technologies do not provide secondary lines of evidence (e.g., visual observation of soils, field screening, and analytical laboratory results) that are provided by more traditional investigation methods that are based on collection and analysis of subsurface soils.

Based on these concerns, Leidos recommends that the scope of the UVOST-HP investigation be modified and reduced in scale, in order to evaluate the effectiveness of the technologies at the Site prior to a larger-scale deployment. Specific recommendations include:

- For the anticipated fall 2020 season field mobilization(s), the UVOST-HP investigation would be limited to approximately six boring locations. Approximate proposed boring locations are shown on Figure 1.
- The primary focus of the investigation would be the area immediately west of the Chelan Chevron service station property. Within this area, the first UVOST-HP boring to be completed would be located near monitoring well MW-44, to the south of the property at 221 E. Woodin Avenue. This location was selected because this monitoring well typically contains measurable LNAPL at a thickness of greater than 0.5 foot (Arcadis, 2020b) and because of highly detailed lithologic data from sonic drill cores that was previously collected at this location in 2018. Comparison of the UVOST-HP results with the data previously collected from this well and other nearby locations will be used to evaluate the effectiveness of the UVOST-HP technology in identifying LNAPL bearing zones and changes in hydraulic conductivity through the vertical geologic profile. Two additional borings, one in the vicinity of well RW-1 and another in the vicinity of well RW-2 would create a north-south transect from the suspected source area at 221 E. Woodin Avenue to the parking area north of Wapato Avenue. Long-term LNAPL occurrence has been documented in this area at monitoring wells MW-9 and MW-10 since 2001. A fourth boring, previously proposed by Arcadis in the vicinity of monitoring well RW-3 would also be completed on the Chelan Chevron station property.
- The secondary focus of the UVOST-HP investigation would be to assess hydraulic conductivity in the southwestern portion of the Site near monitoring wells MW-38 and MW-39, which appear to have no or limited connectivity to Lake Chelan and the shallow perched aquifer present to the north. These UVOST-HP borings locations are consistent with locations previously proposed by Arcadis. However, completion of UVOST-HP borings at these two locations will be contingent upon an in-field evaluation of the real-time data collected at the previous four locations.

2.1 UVOST-HP INVESTIGATION METHODOLOGY

The UVOST-HP investigation will be implemented using the following methodology. Additional details regarding Leidos standard investigation procedures for the Chelan Chevron site can be found in the Sampling and Analysis Plan (SAP), which is included as Appendix A.

- Prior to the start of the UVOST-HP investigation field activities, samples of LNAPL from monitoring wells in the investigation area will be submitted to Dakota Technologies to evaluate fluorescence response to the UVOST equipment. The LNAPL samples will be collected as part of the LNAPL sampling activities presented in Section 3 of this addendum.
- Leidos standard borehole clearance and soil logging/sampling procedures will be used to advance each boring from the ground surface to at least 8 feet below ground surface (bgs).
- Below 5 feet bgs, a sonic drilling rig equipped with a split- barrel core sampler (4-inch diameter, 5-feet in length) will be used to advance each boring to the top of the Unit B (SAIC, 2006) soft silt interface (approximately 10 to 15 feet bgs). Within this interval, soil cores will be collected on a continuous basis. Soil cores will be logged and field-screened by a Leidos geologist per the procedures specified in the SAP.
- Within the upper (i.e., air-knife/sonic) interval of each boring, Leidos will collect at least one soil sample for laboratory analysis by the standard analytical suite for soil samples (as specified in the SAP). Additional samples may also be collected based on field screening results. For example, one sample may be collected to confirm the shallowest depth at which petroleum impacts were encountered, and one or more additional samples may be collected to confirm the highest concentration of petroleum impacts encountered in the upper interval of a boring.
- Following soil core collection and sampling to the top of the Unit B (SAIC, 2006) silt interface, the boring will be cased in preparation of the UVOST-HP tooling deployment.
- A Geoprobe 7822, or equivalent, direct-push rig will be used to advance the UVOST-HP tooling from ground surface to a depth of approximately 60 feet bgs, or until refusal, whichever comes first. Operation and data processing associated with the UVOST-HP equipment will be performed by Dakota Technologies.
- Following completion of the UVOST-HP data collection, the tooling will be withdrawn from the boring and the boring will be backfilled with granular bentonite to approximately 3-feet bgs. The granular bentonite will then be hydrated in the borehole by adding potable water. The remaining boring annulus will be backfilled to the ground surface with concrete.

3. LNAPL SAMPLING

The objective of the LNAPL sampling investigation is to complete a detailed analysis of LNAPL physical properties, and to further evaluate compositional differences in LNAPL present, in different areas of the Site.

Based on laboratory availability, and their standard services offered, Leidos proposes the following revisions to the LNAPL sampling plan:

- LNAPL sample analysis for C8-C40 hydrocarbons would be performed by ASTM Method D5739, in place of EPA 8270 modified.
- One additional LNAPL sample analysis, similar to the ASTM Method D5739 method referenced above, but specific to gasoline-range (C3-C12), instead of heavier-end-range,

hydrocarbons will be performed. This analysis will be performed by EPA 8260 Modified.
- LNAPL sample density analysis would be performed by ASTM Method D1481, in place of ASTM D4052.
- LNAPL sample viscosity analysis would be performed by ASTM Method D445, in place of ASTM D7042.

General identification of refined petroleum products (C3-C36) hydrocarbons will be performed by ASTM Method D3328, and LNAPL interfacial tension will be performed by ASTM D971, as previously proposed by Arcadis. In addition to the samples to be collected for these analyses, additional LNAPL samples will be collected from monitoring wells MW-9, MW-10, MW-44, and RW-1 for submittal to Dakota Technologies prior to implementation of the UVOST-HP field activities (see Section 2 for additional details).

In addition, Leidos would like to provide additional details regarding the number and identification of monitoring wells that are expected to be included in the LNAPL sampling investigation. Due to the volume of LNAPL necessary to perform the proposed analyses (approximately 500 milliliters), only monitoring wells containing LNAPL at a thickness greater than approximately 0.75 feet will be included in the LNAPL sampling event. Therefore, based on LNAPL thickness measurements collected at the Site in 2019, we expect that LNAPL sampling will occur at approximately nine monitoring wells, including MW-9, MW-10, MW-12, MW-16, MW-19, MW-21, MW-27, MW-44, and RW-2.

Additional details regarding LNAPL sample collection procedures are presented in the SAP, which is included as Appendix A.

4. INSTALLATION OF PRESSURE TRANSDUCERS

Per the SRI-5 Work Plan (Arcadis, 2020a), the installation of data-logging pressure transducers was proposed to collect a higher resolution data set that is more conducive to evaluating hydraulic connectivity, and to provide better insight into the way precipitation, lake level fluctuations, and other regional phenomena affect potentiometric surfaces in the water-bearing zones.

Although Leidos agrees with the concept of this proposed investigation activity, we believe that the four previously proposed locations for installation of pressure transducers are not sufficient to achieve the data objectives for this task. Based on our previous work at the Site, Leidos has identified at least four discrete hydrogeologic zones at the Site, which include:

- Portions of the shallow perched aquifer that do not appear to be affected by changes in the surface level elevation of Lake Chelan. This zone is present predominantly in the eastern and central portions of the Site and is represented by monitoring wells such as MW-5, MW-6, MW-8, MW-9, MW-15, MW-16, MW-17, and MW-18.
- Portions of the shallow perched aquifer that do appear to be affected by changes in the surface level elevation of Lake Chelan. This zone is present in the western portion of the Site and is represented by monitoring wells MW-19 and MW-23.

- The southern portion of the Site where the shallow perched aquifer does not appear to be present, but may be temporarily present as a thin water-bearing zone. This zone is represented by MW-38, MW-39, and MW-40.
- The deeper water table aquifer. This zone is represented by monitoring wells MW-30, MW-31, and MW-37.

In order to better assess changes in potentiometric surfaces and possible hydraulic connectivity in and between these zones, Leidos proposes to install transducers in two wells within each of the four hydrogeologic zones, resulting in a total of eight transducers, instead of four as previously proposed. Monitoring wells currently recommended for pressure transducer installation include MW-15, MW-17, MW-19, MW-23, MW-31, MW-37, MW-39, and MW-40.

As proposed by Arcadis in the SRI-5 Work Plan, Leidos intends to use non-vented (or absolute) transducers for the study, which will also require the use of a barometric pressure data logger in order to reference the in-well pressure readings relative to atmospheric pressure. Use of the non-vented transducers is required for the Site because all of the monitoring wells are constructed with flush-grade well boxes that frequently fill with surface runoff, which would result in erroneous measurements and/or damage to vented transducers. Use of the non-vented transducers will eliminate this issue. However, non-vented transducers are also subject to erroneous readings if the air pressure in a well casing differs significantly from the ambient atmospheric pressure. This may especially be an issue in the deep wells, which in recent water level measurements indicate the water table is above the top of the screens. To evaluate the potential of this phenomenon, Leidos will monitor groundwater elevation levels during each transducer data retrieval event in order to determine whether the groundwater elevation level in a well appears to be changing in response removal of the well cap. It is expected that data retrieval from the transducers will be performed on an approximate quarterly basis.

Additional details regarding pressure transducer installation and data retrieval are presented in the SAP, which is included as Appendix A.

5. SHALLOW SOIL INVESTIGATION (221 E. WOODIN AVENUE)

The SRI Phase 5 Work Plan (Arcadis, 2020a) proposed a shallow soil investigation in order to confirm whether suspected underground storage tanks (USTs), previously identified by a ground penetrating radar survey completed in October 2018 (Leidos, 2019), are present on the property at 221 E. Woodin Avenue, as well as to evaluate shallow soil conditions in the vicinity of the suspected USTs. As previously proposed, this investigation task would include:

1. Shallow “pothole” excavations using air-knife equipment to confirm whether suspected orphaned USTs are remaining on the property; and
2. Advancement of three shallow soil borings to a target depth of approximately 20 feet bgs around the perimeter of the suspected UST basin.

Leidos proposes the following modifications to the previously presented methodology for this investigation task:

- If one or more orphaned USTs are determined to be present on the property, Leidos will subcontract a qualified contractor and certified Marine Chemist to safely gain access to the tanks to confirm their contents, and collect samples if necessary.

