Interim Action Work Plan
Coleman Oil Yakima Bulk Plant

Site Name:	Coleman Oil Yakima Bulk Plant
Site Address:	1 East I Street, Yakima 98901
Ecology Site Cleanup ID:	13200
Facility/Site ID:	4233
Agreed Order:	DE 15639
ERTS ID Nos.:	663825, 670092

Prepared for:
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PBS Project No. 41392.000

August 16, 2018

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ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BTEX	Benzene, toluene, ethylbenzene, xylenes
COC	Contaminant/Chemical of Concern
CSID	Cleanup Site Identification number
CSM	Conceptual Site Model
CUL	clean-up levels
DTN	Depth to NAPL
DTW	Depth to Water
Ecology	Washington State Department of Ecology
FS	Feasibility Study
FOC	Fraction of Organic Carbon
FSID	Facility Site identification number
IAWP	Interim Action Work Plan
NAPL	Non-Aqueous Phase Liquid
MTCA	Model Toxics Control Act
PAHs	Polycyclic Aromatic Hydrocarbons
PCS	Petroleum Contaminated Soil
PID	Photoionization detector
QAPP	Quality Assurance Project Plan
RCW	Revised Code of Washington
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
TEE	Terrestrial Ecological Evaluation
TPH	total petroleum hydrocarbon
VCP	Voluntary Cleanup Program
VOCs	Volatile Organic Compounds
WAC	Washington State Administrative Code

1.0 INTRODUCTION

Coleman Oil entered an Agreed Order (No. DE 15639) with other potentially liable parties (PLPs) and the State of Washington Department of Ecology (Ecology). The effective date of the Agreed Order is March 29, 2018. The PLPs are currently:

- Coleman Oil Company, LLC (Coleman Oil)
- BNSF Railway Company (BNSF)
- Carol Jean Wondrack
- Wondrack Distributing, Inc.
- Chevron Environmental Management Company (Chevron)

This Order requires the PLPs to complete a Remedial Investigation (RI), Feasibility Study (FS), and to prepare Draft Cleanup Action Plan (DCAP) for the site identified by Ecology as the Coleman Oil Yakima Bulk Plant located at 1 East I Street in Yakima, Washington (the Site).

PBS Engineering and Environmental Inc. (PBS) has completed this Draft Interim Action Work Plan (IAWP) for the Site. The property is currently developed as a petroleum storage and active fueling facility.

This AIWP was developed as required by Exhibit B of the Agreed Order, *Scope of Work and Schedule*.

1.1 Site Description

The site is located in the northeast quarter of Section 13, Township 13 North, Range 18 East of the Willamette Base and Meridian (W.M.). The site is located in an industrial and commercial area of Yakima. The site is generally flat.

1.2 Adjacent Properties

The eastern portion of the subject property is Yakima County Parcel Number 18131314070 and the western portion of the subject property is a part of Parcel Number 18131399997, which is the BNSF easement. The property to the east of the site (Parcel 18131314441) is occupied by a Jack in the Box restaurant. The property to the northeast of the site (Parcel 18131314440) is occupied by Tammy's Mexican restaurant. The parcels to the north of the site (Parcels 18131314057 and 18131314901) are occupied by Carrier Transports Inc., which is a dealer of semi-truck trailers. The parcel to the west and northwest (Parcel 18131399997) is the easement for the BNSF railroad tracks.

1.3 Site Ownership and Operation

The eastern portion of the parcel (tax parcel #18131314070) was acquired by Standard Oil Company in 1908. It was owned by Standard Oil Company and thereafter its successor in interest, Chevron U.S.A., until 1986 when it was acquired by Joseph E. Wondrack and Carol J. Wondrack. The eastern portion of the site has been owned by Carol Jean Wondrack since February 2010. The western portion of the site (part of tax parcel #18131399997) is owned by BNSF Railroad as successor in interest to the Northern Pacific Railway Company, which acquired its interest in the parcel from the United States of America, pursuant to Section 2 of the Northern Pacific Land Grant Act of 1864. Wondrack Distributing, Inc. operated the bulk fuel distributing facility located at the Site from 1976 to August 1, 2015. Since August 1, 2015, the bulk fuel distributing facility has been operated by the Coleman Oil Company.

2.0 REGIONAL GEOLOGY AND HYDROGEOLOGY

The site is located in the Yakima Valley, which lies within the central portion of the Columbia River Plateau physiographic province. This province is comprised of a series of flood basalts covering much of central and eastern Washington. The basalt flows of the Columbia River Basalt Group (CRBG) are late Miocene Epoch and early Pliocene Epoch (between 17 and 6 million years ago) in age, forming an extensive volcanic plateau. The Yakima Valley lies between anticlinal ridges that generally trend east-west as part of the Yakima Fold Belt; which consists of basaltic lava flows that have faulted and folded from the late Tertiary to the present. Glacial outwash and river-deposited silt, sand and gravel deposits overlie the Columbia River Basalt.

The closest surface water to the site is the Yakima River, located approximately two miles to the northeast. The calculated groundwater flow direction is to the south-southeast, which is the approximate direction the Yakima River flows through this area of the valley.

The property is located within the flood plain of the Yakima River and is underlain in most areas by Quaternary-age alluvium and unconsolidated terrace deposits. The alluvium is composed of unconsolidated silt, sand, gravel, and cobble. It ranges in thickness from 0 to 120 feet with an average thickness of 20 feet (USGS, 2009). The underlying terrace deposits consist of coarse-grained gravel with discontinuous layers of silt, clay, sand, or cemented gravel. The terrace gravels generally occur at the surface away from the river, and beneath the alluvium adjacent to the river. The thickness of this unit ranges from 0 to 350 feet with an average thickness of 90 feet (USGS, 2009). These unconsolidated Quaternary deposits are overlain in some areas by artificial fill material up to 20 feet deep, and are underlain by consolidated, Tertiary-age, continental sediments, primarily of the Upper Ellensburg Formation.
https://fortress.wa.gov/ecy/publications/documents/1703008.pdf

The Yakima River basin aquifer system underlies about 6,200 square miles in south-central Washington. The aquifer system consists of basin-fill deposits occurring in six structural-sedimentary basins, the Columbia River Basalt Group (CRBG), and generally older bedrock. The basin-fill deposits were divided into 19 hydrogeologic units, the CRBG was divided into three units separated by two interbed units, and the bedrock was divided into four units (the Paleozoic, the Mesozoic, the Tertiary, and the Quaternary bedrock units). The thickness of the basin-fill units and the depth to the top of each unit and interbed of the CRBG were mapped. Only the surficial extent of the bedrock units was mapped due to insufficient data. Average mapped thickness of the different units ranged from 10 to 600 feet.

Lateral hydraulic conductivity (Kh) of the units varies widely indicating the heterogeneity of the aquifer system. Average or effective Kh values of the water-producing zones of the basin-fill units are on the order of 1 to 800 ft/d and are about 1 to 10 ft/d for the CRBG units as a whole. Effective or average Kh values for the different rock types of the Paleozoic, Mesozoic, and Tertiary units appear to be about 0.0001 to 3 ft/d. The more permeable Quaternary bedrock unit may have Kh values that range from 1 to 7,000 ft/d. Vertical hydraulic conductivity (Kv) of the units is largely unknown. Kv values have been estimated to range from about 0.009 to 2 ft/d for the basin-fill units and Kv values for the clay-to-shale parts of the units may be as small as 10-10 to 10-7 ft/d. Reported Kv values for the CRBG units ranged from 4×10-7 to 4 ft/d.
Source: https://wa.water.usgs.gov/projects/yakimagw/summary_of_results.htm

3.0 PREVIOUS SITE CHARACTERIZATION AND INTERIM ACTIONS

PBS completed site characterization investigations and interim cleanup actions at the Site beginning in June 2015. Investigations, interim actions and results are detailed in the Draft Data Summary Report for Coleman Oil Yakima Bulk Plant, PBS, dated May 18, 2018. The report includes figures, tabulated data, boring logs and sampling datasheets. A summary timeline is presented below:

Date	Activity	Summary
June 2015	Due Diligence Investigation	Complete push-probe soil borings/sampling to nine-foot depth to identify potential contamination concerns on the Site. TPHs, PAHs, lead and cadmium were identified in soil samples as contaminants of concern with concentrations exceeding the MTCA Method A Cleanup Levels.
March 2016	Diesel Fuel Release	A diesel fuel release from a subsurface line is confirmed. Site characterization and interim actions include stopping the release and conducting soil excavation work. Approximately 215 tons on PCS were excavated and disposed of off-site.
March 2016	Heat Oil Tank Removal	During excavation work a heat oil tank was discovered and decommissioned by removal.
April 2016	Well Installation	Three monitoring wells and one recovery well were installed on site. Monitoring wells are 2-inch diameter and screened from 15-25 feet bgs (MW1 – MW3). The recovery well is 4-inch diameter and screened from 15-30 feet bgs (RW1). Depth to water was approximately 19-feet.
May 2016	Groundwater Sampling	Static water levels ranged from 19.13 feet below top of casing (fbTOC) in MW1 to 19.18 fbTOC in MW2. Light, non-aqueous phase liquid (NAPL), in the form of diesel product, was identified in RW1 (4.2 feet thickness) and in MW3 (4.7 feet thickness).
May to August 2016	NAPL Removal	NAPL was removed directly from RW1 and MW3 using a peristaltic pump. Continuous NAPL removal was unable to be achieved and pumping ceased when NAPL thickness in the well was less than an inch. Eight removal events were undertaken and approximately 4-gallons were removed from MW3 and 48-gallons from RW1.
May 2016 – May 2017	Vacuum Extraction	Vacuum extraction included the rapid removal of NAPL, contaminated groundwater and soil vapor from select wells using a vacuum rig with catchment vessel. Eleven events were undertaken and an approximate total of 3,600 gallons of liquid were removed. Based on observations of storage totes by the subcontractor, it is estimated that 10%, or 360 gallons of diesel product were removed. It is unknown what volume of the contaminant load was removed as vapor.
November 2016	Well Installation	Three additional monitoring wells (MW4-MW-6) were installed and constructed as the originals monitoring wells.
December 2016	Groundwater Sampling	Static water levels ranged from 17.40 fbTOC in MW6 to 23.73 fbTOC in MW3. NAPL identified by the project laboratory as diesel product, was identified in MW5 (0.30-feet thickness). NAPL determined to be mixed diesel and gasoline product was identified in MW2 (8-feet thickness) and MW3 (0.14-feet thickness). RW1 and MW1 were not sampled, but NAPL was observed at thicknesses of 0.25-feet and 1.14-feet, respectively.

Date	Activity	Summary
December 2016	Vapor Intrusion Evaluation	Air samples were collected from outdoors, in the crawlspace and indoors in the office area. In general, contaminant concentrations indoors were similar to those detected outdoors.
June 2017	Aquifer Testing	A single well, rising head test was undertaken at MW4 and MW6 (No NAPL), for hydraulic conductivity determination.
June 2017	Groundwater Sampling	Static water levels ranged from 16.61 fbTOC in MW6 to 20.81 fbTOC in MW3. NAPL was identified in RW1 (1.48-feet thickness), MW1 (0.16-feet thickness), MW3 (2.87-feet thickness), and MW5 (0.66-feet thickness). NAPL in MW5 was identified as a diesel product and NAPL in MW3 was identified as mixed diesel and gasoline product.

