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Revised Supplemental Remedial Investigation Report

Glacier Park East Site
Leavenworth, Washington
Facility Site ID No. 349
Cleanup Site ID No. 4234
Agreed Order No. DE 16838

Prepared For:

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ABBREVIATIONS AND ACRONYMS

Abbreviation/ Acronym	**Definition**
AO	Agreed Order
AST	Aboveground storage tank
bgs	Below ground surface
BNSF	BNSF Railway Company
BTEX	Benzene, toluene, ethylbenzene, and xylenes
btoc	Below top of casing
CAP	Cleanup Action Plan
CFU/100mL	Colony forming units per 100 milliliters
CIPP	Cure-in-place pipe
City	City of Leavenworth
CLARC	Cleanup Levels and Risk Calculations II
cm/sec	Centimeters per second
COC	Chemical/Compound of concern
CSM	Conceptual site model
CUL	Cleanup level
CUSA	Chevron USA, Inc.
DO	Dissolved oxygen
DRO	Diesel-range organics
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
GeoEngineers	GeoEngineers, Inc.
GPE	Glacier Park East
GRO	Gasoline-range organics
GWBZ	Groundwater-Bearing Zone
µg/L	Micrograms per liter
mg/kg	Milligrams per kilogram
MTCA	Model Toxics Control Act
NAVD	North American Vertical Datum
No.	Number
NWTPH-Dx	Northwest Total Petroleum Hydrocarbons as diesel
NWTPH-Gx	Northwest Total Petroleum Hydrocarbons as gasoline
ORO	Heavy oil-range organics
ORP	Oxidation-reduction potential
PEA	Preliminary Environmental Assessment
PID	Photoionization detector
PVC	Polyvinyl chloride
RI	Remedial investigation
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
SFS	Supplement Feasibility Study
SRI	Supplemental Remedial Investigation

Abbreviation/ Acronym	**Definition**
SS	Sanitary sewer
TEE	Terrestrial Ecological Evaluation
TOC	Total organic carbon
TPH	Total Petroleum Hydrocarbons
TRC	TRC Environmental Corporation
VOC	Volatile organic compounds
WAC	Washington Administrative Code

EXECUTIVE SUMMARY

The Glacier Park Budget Fuel East (GPE) Site is located northeast of the intersection of U.S. Highway 2 and Chumstick Highway (formerly State Route 209) in Leavenworth, Chelan County, Washington. The Site is currently under an Agreed Order (AO) with the Washington State Department of Ecology (Ecology), AO No. DE 16838 issued in 2020, and is assigned Cleanup Site No. 4234, and Facility Site No. 349.

This Supplemental Remedial Investigation (SRI) was performed in response to Ecology's request for additional data to support the further evaluation and selection of an appropriate remedy for the Site. The work performed during the SRI followed the methods and procedures described in the Ecology-approved SRI Work Plan and Sampling and Analysis Plan (SAP) (TRC, 2020).

The Site was formerly used as a bulk fuel storage facility that consisted of several aboveground storage tanks (ASTs), drum storage, a pump house, and an unloading rack for receiving product from rail tank cars. Environmental investigations conducted from 1990 through 2001 provided data sufficient to establish a remedy under the prior AO (Ecology, 2001).

As the selected cleanup action under the prior AO, BNSF and Chevron installed a soil isolation cap consisting of approximately 10 to 15 feet of imported clean soil and an engineered asphaltic concrete cap and stormwater conveyance system with scheduled and ongoing groundwater monitoring. In the 2008 Periodic Review, Ecology concluded that ongoing impacts to groundwater following installation of the cap indicated that the remedial action was ineffective. Under the new AO, this SRI was completed to further characterize the nature and extent of soil and groundwater impacted with site-specific constituents of concern (COCs). COCs historically detected in soil and/or groundwater are petroleum hydrocarbons as diesel-range organics (DRO), oil-range organics (ORO), gasoline-range organics (GRO), benzene, toluene, ethylbenzene, xylenes (BTEX), and naphthalenes (in soil only).

The findings of the SRI are summarized as follows:

- Soil impacts exceeding MTCA Method A cleanup levels are limited to GRO at five locations. Two of the locations were beneath the cap and three are northeast and outside of the current cap.

- Shallow saturated conditions at the Site include shallow transient water, intermittent in nature, and a deeper unconfined groundwater-bearing zone (GWBZ).

- Groundwater flow in the deeper unconfined GWBZ is primarily to the north-northwest as indicated by long-term water level transducer data.

- Impacts to the shallow transient water are limited to DRO/ORO in shallow piezometer PZ-4. In addition, total coliform was detected in groundwater at PZ-4 indicating potential groundwater contribution from a known defect in the sanitary sewer conveyance line on northwest side of Site.

- Impacts to the deeper GWBZ are limited to DRO/ORO beneath the capped area. The deeper GWBZ DRO/ORO plume is defined and attenuating over time.

The findings of the SRI support a conclusion that the remedial investigation is sufficiently complete and that the findings of this SRI are sufficient to allow for development and evaluation of remedial alternatives in a supplemental feasibility study. Any additional data needs can be acquired during the design and implementation of a final remedy and do not affect the ability to select a remedy.

1.0 INTRODUCTION

On behalf of BNSF Railway Company (BNSF) and Chevron USA, Inc. (CUSA), TRC Environmental Corporation (TRC) is providing this Supplemental Remedial Investigation (SRI) Report to the Washington State Department of Ecology (Ecology) for the Glacier Park Budget Fuel East (GPE) Site located northeast of the intersection of U.S. Highway 2 and Chumstick Highway (formerly State Route 209) in Leavenworth, Chelan County, Washington (Site; Figure 1). The larger BNSF-owned Subject Property on which the Site is located is also indicated on Figure 1.

As defined in the Washington State Model Toxics Control Act, Chapter 70.105D of the Revised Code of Washington (RCW), and its associated Cleanup Regulations, Chapter 173-340 of the Washington Administrative Code (WAC), together referred to as “MTCA” in this report, the GPE “Site” is defined as entire lateral and vertical extent of petroleum hydrocarbon impacts.

The Site is currently under an Agreed Order (AO) with Ecology, AO No. DE 16838 issued in 2020, and is assigned Cleanup Site No. 4234, and Facility Site No. 349.

1.1 Purpose of the Supplemental Remedial Investigation

The purpose of a SRI is to collect, develop, and evaluate sufficient information to allow evaluation and selection of an appropriate site cleanup action (WAC 173-340-350). The work performed during the SRI was performed following methods and procedures described in the SRI Work Plan and SAP (TRC 2020). Both the Work Plan and SAP were reviewed and approved by Ecology as required by the AO. Data generated during the SRI meet the requirements of the Data Quality Objectives (DQOs) and the DQO decision rules presented in the Work Plan.

1.2 Report Organization

This SRI Report provides an updated presentation and evaluation of data generated during the SRI, including pertinent historical data for context, where applicable. The dataset presented herein provides a comprehensive evaluation of current Site conditions as they relate to the selection of an appropriate remedy. Investigation data previously collected and included in prior reports were not comprehensively compiled or reported herein.

Sections 1.0 through 9.0 comprise the SRI Report. Descriptions of section topics are provided below.

- The remaining portions of Section 1.0 present a general description of the Subject Property, which contains the Site, and its ownership.
- Section 2.0 presents a history of the Subject Property uses, summarizes several environmental investigations performed by various parties through 2013, and identifies potential sources of impacts.

- Section 3.0 summarizes the objectives of the SRI and the SRI activities.
- Section 4.0 presents and interprets the SRI findings.
- Section 5.0 presents the conceptual site model (CSM).
- Section 6.0 presents the approved cleanup levels previously developed for the Site.
- Section 7.0 presents the development objectives for the feasibility study.
- Section 8.0 presents conclusions supported by the SRI findings.
- Section 9.0 presents a bibliography of the documents relied upon to generate this report.

1.3 Setting

The Subject Property and Site are located northeast of the intersection of U.S. Highway 2 and Chumstick Highway (formerly State Route 209) in Leavenworth, Chelan County, Washington (Figure 1). According to AO No. DE 16838, the Subject Property is defined as the 1.72-acre area described in records maintained by the Chelan County Assessor's office and comprising Chelan Country Parcel Numbers 241701430700 and 241701430025. The Site is found within the Subject Property and, as defined in MTCA, comprises all locations where contamination has come to be located. The previously constructed engineered asphaltic concrete cap covers the majority of the Site and is shown on the Site Representation provided as Figure 2.

The City of Leavenworth is in the upper reaches of the Wenatchee River valley at an elevation of approximately 1,170 feet above mean seal level. The Subject Property is currently zoned as General Commercial per the Chelan County, Washington Assessor’s official website. The Subject Property is bordered by U.S. Highway 2 to the southeast, Chumstick Highway to the southwest, BNSF right-of-way to the northwest, and Chelan County Public Utilities District property to the northeast. The Subject Property is a vacant and unoccupied partially vegetated parcel with a gravel covered lot adjacent to Chumstick Highway, approximately 800 feet northwest of the Wenatchee River. Ponderosa pine trees cover most of the Subject Property east of the gravel lot. The Site is covered by clean fill and an engineered and elevated asphaltic concrete cap, which is surrounded by sloped sidewalls protected by boulders on three sides.

1.3.1 Geology/Hydrogeology

The central area of the Subject Property, that comprises the Site, was filled with approximately 10 to 15 feet of clean imported soil prior to capping with asphaltic concrete that includes a stormwater conveyance system. Native subsurface soils are laterally variable, and the soil units present vary in thickness and extent.

The native subsurface soil is primarily composed of approximately 10 to 25 feet of silty sand overlying a 5 to 20 feet of sandy silt that overlies a layer of poorly-graded sand with silt and gravel. Those soils are underlain by well graded sands with varying percentages of gravel and silt down to the maximum extent of exploration [80 feet below ground surface (bgs)]. The geology encountered at monitoring well MW-5 and nearby boring GWB-1 is distinct and includes gravel layers at approximately 55 to 65 and 70 to 80 feet bgs that were not present at other locations.

Groundwater occurs in two separate zones, shallow transient water, intermittent in nature is present seasonally in the vadose zone, and a deeper unconfined GWBZ. Groundwater elevation data are provided in Table 1.

The shallow transient water is seasonally present and laterally discontinuous. The shallow transient water conditions were encountered at approximately 14 feet bgs below the original uncapped ground surface during installation of monitoring well HC-2 in June 1990. This shallow transient water was also observed in piezometers PZ-1, PZ-2, and PZ-3, that were installed in 2016. While the shallow transient water was not initially observed during drilling and piezometer installation, approximately 5 feet of water was measured in PZ-2 during the February 2017 gauging event. Water was measured in all three shallow piezometers in April and May 2017 but has not been observed in PZ-1 and PZ-3 since 2017. Shallow transient water was routinely observed and measured in PZ-2, except for two gauging events performed in November 2018 and November 2019. Given these observations it is evident that shallow transient water is only present during wetter seasons of the year. Such a condition is not uncommon or unexpected when higher permeability soil layers (e.g., clean fill and well- and poorly-graded sand overlie lower permeability soils (e.g., silty sand). Groundwater of this nature is not considered potable since it is not present year-round and would not pass the threshold yield of 0.5 gallons/minute on a sustainable basis to be considered a potable source (WAC 173-340-720(2)(b)(i)).

The deeper unconfined GWBZ is laterally continuous and was encountered at depth of approximately 50 to 75 feet bgs in wells installed at the Subject Property. The groundwater flow direction in the deeper GWBZ is consistently toward the north-northwest as described in greater detail in Section 5.5. Water level elevations measured in MW-5 are consistently between 4 to 10 feet deeper than the other wells. Therefore, groundwater elevations from well MW-5 are interpreted as anomalous and are not included in the preparation of groundwater elevation contour maps or evaluations of groundwater flow directions. Well MW-5 appears to be completed within a separate hydrostratigraphic unit that was not encountered in other borings. The water level elevation in MW-5 is, consistently lower than the other deeper aquifer wells and inclusion of MW-5 data in the groundwater model would not change the interpretation of a generally north-northwesterly groundwater flow direction.

As noted in additional detail below, groundwater samples from well MW-5 have never contained detectable concentrations of any Site analytes.

1.3.2 Natural Resources and Ecological Receptors

The Site is partially covered by an asphaltic concrete cap and crushed gravel, but is otherwise unpaved and unimproved. The property qualifies for a Terrestrial Ecological Evaluation (TEE) exclusion (see TEE Evaluation form, Attachment A) based upon WAC 173-340-7491(1)(c)(i)), which states that:

> *(c)(i) "For sites contaminated with hazardous substances other than those specified in (c)(ii), there is less than 1.5 acres of contiguous undeveloped land on the Site or within 500 feet of the area of the Site."*

The Site does not contain any of the compounds listed in 173-340-7491(1)(c)(ii) which are chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxophene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene.

Surface water and sediment are also not considered potential receptors because (1) surface water (i.e., The Wenatchee River) is greater than 800 feet from the Site, and (2) a completed pathway of migration to surface water does not exist. In addition, storm sewer and other utility piping are reported to be completed above the seasonal high-water table of the deeper aquifer and do not serve as preferential pathways for migration of groundwater.

1.3.3 Utilities

Subsurface utilities surrounding and beneath the Site have been mapped during previous drilling activities based on their marked locations by the respective utilities and confirmation by private utility locator services. Based on the projected location of a City of Leavenworth sewer line beneath the Subject Property near a planned drilling location for the SRI, the City of Leavenworth Public Works Department was contacted to locate and mark the portion of the underground sanitary sewer (SS) line. The City of Leavenworth confirmed the location, construction, and depth of the sewer line beneath the Subject Property in the field on June 1, 2021. The SS is an 8-inch diameter concrete line buried at depths of between 7.1 and 8.8 feet bgs beneath the Subject Property.

It was subsequently confirmed during a call with the City of Leavenworth Public Works Director that an October 2021 inspection of the SS line beneath the Subject Property revealed a structural defect that will require repair. In early 2022, the City of Leavenworth plans to clean and video inspect the SS line to better locate the defect and assess the applicability of a cure-in-place pipe (CIPP) repair. The locations of known utilities, including the SS line and approximate location of a structural defect, are illustrated on Figure 2. It is not known if there are additional structural defects in the SS line nearer the cap.

2.0 SUBJECT PROPERTY HISTORY

2.1 Past Uses

The subject property was first developed during the mid-1920s when Standard Oil Company of California (predecessor in interest to CUSA) leased the property from Great Northern Railroad to construct a bulk fuel storage facility. The bulk fuel storage facility consisted of one 20,000-gallon aboveground storage tank (AST), one 13,000-gallon AST, a pump house, a warehouse/office building, a truck loading rack, a drum storage facility, and an unloading rack for receiving product from rail tank cars. Two smaller ASTs (approximately 5,000 gallons each) were reportedly used to store gasoline for a short period. The locations of historical structures are shown on Figure 2. These structures were removed in 1990.

In 1992, the property was used as a staging area for equipment and soil from the U.S. Highway 2 bridge construction over the Wenatchee River. Prior to installation of the asphaltic concrete cap in 2003, the County placed snow from road plowing operations onto the central portion of the subject property.

2.2 Summary of Previous Environmental Investigations and Remedial Actions

Numerous historical environmental investigations have been performed at the Site. The assessments to date have satisfied the purpose of a remedial investigation (WAC 173-340-350(7)(a)):

> *"…collect data necessary to adequately characterize the site for the purpose of developing and evaluating cleanup action alternatives…"*

The totality of prior assessments and this SRI have met this objective. Each iterative phase of investigation has contributed to the characterization of the lateral and vertical extent of COC impacts at the Site as well as historical sources of environmental impacts. These assessments have satisfied the requirements of WAC 173-340-350(7)(c)(iii)(B) and (C) for characterization of the extent of impacts and WAC 173-340-350(7)(c)(iii)(G) for identifying sources of impact. The historical reports are referenced below, and summary tables of historical soil and groundwater data are presented in Attachment B.

2.2.1 Previous Environmental Investigations

Several previous environmental investigations have been conducted at the Site. Summary descriptions of these historical environmental investigations are presented chronologically in the following sections. In addition, if conclusions or recommendations were presented in the historical reports they are included in the summary.

2.2.1.1 Preliminary Environmental Assessment – Hart Crowser (1990)

In March 1990, Hart Crowser performed a Preliminary Environmental Assessment (PEA) of the Glacier Park Company Property. Areas of potential environmental concern were identified, including soils in the vicinity of the former ASTs and the former fuel loading rack. Based on the PEA, Hart Crowser recommended a Phase II site investigation.

2.2.1.2 Phase II Environmental Investigation – Hart Crowser (1991)

A Phase II Environmental Investigation was performed by Hart Crowser in 1991. The results were presented in a *Subsurface Exploration and Testing Report*. During the Phase II Environmental Investigation, two test pits were excavated; TP-5 located near and to the east of the two former ASTs and TP-6 directly east of the former fuel truck-loading tracks (Figure 2). Total petroleum hydrocarbons (TPH) were detected in soil samples collected from the test pits at concentrations ranging from 47 to 2,500 milligrams per kilogram (mg/kg). Analytical methods in 1991 did not initially differentiate the TPH group. Detected concentrations of fuel hydrocarbons were subsequently confirmed as gasoline and diesel range hydrocarbons. BTEX in soil were also reported.

One monitoring well (HC-2, Figure 2) was installed during this investigation and benzene was reported in groundwater at a concentration of 99 micrograms per liter (µg/L). Petroleum hydrocarbons and BTEX were also identified in the groundwater sample at concentrations greater than the laboratory detection limit. Slug testing was also completed on HC-2 and a hydraulic conductivity of approximately 2×10^{-4} centimeters per second (cm/sec) was reported.

2.2.1.3 Remedial Investigation/Feasibility Study – GeoEngineers (1997)

GeoEngineers completed an RI/FS of the Site in 1997. The RI included the excavation of 12 test pits (RE1 through RE12) and advancement of four soil borings (VES1, VES2, MW-1, and MW-2). The test pits were excavated to depths of between 15 and 24 feet bgs at locations outside the footprint of the former fuel storage area, and within or adjacent to the footprint of the former drum storage facility, the AST area, and the loading racks and pump facility. Two of the soil borings were located in the presumed downgradient direction from the fuel storage facility and these borings were advanced to depths of approximately 70 feet bgs and converted to monitoring wells (MW-1 and MW-2). The other two borings were located in the vicinity of the ASTs and fuel loading rack and advanced to approximately 30 feet bgs and converted to vapor extraction test wells (VES1 and VES2, see Figure 2).

During the RI, a total of 81 soil samples were collected from the 12 test pits and four soil borings, and groundwater samples collected from the three monitoring wells (HC-2, MW-1, and MW-2), The RI identified soil and groundwater impacts from historical releases of gasoline-range and diesel-range petroleum hydrocarbons. The constituents of concern (COCs) were identified as: GRO, DRO, and ORO, and BTEX. The horizontal and vertical extents of soil impacts were well characterized, and data indicated that soil impacts did not extend deeper than 21 feet bgs. The extent of impacts to groundwater remained uncharacterized. Historical soil and groundwater data presented in the 1997 RI/FS are provided in Tables 4, 6, and 7 in Attachment B.

2.2.1.4 Monitoring Well Installation and Groundwater Analyses – GeoEngineers (2001)

In September 2001, GeoEngineers installed monitoring wells MW-3, MW-4, and MW-5. Monitoring well HC-2 was decommissioned in September 2001. Groundwater samples were collected from all five wells. Following a survey of the wells, the resulting groundwater elevation data were contoured and evaluated for groundwater flow direction relative to historically reported groundwater flow directions. Based on groundwater elevation data from this 2001 investigation, groundwater was interpreted by GeoEngineers as migrating east southeasterly toward the Wenatchee River. That finding is inconsistent with the current body of groundwater elevation data, which indicate that groundwater migration is consistently north-northwesterly.

2.2.1.5 Revised Cleanup Action Plan – GeoEngineers (2002)

In September 2001, BNSF and CUSA entered into an AO No. DE 01TCPCR-3168 with Ecology. A *Revised Cleanup Action Plan* (CAP) was prepared by GeoEngineers in 2002.

The CAP presented the selected cleanup action for the Site, which was capping, groundwater monitoring, and cap inspections. The CAP outlined the cap specifications, monitoring and inspection requirements, and institutional controls to be implemented.

2.2.1.6 Shallow Piezometer Installation – TRC (2016)

In November 2016, three shallow piezometers (PZ-1, PZ-2, and PZ-3) were installed at locations around the perimeter of the cap to investigate the potential presence of shallow transient water. The piezometers were installed to address concerns by Ecology regarding the potential mobilization and migration of impacts in soil beneath the cap to deeper groundwater. The piezometer installation and sampling work was conducted in accordance with the *Shallow Piezometer Installation Work Plan* dated October 13, 2016 (TRC, 2016a).

