FINAL REMEDIAL INVESTIGATION WORK PLAN
FORMER CHEVRON SERVICE STATION NO. 90619
1205 Washington Street (formerly 2200 Elm Street)
Bellingham, Washington

December 21, 2018

Prepared for:
Washington State Department of Ecology
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Bellingham, Washington 98225

Prepared by:
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On Behalf of:
Chevron Environmental Management Company
6001 Bollinger Canyon Road.
San Ramon, California 94583

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LIST OF ACRONYMS

Air Toxics – Eurofins Air Toxics, Inc.
ASTM – American Society for Testing and Materials
bgs – below ground surface
BTEX – benzene, toluene, ethylbenzene, and total xylenes
CEMC – Chevron Environmental Management Company
COC – constituent of concern or chain of custody
COPC – chemical of potential concern
cPAHs – carcinogenic polynuclear aromatic hydrocarbons
CSM – conceptual site model
DCAP – draft cleanup action plan
DOT – Department of Transportation
DQO – data quality objective
Ecology – Washington State Department of Ecology
EDB – ethylene dibromide
EDC – ethylene dichloride
FID – flame-ionization detector
FS – Feasibility Study
GeoEngineers – GeoEngineers, Inc.
Lancaster – Eurofins Lancaster Laboratories, Inc.
Leidos – Leidos Inc.
LNAPL – light non-aqueous phase liquid
mL/min – milliliters per minute
MS – matrix spike
MSD – matrix spike duplicate
MTBE – methyl tert-butyl ether
MTCA – Model Toxics Control Act
NAD83HARN – North American Datum 1983 High Accuracy Reference Network
NFA – No Further Action
O.D. – outside diameter
PCBs – polychlorinated biphenyls
PEG – Pacific Environmental Group
PID – photoionization detector
PLP – Potentially Liable Person
QAPP – Quality Assurance Project Plan
QA/QC – quality assurance/quality control
Redox – oxidation-reduction
RI – Remedial Investigation
RPD – relative percent difference
SAP – Sampling and Analysis Plan
SHA – Site Hazard Assessment
Shell – Shell Oil Products US Environmental Services

SOP - Standard Operation Procedure
Stratum – Stratum Group
TEE – terrestrial ecological evaluation
USCS – Unified Soil Classification System
USEPA – United States Environmental Protection Agency
UST – underground storage tank
VES – vapor extraction system
VI – vapor intrusion
VOC – volatile organic compound
WAC – Washington Administrative Code
µg/L – micrograms per liter
%R – percent recovery

FINAL REMEDIAL INVESTIGATION WORK PLAN
FORMER CHEVRON SERVICE STATION NO. 90619

1 INTRODUCTION AND OBJECTIVES

Leidos Inc. (Leidos) prepared this work plan, on behalf of Chevron Environmental Management Company (CEMC), to perform a Remedial Investigation (RI) at the Former Chevron Service Station No. 90619, located at 1205 Washington Street in Bellingham, Washington.

In accordance with Section 200 of Chapter 173-340 of the Washington Administrative Code (WAC 173-340-200), the Site will be defined as the area where concentrations of constituents of concern (COCs), released from the former service station property, have come to be located (the Site). The results of this investigation will be used to determine the nature and extent of the Site, as defined by WAC 173-340-200.

The objectives of this investigation are to address data gaps regarding the nature and extent of petroleum contamination in soil, groundwater, and soil vapor at the Site, and to comply with the requirements of Agreed Order No. DE 15742 which was recently entered into by Shell Oil Products US Environmental Services (Shell), CEMC, and the Washington State Department of Ecology (Ecology). The Agreed Order requires Shell and CEMC to complete a RI and Feasibility Study (FS), and to complete a draft cleanup action plan (DCAP) for the Site. The purpose of the RI is to collect sufficient information to evaluate the impact on human health and the environment to enable development and evaluation of technically feasible cleanup alternatives in accordance with WAC 173-340-360 through 173-340-390. The RI will provide sufficient data to refine the conceptual site model (CSM) for use in evaluating technically feasible cleanup alternatives for selection of a final cleanup action applicable to the Site.

Data collected from this investigation will be incorporated in the Remedial Investigation Report and include the following investigative components:

- Installation and sampling of soil borings to delineate the extent of contamination in soil;
- Installation and sampling of groundwater monitoring wells to delineate the extent of contamination in soil and groundwater; and
- A Tier 1 vapor intrusion assessment to evaluate vapor risk for existing and future receptors.

Collectively, these data will be used to:

- Identify data gaps regarding the nature and extent of petroleum contamination at the Site;
- Develop a preliminary list of cleanup action alternatives to be evaluated in a FS; and
- Determine whether additional Site data are necessary to facilitate evaluation of the preliminary cleanup action alternatives identified for the Site.

2 PROPERTY DESCRIPTION AND BACKGROUND

2.1 PROPERTY DESCRIPTION

The property is located at 1205 Washington Street, at the southwest corner of the intersection of Broadway and Washington Street in Bellingham, Washington, as shown on Figure 1. The property's address has also been listed as 2200 Elm Street in historical reports. The property currently consists of Whatcom County Parcel 380225517547, which is a triangular-shaped relatively flat lot approximately 0.6 acres in size. The property is currently developed with one commercial building, which is 1,135 square feet in size, asphalt parking/driveway, and landscape strips around the perimeter. The building was most recently a coffee shop from approximately 1995, when it was constructed, to 2015. The building was vacant between 2016 and 2017. Currently the property operates as a butcher shop.

The property is bounded to the north by Washington Street, Broadway to the east, and Elm Street to the west. Surrounding properties to the west and southeast are similarly covered by commercial buildings, a fire station, and pavement. Surrounding properties to the north and northeast are residences with small yards. Elizabeth Park is located 320 feet southwest of the property; the 5-acre, wooded park features picnic tables, tennis courts, a playground, and walking trails.

There are other Model Toxics Control Act (MTCA) sites associated with petroleum contamination located in relatively close proximity of the Site. Family Foot Care (Cleanup Site ID 11734) is located 500 feet to the northeast, Yorkstone Family LLC (Cleanup Site ID 5452) is located 275 feet to the south and Bucks Texaco (Cleanup Site ID 6560) is located 450 feet to the southeast of the Site. Both Yorkstone and Bucks Texaco received No Further Action (NFA) determinations from Ecology in 2006. Family Foot Care is awaiting cleanup.

2.2 PROPERTY HISTORY

Service station operations reportedly started operating on the property as early as 1933. The earliest gasoline station and structures were located in the southern end of the property. In 1942, Shell Oil Company Inc. issued a memorandum of lease for a services station at this location. The 1947 Polk Directory listed Bob Schneider Chevron Station at this address. All the original structures were removed and the property was redeveloped with a second gasoline station and repair facility by 1975 (Stratum Group [Stratum], 2016).

The new fueling operations were located in the north and central portion of the property and consisted of three underground gasoline storage tanks, one underground used oil storage tank, one underground fuel oil tank, as well as subsurface fuel delivery lines. The service station was decommissioned in 1991 when the facility structures were demolished and underground storage tanks (USTs) were removed.

In 1994, Chevron sold the property to Richard and Donna McBride. The fueling and repair buildings were removed and a commercial building, utilized as a coffee shop, was constructed in the central portion of the property in approximately 1995. Between July 2007 and July 2016, the Site still operated as a coffee shop, but was owned and operated by Nina Holdings, LLC. In July 2016, the property was acquired by Bayview Loan Services LLC who subsequently sold it in January 2017 to James Wilson, the current property owner.

In 2016 and 2017, Ecology issued Determination of Potentially Liable Person (PLP) letters to the following parties:

- Mr. James Wilson – current property owner
- Nina Holding LLC – former property owner
- Chevron – former property owner
- Shell Oil Products US – predecessor of former lease holder

In February 2018, Ecology provided notice to the property owner (Mr. James Wilson) that a Site Hazard Assessment (SHA) had been completed at the Site. The Site's Hazard Ranking was determined to be a 4, where 1 represents the highest relative risk and 5 is the lowest (Ecology, 2018 and 2018a).

2.3 LAND USE AND ENVIRONMENTAL SETTING

The Site is located in the Bellingham city limits within Whatcom County, Washington. The area is zoned as Fountain District Urban Village, Commercial Transition. The commercial transition zoning areas are intended to allow commercial uses similar to the core downtown area, but with less noise and vehicular impacts on abutting residential areas. The current zoning does not allow for service stations for automobiles to be built within the area. Buildings with residential only uses are permitted in this area.

2.3.1 Surface Water

Surface water within the vicinity of the Site drains to the southwest toward Bellingham Bay. Bellingham Bay is located approximately 1,900 feet from the property. Whatcom Creek is approximately 2,300 feet to the southeast of the property.

2.3.2 Climate

Bellingham's climate is generally mild and typical of the Puget Sound region. The year-long average daily high and low temperatures are 59 and 44.1 °F (15.0 and 6.7 °C), respectively. Western Whatcom County has a marine oceanic climate that is strongly influenced by the Cascade Range and Olympic Mountains. The Cascades to the east retain the temperate marine influence, while the Olympics provide a rain shadow effect that buffers Bellingham from much of the rainfall approaching from the southwest.

2.3.3 Geology and Hydrogeology

The regional geology in the Bellingham area consists of a thick series of glacial and interglacial soils overlying bedrock. These soils were deposited as glaciers advanced and retreated during the Pleistocene Epoch, approximately 2.5 million to 12,000 years ago. Soils at the Site are mapped as glacial outwash (Qgo_s) from the Sumas Stade of the Fraser Glaciation which are characterized as loose, moderately to well-sorted gravel with local boulders, sandy gravel, minor gravelly medium to coarse sand, and rare sand to silt (Lapen, 2000).

Test pits and soil borings at the Site have encountered silt, sand and/or gravel fill to depths ranging from 3 to 11 feet below ground surface (bgs). Native soil consisting of silt with varying amount of fine sand were encountered at the Site at depths ranging from 6 to 11 feet bgs. The silt was generally underlain by sand and gravel layers to a depth of 13 feet bgs. Clay and silt were encountered beneath the sand and gravel to the total depth explored at the Site (14.5 feet bgs).

Past groundwater gauging and sampling events indicate groundwater is typically encountered at approximately 8 to 10 feet bgs with a 0.5-foot seasonal fluctuation in elevation. Groundwater flows toward the southwest. The hydraulic gradient on the Site typically ranges from 0.007 to 0.015 feet/foot.

The City of Bellingham provides domestic water service within the city limits. The main source of drinking water for the City of Bellingham is from Lake Whatcom which is 3 miles to the east of the Site.

No water supply wells are located within two miles of the property. An irrigation supply well serving a 45-acre park (Squalicum Creek Park) is located 3,800 feet northwest of the property. Another irrigation supply well serving a 120-acre golf course (Bellingham Country Club) is located 6,000 feet north of the property (Ecology, 2018).

2.4 PREVIOUS INVESTIGATIONS

Petroleum-hydrocarbon contamination was first encountered at the Site in December 1990 during installation of nine groundwater monitoring wells (MW-1 through MW-9) by GeoEngineers, Inc. (GeoEngineers). The initial subsurface investigation revealed soil and groundwater samples exceeding MTCA Method A cleanup levels for benzene, toluene, ethylbenzene, and total xylenes (BTEX), and diesel-, and gasoline-range hydrocarbons (GeoEngineers, 1991a).

Between January and February 1991, seven USTs, two hydraulic lifts, two pump islands, and subsurface fuel delivery lines were removed from the property. Soil sample analytical results and field observations were documented in the *Report of Geoenvironmental Services, Tank Removal Monitoring* dated March 11, 1991 (GeoEngineers, 1991b). The USTs removed included a 7,500-gallon steel regular gasoline tank, a 6,000-gallon steel unleaded gasoline tank, a 3,000-gallon steel supreme gasoline tank, a 1,000-gallon fiberglass waste oil tank, a 1,000-gallon fiberglass heating oil tank, a 550-gallon steel heating oil tank, and a steel fuel tank that had been previously abandoned in place. The excavations ranged in depth from 4 feet (fuel line excavation) to 12 feet (gasoline tank excavation) bgs. Groundwater samples were also obtained from monitoring wells MW-3, MW-4, and MW-9. Soil samples exceeded MTCA Method A cleanup levels in the following areas:

- At the base of the used oil UST at a depth of 9.5 and 10 feet bgs;
- Both pump island excavations at a depth of 4 and 5 feet bgs;
- The delivery line excavation at a depth of 4 feet bgs; and
- The base of the abandoned fuel tank excavation at a depth of 11.5 feet bgs.

An eighth UST was discovered, removed, and documented in the May 21, 1991 *Report of Geoenvironmental Services, Supplemental Subsurface Hydrocarbon Study* (GeoEngineers, 1991c). Three of the four sidewall soil samples from the second abandoned fuel tank excavation were above MTCA Method A cleanup levels for benzene, and gasoline-range hydrocarbons. Ten additional borings were installed and completed as monitoring wells (MW-10 through MW-19) in March 1991. Soil samples collected from MW-10 (10.5 ft), MW-11 (10.5), and MW-12 (8.5 ft) exceeded MTCA Method A cleanup levels for petroleum constituents. Groundwater samples exceeded MTCA Method A cleanup levels in monitoring wells MW-11 through MW-13, MW-15, MW-16, and MW-19 for petroleum constituents (GeoEngineers, 1991c).

A subsurface soil vapor extraction system (VES) was constructed at the Site in mid-1991 to remediate petroleum hydrocarbons. The VES was activated on May 3, 1991 and was shut down on September 13, 1992 when vapor extraction rates dropped to less than one pound per week.

In September 1992, soil samples were collected from ten test pits (TP-1 through TP-10) to depths of approximately 8-10 feet bgs in areas where results of previous studies indicated petroleum constituents exceeding MTCA Method A cleanup levels. Based on field observations, thirteen soil samples were collected from test pits TP-1 through TP-8. Concentrations of gasoline-range hydrocarbons in test pits TP-3, TP-4, and TP-6 at depths of approximately 8 feet bgs exceeded the MTCA Method cleanup level (GeoEngineers, 1993).

Based on the results of the September 1992 test pits investigation, a remedial excavation of the southern portion of the Site was conducted between September and November 1992. Approximately 1,150 cubic yards of soil were removed from the excavation with final depths ranging from approximately 4.5 to 14 feet bgs. Twenty-nine soil samples (920922-G1 through 921125-G29) were collected from the limits (sides and bottom) of the excavation. Two soil samples, 920922-G2 (11.5 ft bgs) and 921125-G26 (12.0 ft bgs) along the southeast boundary of the excavation exceeded MTCA Method A cleanup level for gasoline-range hydrocarbons. These samples are located along the south property boundary. Oil-range hydrocarbons were also detected above MTCA Method A cleanup level in soil sample 921125-G26, which was collected near a 4-inch diameter clay pipe that exited the southeastern boundary of the property. Stockpiled soil was spread across the site in 18 inch lifts and aerated by a backhoe onsite, resampled, and approximately 250 cubic yards of soil was returned to the excavation as backfill (GeoEngineers, 1993).