4.0 PROPOSED INTERIM ACTIONS

The following interim actions are proposed at this time. Based on the findings of these interim actions, additional interim actions and/or changes to these interim actions may be appropriate. It is understood that Ecology will allow for addendums to this IAWP to be submitted, as the cleanup process proceeds.

4.1 NAPL Baildown Testing

The purpose of the NAPL baildown test is to estimate the NAPL transmissivity. NAPL transmissivity is a useful parameter in understanding the fluid mobility in the subsurface on Site. Gaining an understanding of NAPL transmissivity is necessary to design efficient interim and remedial recovery actions that maximize product recovery.

Pre-test Activities

The following activities will be undertaken prior to the baildown tests:

- NAPL density: Collect a sample of the NAPL from RW1 and MW3 and send to the project analytical laboratory for accurate density determination, and viscosity. Previously a default value of 0.8 g/cm^3 of density was used. Results of this analysis will allow for future modelling and selection of product recovery efforts.
- NAPL characterization: Measure NAPL thickness in all monitoring wells and collect samples of the NAPL from wells within the monitoring network where undiluted NAPL can be recovered. Samples will be analyzed for TPH-Dx, TPH-Gx, semivolatile organic compounds (SVOCs), and VOCs (including: benzene toluene ethylbenzene and xylenes (BTEX), methyl tertiary butyl ether, ethylene dibromide, and 1,2 dichloroethane. Based on laboratory results, additional analysis will be completed on samples with primarily gasoline range signature. These samples will be further analyzed for lead. The proposed analytical methods will allow for a full characterization of the type, and fraction of the NAPL composition. The laboratory data reports will also include a qualitative description of the gas chromatograph results to determine the composition of the NAPL. The chromatogram provided will provide the carbon range, and distribution to further identify the nature of the NAPL.

- NAPL thickness: As discussed above, NAPL thickness will be evaluated at all monitoring wells prior to conducting baildown tests. Based on previously conducted field efforts, it is assumed that MW-3 and RW-1 will have adequate thickness of NAPL to perform the baildown test. However, there is a potential for an upgradient well (MW-1), and a cross gradient well (MW-5) to have NAPL layers with a thickness of more than 0.5 feet. If these wells exhibit a thickness of over 0.5 foot, baildown testing will be conducted at these two monitoring wells.
- Confirm equilibrium conditions: Use hydrograph data and measurements taken immediately prior to the test to confirm depth to NAPL (DTN) and depth to water (DTW) are at equilibrium for the baildown test. Monthly gauging events are currently underway at the Site.

Baildown Tests

Baildown tests will be undertaken at RW-1 and MW-3 (and potentially MW-1 and MW-5, based on field observations). These wells have historically had the largest NAPL column height within the well. Furthermore, RW1 has a different well construction than the other monitoring wells (4-inch compared to 2-inch diameter and 30-foot compared to 25-foot depth bgs). RW1 is also the well selected for the pilot NAPL recovery event (Section 4.2).

The baildown tests will be undertaken using a disposable bailer, a peristaltic pump and interface probe. Dataloggers are not considered necessary for these tests as previous NAPL recovery actions have shown that NAPL on Site does not have a rapid recovery and can be actively tracked during the actual baildown tests.

The initial NAPL displacement will be undertaken using a disposable bailer at RW1, where the thickness of NAPL is greatest. For this well the bailer is ideally suited as it will provide rapid removal while minimally disturbing the water within the well casing. For MW-1, MW-3, and MW-5 a peristaltic pump will be used for initial NAPL displacement. This allows for a rapid removal that is near immediate. The depth to NAPL (DTN) measurement will be taken with an electronic interface probe directly after the NAPL removal. Comparison of the volume of NAPL removed to the initial displacement height allows for the approximation of effective well radius (casing plus gravel pack).

Subsequent removal of additional NAPL will be undertaken with a peristaltic pump at RW-1, which is less disruptive to well fluids than the bailer, once the majority of the product has been displaced. Once minimal NAPL is in the well (<5-inches), pumping will cease, and displacement measurements will begin. This will mark time zero on the time versus displacement curve.

At intervals, DTN and depth to water (DTW) measurements will be taken. As recovery is logarithmic in nature, measurement intervals will be taken at a lower frequency as NAPL recovers in the well. It is anticipated that measurements will be taken every 15 seconds for the first minute or two, and then reduced to every minute, every ten minutes and every 30 minutes until depth to NAPL reaches or approaches equilibrium. A total of 20 to 30 measurements are required to complete the analysis.

Data Analysis

For the purpose of estimating NAPL transmissivity from the data, the Bower-Rice solution (1976) will be utilized. It is linear and more simple than other solutions but should be accurate if recovery is slow, which is anticipated based on previous observations. Should line fitting prove difficult or the line concaves upward, another solution such as Cooper-Jacob (1946) or Cooper-Bredehoeft-Papadopulos (1967) can be utilized. These alternative solutions account for storage. A NAPL storage coefficient would have to be estimated, based on lithology, and entered as a parameter.

4.2 Multiphase Vacuum Extraction

Multiphase Vacuum Extraction (MPVE) includes the extraction of free product, impacted groundwater and vapor from select wells via rigid tubing and a mobile vacuum rig with containment vessel. An MPVE event will be undertaken after the NAPL Baildown testing (Section 4.1). It is considered likely that MPVE events will be undertaken in the near term on a monthly basis. However, the continuance and frequency of the MPVE events will be based on the findings of interim actions and subsequent valuation of MPVE as an interim action for this site.

PBS will conduct the following activities:

Coordinate and provide direct oversight of site activities.

- The vacuum rig subcontractor will be mobilized to the site for up to 6 hours per event.
- Measure NAPL present before and after MPVE events.
- Under vacuum, rigid tubing will be lowered into the NAPL and contaminated water. NAPL, vapor and contaminated water will be vacuumed from select wells directly to subcontractor's truck vessel via hoses.
- Prior to the departure of the subcontractor, PBS will measure DTN and DTW in the containment vessel, to make estimates of NAPL and water removed.
- It is estimated that a total of 200-600 gallons of total fluid will be recovered from select wells, per event. Subcontractor will transport and dispose of NAPL and contaminated water at a permitted facility.

4.3 Pump and Recovery Pilot Test

The pump and recovery pilot test will include pumping groundwater from RW1, beneath the NAPL, to create a cone of depression around the pumping well. By creating a groundwater gradient toward the pumping well, NAPL will migrate downgradient into the cone of depression, and will be recovered by the pump. The objective of the pilot test is to gain the necessary design parameters to efficiently design and implement a long term dual phase groundwater and NAPL removal interim action. More specifically the following design parameters will be obtained through this test:

- Approximate well yield at RW1. Determine a discharge rate needed to produce a drawdown that allows for effective NAPL removal. Knowing the discharge rate will also allow for best management of discharge water in the longer term interim action.
- Approximate radius of influence. Determine a discharge rate, and subsequent drawdown, that will create a cone of depression extending across most of the site, at a gradient that is significant to allow for NAPL migration toward the pumping well.
- Approximate NAPL Removal Rate. The system design should allow for a NAPL removal rate that substantially removes the occurrence of NAPL on-site.

- Optimized design efforts: Provides the necessary data to characterize NAPL properties to implement an interim action for current conditions, which could prevent further NAPL migration. A delayed remedial action could lead to conditions where NAPL capture or other remedial actions are substantially more difficult and cost prohibitive to implement

The pilot test is further described as follows:

Step-drawdown aquifer test

The following are key components of the pilot test:

- Three vented pressure transducers with data loggers (In-situ Level Troll 700 or approved equivalent).
- A downhole electric pump (Whale Super Purger, Grundfos RediFlo3^{TM} or approved equivalent). Discharge controlled with an electric controller or physically with a ball valve.
- A Geotech Geopump peristaltic pump or approved equivalent.
- Separate discharge vessels for groundwater (300-gallon totes or larger steel vessel) and NAPL (300-gallon tote). Water will be characterized and disposed of at a licensed facility. The water and NAPL totes are assumed to be nonhazardous and will not require onsite treatment prior to disposal. Prior to offsite transport, the waste profiles and manifests will be provided to the designated facility and/or Health District. Totes will be placed within a secondary containment structure to prevent offsite discharges in the event of a leak or spill.

Set up dataloggers in monitoring wells MW4, MW5 and MW6. The dataloggers will only produce DTW data. This data will be supplemented with manual DTN and DTW measurements taken every hour with an interface probe.

Place a water pump near the base of RW1. Begin pumping at a low flowrate (<0.5 gpm). Take DTN and DTW measurements with the interface probe until they stabilize at that pumping rate. Discharge rate will be increased in this way until significant and sustainable pumping is attained, which may be based on discharge rate or drawdown.

Constant discharge aquifer test

Maintain the discharge rate determined in the previous step for a minimum of four hours, if possible, and up to 12-hours. The duration of this test will depend on discharge rate and the ability to manage water, drawdown and DTN/DTW in RW-1. Several totes will be onsite and will be the primary water containment mechanism. To be conservative, a portable 5,000-gallon banker tank will also be onsite should the totes not provide enough capacity. Following the completion of the constant discharge aquifer test, the results will be evaluated with known field parameters, and the use of standard semi-analytical modelling to estimate the radius of influence of the extraction. Results can be used to further refine future remedial action effectiveness assessments.

NAPL Recovery

The constant discharge should be allowed to continue uninterrupted for a significant period of time (2 to 4-hours). However, NAPL recovery may begin anytime as needed to keep the pump in groundwater.

Set up the peristaltic pump and tubing so that the tubing inlet is in the center of the NAPL column and outlet is in the catchment vessel. Take DTN/DTW measurements prior to pumping and then begin pumping at a low setting. As the test proceeds, the tubing may need to be constantly adjusted to ensure that the inlet tubing is maintained within the center of the NAPL column. Record estimated discharge rates using a stopwatch and measuring container.

If NAPL elevations are stable during pumping, incrementally increase discharge until a maximum sustainable rate is known. Pumping NAPL and maintaining equilibrium may not be possible. Remove all NAPL in the well column and measure recovery after pumping has ceased. The NAPL recovery may need to be continued after pumping has ceased. DTN, DTW and discharge rates will be noted throughout NAPL recovery testing.

4.4 Interim NAPL Removal Design

Design an interim NAPL removal system for the existing RW-1 location following the baildown and pump test events. The interim design will take into consideration the results of the pump test(s) and effectiveness of fluid drawdown and NAPL skimming recovery. Costs, schedule and implementation will be evaluated as part of the design.

The interim NAPL removal system would include downhole pumps, controller and temporary staged containers for fluids removed from the wells. The design may consider the placement of one to two additional 4-inch recovery wells on the Site. The containerized fluids would periodically be pumped and transported for off-site removal.

It may also be appropriate, based on water discharge volumes, to apply for and utilize a City of Yakima Authorization to Discharge Permit, in accordance with the provisions of City of Yakima Municipal Code 7.65 Sewer Use and Pretreatment Regulations.