GRO was detected in one soil sample collected from 5 to 7.5 ft bgs at the location of piezometer well PZ-2 at a concentration greater than the CUL. The piezometers were dry at the time of installation but were subsequently gauged and sampled in April 2017 when shallow transient water was present. There were no detections of COCs in groundwater in the three shallow piezometers. The groundwater elevation data from the three piezometers collected between April 11 and May 30, 2017, indicated a groundwater flow direction in the shallow transient water, when present, to the south-southwest. The shallow piezometer installation was documented in the *Shallow Piezometer Installation, Second Semi-Annual 2016 Groundwater Monitoring, and Cap Inspection Report* (TRC, 2017) and the shallow piezometer groundwater sampling results were documented in the *Monitoring Well Installation*, *First 2017 Semi-Annual Groundwater Monitoring*, and *Cap Inspection Reports* (TRC, 2017a).

2.2.1.7 Monitoring Well MW-6 Installation – TRC (2017)

In May 2017, monitoring well MW-6 was installed in the presumed downgradient (southeast) direction from the existing monitoring well network in order to evaluate the potential for impacted groundwater to be migrating offsite towards the Wenatchee River. The work was conducted in accordance with the

Monitoring Well Installation Work Plan dated January 20, 2016 (TRC, 2016) and subsequent discussions with Ecology.

There were no detections of COCs in groundwater in well MW-6 and the groundwater elevation was higher than all the existing onsite wells resulting in a revised interpretation of the groundwater flow direction to the east-northeast (TRC, 2017a).

2.2.2 Previous Remedial Actions

The CAP was implemented in 2003 under the prior AO. The selected cleanup action for the AO was soil isolation and groundwater monitoring for a minimum of 5 years. The soil isolation cap consisting of approximately 10 to 15 feet of imported clean soil. The soil cap raised the elevation above the surrounding roadways and adjacent areas. A layer of asphaltic concrete was placed over top of the soil and the western sloped edge of the cap where it meets Chumstick Highway. Along the perimeter of the top of the cap, the asphalt is raised with a half-rolled curb to direct stormwater flow toward the catch basin on the cap and into the stormwater detention tank where sediment settles before water is discharged to the City of Leavenworth storm sewer system. The remaining three edges of the cap are surrounded and protected by a large rock barrier to prevent erosion and limit access to the surface of the cap.

During the 5-year review in 2008 Ecology concluded that continued impacts to groundwater following installation of the cap indicated the remedial action was not sufficiently protective of human health and the environment. Ecology stated, at a minimum, that institutional controls, in the form of an Environmental Covenant, should be implemented at the Site. The required institutional controls included a long-term plan to monitor and document the integrity of the soil isolation cap and long-term groundwater monitoring.

An Environmental Covenant meeting the requirements of the Uniform Environmental Covenants Act (UECA) dated November 26, 2012 was filed with the Chelan County Recorder’s office. The Environmental Covenant included restrictions on property use and soil disturbance.

2.2.3 Groundwater Monitoring – 2001 through 2019

Quarterly groundwater monitoring was initiated in October 2001. Quarterly monitoring continued until 2006, when the monitoring schedule was reduced to semiannual. Groundwater monitoring continued on a semiannual basis from 2007 through 2019.

3.0 OBJECTIVES

The general objective of the SRI activities was to characterize the nature and extent of soil and groundwater impacts to a level sufficient to make meaningful decisions regarding potential remedy enhancements. The following section summarizes the SRI and the investigative objectives. With the completion of the SRI, sufficient information is available to allow for development and evaluation of effective remedial actions for the Site.

3.1 Supplemental Remedial Investigation Activities – 2021

Between June and August 2021, SRI activities were conducted in accordance with the scope of work outlined in the *Supplemental Remedial Investigation Work Plan* (SRI Work Plan) approved by Ecology on October 28, 2020. The SRI activities were completed to address additional data requirements outlined in the SRI Work Plan and to support a Supplemental Feasibility Study (SFS) required under the AO. The following SRI objectives were identified in the SRI Work Plan:

1. Characterization of the vertical distribution of COCs in groundwater within the deeper unconfined GWBZ where historical and current groundwater data are based on samples collected from wells with long well-screen intervals.

2. Characterization of the lateral and vertical extent of COC in soil beneath and northeast of the cap.

3. Evaluation of the potential for shallow transient water beneath the cap, and characterization of COCs, if present.

4. Evaluation of seasonal groundwater elevation fluctuations and determination of hydraulic conductivities in monitoring wells completed in the deeper unconfined GWBZ to better understand the nature of the groundwater gradient, flow direction, and velocity.

5. Characterization of soil stratigraphy near monitoring well MW-5.

The SRI included the following principal elements:

- Utility clearance including magnetic and geophysical surveys, and confirmation by the City of Leavenworth Public Works of the location of a SS line running across the northeast corner of the property (Figure 2),

- Reconnaissance soil sampling for COCs by advancing seven borings (SB-1 through SB-6 and GWB-1) at the locations shown on Figure 2,

- Installation of a 4-inch diameter shallow piezometer (PZ-4) at the location of boring SB-5,

- Sampling groundwater from the shallow transient water in PZ-4 for COCs and for total coliform,

- Depth-discrete groundwater sampling from the deeper unconfined GWBZ for COCs in all six monitoring wells (MW-1 through MW-6),

- Completion of a year-long pressure transducer and data logger evaluation of groundwater elevation fluctuations in all six wells (MW-1 through MW-6),

- Slug testing of all six monitoring wells (MW-1 through MW-6), and

- A round of groundwater sampling collected from the mid-screen interval of all six monitoring wells (MW-1 through MW-6).

Laboratory analyses for the soil and groundwater sampled during this SRI are summarized in Tables 2, 3, and 4.

3.2 Utility Clearance

Before conducting any subsurface exploration during this SRI, the Washington One-Call utility center was notified of the planned work. Additionally, a private utility locating service (Applied Professional Services, Inc.) was retained to confirm and mark the presence and location of underground utilities before drilling. Utilities were located using as-built diagrams, magnetic survey, electrically conductive techniques, and ground-penetrating radar. In addition, BNSF was contacted to clear the Site of any BNSF-owned utilities, and a permit was requested from the City for drilling access on the City-owned right of way.

3.3 Reconnaissance Soil Sampling (SB-1 through SB-6 and GWB01)

A total of seven soil borings were advanced and sampled using sonic drilling methods to further characterize the lateral and vertical distribution of COCs in shallow soil (SB-1 through SB-6) and obtain detailed lithological information from ground surface to the depth of the GWBZ in the vicinity of well MW-5 (GWB-1; Figure 2). The soils in each boring were logged continuously to the terminal depth of exploration. The soils were field screened for the potential presence of volatile compounds using a photoionization detector (PID) and tested for light non-aqueous phase liquid (LNAPL) using sheen tests. Lithologic characteristics, PID readings, and other pertinent field observations were recorded on a field log for each boring. Copies of the boring logs are included in Attachment C.

Soil borings SB-1 through SB-3 were advanced to a terminal depth of 25 feet bgs at locations to the east of the elevated cap. Soil borings SB-4 through SB-6 were advanced to a terminal depth of 35 feet bgs directly through the elevated cap. Soil boring GWB-1 was advanced to a terminal depth of 75 feet bgs at a location immediately north of the cap and adjacent to MW-5 in order to obtain a detailed continuous log of the soil types from ground surface to terminal depth.

A total of 19 soil samples plus one duplicate sample were retained from the seven borings for laboratory analysis. Samples were collected using single-use, disposable stainless-steel sampling tools and placed in laboratory-supplied jars. Samples for VOC analysis were collected using EPA Method 5035 and single-use EnCore™ samplers. The samples were stored in a chilled cooler and submitted to Pace Analytical laboratory under standard chain-of-custody protocols for analysis of the following:

- BTEX by U.S. Environmental Protection Agency (EPA) Method 8260D;
- Naphthalenes by EPA Method 8270C/E-Selected Ion Measurement (SIM);

- Gasoline-range organics (GRO) by Northwest Total Petroleum Hydrocarbons as Gasoline Method (NWTPH-Gx); and
- Diesel-range organics (DRO) and oil-range organics (ORO) with and without silica gel cleanup (SGC) by Northwest Total Petroleum Hydrocarbons as Diesel-Extended Method (NWTPH-Dx).

3.3.1 Soil Sample Analytical Results

The analytical results for the 19 soil samples plus one duplicate sample analyzed as part of this SRI are summarized in Table 2 and results exceeding the MTCA Method A CULs are presented on Figure 3. Copies of the laboratory analytical reports are included in Attachment D.

BTEX compounds were not detected in any of the soil samples from SB-1, SB-2, SB-4, SB-5, and SB-6, at concentrations exceeding the MTCA Method A CUL. Benzene was only detected in SB-5 at 15 feet bgs at a concentration of 0.011 mg/kg, which is less than the CUL of 0.03 mg/kg.

Naphthalenes were detected in soil samples from SB-1, SB-2, SB-4, SB-5, and SB-6. Total naphthalenes concentrations were less than the CUL of 5 mg/kg.

GRO was detected in soil samples from five of the seven boring locations at concentrations ranging from 7.2 mg/kg to 2,820 mg/kg. Only four samples (1,190 mg/kg at 6 feet bgs in SB-1, 166 mg/kg at 10 feet bgs in SB-2, 936 mg/kg at 24 feet bgs in SB-4, and 2,820 mg/kg at 25 feet bgs in SB-6) exceeded the CUL of 30 mg/kg (when benzene is present on site). The maximum depth of detectable GRO impacts in soil was 10 feet bgs in SB-2 (east of the cap) and 30.5 feet bgs in SB-4 installed through the elevated cap. Given the cap thickness of about 15 feet in the area of SB-4, the maximum depths of detectable GRO impacts are within the same general depth horizon in both areas.

DRO was detected in soil samples from all seven boring locations at concentrations ranging from 10.2 mg/kg to 189 mg/kg. However, no detected concentrations exceeded the CUL of 2,000 mg/kg.

ORO was detected in soil samples from five of the seven boring locations at concentrations ranging from 14.8 mg/kg to 87.3 mg/kg. However, no detected concentrations exceeded the CUL of 2,000 mg/kg.

3.3.2 Shallow Piezometer Installation

Based on the field screening results from borings SB-5 and SB-6, boring SB-5 was completed as a 4-inch diameter piezometer (PZ-4). The objective of the piezometer installation was to assess the presence and potential impacts to the shallow transient water intermittently observed at the Site.

The piezometer was completed using 4-inch diameter Schedule 40 polyvinyl chloride (PVC) pipe with a 10-foot-long factory slotted screen with a 0.010-inch slot size and 2/12 silica sand filter pack. The piezometer was screened from 18 to 28 feet bgs to target an interval with the highest PID readings, visible indications of potential impacts, and moisture. The piezometer was completed with a 12-inch diameter flush-mount steel monument set in concrete.

Approximately 48 hours following installation, PZ-4 was developed by bailing and pumping. PZ-4 was observed to have very low yield, even for a 4-inch well, which was consistent with prior observations of limited yield within this depth range. During development, PZ-4 was pumped dry three times. A copy of the piezometer construction diagram with development information is available in Attachment C.

3.3.3 Shallow Piezometer (PZ-4) Sampling and Analytical Results

During a subsequent mobilization on June 24, 2021, a water sample was collected from PZ-4. Prior to sampling, the static water level in PZ-4 was measured and the apparent piezometric elevation for PZ-4 is included on Table 1. The objective of this sampling was to assess potential COC concentrations in shallow transient water beneath the cap and potentially in contact with the impacted soils left in place under the previous remedy. Due to the proximity of the City's sewer line to the site and known structural defects, the groundwater sample from PZ-4 was analyzed for the presence of E. coli and total coliform bacteria to assess if leaking infrastructure contributed to the presence of this shallow transient water. A summary table of analytical results is presented in Table 3. Laboratory analytical results, including the E. coli and total coliform sample results, are included in Attachment D.

Sampling was conducted using low-flow techniques to minimize sample volatilization and reduce turbidity. Purging was performed with a peristaltic pump and single-use dedicated tubing using low-flow, low-impact purging techniques while field measurements of pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), temperature, and conductivity were measured and recorded. PZ-4 again provided only minimal yield. Due to the limited water not all field parameters stabilized before a sample was collected. Field data sheets containing field parameter measurements are included in Attachment E. Purge water was temporarily stored on-Site in properly labeled 55-gallon drums pending characterization and off-Site disposal.

The samples were pumped directly into laboratory-supplied sample containers at a flow rate of less than 100 milliliters per minute (mL/min). Immediately upon collection, each groundwater sample container was appropriately labeled and placed in a chilled cooler pending submittal to the analytical laboratory. The groundwater samples were submitted to Pace Analytical National laboratory for analysis under standard chain-of-custody protocols.

At PZ-4, concentrations of GRO (16,000 µg/L), DRO (5,540 µg/L without SGC and 1,390 µg/L with SGC), and ORO (1,730 µg/L without SGC) were greater than the respective CULs. Neither ORO with SGC nor benzene were detected at concentrations greater than reporting limits.

The PZ-4 sample contained total coliform at 2,000 colony forming units per 100 milliliters (CFU/100mL). E. coli was not detected in the sample. Coliform should not be observed in non-impacted groundwater. This finding indicates leakage from the City of Leavenworth SS line and is a strong indication that water within the shallow zone receives some degree of recharge from sewer line leakage.

3.4 Depth-Discrete Groundwater Sampling

Depth-discrete groundwater sampling was completed in the six existing monitoring wells. The objective of this sampling was to assess whether COC concentrations are stratified within the deeper unconfined GWBZ and whether higher concentrations are present within a particular lithologic unit or zone.

Depth-discrete groundwater sampling intervals were selected during development of the SRI Work Plan based on lithologies presented in the existing well logs and on an evaluation of historical high-water level elevations. The sampling was conducted when groundwater elevations are typically highest and water columns in the wells are the longest. However, only two of the wells had a sufficiently long water column for deployment of all three depth-discrete samplers. In the remaining four wells, two samplers were deployed. Modifications to the depth-discrete sampling depths were made in the field based on the water column lengths. The actual depth-discrete sample depths for each well are listed in Table 4.

HydraSleeve™ depth-discrete samplers were deployed in the six wells on June 11, 2021 and allowed to remain in the wells for 10 days while the water column returned to static, pre-deployment conditions. The samplers were retrieved on June 21, 2021, and groundwater samples were decanted from each individual sampler into new, laboratory-supplied sample containers.

A total of 14 depth discrete samples were collected and were stored in a chilled cooler and submitted to Pace Analytical National laboratory under standard chain-of-custody protocols for analysis of petroleum hydrocarbons by NWTPH-Gx, NWTPH-Dx with and without SGC, and benzene by EPA Method 8260D.

3.4.1 Depth-Discrete Groundwater Analytical Results

Analytical results for the 14 groundwater samples analyzed as part of this investigation are summarized in Table 4. Copies of the laboratory analytical reports are included in Attachment D.

No significant variability in concentrations was observed within the depth discrete samples. The variability observed is generally within the concentration variability expected with normal laboratory analytical results.

While all concentrations were generally low, the wells with the higher concentrations exhibited the least variability. Wells with lower concentrations exhibited higher variability on a relative percent difference (RPD) basis. However, the absolute concentration difference remained small. It is not unusual to see such RPD differences at low concentrations.

For example, the DRO concentrations at MW-3 ranged from 1,830 µg/L to 1,970 µg/L; an absolute difference of 140 µg/L and an RPD of 7.4 percent. The DRO concentrations in well MW-1 ranged from 556 µg/L to 797 µg/L: an absolute difference of only 241 µg/L but an RPD of 35.6 percent. The absolute difference at MW-1 between the two sample intervals was the largest observed at the Site. These findings do not suggest significant stratification within the well screened intervals.

3.5 Transducer Study

To better understand the variability observed historically in the groundwater potentiometric surface and interpretive groundwater flow direction, a long-term evaluation of groundwater elevations was conducted in all six Site wells. Pressure transducers were deployed in September 2019 and remained in the wells recording water level fluctuations until February 2021. The transducers were set to record water levels on 1-minute intervals over the testing period.

Following retrieval, the transducer datasets were downloaded, the data converted to groundwater elevation, and the groundwater elevation trends were compared to the Wenatchee River stage from the Peshastin gauging station located approximately 2.5 miles downstream of the Site.

The groundwater elevation trends for all the wells exhibit a similar seasonal variability that tracks closely with fluctuations in Wenatchee River stage (Figure 4). However, well MW-5, tracks more closely with the changes in river stage throughout the test period. In MW-5, there is very close similarity in the short-term fluctuations with those of the Wenatchee River stage demonstrating a strong hydraulic connection to the river that is not observed in the other wells. This more direct hydraulic connection to the river may also account for the variability in water level elevations historically reported in MW-5, relative to the other wells. Due to this variability, the potentiometric surface and groundwater flow direction determinations have historically not included data from MW-5.

As illustrated in Figure 4, groundwater elevations in all six wells predominantly follow a similar seasonal pattern with each well maintaining a similar groundwater elevation relative to the other wells as they fluctuate over the test period. However, in some cases groundwater elevations between wells intersect and change relative position with respect to each other for a period of time. This overlap in the seasonal pattern is observed between MW-1 and MW-3 and between MW-1 and MW-2. The periods of overlapping groundwater elevation appear to coincide with significant increases or spikes in the Wenatchee River stage and they return to their more common relative position when the river stage drops. River stage is also correlated to seasonal precipitation and snowmelt, which also may impact recharge to the deeper unconfined GWBZ. These data demonstrate a relationship between individual well groundwater elevations and major changes in the Wenatchee River stage. However, the overlapping groundwater elevations between wells MW-1, MW-2, and MW-3 do not impact the overall groundwater flow direction because the groundwater elevations in MW-5 and MW-6 are consistently below and above the elevations of these three interior Site wells. The overall Site groundwater flow direction is consistently generally to the north. As further illustrated in Figures 5A through 5E, groundwater flow directions during the transducer study support an overall generally northerly flow across the Site with a pronounced inward flow toward the center of the Site from the west, south, and east in the southern portion of the Site.

3.6 Slug Testing

Slug tests were performed in all monitoring wells (MW-1 through MW-6) to provide data used to calculate hydraulic conductivity. The slug testing was accomplished using a solid slug with a displacement of 34 cubic inches to result in the instantaneous displacement of the water column during a series of rising head and falling head test performed at each well. Prior to the testing, pressure transducers were deployed in each well and set to record data on 1-second intervals. Following transducer deployment and equilibration of the water column in each well, the slug tests were initiated on one well at a time. A minimum of two rising head and two falling head tests were completed on each well.

The slug testing data evaluation included the following steps:

- Data Reduction – An initial review of the slug testing transducer data was completed to remove initial anomalous data points. Anomalous data can result from inadvertent short-term movement of pressure transducer depths during rapid insertion or removal of slugs. While every effort is made to minimize the potential for pressure transducer movement during aquifer testing, vertical movements can occur and are evidenced in the raw groundwater elevation graphs. Slug tests with anomalous data may be either discarded or evaluated for potential use based on the severity of the anomalous data. Because multiple slug tests were performed at each well during aquifer testing, tests with anomalous data were not used for conductivity calculations.

- Hvorslev Calculations – Slug test data were entered into AquiferTest® software (version 10.0) to calculate hydraulic conductivity using the Hvorslev Method, which was deemed most appropriate based on evaluation of individual bore logs and well construction diagrams. This data evaluation method is appropriate for an unconfined aquifer.

Calculated hydraulic conductivities from all tests ranged from 1.03×10^{-5} to 1.96×10^{-4} cm/sec with average hydraulic conductivities in the six wells ranging from 1.22×10^{-5} to 1.25×10^{-4} cm/sec. This range of hydraulic conductivities indicates low to moderately productive wells and is within the range of expectations for similar soil types.

Hydraulic conductivities for wells MW-1, MW-2, MW-3, MW-4, and MW-6 ranged from 1.03×10^{-5} to 6.9×10^{-5}. These values are relatively low and suggest a relatively slow rate of water migration within these wells.

The average hydraulic conductivity in MW-5 was 1.25×10^{-4} cm/sec, which is approximately one order of magnitude greater than hydraulic conductivity values for the other wells. The significantly different hydraulic conductivity values further suggest that MW-5 is completed in a different hydrostratigraphic unit compared to the other five wells. The greater hydraulic conductivity at MW-5 is likely associated with the presence of a layer of more permeable gravel in the screened interval of the well. This more permeable gravel layer is also the most probable reason for the more immediate and pronounced water level response in MW-5 to river stage in the Wenatchee River. This more permeable gravel layer is not present in any of the other wells.

Copies of individual calculations are included as Attachment F and calculated hydraulic conductivity values is presented in Table 5.

3.7 Groundwater Monitoring

A groundwater monitoring event was performed on August 2 and 3, 2021. The objective of this sampling was to obtain contemporaneous water level and analytical data from the full network of shallow transient water piezometers and deeper GWBZ monitoring wells at the Site.

3.7.1 Groundwater Elevation Measurements

The depth to groundwater was measured in each of the six monitoring wells using an electronic water level meter that was cleaned prior to use and between wells. The depth to water was measured to the nearest 0.01 foot, relative to a surveyed measuring point on the top of the well casing. Depth to water in the deeper GWBZ monitoring wells ranged from 57.44 to 71.50 feet below top of casing (btoc). The range of groundwater depths correspond to elevations of between 1,101.78 and 1,090.51 feet North American Vertical Datum of 1988 (NAVD88). The piezometric elevations were used to prepare an interpretive groundwater elevation contour map, which is presented on Figure 5F. The groundwater elevation data are summarized in Table 1.