In January 1994, GeoEngineers evaluated the condition of the groundwater monitoring wells at the Site and recommended which wells should remain for future sampling. Monitoring wells MW-17 and MW-18 could not be located at that time. Monitoring wells MW-5, MW-7, MW-12, and MW-14 were left in place. Monitoring wells MW-1, MW-3, MW-4, MW-15, MW-16, and MW-19 were abandoned in February 1994 (GeoEngineers, 1994).

In December 1995, Pacific Environmental Group (PEG) collected groundwater samples from the four monitoring wells (MW-5, MW-7, MW-12 and MW-14) located in the north, west and southeastern portions of the Site. This report was not available for review by Leidos but was summarized in *Environmental Site Assessment: Phase II Limited Soil and Groundwater Sampling Investigation* report by Stratum dated December 8, 2016. The groundwater sampling results were non-detect for benzene and petroleum constituents in three of the wells. Samples collected from monitoring well MW-12 showed concentrations of gasoline-range hydrocarbons and benzene in groundwater at 140 micrograms per liter (μg/L) and 12 μg/L, respectively.

In November 2016, Stratum conducted a ground penetrating radar survey across the property to determine if any additional USTs may still be present. No anomalies or tanks were detected on the property. In addition, a total of six soil borings (B1 through B6) were completed in the southeastern portion of the property. Five groundwater samples and six soil samples were collected during this investigation. Concentrations of gasoline-range hydrocarbons in soil exceeded the MTCA Method A cleanup level at 7.5 feet bgs and 8 feet bgs in soil borings B2 and B4, respectively. Concentrations of petroleum hydrocarbons in groundwater were below their respective MTCA Method A cleanup levels (Stratum, 2016).

The historical groundwater monitoring wells were not present at the Site in 2016 and are presumed to be abandoned.

3 TECHNICAL ISSUES FOR THE REMEDIAL INVESTIGATION

This section evaluates the results of previous investigations and the operational history of the property and summarizes additional RI technical issues to be considered. These technical issues may be modified as appropriate, based on the results of the additional RI activities.

3.1 CONTAMINANTS OF POTENTIAL CONCERN

Contaminants of concern (COCs) are determined following completion of the RI activities and presented in the cleanup action plan (CAP). Until that time, contaminants are referred to as contaminants of potential concern (COPC). Based on the results of previous investigations, the following COPCs have been identified for at the Site:

- Gasoline-, diesel-, and oil-range hydrocarbons in soil and groundwater;
- BTEX in soil and groundwater; and
- Dissolved lead in groundwater.

The following additional potential contaminants associated with the former waste oil and heating oil USTs will be investigated further as part of the RI:

- Polychlorinated biphenyls (PCBs);
- Methyl tert-butyl ether (MTBE);
- Ethylene dibromide (EDB);
- Ethylene dichloride (EDC);
- Carcinogenic polynuclear aromatic hydrocarbons (cPAHs);
- n-Hexane; and
- Naphthalenes.

3.2 MEDIA OF CONCERN AND PATHWAYS

Groundwater and soil are known media of concern for the Site. Potential media of concern that will be further evaluated as part of the RI include soil vapor. Soil vapor is a potential concern via intrusion to nearby buildings.

Potential pathways for the migration of COCs include:

- Leaching from soil to groundwater;
- Lateral and vertical contaminant transport in groundwater; and
- Volatilization from soil and/or groundwater to indoor ambient air.

Due to the presence of volatile petroleum-related contamination in subsurface soil and groundwater at the Site, Leidos conducted a Preliminary Vapor Intrusion (VI) Assessment for the Site per Ecology VI guidance (Ecology, 2016a). Per the Ecology VI guidance, the goal of a Preliminary VI Assessment is to determine whether the potential exists for toxic vapor migration from the subsurface to nearby buildings or potential future uses on the property.

In short, a series of two questions are used to decide whether investigation of the VI exposure pathway should continue:

- Are chemicals of sufficient volatility and toxicity known or reasonably suspected to be present at the Site?
- Are occupied buildings present (or could they be constructed in the future) above or near contamination at the Site?

Petroleum contamination is known to be present in the subsurface and the property is occupied by a building. Therefore, the results of the Preliminary VI Assessment for the Site indicate that current site conditions may result in the potential for a VI pathway to exist and that further evaluation in the form of a Tier I VI Assessment should be conducted.

4 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) has been developed to summarize and present the current understanding of the Site. A CSM is an adaptive tool used to assist with identifying COPCs, the confirmed or potential sources of COPCs, the media of concern with concentrations of COPCs above screening levels and potential migration and exposure pathways. The sources of data used in developing the CSM for this RI Work Plan include previous site investigations, site plans, aerial photographs, information from the City of Bellingham and Sanborn Fire Insurance Maps. The CSM has been used to assist with developing the scope of work presented in this RI Work Plan and to meet the data requirements for the completion of the RI in accordance with WAC 173-340-350.

4.1 KNOWN OR SUSPECTED HUMAN AND ENVIRONMENTAL RECEPTORS

The CSM developed for this Site indicates the following potential receptors to be considered in the evaluation of impacts on human health and the environment. Identified potential receptors include:

- Humans who contact contaminated soil in the future during construction, if no worker protection controls are in place;
- Humans who contact contaminated soil in the future if pavement is removed;
- Humans who inhale contaminated soil particles in the future during remedial action activities, if no protection controls are in place;
- Humans who accidently contact or consume groundwater during investigation, remediation, and/or construction work. Drinking water is supplied by the City of Bellingham, and no drinking water wells are locate in the vicinity of the Site, but groundwater will still be considered a potential source of drinking water; and
- Humans who inhale indoor air contaminated via vapor intrusion by volatilization of contaminated shallow groundwater or shallow soil.

The CSM is presented as a diagram in Figure 2. These potential human receptors have been considered in the scope of work. Potential ecological receptors will be evaluated with a terrestrial ecological evaluation (TEE) as part of the RI.

4.2 DATA GAPS

The following data gaps have been identified in the CSM and will be further investigated as part of the RI work:

- The vertical and lateral extent of soil contamination off-property to the south and east. Additional soil quality data is needed to better define the boundary of the Site.
- The concentrations of COPCs in soil in the former waste oil UST and heating oil UST areas.
- The lateral extent of concentrations of COPCs above screening levels in groundwater downgradient of the former service station property.
- A Tier 1 vapor intrusion assessment to determine whether volatile organic compounds (VOCs) are present in soil vapor at concentrations of concern.

5 REMEDIAL INVESTIGATION SCOPE OF WORK

This section provides the approach and scope of work for the RI. The scope of work is designed to address the data gaps presented in Section 4.2 and to provide sufficient information to evaluate and select a technically feasible cleanup alternative.

The RI scope of work includes installation and monitoring of groundwater wells and installation of soil borings to define the nature and extent of COPCs in soil and groundwater immediately adjacent to the former service station property and further define the Site, per MTCA. The second phase of the RI work will include a VI assessment to evaluate the presence of petroleum-related soil vapor contamination in subsurface soil and groundwater.

To accomplish these objectives, Leidos proposes to install five groundwater monitoring wells, seven soil borings, and two soil vapor sampling probes as depicted in Figure 3. Additional soil borings may be added or removed from the scope of work based on observations in the field, results of the field investigation, the location of identified utilities in the right-of-way or safety concerns. If additional monitoring wells are needed to fully delineate the extent of groundwater contamination at the Site, a *Remedial Investigation Work Plan Addendum* will be prepared to address any data gaps remaining, pending results of this investigation.

Proposed RI field data collection activities and quality assurance/quality control (QA/QC) procedures are described in detail in the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) which are included in Appendix A and Appendix B of this work plan, respectively.

5.1 PROPOSED LOCATIONS

The proposed location for each of the groundwater monitoring wells, soil borings, and soil-vapor sampling probes are shown on Figure 3. The locations proposed are adjacent to or downgradient of soil samples that historically had detection of petroleum constituents above MTCA Method A cleanup levels. The proposed locations and selection rationale are as follows:

- Proposed monitoring well MW-20 is located downgradient of the waste oil UST excavation.
- Proposed monitoring wells MW-21 and MW-22 are located in the sidewalk along Broadway and serve to evaluate the downgradient extent of soil and groundwater impacts to the south and east. They are located downgradient of soil samples (920922-G2, 920125-G26, and MW-12), which historically contained gasoline-range hydrocarbons or BTEX above MTCA Method A cleanup levels.
- Proposed monitoring well MW-23 is located in the sidewalk along Elm Street, on the west side of the Site. It will serve to define the lateral extent of groundwater impacts to the west.
- Proposed monitoring well MW-24 is located in the center of the 1993 remedial excavation, adjacent to former monitoring well MW-10, which historically contained petroleum hydrocarbons in both soil and groundwater above MTCA Method A cleanup levels. This monitoring well will serve to assess groundwater conditions on the property.
- Proposed soil borings SB-1 and SB-2 are located in the area of the former waste-oil tank and will be used to collect additional analytical parameters per Table 830-1 in MTCA.
- Proposed soil borings SB-3 and SB-4 are located in the area of the former heating oil UST and will be used to collect additional testing per Table 830-1 in MTCA.

- Proposed soil boring SB-6 is located at the location of soil sample 920922-G2, which exceeded MTCA Method A cleanup level for gasoline-range hydrocarbons in 1992.
- Proposed soil borings SB-5 and SB-7 are located downgradient of soil samples 920922-G2 and 920125-G26 and will help to define the lateral extent of soil impacts to the southeast.
- Proposed soil vapor sampling probes SVP-1 and SVP-2 are located on the property and will be used to assess soil vapor conditions adjacent to the current building. Soil vapor sampling probe SVP-2 is located adjacent to soil borings B2 and B4, which exceeded MTCA Method A cleanup levels for gasoline-range hydrocarbons in 2016.

The groundwater monitoring well locations, soil boring locations, and the soil vapor sampling probe locations shown on Figure 2 are proposed; therefore, actual locations may differ based on permit conditions, utilities, or other conditions encountered in the field. Ecology will be consulted prior to determining the final locations.

Additional boring locations and potential "step out" borings may be required to fully delineate potential petroleum hydrocarbon impacts. Specifically, additional or replacement locations may be selected in the field based on the results of utility clearances. "Step out" boring locations may be proposed in the field for on-site borings based on the results of field screening. However, our experience is that the most productive "step out" boring locations for off-site borings are best determined based on laboratory analysis of the samples. If field screening clearly indicates that the sample is likely impacted, an additional boring will be installed (subject to utility clearance).

If laboratory analysis indicates exceedances of MTCA cleanup levels, particularly in off-site samples, then additional borings will be proposed in a short memo to Ecology.

5.2 SITE ACCESS

Leidos will obtain street use or public right-of-way access permits from the City of Bellingham, as necessary. Scheduling of the RI field activities will be dependent on obtaining necessary permits and approvals in a timely manner.

5.3 UTILITY LOCATE

Prior to beginning groundwater monitoring wells, soil borings, and soil vapor sampling probe installation, 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 other potential infrastructure or other buried objects that would not typically be identified through the public utility locating process.

5.4 SOIL BORINGS

5.4.1 Soil Boring Installation and Sampling

The soil borings will be completed to a total depth of approximately 15 feet bgs. In order to comply with current CEMC requirements for subsurface asset avoidance, each boring will initially be cleared to a depth of at least 8 feet bgs using either an air-vacuum excavation system or similar "soft-dig" method to (e.g. stainless steel hand auger) to avoid damage to buried utilities or other subsurface infrastructure. From ground surface to 8 feet bgs, all soil samples will be collected by a split spoon stainless steel hand-auger. The split spoon auger will minimize the loss of volatiles by allowing the sample to be relatively undisturbed prior to sample collection. Below 8 feet, a direct-push (Geoprobe™) drill rig will be used to collect soil samples continuously until the final depth. Air-vacuum excavation and drilling services will be provided by a Washington State licensed driller.

A Leidos representative will oversee the borehole clearance process and will collect soil samples from the boring at approximate 2-foot intervals between the surface and 8 feet bgs. Samples will be classified and logged in accordance with the Unified Soil Classification System and will be field-screened for the presence of petroleum hydrocarbons by visual and olfactory observations, headspace vapor measurements, and sheen testing.

Field screening and other observations (e.g., depth of water table) will be used to evaluate which samples should be selected for additional laboratory analysis. At a minimum, two soil samples will be collected and submitted for laboratory analysis: one from the capillary fringe, and the second from the bottom-most sample interval attained in the boring. The bottom-most sample will be used to demonstrate that the sampling effort has advanced to sufficient depth to define the vertical extent of petroleum-hydrocarbon impacts, if present. Additional soil samples may also be submitted based on field-screening observations.

Soil boring and sampling procedures are detailed in Section 4 of the SAP included in Appendix A.

5.4.2 Soil Sample Analytical Methods

Selected soil samples collected in soil borings, monitoring well borings, and vapor probe borings will be submitted to Eurofins Lancaster Laboratories, Inc. of Lancaster, Pennsylvania (Lancaster) for the following analyses:

- Gasoline-range hydrocarbons by Ecology method 97-602 NWTPH-Gx;
- Diesel- and heavy oil-range hydrocarbons by Ecology method 97-602 NWTPH-Dx;
- MTBE, EDB, EDC, BTEX by United States Environmental Protection Agency (USEPA) method 8260B;
- Total lead by USEPA method 6010B;
- Naphthalene by USEPA method 8270; and
- cPAHs by USEPA method 8270 SIM.

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 analyses:

- Gasoline-range hydrocarbons by Ecology method 97-602 NWTPH-Gx; and
- BTEX by USEPA method 8260B.

5.5 GROUNDWATER MONITORING WELLS

5.5.1 Monitoring Well Installation and Sampling

The monitoring wells will be completed to a total depth of approximately 15 feet bgs. Soil boring advancement and sampling will be completed as summarized in Section 5.4.

Following the completion of drilling and soil sampling activities at each of the proposed well locations, each boring will be completed as a 2-inch diameter monitoring well in accordance with the WAC Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC).

Wells will be constructed using a 2-inch-diameter PVC casing with 0.020-inch, factory-slotted screen. The screen-interval for the wells are anticipated to be from approximately 5 to 15 feet bgs, but exact depths will depend on the water table at that location. Each well screen will be positioned to straddle the water table during anticipated seasonal fluctuations. The annular space around the well screen will be filled with #10/20 Colorado silica sand to a minimum of 2 feet above the top of the well screen. The remaining annular space will be sealed with hydrated bentonite chips and completed with a steel monument set in concrete and finished flush with the surrounding surface.

Leidos will develop the wells approximately 24 hours after completion. Well development will consist of surging for 10 minutes and pumping at least 10 well casing volumes of groundwater from the well using an electric submersible-pump, until water produced is clear and free of sediment. Well development water will be contained in 55-gallon drums. The drums will be clearly labeled and sampled for profiling prior to appropriate disposal. This procedure is detailed in Section 8 of the SAP.

Groundwater monitoring wells installation and sampling procedures are detailed in Section 5 of the SAP, Appendix A.

5.5.2 Monitoring Well Elevation Survey

Following installation, Leidos will subcontract a Washington State licensed land-surveying firm to perform a location and elevation survey of the new monitoring wells. Monitoring well elevation measurements will be made to the nearest 0.01 foot at the ground surface (i.e., top of well-box lid) and at the top of the well casing, relative to the North American Vertical Datum of 1988. Monitoring well location measurements will be made relative to the North American Datum 1983 High Accuracy Reference Network [NAD83 (HARN)].