4.5 Pilot Scale Biosparge System

It is understood that the results of these field tests, could lead to conclusions, such as high transmissivity, which would result in an insufficient control, or excessive water being generated. As part of this design, additional controls will also be evaluated that could be used in conjunction with the extraction process. These controls include installation of a biosparge system to raise dissolved oxygen levels within the aquifer to promote aerobic degradation of the NAPL. Pilot scale testing will include installation of 2 sparge wells in the vicinity of RW-1 and MW3, to determine the effectiveness of this treatment technology.

5.0 SCHEDULE

It is understood that the NAPL Baildown pre-test activities and the NAPL Baildown testing will occur in September 2018. Results from these activities and the RIWP activities will determine the most appropriate way forward the early time schedule will be formalized at that time.

PBS will conduct the approved IAWP task upon approval form Department of Ecology. The proposed schedule to implement the IAWP scope is a s follows:

NAPL Baildown Testing:	15 to 45 days from IAWP Approval
Multiphase Vacuum Extraction Events:	Monthly, as needed
Pump and Recovery Pilot Test:	30 to 60 days from IAWP approval
Interim NAPL Removal Design:	60 to 90 days from IAWP approval
Pilot Scale Biosparge System	TBD
Reporting (see Section 6.0)	

6.0 REPORTING

Through implantation of the Interim Action Work Plan, 3 reports will be submitted to the Department of Ecology, and includes the following:

NAPL Baildown Summary Report: Within 60 days of completion of the baildown test, a summary report will be submitted to the Department of Ecology. This report will include a summary of all analytical data, along with laboratory data packages, field observations, photographs taken, and a summary of key findings.

Pumping and Recovery Pilot Test Report: Within 60 days of completion of the aquifer test, a summary report will be submitted to the Department of Ecology. This report will include key findings, waste profiles, volume of water and NAPL generated, and recommended recovery options.

Preliminary Conceptual Design for Interim NAPL Systems: Within 60 days of the submittal of the previous report, a conceptual design of NAPL recovery systems, and proposed treatment strategies will be submitted to Ecology.

7.0 HEALTH AND SAFETY PLAN

A Health and Safety Plan (HASP) has been developed to identify and address hazards related to work activities presented in both this IAWP and the Remedial Investigation Work Plan (RIWP). It is included as Attachment A.

8.0 SAMPLE AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN

A Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) has been developed to meet the substantive requirements of MTCA, as presented in WAC 173-340-820 *Sampling and Analysis Plans*. The SAP supports both the this IAWP and the RIWP as presented in Attachment B.

9.0 COMPLIANCE MONITORING PLAN

Compliance Monitoring is required to meet the substantive requirements of MTCA, as presented in WAC 173-340-410 *Compliance monitoring requirements*. The Compliance Monitoring Plan (CMP) addresses protection and performance monitoring for activities proposed in this IAWP. Compliance monitoring at this phase of the project includes the following:

- Adhere to permitting and notification requirements of regulatory agencies.
- Follow the site-specific HASP and PBS internal Health and Safety Manual. Hold a "tailgate" meeting each day prior to work. The tailgate meeting will include reviewing the scope of work for the day, reviewing/updating the HASP and requiring any contractor to discuss hazards and mitigation related to their scope/equipment. An appropriately sized spill kit and response plan will be on hand any time work activities include NAPL handling.
- Incorporate elements of the SAP/QAPP as required in sections (3)(a)(b), including an understanding of the statements and objectives, data analysis and evaluation procedures.

It is understood that the CMP will continue to be developed throughout the IA and RI stages of the project. A more formal CMP, which includes Conformational Monitoring will be finalized as part of the Cleanup Action Plan, as permitted in Section (2): General Requirements.

10.0 PERMITTING

The following are identified permitting or notification requirements:

- Northwest Utility Notification Center – In accordance with Chapter 19.122 RCW, notification shall be undertaken prior to any excavation work, including vertical borings.
- Well Construction Notice of Intent – At least 72 hours prior to installing monitoring well a NOI must be filed with the Depart of Ecology.
- Off-Site Soil Disposal – PCS exported from site must be disposed of to an appropriately licensed/permitted facility. If the disposal facility is in Yakima County approval shall be obtained from the Yakima Health District. Disposal documentation will be retained by Coleman Oil.
- Off-Site Fluids Disposal – Recovered fuel or contaminated groundwater exported from the site must be accepted by an appropriately licensed/permitted facility. Disposal documentation will be retained by Coleman Oil.

11.0 CLOSURE

PBS has prepared this IAWP for use by the Coleman Oil Company. It will be submitted to the Department of Ecology as a requirement of the Agreed Order.

Sincerely,
PBS Engineering and Environmental Inc.

Digitally signed by Ken Nogeire
Date: 2018.08.16 16:01:51 -07'00'

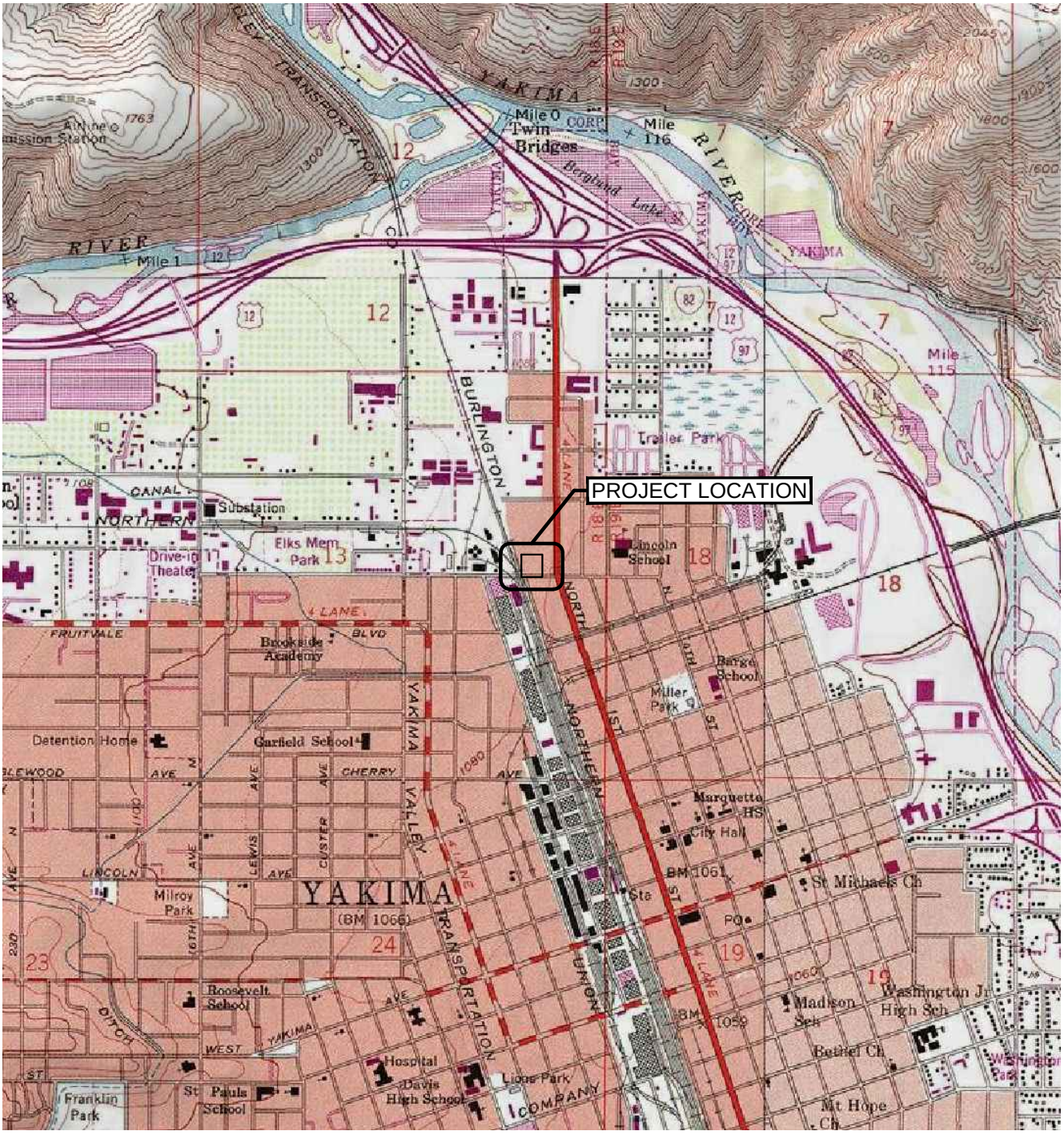
August 16, 2018
Ken Nogeire, LHG — Date
Senior Geologist/Hydrogeologist

Digitally signed by Nathan Williams, PE
Date: 2018.08.16 16:12:57 -07'00'

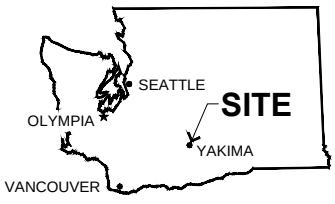
August 16, 2018
Nathan Williams, PE — Date
Senior Environmental Engineer

August 16, 2018
Thomas Mergy, LHG — Date
Senior Hydrogeologist
Environmental Services Manager

FIGURES



SOURCE: USGS YAKIMA WEST, WA QUADRANGLE 1985



WASHINGTON

Scale 1" = 2,000'

0' 1,000' 2,000' 4,000'