3.7.2 Groundwater Sampling Methods

Sampling was conducted using low-flow techniques to minimize sample volatilization and turbidity. The sample depth in each monitoring well was originally proposed to be based on results of the depth-discrete sampling summarized in Section 3.4. However, based on the absence of clear vertical stratification in the wells, samples were collected from the middle of the well screen. Purging was performed using a peristaltic pump equipped with new, single use tubing that was changed between each well. Each well was purged using low-flow low-impact purging techniques until field measurements of pH, DO, ORP, temperature, and conductivity stabilized in accordance with the groundwater sampling standard operating procedure outlined in the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP). Field data sheets containing field parameter measurements are included in Attachment E. Purge water was temporarily stored on-Site in properly labeled 55-gallon drums pending characterization and off-Site disposal.

The groundwater samples were pumped directly into new, laboratory-supplied sample containers at a flow rate of less than 100 mL/min. Immediately upon collection, each groundwater sample container was appropriately labeled and placed in a chilled cooler pending submittal to the analytical laboratory. The groundwater samples were submitted to Pace Analytical National Laboratory for analysis under standard chain-of-custody protocols. Samples were analyzed for groundwater COCs, which include DRO and ORO (with and without SGC), GRO, and benzene, as well as total organic carbon (TOC).

3.7.3 Shallow Transient Water Sampling and Analytical Results

The four shallow piezometers (PZ-1 through PZ-4) were dry during the August 2021 sampling monitoring event and no samples were collected. However, a shallow transient water sample was collected from PZ-

4 during a post-installation sampling event on June 24, 2021. Analytical results for the shallow transient water sample are summarized below.

- GRO was detected at a concentration of 16,000 ug/L which exceeds the MTCA CUL of 800 ug/L.
- DRO and ORO (without SGC) were detected at concentration of 5,540 µg/L and 1,730 µg/L respectively, which exceeds the MTCA CUL of 500 µg/L.
- DRO (with SGC) was detected at concentration of 1,390 µg/L which exceeds the MTCA CUL of 500 µg/L. ORO (with SGC) was not detected in the sample.
- Benzene was not detected in the sample.
- TOC was detected at 17,300 µg/L in the sample.

3.7.4 Unconfined GWBZ Monitoring Well Sampling and Analytical Results

A table of analytical results for groundwater samples collected from the deeper unconfined GWBZ monitoring wells including data collected during the 2021 SRI is presented in Table 3 and the sample locations and table of results exceeding MTCA Method A CULs are shown on Figure 6. A copy of the analytical data report is included in Attachment D. Analytical results from samples collected during the 2021 SRI from the deeper unconfined GWBZ (excluding depth-discrete groundwater data in Table 4) are summarized below.

- GRO and BTEX compounds were not detected in any groundwater samples collected from the deeper unconfined GWBZ.
- When SGC was used, neither DRO nor ORO were detected in samples from any well completed in the deeper unconfined GWBZ at the method detection limits of 200 µg/L and 250 µg/L, respectively.
- DRO without SGC was detected in samples from wells MW-1, MW-3, and MW-4 at concentrations exceeding the CUL of 500 µg/L ranging from 842 µg/L to 1,850 µg/L.
- ORO without SGC was detected in samples from wells MW-1, MW-3, and MW-4 at concentrations exceeding the CUL of 500 µg/L ranging from 1,040 µg/L to 1,640 µg/L.

TOC results ranged from <1,000 µg/L in the sample from MW-6 to 11,200 µg/L in the sample from MW-3 and were generally higher in wells where DRO and ORO was present. In the two wells with no DRO or ORO detections, TOC results were low (1,780 µg/L in MW-5) to non-detect (<1,000 µg/L in MW-6). The high TOC results in wells MW-3 and its field duplicate (11,200/10,400 µg/L) and MW-4 (8,730 µg/L) relative to natural background values associated with wells MW-5 and MW-6 is strong evidence of the breakdown of DRO and ORO that has occurred over time.

The absence of detections of DRO and ORO when using SGC over the last several years indicates that current detections of DRO and ORO (without SGC) are biased high or are false positives due to the presence of polar metabolites resulting from the environmental breakdown of DRO and ORO in groundwater.

3.7.4.1 Total and Fecal Coliform Analyses

In June 2021, a sample of the shallow transient water was collected from piezometer PZ-4. This piezometer is adjacent to a City of Leavenworth SS line that the City has indicated requires repairs for a noted structural defect. The SS line and the location of the defect are illustrated on Figure 2. The sample from PZ-4 was analyzed for total coliform as an indicator of potential leakage from the SS line. Total coliform was detected at 2,000 CFU/100mL.

Groundwater should not contain measurable concentrations of coliform and the detection of total coliform in the sample strongly indicates influence of sewage from the nearby SS line. A more definitive analytical test for fecal coliform was planned for the groundwater sampling event in August 2021 to provide additional data to evaluate the potential influence of water released from the sewers line to the shallow transient water. However, the piezometer was dry at the time of the August sampling event and a sample could not be collected.

Fecal coliform samples were collected from wells MW-3 and MW-5 to evaluate the potential for impacts to the deeper unconfined GWBZ from the potential leaking City of Leavenworth SS line. Samples were submitted to Fremont Analytical of Seattle, Washington, for analysis of fecal coliform by SM 9222D. Neither sample contained detectable levels for fecal coliform. Bacteria are relatively large particles that tend be filtered out of groundwater passing through porous media. Therefore, bacteria associated with leaking from the City of Leavenworth SS line would not be expected to reach the deeper unconfined GWBZ given its depth and the thickness of soil between the leak and the deeper GWBZ.

The City of Leavenworth reportedly plans to repair the SS line in 2022. The known and identified defect in the SS line provides further evidence supporting the hypothesis that total coliform detected in the June 2021 sample from PZ-4 was the result of leakage from the line. It is feasible that this leakage continues to contribute to the limited volume of shallow transient water.

3.8 Surveying

The soil boring locations, shallow piezometers, and existing monitoring wells were surveyed on July 11, 2021, by Erlandsen and Associates of Chelan, Washington. Vertical coordinates (measuring point elevations) were measured at the northernmost point on the top of each PVC well casing to the nearest 0.01 foot, relative to NAVD88. Horizontal coordinates of each soil boring and well were measured relative to the North American Datum of 1983 (adjustment of 1991; NAD83/91). A copy of the survey report is presented in Attachment G. The top-of-casing elevations are summarized in Table 1.

4.0 FINDINGS

4.1 Localized Geology and Hydrogeology

Monitoring wells MW-1 through MW-5 were installed by air rotary drilling methods. Lithologic descriptions of the soil cuttings for these wells does not lend to accurate geologic logging nor did they identify potentially transmissive zones in the saturated zone below 50 feet bgs. MW-6 installed via sonic methods and cored continuously and is therefore a more reliable source for lithologic information.

The geologic log for MW-6 indicates alternating layers, approximately 2 to 5-feet thick, of sand and silty sand in the upper 15 feet of the boring. At 15 feet bgs a 1-foot layer of sandy gravel was encountered underlain by 2-feet of sand extending to approximately 18 feet bgs. Silty sand extends from 18 feet to 46 feet bgs and is underlain by gravelly sand, which is the formation in which the deeper unconfined GWBZ occurs, extending from 46 feet to the total boring depth of 75.5 feet bgs. Groundwater was encountered at approximately 56 feet bgs at the time of drilling.

The lack of stratigraphic detail within the deeper unconfined GWBZ and the use of long screen intervals for the wells raised concerns by Ecology that the groundwater data may not be fully representative. Ecology expressed concern that more transmissive zones could be directing the flow and transport of impacted groundwater in the deeper unconfined GWBZ.

Deep boring GWB-1 was installed during the SRI in close proximity of MW-5 to obtain a detailed stratigraphic log of lithology which was not available from the original air rotary drilling method. The objective of this boring was to identify the potential presence of transmissive zones within the saturated zone below approximately 50 feet bgs. Lithologies observed during advancement of boring GWB-1 consisted primarily of alternating layers, approximately 2 to 5- feet thick, of sand and silty sand in the upper 19 feet. These alternating layers are underlain by silty sand extending from 19 feet to 36 feet bgs. Underlying the silty sand layer is a layer of sand with silt and gravel that extends from 36 to 50 feet bgs. From 50 to 55 feet there were alternating thin, approximately 1 to 2-foot thick, layers of sand, silty sand, and silt. At 55 feet bgs and deeper, geologic materials consistently contain gravel with varying sand and silt content from 55 feet to the terminal depth of 75 feet bgs. The changes in lithology with depth were commonly gradational with the occasional cobble or boulder noted in the gravel. Groundwater was encountered at 68 feet bgs at the time of drilling GWB-1. The stratigraphy in GWB-1, indicated more gravel-bearing lithologies at and below the water table than were logged during the installation of MW-5 in 2001. The presence of more permeable gravel layers in GWB-1 is consistent with the order of magnitude greater hydraulic conductivity values in MW-5 calculated from the SRI slug tests and the faster and more pronounced response to river stage.

The drilling at GWB-1 did not identify shallower soils that could serve as significant or preferential pathways for migration. The absence of any detectable COC concentrations in MW-5 during sampling further supports a conclusion that there is not a significant migration pathway from the area of known impacts to MW-5.

4.2 Groundwater

Saturated conditions were encountered at the Site. As noted, transient water is seasonally present within shallower soils (i.e., shallow transient water) and a deeper unconfined GWBZ is present at depths between about 50 and 70 feet bgs.

The shallow transient water is observed in the spring and early summer after snowmelt and spring rains. The shallow transient water is observed above a silty sand layer that is mostly continuous beneath the Site, which appears to serve as a localized aquitard. Saturated conditions typically begin in early spring fed by precipitation and snowmelt and persist through late June based on gauging data from the SRI. When observed, the shallow the shallow transient water is observed at depths as shallow as 0.13 feet bgs outside the cap to as deep as 22.67 feet bgs beneath the cap. When present, this range of depths correspond to elevations of between 1,133.57 and 1,146.74 feet NAVD88. As noted above, the shallow piezometers have very low yield and recharge only when saturated conditions are present. The fact that saturated conditions are not present throughout the year and the low yield of these soils supports a conclusion that any water present would not be considered potable groundwater nor support a sustained yield of 0.5 gallons/minute.

The presence of finer grained lithologies below the shallow transient water zone and above the deeper unconfined GWBZ have been identified in several boring logs and appear to be extensive beneath Site. These less permeable, less transmissive soils serve as an aquitard for the intermittent saturated conditions and serve to impede the vertical migration of the shallow transient water and near surface impacts to the deeper unconfined GWBZ. Because the saturated conditions are not present throughout the full annual cycle, some amount of petroleum hydrocarbons have migrated to the deeper unconfined GWBZ under the influence of gravity. However, detectable concentrations of petroleum hydrocarbons in soil are limited to less than 25 feet bgs beneath the cap and 10 feet bgs beyond the cap to the east and northeast, and do not indicate significant or extensive vertical migration of impacts.

The deeper unconfined GWBZ underlies these lower permeability zones and consists primarily of fine to coarse sand and gravel with varying amounts of silt, which has high transmissivity where the silt content is low. The unconfined GWBZ is the expression of the local water table and is encountered at depths of between 55 and 75 feet bgs (elevation of approximately 1,101 and 1,082 feet NAVD88).

It is currently interpreted that well MW-5 may have been completed in a different hydrostratigraphic zone than the other wells or a different stratigraphy within the same zone with distinct properties. Well MW-5 appears more directly hydraulically connected to Wenatchee River stages with a more immediate response to changes in river elevation. As noted in Figures 5A through 5F when MW-5 is excluded, potentiometric contours consistently indicate generally northerly direction of groundwater migration. Westerly, southwesterly, or southerly groundwater gradients have not been observed in the groundwater elevation data set. Additional details are provided in Section 3.5 above.

4.3 Nature and Extent of Impacts

4.3.1 Soil

SRI data for soil samples with detected COCs is presented in Table 2. Historical soil data tables are provided in Attachment B. Recent and historical soil sampling locations are shown on Figure 2.

Previous data indicated that impacted soils were generally bounded within the capped area. The SRI included sampling to further characterize the lateral limits of impacts to soil. This was performed by collecting and analyzing additional soil samples during drilling of SB-1 through SB-6 and GWB-1. Drilling and sampling locations are indicated on Figure 3.

Neither DRO, ORO, BTEX, nor naphthalenes were detected at concentrations exceeding a CUL in any of the additional samples. This SRI and the result of prior investigations indicate that the extent of those compounds at concentrations exceeding CULs is limited to the area beneath the cap.

GRO was detected at concentrations exceeding the CUL in borings SB-1, SB-2, SB-4, SB-5, and SB-6. GRO concentrations ranged from 7.2 mg/kg to 2,820 mg/kg. The maximum depth of impacts was at 25 feet bgs at SB-6.

Figure 3 presents the interpreted lateral extent of GRO impacts to soil. As indicated, the lateral extent of impacts extends beyond the cap to the northeast with exceedances of MTCA Method A CULs identified in the top 10 feet of the soil column outside the soil cap. The interpreted vertical distribution of GRO in soil is presented on cross sections A-A’ (Figure 7) and B-B’ (Figure 8). The vertical extent of GRO impacts at concentrations exceeding the CUL is well characterized and does not appear to extend deeper than about 25 feet beneath the cap.

4.3.2 Shallow Transient Water

SRI data for shallow transient water samples with detected COCs are presented in Tables 3 and 4. Historical groundwater data tables are provided in Attachment B. Shallow transient water sampling locations are shown on Figure 2.

Based on the groundwater sample collected from shallow piezometer PZ-4 in June 2021, the shallow transient water, when present beneath the cap, is impacted with GRO, DRO, and ORO. Benzene was not present at a detectable concentration. GRO was detected at a concentration of 16,000 µg/L, which exceeded the CUL of 800 µg/L. DRO was detected at a concentration of 5,540 µg/L without SGC and at 1,390 µg/L with SGC, which exceeded the CUL of 500 µg/L. ORO was detected at a concentration of 1,730 µg/L without SGC, which exceeded the CUL of 500 µg/L but was not detected with SGC.

Shallow transient water beyond the boundaries of the soil isolation cap at PZ-1, PZ-2, and PZ-3 did not contain detectable concentrations of GRO, DRO, ORO, and BTEX when sampled in April 2017.

Piezometers PZ-1, PZ-2, and PZ-3 were dry during multiple groundwater gauging events between June and August 2021.

These findings suggest that, when present, shallow transient water beneath the cap may become impacted with GRO as a result of dissolution from the capped and impacted soils. Those impacts do not appear to extend beyond the limits of the cap.

4.3.3 Unconfined GWBZ

SRI data for unconfined GWBZ samples with detected COCs are presented in Tables 3 and 4. Historical groundwater data tables are provided in Attachment B. Unconfined GWBZ monitoring well locations are shown on Figure 6.

The COCs in the unconfined GWBZ are currently limited to DRO and ORO and only for samples analyzed without SGC. These non-SGC detections of DRO and ORO correspond with high TOC concentrations. The high TOC concentrations relative to background levels are evidence of significant degradation of DRO and ORO to polar metabolites and degradation products in the unconfined groundwater. During the August 2021 sampling event DRO and ORO detections at concentrations greater than the CULs were limited to non-SGC samples from wells MW-1, MW-3, and MW-4. Wells MW-5 and MW-6 have no historical COC detections, at concentrations greater than the CUL. MW-5 and MW-6 bracket the northwestern and southeastern limits of the Site, respectively, and characterize the extent of the deeper aquifer plume in the downgradient and upgradient directions, respectively.

5.0 CONCEPTUAL SITE MODEL

The conceptual site model (CSM) is based on the data collected during the investigative actions performed at the Site and identifies potential human and ecologic exposure pathways. The CSM therefore forms the basis for CUL development and selection. The CSM is summarized below.

The primary historical source area for petroleum hydrocarbon impacts is in the northwest corner of the Site. Operations related to the 15,000-gallon AST, 20,000-gallon AST, and truck loading rack were identified as potential sources of petroleum-related impacts. Subsequent investigations in 1991 and 1995 further characterized the lateral and vertical extent of impacted soil beneath the Site and confirmed the depth of groundwater. Those investigations also confirmed the presence of impacts to groundwater.

Based on the location and extent of soil impacts, it appears that the primary release(s) were to the surface or near-surface from historical leaks in above-grade and below-grade product lines and/or releases during fuel transloading at the loading rack. Impacts from these surface and near-surface releases migrated vertically through preferential pathways to the deeper unconfined GWBZ at depths between 50 to 60 feet bgs.

This vertical migration was facilitated by shallow transient water that is only present intermittently during the year and, when present, is not present throughout the entire Site. Water was observed seeping from the walls of test pits RE5 (14 feet bgs), RE8 (11 feet bgs), RE9 (14.5 feet bgs), and RE10 (16.5 feet bgs) located in the northern portion of the Site. Seeps were not observed in the walls of the remainder of the test pits installed during the 1995 investigation. Petroleum hydrocarbons in the groundwater within the deeper unconfined GWBZ at depths of between 50 to 60 feet bgs do not appeared to have migrated any significant distance from the source area.

The extent of impacted soil defined in the 1997 RI/FS was capped beneath 10 to 15 feet of clean fill soil in 2003 as the approved remedy under the 2001 AO No. DE 01TCPCR3168. The lateral distribution of soil impacted with COCs defined during this SRI at concentrations greater than CULs is shown on Figure 3.

Soil impacts identified in PZ-2 (during installation in 2017) and in SB-1 and SB-2 completed during the SRI indicate that GRO impacts in soil extend beyond the footprint of the cap to the east and northeast. The maximum lateral extent of those impacts is not fully characterized but is not expected to be extensive based on the current data. All other COCs appear limited to beneath the cap. The vertical extent of soil impacts at concentrations greater than CULs range in elevations from 1,130 to 1,150 feet NADV88 (Figures 7 and 8).

Site COCs are those compounds that were detected in soil and/or groundwater during the SRI at concentrations exceeding laboratory method detection limits and are potentially associated with release(s) from the fuel bulk storage and transloading operation. The COCs for the Site soils are DRO, ORO, GRO, BTEX, and naphthalenes. The COCs for groundwater are DRO, ORO, GRO, and benzene.

Shallow transient water was identified in 2016 with the installation of shallow piezometers PZ-1, PZ-2, and PZ-3 at locations immediately north, east, and south of the cap. The shallow transient water is present only during short portions of the year and is not laterally continuous across the Site. The shallow transient water was observed during multiple events conducted between April and May 2017. During those events the groundwater flow direction in the shallow transient water appeared to be the south southwest. The presence of shallow transient water beneath the cap was confirmed briefly with the installation of PZ-4 during the SRI in June 2021; however, the piezometers were dry during the latter half of 2021.

Extensive groundwater elevation data collected during the completion of this SRI indicate that the primary groundwater flow direction in the deeper unconfined GWBZ is generally to the north with some localized variability. Seasonal fluctuations in relative groundwater elevations in wells MW-1, MW-2, and MW-3, as shown on Figure 4, and overall changes in groundwater elevation in all wells relative to changes in river stage cause localized variations in the direction of groundwater flow in the southern portion of the Site, but the overall flow direction across the Site is toward the north-northwest.

The source of the shallow transient water has long been assumed to be due primarily to the accumulation of snow and resulting melt water and other surface water runoff and in low lying topographic areas of the Subject Property immediately adjacent to the cap. However, based on new information obtained during the SRI regarding a defect in a portion of the City of Leavenworth SS line beneath the northwest corner of the property just north of the cap, and on high counts of coliform bacteria detected in shallow transient water in PZ-4, some contribution of water from the damaged City SS line is occurring.

Soil data from borings advanced through the cap (SB-4, SB-5, and SB6) and data from shallow piezometer PZ-4 confirm the presence of COC impacts to soil and groundwater beneath the cap. Only GRO was detected at concentrations exceeding a CUL in soil beneath the cap during this SRI. GRO, DRO and ORO were detected at concentrations above the CULs in the shallow transient water.

The deeper unconfined GWBZ is impacted with COCs at concentration exceeding CULs. Following installation of the soil cap in 2003, groundwater COC concentrations generally declined in all monitoring wells and remained less than the respective CULs until approximately 2007. The trend graphs of MW-2, MW-3, and MW-4 (Attachment H) illustrate the increases in dissolved-phase COC concentrations between 2007 and 2011, and the subsequent decline in concentrations in more recent years.

Confirmation of shallow transient water beneath the cap during the SRI is consistent with findings in 2016 and 2017 when the presence of saturated conditions was identified in three shallow piezometers (PZ-1, PZ-2, and PZ3) installed around the perimeter of the cap. The shallow transient water appears to perch on less permeable soils, which tends to impede vertical migration.

Concentrations of COCs greater than CULs in the deeper unconfined GWBZ have been limited to wells MW-3 and MW-4 historically, with only sporadic detections in wells MW-1 and MW-2. Wells MW-5 and MW-6 on the downgradient and upgradient limits of the Site, respectively, have no detections of COCs in groundwater.