5.5.3 Groundwater Monitoring and Analytical Methods

Following completion of the monitoring well installation activities, each of the four new monitoring wells will be sampled and added to a quarterly groundwater monitoring program.

Groundwater monitoring will consist of water level measurements, and groundwater samples will be collected for laboratory analysis. When conditions permit, groundwater samples will be collected using low-flow purging and sampling techniques as detailed in the SAP. Samples will be submitted to Lancaster for the following analyses:

- Gasoline-range hydrocarbons by Ecology method 97-602 NWTPH-Gx;
- Diesel- and heavy oil-range hydrocarbons by Ecology method 97-602 NWTPH-Dx, without silica gel cleanup;
- BTEX, MTBE, and EDC by USEPA method 8260B;
- EDB by USEPA method 504.1;
- Naphthalene by USEPA method 8270;
- PAHs by USEPA method 8270 SIM; and

- Dissolved lead by USEPA method 6010B.

5.6 SOIL VAPOR SAMPLING PROBES

5.6.1 Soil Vapor Sampling Probe Installation

The soil vapor sampling probes will be completed to a total depth of approximately 5.5 feet bgs using a stainless steel hand auger. Soil sampling will be completed from the soil vapor sampling borings as summarized in Section 5.4.

Once each soil boring has been advanced to its designated depth, a soil vapor sampling probe consisting of a 6-inch long, 0.75-inch diameter stainless steel screen with a 0.0057-inch (0.15-millimeter) screen pore size will be used to collect the soil vapor sample. Each screen will be connected to a length of ¼-inch outside diameter (O.D.) Teflon® tubing via a Swagelok® fitting with a rubber compression ferule. The above-grade end of the soil vapor sampling probe tubing will be fitted with a Swagelok® stainless steel on/off control valve.

Each 6-inch long screen tip will be vertically centered in a 1-foot long interval containing standard sand pack, resulting in 3 inches of sand being above and below the screen. Each sand pack will be covered with a 1-foot interval of dry granular bentonite, which is then covered with at least 2 feet of hydrated granular bentonite. The dry granular bentonite is emplaced immediately above the sand pack to ensure that hydrated granular bentonite slurry does not flow down to the probe screen and seal it off from the adjacent soil. The remainder of the borehole will be filled with hydrated granular bentonite slurry (mixed at the surface and poured in) to approximately 12 inches bgs. The top portion will be completed with a 1-foot 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.

Soil vapor sampling probe installation and sampling procedures as well as construction details are provided in Section 6 of the SAP, Appendix A.

5.6.2 Soil Vapor Sampling Analytical Methods

Soil vapor samples will be submitted to Eurofins Air Toxics, Inc. of Folsom, California (Air Toxics) for the following analyses:

- BTEX, MTBE, and naphthalene by USEPA method TO-15 (Low Level); and
- Oxygen, carbon dioxide, methane, nitrogen, and helium by American Society for Testing and Materials (ASTM) D1946.

Soil gas samples will be collected from two soil vapor probes, along with a duplicate and an ambient air sample. In addition, an equipment blank will be collected by collecting a sample of nitrogen through the probe materials prior to installation activities.

Standard laboratory turn-around time will be requested for each of the above-referenced analytical methods. The sampling containers will be packaged for shipping and sent to the laboratory under chain of custody protocol. Chain of custody will be maintained and documented at all times, including sealing the shipping container with chain of custody seals.

5.7 ECOLOGICAL IMPACT MONITORING

As part of the RI, the Site will be assessed for risk to terrestrial organisms using criteria described in WAC 173-340-7491. According to MTCA, a TEE is conducted for the following reasons:

- To determine if the existence of hazardous substances at a site could harm plants or animals.
- To identify and characterize the existing or potential threats to the plants or animals that may be exposed to hazardous substances in the soil.
- To establish cleanup levels to protect the plants and animals, as well as the ecologically important functions of the soil biota.

Certain circumstances provide a primary exclusion from any further ecological evaluation either because the contaminants have no pathway to harm the plants or animals (e.g., they are under buildings or deep in the ground), or because there is no habitat where plants or animals live near the contamination, or because the contamination does not occur at concentrations higher than occurs naturally in the area. If a site meets any one of these primary exclusions, the ecological evaluation is complete.

If the site does not meet the exclusion criteria described in this section of MTCA, then a TEE or simplified TEE will be conducted. These evaluations involve examination of the nature of potential receptors, the toxicity of on-site contaminants to terrestrial organisms, and the presence of exposure pathways.

The type of evaluation required, TEE or simplified TEE, is dependent upon four primary concerns about a site in relation to terrestrial ecological receptors, as described in MTCA. If none of the listed situations of concern are applicable to the site, then the site qualifies for a simplified TEE. The purpose of the simplified terrestrial ecological evaluation process is to identify those sites that do not have a substantial potential for posing a threat of significant adverse effects to terrestrial ecological receptors, and thus remove them from further ecological consideration during the remedial investigation and cleanup process. For the remaining sites, the process provides several options, including chemical concentrations that may be used as cleanup levels, and the choice of developing site-specific concentrations using bioassays or conducting a site-specific evaluation. Under MTCA, it is always an option to conduct a site-specific terrestrial ecological evaluation and to develop site-specific cleanup levels.

6 SCHEDULE

The schedule for conducting the RI is presented in Exhibit C, Table 1 of the Agreed Order. The anticipated schedule for implementation of this investigation is as follows:

1. Completion of RI Field Investigations – 180 days after Final RI Work Plan. This timeline is heavily dependent on permitting and access to the proposed boring locations.
2. Agency Review Draft RI Report – Within 90 days of receiving all validated analytical data.
3. Public Review Draft RI Report – 30 days after receipt of Ecology comments.
4. Final RI Report – Within 30 days after receipt of Ecology comments, subsequent to public comment.

7 REFERENCES

Ecology, 2016a. Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action" – Review Draft. Washington State Department of Ecology Publication No. 09-09-047. Revised February 2016.

Ecology, 2018. Site Hazard Assessment: Facility Site ID #35363194. Chevron 90619. 1205 Washington St, Bellingham, WA 98225. Cleanup Site ID 8836. February 7.

Ecology, 2018a. Site Hazard Assessment Worksheet 1. Chevron Station 90619. February 22.

GeoEngineers, 1991a. Report of Geoenvironmental Services Subsurface Hydrocarbon Study. Service Station 0619. January 23, 1991.

GeoEngineers, 1991b. Report of Geoenvironmental Services, Tank Removal Monitoring. Chevron Service Station 60090619 Broadway and Elm, Bellingham, Washington. March 11, 1991.

GeoEngineers, 1991c. Report of Geoenvironmental Services, Supplemental Subsurface Hydrocarbon Study. Decommissioned Service Station 60090618, 220 Elm Street, Bellingham, Washington. May 21, 1991.

GeoEngineers, 1993. Report of Geoenvironmental Services Supplemental Subsurface Explorations and Remedial Excavation Monitoring. Decommissioned Service Station 60090619, 2200 Elm Street, Bellingham, Washington. February 10, 1993.

GeoEngineers, 1994. Monitoring Well Abandonment Services. Former Chevron Service Station 60090619, 2200 Elm Street, Bellingham, Washington. April 22, 1994.

Lapen, Thomas, 2000. Geologic Map of the Bellingham 1:100,000 Quadrangle, Washington. Open File Report 2000-5, Washington Division of Geology and Earth Resources. December 2000.

PEG, 1995. Quarterly Monitoring and Sampling Activities, Former Chevron Station 9-0619. January 22, 1996.

Stratum, 2016. Environmental Site Assessment: Phase II Limited Soil and Groundwater Sampling Investigation, 1205 Washington Street, Whatcom County Parcel 380225517547, Bellingham, Washington. December 8, 2016.

LIMITATIONS

This technical document was prepared on behalf of CEMC 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.

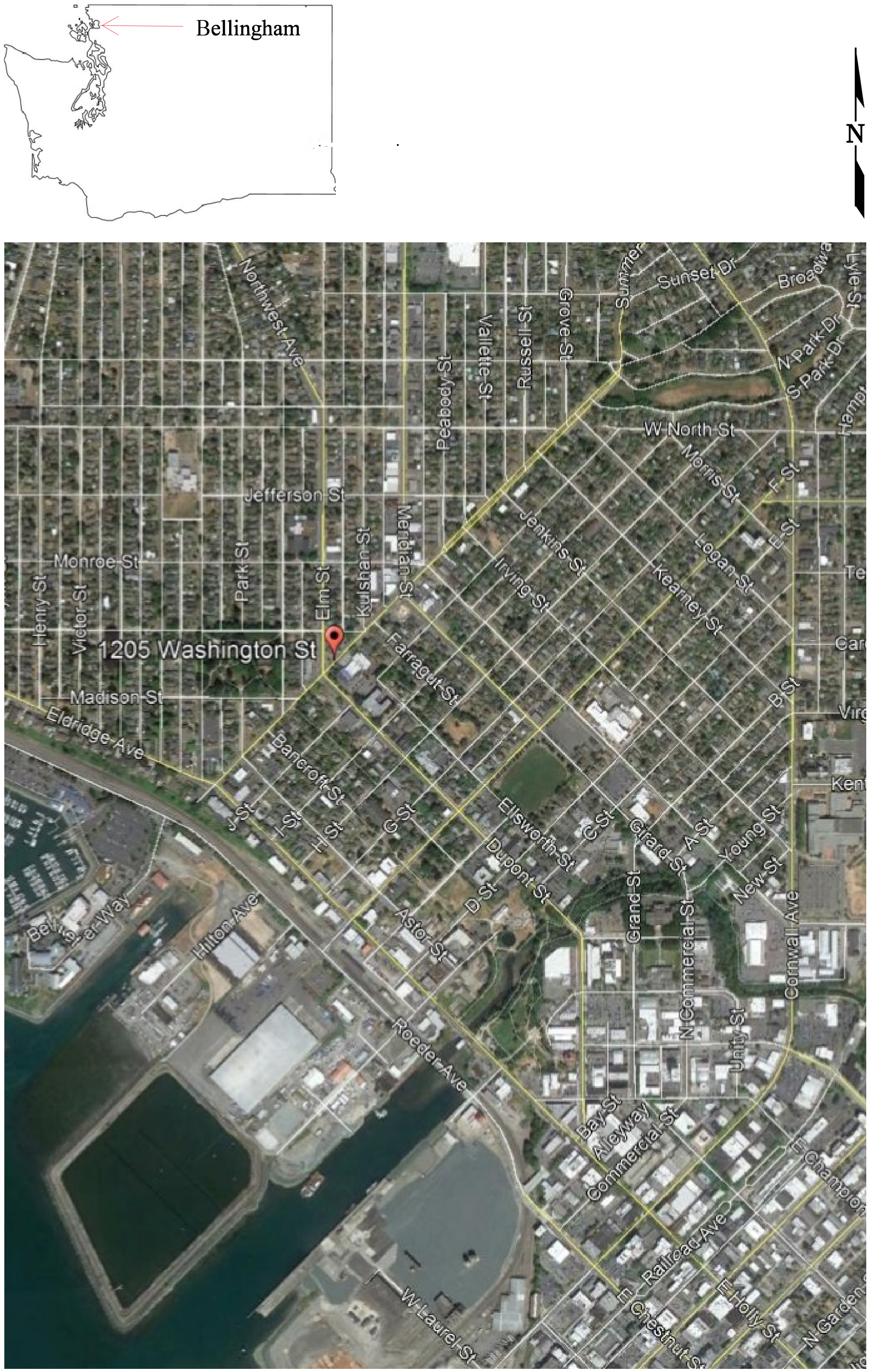
Site history and background information provided in this technical document are based on sources that may include interviews with environmental regulatory agencies and property management personnel and a review of acquired environmental regulatory agency documents and property information obtained from CEMC 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



Former Chevron Facility No. 90619
1205 Washington Street
Bellingham, Washington

FIGURE 1
Vicinity Map

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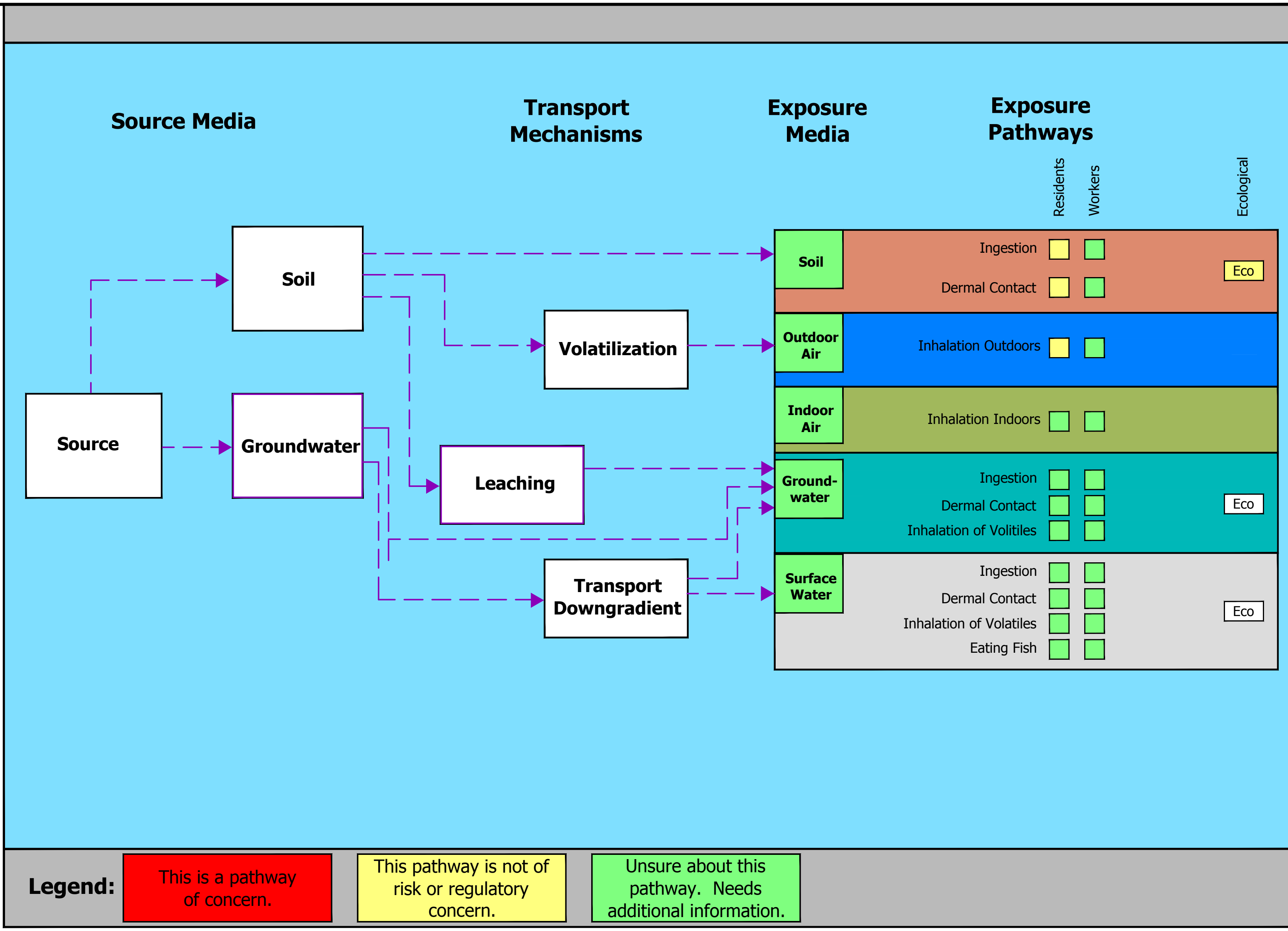