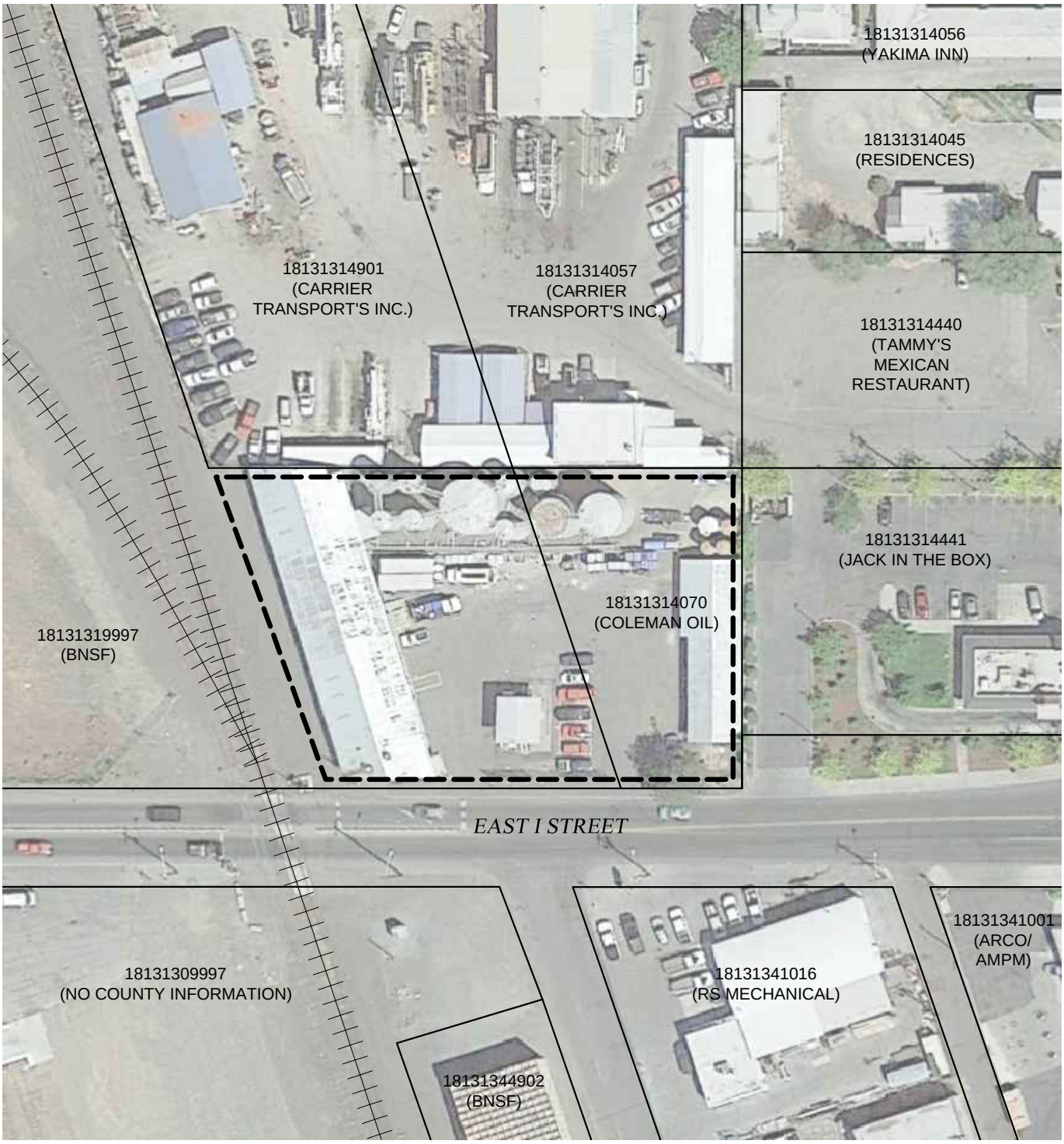
PREPARED FOR: COLEMAN OIL

VICINITY MAP

1 EAST I STREET
YAKIMA, WASHINGTON

JUL 2018
41392.000

FIGURE
1



SOURCE: © 2016 GOOGLE EARTH PRO

LEGEND

APPROXIMATE PARCEL BOUNDARIES

SUBJECT PROPERTY

Scale 1" = 80'

0' 40' 80' 160'

PREPARED FOR: COLEMAN OIL

SITE PLAN

1 EAST I STREET
YAKIMA, WASHINGTON

JUL 2018
41392.000

FIGURE
2

SOURCE: © 2017 GOOGLE EARTH PRO

LEGEND

- MW-1 — EXISTING WELL NUMBER AND LOCATION (RW-1, MW-1 - MW-6)
- S1 — NEAR SURFACE SOIL SAMPLE NUMBER AND APPROXIMATE LOCATION (APRIL 2015)
- S11 — SOIL BORING NUMBER AND APPROXIMATE LOCATION (APRIL 2015)
- VS1 — VAPOR SAMPLE NUMBER AND LOCATION
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- FORMER SUBSURFACE FUEL LINES

Scale 1" = 30'

0' 15' 30' 60'

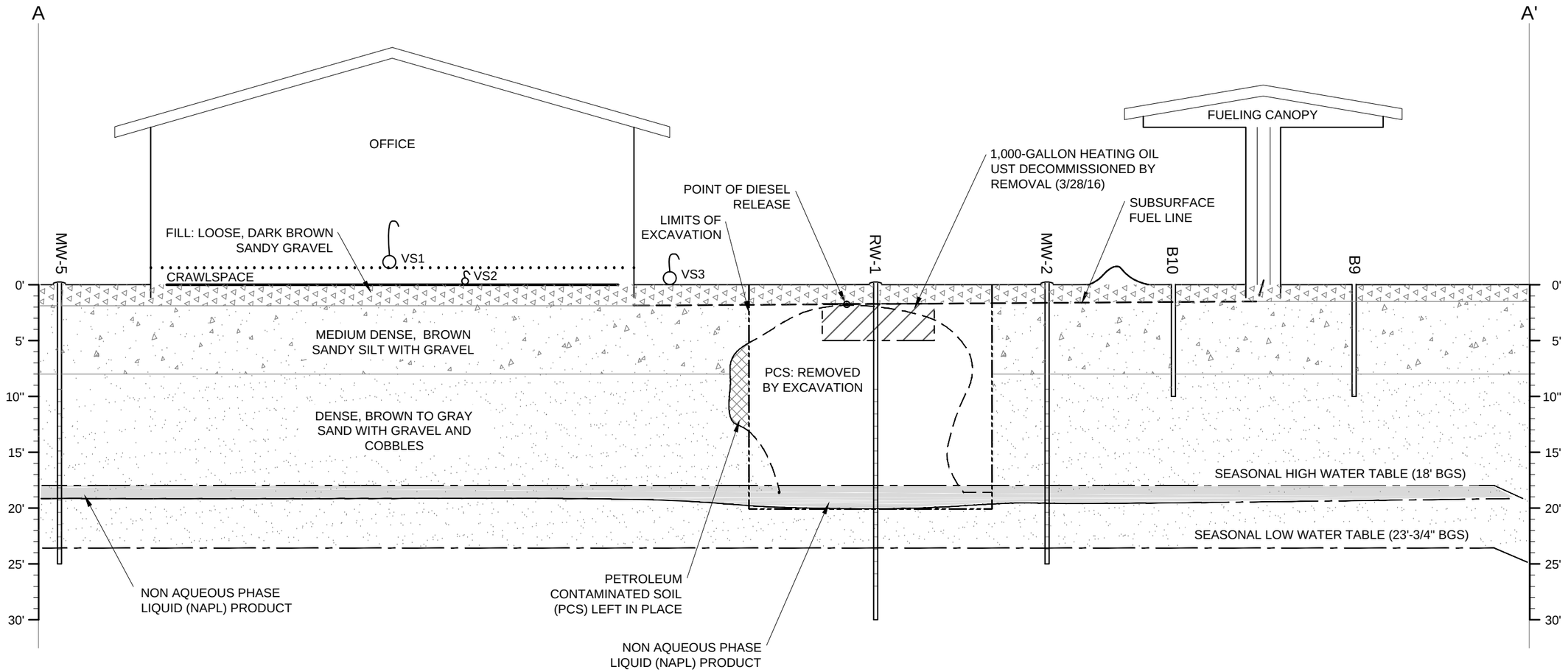
PREPARED FOR: COLEMAN OIL

SITE PLAN: CHARACTERIZATION SAMPLE LOCATIONS

1 EAST I STREET
YAKIMA, WASHINGTON

JUL 2018
41392.000

FIGURE
3



CROSS-SECTION A - A'

LEGEND

VS3 VAPOR SAMPLE LOCATION AND NUMBER

Scale 1" = 10'

0' 5' 10' 20'

PREPARED FOR: COLEMAN OIL

PBS Engineering and Environmental Inc.
2517 Eastlake Ave East, Ste 100
Seattle, WA 98102
206.233.9639
pbsusa.com

COLEMAN OIL

CROSS-SECTION A - A'

1 EAST I STREET, YAKIMA, WASHINGTON

PROJECT
41392.000
DATE
MAY 2018
SHEET ID
6

Full Size Sheet Format Is 11x17; If Printed Size Is Not 11x17, Then This Sheet Format Has Been Modified & Indicated Drawing Scale Is Not Accurate.

ATTACHMENT A

Health and Safety Plan

Site-Specific Health and Safety Plan
Investigative and Remedial Actions

PBS Project Name:	Coleman Oil Yakima Bulk Plant
PBS Project Number:	41392.000
Property Address:	1 East I Street, Yakima, WA 98901
Proposed Scope of Work:	Interim Actions for petroleum based NAPL testing/removal; Site Characterization drilling, well installation, soil, soil gas and groundwater sampling/monitoring
HASP Preparation Date:	June 27, 2018
HASP Preparer:	Ken Nogeire, LHG
HASP Reviewer:	Tom Mergy, LHG

All work that PBS employees perform is conducted under the PBS Safety Plan, which provides the basis upon which safety decisions should be made to maintain a safe and healthy work environment. All employees are required to read and abide by the contents in the PBS Safety Plan as a condition of employment.

A site-specific health and safety plan (HASP) is created to serve as a tool by which information about a project can be communicated to employees prior to field activities. As allowed under 29 CFR 1910.120(b)(1)(ii)(C), this HASP supplements the PBS Safety Plan and does not repeat standard operating procedures for safety and health. The information contained in this HASP is site-specific and directly applicable to the proposed scope of work.

The procedures and requirements contained in this HASP are intended for PBS personnel performing field activities. PBS Subcontractors have the sole responsibility for safety of their own personnel.

If field conditions change or are different than what was assumed during HASP preparation, this plan shall be modified to reflect the current conditions.

A. PROJECT CONTACTS

PBS Project Manager

Ensures that HASP is complete and employees are in compliance with HASP

Name:	Ken Nogeire
Office #:	206.233.9639
Mobile #:	509.572.8163

PBS Site Safety Officer

Responsible for implementation of HASP during field-related activities (PBS Project Manager may serve this role)

Name:	Ken Nogeire
Office #:	206.233.9639
Mobile #:	509.572.8163

Client Contact

Name:	Jim Cach
Office #:	NA
Mobile #:	208.791.6288

Emergency Telephone Numbers

Ambulance/Police/Fire 911
Poison Control Center 800.222.1222
National Response Center 800.424.8802
EPA Environmental Response Team 206.553.1200

Utility Notification Center (Washington) 800.424.5555
Puget Sound Energy Gas - Emergency 888.225.5773
Washington OSHA Central (Tumwater) 360.902.4200

B. NEAREST HOSPITAL / EMERGENCY MEDICAL CENTER

Facility Name: Memorial Hospital
Street Address: 2811 Tieton Dr.
City, State: Yakima, WA
Phone # : 509.575.8000

Route directions:

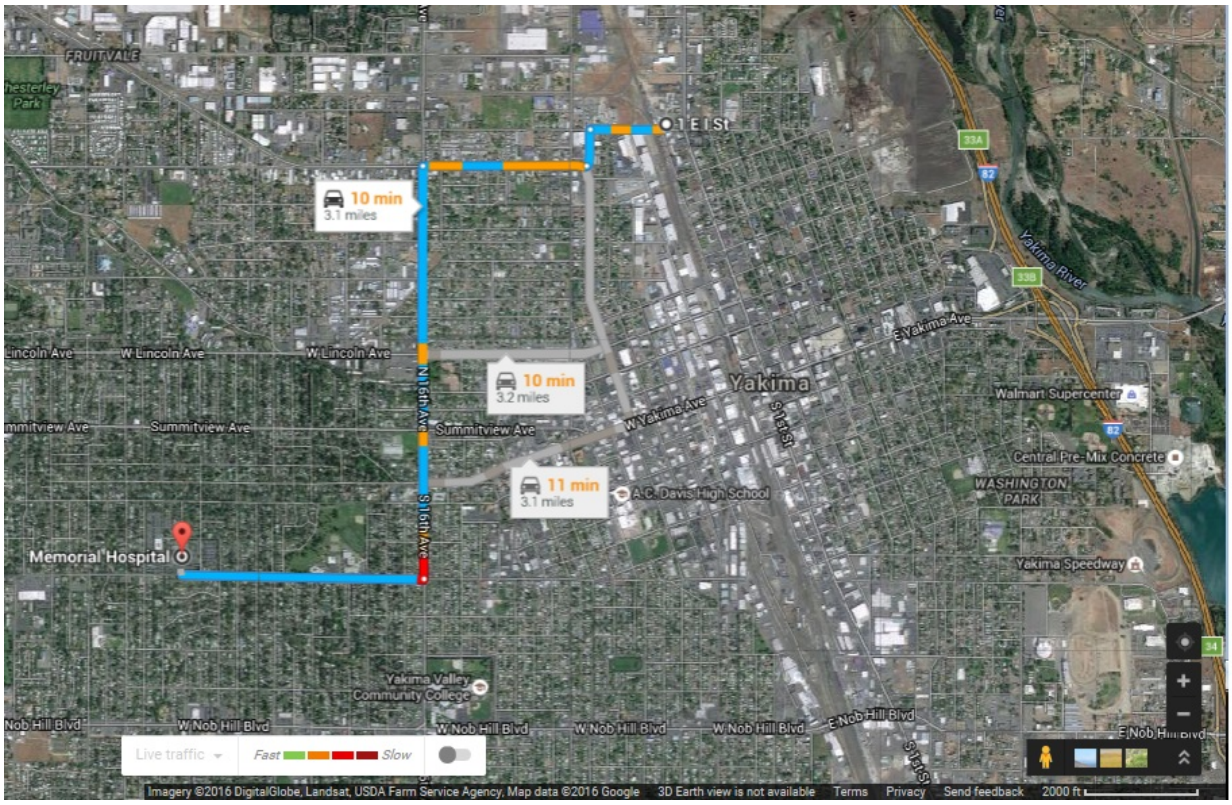
Head west on E. I Street

Turn left onto N. 5th Ave

At the traffic circle, take the first exit onto Fruitvale Blvd

Turn left onto N. 16th Ave

Turn right onto W. Tieton Dr (destination will be on your right)



C. CONTAMINANTS OF INTEREST

The proposed activities may encounter contamination in water (ground or surface), soil, or soil gas at the site. Suspect or known contaminants of interest are listed in Table 1.

Table 1. Potential Contaminants of Interest and Exposure Pathways

Substance	Potential Media			Concentrations (List value if known, include units)
	Soil	Water	Soil Gas	
Diesel-range	☑	☑	☑	NAPL
Gasoline-range	☑	☑	☑	NAPL
Heavy Oil-range	☑	☑	☐	NAPL
Waste Oil	☐	☐	☐	
Benzene	☑	☑	☑	NAPL
Toluene	☑	☑	☑	
Ethylbenzene	☑	☑	☑	
Xylenes	☑	☑	☑	
Naphthalene	☑	☑	☑	
PCBs	☐	☐	☐	
(list individual heavy metals)	☐	☐	☐	
(list individual PAHs)	☐	☐	☐	
(list individual VOCs)	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

D. JOB HAZARD ANALYSIS (JHA)

Hazards at a job site typically fall into physical, chemical, and biological categories. A job hazard analysis (JHA) is a technique that focuses on job tasks as a way to identify and mitigate or eliminate hazards.

The duties for this job are:

- Gauge diesel and gasoline NAPL thickness
- Conduct NAPL removal/baildown
- Pumping Pilot Test
- Drilling oversite for soil assessment, soil vapor bore installation, monitoring well installation
- Sample soil, soil gas, groundwater and NAPL

The following table provides a JHA for the potential risks and hazards that may be present during field activities.

Table 2. Job Hazard Analysis

Field Activities	Risks / Hazards	Recommended Mitigation / Controls
Measuring, handling, extracting free petroleum products (gasoline and diesel)	Chemical exposure Fire / Explosion	• Review this hasp with the contractor. Discuss hazards and mitigation related to contractor equipment (rig grounding). • Discuss planned activities and free product with other onsite personnel. • Have a spill kit in the work area that includes absorbants and bags or bin. • Survey for possible ignition sources prior to opening wells • Use intrinicaly safe Interface probe to measure product thickness in well. • Reel up IP and lift hose up through papertowel to remove free liquid. Discard paper towel. • Wear nitrile gloves • Clear escape route and rendevous point.

Field Activities	Risks / Hazards	Recommended Mitigation / Controls
Work around and with large equipment (such as a drill rig)	Vehicular traffic and large equipment operation	• Communicate scope of work/tasks to equipment operators and ground personnel during daily tailgate meeting. • Verify where equipment operator wants ground personnel to stand. • Stay alert to vehicle operations; stay clear of them during movement. • Wear safety vest for high visibility. • Wear hard hat and safety-toed shoes; follow personal protective equipment (PPE) requirements in this HASP. • Communicate with subcontractor on information you need. • Pay attention to what is going on around you when taking photos or notes.
	Noisy environment	• Bring and wear hearing protection; follow PPE requirements in this HASP.
	Airborne debris from equipment movement or operation	• Stay clear of equipment when in operation . • Wear safety glasses if warranted; follow PPE requirements in this HASP. • Maintain upwind position when possible.
	Subsurface or overhead utilities may be encountered or impede field activities	• Coordinate with the subcontractor to have public and private utilities located prior to commencement of work. • Have property owner provide locations of on-site private utilities. • Utilize alternate drilling methods , such as hand augering or a vactor truck, if location and depth of utilities are unknown or pose a risk.
Carry monitoring and sampling equipment from field vehicle to work zone	Equipment may be heavy or awkward to lift and carry	• Plan your route to work zone. • Carry equipment in field vehicle to greatest extent possible. • Do not overload; make multiple trips if needed. • Get assistance to carry items.
Work in vicinity of and with contaminated media (soil, soil gas, groundwater)	Ingestion of or dermal contact with contaminants of concern (contaminated soil or groundwater)	• Wear gloves (typically nitrile); dispose of gloves as appropriate for site conditions. • Minimize time in contact with soil and groundwater. • Decontaminate or dispose of sampling equipment as appropriate for site condition. • Wash hands and face prior to eating.

Field Activities	Risks / Hazards	Recommended Mitigation / Controls
	Inhalation of vapors from contamination	• Monitor breathing space in work zone with photoionization detector (PID) and make adjustments to location or PPE as necessary. • Stand upwind of borehole/drill rig. • Communicate with subcontractor on PID readings and take appropriate action when necessary. • Do not stand directly over boreholes.
Working outside	Weather (heat, strong winds, cold)	• Check weather report when preparing for the field. • Bring weather-appropriate clothing and outerwear. • Refer to PBS safety procedure on heat and cold stress. • Stay hydrated and eat at regular intervals.
	Encounter angry tenants, neighbors, or transients	• If possible, have client/property representative alert tenants to site visit prior to it occurring. • Keep cell phone charged and available for quick use. • If known in advance to be a hazard, use the buddy system. • Do not engage people in discussion unless warranted.
	Disturbing dogs, larger animals, or insects	• Be alert for these conditions. • Do not disturb the animals; do not enter their areas. • Work with the property owner if access is needed.
	Encountering poisonous plants	• Know how to identify poisonous plants if known or suspected to be present at site. • Wear long pants and long sleeves, if warranted. • Have disposable gloves available to use. • Have steroid cream or similar product available in case there is accidental exposure.
	Slips, trips, or falls on uneven ground or due to equipment, cords, or other materials lying on ground	• Watch where you are walking. • Do not take shortcuts – determine the safest path before proceeding.
Driving to site	Accident	• Know where you are going. Have directions ready • Do not use mobile phone • Make sure vehicle has been serviced appropriately
Additional Observed Hazards	Railroad Operations	• Coordinate with BNSF when working within 25 feet of the railroad • Do not walk on,or cross tracks

Field Activities	Risks / Hazards	Recommended Mitigation / Controls
		•
		•

E. EMPLOYEE TRAINING REQUIREMENTS

- Review HASP; sign acknowledgement page
- Review site-specific work plan
- Attend tailgate safety meeting

F. AIR MONITORING REQUIREMENTS

Equipment:	NA
Calibration gas:	Isobutylene
Action Limit Concentration:	10 ppm
Minimum Frequency of Measurements:	Hourly during drilling activiites

G. PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE is selected based on the contaminant type(s), concentration(s) in applicable matrix (soil, water, air) and the known route(s) of entry into the human body. Project personnel are not permitted to use lower levels of protection from the specified levels of protection without the prior approval of the Site Safety Officer.

PPE Level:	Modified Level D
Safety Boots (toe protection):	Required
Hard Hat:	Required when working around heavy equipment
Safety Vest:	Required when personal visibility is necessary
Safety Glasses/ Goggles:	Required when working near drill rig
Hearing Protection:	Required when working around loud equipment.

Gloves:	Nitrile gloves used during sample collection (including purging and preparatory activities)
Level C PPE: (respirator and chemical-resistant clothing)	Not required for this project. If PID readings exceed action levels, this HASP must be modified to reflect requirements for proceeding under Level C PPE.

H. HAZWOPER-SPECIFIC REQUIREMENTS

Emergency Response

Attachment 1 is a standard emergency response plan. Site-specific information is provided below. If site conditions warrant a detailed emergency response plan, this HASP must be modified to include it.

Decontamination

Decontamination procedures should be described in a site-specific work plan. If site conditions warrant upgraded decontamination procedures, this HASP must be modified to include them.

Confined Space Entry

Not expected on this project.

PBS employees are not allowed to enter permit-required confined spaces. Refer to PBS Safety Plan for more details.

Medical Surveillance

Not specifically required for this project.
Refer to PBS Safety Plan for the corporate medical surveillance program.

Site Control / Work Zones

Drilling locale must be made visible and only people working on the project are allowed near the drill rig and other heavy equipment.

If site conditions warrant separate work zones, this HASP must be modified to identify Exclusion (Hot), Decontamination (Warm), and Support (Cold) Zones.

I. ACKNOWLEDGEMENT PAGE

SITE: Coleman Oil – Yakima, Washington

PROJECT NUMBER: 41392

PBS Employees: *I have read this HASP and will abide by the requirements specified for this project.*

NAME	SIGNATURE	DATE

Non-PBS Employees: *I have attended a tailgate safety briefing or have been briefed on site hazards by the Site Safety Officer.*

NAME	SIGNATURE	COMPANY	DATE

ATTACHMENT 1 – STANDARD EMERGENCY RESPONSE PLAN

This standard Emergency Response Plan is provided to guide the Site Safety Officer (SSO) during emergency situations. Such situations include but are not limited to: fire or explosion, medical emergencies, and uncontrolled contaminant release.

The following emergency equipment shall be kept on site:

- A fire extinguisher will be kept in the PBS field vehicle. A fire extinguisher must also be kept in vicinity of drilling activities (typically the responsibility of the drilling contractor). The extinguisher will be Type ABC approved by the National Fire Prevention Association (NFPA). The extinguisher will be serviced or replaced yearly.
- A first-aid kit will be available in the PBS field vehicle.
- PBS employees will carry a mobile phone or other appropriate emergency communication device (e.g., satellite personal tracker) to the project site.