The lithologies logged during the advancement of soil borings and well installations, including deep boring GWB-1 installed near MW-5 as part of the SRI, demonstrate a complex and laterally heterogenous stratigraphy that varies across the Site, which is consistent with the geologic and recent glacial depositional history of the region.

Based on the review of groundwater elevations (see Section 3.5) the overall groundwater flow is generally to the north with some minor variation.

Figure 2 shows the orientation of two geologic cross sections trending northwest-southeast (A-A’) and southwest-northeast (B-B’) through the Site and extending beyond the property lines. The geologic cross sections themselves are presented on Figures 7 and 8 and include the interpreted vertical and lateral extent of COC impacts to soil and groundwater, based on the most relevant available data.

The CSM also evaluates current and potential future exposure pathways based upon the current and foreseeable future land uses. A CSM outlining the primary sources, COCs, media of concern, transport mechanisms, and exposure pathway analysis is shown on Figure 9.

The current and potential future exposure pathways:

- inhalation of volatilized vapors from impacted soil and groundwater,
- ingestion and direct contact with soil,

- direct contact with groundwater, and
- consumption of groundwater, although this is not a complete exposure pathway, it must be considered under MTCA regulations.

Potential human receptors associated with these exposure pathways are primarily construction workers. The majority of the Site is covered by a cap and clean fill soil up to 15 feet thick. A small area of the impacted soil with GRO concentrations greater than CULs extends beyond the footprint of the protective cap (Figure 3). There is no potential for indoor air exposures because the Site is currently covered by a soil isolation cap and an Environmental Covenant is in place limiting the use of the property. Future development of the Site for residential or commercial uses is also unlikely. There are currently no completed exposure pathways based on the Site use and the Environmental Covenant.

Direct exposure to shallow transient water is unlikely because this water, when intermittently present is covered with an impermeable cap in most areas where COCs have been detected at concentrations exceeding CULs. In areas where COCs in shallow transient water extend beyond the cap, exposure is mitigated via the Environmental Covenant.

The potential exposure pathways that have been identified as incomplete are described below.

- Groundwater migration to surface water. The nearest surface water body is approximately 800 feet south from impacted groundwater at the Site and the established groundwater flow direction at the Site is generally northerly. The most hydraulically downgradient well is not impacted. Therefore, there are no complete exposures to surface water receptors.
- Human ingestion of freshwater organisms.
- Terrestrial ecological exposures do not require further evaluation based on the exclusions contained in the MTCA regulations under WAC 173-340-7491(1)(c)(i), and specifically the insufficient acreage of contiguous habitat surrounding the Site to ecological receptors, as described in Section 1.3.2.

6.0 CLEANUP LEVEL DEVELOPMENT

The CULs and associated points of compliance were developed based on the exposure pathways and potential receptors identified in the CSM in Section 5.0. As required by MTCA, the CULs must ensure protectiveness of all exposure pathways identified in the CSM. The selected CULs must be protective of human health and the environment after completion of the selected remedial action and implementation of institutional and/or engineering controls (if any) and must consider the exposure pathways that remain after remedy implementation.

The following evaluation of CULs is for the purposes of evaluating the potential effectiveness of remedial alternatives and the likely ability of those alternatives to attain a cleanup standard. Remedial objectives will be evaluated, at least in part, on their likely ability to attain CULs in all media throughout the Site, with the ultimate objective of satisfying the AO and obtaining a No Further Action (NFA) determination for the Site.

The work documented herein is intended to comply with the laws and regulations of the State of Washington. The work to be performed during implementation of the selected remedy will be performed under the AO and will necessarily comply with MTCA. Applicable or Relevant and Appropriate Requirements (ARARs) for the selected remedy will be MTCA, and all potential exposure pathways will be addressed. This SRI contains a fully MTCA-compliant CUL development.

6.1 Points of Compliance

A point of compliance is that point or location on a property where the CULs must be attained. The standard point of compliance within MTCA is all media throughout a Site. If a conditional point of compliance is appropriate, it must be established as close to the source of the release as practicable.

The lateral boundary of the Site includes the historical extent of soil and groundwater with COC concentrations greater than applicable screening levels. Analytical data for soil samples from borings SB-1, SB-2, and SB-3, collected during this SRI, indicate GRO-impacted soil at those locations that are immediately northwest of the property line (Figure 3).

Final points of compliance, including conditional points of compliance for soil, groundwater, and indoor air (if applicable), will be established in the CAP.

6.2 Soil

Soil CULs and associated points of compliance were established to ensure protectiveness associated with the current and potential future exposure pathways identified in the CSM. For purposes of this SRI, the point of compliance for soil is the upper 15 feet of soil at the perimeter of the cap, as defined in Section 3.1.

In the process of developing soil CULs, the transport mechanisms and exposure pathways identified in the CSM were considered. The MTCA Method A Soil CULs for Unrestricted Land Uses (WAC 173-340-900; Table 740-1) are the applicable CULs for soil. The selected soil CULs are protective of potential direct exposure to soils shallower than 15 feet and are generally accepted as being protective of groundwater to a drinking water standard. Potential soil exposures are further limited by the existing cap. The cap also is protective of the soil-to-groundwater migration pathway by significantly reducing surface infiltration.

6.3 Groundwater

Groundwater CULs and associated points of compliance were established to ensure protectiveness of the current and potential future exposure pathways identified in the CSM. For purposes of this SRI, the point of compliance for groundwater is the standard point of compliance at the Site (i.e., all groundwater throughout the Site as defined in Section 6.1). The standard point of compliance is, by definition, protective of all exposure pathways.

In the process of developing groundwater CULs for the Site, the transport and exposure pathways identified in the CSM were considered. The MTCA Method A CULs for Groundwater (WAC 173-340-900; Table 720-1) are the applicable CULs for groundwater. The CULs for groundwater are summarized in the table below and in the attached Table 3.

6.4 Final COCs and CULs

Site-specific COCs are associated with historical bulk fuel storage and fuel transloading operations. COCs for the Site are selected based on historical detections, completion of analytical requirements of Table 830-1 and the 2008 Ecology review.

Site-Specific Constituents of Concerns and Cleanup Levels

COC[(a)]	Soil		Groundwater	
	Applicable CUL[(b)] (mg/kg)	Regulatory Basis	Applicable CUL)[(c)] (µg/L)	Regulatory Basis
DRO	2,000	MTCA Method A	500	MTCA Method A
ORO	2,000	MTCA Method A	500	MTCA Method A
GRO	100 / 30[(d)]	MTCA Method A	1,000 / 800[(d)]	MTCA Method A
Benzene	0.03	MTCA Method A	5	MTCA Method A
Toluene	7	MTCA Method A	1,000	MTCA Method A
Ethylbenzene	6	MTCA Method A	700	MTCA Method A
Xylenes	9	MTCA Method A	1,000	MTCA Method A
Naphthalenes	5	MTCA Method A	N/A	

(a) COCs are based on those outlined in the Ecology-approved *Supplemental Remedial Investigation Work Plan* dated October 28, 2020. Naphthalenes are a COC for soil but not groundwater.

(b) WAC 173-340-900, Table 740-1

(c) WAC 173-340-900, Table 720-1

(d) When benzene is also identified as a COC or when the sum of toluene, ethylbenzene, and total xylenes exceeds 1 percent of the GRO concentration

7.0 SUPPLEMENTAL FEASIBILITY STUDY DEVELOPMENT OBJECTIVES

Soil borings SB-1 and SB-2 were located beyond the lateral limits of the current cap. GRO was detected at concentrations greater than the CUL in two soil samples from SB-1 and SB-2. Though above the CUL, impacts are not expected to extend much farther to the east and northeast. Additional shallow soil sampling east and northeast of the SB-1 and SB-2 can be performed as a component of remedial design and does not preclude the evaluation and development of remedial alternatives as a component of the SFS.

The lateral extent and seasonal duration of the shallow transient water is limited. This water has been sporadically observed during past semiannual sampling events and was confirmed under the cap at PZ-4 during the SRI; however, shallow transient water was non-existent across the site just a few weeks later. GRO, DRO, and ORO impacts at PZ-4 exceed CULs; however, the shallow transient water is only sporadically present and is located under the existing soil and asphalt covered cap.

The potential for contribution to shallow saturated conditions from a confirmed defect in the City of Leavenworth SS line should be mitigated once the line is repaired. The City of Leavenworth plans to video-inspect the section of SS line in early 2022 to determine if the line can be repaired using a CIPP process. Repairs to the SS line would then be completed in the summer of 2022. The removal of this leakage to the shallow soils will further limit the amount of water within the shallow zone. This issue does not preclude the completion of the SFS at this time.

8.0 SUPPLEMENTAL REMEDIAL INVESTIGATION CONCLUSIONS

The remedial investigation is sufficiently complete, and the findings of the SRI are adequate to allow for development and evaluation of remedial alternatives. While additional data may be needed to support development of a remedial design, there is sufficient information to continue the evaluation and selection of remedial alternatives.

The sources of impacts to soil and groundwater at the Site are from past releases associated with historical fuel storage and transloading operations that occurred between 1920 and 1990. The nature and extent of impacts to soil have been adequately characterized to allow for development and evaluation of remedial alternatives. Additional characterization of the lateral extent of impacts may be necessary to finalize an Engineering Design Report for a selected remedy.

The nature of impacts to shallow transient water has been further characterized during the SRI. As noted, the shallow transient water does not meet the definition of groundwater within MTCA since the water is not present year-round and would not provide a sustained yield of 0.5 gallons/minute. This shallow transient water is therefore not a source of potable groundwater and does not pose a realistic threat of human ingestion. The current Environmental Covenant is protective of potential exposure to impacts.

The extent of impacts within the deeper unconfined GWBZ is well established by the existing monitoring well network. The downgradient (i.e., MW-5) and upgradient wells (i.e., MW-6) do not have detectable concentrations of impacts. Additionally, the hydraulic gradient is well established as being consistently to the north, eliminating the need for additional wells to the southeast or east.

Dissolved-phase COC concentrations in the deeper unconfined GWBZ have continued to attenuate over time and their presence in groundwater at concentrations greater than CULs is only detected in samples analyzed without SGC. This finding strongly indicates that the petroleum present is highly degraded through environmental weathering and will continue to degrade over time. Based on current data, it is appropriate to revise the groundwater monitoring plan to further focus on the COCs that continue to be present at concentrations exceeding CULs.

The existing cap and Environmental Covenant are fully protective of all current or potential exposure pathways. The SRI has demonstrated that surface water exposures are also not complete.

Terrestrial ecological exposures do not require further evaluation based on an exclusion contained in the MTCA regulations under WAC 173-340-7491(1)(c)(i) as described above in Section 1.3.2. A completed Terrestrial Ecological Evaluation Form is presented in Attachment A in support of this statement.

Ethylbenzene, toluene, xylenes and naphthalenes have never been detected at concentrations greater than the applicable MTCA Method A Cleanup level in soil. In addition, benzene has not been detected at concentrations greater than the MTCA Method A cleanup level in any of the last eight groundwater sampling events since 2016. Benzene was not detected in any soil samples exceeding MTCA Method A cleanup level during the SRI. Based on the weight of evidence, BTEX and naphthalenes are not COCs.

9.0 BIBLIOGRAPHY

GeoEngineers, Inc. (GeoEngineers). 1997. *Report, Remedial Investigation/Feasibility Study, Glacier Park East, Leavenworth, Washington*. February 27.

———. 1999. *Feasibility Study – Supplemental Information Supporting Remedial Alternative Recommendation, Glacier Park East Site*, *Leavenworth, Washington*. Prepared for The Burlington Northern and Santa Fe Railway Company and Chevron Products Company. May 27.

———. 2001. *Monitoring Well Installation and Ground Water Analyses, Glacier Park East Site*, *Leavenworth, Washington*. Prepared for The Burlington Northern and Santa Fe Railway Company and Chevron Products Company. December 4.

———. 2002. *Revised Cleanup Action Plan, Glacier Park East Site*, *Leavenworth, Washington*. Prepared for The Burlington Northern and Santa Fe Railway Company and Chevron Products Company. May 24.

Groundwater Technology. 1994. *Remedial Investigation and Feasibility Study Work Plan, Glacier Park East Site, Leavenworth, Washington*. Prepared for the Burlington Northern Railroad Company, Chevron U.S.A., Inc, Boyd Cascade, Inc., Jack Wedebert, and Janet Mottler.

———. 1994a. *Field Investigation and Sampling and Analysis Plan, Glacier Park East Site, Leavenworth, Washington*. Prepared for the Burlington Northern Railroad Company, Chevron U.S.A., Inc, Boyd Cascade, Inc., Jack Wedebert, and Janet Mottler.

Hart Crowser. 1990. *Preliminary Environmental Assessment, Glacier Park Company Property, Property Sequence No. 99, Leavenworth, Washington*. Prepared for the Glacier Park Company. March 14

———. 1991. *Subsurface Investigation and Testing, Glacier Park Company Property, Property Sequence No. 99, Leavenworth, Washington*. Prepared for the Glacier Park Company. April 17

TRC. 2016. *Monitoring Well Installation Work Plan, Glacier Park East Site, Leavenworth, Washington*. Prepared for BNSF Railway Company and Chevron U.S.A, Inc. January 20

———. 2016a. *Shallow Piezometer Installation Work Plan, Glacier Park East Site, Leavenworth, Washington*. Prepared for BNSF Railway Company and Chevron U.S.A, Inc. October 13

———. 2017. *Shallow Piezometer Installation, Second Semi-Annual 2016 Groundwater Monitoring, and Cap Inspection Report, Glacier Park East Site, Leavenworth, Washington*. Prepared for BNSF Railway Company and Chevron U.S.A, Inc. February 21

———. 2017a. *Monitoring Well Installation, First Semi-Annual 2017 Groundwater Monitoring, and Cap Inspection Report, Glacier Park East Site, Leavenworth, Washington*. Prepared for BNSF Railway Company and Chevron U.S.A, Inc. August 17

———. 2020. *Supplemental Remedial Investigation Work Plan, Glacier Park East Site, Leavenworth, Washington*. Prepared for BNSF Railway Company and Chevron U.S.A, Inc. October 26

Washington State Department of Ecology (Ecology). 1995. Agreed Order No. 94TC-C441. January 1.

———. 2001. Agreed Order No. DE 01TCPCR-3168. September 25.

———. 2007. Re: Glacier Park East, Response to Request for Reduced Monitoring. April 30.

———. 2013. *Model Toxics Control Act Regulation and Statute, MTCA Cleanup Regulation Chapter 173-340 WAC, Model Toxics Control Act Chapter 70.105D RCW, Uniform Environmental Covenants Act Chapter 64.70 RCW*. Publication No. 94-06. Revised 2013.

———. 2018. *Ecology determination of insufficiency in meeting the cleanup standards following the implementation of the cleanup action plan*, Glacier Park Budget Fuel East, March 15, 2018.

———. 2020. Agreed Order No. DE 16838. January 22.

Tables

Table 1
Groundwater Elevation Data
Supplemental Remedial Investigation Report
BNSF Railway Company Glacier Park East
Leavenworth, Washington

Monitoring Well	Well Elevation[a] (feet NGVD29 / NAVD88)	Date	Depth to Water (feet below top of casing)	Water Elevation (feet NGVD29 / NAVD88)	Change in Water Elevation (feet)
MW-1	1,149.84	10/5/2001	59.12	1,090.72	--
		12/20/2001	59.41	1,090.43	-0.29
		3/21/2002	59.12	1,090.72	0.29
		6/26/2002	57.29	1,092.55	1.83
		9/24/2002	57.70	1,092.14	-0.41
		12/18/2002	62.26	1,087.58	-4.56
	1,153.50	3/14/2003	65.22	1,088.28	--
		5/30/2003	60.30	1,093.20	4.92
	1,153.24	3/26/2004	60.44	1,092.80	--
		6/29/2004	56.45	1,096.79	3.99
		9/27/2004	60.50	1,092.74	-4.05
		12/1/2004	60.69	1,092.55	-0.19
		3/9/2005	61.10	1,092.14	-0.41
		6/29/2005	61.11	1,092.13	-0.01
		9/23/2005	61.82	1,091.42	-0.71
		12/30/2005	61.69	1,091.55	0.13
		3/28/2006	61.76	1,091.48	-0.07
		6/29/2006	58.89	1,094.35	2.87
		9/5/2006	59.23	1,094.01	-0.34
		12/11/2006	59.14	1,094.10	0.09
		3/30/2007	57.85	1,095.39	1.29
		9/6/2007	--	--	--
		4/29/2008	59.30	1,093.94	-1.45
		10/1/2008	59.22	1,094.02	0.08
		4/30/2009	59.36	1,093.88	-0.14
		10/12/2009	58.94	1,094.30	0.42
		4/29/2010	59.85	1,093.39	-0.91
	1,153.21	8/17/2010	59.10	1,094.11	--
		10/12/2010	59.90	1,093.31	-0.80
		4/28/2011	60.02	1,093.19	-0.12
		10/13/2011	58.29	1,094.92	1.73
		3/9/2012	59.34	1,093.87	-1.05
		6/20/2012	57.74	1,095.47	1.60
		9/20/2012	56.95	1,096.26	0.79
		12/11/2012	58.39	1,094.82	-1.44
		3/18/2013	59.31	1,093.90	-0.92
		12/4/2013	59.35	1,093.86	-0.04
		03/18/2014	60.08	1,093.13	-0.73
		06/19/2014	59.11	1,094.10	0.97
		11/19/2014	59.78	1,093.43	-0.67
		4/14/2015	59.80	1,093.41	-0.02
		11/3/2015	59.80	1,093.41	0.00
		6/1/2016	56.09	1,097.12	3.71
		11/9/2016	56.82	1,096.39	-0.73
		4/11/2017	57.97	1,095.24	-1.15
	1,157.11	5/30/2017	56.01	1,101.10	--
		11/8/2017	60.35	1,096.76	-4.34
		5/15/2018	56.38	1,100.73	3.97
		6/13/2018	56.29	1,100.82	0.09
		11/6/2018	57.89	1,099.22	-1.60
		6/19/2019	58.45	1,098.66	-0.56
		11/20/2019	59.87	1,097.24	-1.42
		2/3/2021	61.21	1,095.90	-1.34
		5/26/2021	58.90	1,098.21	2.31
	1,157.13	6/11/2021	58.26	1,098.87	0.66
		8/2/2021	58.35	1,098.78	-0.09
MW-2	1,150.95	10/5/2001	64.02	1,086.93	--
		12/20/2001	63.24	1,087.71	0.78
		3/21/2002	64.02	1,086.93	-0.78
		6/26/2002	58.14	1,092.81	5.88
		9/24/2002	59.53	1,091.42	-1.39
		12/18/2002	--	--	--
		3/14/2003	--	--	--
		5/30/2003	60.35	1,090.60	--
	1,161.19	3/26/2004	69.57	1,091.62	--
		6/29/2004	63.98	1,097.21	5.59

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Monitoring Well	Well Elevation[a] (feet NGVD29 / NAVD88)	Date	Depth to Water (feet below top of casing)	Water Elevation (feet NGVD29 / NAVD88)	Change in Water Elevation (feet)
MW-2 (cont'd)	1,161.19	9/27/2004	69.40	1,091.79	-5.42
		12/1/2004	69.98	1,091.21	-0.58
		3/9/2005	70.55	1,090.64	-0.57
		6/29/2005	70.20	1,090.99	0.35
		9/23/2005	72.34	1,088.85	-2.14
		12/30/2005	71.82	1,089.37	0.52
		3/28/2006	72.06	1,089.13	-0.24
		6/29/2006	66.46	1,094.73	5.60
		9/5/2006	68.72	1,092.47	-2.26
		12/11/2006	68.81	1,092.38	-0.09
		3/30/2007	66.48	1,094.71	2.33
		9/6/2007	67.05	1,094.14	-0.57
		4/29/2008	69.11	1,092.08	-2.06
		10/1/2008	68.96	1,092.23	0.15
		4/30/2009	68.23	1,092.96	0.73
		10/12/2009	68.60	1,092.59	-0.37
		4/29/2010	68.96	1,092.23	-0.36
	1,161.12	8/17/2010	68.02	1,093.10	--
		10/12/2010	68.91	1,092.21	-0.89
		4/28/2011	68.65	1,092.47	0.26
		10/13/2011	67.05	1,094.07	1.60
		3/9/2012	68.69	1,092.43	-1.64
		6/20/2012	66.03	1,095.09	2.66
		9/20/2012	66.40	1,094.72	-0.37
		12/11/2012	67.81	1,093.31	-1.41
		3/18/2013	68.02	1,093.10	-0.21
		12/4/2013	68.25	1,092.87	-0.23
		03/18/2014	68.99	1,092.13	-0.74
		06/19/2014	67.35	1,093.77	1.64
		11/19/2014	68.56	1,092.56	-1.21
		4/14/2015	67.92	1,093.20	0.64
		11/3/2015	68.42	1,092.70	-0.50
		6/1/2016	63.59	1,097.53	4.83
		11/9/2016	65.23	1,095.89	-1.64
		4/11/2017	66.58	1,094.54	-1.35
	1,165.01	5/30/2017	64.09	1,100.92	--
		11/8/2017	66.13	1,098.88	-2.04
		5/15/2018	64.59	1,100.42	1.54
		6/13/2018	64.23	1,100.78	0.36
		11/6/2018	66.70	1,098.31	-2.47
		6/19/2019	66.80	1,098.21	-0.10
		11/20/2019	68.61	1,096.40	-1.81
		2/3/2021	69.58	1,095.43	-0.97
		5/26/2021	66.10	1,098.91	3.48
	1,165.17	6/11/2021	65.51	1,099.66	--
		8/2/2021	65.94	1,099.23	-0.43
MW-3	1,151.20	10/5/2001	60.38	1,090.82	--
		12/20/2001	61.06	1,090.14	-0.68
		3/21/2002	60.38	1,090.82	0.68
		6/26/2002	57.72	1,093.48	2.66
		9/24/2002	58.01	1,093.19	-0.29
		12/18/2002	64.56	1,086.64	-6.55
	1,156.35	3/14/2003	66.72	1,089.63	--
		5/30/2003	61.95	1,094.40	4.77
	1,156.34	3/26/2004	63.10	1,093.24	--
		6/29/2004	59.22	1,097.12	3.88
		9/27/2004	62.88	1,093.46	-3.66
		12/1/2004	63.99	1,092.35	-1.11
		3/9/2005	63.95	1,092.39	0.04
		6/29/2005	63.90	1,092.44	0.05
		9/23/2005	64.98	1,091.36	-1.08
		12/30/2005	67.80	1,088.54	-2.82
		3/28/2006	65.01	1,091.33	2.79
		6/29/2006	61.27	1,095.07	3.74
		9/5/2006	60.89	1,095.45	0.38