- Following clearance of each UST basin perimeter boring to 5-feet bgs, according to Leidos standard borehole clearance procedures, a direct-push or sonic drill rig will be used to advance borings to the target depth. Within this interval, soil cores will be collected in 5-foot lengths, on a continuous basis. Soil cores will be logged and field-screened by a Leidos geologist. Selection of soil intervals for collection of soil samples for laboratory analysis will be based on visual inspection and field screening of the soil cores, instead of sampling at predetermined depth intervals. It is expected that approximately four soil samples from each boring location will be submitted for laboratory analysis.

Additional details regarding Leidos standard investigation procedures for the Site that are applicable to this task can be found in the SAP, which is included as Appendix A.

6. SOIL VAPOR INVESTIGATION

Section 8 of the SRI Phase 5 Work Plan (Arcadis, 2020a) proposed completion of Tier I sampling to assess soil vapor conditions in the vicinity of shallow soil impacts known to be present in the vicinity of monitoring wells MW-21 and MW-44. Sampling was proposed at two exterior soil vapor probes, which would be constructed with the probes screens centered at a depth of 9.5 feet bgs.

Leidos recommends the following modifications to the SRI Phase 5 soil vapor investigation:

1. Access to conduct remedial investigation activities on the property at 221 E. Woodin Avenue has been obtained. Therefore, Leidos recommends relocating the soil vapor probe that is currently proposed for the sidewalk south of this property, to the north, adjacent to the existing building. In addition, Leidos recommends that the soil vapor probe at this location be installed with the top of the screen set at a depth of approximately 5-feet bgs, instead of 9 feet bgs as was originally proposed. This change is recommended in order to allow collection of soil vapor samples that will be more representative of shallow soil conditions near the structures at 217 and 221 E. Woodin Avenue, which do not have subgrade basement areas.
2. The Arcadis work plan specifies that soil vapor samples will be collected in 1-liter vacuum sampling canisters, which are to be analyzed by Eurofins Air Toxics by methods TO-15, MA APH, and ASTM D-1946. However, based on other recent soil vapor investigation work that Leidos has performed with Eurofins Air Toxics, it is our understanding that Eurofins Air Toxics will not analyze 1-liter canisters by TO-15 SIM and cannot attain reporting limits sufficiently low enough to demonstrate compliance with the MTCA Method B Screening level for naphthalene (2.5 micrograms per cubic meter). In addition, Eurofins Air Toxics no longer performs the MA APH analysis. To address these issues, Leidos recommends the following:
    a. 6-liter vacuum sampling canisters (100% certified for the TO-15 target analyte list) will be used instead of 1-liter canisters. The additional sample volume provided by use of the 6-liter canisters will allow Eurofins Air Toxics to reach lower reporting limits than would be possible using the 1-liter canisters.

b. Eurofins Air Toxics will subcontract the MA APH analyses to a sister Eurofins lab located in Burlington Vermont. However, because the Eurofins Air Toxics lab in Folsom, California will prepare the sampling media and perform the TO-15 and ASTM D-1946 analyses, the following variances to the MA APH will be required:
    i. Eurofins Air Toxics will certify each individual canister for target analytes; however, a search for specific MA APH hydrocarbon ranges will not be performed.
    ii. Eurofins Air Toxics will set the flow rate on each flow controller but will not log the individual flow rates, nor will a post-sampling calibration verification with relative percent difference calculation be performed.

Additional details regarding Leidos procedures for soil vapor probe installation and sampling are presented in the SAP, which is included as Appendix A.

7. ADDITIONAL PROPOSED SRI PHASE 5 FIELD ACTIVITIES

In addition to the investigation activities previously proposed in the SRI Phase 5 Work Plan (Arcadis, 2020a), Leidos proposes adding the following two tasks to the SRI Phase 5 field activities:

- A geophysical survey and shallow soil boring investigation in the vicinity of monitoring well MW-27; and
- A shallow soil boring investigation to further delineate shallow soil impacts in the vicinity of the orphaned UST basin near monitoring well MW-21.

The objective of the investigation near MW-27 would be to further evaluate the source of shallow gasoline-range and diesel-range petroleum hydrocarbon impacts, and LNAPL, in this area. Performance of this investigation task is contingent upon access to the property at 136 E. Johnson Avenue. The MW-27 area investigation would consist of a non-intrusive geophysical survey utilizing ground-penetrating radar to identify potential abandoned USTs or other subsurface infrastructure that may be present in the area. Following the geophysical survey, Leidos would advance approximately three soil borings in the area in order to further delineate the lateral and vertical extents of petroleum impacts in the vicinity, and collect additional soil lithologic data.

The goal of the soil boring investigation near monitoring well MW-21 would be to further delineate the lateral extent and concentration levels of shallow impacts to soil (less than 20 feet bgs) in this area. This information would be used in support of the future Supplemental Feasibility Study for the Site, in order to evaluate the potential benefits and feasibility of a future excavation based remedial cleanup action in this area.

Approximate potential boring locations for the shallow soil boring investigation near MW-27 and MW-21 are shown on Figure 1. However, actual boring conditions will be determined in the field based on the results of utility location surveys and other conditions encountered in the field.

Soil borings for the MW-27 and MW-21 area investigations would be advanced using a direct-push drill rig or sonic rig outfitted with a split core-barrel sampling device in order to minimize disturbance of the soil cores. Each boring would be advanced to a minimum depth of approximately 20 feet bgs; however, some borings may be advanced beyond 25 feet bgs if field screening results indicate that the bottom-most extent of contamination has not been delineated.

Additional details regarding Leidos standard investigation procedures for the Site that are applicable to this task can be found in the SAP, which is included as Appendix A.

8. INVESTIGATION-DERIVED WASTE MANAGEMENT

Regulated investigation-derived waste (IDW) associated with the SRI Phase 5 activities is anticipated to include soil cuttings and water, which will be generated during drilling activities and equipment decontamination. Mixed liquid waste consisting of LNAPL and groundwater may also be generated. All regulated IDW will be containerized in 55-gallon United States Department of Transportation-approved drums. Drums containing LNAPL will be staged in a lockable secondary-containment storage unit on the Chevron service station property. All other IDW drums will be stored on the Chevron service station property at a location approved by the station manager until a waste disposal profile can be generated and off-site transportation and disposal can be arranged (typically 6 to 8 weeks). RELLC will be the generator of record for any regulated IDW generated by the SRI Phase 5 field activities.

Non-regulated IDW, such as nitrile gloves, plastic sheeting, and bailers will be bagged and disposed as standard municipal waste.

9. SCHEDULE

Leidos anticipates initiating implementation of the SRI Phase 5 field activities in October 2020. Most field activities associated with this phase of the SRI are expected to be completed by December 2020; however, groundwater elevation data collection associated with the pressure transducer installation is expected to be performed until October 2021 (one full year). The shallow soil sampling investigation proposed for the vicinity of monitoring well MW-27 may be delayed by property access coordination, or eliminated entirely from the scope of work if property access to that area cannot be obtained by RELLC.

Leidos will provide Ecology with at least one week's notice prior to the start of any SRI field activities.

10. REFERENCES

Arcadis (2020a). "Supplemental Remedial Investigation Workplan – Phase 5, Chevron Service Station No. 9-6590." June 16.

Arcadis (2020b). "2019 Groundwater Monitoring Summary Report, Chevron Service Station No. 96590." July 8.

Leidos (2019). "Agency Review Draft – Supplemental Remedial Investigation Report – Phase 4, Chelan Chevron." July 8.

SAIC (2006). "Final Remedial Investigation / Feasibility Study Report, Chelan Service Station No. 9-6590." December.

LIMITATIONS

This technical document was prepared on behalf of RELLC and is intended for its sole use and for use by the local, state, or federal regulatory agency that the technical document was sent to by Leidos. Any other person or entity obtaining, using, or relying on this technical document hereby acknowledges that they do so at their own risk, and Leidos shall have no responsibility or liability for the consequences thereof.

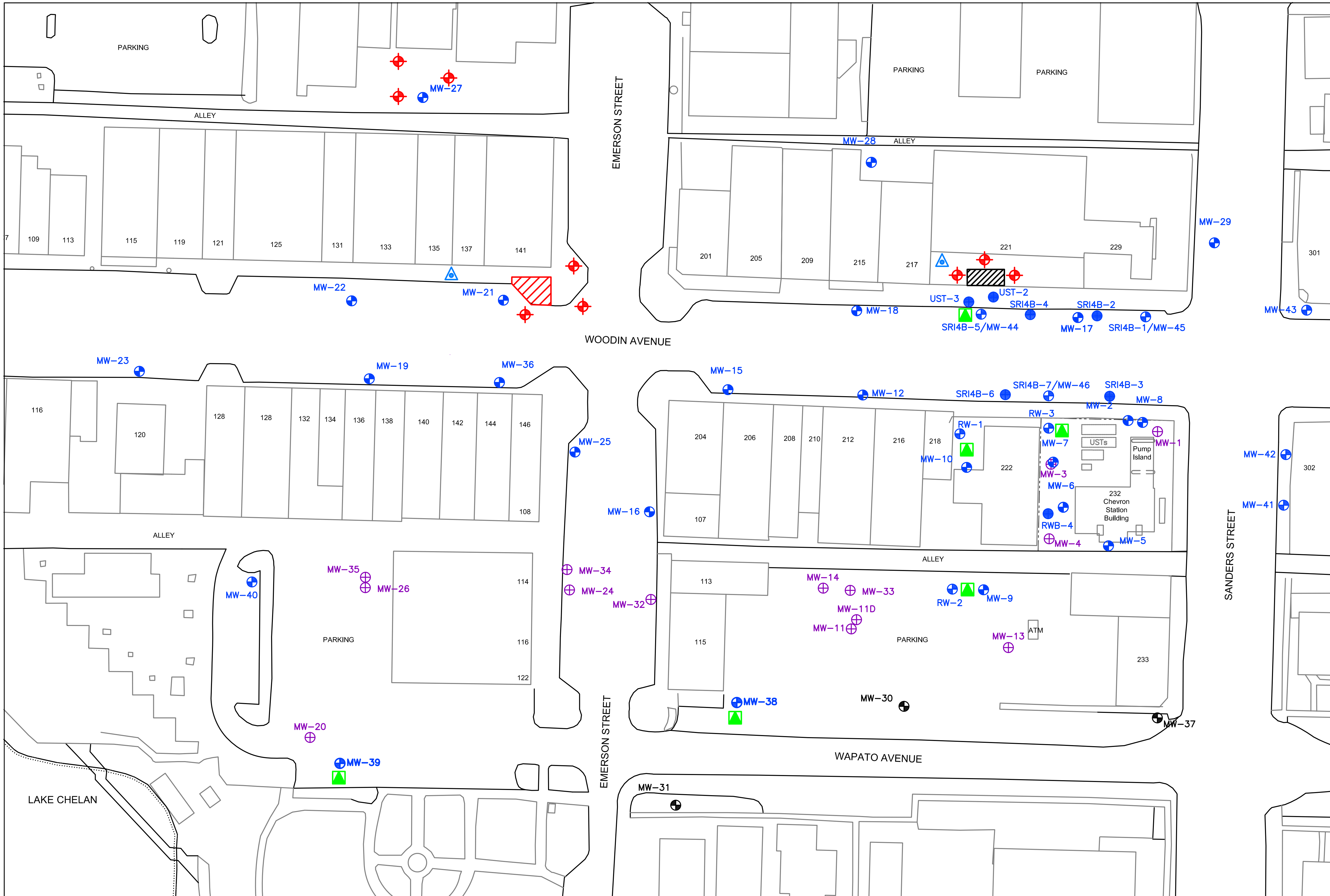
Site history and background information provided in this technical document are based on sources that may include interviews with environmental regulatory agencies and property management personnel and a review of acquired environmental regulatory agency documents and property information obtained from RELLC and others. Leidos has not made, nor has it been asked to make, any independent investigation concerning the accuracy, reliability, or completeness of such information beyond that described in this technical document.