Plan Implementation

The Site Safety Officer (SSO) will have primary responsibility for directing activities in the event of an emergency situation. The SSO will evaluate the situation and will determine the need to implement the emergency procedures in concert with other personnel (may include client representatives and the Project Manager). Other field personnel will assist the SSO as required during the emergency.

If the Emergency Response Plan is implemented, the SSO or designees are responsible for alerting all personnel at the affected area by use of a signal device (such as a hand held air horn), visual, or shouted instructions, as appropriate.

Emergency Contacts

Contact phone numbers and hospital information must be provided in each site-specific health and safety plan (HASP). The HASP will be kept in the SSO's vehicle or other unlocked location so that PBS field personnel and subcontractors can readily access it.

Fires

If a fire occurs, the area should be evacuated and a call placed to 911 for the local fire department. If immediate use of a fire extinguisher for a small, non-explosion-related fire can reduce the chance of injury or property damage, then it may be done with caution but is not required. If an explosion appears likely, evacuate the area immediately and call 911. The PM should be informed immediately of the situation.

Medical Emergencies

If a worker is seriously injured or becomes ill or unconscious, call 911. If a worker leaves the site to seek medical attention, another worker must accompany the patient to the medical facility.

When in doubt about whether medical attention is necessary, always seek medical attention as a conservative approach. Notify the PM of the outcome of the medical evaluation as soon as possible.

In the event that a seriously injured person is also heavily contaminated, inform the emergency personnel immediately prior to their transporting the person off-site. Less severely injured individuals may have their protective clothing carefully removed or cut off before transport to the hospital.

Spills or Leaks

PBS and its subcontractors will follow all applicable local, state, and federal regulations regarding petroleum or hazardous substance releases. Following any quantity of release, the PM (if not on site) will be notified, and notification will be made to regulatory agencies, as appropriate.

Emergency Notification, Documentation and Review

The PM and/or the SSO will notify the PBS Human Resources Manager as soon as possible after an emergency situation has been stabilized. The PM will also notify the appropriate client contacts and regulatory agencies, if applicable. If an individual is injured, the PM will complete and submit a PBS Accident Report within 24 hours.

The PM and a PBS senior manager will critique the emergency response action following the event. The results of the review will be used to improve future Emergency Response Plans and actions.

ATTACHMENT B

Sampling and Analysis Plan
Quality Assurance Project Plan

Sampling and Analysis Plan
Quality Assurance Project Plan

TABLE OF CONTENTS

1.0 INTRODUCTION

The Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) have been developed to meet the substantive requirements of MTCA, as presented in WAC 173-340-820 *Sampling and Analysis Plans*. The SAP/QAPP supports both the RIWP and the IAWP, as required by Exhibit B of the Agreed Order, *Scope of Work and Schedule*.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project team members and roles and responsibilities for interim action and remedial investigation activities are summarized below.

2.1 Project Communications

Personnel from the Department of Ecology and each of the PLPs is designated as a lead representative for communication.

Personnel	Project Role	Phone #	Email
WA State Department of Ecology			
Frank Winslow	Ecology Project Coordinator	509-454-7835	fwin461@ECY.WA.GOV
Coleman Oil			
Jim Cach	PLP Project Coordinator	509-396-2177	Jim@colemanoil.com
PBS Engineering			
Ken Nogeire	Coleman Oil's Consultant Project Manager	509-572-8163	Ken.nogeire@pbsusa.com
BNSF			
Shane DeGross	BNSF Lead	253-591-2567	shane.degross@bnsf.com
Wondrack			
John Schultz	Wondrack Lead	509-736-1330	jschultz@tricitylaw.com
Chevron			
Mark Horne	Chevron Lead	925-842-0973	MarkHorne@chevron.com

3.0 SAMPLING AND ANALYSIS

3.1 Soil Investigation

A total of fourteen (14) test borings will be advanced to depths of 12 feet (or deeper if conditions allow) on the Site to characterize soil conditions across the Site. A direct push drilling rig (track mounted Geoprobe 7822 DT or similar) will be used for the test borings. PBS will field screen soil samples from the proposed locations by hand-held photoionization detector (PID) and by visual and olfactory means. Soil samples will be collected from soils exhibiting field indications of contamination or, in the absence of field indications of contamination, from representative intervals and/or at changes in lithology. PBS will log the soils, making note of grain size, color and odor, and other relevant observations.

Based on previous investigations it is not anticipated that groundwater will be reached with the direct push drilling method. However, should recoverable groundwater be encountered a groundwater "grab" sample will be collected by lowering a temporary well screen into the open borehole and collected by use of a peristaltic pump.

PBS Standard Operating Procedure (SOP) for drilling and soil sampling adds further detail and is included in Attachment B of the RIWP.

The approximate locations of proposed soil borings are presented on Figure 2 of the RIWP: Sample Locations.

3.2 NAPL and Groundwater Sampling

Conduct a groundwater monitoring event (GME) on the monitoring well network (total of 11 wells) located at the project site as follows:

- Gauge depth to water (and depth to NAPL if present) in each well using an electronic interface probe.
- If NAPL is present at 2-inches thickness or greater, collect a sample with a disposable bailer for visual inspection in the field. Based on the NAPL, no groundwater sample will be submitted for laboratory analysis.
- If NAPL is not measured, sampling will be conducted using low-flow sampling techniques to ensure minimal drawdown and agitation of well water and the loss of volatiles. This technique will also reduce the volume of purged groundwater needing to be disposed of at an off-site location. Groundwater field parameters (conductivity, pH, temperature, dissolved oxygen and oxidation-reduction potential) will be recorded during purging using a YSI Model 556MSP water-quality analyzer equipped with a flow-through cell. Once groundwater parameters have stabilized, which indicates groundwater is representative of the aquifer formation, a sample will be collected.

3.3 Soil Gas Sampling

Install one soil gas bore on site (see Figure 2 of RIWP for the proposed location).

- Using a direct push drill rig, advance one boring to 10-feet bgs and remove soil core (2-inch diameter) for disposal.
- Connect a 6-inch stainless steel screen to tubing and lower to placement within the bore at 8.5 to 9-feet bgs.
- Place coarse sand from 7 to 10-feet bgs within the bore (sample interval).
- Complete bore to the near surface with hydrated bentonite grout.
- Complete the bore with capped tubing and a concrete embedded flush mounted monument.

PBS Standard Operating Procedure (SOP) for soil gas sampling is included in Attachment B of the RIWP.

3.4 Sample and Analysis Plan

Sample Locations are present on attached Figure 2 of the RIWP.

Location	Rationale for Assessment	Contaminants of Interest	Investigation	Sampling and Analysis Information
Grid 1: Vicinity of the formerly used canopy and dispensers	-Near surface contamination identified in 2015 soil assessment -Downgradient well to the south	TPH-Dx, TPH-Gx, PAHs, and select VOCs	Eight soil borings MW12: Install one off-site monitoring well south of Grid 1 Collect one groundwater sample	Screen samples (by PID, visible or olfactory means) Collect soil samples at 2-foot increments from each soil bore. Groundwater: TPHs, SVOCs, select VOCs, PCBs, and MTCA-5 metals
Upgradient 1: Far northwest corner of the property	Upgradient well	TPH-Dx, TPH-Gx, select VOCs, SVOCs, PCBs	MW7: Install one monitoring well Collect one groundwater sample	Groundwater: TPHs, SVOCs, select VOCs, PCBs, and MTCA-5 metals
Grid 2: North central and northeast area of the property	-Upgradient groundwater wells -Near surface contamination identified in 2015 soil assessment	TPH-Dx, TPH-Gx, SVOCs, PCBs, select VOCs, and metals	Six Soil Borings MW8 and MW9: Install 2 monitoring wells	Screen samples (by PID, visible or olfactory means) Collect soil samples at 2-foot increments from each soil bore. Soil Samples: TPHs, select VOCs, PAHs; Groundwater: TPHs, SVOCs, select VOCs, PCBs, and MTCA-5 metals
Grid 3: Southeast area of the property	-Near surface contamination identified in 2015 soil assessment -Downgradient groundwater delineation	TPH-Dx, TPH-Gx, PAHs, and select VOCs and metals	Five soil borings MW10: Install one monitoring well	Screen samples Collect two soil samples from approximately 4 and 12 feet bgs. Soil Samples: TPHs, select VOCs, PAHs and metals Groundwater: TPHs, select VOCs, MTCA-5 metals
Grid 4: Vicinity of former subsurface fuel line	Confirmed Nov/Dec 2016 gasoline release	TPH-Dx, TPH-Gx, PAHs, and select VOCs	Nine soil borings	Screen samples (by PID, visible or olfactory means) Collect soil samples at 2-foot increments from each soil bore. Soil Samples: TPHs, select VOCs, PAHs; Groundwater: TPHs, select VOCs, PAHs

Location	Rationale for Assessment	Contaminants of Interest	Investigation	Sampling and Analysis Information
Grid 5: Western edge	-Spatial distribution and delineation -Downgradient Well to the south	TPH-Dx, TPH-Gx, PAHs, and select VOCs	Five soil borings MW11: Install one off-site monitoring well south of Grid 5. Collect one groundwater sample	Screen samples (by PID, visible or olfactory means) Collect soil samples at 2-foot increments from each soil bore Soil Samples: TPHs and select VOCs Groundwater: TPHs, SVOCs, select VOCs, PCBs, and MTCA-5 metals
Vicinity of occupied office areas	Vapor Intrusion Evaluation	Select petroleum hydrocarbon VOCs	Install and sample soil gas from VB1	Soil Gas: select VOCs by TO-15

Sample Containers

The testing laboratory will provide sample containers for soil, soil gas and groundwater sampling. PBS personnel responsible for sampling will inspect sampling containers and coolers prior to use. Sample containers will be kept away from fuels and solvents.

Sample Identification

A unique identification number will be assigned to all samples at the time of collection, and a complete label will be attached to each sample container during sample collection. All sample identification numbers and sample depths will be keyed to the sample location (for example, BH1-12 indicates boring 1 with a sample collected from 11-12 feet bgs.

Sample Custody, Delivery, and Schedule

The chain-of-custody (COC) protocol begins with sample collection and ends with sample disposal and creates a document for each sample during this time frame. Under no circumstance is there to be a break in custody. Samples will be stored on ice in an ice chest and shipped to the lab within 48 hours of collection. The sample collector is responsible for prompt shipping of samples and the laboratory Quality Assurance Project Manager (QA PM) is responsible for extracting the samples within the acceptable time limits for each sampling method.

A COC form will be completed by PBS personnel for each group of samples submitted to the laboratory and will remain with the samples until receipt by the laboratory. Prior to samples being delivered to the shipper, PBS will sign, date, and time the COC under "relinquished by." Coolers will be packaged and sealed to ensure that no liquids can escape during shipment.

Upon delivery of the cooler to the analytical laboratory, custody transfers from PBS to the lab's staff. The lab employee will sign, date, and time the COC under "received by." The laboratory will note the condition of received samples on the COC, including temperature if appropriate. The laboratory's QA PM is responsible for laboratory sample handling and storage, and ultimate disposal of samples.

4.0 QUALITY CONTROL

Quality control field samples may include duplicates and trip blanks and are dependent on the type of media being sampled and the analyses being performed. PBS will collect one duplicate sample for each 10 samples. A trip blank will accompany all shipments sent to the laboratory.