Table 1
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Monitoring Well	Well Elevation[a] (feet NGVD29 / NAVD88)	Date	Depth to Water (feet below top of casing)	Water Elevation (feet NGVD29 / NAVD88)	Change in Water Elevation (feet)
MW-3 (cont'd)	1,156.34	12/11/2006	61.81	1,094.53	-0.92
		3/30/2007	60.60	1,095.74	1.21
		9/6/2007	58.71	1,097.63	1.89
		4/29/2008	62.10	1,094.24	-3.39
		10/1/2008	61.35	1,094.99	0.75
		4/30/2009	62.12	1,094.22	-0.77
		10/12/2009	61.46	1,094.88	0.66
		4/29/2010	63.01	1,093.33	-1.55
	1,156.29	8/17/2010	61.49	1,094.80	--
		10/12/2010	62.66	1,093.63	-1.17
		4/28/2011	62.58	1,093.71	0.08
		10/13/2011	59.96	1,096.33	2.62
		3/9/2012	62.12	1,094.17	-2.16
		6/20/2012	60.43	1,095.86	1.69
		9/20/2012	59.64	1,096.65	0.79
		12/11/2012	61.33	1,094.96	-1.69
		3/18/2013	62.30	1,093.99	-0.97
		12/4/2013	62.80	1,093.49	-0.50
		03/18/2014	63.95	1,092.34	-1.15
		06/19/2014	62.21	1,094.08	1.74
		11/19/2014	63.26	1,093.03	-1.05
		4/14/2015	62.22	1,094.07	1.04
		11/3/2015	63.58	1,092.71	-1.36
		6/1/2016	57.81	1,098.48	5.77
		11/9/2016	58.49	1,097.80	-0.68
		4/11/2017	60.35	1,095.94	-1.86
	1,160.19	5/30/2017	58.53	1,101.66	--
		11/8/2017	59.45	1,100.74	-0.92
		5/15/2018	59.00	1,101.19	0.45
		6/13/2018	59.00	1,101.19	0.00
		11/6/2018	60.39	1,099.80	-1.39
		6/19/2019	60.95	1,099.24	-0.56
		11/20/2019	62.90	1,097.29	-1.95
		2/3/2021	63.62	1,096.57	-0.72
		5/26/2021	60.37	1,099.82	3.25
	1,160.24	6/11/2021	59.71	1,100.53	--
		8/2/2021	59.19	1,101.05	0.52
MW-4	1,155.29	10/5/2001	64.03	1,091.26	--
		12/20/2001	64.42	1,090.87	-0.39
		3/21/2002	64.03	1,091.26	0.39
		6/26/2002	61.72	1,093.57	2.31
		9/24/2002	61.26	1,094.03	0.46
		12/18/2002	65.92	1,089.37	-4.66
	1,158.42	3/14/2003	73.22	1,085.20	-4.17
		5/30/2003	63.90	1,094.52	9.32
	1,156.92	3/26/2004	63.70	1,093.22	-1.30
		6/29/2004	60.50	1,096.42	3.20
		9/27/2004	63.79	1,093.13	-3.29
		12/1/2004	64.29	1,092.63	-0.50
		3/9/2005	64.66	1,092.26	-0.37
		6/29/2005	64.72	1,092.20	-0.06
		9/23/2005	65.67	1,091.25	-0.95
		12/30/2005	66.11	1,090.81	-0.44
		3/28/2006	65.86	1,091.06	0.25
		6/29/2006	62.21	1,094.71	3.65
		9/5/2006	61.85	1,095.07	0.36
		12/11/2006	62.50	1,094.42	-0.65
		3/30/2007	61.38	1,095.54	1.12
		9/6/2007	59.75	1,097.17	1.63
		4/29/2008	62.90	1,094.02	-3.15
		10/1/2008	62.24	1,094.68	0.66
		4/30/2009	63.07	1,093.85	-0.83
		10/12/2009	62.33	1,094.59	0.74
		4/29/2010	63.89	1,093.03	-1.56

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Monitoring Well	Well Elevation[a] (feet NGVD29 / NAVD88)	Date	Depth to Water (feet below top of casing)	Water Elevation (feet NGVD29 / NAVD88)	Change in Water Elevation (feet)
MW-4 (cont'd)	1,156.90	8/17/2010	62.43	1,094.47	--
MW-4 (cont'd)	1,156.90	10/12/2010	63.48	1,093.42	-1.05
MW-4 (cont'd)	1,156.90	4/28/2011	63.63	1,093.27	-0.15
MW-4 (cont'd)	1,156.90	10/13/2011	60.73	1,096.17	2.90
MW-4 (cont'd)	1,156.90	3/9/2012	62.92	1,093.98	-2.19
MW-4 (cont'd)	1,156.90	6/20/2012	61.32	1,095.58	1.60
MW-4 (cont'd)	1,156.90	9/20/2012	60.48	1,096.42	0.84
MW-4 (cont'd)	1,156.90	12/11/2012	62.11	1,094.79	-1.63
MW-4 (cont'd)	1,156.90	3/19/2013	63.15	1,093.75	-1.04
MW-4 (cont'd)	1,156.90	12/4/2013	63.49	1,093.41	-0.34
MW-4 (cont'd)	1,156.90	03/18/2014	64.57	1,092.33	-1.08
MW-4 (cont'd)	1,156.90	06/19/2014	63.11	1,093.79	1.46
MW-4 (cont'd)	1,156.90	11/19/2014	63.91	1,092.99	-0.80
MW-4 (cont'd)	1,156.90	4/14/2015	63.18	1,093.72	0.73
MW-4 (cont'd)	1,156.90	11/3/2015	64.09	1,092.81	-0.91
MW-4 (cont'd)	1,156.90	6/1/2016	58.66	1,098.24	5.43
MW-4 (cont'd)	1,156.90	11/9/2016	59.25	1,097.65	-0.59
MW-4 (cont'd)	1,156.90	4/11/2017	61.26	1,095.64	-2.01
MW-4 (cont'd)	1,160.80	5/30/2017	59.38	1,101.42	--
MW-4 (cont'd)	1,160.80	11/8/2017	60.21	1,100.59	-0.83
MW-4 (cont'd)	1,160.80	5/15/2018	59.82	1,100.98	0.39
MW-4 (cont'd)	1,160.80	6/13/2018	58.89	1,101.91	0.93
MW-4 (cont'd)	1,160.80	11/6/2018	61.15	1,099.65	-2.26
MW-4 (cont'd)	1,160.80	6/19/2019	61.84	1,098.96	-0.69
MW-4 (cont'd)	1,160.80	11/20/2019	63.65	1,097.15	-1.81
MW-4 (cont'd)	1,160.80	2/3/2021	64.35	1,096.45	-0.70
MW-4 (cont'd)	1,160.80	5/26/2021	61.12	1,099.68	3.23
MW-4 (cont'd)	1,160.81	6/11/2021	59.71	1,101.10	--
MW-4 (cont'd)	1,160.81	8/2/2021	59.88	1,100.93	-0.17
MW-5	1,158.11	10/5/2001	75.57	1,082.54	--
MW-5	1,158.11	12/20/2001	74.23	1,083.88	1.34
MW-5	1,158.11	3/21/2002	75.57	1,082.54	-1.34
MW-5	1,158.11	6/26/2002	67.96	1,090.15	7.61
MW-5	1,158.11	9/24/2002	73.87	1,084.24	-5.91
MW-5	1,158.11	12/18/2002	74.60	1,083.51	-0.73
MW-5	1,158.11	3/14/2003	73.09	1,085.02	--
MW-5	1,158.11	5/30/2003	68.95	1,089.16	4.14
MW-5	1,158.11	3/26/2004	72.15	1,085.96	-3.20
MW-5	1,158.11	6/29/2004	65.78	1,092.33	6.37
MW-5	1,158.11	9/27/2004	73.40	1,084.71	-7.62
MW-5	1,158.11	12/1/2004	72.99	1,085.12	0.41
MW-5	1,158.11	3/9/2005	73.25	1,084.86	-0.26
MW-5	1,158.11	6/29/2005	73.06	1,085.05	0.19
MW-5	1,158.11	9/23/2005	75.51	1,082.60	-2.45
MW-5	1,158.11	12/30/2005	73.86	1,084.25	1.65
MW-5	1,158.11	3/28/2006	73.65	1,084.46	0.21
MW-5	1,158.11	6/29/2006	68.18	1,089.93	5.47
MW-5	1,158.11	9/5/2006	73.52	1,084.59	-5.34
MW-5	1,158.11	12/11/2006	72.48	1,085.63	1.04
MW-5	1,158.11	3/30/2007	69.10	1,089.01	3.38
MW-5	1,158.11	9/6/2007	--	--	--
MW-5	1,158.11	4/29/2008	72.40	1,085.71	-3.30
MW-5	1,158.11	10/1/2008	73.66	1,084.45	-1.26
MW-5	1,158.11	4/30/2009	71.29	1,086.82	2.37
MW-5	1,158.11	10/12/2009	73.97	1,084.14	-2.68
MW-5	1,158.11	4/29/2010	71.60	1,086.51	2.37
MW-5	1,158.09	8/17/2010	72.17	1,085.92	--
MW-5	1,158.09	10/12/2010	73.07	1,085.02	-0.90
MW-5	1,158.09	4/28/2011	71.56	1,086.53	1.51
MW-5	1,158.09	10/13/2011	72.23	1,085.86	-0.67
MW-5	1,158.09	3/9/2012	73.08	1,085.01	-0.85
MW-5	1,158.09	6/20/2012	67.64	1,090.45	5.44
MW-5	1,158.09	9/20/2012	71.23	1,086.86	-3.59
MW-5	1,158.09	12/11/2012	73.23	1,084.86	-2.00
MW-5	1,158.09	3/18/2013	72.09	1,086.00	1.14

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MW-5 (cont'd)	1,158.09	12/4/2013	72.81	1,085.28	-0.72
		03/18/2014	72.28	1,085.81	0.53
		06/19/2014	69.41	1,088.68	2.87
		11/19/2014	72.44	1,085.65	-3.03
		4/14/2015	71.30	1,086.79	1.14
		11/3/2015	72.62	1,085.47	-1.32
		6/1/2016	68.90	1,089.19	3.72
		11/9/2016	70.73	1,087.36	-1.83
		4/11/2017	70.34	1,087.75	0.39
	1,161.99	5/30/2017	65.86	1,096.13	--
		11/8/2017	72.15	1,089.84	-6.29
		5/15/2018	66.69	1,095.30	5.46
		6/13/2018	68.28	1,093.71	-1.59
		11/6/2018	72.11	1,089.88	-3.83
		6/19/2019	69.81	1,092.18	2.30
		11/20/2019	73.34	1,088.65	-3.53
		2/3/2021	73.10	1,088.89	0.24
		5/26/2021	68.43	1,093.56	4.67
	1,162.01	6/11/2021	68.16	1,093.85	0.29
		8/2/2021	71.50	1,090.51	-3.34
MW-6	1,159.11	5/30/2017	56.58	1,102.53	--
		11/8/2017	57.26	1,101.85	-0.68
		5/15/2018	56.94	1,102.17	0.32
		6/13/2018	56.36	1,102.75	0.58
		11/6/2018	57.91	1,101.20	-1.55
		6/19/2019	58.22	1,100.89	-0.31
		11/20/2019	59.45	1,099.66	-1.23
		2/3/2021	60.59	1,098.52	-1.14
		5/26/2021	57.82	1,101.29	2.77
	1,159.22	6/11/2021	57.46	1,101.76	--
		8/2/2021	57.44	1,101.78	0.02
PZ-1	1,159.50	11/9/2016	Dry	Dry	--
		2/17/2017	--	--	--
		4/11/2017	13.59	1,145.91	--
		4/21/2017	13.69	1,145.81	-0.10
	1,163.04	5/30/2017	16.90	1,146.14	0.33
		11/8/2017	Dry	Dry	--
		5/15/2018	Dry	Dry	--
		6/13/2018	Dry	Dry	--
		11/6/2018	Dry	Dry	--
		6/19/2019	Dry	Dry	--
		11/20/2019	Dry	Dry	--
		5/26/2021	Dry	Dry	--
	1,163.07	6/11/2021	Dry	Dry	--
		8/2/2021	Dry	Dry	--
PZ-2	1,146.87	11/9/2016	14.07	1,132.80	--
		2/17/2017	9.23	1,137.64	--
		4/11/2017	0.13	1,146.74	9.10
		4/21/2017	0.43	1,146.44	-0.30
	1,150.45	5/30/2017	4.33	1,146.12	-0.32
		11/8/2017	14.46	1,135.99	-10.13
		5/15/2018	4.79	1,145.66	9.67
		6/13/2018	6.33	1,144.12	-1.54
		11/6/2018	Dry	Dry	--
		6/19/2019	13.77	1,136.68	--
		11/20/2019	Dry	Dry	--
		5/26/2021	6.00	1,144.45	--
	1,150.55	6/11/2021	6.69	1,143.86	--
		8/2/2021	Dry	Dry	--
PZ-3	1,154.66	11/9/2016	Dry	Dry	--
		2/17/2017	Dry	Dry	--
		4/11/2017	21.1	1,133.56	--
		4/21/2017	20.83	1,133.83	0.27
	1,158.24	5/30/2017	22.67	1,135.57	--
		11/8/2017	Dry	Dry	--

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Monitoring Well	**Well Elevation**[a] (feet NGVD29 / NAVD88)	**Date**	**Depth to Water** (feet below top of casing)	**Water Elevation** (feet NGVD29 / NAVD88)	**Change in Water Elevation (feet)**
PZ-3 (cont'd)	1,158.24	5/15/2018	Dry	Dry	--
		6/13/2018	Dry	Dry	--
		11/6/2018	Dry	Dry	--
		6/19/2019	Dry	Dry	--
		11/20/2019	Dry	Dry	--
		5/26/2021	Dry	Dry	--
	1,158.31	6/11/2021	Dry	Dry	--
		8/2/2021	Dry	Dry	--
PZ-4	1,165.86	6/11/2021	24.82	1,141.04	--
		6/24/2021	25.45	1,140.41	-0.63
		8/2/2021	Dry	Dry	--

Notes:
Monitoring wells and piezometers re-surveyed on June 11, 2021 by Erlandsen and Associates.
Elevation datum prior to 2017 survey in NGVD29.
Vertical datum of June 5, 2017 and June 11, 2021 surveys completed by Erlandsen and Associates.
a Surveyed elevations prior to 2017 are in NGVD29; surveyed elevations in 2017 and later are in NAVD88.
-- Not measured.
bgs Below ground surface.

Table 2
Summary of Soil Analytical Results
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Boring ID	Sample Depth (feet bgs)	Sample Date	Total Petroleum Hydrocarbons					Volatile Organic Compounds[d]				Naphthalenes[e]
			GRO[a]	DRO (w/ SGC)[b]	DRO (w/o SGC)[c]	ORO (w/ SGC)[b]	ORO (w/o SGC)[c]	Benzene	Toluene	Ethylbenzene	Total Xylenes	
MTCA Method A Cleanup Levels[f]			**100/30[g]**	**2,000**		**2,000**		**0.03**	**7**	**6**	**9**	**5**
PZ-1	24-25	10/18/2016	<0.109	--	<4.36	--	<10.9	<0.00109	<0.00545	<0.00109	<0.00327	<0.00545
PZ-2	5-7.5	10/17/2016	**1,180 J3**	--	302	--	<12.2	<0.0316	<0.585	4.28	8.22	**6.12**
	8-9	10/17/2016	<0.107	--	<4.29	--	<10.7	<0.00107	<0.00536	<0.00107	<0.00322	<0.00536
PZ-3	20-21.25	10/18/2016	0.194	--	<5	--	<12.5	<0.00125	<0.00624	0.00133	<0.00375	<0.00624
	21.5-22	10/18/2016	<0.129	--	<5.15	--	<12.9	<0.00129	<0.00644	0.0237	<0.00386	<0.00644
SB-1	6	6/3/2021	**1,190**	93	74.1	<14.4	<14.4	<0.00195	<0.00973	<0.00486	0.247	0.179
	12	6/3/2021	<2.9	<4.32	<4.32	<10.8	<10.8	<0.00116	<0.00580	0.0144	0.00935	<0.0216
	19	6/3/2021	<2.96	<4.33	<4.33	<10.8	<10.8	<0.00119	<0.00593	<0.00296	<0.00771	<0.0216
SB-2	8.5	6/4/2021	<2.95	<4.34	<4.34	<10.8	<10.8	<0.00118	<0.00591	<0.00295	<0.00768	<0.0217
	10	6/4/2021	**166**	109	74.8	<10.6	<10.6	<0.00114	<0.00572	0.00719	<0.00744	0.0407
	22	6/4/2021	<2.87	<4.26	<4.26	<10.7	<10.7	<0.00115	<0.00574	<0.00287	<0.00746	<0.0213
SB-3	12	6/3/2021	<3.08	4.75	<4.41	16.5	<11	<0.00123	<0.00616	<0.00308	<0.00801	<0.0221
	25	6/3/2021	<2.99	<4.34	<4.34	<10.8	<10.8	<0.0012	<0.00598	<0.00299	<0.00777	<0.0217
SB-4	20.5	6/2/2021	<3.1	21.7	20.6	84.5	87.3	<0.00132	<0.00658	<0.0033	<0.00855	<0.0222
	24	6/2/2021	**936**	186 J3 / J5	180 J3 / J5	18.6	14.8	<0.00129	<0.00645	1.97	2.47	0.341
	30.5	6/2/2021	20.3	<4.29	<4.29	<10.7	<10.7	<0.00116	<0.00582	<0.00291	<0.00757	<0.0214
SB-5	15	6/1/2021	28.2	38.8	34.9	72.5	35.7	0.011	0.0381	0.161	0.335	0.5758
	24	6/1/2021	69.7	71.8	87.4	<12.4	<12.4	<0.00149	<0.00746	0.419	0.579	0.2632
	28	6/1/2021	7.2	<4.33	<4.33	<10.8	<10.8	<0.00137	<0.00686	0.0161	0.0208	<0.0217
SB-6	22.5	6/2/2021	54.3	25.1	25.4	60.4	63.1	<0.00117	<0.00586	0.0104	<0.00762	0.0598
	25	6/2/2021	**2,820**	45.3	43.4	<12.9	<12.9	<0.00164	0.0136	1.41	0.154	0.744
	28	6/2/2021	<2.7	<4.14	<4.14	<10.4	<10.4	<0.00107	<0.00537	0.0037	<0.00698	<0.0207
GWB-1	25	6/4/2021	<2.97	<4.33	<4.33	<10.8	<10.8	<0.00117	<0.00583	<0.00292	<0.00758	<0.0217
	35	6/4/2021	<3.01	13.9	10.2	59.2	46.3	<0.00114	<0.00572	<0.00286	<0.00744	<0.0214

Notes:
All results presented in milligrams per kilogram (mg/kg).
-- Sample not analyzed for this compound
Bold Bold results are greater than or equal to the applicable cleanup level..
< Less than the laboratory detection limit.
a Analyzed by Northwest Method NWTPH-Gx.
b Analyzed by Northwest Method NWTPH-Dx-SGT (with silica gel cleanup).
c Analyzed by Northwest Method NWTPH-Dx-NO SGT (no silica gel cleanup).
d Analyzed by United States Environmental Protection Agency Method 8260D.
e Sum of napthalene, 1-methylnaphthalene, and 2-methylnaphthalene results. Analyzed by United States Environmental Protection Agency Method 8270C-SIM/8270E-SIM.
f Washington State Department of Ecology, Model Toxics Control Act (MTCA) Regulation and Statute, MTCA Cleanup Regulation Chapter 173-340 WAC, Model Toxics Control Act Chapter 70.105D RCW, Uniform Environmental Covenants Act Chapter 64.70 RCW. Publication No. 94-06. Revised May 2019.
g Cleanup levels for gasoline are 100 mg/kg when benzene is not detected, 30 mg/kg when benzene is detected.
bgs Below ground surface.
SGC Silica gel cleanup.