Recognizing reasonable limits of time and cost, this technical document cannot wholly eliminate uncertainty regarding the vertical and lateral extent of impacted environmental media.

Opinions and recommendations presented in this technical document apply only to site conditions and features as they existed at the time of Leidos site visits or site work and cannot be applied to conditions and features of which Leidos is unaware and has not had the opportunity to evaluate.

All sources of information on which Leidos has relied in making its conclusions (including direct field observations) are identified by reference in this technical document or in appendices attached to this technical document. Any information not listed by reference or in appendices has not been evaluated or relied on by Leidos in the context of this technical document. The conclusions, therefore, represent our professional opinion based on the identified sources of information.

Figures



LEGEND

- MW-2 — EXISTING PERCHED GROUNDWATER MONITORING OR RECOVERY WELL
- MW-30 — EXISTING DEEP GROUNDWATER MONITORING WELL
- MW-1 — EXISTING ABANDONED DRY MONITORING WELL
- SRI4B-2 — SRI 4 SOIL BORING LOCATION
- APPROXIMATE AREA OF SOIL BORING INVESTIGATION AT UNDOCUMENTED UST BASIN
- APPROXIMATE AREA OF SUSPECTED UST BASIN (SEE GEOPHYSICAL SURVEY SUMMARY REPORT FOR ADDITIONAL LOCATION DETAILS)
- PROPOSED UVOST-HP BORING LOCATION
- PROPOSED SHALLOW SOIL BORING LOCATION
- PROPOSED SOIL VAPOR PROBE LOCATION

N

NOTES

Base Map from City of Chelan, 1994

Additional Reference Material:
Aerial Photograph from September 1991
(Washington State Department of Natural Resources)

0 80' 160'

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Chevron Service Station No. 96590
232 East Woodin Avenue
Chelan, Washington

FIGURE 1
Site Map with Proposed SRI Phase 5 Investigation Locations

FILE NAME: Chelan_SRI-5 WP Site Map

DATE: 9/18/2020

Appendix A:
Sampling and Analysis Plan

APPENDIX A
SRI PHASE 5 SAMPLING AND ANALYSIS PLAN

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APPENDIX A
SRI PHASE 5 SAMPLING AND ANALYSIS PLAN

1 INTRODUCTION AND OBJECTIVES

This Sampling and Analysis Plan (SAP) has been prepared by Leidos for anticipated Supplemental Remedial Investigation – Phase 5 (SRI Phase 5) field activities to be conducted at the Chelan Chevron site (the Site), located at 232 E. Woodin Avenue in Chelan, Washington. This SAP is not intended to be a stand-alone document. Instead, the SAP has been prepared as an appendix to Addendum 1 of the SRI Work Plan – Phase 5 (SRI-5 Work Plan; Arcadis, 2020a), and is designed to be used in conjunction with the work plan, Quality Assurance Project Plan (QAPP), and Health and Safety Plan (HASP) for the project.

The objective of the SAP is to establish the procedures necessary to complete the scope of work presented in the SRI-5 Work Plan. Based on the currently anticipated scope of work for the RI field activities, the following procedures are included in this version of the SAP:

- General Sampling Procedures;
- Soil Boring and Soil Sampling Procedures;
- LNAPL Sampling Procedures;
- Pressure Transducer Installation and Data Retrieval Procedures;
- Procedures for Evaluating Suspected Underground Storage Tanks (USTs);
- Shallow Soil Vapor Sampling Probe Installation Procedures;
- Shallow Soil Vapor Sampling Procedures;
- Field Equipment Decontamination Procedures; and
- Investigation-Derived Waste Management Procedures.

If, based on the results of the initial SRI-5 field activities, additional investigation tasks are added or modified beyond the scope of this SAP, the SAP will be amended to include procedures for those additional or revised tasks.

2 GENERAL SAMPLING PROCEDURES

Sampling personnel will be equipped with a bound field notebook during performance of SRI field activities. All data regarding sample collection will be recorded in the field notebook, or field data forms.

The chain of custody (COC) program will be adequate to allow for the tracing, possession and handling of individual samples from the time of field collection through laboratory analysis. The COC form will be used by personnel responsible for ensuring the integrity of the samples and will be maintained in the project files as documentation of sample handling procedures.

2.1 SAMPLE CONTAINER PREPARATION

All containers used in the sampling of soils, groundwater, and/or soil vapor will be laboratory cleaned as specified in the Quality Assurance Project Plan (QAPP) provided in Appendix B. The container type and preservative requirements will follow the specifications of the QAPP.

2.2 PROCEDURES TO PREVENT CROSS-CONTAMINATION

Personnel collecting soil, groundwater, and/or soil vapor samples will take the following precautions to minimize sample contamination or cross-contamination between samples:

- New nitrile gloves will be used while taking all samples and disposed of after equipment has been decontaminated.
- Sampling personnel will not touch the inside of the sampling container.
- Only equipment that has been properly decontaminated according to the procedures specified by the SAP will be used for environmental sample collection.

Immediately following the collection of the sample, the container will be sealed and the sample will be labeled and entered in the field notebook.

The sample will then be placed in a pre-cooled ice chest container and preserved (if required) according to the directions of the QAPP.

2.3 SAMPLE IDENTIFICATION AND LABELING

The sample designation protocols will be adhered to during the sample collection procedures to maintain sample data integrity. Each sample will be identified in the logbook and on the sample container label. The label will be filled out as follows:

- Sampler's initials;
- Sample location number;
- Site identifier;
- Date of sample collection; and
- Time of sample collection.

2.3.1 Soil Sample Designation

Subsurface soil boring samples will be designated with the number corresponding to the boring and the depth at which the sample was collected. Sample names will be created using the following format:

- SB-1-S-10.0-YYMMDD

QA/QC samples such as equipment rinsate blanks, trip blanks, and duplicate samples collected during the SRI field activities will be labeled with unique sample identifiers and the date at which the sample was collected. A record of the QA/QC samples collected will be kept in the field notebook along with the COC. The following format will be used for QA/QC samples:

Equipment Rinsate Blanks

- ER-1-YYMMDD

Trip Blanks

- TB-1-YYMMDD

Duplicate Samples

- DUP-1-S-YYMMDD

2.3.2 UST Contents Sample Designation

Samples collected to assess the contents of orphaned USTs will be labeled according to an assigned location ID and the date of collection. The date and time of collection will be recorded in the field logbook and on the COC.

- UST-1-L-YYMMDD (for a liquid sample)
- UST-1-S-YYMMDD (for a solid sample)

2.3.3 Soil Vapor Sample Designation

Soil vapor samples will be labeled according to the soil vapor probe ID and the date of collection. The date and time of collection will be recorded in the field logbook and on the COC.

- SVP-1-YYMMDD.

QA/QC samples such as equipment blanks and duplicate samples collected during the RI will be labeled with unique sample identifiers and the date at which the sample was collected. A record of the QA/QC samples collected will be kept in the field notebook along with the COC. The following format will be used for QA/QC samples:

Equipment Blanks

- EB-1-YYMMDD

Duplicate Samples

- DUP-1-YYMMDD

2.4 FIELD DOCUMENTATION

Field personnel will maintain detailed records of drilling, sampling, and other field activities. These records will consist of soil boring logs, soil vapor sample collection field-data forms, information recorded in field notebooks, and other field forms.

A bound field notebook will be maintained by the sampler to provide a daily record of events. At the beginning of each entry, the following will be recorded:

- Date;
- Time;
- Meteorological conditions;
- Field personnel present;

- List of on-site visitors and equipment; and
- Initials of the person making the entry.

Field notebook entries will be recorded in as much detail as necessary so that essential information is properly documented. All documentation in field notebooks will be in ink. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Corrections will be dated and initialed. No entries will be obliterated or rendered unreadable.

If sample locations cannot be indicated on field maps, a sample drawing of the location (not to scale) will be included in the notebook to provide an illustration of all sampling points relative to surrounding features.

The cover of each notebook used will contain:

- Project ID and book number;
- Start date and (eventually) end date; and
- A list of personnel that are authorized to record entries into the notebook.

Daily activities will be summarized in the field notebook. Entries in the notebook may include the following information for each sample date:

- Site identification;
- Location of sampling points;
- Description of sampling points;
- References to photographs (if applicable) and brief sketch of sampling points;
- Sample identification number;
- Number of samples collected;
- Time of sample collection;
- Reference to sample location map;
- Number of QA/QC samples collected and their labeled identifier;
- Sampler's name;
- Field observations;
- Sample distribution (i.e., split samples, analytical lab); and
- Any field measurements made that are not on field forms (e.g., PID readings).

3 SOIL BORING AND SAMPLING PROCEDURES

Soil boring advancement and soil sampling proposed in the SRI-5 Work Plan (Arcadis, 2020a) will be conducted according to the following procedures.