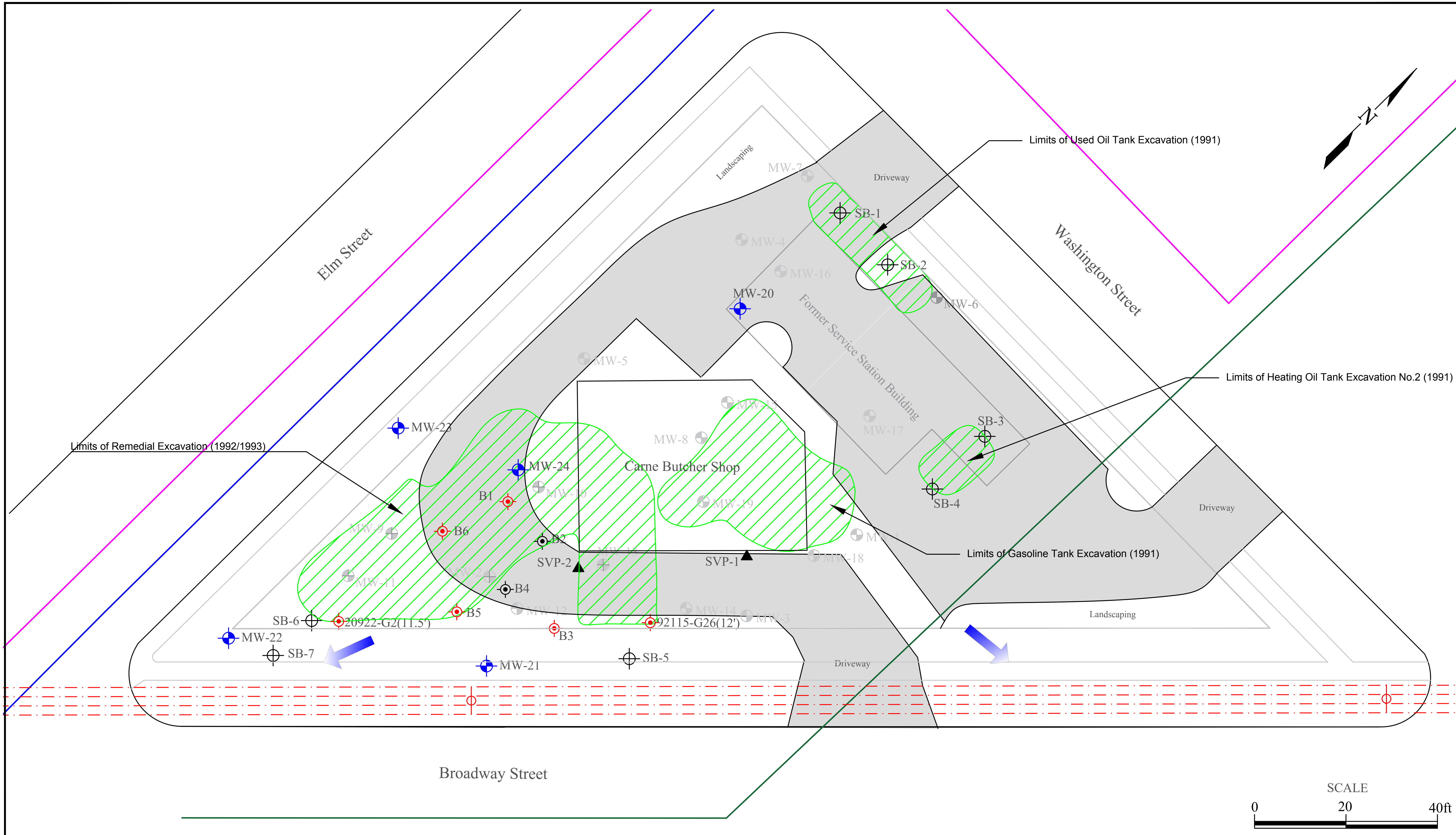
Conceptual Site Model

Former Chevron Facility 90169
1205 Washington Street,
Bellingham, Washington

Date: 12/12/2018 Drawn By: CMW

FIGURE

2



SOURCE: GeoEngineers Map, dated 1991. Google Earth

Legend

- Test Excavation
- B1 — Soil Boring (2016)
- 92115-G26(82') — Soil Sample Above MTCA Method A Cleanup Levels
- MW-5 — Groundwater Monitoring Well
- Paved Area
- SVP-1 — Proposed Soil Vapor Probe Location
- SB-1 — Proposed Soil Boring Location
- MW-20 — Proposed Groundwater Monitoring Well Location
- MW-5 — Abandoned Groundwater Monitoring Well Location
- Groundwater Flow Direction (1993)
- Former Site Features
- Water Line
- Sanitary Sewer Line
- Storm Sewer Line
- Overhead Electrical Lines

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Former Chevron Facility #90169
1205 Washington Street
Bellingham, Washington

FIGURE 3
PROPOSED SAMPLING LOCATIONS

DATE: 10/3/2018 | DRAWING: 90169 Site Map.dwg

Appendix A:
Sampling and Analysis Plan

REMEDIAL INVESTIGATION SAMPLING AND ANALYSIS PLAN
FORMER CHEVRON SERVICE STATION NO. 90619
1205 Washington Street (formerly 2200 Elm Street)
Bellingham, Washington

December 21, 2018

Prepared for:
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3190 160th Avenue SE
Bellevue, Washington 98008

Prepared by:
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TABLE OF CONTENTS

AGENCY REVIEW DRAFT REMEDIAL INVESTIGATION SAMPLING AND ANALYSIS PLAN

1 INTRODUCTION

The Sampling and Analysis Plan (SAP) for the former Chevron Service Station No. 90169 Remedial Investigation (RI) Work Plan describes specific activities, methods and procedures that will be used during data collection activities associated with the RI Work Plan. Standard operating procedures in this document govern all aspects of field measurement, testing, sample collection, and documentation efforts to ensure that samples collected are representative of conditions in the field, measurements and observations are clearly and concisely documented, and the information obtained is valid.

This SAP is not intended to be a stand-alone document. Instead, the SAP has been prepared as an appendix to the RI Work Plan for the Site, and is designed to be used in conjunction with both the RI Work Plan and the Quality Assurance Project Plan (QAPP) for the project.

2 PROGRAM OBJECTIVE

The objective of the SAP is to collect sufficient and valid analytical data to determine compliance with the RI Work Plan. This summary includes descriptions of the overall data quality objectives (DQOs), prioritized data uses, appropriate analytical levels, contaminants of concern, analytical program, and critical samples.

Based on the currently anticipated scope of work for the RI field activities, the following procedures are included in the SAP:

1) General Field Procedures;
2) Soil Boring and Soil Sampling Procedures;
3) Ground Water Monitoring Well Installation and Sampling Procedures;
4) Soil Vapor Sampling Probe Installation and Sampling Procedures;
5) Field Equipment Decontamination Procedures; and
6) Investigation-Derived Waste Management Procedures.

3 GENERAL FIELD PROCEDURES

3.1 FIELD DOCUMENTATION

Sampling personnel will be equipped with a bound field notebook during performance of RI field activities.

Field personnel will maintain detailed records of drilling, installation, well development, and sampling activities. These records will consist of soil boring and well installation and development logs, information recorded in field notebooks, and driller’s daily field reports.

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 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.

The cover of each notebook used will contain:

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

Entries in the notebook will 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 quality assurance / quality control (QA/QC) samples collected and their labeled identifier;
- Sampler's name;
- Field observations;
- Sample distribution (i.e., split samples, analytical lab); and
- All field measurements made (e.g., photoionization detector [PID] readings, etc.).

Daily activities will be summarized in the field notebook.

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.

3.2 SAMPLE CONTAINER PREPARATION

All containers used in the sampling of soils and ground water shall be laboratory cleaned as specified in the QAPP. The container type and preservative requirements shall follow the specifications of the QAPP.

3.3 PROCEDURES TO PREVENT CROSS-CONTAMINATION

Personnel collecting soil and ground water 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 have been decontaminated.
- Sampling personnel will not touch the inside of the sampling container.
- Only equipment that has been properly decontaminated according to the procedures 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. At this time, the COC form will be completed to note the acquisition of the sample.

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

3.4 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 – date of sample collection;
- Time – time of sample collection; and
- Source – sample number and matrix (i.e., soil, water).

3.4.1 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-1-10.0-S-MMDDYY

QA/QC samples such as method blanks, trip blanks, field 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 Rinsate Blanks

- ER-1-MMDDYY

Trip Blanks

- TB-1-MMDDYY

Duplicate Samples

- DUP-1-MMDDYY

3.4.2 Ground Water Sample Designation

Groundwater samples collected from proposed monitoring wells (if monitoring wells are installed at the Site) will be labeled according to the monitoring well ID and the date of collection. The date and time of collection will be recorded in the field logbook and on the COC.

- MW-14-W-MMDDYY.

QA/QC samples collected during groundwater sampling will be labeled in the same manner as QA/QC samples for soil.

3.4.3 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-MMDDYY.

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-MMDDYY

Duplicate Samples

- DUP-1-MMDDYY

4 SOIL BORING AND SAMPLING PROCEDURES

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 at a particular site. Care will be taken to quickly collect and preserve soil samples in order to minimize the potential loss of volatile organic compounds. All techniques will be thoroughly documented to ensure future re-creation. The location of each sample will be mapped using a measuring tape or wheel and referenced to a local permanent feature where possible.

In order to avoid possible damage to undetected underground utilities, soil borings will be advanced for the first 8 feet with a stainless steel hand-auger and/or air knife. From ground surface to 8 feet below ground surface (bgs) all soil samples will be collected in advance of the air knife by a split spoon stainless steel hand-auger. The split spoon auger will minimize the loss of volatiles by allowing the sample to be relatively undisturbed prior to sample collection.

4.1 SAMPLE FREQUENCY

Soil sampling in the upper 8 feet of the boring will be performed using a split spoon stainless steel hand auger at approximately 2-foot sampling interval. Below 8 feet, the Geoprobe rig will collect soil samples continuously until the final depth.

Soil samples will be classified 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 PID, and sheen testing.

At a minimum, two soil samples from each boring will be submitted for laboratory analysis: one from the capillary fringe, and the second from the bottom-most sample interval attained in the boring. The bottom-most sample will be used to demonstrate that the sampling effort has advanced to a sufficient depth to define the vertical extent of petroleum-hydrocarbon impacts. Additional soil samples may also be submitted based on field-screening observations. For example, the sample producing the highest PID readings, strongest sheen, or otherwise having the greatest visual or olfactory indication of hydrocarbon impacts may also be submitted for laboratory analysis.

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, or equivalent),
- 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), and
- Field screening results (see below).

4.2 FIELD SCREENING

4.2.1 Headspace Vapor

Each sample will be field screened to obtain a relative estimate of its volatile organic compounds (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 field flame-ionization detector (FID) or PID. The field screening 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. If the ambient temperature is below 65ºF, the sample will be warmed (e.g., in a heated vehicle) before the headspace measurement is made.

4.2.2 Sheen Testing

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, 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.

4.3 SOIL CHEMICAL ANALYSES

Selected soil samples will be submitted to Eurofins Lancaster Laboratories, LLC of Lancaster, Pennsylvania (Lancaster) for the following analyses:

- Gasoline-range hydrocarbons by Washington State Department of Ecology (Ecology) method 97-602 NWTPH-Gx;
- Diesel-range hydrocarbons and heavy oil-range hydrocarbons by Ecology method 97-602 NWTPH-Dx,;
- Methyl tertiary butyl ether (MTBE), ethylene dibromide (EDB), ethylene dichloride (EDC), benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency (USEPA) method 8260B;
- Total lead by USEPA method 6010B;
- Naphthalene by USEPA method 8270; and
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by USEPA method 8270 SIM.

5 GROUND WATER MONITORING WELL INSTALLATION AND SAMPLING PROCEDURES

5.1 MONITORING WELL CONSTRUCTION

Following the completion of drilling and sampling activities at each of the proposed well location, each boring will be completed as a 2-inch diameter monitoring well in accordance with the Washington Administrative Code (WAC) Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC).

Wells will be constructed using a 2-inch-diameter PVC casing with 0.020-inch, factory-slotted screen. The screen-interval for the wells are anticipated to be from approximately 5 to 15 feet bgs, but exact depths will depend on the water table at that location. Each well screen will be positioned to straddle the water table during anticipated seasonal fluctuations. The annular space around the well screen will be filled with #10/20 Colorado silica sand to a minimum of 2 feet above the top of the well screen. The remaining annular space will be sealed with hydrated bentonite chips and completed with a steel monument set in concrete and finished flush with the surrounding surface.

5.2 MONITORING WELL DEVELOPMENT

The purpose of the development activities is to set the sand pack and to remove fine-grained material from the sand pack and casing. This is done to enable the collection of ground water samples with a low turbidity**.** Wells will not be developed until at least 24 hours after being installed in order to allow the surface seal to adequately cure. If LNAPL are observed in any new wells, the LNAPL will be removed prior to development. The well will be allowed to stabilize after development for at least 24 hours before being sampled.

Well Development Procedures:

- Record the date and time of arrival, general site conditions and other applicable field observations related to the Site.
- Verify the locations and conditions of the wells. The least contaminated wells (if known) and background wells should be developed first to minimize the potential for cross contamination.
- Check the monitoring instruments by performing one calibration check. Record the results in the field logbook.
- Inspect the well to determine the condition of the surface casings, surface seal and well identification.
- A water level indicator (electronic) will be used to measure depth to water in the well. The total depth of each well will be measured. The measurement will be used to calculate the thickness of the water column (height of standing water in the well). Compare well depth to completion data and report significant differences that may indicate silt buildup in the well.
- Well development will consist of surging for 10 minutes and pumping at least 10 well-casing volumes of ground water from the well using an electric submersible pump until water produced from the well is clear and free of sediment.

5.3 GROUND WATER SAMPLING

Proper sampling protocol must be followed to ensure that representative samples of ground water are provided for analysis and that the act of sampling does not contribute to further impact at the site or cross-contamination of samples. Techniques employed shall be thoroughly documented.

The pump (or intake hose) will be placed near the middle or slightly above the middle of the screened interval. The well will be purged at a rate of 100 to 500 ml/min; the goal is to minimize drawdown in the well (ideally less than 10 cm drawdown).

Purge-water temperature, pH, specific conductance, dissolved oxygen, oxidation-reduction (redox) potential, and turbidity will be monitored using an in-line flow cell. Readings will be taken every 3 to 5 minutes.