Compounds:
GRO Analyte was detecte Gasoline-range organics
DRO Analyte was detecte Diesel-range organics
ORO Analyte was detecte Oil-range organics
Qualifiers:
J3 Analyte was detecte The associated batch QC was outside the established quality control range for precision.
J5 The sample matrix interfered with the ability to make any accurate determination; spike val

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Table 3
Groundwater Monitoring Analytical Results
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BNSF Railway Company Glacier Park East
Leavenworth, Washington

Monitoring Well	Sample Date	TOC	Total Petroleum Hydrocarbons					Volatile Organic Compounds[d]			
			GRO[a]	DRO (w/ SGC)[b]	DRO (w/o SGC)[b]	ORO (w/ SGC)[c]	ORO (w/o SGC)[c]	Benzene	Toluene	Ethyl - benzene	Total Xylenes
MTCA Method A Cleanup Levels[e] (µg/L)		NA	800	500	500	500	500	5	1,000	700	1,000
MW-1	10/4/2001	--	<50	<281 I	--	<562	--	<0.5	1.79	<0.5	<1.0
MW-1	12/20/2001	--	<50	<250 J	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	3/21/2002	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	6/26/2002	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	9/24/2002	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	12/18/2002	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	3/14/2003	--	<50	**543**	--	<500	--	<0.5	<0.5	<0.5	1.24
MW-1	5/30/2003	--	<50	**710**	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	3/26/2004	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	6/29/2004	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	9/27/2004	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	12/1/2004	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	3/9/2005	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	6/29/2005	--	<50	**1,710**	--	**1,130**	--	<0.5	<0.5	<0.5	<1.0
MW-1	6/29/2005 - Dup	--	<50	**1,040**	--	**722**	--	<0.5	<0.5	<0.5	<1.0
MW-1	9/23/2005	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	12/30/2005	--	<50	<282	--	<562	--	<0.5	<0.5	<0.5	<1.0
MW-1	3/28/2006	--	<50	<253	--	<505	--	<0.5	<0.5	<0.5	<1.0
MW-1	6/29/2006	--	<50	<253	--	<505	--	<0.5	<0.5	<0.5	<1.0
MW-1	9/5/2006	--	<80	<248	--	<495	--	<0.5	<0.5	<0.5	<1.0
MW-1	12/11/2006	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-1	3/30/2007	--	<50	<248	--	<495	--	<0.5	<0.5	<0.5	<1.0
MW-1	6/13/2018	--	<100	<200	488	<250	**517**	<1.00	<1.00	<1.00	<3.00
MW-1	11/6/2018	--	<100	<200	412	<250	<250	<1.00	<1.00	<1.00	<3.00
MW-1	6/20/2019	--	<100	<200	337	<250	377	<1.00	<1.00	<1.00	<3.00
MW-1	11/22/2019	--	<100	<200	289	<250	<250	<1.00	<1.00	<1.00	<3.00
MW-1	8/2/2021	4,820 B	<100	<200	**842**	<250	**1,640**	<1.00	<1.00	<1.00	<3.00
MW-2	10/4/2001	--	<50	--	--	--	--	<0.5	<0.5	<0.5	<1.0
MW-2	12/20/2001	--	102	<250 J	--	<500	--	0.52	<0.5	<0.5	<1.0
MW-2	3/21/2002	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-2	6/26/2002	--	82	<250	--	<500	--	<0.5	<0.5	<0.5	1.73
MW-2	9/24/2002	--	125	<250	--	<500	--	<0.5	<0.5	0.815	1.06
MW-2	12/18/2002	--	--	--	--	--	--	--	--	--	--
MW-2	3/14/2003	--	--	--	--	--	--	--	--	--	--
MW-2	5/30/2003	--	165	499	--	<500	--	1.18	<0.5	<0.5	<1.0
MW-2	3/26/2004	--	99.1	<250	--	<500	--	<0.5	<0.6	<0.5	1.30
MW-2	6/29/2004	--	71.2	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-2	9/27/2004	--	96.9	264	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-2	12/1/2004	--	67.8	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-2	3/9/2005	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-2	6/29/2005	--	55.6	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-2	9/23/2005	--	54.6	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-2	12/30/2005	--	84.6	<248	--	<495	--	<0.5	<0.5	0.763	2.74
MW-2	3/28/2006	--	180	<253	--	<505	--	0.558	<0.5	0.993	1.38
MW-2	6/29/2006	--	154	<250	--	<500	--	0.801	<0.5	<0.5	<1.0
MW-2	9/5/2006	--	98.2	<278	--	<556	--	0.932	<0.5	0.79	<1.0
MW-2	12/11/2006	--	71	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
MW-2	3/30/2007	--	258	<245	--	<490	--	2.66	<0.5	1.11	2.12
MW-2	9/6/2007	--	341	<253	--	<505	--	**5.28**	<0.5	3.67	3.23
MW-2	4/29/2008	--	318	<250	--	<500	--	3.22	<0.5	0.968	1.28
MW-2	10/1/2008	--	563	<250	--	<500	--	2.97	0.608	3.93	2.88
MW-2	4/30/2009	--	154	<245	--	<490	--	0.604	<0.5	<0.5	1.10
MW-2	10/12/2009	--	300	180	--	<470	--	1.0 H	<1.0	<1.0	<1.0
MW-2	4/29/2010	--	160	<120	--	300	--	<0.5	<0.5	<0.5	1.8
MW-2	10/12/2010	--	190	220	--	<250	--	0.76	<0.5	<0.5	<1.0
MW-2	4/28/2011	--	97	<120	--	<240	--	<1.0	<1.0	<1.0	<1.0
MW-2	10/13/2011	--	590	140	--	<260	--	4.6	<1.0	6.4	2.7
MW-2	3/9/2012	--	580	75.2	--	<450	--	<1.0	<1.0	<1.0	<3.0
MW-2	6/20/2012	--	118	<76	--	<380	--	1.1	<1.0	<1.0	<3.0
MW-2	9/20/2012	--	74.7	<76	--	<380	--	<1.0	<1.0	<1.0	<3.0
MW-2	12/11/2012	--	<100	200	--	290	--	<1.0	<1.0	<1.0	<3.0
MW-2	3/18/2013	--	<100	240	--	<250	--	<0.5	<5.0	<0.5	<1.5
MW-2	12/4/2013	--	<100	240	--	<250	--	<0.5	<5.0	<0.5	<1.5
MW-2	3/18/2014	--	<100	240	--	<250	--	<0.5	<5.0	<0.5	<1.5
MW-2	6/19/2014	--	<100	260	--	<250	--	<0.5	<5.0	<0.5	<1.5
MW-2	11/20/2014	--	<100	**700**	--	**610**	--	<0.5	<5.0	<0.5	<1.5
MW-2	4/15/2015	--	<100	350	--	<250	--	<0.5	<5.0	<0.5	<1.5
MW-2	11/3/2015	--	<100	436	--	**537**	--	<0.5	<5.0	<0.5	<1.5
MW-2	6/1/2016	--	370	**554**	--	357	--	**5.54**	<5.0	2.39	<1.50 B
MW-2	11/9/2016	--	<100	284	487	<500	<500	<1.0	<5.0	<1.0	<3.0
MW-2	5/30/2017	--	211	314	391	<250	365	<1.00	<1.00	<1.00	<3.00

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Monitoring Well	Sample Date	TOC	Total Petroleum Hydrocarbons					Volatile Organic Compounds[d]			
			GRO[a]	DRO (w/ SGC)[b]	DRO (w/o SGC)[b]	ORO (w/ SGC)[c]	ORO (w/o SGC)[c]	Benzene	Toluene	Ethyl - benzene	Total Xylenes
MTCA Method A Cleanup Levels[e] (µg/L)		**NA**	**800**	**500**	**500**	**500**	**500**	**5**	**1,000**	**700**	**1,000**
MW-2 (cont'd)	11/8/2017	--	107	<200	392	<250	<250	<1.00	<1.00	<1.00	<3.00
	6/13/2018	--	<100	<200	389	<250	358	<1.00	<1.00	<1.00	<3.00
	11/6/2018	--	104 B	<200	411	<250	319	<1.00	<1.00	<1.00	<3.00
	6/20/2019	--	141 B	<200	327	<250	309	<1.00	<1.00	<1.00	<3.00
	11/21/2019	--	<100	<200	247	<250	<250	<1.00	<1.00	<1.00	<3.00
	8/2/2021	3,060 B	<100	<200	381	<250	308	<1.00	<1.00	<1.00	<3.00
MW-3	10/5/2001	--	**1,280 I**	**1,730**	--	<500	--	**28.1 I**	11.2 I	51.6 I	4.52 I
	12/20/2001	--	**977 I**	<250 J	--	<500 J	--	**19.2 I**	2.40 I	7.62 I	3.55 I
	12/20/2001 - Dup	--	**950 I**	<250 J	--	<500 J	--	**19.3 I**	2.42 I	7.60 I	3.55 I
	3/21/2002	--	**993 I**	255	--	<500	--	**14.9 I**	2.95 I	4.58 I	7.35 I
	3/21/2002 - Dup	--	**963 I**	428	--	<500	--	**16.7 I**	1.23 I	2.66 I	1.84 I
	6/26/2002	--	**823**	<250	--	<500	--	**16.6**	1.02 I	2.46 I	3.6
	6/26/2002 - Dup	--	762	<250	--	<500	--	**15.4**	1.03 I	2.48 I	3.56 I
	9/24/2002	--	**1,020 I**	<250 J	--	<500 J	--	**16.2 I**	4.77 I	29.4 I	8.74 I
	9/24/2002 - Dup	--	**1,030 I**	<250 J	--	<500 J	--	**16.3 I**	4.73 I	29.6 I	8.69 I
	12/18/2002	--	**1,300**	<250	--	<500	--	**20.7**	7.42	78.9	10.4
	12/18/2002 - Dup	--	**1,250**	<250	--	<500	--	**21.1**	7.43	79.4	10.2
	3/14/2003	--	**919 I**	**2,330**	--	<500	--	**12 I**	2.58 I	27.7 I	2.5 I
	3/14/2003 - Dup	--	**849 I**	**2,200**	--	<500	--	**11.4 I**	2.21 I	25.5 I	2.32 I
	5/30/2003	--	**959**	**2,820**	--	<500	--	**22.7**	6.01	42.8	7.12
	5/30/2003 - Dup	--	**845**	**3,610**	--	**580**	--	**14.4**	3.88	27	3.46
	3/26/2004	--	**1,060**	443	--	<500	--	**19.7**	7.44	24	4.32
	3/26/2004 - Dup	--	**1,090**	**528**	--	<500	--	**19.1**	7.14	23	3.62
	6/29/2004	--	**1,260**	305	--	<500	--	**25.6**	8.11	20.7	2.99
	6/29/2004 - Dup	--	**1,050**	<250	--	<500	--	**21.7**	6.82	17.4	2.61
	9/27/2004	--	**1,340**	**535**	--	<500	--	**19.4**	9.41	31.8	7.29
	12/1/2004	--	**1,450**	259	--	<500	--	**20.9**	8.06	27	4.82
	3/9/2005	--	698	**602**	--	<500	--	**11.7**	2.52	4.84	1.28
	3/9/2005 - Dup	--	639	334	--	<500	--	**9.33**	1.98	3.84	<1.0
	6/29/2005	--	**909**	324	--	<500	--	**11**	1.67	4.72	2.27
	6/29/2005 - Dup	--	--	--	--	<501	--	--	--	--	--
	9/23/2005	--	718	<250	--	<500	--	**7.38**	0.994	1.96	2.25
	12/30/2005	--	377	<248	--	<495	--	**5.01**	0.799	0.89	1.04
	3/28/2006	--	603	<250	--	<500	--	4.28	<0.5	0.918	1.99
	6/29/2006	--	**998**	<278	--	<500	--	**12.7**	1.61	10.5	3.03
	9/5/2006	--	655	366	--	<556	--	**20.1**	8.83	74.5	33.5
	12/11/2006	--	**959**	369	--	<490	--	4.66	<0.5	<0.5	2.06
	3/30/2007	--	**2,510**	341	--	<485	--	**32.3**	17.7	89.9	56.8
	9/6/2007	--	**2,080**	<250	--	<500	--	**30.7**	38.8	137	106
	4/29/2008	--	**1,550 J**	419 I	--	<476	--	**12.8**	16.2	48.4	29.9
	4/29/2008 - Dup	--	**2,000 J**	<250	--	<500	--	**16.7**	19.9	54.6	31.7
	10/1/2008	--	**2,250 J**	<248	--	<495	--	**17.4**	24.2	117	84.2
	10/1/2008 - Dup	--	**2,390 J**	<240	--	<481	--	**18.3**	25.4	118	88.9
	4/30/2009	--	**1,050**	<248	--	**532**	--	**9.39**	7.33	26.5	25
	4/30/2009 - Dup	--	**1,040**	<238	--	<476	--	**9.36**	7.3	26.2	24.6
	10/12/2009	--	**4,600**	**980**	--	**720**	--	**27**	41	180	40
	10/12/2009 - Dup	--	**4,700**	**910**	--	**570**	--	**27**	43	190	42
	4/29/2010	--	**1,100**	**690**	--	<250	--	**9.9**	7.5	16	13
	4/29/2010 - Dup	--	**890**	480	--	<250	--	**9**	6.4	14	12
	10/12/2010	--	**1,300**	**1,600**	--	<240	--	**11**	18	69	68
	10/12/2010 - Dup	--	**1,300**	**2,700**	--	370	--	**10**	18	70	69
	4/28/2011	--	65	120	--	<250	--	1	<1.0	<1.0	<1.0
	4/28/2011 - Dup	--	74	150	--	<250	--	1	<1.0	<1.0	<1.0
	10/13/2011	--	<50	<130	--	<260	--	<1.0	<1.0	<1.0	<1.0
	10/13/2011 - Dup	--	57	<120	--	<250	--	<1.0	<1.0	<1.0	<1.0
	3/9/2012	--	**1,080**	**3,800**	--	**1,400**	--	**10**	9.6	9.7	18.6
	3/9/2012 - Dup	--	**985**	**4,100**	--	**1,500**	--	**9.1**	8.7	8.9	17
	6/20/2012	--	50.6	120	--	<380	--	1.4	<1.0	<1.0	<3.0
	6/20/2012 - Dup	--	62.1	<82	--	<410	--	1.6	<1.0	<1.0	<3.0
	9/20/2012	--	<50	93	--	<420	--	<1.0	<1.0	<1.0	<3.0
	9/20/2012 - Dup	--	<50	<79	--	<400	--	<1.0	<1.0	<1.0	<3.0
	12/11/2012	--	**1,460**	**1,800**	--	**1,300**	--	**7.3**	39.9	14.9	71.5
	12/11/2012 - Dup	--	708	**1,600**	--	**1,300**	--	3.7	22.9	7.2	35.1
	3/18/2013	--	600	**1,800**	--	**1,300**	--	**5.2**	7.8	2.7	24
	3/18/2013 - Dup	--	610	**1,100**	--	**250**	--	**5.4**	8.1	2.8	25
	12/4/2013	--	**1,000**	**2,300**	--	**630**	--	**14**	21	19	110
	12/4/2013 - Dup	--	**1,000**	**2,900**	--	**1,000**	--	**14**	20	19	110
	3/18/2014	--	<100	**1,900**	--	**860**	--	1.7	<5.0	<0.5	1.6
	3/18/2014 - Dup	--	<100	**1,900**	--	**870**	--	1.6	<5.0	<0.5	1.6
	6/19/2014	--	<100	**800**	--	250	--	0.95	<5.0	<0.5	<1.5
	6/19/2014 - Dup	--	<100	**1,000**	--	380	--	<0.5	<5.0	<0.5	<1.5

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Monitoring Well	Sample Date	TOC	Total Petroleum Hydrocarbons					Volatile Organic Compounds[d]			
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MTCA Method A Cleanup Levels[e] (µg/L)		**NA**	**800**	**500**	**500**	**500**	**500**	**5**	**1,000**	**700**	**1,000**
MW-3 (cont'd)	11/20/2014	--	150	**2,700**	--	**1,400**	--	1.7	<5.0	0.74	<1.5
	11/20/2014 - Dup	--	120	**2,800**	--	**1,500**	--	1.8	<5.0	0.64	<1.5
	4/15/2015	--	<100	**1,400**	--	**510**	--	0.77	<5.0	<0.5	<1.5
	11/3/2015	--	471	**3,080**	--	**1,820**	--	4.65	<5.0	1.95	5.68
	6/1/2016	--	<100	**1,700**	--	**1,100**	--	1.21	<5.0	<0.5	<1.5 B
	11/10/2016	--	230	**1,210**	**3,010**	<500	**1,640**	2.87	<5.0	<1.0	<3.0
	5/30/2017	--	212	**1,340**	**1,500**	**785**	**1,110**	1.83	<1.00	<1.00	<3.00
	11/9/2017[f]	--	749	**547**	**2,200**	<250	**1,130**	4.16	14.7	26.7	79.3
	6/13/2018	--	<100	<200	**1,110**	<250	**970**	<1.00	<1.00	<1.00	<3.00
	11/6/2018	--	**1,230**	<200	**2,670**	<250	**1,210**	4.74	16.5	27.5	102
	6/20/2019	--	219 B	<200	**1,540**	<250	**924**	1.02	<1.00	<1.00	<3.00
	11/22/2019	--	**1,080**	<200	**2,070**	<250	**907**	2.68	6.47	<1.00	43.4
	8/3/2021[g]	11200	<100	<200	**1,960**	<250	**1,500**	<1.00	<1.00	<1.00	<3.00
	8/3/2021-Dup	10400	<100	<200	**1,850**	<250	**1,040**	<1.00	<1.00	<1.00	<3.00
MW-4	10/5/2001	--	149	**1,940**	--	<561	--	<0.5	2.17	<0.5	<1.0
	10/5/2001 - Dup	--	140	**2,180**	--	<561	--	<0.5	2.08	<0.5	<1.0
	12/20/2001	--	50.7	<250 J	--	<500 J	--	<0.5	<0.5	<0.5	<1.0
	3/21/2002	--	63.4	393	--	<500	--	<0.5	<0.5	<0.5	<1.0
	6/26/2002	--	244	<250	--	<500	--	2.73	<0.5	<0.5	1.06
	9/24/2002	--	253	<250	--	<500	--	3.31	<0.5	<0.5	1.01
	12/18/2002	--	236	<250	--	<500	--	1.73	<0.5	<0.5	<1.0
	3/14/2003	--	254	**2,830**	--	<500	--	0.847	<0.5	<0.5	<1.0
	5/30/2003	--	199	**2,980**	--	<500	--	0.602	<0.5	<0.5	<1.0
	3/26/2004	--	204	314	--	<500	--	<0.5	<0.5	<0.5	<1.0
	6/29/2004	--	204	469	--	<500	--	<0.5	<0.5	<0.5	<1.0
	9/27/2004	--	192	408	--	<500	--	<0.5	<0.5	<0.5	<1.0
	12/1/2004	--	196	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	3/9/2005	--	153	378	--	<500	--	<0.5	<0.5	<0.5	<1.0
	6/29/2005	--	183	477	--	<500	--	<0.5	<0.5	<0.5	<1.0
	9/23/2005	--	180	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	12/30/2005	--	137	<248	--	<495	--	<0.5	<0.5	<0.5	<1.0
	3/28/2006	--	170	<243	--	<485	--	<0.5	<0.5	<0.5	<1.0
	6/29/2006	--	132	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	9/5/2006	--	<80	<263	--	<526	--	<0.5	<0.5	<0.5	<1.0
	12/11/2006	--	<50	<245	--	<490	--	<0.5	<0.5	<0.5	<1.0
	3/30/2007	--	<50	<253	--	<505	--	<0.5	<0.5	<0.5	<1.0
	9/6/2007	--	267	<250	--	<500	--	0.65	<0.5	<0.5	<3.0
	4/29/2008	--	98.7	<248	--	<495	--	<0.5	<0.5	<0.5	<1.0
	10/1/2008	--	52.2	<248	--	<495	--	<0.5	<0.5	<0.5	<1.0
	4/30/2009	--	76.4	<245	--	<490	--	--	<0.5	<0.5	<1.0
	10/12/2009	--	68	<120	--	<250	--	<1.0	<1.0	<1.0	<1.0
	4/29/2010	--	75	<120	--	<240	--	<0.5	<0.5	<0.5	<1.0
	10/12/2010	--	65	**580**	--	<240	--	<0.5	<0.5	<0.5	<1.0
	4/28/2011	--	<50	<120	--	<240	--	<1.0	<1.0	<1.0	<1.0
	10/13/2011	--	140	350	--	<250	--	<1.0	<1.0	<1.0	<1.0
	3/9/2012	--	<50	**2,800**	--	**1,400**	--	<1.0	<1.0	<1.0	<3.0
	6/20/2012	--	<50	<79	--	<400	--	<1.0	<1.0	<1.0	<3.0
	9/20/2012	--	<50	<79	--	<400	--	<1.0	<1.0	<1.0	<3.0
	12/11/2012	--	<100	**2,100**	--	**1,800**	--	<1.0	<1.0	<1.0	<3.0
	3/18/2013	--	<100	**1,400**	--	400	--	<0.5	<5.0	<0.5	<1.5
	12/4/2013	--	<100	**1,300**	--	440	--	<0.5	<5.0	<0.5	<1.5
	3/18/2014	--	<100	**2,200**	--	**1,100**	--	<0.5	<5.0	<0.5	<1.5
	6/19/2014	--	<100	**1,600**	--	**710**	--	<0.5	<5.0	<0.5	<1.5
	11/20/2014	--	<100	**2,900**	--	**1,900**	--	<0.5	<5.0	<0.5	<1.5
	4/15/2015	--	<100	**1,900**	--	**940**	--	0.56	<5.0	<0.5	<1.5
	4/15/2015 - Dup	--	<100	**1,800**	--	**790**	--	<0.5	<5.0	<0.5	<1.5
	11/3/2015	--	<100	**1,980**	--	**1,310**	--	<0.5	<5.0	<0.5	<1.5
	6/1/2016	--	<100	**878**	--	**575**	--	<0.5	<5.0	<0.5	<1.5 B
	6/1/16 - Dup	--	<100	**1,160**	--	**937**	--	<0.5	<5.0	<0.5	<1.5 B
	11/10/2016	--	<100	**1,200**	**2,930**	<500	**1,490**	<1.0	<5.0	<1.0	<3.0
	11/10/2016- Dup	--	<100	**1,070**	**2,930**	<500	**1,500**	<1.0	<5.0	<1.0	<3.0
	5/30/2017	--	<100	**1,040**	**1,090**	**880**	**1,120**	<1.00	<1.00	<1.00	<3.00
	5/30/2017- Dup	--	<100	**1,010**	**1,120**	**833**	**1,150**	<1.00	<1.00	<1.00	<3.00
	11/8/2017	--	<100	324	**2,680**	<250	**1,710**	<1.00	<1.00	<1.00	<3.00
	11/8/2017- Dup	--	<100	356	**2,670**	<250	**1,640**	<1.00	<1.00	<1.00	<3.00
	6/13/2018	--	<100	<200	**1,150**	<250	**1,060**	<1.00	<1.00	<1.00	<3.00
	6/13/2018 - Dup	--	<100	<200	**1,160**	<250	**1,170**	<1.00	<1.00	<1.00	<3.00
	11/7/2018	--	<100	<200	**1,830**	<250	**1,220**	<1.00	<1.00	<1.00	<3.00
	6/20/2019	--	<100	<200	**620**	<250	**685**	<1.00	<1.00	<1.00	<3.00
	11/22/2019	--	<100	<200	**1,120**	<250	**551**	<1.00	<1.00	<1.00	<3.00