3.1 BOREHOLE CLEARANCE

Prior to beginning of ground disturbance activities, Leidos will contact the Utilities Underground Location Center to request location of all public utilities in the vicinity of the proposed locations. In addition, Leidos will subcontract a private utility locating contractor to locate on-site infrastructure or other buried objects that would not typically be identified through the public utility locating process. The private utility survey will use a combination of ground-penetrating radar (GPR) and electromagnetic (EM) locating techniques.

Soil borings will not be advanced within 3 feet horizontally of known underground utilities and 10 feet from any overhead utilities without first evaluating alternative boring locations, and without written approval to proceed from RELLC.

If present, asphalt/concrete will be removed from each of the boring locations using appropriate equipment (e.g. jackhammer, concrete cutter or coring machine).

As required by current Leidos health & safety policies for subsurface asset avoidance, each boring will initially be cleared to a depth of at least 8 feet below ground surface (bgs) using an air-vacuum excavation system (air-knife) or similar "soft-dig" method to avoid damage to buried utilities or other subsurface infrastructure. Within this interval, the diameter of the boring is required to be at least 3 inches larger than the largest diameter of tooling to be advanced into the boring.

When soil sample collection is required between the ground surface and 8 feet bgs, air-vacuum excavation will be stopped at least 6 inches above the top of the desired sampling interval and a hand-auger will be used to clear the boring to the desired sampling depth and collect the soil sample.

In the event that the air-knife borehole will not be drilled out on the same day, this 5-foot deep borehole will be temporarily backfilled and cold patch asphalt applied at the surface. Backfill will consist of native soil removed from the borehole, if observations and field screening results indicate that petroleum impacts were not encountered in the borehole. Otherwise, the borehole will be backfilled with clean imported material. When this borehole is later drilled, the drill or direct-push rig will advance through the backfilled soil.

3.2 SOIL SAMPLE COLLECTION METHODS

The soil sampling scope of work proposed in the SRI-5 Work Plan (Arcadis, 2020a) includes soil sampling by one or more of the following methods:

- Hand auger;
- Direct-push; or
- Use of a split-core-barrel sampler during sonic drilling operations.

Appropriate soil sampling procedures will be followed at all times to ensure that representative soil samples are provided for analysis and that the act of sampling does not contribute to further contamination by cross-contamination. Care will be taken to quickly collect and preserve soil samples in order to minimize the potential loss of volatile organic compounds (VOCs). All techniques will be thoroughly documented to ensure future re-creation. The location of each sample will be mapped using a measuring tape or measuring wheel and referenced to a local permanent feature where possible.

For soil samples collected between the ground surface and 8 feet bgs (i.e., the boring clearance interval), soil samples will be collected using a stainless steel hand-auger. Samples within this interval will generally be collected at approximate 2-foot intervals, unless otherwise specified in the SRI-5 Work Plan.

For soil sampling at depths below 8 feet bgs, samples will be collected using direct-push tooling or a sonic drill rig equipped with a split-core-barrel sampler, with soil cores collected on a continuous basis.

3.3 LOGGING AND FIELD SCREENING OF SOIL SAMPLES

Soil samples will be logged in the field in accordance with the Unified Soil Classification System (USCS). In addition, each sample will be field screened for the presence of petroleum hydrocarbons by headspace vapor measurements using a photo-ionization detector (PID) and sheen testing.

The samples will be examined and the following items will be noted in the field logbook or boring log:

- Color;
- Moisture content (dry, damp, moist, or wet);
- Lithology (using USCS);
- Geological interpretation, if possible (e.g., fill, topsoil, alluvium, till, etc.);
- Presence of sheen or light non-aqueous phase liquid (LNAPL);
- Other indications of contamination (e.g., discoloration or odor); and
- Field screening results (see below).

Each sample will be field screened to obtain a relative estimate of its VOC concentration. This field screening will be performed by measuring the concentration of VOCs in the headspace above the sample in a closed container using a PID. Headspace vapor measurements will be performed by placing the soil into a sealed plastic bag (e.g., Ziploc), disaggregating the soil by hand, allowing the sample to equilibrate for at least five minutes, and then opening the bag slightly, inserting the instrument probe, and measuring the VOC concentration in the headspace.

Sheen testing will be conducted by placing soil in a pan of water and observing the water surface for signs of sheen. Sheens are classified as follows:

- ***Slight Sheen***: Light, colorless (gray or white), dull sheen. The spread is irregular and dissipates rapidly.
- ***Moderate Sheen***: Light to heavy sheen, may show color/iridescence. The spread is irregular to flowing. Few remaining areas of no sheen are evident on the water surface.
- ***Heavy Sheen***: Heavy sheen with color/iridescence. The spread is rapid and the entire water surface may be covered with sheen.

3.4 SOIL SAMPLES ANALYSIS

Selected soil samples will be submitted to Pace Analytical for the following analyses:

- Gasoline-range hydrocarbons (GRO) by Ecology NWTPH-Gx;
- Diesel-range hydrocarbons (DRO) and oil-range organics (ORO) by Ecology NWTPH-Dx;

- Benzene, toluene, ethylbenzene, and total xylenes (BTEX), methyl tertiary butyl ether (MTBE), ethylene dibromide (EDB), and ethylene dichloride (EDC) by USEPA method 8260; and
- Total lead by USEPA method 6010.

Select soil samples (such as those displaying strong field-screening indications of petroleum hydrocarbon, and which are collected in the vicinity of undocumented USTs) may also be submitted for the following additional analyses:

- Naphthalene, 1-methyl naphthalene, and 2-methly naphthalene by USEPA 8270;
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by USEPA method 8270 SIM;
- Polychlorinated biphenyls (PCBs) by USEPA method 8082; and
- Halogenated volatile organic compounds (HVOCs) by USEPA method 8260.

Duplicate soil samples will be collected at a rate of one per each 20 soil samples and submitted for the above-referenced analyses to ensure QA/QC. Additional QA/QC samples will include one trip blank to accompany each sample cooler, and equipment rinse samples to verify equipment decontamination procedures. Equipment rinse sampling will be performed by collecting laboratory-supplied distilled water that has been used as the final rinse following equipment decontamination procedures. Equipment rinse samples will be collected at a rate of one per sample collection method. Trip blank and equipment rinse QA/QC samples will be submitted for the following analysis:

- GRO by Ecology NWTPH-Gx; and
- BTEX, MTBE, EDB and EDC by USEPA method 8260.

3.5 SOIL BORING ABANDONMENT

Following soil sample collection, soil borings will be decommissioned with hydrated bentonite by a Washington State Licensed Driller, in accordance with requirements of WAC 173-160. The ground surface will be restored with an asphalt, concrete, or natural cover to resemble the surrounding area.

4 LNAPL SAMPLING PROCEDURES

Collection of samples of light non-aqueous phase liquid (LNAPL) will be conducted according to the following procedures.

4.1 LNAPL SAMPLE COLLECTION

Petroleum LNAPL is highly volatile and potentially flammable. Many of the monitoring wells containing LNAPL at the Chelan Chevron site are located in close proximity to sidewalks, parking areas, and other public spaces. Therefore, when possible, LNAPL sampling activities should be performed during off-peak hours for the nearby surrounding areas.

LNAPL sample collection procedures are as follow:

1. Date and time of arrival at the sampling location, general site conditions, monitoring well conditions, and other applicable field observations will be recorded.
2. Approximately 6 mil thick Visqueen or equivalent plastic sheeting (approximately 25 square feet) will be placed over the sampling location and secured along the perimeter with sand bags or similar heavy objects. A hole (approximately 8 to 10 inches in diameter will be cut into the sheeting to allow access to the monitoring well. A stockpile of oil absorbent pads and heavy-duty paper towels will be placed nearby to address LNAPL drips from sampling and measuring equipment during the sample collection process.
3. The well box will be opened, and if necessary, accumulated surface water will be removed using a hand pump, disposable cup, or equivalent device.
4. The well cap (j-plug) will be removed. Immediately following removal of the well cap, a previously decontaminated electronic oil/water interface probe will be used to measure the depth-to-product (DTP) and depth-to-water (DTW), relative to the approximate north side of the well casing. Following these initial measurements, the well will be left open for a period of at least 5 minutes to allow fluid levels in the well to equilibrate with atmospheric conditions. After at least 5 minutes has elapsed, the DTP and DTW will be measured again. This process will be repeated until both the DTP and DTW measurements from two successive readings do not vary by more than 0.01 foot. All measurements will be recorded in the field log book, or onto a field data form.
5. LNAPL samples will only be collected from monitoring wells containing LNAPL at a thickness of approximately 0.75-foot or greater.
6. Sample bottles will be checked for conformance with the QAPP and labeled. Samples will be collected using a disposable bailer dedicated to the sampling location. Sample bottles will be filled using a VOA vial sampling tip and the sample collection time and sample ID will be recorded in the field log book.
7. Following sample completion, the monitoring well will be resealed and securely closed. If present, liquids on the Visqueen sheeting will be mopped up using absorbent pads or paper towels prior to demobilization from the sampling site.

4.2 LNAPL SAMPLE ANALYSIS

LNAPL samples for physical properties analysis will be sent to Integrated Geosciences Laboratories, LLC in Houston, Texas for the following analyses:

- Density by ASTM D1481;
- Viscosity by ASTM D445; and
- LNAPL/water and LNAPL/air interfacial tension by ASTM D971

LNAPL samples for chemical fingerprinting analysis will be sent to Microbial Insights, Inc. in Knoxville, Tennessee for the following analyses:

- C3-C36 Whole Oil Fingerprint by ASTM D3328;

- C3-C12 Semi-Quantitative Characterization for gasoline-range petroleum products by EPA 8260 Modified; and
- C8-C40 Full Scan Semi-Quantitative Characterization for diesel-range and heavier-end petroleum products by ASTM D5739.

Sample container information for these analyses is presented in Table B-2 of the QAPP.