Purging will cease when the following parameters have stabilized as defined below for three successive readings or when at least one well casing volume has been purged:

- Temperature: $\pm$ 1 ºC;
- pH: $\pm$ 0.1 units;
- Specific conductance: $\pm$ 10 percent; and
- Dissolved oxygen or turbidity: $\pm$ 10 percent.

To minimize delays in field parameter stabilization and potential bias in analytical testing results, any vents or other potential sources of air bubbles in the pump discharge tubing or in-line flow cell should be identified and sealed off (or otherwise isolated) prior to purging or as soon as possible after purging begins.

If well yield is so low that continuous flow is lost during well purging even at the minimum sustainable purge rate, turn the pump off and allow the well to recover as much as possible (but not longer than 24 hours). If only unfiltered samples will be collected for metals/inorganics, allow the well to recover overnight. Do not attempt to maximize purge volume by lowering the pump to the bottom of the well. After the water level in the well has recovered, collect the required samples with the pump placed near the middle of the screened interval. If using a non-dedicated pump, be sure to minimize disturbance of the water column by lowering the pump slowly into the well.

5.4 GROUND WATER CHEMICAL ANALYSES

Ground water samples will be submitted to Lancaster for the following analyses:

- Gasoline-range hydrocarbons by Ecology method 97-602 NWTPH-Gx;
- Diesel- and heavy oil-range hydrocarbons by Ecology method 97-602 NWTPH-Dx, without silica gel cleanup;
- BTEX, MTBE, and EDC by USEPA method 8260B;
- EDB by USEPA method 504.1;
- Naphthalene by USEPA method 8270;
- cPAHs by USEPA method 8270 SIM; and
- Dissolved lead by USEPA method 6010B.

5.5 GROUND WATER ELEVATION MONITORING

Accurate ground water monitoring data is essential to development of a thorough understanding of ground water flow dynamics and is an integral part of the site hydrogeologic investigation. The evaluation of ground water movement within and between water-bearing zones requires frequent measurement of ground water elevations over a period of time to determine whether temporal fluctuations in ground water elevations and/or flow patterns exist.

- The necessary frequency for measuring ground water elevations depends on factors such as: the goals of the investigation;
- Site specific conditions;
- The frequency of ground water sampling (as water levels are always taken during sampling events); and/or
- State or Federal regulations and requirements.

Several different methods to conduct ground water elevation monitoring are available. However, the level of accuracy is dependent upon the equipment used as well as accurate measurement and recording of data. Available methods include the use of battery operated electric water level meters and more sophisticated digital-analog, computerized, continuous-recording systems (pressure transducers). All instruments used in the field will be thoroughly decontaminated prior to well entry.

6 SOIL VAPOR SAMPLING PROBES INSTALLATION AND SAMPLING PROCEDURES

6.1 SOIL VAPOR SAMPLING PROBE CONSTRUCTION

Soil vapor probe installation and sampling will meet requirements outlined in Ecology's Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action.

Soil borings will be advanced to a depth of 5.5 feet bgs using a hand auger. Each soil vapor sampling probe will consist of a shallow probe that will be installed at a depth of approximately 5.25 feet bgs.

Once each soil vapor probe has been advanced to its maximum depth, a soil vapor sampling probe consisting of a 6-inch long, 0.75-inch diameter stainless steel screen with a 0.0057-inch (0.15-millimeter) screen pore size. Each screen will be connected to a length of ¼-inch outside diameter (O.D.) Teflon® tubing via a Swagelok® fitting with a rubber compression ferule. The above-grade end of the soil vapor sampling probe tubing will be fitted with a Swagelok® stainless steel on/off control valve.

Each 6-inch long screen tip will be vertically centered in a 1-foot long interval containing standard sand pack, resulting in 3 inches of sand being above and below the screen. Each sand pack will be covered with a 1-foot interval of dry granular bentonite, which is then covered with at least 2 feet of hydrated granular bentonite. The dry granular bentonite is emplaced immediately above the sand pack to ensure that hydrated granular bentonite slurry does not flow down to the probe screen and seal it off from the adjacent soil. The remainder of the borehole will be filled with hydrated granular bentonite slurry (mixed at the surface and poured in) to approximately 12 inches bgs. The top portion will be completed with a 1-foot 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.

6.2 SOIL VAPOR SAMPLE COLLECTION

Once the soil probes are installed and the concrete at each vapor point has fully cured, vapor sampling activities will commence (minimum of 48 hours). Sampling will not be conducted during or immediately after a significant rain event due to the reduced effective diffusion coefficient and decrease in relative vapor saturation in the unsaturated zone. If rain is encountered prior to sampling, the event will be postponed at least 24 hours. Written documentation will be kept of field conditions including temperature, barometric pressure, wind direction and speed, humidity, and surface soil conditions. Records will also be kept of names of field personnel, dates and times of sampling, purge volumes and purge rate, sampling volume, and leak testing description.

Soil vapor samples will be collected in 6-liter Summa air-sampling canisters (Summa canisters), which will be provided by Eurofins Air Toxics, Inc. of Folsom, California (Air Toxics). 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 compounds.

Prior to sample collection, the initial vacuum of each Summa canister will be measured to verify that the canister has not leaked or been inadvertently opened 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 project log book.

Following the initial canister vacuum check, the sampling canister will be fitted with a sampling manifold, which will allow the sampling canister to be connected to another Summa canister that will be used for purging the sample collection train. The manifold is also equipped with a filter and a flow restrictor that is calibrated to provide a sampling flow rate of approximately 167 milliliters per minute (mL/min). This flow rate equates to a sampling interval of approximately 30 minutes for a 6-liter Summa canister.

After connecting the sampling manifold and purge canister, a preliminary leak check of the system will be performed. 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 from both of the two vacuum gauges on the sampling manifold. After a period of approximately 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 reading differ, the manifold will be reconnected to the canisters and checked again until the system is leak free. If, after a third attempt, a leak-free connection cannot be maintained, the sampling manifold will be removed from service and not used for sample collection.

Following completion of the preliminary leak check, the sampling manifold 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.

As a secondary check for leaks or short circuiting, helium will be used as a tracer gas to test for ambient air leakage 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.

Prior to collecting a soil-vapor sample, each soil-vapor sampling probe will be purged to remove stagnant air from the sample collection train. 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 volumes will be purged from each soil-vapor sampling probe prior to sample collection. 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 2 minutes at a purge rate of 167 mL/min.

Following completion of the purge cycle, the valve on the sampling canister will be opened to begin sample collection. The start time and initial canister vacuum will be recorded in the project log book. Collection of the sample should require approximately 30 minutes. During this time, the sampling technician will periodically check the canister vacuum 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 3 to 5 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.

In order to verify sample collection, and laboratory QA/QC, one equipment blank and one duplicate soil-vapor sample will be collected. The QA/QC equipment blank will be collected by passing laboratory-certified nitrogen through a section of Teflon® tubing, and the sampling manifold, into a 6-liter Summa canister. 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. Due to the doubling of the sample volume to be collected for a duplicate sample, the sample collection time for this sample will be approximately 60 minutes.

6.3 SOIL VAPOR SAMPLE ANALYSES

Soil vapor samples will be submitted to Air Toxics for the following analyses:

- BTEX, MTBE, and naphthalene by USEPA method TO-15 (Low Level); and
- Oxygen, carbon dioxide, methane, nitrogen, and helium by American Society for Testing and Materials (ASTM) D1946.

Soil gas samples will be collected from two soil vapor probes, along with a duplicate and an ambient air sample. In addition, an equipment blank will be collected by collecting a sample of nitrogen through the probe materials prior to installation activities.

Standard laboratory turn-around time will be requested for each of the above-referenced analytical methods. The canisters will be packaged for shipping and sent to the laboratory under chain of custody protocol. Chain of custody will be maintained and documented at all times, including sealing the shipping container with chain of custody seals.

7 DECONTAMINATION OF EQUIPMENT PROCEDURES

Field equipment used during drilling soil borings and sampling will be decontaminated prior to use and during sampling 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.

7.1 EQUIPMENT AND MATERIALS

Equipment and materials that will be used to decontaminate sampling equipment are listed below.

- distilled bottled water,
- 5-gallon buckets,
- scrub brush and long handled bottle brush,
- trash receptacle,
- aluminum foil,
- plastic sheeting,
- Liquinox (or equivalent).

7.2 PROCEDURE

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. Decontamination procedures shall be documented in the field notebook.

7.2.1 Exploration and Construction Equipment

Prior to use, between locations, upon arriving at the site and when leaving the site; augers, direct-push rods, well screens, 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 (water at 1,500 psi);
- Allow to air dry; and
- Store in a clean area on plastic sheeting.

7.2.2 Sampling Equipment

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

- Rinse thoroughly with potable water;
- Scrub with Liquinox and water to remove any visible dirt;
- Rinse thoroughly with potable water; and
- Rinse with distilled water.

Sampling equipment shall be stored in the same manner as non-sampling equipment described above.

7.2.3 Sample Containers

Sample containers will be laboratory cleaned and will be supplied by the analytical laboratory performing the analyses.

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.

8 INVESTIGATION DERIVED WASTE MANAGEMENT PROCEDURES

8.1 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 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, contact information for the CEMC Waste Management Center, 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.

8.2 IDW SAMPLING

For waste profiling purposes, waste samples will be collected and submitted under a separate COC. For soil waste, a 4-point composite sample will be collected and composited by the laboratory. For liquid waste, one sample will be collected from the container where the liquid is stored. The waste samples will be submitted to Lancaster for analysis specified by CEMC in the site-specific waste sampling plan.

8.3 IDW DISPOSAL

Following receipt of laboratory analytical data, the waste soil and water will be transported for disposal at a permitted facility by an approved disposal subcontractor.

REMEDIAL INVESTIGATION QUALITY ASSURANCE PROJECT PLAN

FORMER CHEVRON SERVICE STATION NO. 90619
1205 Washington Street (formerly 2200 Elm Street)
Bellingham, Washington

December 21, 2018

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1 PROJECT OBJECTIVES

The following sections document standard practices for project Quality Assurance. Protocols, practices and procedures described here may be above the level of detail required for the scope of the former Chevron Service Station No. 90169 RI Work Plan. This Quality Assurance Project Plan (QAPP) is not intended to be a stand-alone document. Instead, the QAPP has been prepared as an appendix to the RI Work Plan for the Site, and is designed to be used in conjunction with both the RI 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 RI field investigation activities are of the type and quality needed. The quality of data collected for the RI must be documented in order to ensure that the data is scientifically and legally defensible.

2 PROJECT ORGANIZATION AND RESPOSIBILITY

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

Project Manager (Don Wyll – 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.

Field Manager (Aaron Wisher – Leidos): The field manager is responsible for overseeing the field sampling program outlined in the RI 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, assure that monitoring equipment is operational and calibrated in accordance with the specifications provided herein.

Data Quality Manager. The data quality manager is responsible for developing data quality objectives, selecting analytical methods, coordinating with the analytical laboratory, overseeing laboratory performance, and approving quality assurance / quality control (QA/QC) procedures.

Laboratory Project Manager – Eurofins Lancaster Laboratories. The laboratory project manager is responsible for ensuring that all laboratory analytical work for soil and water media complies with project requirements, and acting as a liaison with the project manager, field manager, data quality manager, and data validation manager to fulfill project needs on the analytical laboratory work. This responsibility also applies to analyses the laboratory project manager subcontracts to another laboratory.

Laboratory Project Manager –Eurofins Air Toxics. The laboratory will be utilized for soil vapor analyses. The laboratory project manager is responsible for ensuring that all laboratory analytical work for soil vapor media complies with project requirements, and acting as a liaison with the project manager, field manager, and data quality manager to fulfill project needs on the analytical laboratory work. This responsibility also applies to analysis the laboratory project manager subcontracts to another laboratory.

3 QUALITY ASSURANCE OBJECTIVES

3.1 ACCURACY

Accuracy is a measure of the closeness of an individual measurement or an average of a number of measurements to the true value. Accuracy is calculated in terms of percent recovery (%R) of a known value. The "known" can take the form of United States Environmental Protection Agency (USEPA) or National Institute of Standards and Technology-traceable standards, laboratory-prepared solutions of target analytes or solutions of surrogate compounds spiked into each sample.

3.2 PRECISION

Precision is the agreement between a set of replicate measurements without assumption of knowledge of the true value. It is a measure of the variability in repeated measurements of the sample compared to the average value. The precision assessment should represent the variability of sampling, sample handling, preservation, storage, and analysis of the sample data. Precision is reported as relative percent difference (RPD), the difference divided by the average of two positive sample results.

The overall precision is a mixture of sampling and laboratory variability. Laboratory and field duplicates analyses are used to determine precision. Laboratory duplicate RPDs provide a measurement of analytical precision and field duplicates RPDs provide a measure of overall precision.

3.3 COMPLETENESS

Completeness is the measure of how the amount of usable (valid) data obtained from a measurement system compares to the expected amount. Completeness is calculated after all analytical data have been reviewed for usability and is expressed as a decimal or percent usable data.

3.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of population, parameter variations at a sampling point, a process condition, or an environmental condition.

Representativeness of the data is addressed qualitatively in the RI Work Plan to assure that rationale of sampling locations is adequate to account for all site variations and the sampling and analytical techniques.

3.5 COMPARABILITY

Comparability expresses the confidence with which one data set can be compared to another data set. All data in the RI should be internally directly comparable. Whenever possible, data produced during the RI should be comparable to other data produced from other similar site investigations using similar techniques and analytical procedures.

4 QUALITY ASSURANCE / QUALITY CONTROL FIELD PROCEDURES

The following QA/QC procedures will be utilized during this investigation to ensure that accurate, reproducible, and defensible data is collected.

4.1 MONITORING EQUIPMENT CALIBRATION

The portable photo-ionization detector (PID) used for screening soil vapor headspace will be calibrated at the beginning of each day according to the manufacturer's recommended procedure using a laboratory-certified isobutylene gas standard. The PID may also be calibrated during the course of the day.

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 RI field activities will be recorded in the project logbook.

The PID will be calibrated daily in the field in accordance with the manufacturer's recommended procedure using a laboratory-certified isobutylene gas standard. A calibration test will be performed as necessary in the field using the calibration gas to check if the instrument remains properly calibrated throughout the day.

4.2 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. The Consultant 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.

4.3 SAMPLE IDENTIFIERS AND LABLES

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.

4.4 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. All field QC samples will be submitted as blind samples to the laboratory. 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 them. The blanks will be handled like a sample and shipped to the laboratory for analyses. One trip blank will accompany each sample cooler containing water samples.

- **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 site, per sampling activity.
- **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 duplicates are designed to assess actual field variability as compared to analytical duplicate or matrix spike duplicate (MSD) analyses which measure laboratory variability. Duplicate samples will be collected at a rate of one for each 20 (soil and groundwater) samples.
- **MS/MSDs** are environmental samples that are spiked, in the laboratory, with a known concentration of a target analyte. The matrix spike (MS)/MSDs are used to check sample matrix interferences and evaluate error due to laboratory bias and precision. Additional sample volume will be submitted for water samples. The project laboratory will perform MS/MSD analyses at a rate of one for each 20 samples of a particular matrix.

4.5 SAMPLE STORAGE

All soil and groundwater samples 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 and stored in the dark at approximately 4°C.

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.