Table 3
Groundwater Monitoring Analytical Results
Supplemental Remedial Investigation Report
BNSF Railway Company Glacier Park East
Leavenworth, Washington

Monitoring Well	Sample Date	TOC	Total Petroleum Hydrocarbons					Volatile Organic Compounds[d]			
			GRO[a]	DRO (w/ SGC)[b]	DRO (w/o SGC)[b]	ORO (w/ SGC)[c]	ORO (w/o SGC)[c]	Benzene	Toluene	Ethyl - benzene	Total Xylenes
MTCA Method A Cleanup Levels[e] (µg/L)		**NA**	**800**	**500**	**500**	**500**	**500**	**5**	**1,000**	**700**	**1,000**
MW-4 (cont'd)	11/22/2019 - Dup	--	<100	<200	**1,100**	<250	**553**	<1.00	<1.00	<1.00	<3.00
	8/3/2021	8,730	<100	<200	**1,180**	<250	**1,180**	<1.00	<1.00	<1.00	<3.00
MW-5	10/5/2001	--	<50	--	--	--	--	<0.5	<0.5	<0.5	<1.0
	12/20/2001	--	<50	<250 J	--	<500	--	<0.5	<0.5	<0.5	<1.0
	3/21/2002	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	6/26/2002	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	9/24/2002	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	12/18/2002	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	3/14/2003	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	1.24
	5/30/2003	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	3/26/2004	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	6/29/2004	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	9/27/2004	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	9/27/2004 - Dup	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	12/1/2004	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	12/1/2004 - Dup	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	3/9/2005	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	6/29/2005	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	9/23/2005	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	9/23/2005 - Dup	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	12/30/2005	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	12/30/2005 - Dup	--	<50	<248	--	<495	--	<0.5	<0.5	<0.5	<1.0
	3/28/2006	--	<50	<243	--	<485	--	<0.5	<0.5	<0.5	<1.0
	3/28/2006 - Dup	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	6/29/2006	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	6/29/2006 - Dup	--	<50	<263	--	<526	--	<0.5	<0.5	<0.5	<1.0
	9/5/2006	--	<80	<278	--	<556	--	<0.5	<0.5	<0.5	<1.0
	9/5/2006 - Dup	--	<80	<253	--	<505	--	<0.5	<0.5	<0.5	<1.0
	12/11/2006	--	<50	<250	--	<500	--	<0.5	<0.5	<0.5	<1.0
	12/11/2006 - Dup	--	<50	<248	--	<495	--	<0.5	<0.5	<0.5	<1.0
	3/30/2007	--	<50	<245	--	<490	--	<0.5	<0.5	<0.5	<1.0
	3/30/2007 - Dup	--	<50	<245	--	<490	--	<0.5	<0.5	<0.5	<1.0
	8/3/2021[g]	1,780 B	<100	<200	<200	<250	<250	<1.00	<1.00	<1.00	<3.00
MW-6	5/31/2017	--	<100	<200	<400	<250	<500	<1.00	<1.00	<1.00	<3.00
	11/9/2017[f]	--	<100	<200	<200	<250	<250	<1.00	<1.00	<1.00	<3.00
	6/13/2018	--	<100	<200	204	<250	335	<1.00	<1.00	<1.00	<3.00
	11/5/2018	--	<100	<200	<200	<250	<250	<1.00	<1.00	<1.00	<3.00
	6/19/2019	--	<100	<200	<200	<250	<250	<1.00	<1.00	<1.00	<3.00
	11/21/2019	--	<100	<200	<200	<250	<250	<1.00	<1.00	<1.00	<3.00
	8/3/2021	<1,000	<100	<200	<200	<250	<250	<1.00	<1.00	<1.00	<3.00
PZ-1	4/21/2017	--	<100	<200	<200	<250	<250	<1.00	<1.00	<1.00	<3.00
PZ-2	4/21/2017	--	<100	<200	<200	<250	<250	<1.00	<1.00	<1.00	<3.00
PZ-3	4/21/2017	--	<100	<200	<200	<250	<250	<1.00	<1.00	<1.00	<3.00
PZ-4[h]	6/24/2021	17,300	**16,000**	**1,390**	**5,540**	<250	**1,730**	<1.00	--	--	--

Notes:
All results presented in micrograms per liter (µg/L).

Bold	Bold results are greater than or equal to the applicable cleanup level..
<	Less than the laboratory detection limit.
a	Analyzed by Northwest Method NWTPH-Gx.
b	Analyzed by Northwest Method NWTPH-Dx-NO SGT (no silica gel cleanup).
c	Analyzed by Northwest Method NWTPH-Dx-SGT (with silica gel cleanup).
d	Analyzed by United States Environmental Protection Agency Method 8260D.
e	Washington State Department of Ecology, Model Toxics Control Act (MTCA) Regulation and Statute, MTCA Cleanup Regulation Chapter 173-340 WAC, Model Toxics Control Act Chapter 70.105D RCW, Uniform Environmental Covenants Act Chapter 64.70 RCW. Publication No. 94-06. Revised May 2019.
f	Samples were analyzed outside of the analytical holding time for samples collected on 11/9/17 and 11/10/2017 and should be considered minimum values.
g	Samples from MW-3 and MW-5 was additionally analyzed for fecal coliform by Standard Method (SM) 9222D. Fecal coliform bacteria were not detected in either sample.
h	Sample from PZ-4 was additionally analyzed for total coliform and E. Coli by m-ColiBlue24® (MF Count). Total coliform coliform bacterial value of 2,000 Colony Forming Units per 100 milliliters (CFU/100mL). E. coli was not detected.
--	Sample was not analyzed for this compound.
Dup	Duplicate sample.
MW	Monitoring well.
NA	Not applicable.
PZ	Piezometer.
SGC	Silica gel cleanup.

Qualifiers:

B	Analyte was detected in the blank and the value presented here may be biased high.
H	Samples were analyzed outside of the analytical holding time due to an analyst oversight.
I	Analyte concentration may be artifically elevated because of co-eluting compounds or components.
J	Analyte was detected in the sample at an estimated concentration between the method detection limit and the detection limit.

Compounds:

TOC	Total organic carbon
GRO	Gasoline-range organics
DRO	Diesel-range organics
ORO	Oil-range organics

Table 4

Depth-Discrete Groundwater Analytical Results

Supplemental Remedial Investigation Report

BNSF Railway Company Glacier Park East

Leavenworth, Washington

Monitoring Well	**Sample Depth**	**Screen Interval**	**Sample Date**	**Total Petroleum Hydrocarbons**					**VOCs**
	(feet below top of casing)			**GRO**[a]	**DRO** (w/ SGC)[b]	**DRO** (w/o SGC)[c]	**ORO** (w/ SGC)[b]	**ORO** (w/o SGC)[c]	**Benzene**[d]
MTCA Method A Cleanup Levels[a] **(µg/L)**				**1,000/ 800**[f]	**500**	**500**	**500**	**500**	**5**
MW-1	60[g]	62 - 77	6/21/2021	<100	<200 J3	**797**	<250	**580**	<1.00
	65[g]		6/21/2021	<100	<200 J3	**556**	<250	366	<1.00
MW-2	68.5	63-83	6/21/2021	103	<200 J3	300	<250	<250	<1.00
	73.5		6/21/2021	<100	<200 J3	283	<250	<250	<1.00
	78		6/21/2021	<100	<200 J3	434	<250	<250	<1.00
MW-3	63	58-78	6/21/2021	<100	<200 J3	**1,890**	<250	**1,060**	<1.00
	69		6/21/2021	<100	<200 J3	**1,830**	<250	**995**	<1.00
	75		6/21/2021	<100	<200 J3	**1,970**	<250	**1,140**	<1.00
MW-4	64	54-74	6/21/2021	<100	<200 J3	**616**	<250	**519**	<1.00
	72		6/21/2021	<100	<200 J3	**596**	<250	469	<1.00
MW-5	71	60.5-80.5	6/21/2021	<100	<200 J3	<200	<250	<250	<1.00
	78		6/21/2021	<100	<200 J3	319	<250	<250	<1.00
MW-6	63	53-73	6/21/2021	<100	<200 J3	<200	<250	<250	<1.00
	71		6/21/2021	<100	<200 J3	<200	<250	<250	<1.00

Notes:

All results presented in micrograms per liter (µg/L).

Bold	Bold results are greater than or equal to the applicable cleanup level..
<	Less than the laboratory detection limit.
a	Analyzed by Northwest Method NWTPH-Gx.
b	Analyzed by Northwest Method NWTPH-Dx-SGT (with silica gel cleanup).
c	Analyzed by Northwest Method NWTPH-Dx-NO SGT (no silica gel cleanup).
d	Analyzed by United States Environmental Protection Agency Method 8260D.
e	Washington State Department of Ecology, Model Toxics Control Act (MTCA) Regulation and Statute, MTCA Cleanup Regulation Chapter 173-340 WAC, Model Toxics Control Act Chapter 70.105D RCW, Uniform Environmental Covenants Act Chapter 64.70 RCW. Publication No. 94-06. Revised May 2019.
f	Cleanup levels for gasoline are 1,000 µg/L when benzene is not detected, 800 µg/L when benzene is detected.
g	Sample depths are approximate due to approximately 10 feet of sediment in bottom of MW-1.
SGC	Silica gel cleanup.

Compounds:

GRO	Gasoline-range organics
DRO	Diesel-range organics
ORO	Oil-range organics
VOCs	Volatile organic compounds

Qualifiers:

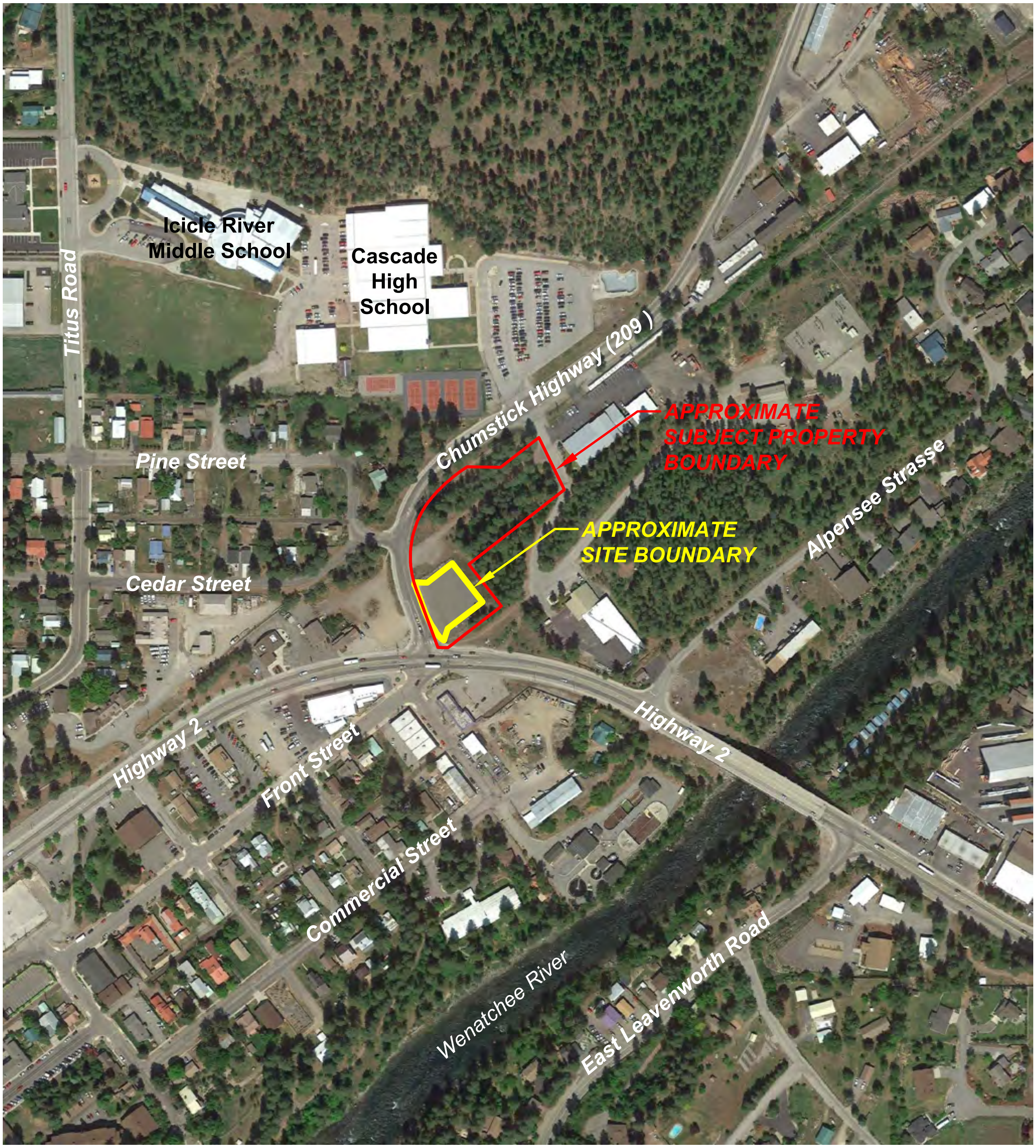
J3	The associated batch QC was outside the established quality control range for precision.

Table 5
Calculated Hydraulic Conductivities
Supplemental Remedial Investigation Report
BNSF Railway Company Glacier Park East
Leavenworth, Washington

Location	Slug Test No.	Hydraulic Conductivity (cm/sec)
MW-1	1	2.76E-05
	2	6.90E-05
	3	5.66E-05
	4	5.75E-05
	Average	5.27E-05
MW-2	1	1.40E-05
	2	1.03E-05
	Average	1.22E-05
MW-3	1	4.41E-05
	2	3.58E-05
	3	3.33E-05
	4	5.37E-05
	Average	4.17E-05
MW-4	1	3.47E-05
	2	5.09E-05
	3	2.28E-05
	4	3.48E-05
	Average	3.58E-05
MW-5	1	8.36E-05
	2	7.43E-05
	3	1.45E-04
	5	1.96E-04
	Average	1.25E-04
MW-6	1	5.38E-05
	3	4.03E-05
	4	2.74E-05
	5	1.91E-05
	Average	3.52E-05

Notes:
All results presented in centimeters per second (cm/sec).

Figures

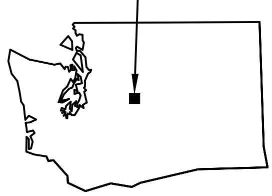


SOURCE AERIAL PHOTO: Google Earth Professional, June 2015.

N

APPROXIMATE SCALE (FEET)

0 400 800



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ISSAQUAH, WA 98027
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425.395.0010

FIGURE 1

VICINITY MAP

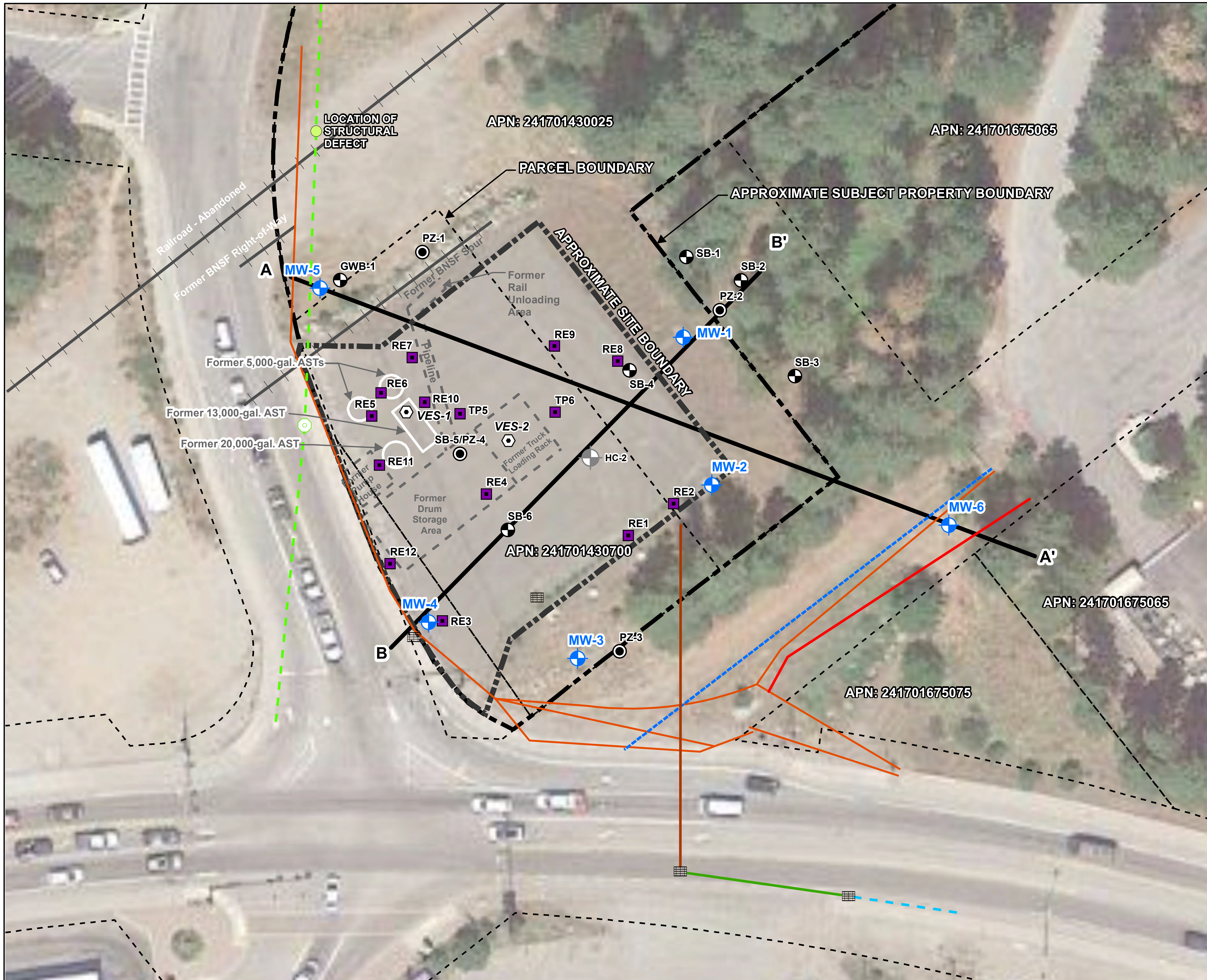
REPORT
SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

PREPARED FOR
BNSF RAILWAY COMPANY AND CHEVRON USA, INC.