5 PRESSURE TRANDUCER INSTALLATION AND DATA RETRIVAL PROCEDURES

5.1 PRESSURE TRANSDUCER INSTALLATION

Installation procedures for the pressure transducers are as follow:

1. Prior to mobilization to the field, each of the pressure transducers and barometric pressure data logger will be checked for proper function per the manufacturer's recommendations. The date and time settings will be updated and synchronized between all units, and sufficient battery life and data storage capability will be confirmed.
2. In the field, upon arrival at the pressure transducer installation location, the date and time of arrival, monitoring well ID, general site conditions, monitoring well conditions, and other applicable field observations will be recorded.
3. The well box will be opened, and if necessary, accumulated surface water will be removed using a hand pump, disposable cup, or equivalent device.
4. Immediately following removal of the well cap, a previously decontaminated electronic water-level meter will be used to measure the DTW, relative to the approximate north side of the well casing. Following this initial measurement, the well will be left open for a period of at least 5 minutes to allow fluid levels in the well to equilibrate with atmospheric conditions. After at least 5 minutes has elapsed, the DTW will be measured again. This process will be repeated until DTW measurements from two successive readings do not vary by more than 0.01 foot. The final DTW measurement will be considered the initial DTW value for the transducer installation. All measurements will be recorded in the field log book, or onto a field data form. These measurements will also be used to assess the existence of pressure differentials between the atmosphere and monitoring well casing that may cause erroneous interpretation of the pressure transducer data.
5. Following the DTW measurements, the electronic water-level meter will be used to measure the depth-to-bottom (DTB) of the well. During this process, the water-level meter will be used to "feel" the bottom of the well to determine if significant sediment deposits are present in the well casing that may interfere with the function of the transducer. If deemed necessary, wells may be surged and bailed using a disposal bailer in order to remove accumulated sediments. **If bailing of a well is performed, the groundwater level will be allowed to return to the approximate initial DTW level determined in Step 4 before proceeding with the pressure transducer installation.**

6. Prior to installation, the transducer date/time and data collection frequency settings will be verified. The transducers will be set to record readings at least once every 60 minutes. The transducer will then be lowered to the bottom of the well casing using a manufacturer's recommended tether or direct-read cable.
7. After being deployed in the monitoring well for at least one hour, Leidos will use a personal computer (PC) or equivalent data collection device to connect to the transducer and check its reading versus manual measurements made at the well with an electronic water-level meter.
8. After the current readings are confirmed to be correct, the direct-read cable will be capped and stowed in the well casing, and the well will be capped and securely closed to prevent any surface water from entering the well casing.

5.2 PRESSURE TRANSDUCEER DATA RETRIEVAL

Data retrieval from the pressure transducers is expected to be performed on an approximate quarterly basis. Leidos will attempt to coordinate these events with groundwater monitoring and sampling events for the Site, which are expected to be performed by Gettler-Ryan. This coordination will be necessary to allow Leidos personnel to accompany Gettler-Ryan and to remove and replace transducer units in monitoring wells that will be sampled. Removal of the transducers will be necessary because groundwater samples cannot be collected with a peristaltic pump from most monitoring wells at the Site; therefore, Gettler-Ryan uses a downhole bladder pump for groundwater sampling, which would interfere with the transducer and cable.

Data retrieval procedures for the pressure transducers are as follow:

1. Upon arrival at the sampling location, the date and time of arrival, monitoring well ID, general site conditions, monitoring well conditions, and other applicable field observations will be recorded.
2. The well box will be opened, and if necessary, accumulated surface water will be removed using a hand pump, disposable cup, or equivalent device.
3. Immediately following removal of the well cap, the direct-read cable for the transducer will be positioned to allow measurement of DTW using an electronic water-level meter. Following this initial measurement, the well will be left open for a period of at least 5 minutes to allow fluid levels in the well to equilibrate with atmospheric conditions. After at least 5 minutes has elapsed, the DTW will be measured again. This process will be repeated until DTW measurements from two successive readings do not vary by more than 0.01 foot. All measurements will be recorded in the field log book, or onto a field data form. These measurements will also be used to assess the existence of pressure differentials between the atmosphere and monitoring well casing that may cause erroneous interpretation of the pressure transducer data.
4. Leidos will use a personal computer (PC) or equivalent data collection device to connect to the transducer and check its reading versus manual measurements made at the well with an electronic water-level meter. Data stored in the transducer will

be downloaded to the PC or data collection device. The battery condition and remaining data storage capability of the transducer will be verified.

5. After the completing the data retrieval, the direct-read cable will be capped and stowed in the well casing, and the well will be capped and securely closed.

6 PROCEDURES FOR EVALUATIONG SUSPECTED ORPHANED UNDERGROUND STORAGE TANKS

The presence of suspected orphaned USTs at the Site will be evaluated according to the following procedures.

6.1 CONFIRMATION OF UST PRESENCE

1. A ground penetrating radar (GPR) survey will be performed in the area where orphaned USTs are suspected to be present. If suspected USTs are identified, the GPR results will be used to determine the approximate depth and lateral extents of the UST(s).
2. If a suspected USTs is identified, air-knife equipment will be used to advance one, approximately 6-inch diameter, boring from the ground surface to the top of the suspected UST in order to confirm its presence. The boring will be located in the approximate center of the UST "footprint" determined by the GPR survey. This procedure will be repeated at each of the suspected UST locations identified by the GPR survey. If a UST is encountered, Leidos will field-screen soils immediately above the UST for the presence of petroleum impacts due to overfilling.

6.2 EVALUATION OF UST CONTENTS

1. If the presence of an orphaned UST is confirmed, Leidos will subcontract a qualified contractor and certified Marine Chemist to safely gain access to the interior of the UST to confirm its contents.
2. If a UST is found to contain standing liquids, a representative sample of the material will be collected in a disposable bailer, or other suitable sampling device. If a UST is found to contain solid or semi-solid material, a hand auger, or other suitable sampling device, will be used for sample collection.
3. Samples of UST contents will be submitted to Pace Analytical for the following analyses[1]:
    - GRO by Ecology NWTPH-Gx;
    - DRO and ORO by Ecology NWTPH-Dx;
    - BTEX, MTBE, EDB, EDC by USEPA method 8260B (EDB by USEPA 8011 for liquid samples);
    - Naphthalenes by USEPA method 8270;
    - cPAHs by USEPA method 8270 SIM;

[1] The list of analyses for UST contents samples is subject to field modification based on the available volume of sample that can reasonably be collected.

- PCBs by USEPA method 8082[2];
- HVOCs by USEPA method 8260; and
- Additional analyses as may be specified by the Investigation Derived Waste Management Plan for the project.

4. Following evaluation of the UST contents, the UST will be temporarily closed and resealed, if necessary, to prevent groundwater infiltration. The overlying area will be backfilled and the surface temporarily restored to allow use of the area until analytical results are received, and further evaluation of the USTs is completed.

7 SHALLOW SOIL VAPOR SAMPLING PROBE INSTALLATION PROCEDURES

Shallow soil vapor sampling probe installation proposed in the SRI-5 Work Plan (Arcadis, 2020a) will be conducted according to the following procedures.

7.1 BORINGS FOR SHALLOW SOIL VAPOR PROBE INSTALLATION

Borings for installation of shallow soil vapor sampling probes will be advanced with a stainless-steel hand auger, with air-knife assistance (if necessary). Note that a longer period of time for post-installation equilibration of soil vapor conditions will be necessary prior to sampling if air-knife equipment is used for the soil vapor sampling probe installation (see Section 7.1 of the SAP for additional details). During advancement of the soil vapor sampling probe borings, samples will be collected every 2 feet for logging and field screening. If an air-knife is being used to assist the boring advancement, the air-knife will be stopped at least 6 inches above the top of the desired sampling interval and a hand-auger will be used to clear the boring to the desired sampling depth and collect the soil sample.

7.2 SHALLOW SOIL VAPOR SAMPLING PROBE CONSTRUCTION

Construction of shallow soil vapor sampling probes will be performed under the supervision of a Washington State licensed driller. Upon completion of the sampling probe boring to the required depth, the borehole will be prepared by placing a 6-inch lift of 2/12 Monterey sand (or equivalent) into the bottom of the borehole. The vapor sampling probe hardware, which will consist of a 6-inch long, 0.75-inch diameter stainless steel screen (0.0057-inch screen pore size) connected to a length of ¼-inch outside diameter (O.D.) Teflon® tubing via a Swagelok® fitting with a rubber compression ferule, will then be placed in the approximate center of the boring, and additional sand will be added until the sand pack extends to a depth approximately 6 inches above the top of the probe screen. Approximately 12 inches of dry, granular bentonite will then be placed above the sand pack. The boring will then be sealed with at least 24 inches of pre-hydrated granular bentonite and the upper portion of the boring will be completed with an 18-inch thick cement cap. An 8-inch flush-mounted well box will be installed to protect the tubing line that is set in the cement cap. The above-grade end of the soil vapor sampling probe tubing

[2] Liquid samples to be analyzed for PCBs will be submitted to the Pace Analytical Laboratory in Minneapolis, Minnesota for low-level PCB analysis sufficient to demonstrate compliance with MTCA Method A cleanup levels.

will be fitted with a Swagelok® stainless steel on/off control valve. An illustration showing the typical construction of a soil vapor sampling probe is included as Figure A-1.

8 SHALLOW SOIL VAPOR SAMPLING PROCEDURES

Shallow soil vapor sampling proposed in the RI Work Plan (Arcadis, 2002a) will be conducted according to the following procedures.

8.1 SHALLOW SOIL VAPOR SAMPLING EVENT SCHEDULING

Sampling of shallow soil vapor sampling probes will not be performed within the first 48 hours after installation of the probes, in order to ensure that the surface seal of the probes is sufficiently cured. If an air-knife, or similar high pressure air excavation equipment, is used during the probe installation activities, sampling will not be performed within 7 days of the probe installation.

Soil vapor sampling will not be performed during or within 48 hours after a significant rain event (greater than 1 inch of precipitation), due to the potential reduction of the effective diffusion coefficient and decrease in relative vapor saturation in the unsaturated zone. Soil vapor sampling will also not be performed during periods of high winds, or during other major storm events with the potential to cause significant and rapid changes in barometric pressure trends.

8.2 SHALLOW SOIL VAPOR SAMPLING EQUIPMENT

Soil vapor samples will be collected in stainless steel Summa air-sampling canisters (Summa canisters), which will be provided by the subcontracted laboratory for the vapor sampling portion of the project. Each Summa canister used for sample collection will be individually certified (100-percent certified) to contain less than the reporting limit for each of the target analytes listed in Section 7.8. Soil vapor sampling manifolds, duplicate sampling tees, purge canisters, and tubing will also be supplied by the subcontracted laboratory.