4.6 CHAIN OF CUSTODY RECORDS AND PROCEDURES

The primary objective of 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 will be fully completed in the field and signed by the sample collector. The samples will be entered onto the COC as they are collected.

4.7 CUSTODY SEALS

Custody seals will be used on all coolers and sample shipping containers. The number of seals per container is dependent upon the nature of each container. Seals will be signed and dated prior to use. Clear strapping tape will be placed over each seal to ensure that seals are not accidentally broken during shipment.

4.8 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.
- Coolers or boxes containing cleaned bottles will be sealed with a custody tape seal during transport to the field or while in storage prior to use. Sample bottles from unsealed coolers or boxes, or bottles that appear to have been tampered with will not be used.
- 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 rules.
- The sample collector will record sample data in the field logbook.
- The site team leader will determine whether proper custody procedures were followed during the fieldwork and decide if additional samples are required.

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. When transferring samples, the individuals relinquishing and receiving them must sign, date and note the time on the COC record. This record documents sample custody transfer.
- Samples will be dispatched to the laboratory for analysis with separate COC records accompanying each shipment. Shipping containers will be sealed with custody seals for shipment to the laboratory. The method of shipment, name of courier and other pertinent information will be entered in 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 distributed appropriately to the project manager.
- Sent by common carrier, a bill of lading will be used. Freight bills and bills of lading will be retained as part of the permanent documentation.

5 LABORATORY CUSTODY PROCEDURES

The laboratories receiving the samples will receive and document samples in accordance with their respective Standard Operation Procedures (SOPs).

This section addresses procedures that will be used to identify samples and document the samples' COC. These procedures are necessary to ensure that the quality of the samples is maintained during their collection, transportation, storage and analysis. Procedures for custody, documentation, handling, packaging and shipping environmental samples are described below.

5.1 SAMPLE PACKAGING, HANDLING, AND SHIPPING

The transportation and handling of samples must be accomplished in a manner that not only protects the integrity of the sample, but also prevents any detrimental effects to sample handlers due to the possible hazardous nature of samples. Regulations for packaging, marking, labeling and shipping hazardous materials are promulgated by Department of Transportation (DOT) in the Code of Federal Regulations, 49 CFR 171 through 177 and/or the International Air Transport Association regulations for Dangerous Goods.

5.2 SAMPLE PACKAGING

Samples must be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures. The following sample package requirements will be followed:

- Sample bottle lids must never be mixed. All sample lids must stay with the original containers.
- All sample bottles will be placed in a plastic bag to minimize leakage in the event a bottle breaks during shipment.
- The environmental samples will be cooled. Ice sealed in plastic bags or artificial icing materials may be used. Ice is not to be used as a substitute for packing materials.
- Approximately 2 inches of inert packing material, such as closed-cell foam or bubble wrap, should be placed in the bottom of all coolers. Any remaining space in the cooler should be filled with inert packing material. Under no circumstances should material, such as sawdust, newspaper, or sand be used.
- The custody record must be placed in a plastic bag and placed inside of the cooler lid. Signed and dated custody seals must be affixed to the sample cooler and must be covered with clear tape.
- Cooler lids must be secured with strapping tape at a minimum of two locations without covering any labels and the cooler drain must be taped shut.
- Completed shipping labels must be attached to the top of the cooler, with "This Side Up" labels.

5.3 SHIPPING CONTAINERS

Shipping containers are to be custody-sealed for shipment as appropriate. The container will be secured with clear tape wrapped around the package at least twice in at least two locations. Custody seals will be affixed in such a way that access to the container can be gained only by cutting the tape and breaking a seal.

- The custody seals will be covered with clear tape.
- Field personnel will make arrangements for transportation of samples to the laboratory. When custody is relinquished to a shipper, field personnel will telephone the laboratory sample custodian, to inform him/her of the expected time of arrival of the sample shipment and to advise him/her of any time constraints on sample analysis.

5.4 MARKING AND LABELING

The marking and labeling for shipping containers should follow the guidance presented below:

- Use abbreviations only where specified.
- The words "This End Up" or "This Side Up" must be clearly printed on the top of the outer package. Upward pointing arrows should be placed on the sides of the package.
- After a shipping container has been sealed, two COC seals are placed on the container, one on the front and one on the back. The seals are protected from accidental damage by placing clear tape over them.

6 ANALYTICAL PROCEDURES

The analytical methodologies to be used for generation of field analytical data (pH, temperature, conductivity, dissolved oxygen and static water level) are summarized in the RI Work Plan and the SAP. Field analytical data will be used to augment information generated through laboratory analysis and aid in delineating the groundwater impacts during field investigations. Equipment for monitoring groundwater conditions during well development and purging prior to sampling will meet the specifications of methods specified.

Tables B-1 through B-3 provide the laboratory analytical methods to be used for completing the laboratory analytical tasks defined in the RI Work Plan and the SAP. Table B-4 summarizes sample containers, preservation, and holding times.

7 DATA VALIDATION, REPORTING, AND ASSESSMENT

7.1 DATA VALIDATION

All data generated from sampling will be reviewed by comparing calibration, accuracy, and precision to the QC criteria listed in the method description. The validation procedures are generally composed of, but not limited to, the following steps:

- Verifying the correct samples were analyzed and reported in appropriate units.
- Verifying preservation and holding times.
- Verifying that initial and continuing calibrations were performed and met QC criteria.
- Verifying that no analytes were present in the method blanks and that one blank was run every 10 samples.
- Verifying that a duplicate and matrix spike, or MS/MSD were run every 20 samples and that QC criteria were met.

7.2 DATA REPORTING

All laboratory data calculations and reductions will be performed as described in the applicable method references. Raw data, including laboratory worksheets, notebooks, sample tracking records, instrument logs, standard and sample preparation logs, calibration data and associated QC records, should be retained by the laboratory for a minimum of 10 years and be available for inspection if necessary. While the laboratory data management system may store records electronically, provision should be made for hard copies as necessary to validate results.

Electronic laboratory data will be submitted to Ecology per Policy 840 and as dictated in the Agreed Order.

Deliverables by the contract laboratory shall be in standard data reporting format. The report shall include the following:

- Cover sheet listing the sample types received, tests performed, and a case narrative describing problems encountered and identifying any analyses not meeting QC criteria and general comments.
- Chain-of-custody forms and cooler receipt forms;
- Analytical data reported by sample or by test and containing pertinent information (i.e., field identification number, contract laboratory identification number, date of sample collection, receipt, extracted/digested/analyzed, batch number(s), dilution factors, all analytes and their reporting limits, data qualifiers, matrix units, percent of solids for soil samples, and sample description).
- Analytical information for QC sample spikes, laboratory duplicates, initial and continuing calibration verifications of standards and laboratory blanks, standard procedural blanks, LCS, surrogates, laboratory reference materials, ICP interference check samples, and detection limit check samples.
- Copies of any other forms pertinent to the data review process (corrective action forms, validation forms, raw data, etc.)

- The contract laboratory shall maintain on file all the supporting data and documentation for these samples.

7.3 DATA ASSESSMENT

The project data assessment procedures are generally composed of but not limited to the following steps:

- Review the COC and verify that all samples were received and analyzed.
- Review laboratory sample delivery group narrative for potential deficiencies in the data.
- Identify and organize the data according to laboratory data packages.
- Apply appropriate data qualifiers to the data.
- Verify the usability of the qualified data.

The Project Manager conducts a critical review of the comments provided in the summary report to determine if they are sufficient to describe and explain any associated problems with the data. If any data gaps are identified in the summary, the project manager resolves them using professional judgment based on the application of the USEPA *Functional Guidelines for Data Validation* or USEPA *Functional Guidelines for Inorganic Data Review*.

Data qualifiers will be assigned to the data as identified in the summary report. The data qualifiers or flags are assigned by the consultant in accordance with USEPA *Functional Guidelines for Data Validation* or USEPA *Functional Guidelines for Inorganic Data Review.*

8 INTERNAL QUALITY CONTROL CHECKS

8.1 PERFORMANCE AND SYSTEM AUDITS

Performance and systems audits include careful evaluation of both field and laboratory QC. Performance and system audits are performed on a regularly scheduled basis during the lifetime of the project to assess the accuracy of the measurement systems.

Performance and system audits may be performed through split sampling in the field and/or by issuing the laboratory periodic blind samples. Audits of field activities can be carried out to evaluate sampling activities such as sample identification, sample control, COC procedures, field documentation and general sampling operations.

8.2 PROJECT ANALYTICAL QA PREVENTATIVE MAINTENANCE

All field instruments and equipment used for analysis will be serviced and maintained only by qualified personnel. All repairs, adjustments and calibrations will be documented in an appropriate logbook or data sheet that will be kept on file. The instrument maintenance logbooks will clearly document the date, a description of the problem, the corrective action taken, the result and who performed the work.

All equipment used in the field is subject to standard preventative maintenance schedules. When in use, equipment is inspected at least twice daily, once before start-up in the morning and again at the end of the work shift prior to overnight storage or return to the equipment supplier. Regular maintenance such as cleaning lenses, replacement of in-line filters and removal of accumulated dust is to be conducted according to manufacturer's recommendations and in-field need, whichever is appropriate. All preventive maintenance performed will be entered in the individual equipment's logbook and the field notebook.

In addition to preventive maintenance procedures, daily calibration checks will be performed at least once a day in the morning prior to use and recorded in the field notebook. Additional calibration checks will be performed as required. All field notebooks will become part of the permanent site file.

8.3 CORRECTIVE ACTION

Corrective actions are procedures that may be implemented on samples that do not meet QA specifications. The need for corrective action will be based on the limits of acceptability as specified in the appropriate sections of this QAPP. Corrective actions will depend on the problem(s) encountered and, in many cases, may have to be defined as the need arises. Persons responsible for initiating actions and procedures for identifying, documenting and reporting corrective actions include the project manager and QA officer.

8.4 QA/QC REPORTS

Serious analytical problems will be reported to the Potentially Liable Person (PLP) and Ecology. The time and type of corrective action, if needed, will depend on the severity of the problem and relative overall project importance. Corrective actions may include altering procedures in the field, conducting an audit, or modifying laboratory protocol.

In addition to the performance and system audit reports provided to the project manager, the final RI report will contain sections that summarize all relevant data quality information collected during the project.

Tables

Tables

TABLE B-1
Analytical Methods and Detection Limits for Soil Samples

Analyte	Soil					
	Analytical Method	MDL	LOD	LOQ	LCS	RPD
		(mg/kg)			(%)	
Petroleum Hydrocarbons						
GRO	NWTPH-Gx	1	2	5	80-120	≤ 30
DRO	NWTPH-Dx[1]	3	6	25	61-115	≤ 20
EPH	NWVPH	3	6	5	61-115	≤ 20
VPH	NWEPH	3	6	5	61-115	≤ 20
Volatile Organic Compounds						
Benzene	USEPA 8260B	0.0005	0.002	0.005	80-120	≤ 30
Ethylbenzene	USEPA 8260B	0.001	0.002	0.005	80-120	≤ 30
Toluene	USEPA 8260B	0.001	0.002	0.005	80-120	≤ 30
Total Xylenes	USEPA 8260B	0.001	0.002	0.005	80-120	≤ 30
n-Hexane	USEPA 8260B	0.001	0.002	0.005	8-120	≤ 30
Fuel Additives						
EDC	USEPA 8260B	0.001	0.002	0.005	70-133	≤ 30
EDB	USEPA 8260B	0.001	0.002	0.005	80-120	≤ 30
MTBE	USEPA 8260B	0.000231	0.001	0.005	59-120	≤40
Other Petroleum Components						
Carcinogenic PAHs						
benzo[a]pyrene	USEPA 8270 SIM	0.000065	0.010	0.05	51-118	≤20
benzo[a]anthracene	USEPA 8270 SIM	0.000088	0.010	0.05	51-115	≤20
benzo[b]fluoranthene	USEPA 8270 SIM	0.000182	0.010	0.05	56-123	≤20
benzo[k]fluoranthene	USEPA 8270 SIM	0.000194	0.010	0.05	54-131	≤20
chrysene	USEPA 8270 SIM	0.000165	0.010	0.05	55-129	≤20
dibenz[a,h]anthracene	USEPA 8270 SIM	0.00025	0.010	0.05	50-141	≤20
indeno[1,2,3-cd]pyrene	USEPA 8270 SIM	0.000183	0.010	0.05	49-148	≤20
Naphthalene	USEPA 8270	0.000429	0.005	0.5	71 – 122	≤ 30
Other Non-Petroleum Contaminants						
Halogenated VOCs	USEPA 8260B	0.001	0.002	0.005	80-120	≤ 30
PCB Arachlors	USEPA 8082	0.001	0.002	0.04	80-120	≤ 30
Metals						
Lead	USEPA 6010B	0.55	1.5	1.5	80-120	≤ 20

Notes:
DRO = diesel-range hydrocarbons
EDB = ethylene dibromide
EDC = ethylene dichloride
EPH = extractable petroleum hydrocarbons
GRO = gasoline-range hydrocarbons
LCS = laboratory control sample (supplied by Eurofins Lancaster)
LOD = limit of detection (supplied by Eurofins Lancaster)
LOQ = limit of quantitation (supplied by Eurofins Lancaster; equivalent to PQLs or RLs)
MDL = method detection limit (supplied by Eurofins Lancaster)
MTBE = methyl tert-butyl ether
PAHs = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Biphenyl
RPD = relative percent difference (supplied by Eurofins Lancaster)
SIM = Selective Ion Monitoring
USEPA = United States Environmental Protection Agency
VPH = volatile petroleum hydrocarbons
[1] = analyzed with silica gel cleanup
mg/kg = milligrams per kilogram

TABLE B-2
Analytical Methods and Detection Limits for Groundwater Samples

Analyte	Groundwater					
	Analytical Method	MDL	LOD	LOQ	LCS	RPD
		(µg/L)			(%)	
Petroleum Hydrocarbons						
GRO	NWTPH-Gx	50	100	250	75-135	≤ 30
DRO	NWTPH-Dx[1]	45	90	100	32-115	≤ 20
Volatile Organic Compounds						
Benzene	USEPA 8260B	0.5	1	1	78-120	≤ 30
Ethylbenzene	USEPA 8260B	0.5	1	1	78-120	≤ 30
Toluene	USEPA 8260B	0.5	1	1	80-120	≤ 30
Total Xylenes	USEPA 8260B	0.5	1	1	80-120	≤ 30
Fuel Additives						
Methyl tert-butyl ether	USEPA 8260B	0.5	1	1	75-120	≤ 30
EDC	USEPA 8260B	0.5	1	1	66-128	≤ 30
EDB	USEPA 8011	0.0	0.02	0.03	60-140	≤ 20
Other Petroleum Components						
Carcinogenic PAHs						
benzo[a]pyrene	USEPA 8270 SIM	0.000065	0.010	0.02	51-118	≤20
benzo[a]anthracene	USEPA 8270 SIM	0.000088	0.010	0.02	51-115	≤20
benzo[b]fluoranthene	USEPA 8270 SIM	0.000182	0.010	0.02	56-123	≤20
benzo[k]fluoranthene	USEPA 8270 SIM	0.000194	0.010	0.02	54-131	≤20
chrysene	USEPA 8270 SIM	0.000165	0.010	0.02	55-129	≤20
dibenz[a,h]anthracene	USEPA 8270 SIM	0.00025	0.010	0.02	50-141	≤20
indeno[1,2,3-cd]pyrene	USEPA 8270 SIM	0.000183	0.010	0.02	49-148	≤20
Naphthalene	USEPA 8270	0.118	0.5	1	80 – 128	≤ 30
Metals						
Total Lead	USEPA 6010B	6.2	15	15	80-120	≤ 20