4.1 PBS Quality Assurance/Quality Control (QA/QC) Officer

The PBS QA/QC officer is responsible for planning and executing QC oversight of field and laboratory operations and for ensuring compliance with specified QC requirements. Responsibilities include offering guidance related to quality control issues and working with the PBS project manager to identify such issues and verify corrective actions.

The PBS QA/QC officer or designee will have sufficient authority, including stop-work authority, to ensure that project activities comply with applicable specifications of this QAPP. This authority applies equally to all project activities, whether performed on or off site, by PBS or its subcontractors and suppliers. The QA/QC officer or designee will be physically on site, when necessary, to provide oversight to field sampling work.

Thomas Mergy, Washington-licensed hydrogeologist, will serve as the PBS QA/QC officer. He will delegate day-to-day duties to the PBS project manager, retaining the role of senior technical reviewer to ensure compliance with the SAP and QAPP. The PBS project manager will provide additional QA/QC oversight and work with the lab to ensure compliance.

4.2 PBS Project Manager

The PBS project manager (PBS PM) is charged with ensuring that project activities comply with the SAP and QAPP requirements. Duties include but will not be limited to:

- Developing, maintaining, and distributing project documents.
- Reviewing qualifications of proposed technical staff and subcontractors.
- Ensuring that field personnel are familiar with, and adhere to, proper sampling procedures, field measurement techniques, and sample identification and custody procedures.
- Ensuring that sufficient QA samples are collected.
- Planning and ensuring field activity conforms with the SAP and QAPP.

The PBS PM will additionally act as the analytical data manager, who is charged with organizing, processing, and verifying analytical data generated from sampling activities. Duties will include, but will not be limited to:

- Reviewing sample submittal documents and laboratory log-in records to ensure proper analyses.
- Reviewing analytical reports and validating analytical results.
- Acting as liaison with the laboratory to address data accuracy or quality issues.
- Creating tables of analytical data for reporting.

Ken Nogeire, Washington-licensed hydrogeologist or his designee will serve as the PBS PM for this project.

4.3 Field Geologist

The PBS field geologist or engineer charged with assisting with field documentation and field work under the guidance of the PBS Project Manager, ensuring that project activities are conducted in accordance with this SAP and QAPP.

4.4 PBS Site Health and Safety

The PBS site safety officer (SSO) is responsible for ensuring that field activities are conducted safely and according to provisions of the HASP. The SSO has full stop-work authority if adverse conditions exist that threaten personnel health and safety.

5.0 PERSONNEL QUALIFICATIONS AND TRAINING

5.1 PBS Engineering and Environmental Inc.

Field staff shall be qualified to perform assigned tasks, which is accomplished by establishing and enforcing minimum qualification requirements, verifying personnel proficiency, and implementing a formal training program for the designated task. Field sampling personnel conducting or observing sampling activities are to be trained and certified in accordance with established PBS protocols, including unanticipated field conditions. All personnel engaged in site activities will have completed the OSHA HAZWOPER 40-hour health and safety training and have current annual 8-hour refresher training.

5.2 Laboratory Qualifications

The selected analytical laboratory for this project is Friedman and Bruya (F&B). F&B is Washington Department of Ecology (Ecology)-certified for the selected analytical procedures they will perform for this project.

A copy of the relevant laboratory Quality Assurance Manual is maintained at the lab and has been reviewed by PBS. Laboratory certifications for both laboratories are included with this QAPP. Key laboratory personnel will have at minimum the following requirements:

Laboratory Director/Supervisor

The laboratory director/supervisor shall have at least five years of related laboratory experience including three years of laboratory management experience and possess a Bachelor of Science in chemistry or a related field.

Inorganic and Organic Chemists

Inorganic and organic chemists shall have at least one year of related inorganic/organic experience in, respectively, inductively coupled plasma-atomic emission spectrometry (ICP) or atomic absorption spectrometry (AA), and high-performance liquid chromatography (HPLC). Both shall possess a Bachelor of Science in chemistry or a related field.

Inorganic and Organic Interpretation Chemists

Inorganic and organic interpretation chemists shall have at least two years' experience performing, respectively, ICP or AA, and HPLC analyses. Both shall possess a Bachelor of Science in chemistry or a related field.

Preparation Technician

All inorganic and organic preparations shall be performed by an analyst with at least one year of method-related experience, and work accomplished shall be under the supervision of a chemist.

QA/QC Chemist

The QA/QC chemist shall have a minimum of three years' experience with hazardous waste projects.

6.0 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

QA/QC samples are collected and analyzed to assess the quality of the sampling and analysis by both the field personnel and the laboratory. For samples sent to the laboratory, field QA samples will be collected as follows:

Laboratory	QA/QC Sample	Purpose	Frequency
Analysis by F&F Lab	MS/MS	Accuracy	5%
Analysis by F&B Lab (as requested)	Field Duplicate	Precision	10%

Field Duplicates

Field duplicates are used to document sampling and laboratory analysis reproducibility or precision. One duplicate sample will be collected and analyzed for every ten samples collected. Field duplicates will be collected for all media sampled (soil, NAPL, and groundwater). Field duplicates will be issued unique sample identifications that will not allow F&B to identify the source.

Matrix Spike and Matrix Spike Duplicate (MS/MSD)

MS/MSD samples are used to evaluate matrix interference and to a lesser extent, determine laboratory accuracy. The sampling location in which the MS/MSD samples are collected will change with each event.

Trip Blanks

Trip blanks will be placed in every cooler with VOCs and will be analyzed to document instances where false positive results are observed.

7.0 SAMPLE DOCUMENTATION AND CUSTODY

Collected samples are to be handled in a manner that ensures their integrity and traceability to the sampling location. This is achieved through the use of trained field and laboratory personnel; controlled field, transport, and laboratory conditions; and implementation of rigorous sample preparation, containerization, preservation, storage, packaging, transportation, and custody procedures. Sample custody procedures are designed to ensure that the following objectives are met:

- Each sample is identified uniquely and correctly.
- Each sample is traceable to its source/point of origin.
- Sample representativeness is preserved.
- Sample alteration, such as by preservation or filtration, is documented.
- A record of sample integrity is established and maintained throughout the custody process.
- Sample custody is to be maintained and documented in the field, during shipment, and at the analytical laboratory.

A permanent record for each sample will be documented by sample labels, chain of custody, sampler receipt (completed by the lab).

Sample Labels

A label is affixed to each sample bottle prior to transportation to the laboratory. The label and the sample number will not indicate whether a sample is a duplicate. Information on sampling labels will include:

- Site Name
- Sample Number
- Date
- Time

The label will be identified upon receipt by the laboratory and cross-referenced to the COC record. When the samples arrive at the laboratory following shipment, the sample custodian will receive the samples. Any inconsistencies will be noted on the custody record. Laboratory personnel will notify PBS immediately if any inconsistencies exist in the paperwork associated with the samples. PBS will verify the sample custodian has accurately transcribed sample names from the COC and notify of any discrepancies.

Chain-of-Custody Records

COC forms will accompany sample containers during transit to, and upon receipt by, the laboratory. The COC form will be submitted with the sampling package to the lab. PBS will retain an electronic copy (returned by the lab) with the project files.

The COC will be filled out using indelible ink and will include the following:

- Project name and number
- The signatures of sampling personnel
- Sample identification number, which includes sample location code
- Sampling dates and times
- Total number of containers per sample location
- Analyses to be performed on each sample
- Sample relinquisher, date, and time
- Hazards associated with samples
- Any remarks and/or special instructions

The samples will be picked up and transported to the lab (F&B). Transfer of sample custody will occur as follows:

- PBS will sign, date, and enter time on the COC form under "Relinquished by."
- Lab will sign under "Received by" and enter date and time.

Sample Receipt Form

The laboratory directly logs samples into their computer tracking system and notes problems in sample packaging, chain-of-custody, and sample preservation. The following will occur during sample receipt:

- The deliverer and the time of arrival are documented in the log. The number of items is checked with the actual number received to ensure that all samples arrived.
- Notation is made as to whether the sample container was sealed.

- The container is opened, the internal ambient temperature is taken by use of an included temperature blank, and the samples itemized. All deviations are noted and reported to the sample coordinator.

Documentation
All completed forms should be reviewed and maintained by the PBS PM. Corrective actions taken upon discovery of anomalies are to be documented. All QC records are to ultimately be maintained as part of the project QC file.

Corrections to Documentation
The PBS PM is responsible for ensuring that the requisite QC records are generated and controlled. The QA/QC officer will verify that these controls are implemented as follows:

- Measurements and observations are recorded at the time they are made.
- Documentation is orderly, legible, and traceable to relevant items/conditions.
- Documentation includes sufficient information to be readily interpreted by staff other than those responsible for its generation.
- Changes or revisions to a record are made in a manner that preserves the original data, such as by drawing a single line through a hard copy entry or maintaining historical records of electronic entries/files.
- Changes to records are signed (or initialed) and dated.
- As a minimum standard, changes to a record are subject to the same review and approval protocols as the original entry.
- Records adequately document digressions from specified procedures, QA plan, or work plan, and identify authorization for the digression.
- Project documents and records, including photographic and electronic records, are protected from loss, damage, misuse, or deterioration.

8.0 SAMPLE PACKAGING AND SHIPPING

Samples will be transferred to the selected laboratory for analysis via sturdy waterproof coolers. All samples will be packaged and shipped upon sample completion. Each cooler will be packed as follows:

- Ensure sample lids are tight and containers are sufficiently cushioned to prevent breakage.
- Evidence of sample custody shall be traceable from the time the sample is taken until the filled sample bottles are received by the laboratory.
- The laboratory will be notified of the sample shipment and the estimated date of arrival.

Laboratory Addresses and Points of Contact:
PBS Contact: PBS Project Manager (Ken Nogeire)
509.572.8163

Contracting Analytical Laboratory:
Friedman and Bruya Laboratory
3012 16th Avenue West
Seattle, Washington 98119
206.285.8282
Laboratory Project Manager: Eric Young

9.0 LABORATORY ANALYTICAL PROCEDURES

Project samples are to be prepared, extracted, and analyzed per specifications of the project SAP - QAPP. SOPs for the laboratory are maintained internally in their operations and quality assurance manuals. The analytical laboratory is to demonstrate achievement of the specified detection/quantitation limits and method performance criteria. Project samples are to be prepared, extracted, and analyzed by the specific analytical laboratory identified herein.

Specified methods are to be implemented as published. Modifications to approved procedures, alternate procedures, or additional procedures are to be pre-approved in writing by PBS. If non-standard methods are considered, the analytical laboratory shall provide, upon request, method validation data for consideration. Where deemed necessary to fulfill the requirements of the project, a request for approval for an alternate or modified method is to be made by PBS. QAPP-specified QC requirements are to be followed explicitly.

9.1 Calibration Procedures and Frequency

Measurement and test equipment is to be calibrated to the appropriate traceable standards. Records of these activities are to be generated by the laboratory individual performing the activity and retained by the laboratory. The SW-846 Method protocols are to be regarded as establishing the minimum calibration goals. Calibration procedures and instrumentation shall be consistent with the sample analysis requirements of this project and the applicable EPA approved methods.