8.3 PRE-SAMPLING EQUIPMENT SETUP AND LEAK TESTING

8.3.1 Initial Canister Vacuum Check

To begin setup for the vapor sample collection process, the sampling canister (or canisters if a duplicate sample is being collected) will be checked to determine their initial vacuum level, in order to verify that the canisters have not been inadvertently opened or have otherwise leaked prior to the sampling event. The initial vacuum, which should be approximately 29 inches of mercury vacuum, will be recorded on the canister's identification tag and in the field log book and/or field data form. Sampling canisters with initial vacuum readings of less than 27 inches of mercury vacuum will not be used for soil vapor sample collection.

8.3.2 Sampling Canister and Manifold Assembly and Shut-In Test

Following the initial canister vacuum check, the sampling canister (or canisters if a duplicate sample is being collected) will be fitted with a sampling manifold. The sampling manifold will be equipped with an on/off valve and a flow controller that will be calibrated to provide a sample collection flow rate of less than 200 milliliters per minute (mL/min). Vacuum gauges will be provided on both in the inlet and outlet side of the flow controller. The manifold will also allow the sampling canister to be connected to another Summa canister that will be used to purge the soil vapor sampling probe and sampling equipment train. Where duplicate samples are to be collected, the sampling manifold will also allow connection of another Summa canister for simultaneous collection of a duplicate sample.

After connecting the sampling manifold to the sampling canister(s) and purge canister, a "shut-in" test will be performed as a preliminary check of the manifold connections. With the inlet to the manifold tightly capped, the purge canister will be opened momentarily and then shut, thereby applying a vacuum to the sampling manifold. Initial vacuum readings will then be recorded in the field log book and/or field data form from both of the two vacuum gauges on the sampling manifold. After a period of at least 5 minutes, the vacuum readings of each gauge will be checked again to verify that the initial vacuum levels have been maintained. If the vacuum readings between the initial and final readings are the same, the results of the shut-in test will be recorded and the sampling canister and manifold assembly will be used for vapor sample collection. However, if the vacuum readings between the initial and final readings are different, it is an indication that one or more of the manifold connections is leaking. In that event, an attempt will be made to tighten the manifold connections, or otherwise remedy the manifold leak(s), and the shut-in test will be repeated. If after three attempts, shut-in test results still indicate that the sampling canister and manifold assembly is not leak-free, the sampling manifold will be removed from service and not used for vapor sample collection.

8.4 CONNECTION TO SAMPLING PROBE AND PRE-SAMPLE COLLECTION PURGING

After satisfactory completion of the shut-in test, the sampling canister and manifold assembly will be connected to the soil vapor sampling probe. Teflon® tubing (¼-inch outside diameter) will be used to connect the soil vapor sampling probe control valve to the inlet of the sampling manifold. Swagelok® fittings with rubber compression ferrules will be used to make connections from the Teflon® tubing to the control valve and sampling manifold inlet. During this process, the soil vapor sampling probe control valve will be maintained in the closed position.

Prior to collecting a soil vapor sample, each soil vapor sampling probe will be purged to remove the air volume present in the sample collection train, which would not be representative of subsurface soil vapor conditions. Purge volume will be based on the volume of air contained within the inner diameter of the soil-vapor sampling probe and all tubing connected to the inlet of the sampling canister. The sand pack volume of the soil-vapor sampling probe will not be included in the purge volume calculation, as it is assumed that the soil-vapor concentration in the sand pack will be in equilibrium with the surrounding soil. Three purge volumes will be removed from each soil-vapor sampling probe prior to sample collection. The purge cycle will be completed by applying vacuum to the manifold, using the purge container, for the duration of the calculated purge time. Upon completion of the purge cycle, the purge canister valve will be closed to reseal the sampling manifold.

Assuming use of ¼-inch O.D. tubing and an approximate combined sampling probe and tubing length of 10 feet, it is estimated that the total purge volume would be equal to approximately 300 milliliters, which would equate to a purge time of approximately 1.5 minutes at a purge rate of approximately 200 mL/min.

8.5 SECONDARY LEAK TESTING AND SAMPLE COLLECTION

In order to verify the integrity of the vapor sample collection system during the sampling process, helium gas will be used as a tracer to check for leaks or short-circuiting of ambient air into the sampling system. To accomplish this, the entire soil-vapor sampling train (soil-vapor sampling probe, sampling manifold, sampling canister, and purge canister) will be contained in a shroud in which a helium-rich environment will be maintained throughout the duration of the sample collection. Laboratory-grade helium will be used as the tracer gas. During the duration of the sampling, the concentration of helium inside the shroud will be monitored using a Mark 9822, or equivalent, helium detector. During sample collection, the sampling technicians will attempt to maintain a concentration of helium of approximately 10 percent by volume in the sampling shroud. An illustration showing the typical equipment setup for soil vapor sample collection is included as Figure A-1.

After reaching a helium concentration in the sampling shroud of at least 10 percent by volume, the valve on the sampling canister(s) will be opened to begin sample collection. The start time and initial canister vacuum(s) will be recorded in the project log book. During collection of each sample, the sampling technician will periodically check the canister vacuum(s) readings to verify that the canister is filling at the expected rate. The sampling technician will also monitor and maintain the concentration of helium leak-detection gas within the sampling shroud. Sample collection will be stopped when the vacuum gauge on the sampling canister indicates that between approximately1 to 2 inches of mercury vacuum is remaining in the sampling canister. Once sample collection is done, the final canister vacuum will be recorded on the canister ID tag and also in the project log book or field data form.

8.6 QA/QC SAMPLE COLLECTION

In order to verify sample collection and laboratory QA/QC, one duplicate soil vapor sample and one equipment blank sample will be collected.

The QA/QC duplicate sample will be collected using a duplicate-sampling manifold, which will allow two sample collection canisters to be filled simultaneously in a parallel configuration. The sample collection time for this sample will be approximately two times longer than for collection of a standard soil vapor sample because two times the volume of sample will be collected.

The QA/QC equipment blank will be collected to evaluate the potential for contamination of the soil vapor samples by Leidos field equipment, procedures, or the materials used to construct the soil vapor sampling probes. The QA/QC equipment blank will consist of one sample of ambient air that will be drawn through a representative soil vapor probe screen, tubing, and valve. The control for this sample will be a second ambient air sample that will be collected simultaneously, and immediately adjacent to, the first sample – but without being drawn through the sampling equipment.

8.7 WEATHER MONITORING AND OBSERVATIONS

During the soil vapor sampling event, the following weather data and observations will be recorded at the start of the work day, at the approximate time of each sample collected, and at the end of the work day:

- General weather conditions;
- Barometric pressure; and
- Wind speed and direction.

General weather conditions will be recorded based on observations in the field by Leidos personnel. Weather data will recorded from National Weather Service or equivalent web-based resources available for the regional area.

8.8 SOIL VAPOR SAMPLE ANALYSIS

Soil vapor samples will be submitted to Eurofins Air Toxics in Folsom, California for the following analyses:

- BTEX, MTBE; and naphthalene by Modified EPA Method TO-15 GS/MS SIM;
- Oxygen, carbon dioxide, methane, nitrogen, and helium by Modified ASTM D-1946; and
- C9-C10 aromatics, C5-C8 aliphatics, and C9-C12 aliphatics by Massachusetts Department of Environmental Protection Air Phase Petroleum Hydrocarbons (MA APH).

9 FIELD EQUIPMENT DECONTAMINATION PROCEDURES

Field equipment used during drilling soil borings and sampling will be decontaminated prior to use and between sample collection events to reduce the potential for the introduction of contamination and cross-contamination in accordance with the guidelines and procedures set forth in this document. These procedures are necessary to ensure quality control in decontamination of field equipment and to serve as a means to identify and correct potential errors in sample collection and sample handling procedures.

The decontamination fluids generated during decontamination procedures will be treated as though they are contaminated and will be contained in 55-gallon drums, marked and secured until a proper disposal method is developed and implemented based on analytical test results.

Decontamination of all non-disposable field sampling equipment, field instruments and sample containers will be conducted in a thorough and step-wise manner as described below. New, disposable nitrile gloves will be worn when handling clean sampling equipment and monitoring well construction materials to ensure that the equipment is not cross-contaminated.

9.1 EXPLORATION AND CONTRUCTION EQUIPMENT

Prior to use, between locations, and before leaving the Site; sonic core-barrel samplers, augers, direct-push rods, casings and other non-sampling equipment shall be certified clean or decontaminated in accordance with the following procedures:

- Move equipment to designated decontamination area;
- Clean thoroughly (inside and outside) with a high-pressure steam cleaning unit;
- Allow to air dry; and
- Store in a clean area on plastic sheeting.

9.2 SAMPLING EQUIPMENT

All non-disposable sampling equipment will be decontaminated between each sample. The decontamination procedure is provided as follows:

- Scrub with Liquinox and water to remove any visible dirt;
- Rinse thoroughly with potable water;
- Rinse with distilled water; and
- Store in a clean area or seal in a clean container or in aluminum foil.

9.3 SAMPLE CONTAINERS

Reusable sample containers (such as Summa canisters for vapor sample collection) will be cleaned and certified prior to use, by the analytical laboratory performing the analyses.