Notes:
DRO = diesel-range hydrocarbons
EDB = ethylene dibromide
EDC = ethylene dichloride
GRO = gasoline-range hydrocarbons
LCS = laboratory control sample (supplied by Eurofins Lancaster)
LOD = limit of detection (supplied by Eurofins Lancaster)
LOQ = limit of quantitation (supplied by Eurofins Lancaster; equivalent to PQLs or RLs)
MDL = method detection limit (supplied by Eurofins Lancaster)
PAHs = Polycyclic Aromatic Hydrocarbons
RPD = relative percent difference (supplied by Eurofins Lancaster)
SIM = Selective Ion Monitoring
USEPA = United States Environmental Protection Agency
µg/L = Micrograms per liter
[1] = analyzed without silica gel cleanup

TABLE B-3
Analytical Method and Detection Limits for Soil Vapor Samples

Analyte	Soil Vapor					
	Analytical Method	MDL	LOD	LOQ*	LCS	RPD
		(ug/m^3)			(%)	
Volatile Organic Compounds						
Benzene	USEPA TO-15 (Low)	0.27	0.42	0.83	70 - 130	≤ 25
Ethylbenzene	USEPA TO-15 (Low)	0.26	0.56	1.1	70 - 130	≤ 25
Methyl tert-butyl ether	USEPA TO-15 (Low)	0.40	0.47	0.94	70 - 130	≤ 25
Toluene	USEPA TO-15 (Low)	0.21	0.49	0.99	70 - 130	≤ 25
m,p-Xylene	USEPA TO-15 (Low)	0.28	0.56	1.1	70 - 130	≤ 25
o-Xylene	USEPA TO-15 (Low)	0.27	0.56	1.1	70 - 130	≤ 25
Naphthalene	USEPA TO-15 (Low)	2.3	5.5	6.8	60 - 140	≤ 25
Atmospheric Gases						
Carbon dioxide	ASTM D-1946 modified	--	--	0.01	--	--
Helium	ASTM D-1946 modified	--	--	0.05	--	--
Methane	ASTM D-1946 modified	--	--	0.0001	--	--
Nitrogen	ASTM D-1946 modified	--	--	0.01	--	--
Oxygen	ASTM D-1946 modified	--	--	0.01	--	--

Notes:
ASTM = American Society for Testing and Materials
LCS = laboratory control sample (supplied by Eurofins Air Toxics)
LOD = limit of detection (supplied by Eurofins Air Toxics)
LOQ = limit of quantitation (supplied by Eurofins Air Toxics; equivalent to PQLs or RLs)
MDL = method detection limit (supplied by Eurofins Air Toxics)
RPD = relative percent difference (supplied by Eurofins Air Toxics)
USEPA = United States Environmental Protection Agency
ug/m^3 = micrograms per cubic meter
-- Not applicable or not available
Low refers to low-level or medium-level quantitation limits.
* LOQs for soil vapor are considered approximate; LOQs for atmospheric gases are in percent.

TABLE B-4
Sampling Containers, Preservatives, and Holding Times

Sample Matrix	Analytical Parameter	Analytical Method	Sample Container	No. of Containers	Preservation Requirements	Holding Time
Soil	GRO	NWTPH-Gx	Method 5035A, 40-mL VOA vials	4	4°C ±2°C, Freeze within 48 hours to <-7°C	14 days
	DRO	NWTPH-Dx	4-ounce jar	1	4°C ±2°C	14 days for extraction; 40 days for analysis
	EPH/ VPH	NWEPH/NWVPH	4-ounce jar/ 40-mL VOA vials	5	4°C ±2°C, Freeze within 48 hours to <-7°C	14 days
	BTEX, MTBE, EDC, EDB, n-hexane, Halogenated VOCs	USEPA 8260B	Method 5035A, 40-mL VOA vials	4	4°C ±2°C, Freeze within 48 hours to <-7°C	14 days
	PCB Arachlors	USEPA 8082	4-ounce jar	1	4°C ±2°C	6 months
	cPAHs	USEPA 8270 SIM	4-ounce jar	1	4°C ±2°C	6 months
	Naphthalene	USEPA 8270	4-ounce jar	1	4°C ±2°C	6 months
	Lead	USEPA 6010B	4-ounce jar	1	4°C ±2°C	6 months
Water	GRO	NWTPH-Gx	40-mL VOA vials	3	4°C ±2°C, HCl pH < 2	14 days
	DRO	NWTPH-Dx	500-mL amber glass bottle	1	4°C ±2°C	7 days for extraction,40 days for analysis
	BTEX, MTBE, EDC	USEPA 8260B	40-mL VOA vials	3	4°C ±2°C	14 days for analysis
	EDB	USEPA 8011	1 L amber glass bottle	1	4°C ±2°C	14 days for analysis
	cPAHs	USEPA 8270 SIM	1 L amber glass bottle	1	4°C ±2°C	7 days for extraction,40 days for analysis
	Naphthalene	USEPA 8270	1 L amber glass bottle	1	4°C ±2°C	7 days for extraction,40 days for analysis
	Lead	USEPA 6010B	500-mL HDPE bottle	1	4°C ±2°C, $HN0_3$	180 days

Notes:

HCL = hydrochloric acid
VOA = volatile organic analysis
DRO = diesel-range hydrocarbons
EDB = ethylene dibromide
EDC = ethylene dichloride
EPH = extractable petroleum hydrocarbons
GRO = gasoline-range hydrocarbons
MTBE = methyl tert-butyl ether
cPAHs = carcinogenic Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Biphenyl
USEPA = United States Environmental Protection Agency
VPH = volatile petroleum hydrocarbons
VOCs = volatile organic compounds

Appendix C:
Health and Safety Plan

HEALTH AND SAFETY PLAN (HASP)
FOR FIELD OPERATIONS

CHEVRON FACILITY 90619
1205 Washington St, Bellingham, WA

Prepared by

Prepared for

Chevron Environmental Management Company (CEMC)

October 1, 2018

Remedial Investigation

Approval Signatures

Leidos Project Manager	Date
Leidos Field Manager/Site Health and Safety Officer	Date
Leidos Health and Safety Approval	Date

CEMC Acceptance

The Chevron Project Manager's (PM) signature on an EMC Project Manager HASP Review Checklist will serve as documentation that the PM has reviewed and accepted the HASP. A copy of the signed checklist will be maintained with the field copy of this HASP.

Key Contact Information

Fire/Police/EMS	911
WorkCare Early Injury Intervention	(888) 449-7787
PeaceHealth St Joseph	(360) 734-5400

Purpose and Program-Specific Policies, Procedures, and Protocols

This plan was developed to satisfy requirements identified in 29 CFR 1910.120, 29 CFR 1926.65, the regulations of the State of Washington, and Section 7.0 of Leidos Engineering, LLC's (Leidos) Environmental, Health and Safety Program (EH&SP) Manual, *Hazardous Waste Operations*. This plan represents a good-faith effort to identify, evaluate, and prescribe controls for the hazards that will be posed by this work and provide guidance for emergency response. ***Revisions to this plan must be documented, and the Project Manager (PM) and responsible Health and Safety (H&S) manager must approve any revisions that result in changes to the level of protection specified in this plan***. Employees and subcontractors of Leidos will be informed of the requirements of this plan and provided with unrestricted access to the document; however, the use of this plan by other entities will be at those parties' own risk.

Company- and Program-specific requirements associated with operations at CEMC field sites are identified in applicable sections of this plan and in Leidos' ***Health and Safety Policy Manual for the Chevron Program***.

Site History and Description

The site is a former service station, relatively flat, and approximately 0.6 acres in size. The Site is currently developed with one commercial building, which is 1,135 square feet in size, asphalt parking/driveway, and landscape strips around the perimeter. The building was most recently a coffee shop from approximately 1995, when it was constructed, to 2015. The Site was vacant between 2016 and 2017. Currently the Site operates as a butcher shop.
The Site is bounded to the north by Washington Street, Broadway to the east, and Elm Street to the west. Surrounding properties to the west and southeast are similarly covered by commercial buildings, a fire station, and pavement. Surrounding properties to the north and northeast are residences with small yards. Elizabeth Park is located 320 feet southwest of the property; the 5-acre, wooded park features picnic tables, tennis courts, a playground, and walking trails.

Scope of Work to be Performed by Leidos and Subcontractors

A general scope of work for this project is listed in the following section; a more detailed description of proposed activities and an overview of field logistics are presented in a work plan or similar document(s):

- A private utility locator will mark the approximate positions of subsurface utilities and/or assets prior to beginning any intrusive work.
- Seven soil borings will be drilled to depths of approximately 15 feet below ground surface (ft bgs) using hand auger methods.
- Each soil boring will be advanced to a depth of approximately 8 ft bgs using an air-excavation rig prior to beginning powered drilling to provide physical clearance of subsurface utilities and assets.
- Soil samples will be collected using a hand auger.
- Two vapor points will be installed at shallow depths of approximately 5.25 ft bgs in soil borings advanced by hand augers.
- Five monitoring wells, constructed of 2-inch diameter PVC, will be installed. Each monitoring well will be developed using a bailer, and a groundwater sample will be collected using a peristaltic pump after each well has been developed.
- Ground surface will be completed flush and to closely match surrounding grade (asphalt, concrete, soil).
- All reusable tools and equipment will be decontaminated before initial use, between sampling locations, and before demobilization from the site.

Private utility location services will be provided by ULS/GeoMarkout. Air-excavation, drilling, and well installation activities will be conducted by Cascade Drilling, Inc. Leidos employees will provide technical/H&S oversight for all field operations and collect soil and groundwater samples.

Chemicals/Constituents of Concern

The concentrations of chemical constituents that have been hisorically reported in groundwater and soil at this site above MTCA Method A cleanups follow: Total petroleum hydrocarbons (TPH) as gasoline (TPHg), toluene, benzene, ethylbenzene, and xylenes.

Potential Hazards Associated with Field Operations

The following, general hazards may be associated with the work described in this HASP:

- Third parties being in close proximity to work zones.
- Traffic accidents associated with travel to and from the site.
- Traffic associated with work conducted in parking lots or similar high-traffic areas.
- Exposure to chemicals/constituents of concern (see Chemicals/Constituents of Concern section).
- Noise (air-excavation rig).
- Lifting or moving materials and/or equipment.
- Contact with overhead or buried utilities.
- Cuts, contusions, sprains, strains, etc. from the use of hand tools and equipment.
- Contact with flying debris.
- Exposure to temperature extremes.
- Physical hazards (slips/trips/falls, burns, cuts/contusions).
- Biological hazards (biting/stinging insects, venomous snakes, stray dogs).
- Being struck by mobile equipment (vehicles, air-excavation rig).
- Fire.

Emergency Medical Facility and Emergency Telephone Numbers

The emergency medical facility is Peacehealth St Joseph Medical Center. A map showing the location and directions to the facility and a list of emergency telephone numbers are presented in ***Appendix A***.

In the event of a non-life threatening emergency the employee shall contact WorkCare (888) 449-7787 and the licensed health care professional will direct the employee to the appropriate urgent medical facility when necessary.

Emergency Reporting and Communication

The Site Health and Safety Officer (SHSO), or an alternate team member, will immediately contact emergency response organizations (if necessary) and the Leidos PM to report any incident or near-incident. The Leidos PM will continue to report the event through Leidos' internal, incident notification process. If the Leidos PM is not available to accept the initial notification, then the SHSO will contact the H&S Manager, Program Manager, or another Leidos PM to report the event. While it may be appropriate to leave voicemails and/or emails when reporting an incident, the notification process must continue until the event has been reported to a responsible manager, either in person or by voice contact. Notifications to CEMC will be initiated by Leidos' Program Leadership Team, as required by the most recent version of CEMC's Incident Investigation and Reporting Process.
The Emergency Chain-of-Reporting is presented in ***Appendix A***; Leidos' procedures that are applicable to emergency reporting include sections 4.0, *Incident Reporting, Investigation & Management,* and 21.0, *Regulatory Agency Inspections & Regulatory Incident Reporting* of Leidos' EH&SP Manual.

Emergency Evacuation Protocols

When within practical visual distance of other staff members, verbal communication will serve as the notification to evacuate the work zone. If staff is not within practical visual distance, one long blast from a vehicle or portable air horn will serve as the site emergency alarm. In the event of an emergency, the SHSO, or an alternate team member, will call 911, utility companies (if necessary), safety personnel at adjacent facilities (if applicable), and initiate notifications to the project team, as described in the preceding section of this plan.

Workers will immediately relocate from the work area to a designated assembly point. If the assembly point is inaccessible or is in an unsafe area, then workers will relocate to an alternate assembly point. If both assembly points are inaccessible, then the SHSO or FM will direct the field team to assemble at a different location. The SHSO or FM will use the current Safe Work Permit to conduct an accountability of all employees onsite. If any employee is missing, then that person's name will be presented to emergency responders. An emergency evacuation practice drill will be conducted during the first week of work at the site and at regular intervals for extended-duration projects. A map showing the locations of the designated assembly points is presented in ***Appendix A***.

Additional information concerning procedures and protocols that will be followed in the event of an emergency is presented in Leidos' ***Health and Safety Policy Manual for the Chevron Program***.

Emergency Decontamination Procedures

Field operations at this site could potentially cause the skin, eyes, and lungs to become exposed to compounds that are associated with petroleum hydrocarbons.

Chemical contact with the skin: Remove affected clothing, and wash the affected skin with soap and water until the contamination is removed. Seek medical attention if irritation of the skin is observed (redness, swelling, rash).

Chemical contact with the eye: Immediately flush the eye(s) using an eye wash bottle or station, as appropriate. When using an eye wash bottle, the eyelid should be lifted several times while the eye is being flushed. Seek medical attention immediately.

Inhalation of organic vapor: Move affected workers to an area that is upwind of the source of the vapors. If workers experience dizziness or nausea, they should rest until their symptoms subside.

Refer to NIOSH Pocket Cards, which are located in the ***Health and Safety Policy Manual for the Chevron Program***, for additional guidance concerning decontamination procedures and protocols.

Decontamination of reusable tools and equipment will be accomplished using processes that have been identified in operating procedures, job safety analyses (JSAs), or applicable work control documents.

Emergency Equipment and Supplies

Safety supplies (fire extinguisher, first aid kit, eyewash bottles, etc.) will be inspected monthly and documented in the field logbook or on an inspection tag. The following supplies are required during all field activities:

- Air horn or similar emergency warning device(s).
- Cellular telephone (or immediate access to a land line or satellite phone).
- First aid kit that meets minimum requirements in applicable federal and/or state regulations.
- Fire extinguisher(s) with minimum ratings of 5 pounds and 2A 5BC and documented evidence of having passed an annual maintenance check and monthly inspections.
- Eyewash bottle.