9.2 Internal Quality Control Checks

Method Quality Control

Method QC includes the analyses and activities required to ensure that the analytical system is in control prior to and during an analytical run. Method QC requirements for this project are specified within each method. These include, but are not limited to, the following: laboratory blanks (method and instrument), laboratory control spikes, surrogate spikes, matrix spikes, laboratory duplicates and/or matrix spike duplicate pairs, LCS, field duplicates, and field blanks.

Internal quality control checks are designed to establish technically sound criteria for each measurement parameter, which shall serve to accept, qualify, or reject data in a uniform and systematic manner. Ten percent of the total number of a given type of sample shall be devoted to internal QC checks. These checks include blanks, laboratory control spikes, duplicates, matrix spikes, reference standards, and performance evaluation samples.

10.0 DATA QUALITY OBJECTIVES

The overall data quality objective is to provide data of known and sufficient quality to evaluate the physical extent and concentration ranges of chemicals of potential concern from analysis of samples, and to assure compliance with environmental and health-related agencies.

10.1 QA Objectives for Chemical Data Management.

Chemical analyses shall meet data quality objectives for precision, accuracy, and completeness. Accuracy goals, measured by the LCS and to a lesser extent, the MS recovery and the surrogate recovery, are determined by the laboratory and are based upon QC limits established in published EPA methods. The completeness goal for the sediment analytical data is 95 percent. Actual data quality objectives will be listed in each analytical report generated by the laboratory. Data quality objectives are applicable to all samples submitted to the laboratory, including primary samples, duplicates, and MS/MSDs.

10.2 Calculation of Data Quality Objectives—Analytical Precision

Field Duplicate

Precision indicated by analysis of the field duplicate will be expressed as the relative percent difference (RPD) between a sample and its field duplicate. RPD is calculated as follows:

$$\text{RPD (\%)} = \left| \frac{X_1 - X_2}{(X_1 + X_2)/2} \right| \bullet 100\%$$

where: X_1 = measured concentration in the first sample
X_2 = measured concentration in the second sample

Laboratory Duplicate

Two sample aliquots of the same sample are taken in the analytical laboratory and analyzed separately with identical procedures. Analyses of the sample and duplicate give a measure of the precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures. Precision is expressed as RPD (%).

Analytical Accuracy

The accuracy of the laboratory procedure will be estimated from the analyses of the percent recovery of the LCS and to a lesser extent, the MS/MSD sample. Accuracy is calculated based on the percentage of the spike recovered (REC) in the analysis as follows:

$$\text{\% REC} = \left(\frac{Xs - Xu}{SA}\right) \bullet 100\%$$

where: X_s = measured amount in the spiked sample
X_u = measured amount in the unspiked sample
SA = spiked amount

Several EPA methods do not include an MS/MSD analysis. The accuracy for analytical procedures that do not include an MS analysis will be monitored by the percent difference of the true value for a LCS from its measured value. Accuracy is calculated based on the percentage difference of the LCS in the analysis as follows:

$$\%D = (TV\text{-}R) / TV \bullet 100\%$$

where: TV = true value of laboratory control sample
R = result

Completeness

Completeness will be calculated and expressed as the percentage of number of samples that were judged to be valid (i.e., not rejected) and acceptable for all intended data use. Completeness (%C) is calculated for each type of measurement/analysis as follows:

$$\%C = \frac{(SE - SR)}{SE} \bullet 100\%$$

where: *SE* = number of samples collected
SR = number of samples rejected

Sensitivity

Sensitivity is to be expressed in terms of detection and quantitation limits for each type of measurement/analysis.

- The analytical laboratory is to notify the PBS PM if the laboratory anticipates or experiences any difficulties in achieving the detection/quantitation limits specified.
- Matrix effects should be considered in assessing the analytical laboratory's compliance with sensitivity specifications. The laboratory is to provide a detailed discussion of all failures to meet sensitivity specifications in the project narrative.
- If a sample dilution results in non-detect values for analytes that had been detected in the original analysis, then the results of the original run and the dilution are to be reported with the appropriate notations in the project narrative.

Representativeness

Representativeness expresses the degree to which sample data represent the characteristics of a population of samples, parameter variations at a sampling point, or an environmental condition. Representativeness is to be ensured in the field through implementation of appropriate sample collection, preservation, handling, and techniques. In the laboratory, representativeness is to be ensured by meeting method hold times and appropriate subsampling or aliquot techniques. Representativeness is to be assessed through results of duplicate field and laboratory samples.

11.0 DATA REDUCTION, REVIEW, AND REPORTING

Conversion of raw data into reported results is to be performed by the laboratory's QC chemist as detailed in the analytical methods. Laboratory SOPs include automated or manual data reduction procedures, equations, conversion factors, significant figures, and reporting units. Suspected outliers are to be reviewed for calculation and transcription errors, instrument malfunctions, and verification of measurement. If no errors are found, statistical methodology can be performed to determine whether the data point is to be rejected or retained. The PBS PM will be responsible for inspection of reported results for laboratory data.

11.1 Data Review

General

Data review is independent of the intended use of the data and determines the technical merit of the data by comparing QC results to method and Ecology-specified criteria. Data are reviewed for traceability, documentation, calculations, transcription errors, and evaluation of data deliverables for contract compliance.

Field Parameters

Field staff are to review their data and implement any necessary corrective actions prior to submitting data for use. All field data must be within the acceptance criteria specified in the SAP before being used for decision-making purposes. Any corrective actions should be noted in the daily report.

11.2 Data Tracking and Reporting

Data Tracking

The submittal from the analytical laboratory will be tracked and reviewed by the PBS PM. Final data will be included in the reporting memorandum.

Electronic Data

The format for electronic data delivery from the laboratory will be a customized electronic data deliverable (EDD) package. The information in the EDD will be checked against each input source using input file structure comparison, comparison of requested and reported data, sample number verification, parameter spelling check, reporting unit consistency, consistency between electronic and validated results, independent spot checks of electronic and hard copy data, detection limit specifications, and other internal consistency checks of the data. The output from the database will also to be checked by the PBS PM to determine if it makes sense from an historical perspective, is representative, and agrees with previous data collected or literature reported values. No project data will be released for use until QC checks have been performed and discrepancies resolved.

11.3 Quality Control Reports

Data Review—Laboratories

Laboratory data are to be reviewed by F&B's laboratory QC chemist prior to delivery as prescribed in the analytical laboratory's approved Quality Management Plan. Data will be reviewed following contract laboratory program function guidelines using SW-846 method requirements, SOPs, and the DQOs. Data reviews by the laboratory QC chemist will include data on initial and continuing calibration, blanks, laboratory control spikes, duplicates, controls, surrogates, and MS/MSD. The reviews will include an assessment of accuracy, precision, representativeness, calibration, comparability, sensitivity, and completeness, any performance or system audit results, and any significant QA problems encountered. Data that are qualified (flagged) during analysis or review will be noted as such in reports where they are used.

Data Review—PBS

The PBS PM will conduct the initial data review for PBS. The sample parameter quantification level data will be reviewed and include cross-checking data from original, duplicate, and MS/MSD samples for consistency; and review of sample data flagged by the laboratory. The data will be compared with Ecology requirements and DQOs before being submitted.

If there are no qualifiers, that will indicate that the data are acceptable both qualitatively and quantitatively. If data need to be flagged during the QC data review, the qualifiers outlined in the following table will be used. Under certain circumstances, additional flags may be used if necessary.

Qualifier	Reason
B	Results are estimated because the compound was detected in an associated blank.
C2	RPD between the primary column and the confirmation column results exceed the laboratories RPD criteria. The higher result was reported. The results are acceptable both qualitatively and quantitatively.
E	Results exceeded the concentration range for the instrument. Data are not acceptable for any purpose.

Qualifier	Reason
J	Results are estimated, and the data are valid for limited purposes. The results are qualitatively acceptable.
N	Analysis was not performed.
R	Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound. Data are not acceptable for any purpose.
U	Reported value is below method reporting limit. The results are qualitatively acceptable.

12.0 PREVENTIVE MAINTENANCE

The laboratory's preventive maintenance program is described in their Quality Assurance Manual, which is maintained at the laboratory. Equipment used by PBS personnel in the field for sampling, measuring, and analysis will be maintained following manufacturer's recommended practices.

13.0 PERFORMANCE AND SYSTEM AUDITS

Laboratory and field audits may be scheduled and performed at the direction of the PBS PM.

14.0 CORRECTIVE ACTIONS BY LAB

Documentation for corrective actions implemented by the laboratory is to be generated and retained in the laboratory's project file.

14.1 Corrective Action Documentation

This documentation is to be made accessible to the PBS PM. Corrective actions are required for the following conditions:

- QC data outside the defined acceptance windows for precision or accuracy.
- Blanks or LCS that contain contaminants above acceptable levels stated in the DQOs.
- Undesirable trends in spike or surrogate recoveries or RPD between spiked duplicates.
- Unusual changes in method reporting limits.
- Deficiencies identified during internal or external audits, or from the results of performance evaluation samples.
- Project management inquiries concerning data quality.

The following corrective actions should be taken for common problems:

Incoming Samples

Problems noted during sample receipt are to be documented on the Cooler Receipt Form. The PBS PM is to be notified for problem resolution.

Sample Holding Times

If maximum holding time is or may be exceeded by the laboratory, the PBS PM must be notified for problem resolution. Resampling may be necessary for the requested parameters.

Instrument Calibration

Sample analysis may not proceed until initial calibrations meet method criteria. Calibrations must meet method time requirements or recalibration must be performed. Continuing calibrations that do not meet accuracy criteria should result in a review of the calibration, rerun of the appropriate calibration standards, and reanalysis of samples affected back to the previous acceptable calibration check.

Practical Quantitation Limits

Appropriate sample clean-up procedures must be employed to attempt to achieve the practical quantitation limits as stated in the method. If difficulties arise in achieving these limits due to a particular sample matrix, the laboratory should notify the PBS PM of the problem for resolution. Dilutions are to be documented in the case narrative along with the revised practical quantitation limits for those analytes directly affected. Analytes detected above the method detection limits but below the practical quantitation limits are to be reported as estimated values and qualified "J."

Method Quality Control

Results related to method QC, including blank contamination, duplicate measurement reproducibility, MS/MSD recoveries, surrogate recoveries, LCS recoveries, and other method-specified QC measures are to meet the laboratory's SOPs and DQOs specified in this plan; otherwise, the affected samples may be reanalyzed and/or re-extracted and reanalyzed within method-required holding times to verify the presence or absence of matrix effects. In order to confirm matrix effects, QC results must observe the same direction and magnitude (ten times) bias. The PBS PM should be notified as soon as possible to discuss appropriate corrective action.

Calculation Errors

Reports must be reissued if calculation and/or reporting errors are noted with any given data package. The case narrative is to state the reason(s) for re-issuance of a report.

15.0 PLAN AMENDMENTS

This combined SAP and QAPP will serve as the primary plan governing all field and reporting activities related to this limited sampling at the Coleman Oil Yakima. If any portion of this plan warrants or requires amendment, the changes shall be communicated by either issuing a revised plan in its entirety, or preparing an addendum describing the changes and implementation schedule.