10 INVESTIGATION DERIVED WASTE MANAGEMENT PROCEDURES

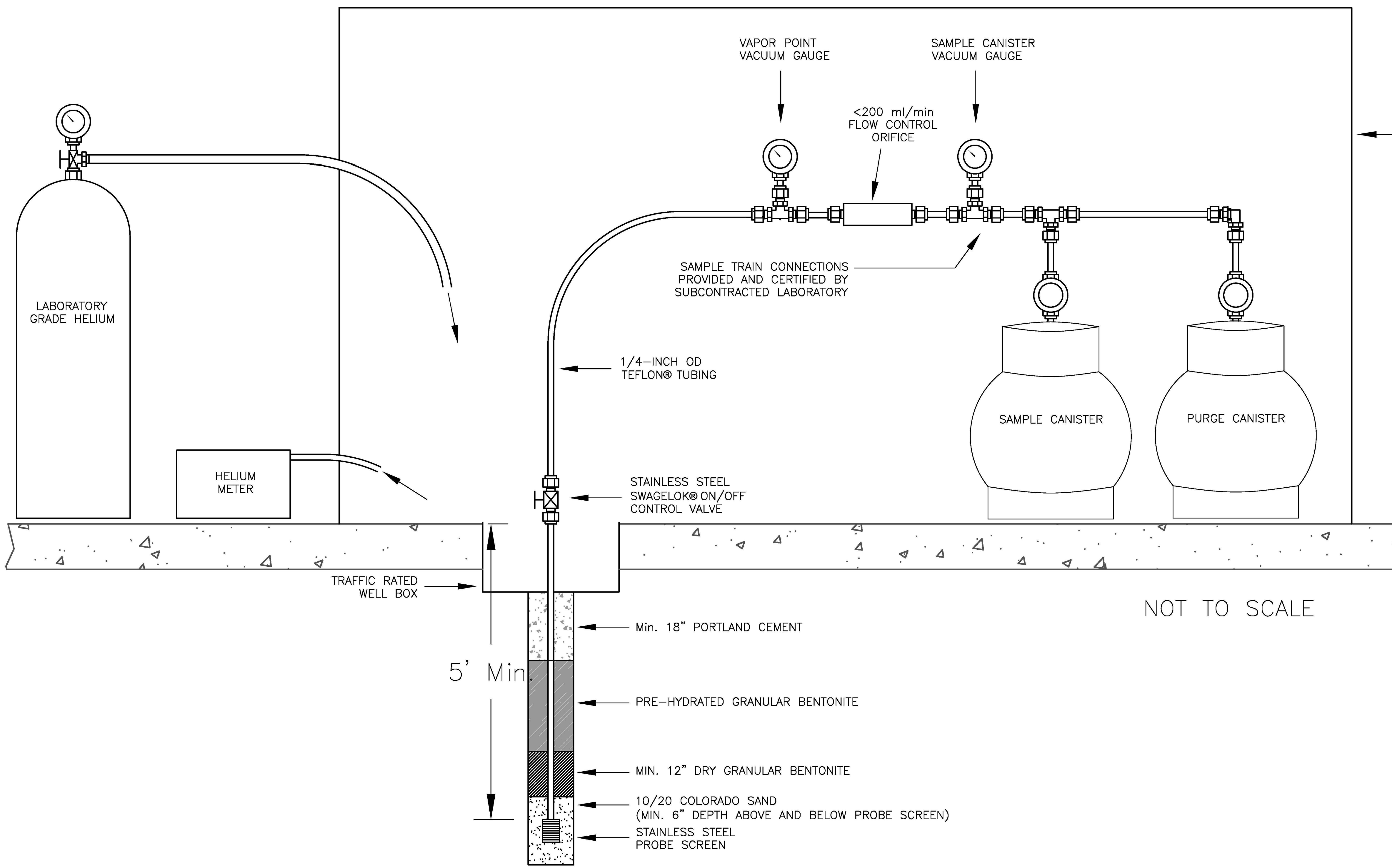
10.1 IDW STORAGE

Residual soil from this investigation will be contained in 55-gallon Department of Transportation (DOT) approved drums, which will remain on-site for temporary storage while awaiting laboratory results. All decontamination and purge water will be stored in polyethylene 55-gallon DOT approved waste drums.

Each drum will be labeled immediately before waste is placed into the container using a non-hazardous waste or pending analysis label. The following information, at a minimum, will be written in indelible, waterproof ink on each label: container number, date of generation, facility address, generator contact information, and a brief description of the contents of the container. Each drum will be secured after every addition of waste and prior to departing the site on each work day.

10.2 IDW SAMPLING AND DISPOSAL

IDW sampling and disposal will be performed according to the RELLC approved waste management plan for the project.



leidos

FIGURE A-1

TYPICAL SOIL VAPOR SAMPLING PROBE CONSTRUCTION AND EQUIPMENT LAYOUT

FILE NAME:	DATE:
SVSP.dwg	09/17/2020

Appendix B:
Quality Assurance Project Plan

APPENDIX B
SRI PHASE 5 QUALITY ASSURANCE PROJECT PLAN

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TABLES

APPENDIX B
SRI PHASE 5 QUALITY ASSURANCE PROJECT PLAN

1 INTRODUCTION AND OBJECTIVES

This Quality Assurance Project Plan (QAPP) has been prepared by Leidos for anticipated Supplemental Remedial Investigation – Phase 5 (SRI Phase 5) field activities to be conducted at the Chelan Chevron site (the Site), located at 232 E. Woodin Avenue in Chelan, Washington. This QAPP is not intended to be a stand-alone document. Instead, the QAPP has been prepared as an appendix to Addendum 1 of the SRI Work Plan – Phase 5 (SRI-5 Work Plan), and is designed to be used in conjunction with both the work plan and the Sampling and Analysis Plan (SAP) for the project.

The objective of the QAPP is to establish the practices and procedures necessary to ensure that data collected as part of the SRI Phase 5 field investigation activities are of the type and quality needed. The quality of data collected for the SRI must be documented in order to ensure that the data is scientifically and legally defensible.

2 PROJECT ORGANIZATION AND RESPONSIBILITY

Leidos is the lead project consultant, involved with sample collection and data generation. Key roles on this project are as follows:

Project Manager – Leidos. The project manager is responsible for the successful completion of all aspects of this project, including day-to-day management, production of reports, liaison with party and regulatory agencies, and coordination with the project team members. The project manager is also responsible for resolution of non-conformance issues, is the lead author on project plans and reports, and will provide regular, up-to-date progress reports and other requested information to project team and Ecology. The project manager is responsible for developing the data quality objectives, selecting analytical methods, coordinating with the analytical laboratory, overseeing laboratory performance, and approving QA/QC procedures.

Field Manager – Leidos. The field manager is responsible for overseeing the field sampling program outlined in the SRI-5 Work Plan, including collecting representative samples and ensuring that they are handled properly prior to transfer of custody to the project laboratory. The field manager will manage procurement of necessary field supplies and assure that monitoring equipment is operational and calibrated in accordance with the specifications.

Laboratory Project Managers – The laboratory project managers are responsible for ensuring that all laboratory analytical work complies with project requirements, and acting as a liaison with the project manager, and field manager to fulfill project needs on the analytical laboratory work. This responsibility also applies to analyses the laboratory to another laboratory.

3 QUALITY ASSURANCE/QUALITY CONTROL FIELD PROCEDURES

The following quality assurance (QA)/quality control (QC) procedures will be utilized during this RI to ensure that accurate, reproducible, and defensible data is collected.

3.1 FIELD MONITORING EQUIPMENT CALIBRATION

All instruments and equipment (field meters including pH, conductivity, dissolved oxygen, temperature probe, and PID) used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturer's guidelines. Operation, calibration, and maintenance will be performed by personnel properly trained in these procedures. Documentation of all routine and special maintenance and calibration conducted during the duration of the SRI field activities will be recorded in the project logbook.

PID calibration will be checked daily in the field in accordance with the manufacturer’s recommended procedure using a laboratory-certified isobutylene gas standard. Calibration checks will be performed as necessary in the field using the calibration gas to verify that the instrument remains properly calibrated throughout the day.

3.2 SAMPLE COLLECTION

The specific methods for sample container size and type, sample preservation requirements and holding times are determined by the contact laboratory chosen for the project. The laboratory will provide the sample containers. Leidos will verify that the laboratory has supplied the proper containers and that they are pre-cleaned and shipped in sealed boxes.

All samples (with the exception of trip blanks) will be prepared and sealed in the field. Sample collection procedures, locations and protocols will be documented in a bound field notebook.

3.3 SAMPLE IDENTIFIERS AND LABELS

Sample identifiers and labels will be assigned by the sampling team as described in the SAP. The unique sample identifier will be clearly written on the sample label affixed to each sample container. Sample labels will be affixed to each sample container in such a way so as to not obscure any QA/QC lot numbers on the containers. Sample information will be printed clearly on each label. Field identification will be sufficient to enable cross-reference with the project field book.

3.4 QA/QC SAMPLING

QC data are necessary to determine precision and accuracy and to demonstrate the absence of interference and/or contamination of sampling equipment glassware and reagents, etc. Specific QC requirements for laboratory analyses will be the responsibility of the project laboratory. Field QC will include the following:

- **Trip Blanks** are blank samples prepared to assess ambient transport conditions. The contract laboratory will prepare the trip blanks. The blanks will be handled like a sample, with a field label, and shipped to the laboratory for analyses. One trip blank will accompany each sample cooler containing samples for volatile constituent analysis.
- **Equipment Rinsate Blanks** are blank samples designed to demonstrate that sampling equipment has been properly prepared and cleaned before field use and that cleaning procedures between samples are sufficient to minimize cross contamination. Rinsate

blanks will be collected at a rate of one blank per sample collection method, per field mobilization event.

- **Field Duplicate** samples consist of a set of two samples collected independently of one another at the same sampling location during the same sampling event. Field duplicate samples will be submitted as blind samples to the laboratory. Field duplicates are designed to assess actual field variability, as compared to analytical duplicate or matrix spike/duplicate analyses which measure laboratory variability. Duplicate samples will be collected at a rate of one for each 20 samples.

3.5 SAMPLE STORAGE

Samples will be stored per the requirements specified in attached Tables B-1 through B-4.

Samples that are required to be stored at 4°C will be stored in an ice chest while at the Site and during transportation to the laboratory. Samples will be sub-packed by sample location in new Ziploc plastic bags.

Summa canisters used for soil vapor sample collection are not subject to special preservation requirements. However, used Summa canisters (i.e., those containing soil vapor samples) will be clearly marked and segregated from unused canisters in order to prevent possible compromise of the samples by inadvertently reopening a used sample canister. Used canisters will be returned to their original shipping box, or a similar protective enclosure, and stored away from heating sources or direct sunlight.

3.6 CHAIN OF CUSTODY RECORDS AND PROCEDURES

The primary objective of the chain of custody (COC) protocol is to provide an accurate written record that can trace the possession and handling of a sample from collection to the completion of all required analyses. A sample is in custody if it is in someone's possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel only.

The COC record will be fully completed in the field and signed by the sample collector.

3.7 CUSTODY SEALS

Custody seals will be used on all coolers and sample shipping containers. At least one seal will be affixed to each container, across the base of the lid. Seals will be signed and dated prior to use. Clear packing tape will be placed over each seal to ensure that seals are not accidentally broken during shipment.