Permit to Work

Leidos will issue work permits for field activities that will be conducted for this project/for its employees and subcontractors. Refer to CEMC MSW 2017, *Permit to Work*, and the ***Health and Safety Policy Manual for the Chevron Program*** for specific information concerning Leidos' implementation of CEMC's Permit to Work Process.

Delineation of Work Zones and Traffic Control

The following measures will be used to delineate work zones and provide traffic control at this site**.** Traffic cones may be used as secondary delineators or to mark locations within a work zone where specific hazards may be present (ruts, disturbed ground, along runs of hoses, etc.).

All work zones will be delineated to contain physical and chemical hazards that may be present in the work area and to discourage encroachment of the work zone by third parties or untrained employees. The level of traffic control that will be used to establish a work zone will be identified in the HASP for the project. No food, drink, or tobacco products will be allowed inside of an exclusion zone. Upon exiting an exclusion zone, field team members will wash their hands prior to eating, drinking, etc.

Level 2:

- 48-inch (minimum) tall, high-visibility, traffic barricades ('sawhorses,' traffic candles, etc.) with two strands of caution tape connecting the barricades will be used as primary work zone delineators.
- Field vehicles will be used, when possible, to protect the field team from vehicle traffic that may intrude upon the work zone.

Journey Management Plan

A site-specific Journey Management Plan (JMP) will be created for this project and kept with this HASP during site activities.

Air Monitoring

The concentration of each chemical/substance that is listed, below, will be monitored by a qualified person using a properly-calibrated, portable meter during drilling activities. If the action level for a constituent should be exceeded, then the field team will suspend work and relocate to a designated assembly point.

Chemical/Substance	Area Monitored	Action Level	Duration
Organic vapors (undifferentiated)	Breathing zone	≥5 parts per million (ppm)	1 minute

Each chemical/substance above will be monitored and concentrations recorded every 15 minutes or as changes in site conditions or tasks warrant. The frequency of air monitoring may be adjusted by the SHSO; however, the reason for adjustments will be documented in the field log book or field notes. If the above action levels are reached, work will be stopped, EH&S management will be contacted, and a hazard analysis will be performed and documented to identify changes to these requirements before work can continue.

Training

General training requirements for field operations are described in Leidos' ***Health and Safety Policy Manual for the Chevron Program***. Task-specific training is listed in applicable JSA or standard operating procedures and documented in Leidos' intranet database. A summary of training expectations for Leidos subcontractors is presented in the Subcontractors section of the ***Health and Safety Policy Manual for the Chevron Program***.

Investigation-Derived Waste

A project-specific waste plan is presented in ***Appendix B***. Leidos' procedures that are applicable to investigation-derived waste include Section 46.0 of Leidos' ES&HP Manual, *Management of Waste Generated at Project Sites*.

Job Safety Analyses and Personal Protective Equipment

A JSA will be prepared for each significant task that will be performed by the field team. The JSA for each task shall be reviewed, manually updated (when necessary), and validated with the field team prior to beginning the task. ***Significant changes to a JSA (levels of personal protective equipment [PPE] or other protective systems) must be approved by an H&S manager. All JSAs that were used during field operations must be assessed for completeness and applicability during a post-task meeting that will be conducted at the end of each day.***

General requirements that are associated with PPE are described in the ***Health and Safety Policy Manual for the Chevron Program***; task-specific requirements are presented within each JSA. JSAs that will be used by Leidos employees are presented in ***Appendix C***. Subcontractors to Leidos are required to provide applicable task-specific JSAs for activities they will be performing. These JSAs must meet current CEMC JSA standards.

Safety Data Sheets

A list of hazardous chemical tools that will be used onsite and their corresponding Safety Data Sheets (SDSs) are presented in ***Appendix D***.

Field Data Forms

Field data forms are presented in ***Appendix E***.

APPENDIX A—Emergency Contact Information and Hospital Map

Emergency Telephone Numbers

Fire/Police/EMS	911
WorkCare Early Injury Intervention	(888) 449-7787

A contact list including all applicable utility members will be generated by a local 'one-call' dig center and kept with this HASP during applicable field activities.

Project Team Organization List

Title	Name	Office Phone	Cellular Phone
CEMC Project Manager	Eric Hetrick	(925) 842-2418	(916) 0715-4782
Leidos Project Manager	Don Wyll	(425) 482-3315	(425) 275-1172
Leidos Field Manager/SHSO	Aaron Wisher	(425) 398-2016	(206) 999-8293
Subcontractors			
ULS/GeoMarkout	Mike Benedict	(206) 384-2857	(206) 384-2857
Cascade Drilling	Kasey Goble	(425) 485-8908	(425) 485-8908

Emergency Chain-of-Reporting

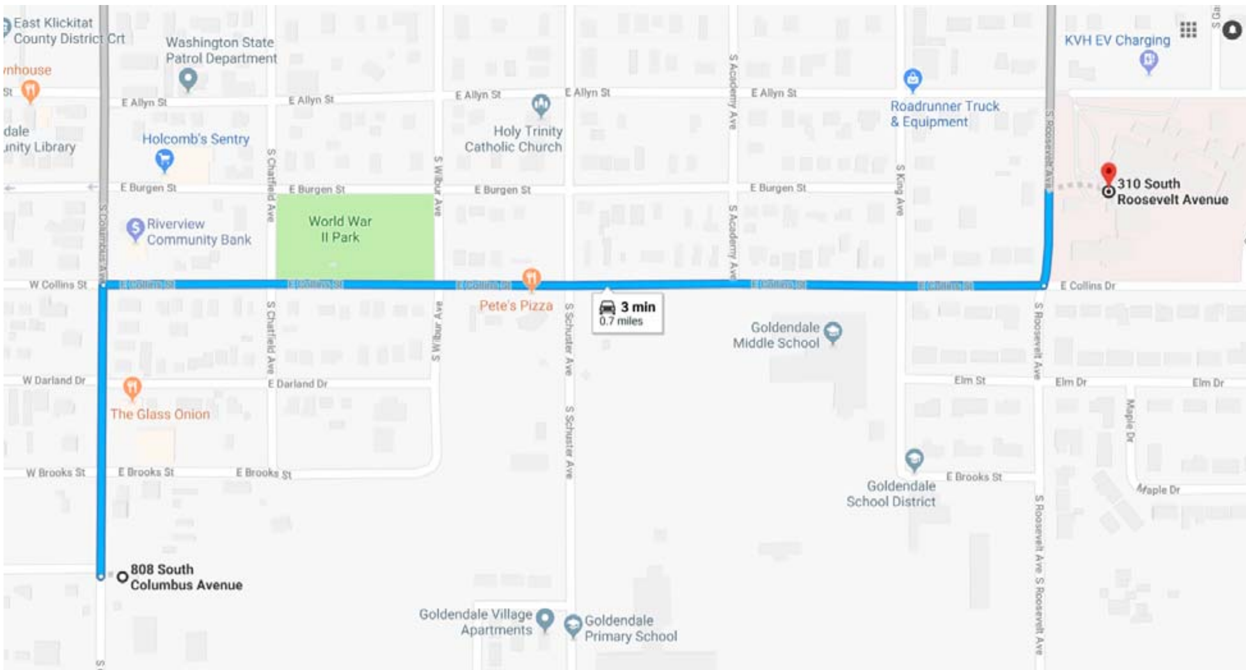
When reporting any incident or near-incident, contact the Leidos management team members listed below. Begin at the bottom of the list and continue upward until voice contact has been established with a member of the management team.

Title	Name	Office Phone	Cellular Phone
Leidos H&S Manager	Steve Lowery	(405) 701-3158	(405) 919-4176
OE Program Manager	Nicholas Kidd	(717) 409-2857	(717) 409-2857
Division/Program H&S Manager	Chris Fontana	(610) 594-4305	(610) 952-1752
Project Manager	Don Wyll	(425) 482-3315	(425) 275-1172

MAP AND DRIVING DIRECTIONS TO EMERGENCY CARE FACILITY

Klickitat Valley Health
310 S Roosevelt Ave, Goldendale, WA
(509) 773-4022

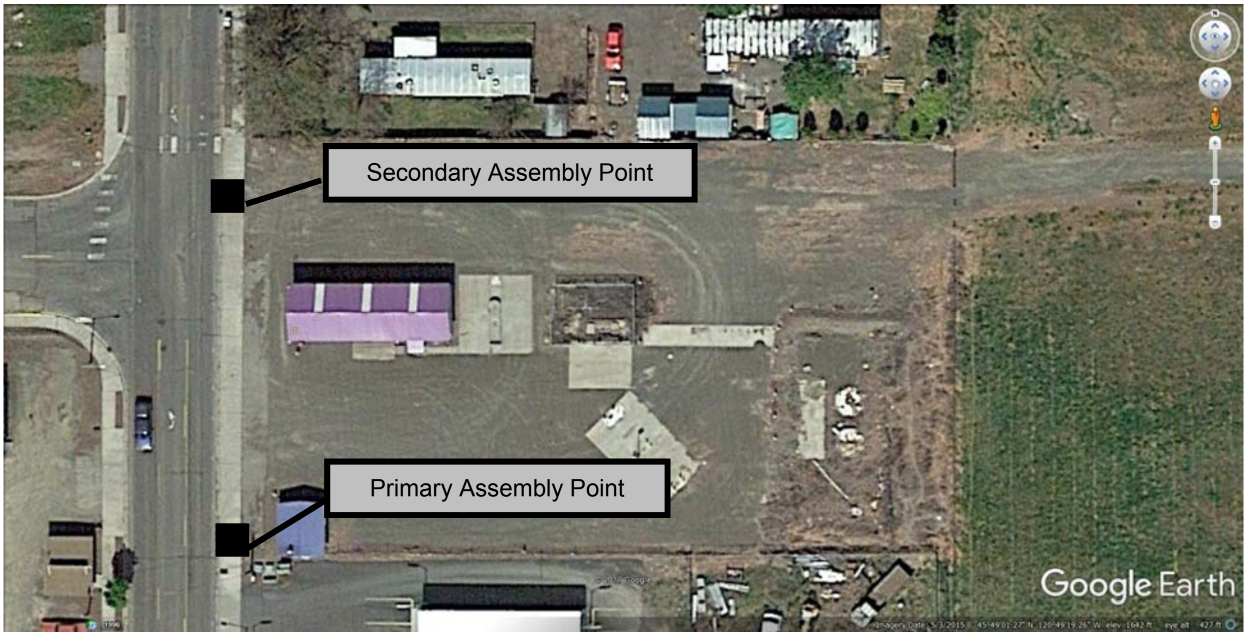
Starting From:	808 S Columbus Ave, Goldendale, WA
Arriving At:	310 S Roosevelt Ave, Goldendale, WA
Distance:	0.7 miles
Approximate Travel Time:	3 minutes



Directions:

1.	Head north on S Columbus Ave	0.2 miles
2.	Turn right onto E Collins St	0.5 miles
3.	Turn left onto S Roosevelt Ave.	266 feet

SITE MAP (INGRESS/EGRESS ROUTES AND EMERGENCY ASSEMBLY POINTS)



Primary Assembly Point:	Southwest corner of the site between existing building and S Columbus St
Secondary Assembly Point:	Northwest corner of the site on sidewalk

(Refer to associated Journey Management Plan for site-specific hazards and restrictions).

Chevron Facility 375289, 808 S Columbus Ave, Goldendale, WA

Purpose

This plan has been developed to clearly outline Leidos' responsibilities that are associated with project wastes, so that those responsibilities are executed according to applicable environmental regulations, DOT regulations, CEMC requirements, and Leidos procedures. This plan is intended to be used by employees of Leidos and its subcontractors; use by other entities will be at those parties' own risk.

Scope of Work

The scope of work for this project includes the drilling of forty-one soil borings, installation of two soil vapor points, and installation of three monitoring wells using a hand auger, development of the wells using bailers, and collection of groundwater samples using a peristaltic pump.

Anticipated Waste Streams

Waste that may be generated during field operations could include the following materials:

Soil

Soil waste is expected to be generated during drilling activities. The volume of soil is anticipated to fill 5 55-gallon drums.

Water

Aqueous waste is expected to be generated during well development, groundwater sampling, and equipment decontamination activities. The volume of water is anticipated to fill three, 55-gallon drums.

Investigation-Derived Debris

Uncontaminated or decontaminated, investigation-derived debris (concrete, asphalt) is expected to be generated during well construction and drilling activities. The volume of debris is anticipated to fill four, 55-gallon drums and will be disposed by the drilling subcontractor at a facility that accepts such waste. Containers used to mix well sealing materials (neat cement grout) will be transported offsite by the drilling subcontractor.

Expendable Solid Waste

Expendable solid waste associated with general field operations, such as lightly-soiled gloves, disposable sample tubing, bailers, cardboard, paper, plastic, etc. will be disposed as sanitary waste by the drilling subcontractor or Leidos personnel. The volume of waste is anticipated to fill eight, 30-gallon trash bags.

Containment and Labeling Requirements

Soil and aqueous waste will be segregated and stored in DOT-approved, 55-gallon capacity, steel drums (new or reconditioned, open-head drums for soil and new, closed-head drums for liquids). When feasible, the integrity and condition of all waste containers will be inspected and documented prior to use. Each drum will be labeled immediately before waste is placed into the container using a non-hazardous waste, hazardous waste, or pending analysis label. The following information will be written in indelible, waterproof ink on each label, at a minimum: container number, date of generation, facility address, CEMC Project Manager's name/telephone number, CEMC Business Unit, 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.

Each drum that will be used to contain liquids will be filled to a level that is no greater than 85% of the rated capacity of the container and will be outfitted with a secondary containment structure. Each empty waste container left onsite will be labeled accordingly.

Management of Waste Streams

The following measures will be taken to manage soil and aqueous waste at this site:

- Waste will be staged in an area that is acceptable to affected property owners and preferably in an area that is protected from traffic and isolated from pedestrians.
- An inspection will be conducted at the end of each day and prior to demobilization to ensure that all waste containers have been secured and are properly labeled.
- The FM will take photographs of the waste staging area prior to demobilizing from the site and will document the number and types of containers that are present onsite, the location of the containers, and any restrictions associated with the staging area. The FM will communicate this information to the Leidos PM after the field team has demobilized from the site.
- Leidos will provide CEMC with documentation of the status of waste at the site (approximate quantities, location, etc.). Leidos may coordinate and document the pickup of the waste by vendor(s) that will be contracted directly to CEMC.
- Leidos will not be responsible for the management or security of waste containers, except when Leidos is present onsite.

Leidos may collect characterization samples during field operations; however, Leidos will not be responsible to determine the regulatory status of waste (sign profiles) or to execute any shipping papers associated with waste (sign manifests, bills of lading, land disposal restrictions, or similar documents). CEMC or one of its ‘direct-billed’ vendors will sign all documents associated with the disposal of PSH, soil, and water from this site.

PSH, soil, and water will be transported from the site and disposed by CEMC-approved and ‘direct-billed’ vendors. Leidos will not subcontract for the transportation or disposal of such waste.

Reporting

The management and disposition of waste will be documented in field notes and a field activities report.

APPENDIX D—Safety Data Sheets

SDSs will be maintained onsite for each of the following chemicals:

- Asphalt patch
- Bentonite
- Concrete
- Horiba calibration fluid
- Isobutylene calibration gas
- Liquinox
- Silica sand