3.8 FIELD CUSTODY PROCEDURES

The following guidance will be used to ensure proper control of samples while in the field:

- As few persons as possible will handle samples.
- The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another person or dispatched properly under COC protocols.
- The sample collector will record sample data in the field logbook.

When transferring custody (i.e., releasing samples to a shipping agent), the following will apply:

- The coolers in which the samples are packed will be sealed and accompanied by COC records. Separate COC records will accompany each shipment.
- When transferring custody of samples between individuals, the individuals relinquishing and receiving them (aside from commercial carrier) must sign, date and note the time on the COC record. This record documents sample custody transfer.
- When transferring custody of samples to a commercial carrier (e.g., FedEx or UPS) the individual relinquishing them must sign, date and note the time on the COC record and record the method of shipment, name of courier, and shipment tracking information on the COC record.
- All shipments will be accompanied by COC records identifying their contents. The original record will accompany the shipment. The other copies will be provided to the Project Manager and copies will be retained in the project files.

4 LABORATORY ANALYTICAL METHODS

Tables B-1 through B-4 provide summaries of the laboratory analytical methods, associated sample containers, and storage requirements for samples to be collected in association with the SRI Phase 5 field activities.

TABLE B-1
Analytical Methods Details Summary for Soil or Solid-Waste Samples

Analyte	Analytical Method	Laboratory Reporting Limit[1] (mg/kg)	Method A Clean-Up Level (mg/kg)	Sample Container / Preservative	No. of Containers	Sample Storage & Shipping Requirement	Holding Time
Total Petroleum Hydrocarbons							
GRO	NWTPH-Gx	2.5	30/100[2]	Method 5035A, 40-mL VOA vial (methanol preserved)	1	Chill to 4°C	14 days
DRO and HRO	NWTPH-Dx	4	2,000	4-ounce jar (unpreserved)	1	Chill to 4°C	14 days
Volatile Petroleum Compounds and Fuel Additives/Blending Compounds							
Benzene	USEPA 8260	0.001	0.03	Method 5035A, 40-mL VOA vial (methanol preserved)	1	Chill to 4°C	14 days
Ethylbenzene		0.0025	6				
Toluene		0.005	7				
Total Xylenes		0.0065	9				
MTBE		0.001	0.1				
EDB		0.0025	0.005				
EDC		0.0025	--				
Other Petroleum Components							
Carcinogenic PAHs							
benzo[a]pyrene	USEPA 8270 SIM	.006	0.1[3]	4-ounce jar (unpreserved)	1	Chill to 4°C	14 days
benzo[a]anthracene		0.006					
benzo[b]fluoranthene		0.006					
benzo[k]fluoranthene		0.006					
chrysene		0.006					
dibenz[a,h]anthracene		0.006					
indeno[1,2,3-cd]pyrene		0.006					
Naphthalene	USEPA 8270	0.02	5	4-ounce jar (unpreserved)	1	Chill to 4°C	14 days
1- Methyl Naphthalene		0.02	--				
2-Methyl Naphthalene		0.02	--				
Other Non-Petroleum Contaminants							
PCBs	USEPA 8082	0.034	1	4-ounce jar (unpreserved)	1	Chill to 4°C	1 year
Halogenated VOCs	USEPA 8260	0.025	--[4]	Method 5035A, 40-mL VOA vial (methanol preserved)	1	Chill to 4°C	14 days
Metals							
Lead	USEPA 6010	0.55	250	4-ounce jar (unpreserved)	1	Chill to 4°C	6 months

Notes:
DRO = Diesel-range hydrocarbons
EDB = Ethylene dibromide
EDC = Ethylene dichloride
GRO = Gasoline-range hydrocarbons
mg/kg = Milligrams per kilogram
MTBE = Methyl tert-butyl ether
PAHs = Polycyclic aromatic hydrocarbons
PCB = Polychlorinated biphenyl
SIM = Selective ion monitoring
USEPA = United States Environmental Protection Agency
VOCs = Volatile organic compounds
[1] = Laboratory Reporting Limits provided by Pace Analytical Labotoratories for the analytes listed
[2] = Benzene present/benzene absent
[3] = Sum of concentrations normalized to benzo(a)pyrene using toxicity equivalence factors (TEFs) per WAC 173-340-708(8)
[4] = Refer to the CLARC database for individual concentrations
-- Not applicable or not available

TABLE B-2
Analytical Methods Details Summary for LNAPL Samples

Parameter	Analytical Method	Sample Container / Preservative	No. of Containers	Sample Storage & Shipment Requirement	Holding Time
Density	ASTM D 1481	250 ml - LNAPL 250 ml - Water (unpreserved)	1 - LNAPL 1- Water	None	None
Viscosity	ASTM D445				
LNAPL - Water Interfacial Tension	ASTM D971				
LNAPL - Air Interfacial Tension	ASTM D971				
Tier 1: C3 - C36 Whole Oil Petroluem Fingerprint	ASTM D3328	40 ml VOA (unpreserved)	2	Chill to 4°C	14 days
Tier 2: C3 - C12 Semi-Quantitative Characterization for Gasoline-Range Petroleum Products	EPA 8260 Modified	40 ml VOA (unpreserved)	2	Chill to 4°C	14 days
Tier 2: C8 - C40 Semi-Quantitative Characterization for Heavier-Range Petroleum Products	ASTM D5739	40 ml VOA (unpreserved)	2	Chill to 4°C	14 days

TABLE B-3
Analytical Methods Details Summary for Liquid-Waste Samples

Analyte	Analytical Method	Laboratory Reporting Limit[1] (µg/L)	Method A Clean-Up Level (µg/L)	Sample Container / Preservative	No. of Containers	Sample Storage & Shipping Requirement	Holding Time
Total Petroleum Hydrocarbons							
GRO	NWTPH-Gx	100	800/1,000[2]	40-mL VOA vial (HCL preserved)	2	Chill to 4°C	14 days
DRO and HRO	NWTPH-Dx	200 - DRO 250 - HRO	500	40-mL VOA vial (HCL preserved)	2	Chill to 4°C	14 days
Volatile Petroleum Compounds and Fuel Additives/Blending Compounds							
Benzene	USEPA 8260	0.04	5	40-mL VOA vial (HCL preserved)	2	Chill to 4°C	14 days
Ethylbenzene		0.1	700				
Toluene		0.2	1,000				
Total Xylenes		0.26	1,000				
MTBE		0.04	20				
EDC		0.1	5				
EDB[3]	USEPA 8011	0.02 (MDL = 0.005360)	0.01	40-mL VOA vial (sodium thiosulfate preserved)	2	Chill to 4°C	14 days
Other Petroleum Components							
Carcinogenic PAHs							
benzo[a]pyrene	USEPA 8270 SIM	0.05	0.1[4]	40-mL VOA vial (unpreserved)	2	Chill to 4°C	7 days
benzo[a]anthracene		0.05					
benzo[b]fluoranthene		0.05					
benzo[k]fluoranthene		0.05					
chrysene		0.05					
dibenz[a,h]anthracene		0.05					
indeno[1,2,3-cd]pyrene		0.05					
Naphthalene	USEPA 8270	0.25	160	100-mL jar (unpreserved)	2	Chill to 4°C	7 days
1- Methyl Naphthalene		0.25	--				
2-Methyl Naphthalene		0.25	--				
Other Non-Petroleum Contaminants							
PCBs[5]	USEPA 8082	0.1	0.1	100-mL jar (unpreserved)	2	Chill to 4°C	1 year
Halogenated VOCs	USEPA 8260	0.1	--[6]	40-mL VOA vial (HCL preserved)	2	Chill to 4°C	14 days
Metals							
Lead	USEPA 6010	5.00	15	500-mL bottle (nitric acid preserved)	1	Chill to 4°C	6 months

Notes:
DRO = Diesel-range hydrocarbons
EDB = Ethylene dibromide
EDC = Ethylene dichloride
GRO = Gasoline-range hydrocarbons
HCL = Hydrochloric acid
µg/L = Micrograms per liter
MDL = Method detection limit
MTBE = Methyl tert-butyl ether
PAHs = Polycyclic aromatic hydrocarbons
PCB = Polychlorinated biphenyl
SIM = Selective ion monitoring
USEPA = United States Environmental Protection Agency
VOCs = Volatile organic compounds
[1] = Laboratory Reporting Limits provided by Pace Analytical Labotoratories for the analytes listed
[2] = Benzene present/benzene absent
[3] = Laboratory reporting limit for this analyte is not low enough to demonstrate compliance with Method A clean-up level; therefore, estimated values reported down to the method detection limit will be used.
[4] = Sum of concentrations normalized to benzo(a)pyrene using toxicity equivalence factors (TEFs) per WAC 173-340-708(8)
[5] = Analysis of samples for PCBs will be subcontracted to Pace Analytical Lab in Minneapolis, MN for low-level PCB analysis
[6] = Refer to the CLARC database for individual concentrations
-- Not applicable or not available

TABLE B-4
Analytical Methods Details Summary for Soil Vapor Samples

Analyte	Analytical Method	Reporting Units	Laboratory Reporting Limit[1]	Ecology Method B Sub-Slab Soil Gas Screening Level	Sample Container	No. of Containers	Sample Storage & Shipping Requirement	Holding Time
Benzene	Modified EPA Method TO-15 GC/MS SIM	µg/m3	0.28	10.7	6-Liter Summa Canister 100% SIM Certified	1	None	14 days
Toluene		µg/m3	0.33	76,200				
Ethylbenzene		µg/m3	0.15	15,200				
m,p-Xylene		µg/m3	0.30	1,520				
o-Xylene		µg/m3	0.15	1,520				
Methyl tert-butyl ether		µg/m3	0.63	321				
Naphthalene		µg/m3	0.46	2.5				
C9 - C10 Aromatics	Massachusetts DEP Air Phase Petroleum Hydrocarbons	µg/m3	12	4,700 (Total TPH)			None	6 months
C5 - C8 Aliphatics		µg/m3	12					
C9 - C12 Aliphatics		µg/m3	10					
Carbon dioxide	Natural Gas Analysis by Modified ASTM D-1946	%	0.010	---			None	14 days
Helium		%	0.050	---				
Methane		%	0.00010	---				
Nitrogen		%	0.10	---				
Oxygen		%	0.10	---				

Notes:

[1] = Laboratory Reporting Limits provided by Eurofins Air Toxics Laboratory for the analytes listed

µg/m^3 = Micrograms per cubic meter

-- Not applicable or not available