PROJECT NUMBER
444428

LOCATION
CHUMSTICK HIGHWAY AND STATE HIGHWAY 2
LEAVENWORTH, WASHINGTON

DATE 11/17/21
DRAWN BY .... RMC
REVIEWED BY .... DK



Legend

Surveyed locations of:

- Groundwater-Bearing Zone Monitoring Well
- Shallow Transient Water Piezometer
- Soil Boring

Approximate locations of:

- Test Pit
- Abandoned Monitoring Well
- Former Vapor Extraction Well
- Catch Basin
- A — A' Cross Section

Utilities:

- Underground Power Line
- Sanitary Sewer Line
- Telecom Line
- Water Line
- 10-Inch Ductile Iron Pipe
- Corrugated Sewer Pipe
- Existing CCP Storm Drain

SOURCES:
AERIAL PHOTO: Google Earth, July 2017.
BASE PLAN:Groundwater Potentiometric Map by Kennedy/Jenks Consultants, December 2013, and site plans by Geo Engineers, March 2002.

NOTES:
Wells and piezometers surveyed in June 2021 by Erlandsen & Associates, East Wenatchee, Washington. Coordinate system: NAD83 Washington State Planes, North Zone, US foot.

Property boundary extends farther to the north east.

AST = aboveground storage tank.

Utility locations are appoximate based on utility locate results.

N

0 40 80 Feet

1:480

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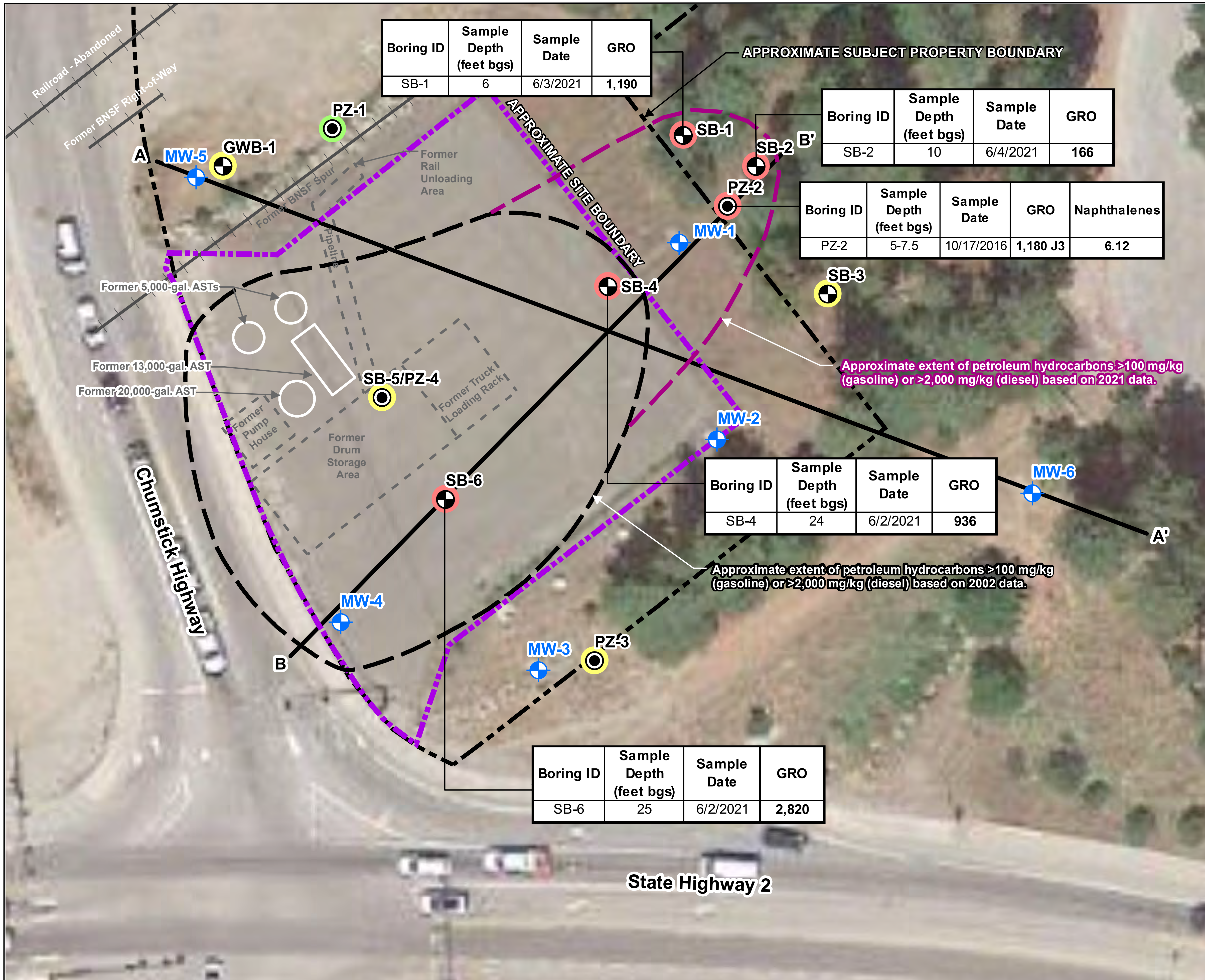
FIGURE 2

SITE REPRESENTATION WITH UTILITIES, SAMPLES, AND CROSS SECTION LOCATIONS

REPORT SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT	*PREPARED FOR* BNSF RAILWAY COMPANY AND CHEVRON USA, INC.
	PROJECT NUMBER 444428
LOCATION CHUMSTICK HIGHWAY AND STATE HIGHWAY 2 LEAVENWORTH, WASHINGTON	*DATE*........ 1/5/22 *DRAWN BY*........ RMC *REVIEWED BY*........ DK



Boring ID	Sample Depth (feet bgs)	Sample Date	GRO
SB-1	6	6/3/2021	**1,190**

Boring ID	Sample Depth (feet bgs)	Sample Date	GRO
SB-2	10	6/4/2021	**166**

Boring ID	Sample Depth (feet bgs)	Sample Date	GRO	Naphthalenes
PZ-2	5-7.5	10/17/2016	**1,180 J3**	**6.12**

Boring ID	Sample Depth (feet bgs)	Sample Date	GRO
SB-4	24	6/2/2021	**936**

Boring ID	Sample Depth (feet bgs)	Sample Date	GRO
SB-6	25	6/2/2021	**2,820**

Legend

Surveyed locations of:

- Groundwater-Bearing Zone Monitoring Well
- Shallow Transient Water Piezometer
- Soil Boring
- Indicates Sample Where One or More Constituent Concentrations Exceeded CULs
- Indicates Sample Where One or More Constituent Concentrations were greater than the DLs, but less than the CULs
- Indicates Sample has no Constituent Concentrations Exceeding the CULs or DLs

NOTES:
Results in bold denote concentrations detected at or greater than the applicable cleanup level.
All analytical results are shown in milligrams per kilogram (mg/kg).

ABBREVIATIONS:
mg/kg = milligram per kilogram
bgs = below ground surface
GRO = gasoline-range organics
MTCA = Model Toxics Control Act
J3 = The associated batch QC was outside the established quality control range for precision
CUL = cleanup level
DL = laboratory detection limit

Wells and piezometers surveyed in June 2021 by Erlandsen & Associates, East Wenatchee, Washington.
Coordinate system: NAD83 Washington State Planes, North Zone, US foot.

Property boundary extends farther to the north east.

SOURCES:
AERIAL PHOTO: Google Earth, July 2017.
BASE PLAN: Groundwater Potentiometric Map by Kennedy/Jenks Consultants, December 2013, and site plans by Geo Engineers, March 2002.

N

0 30 60 Feet

1:360

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FIGURE 3
SITE PLAN SHOWING CLEANUP LEVEL EXCEEDANCES IN SOIL

REPORT
SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

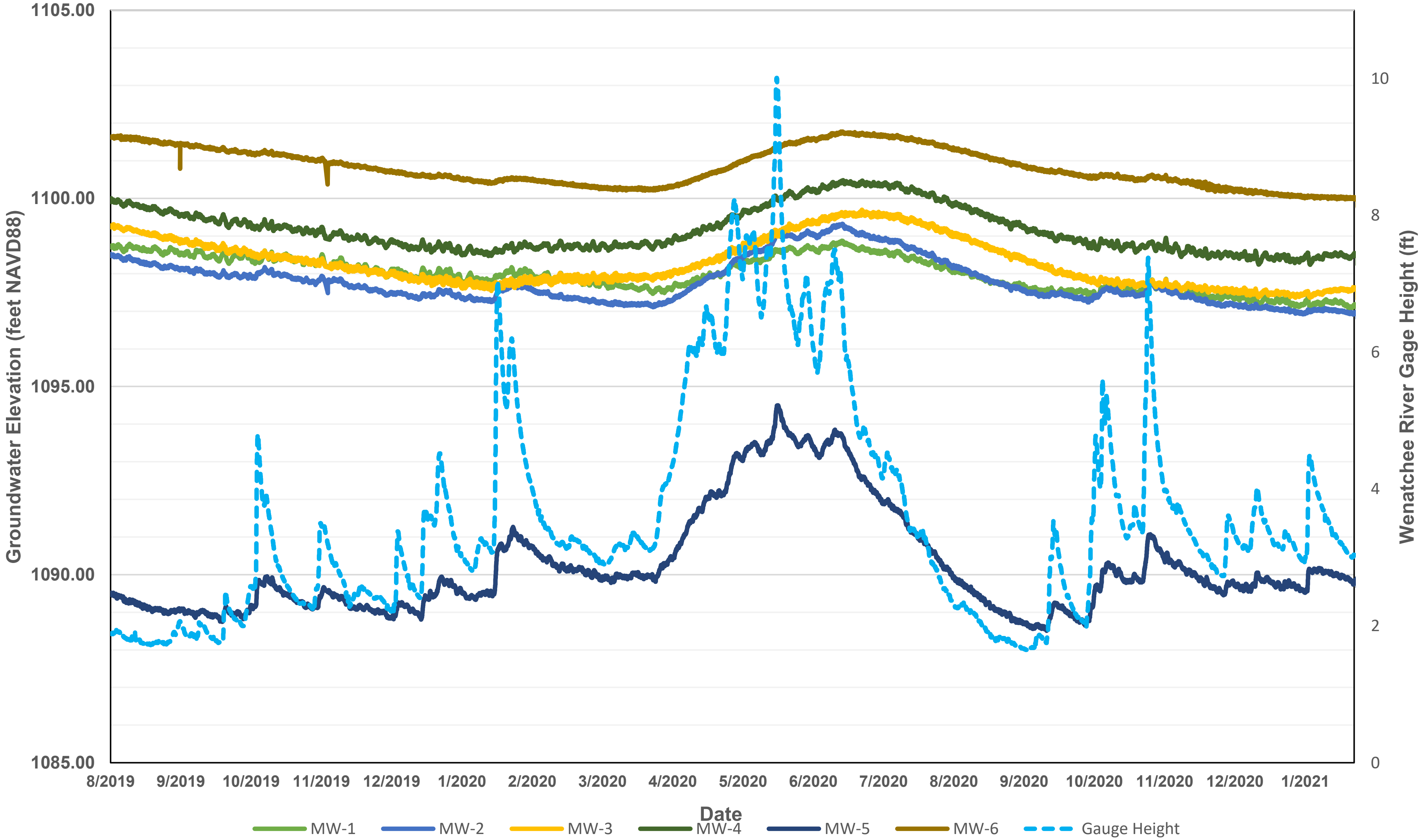
PREPARED FOR
BNSF RAILWAY COMPANY AND CHEVRON USA, INC.

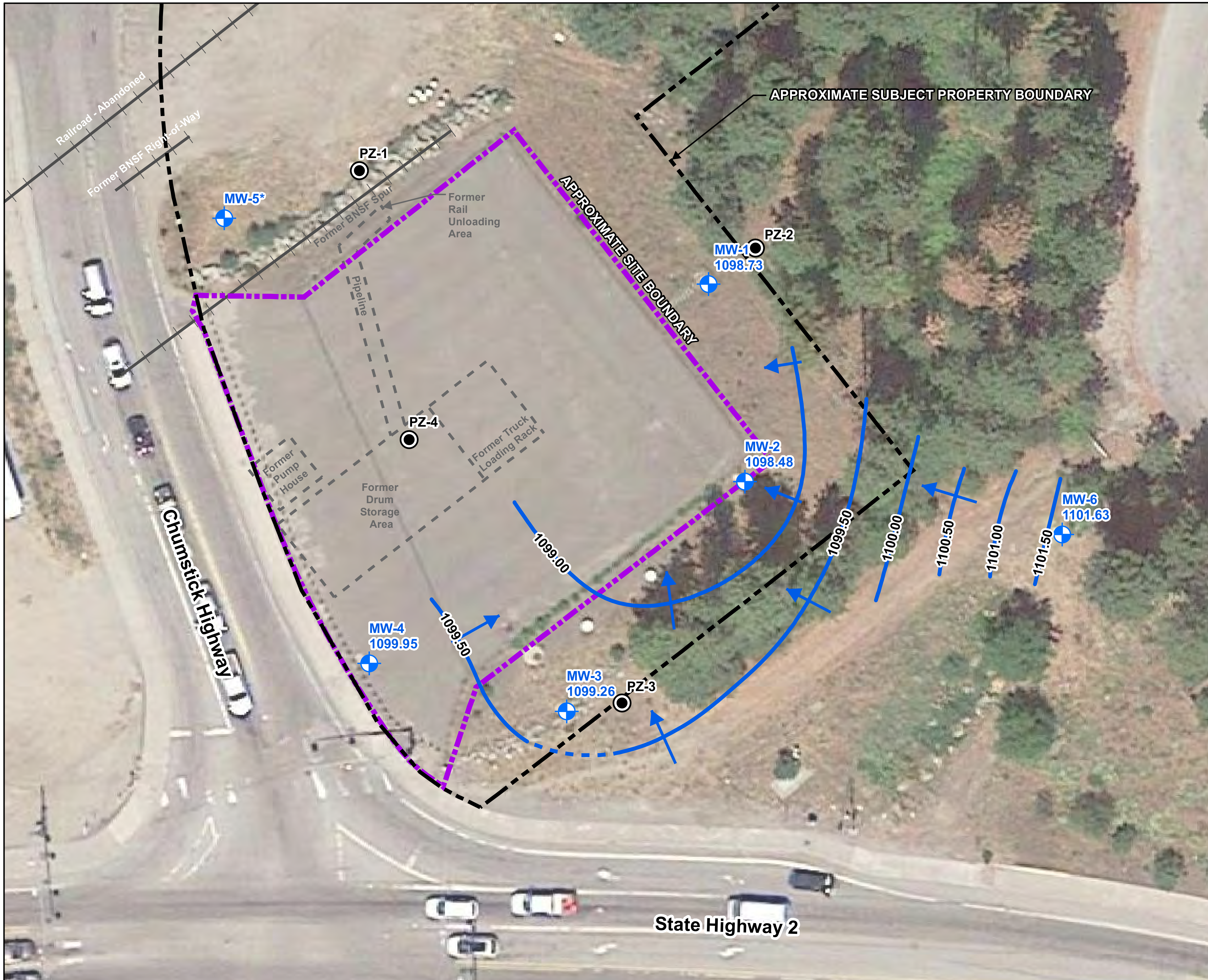
PROJECT NUMBER
444428

LOCATION
CHUMSTICK HIGHWAY AND STATE HIGHWAY 2
LEAVENWORTH, WASHINGTON

DATE........ 1/5/22
DRAWN BY........ RMC
REVIEWED BY........ DK

Figure 4
Transducer Groundwater Elevation Trends vs. Wenatchee River Stage
Data collected between 9/1/2019 to 2/1/2021
BNSF Railway Company
Glacier Park East, Leavenworth, Washington





Legend

- Groundwater-Bearing Zone Monitoring Well
- Shallow Transient Water Piezometer
- 1101.63 Groundwater Elevation
- 1,101.5 Groundwater Elevation Contour Line (ft NAVD88), Dashed where inferred
- Inferred Direction of Groundwater Flow

SOURCES:
AERIAL PHOTO: Google Earth, July 2017.
BASE PLAN: Groundwater Potentiometric Map by Kennedy/Jenks Consultants, December 2013, and site plans by Geo Engineers, March 2002.

NOTES:
Wells and piezometers surveyed in June 2021 by Erlandsen & Associates, East Wenatchee, Washington. Coordinate system: NAD83 Washington State Planes, North Zone, US foot.

Property boundary extends farther to the north east.

* = not used for contouring.

N

0 30 60 Feet
1:360

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425.395.0010

FIGURE 5A
POTENTIOMETRIC SURFACE FOR DEEPER AQUIFER - AUGUST 2019

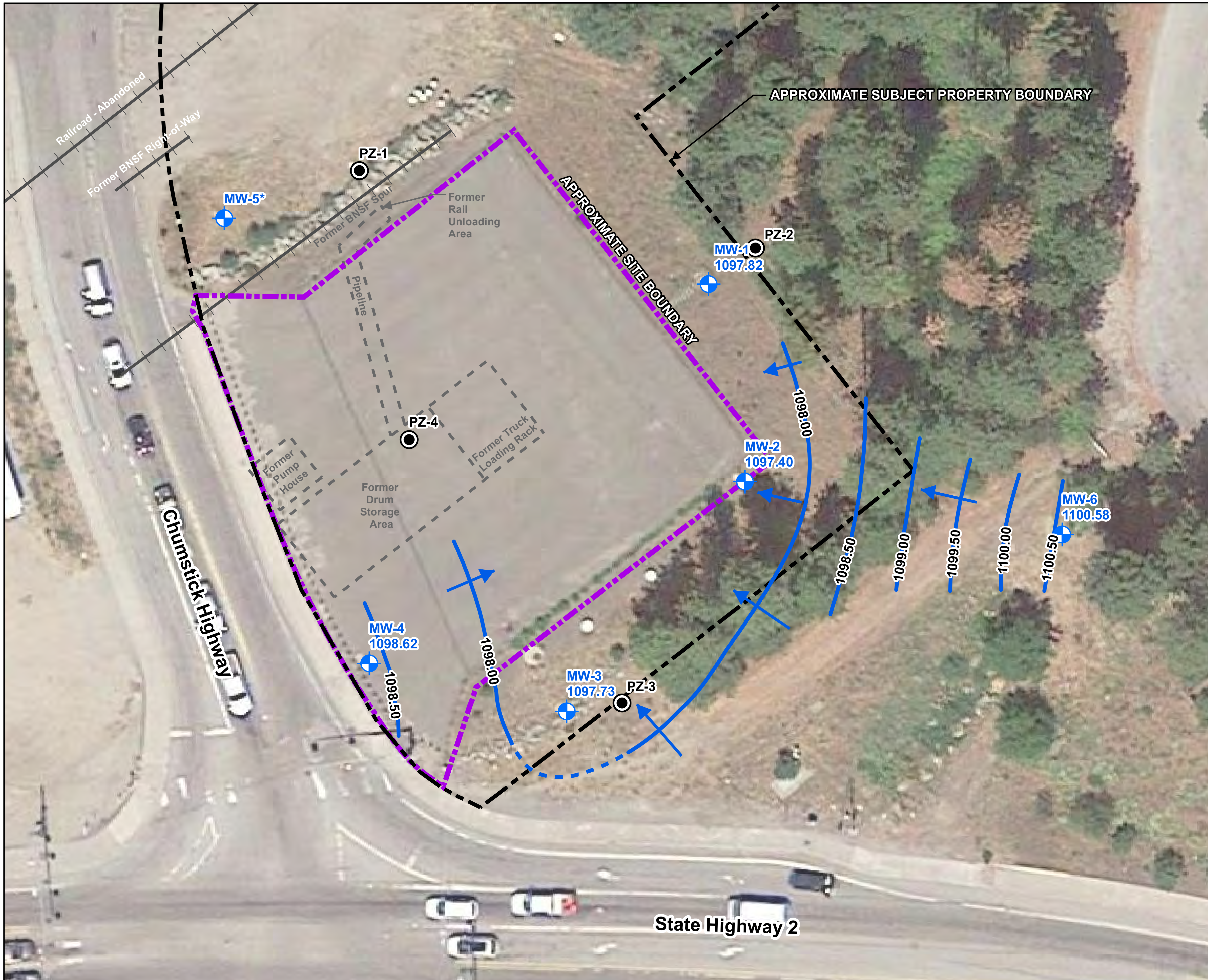
REPORT
SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

PREPARED FOR
BNSF RAILWAY COMPANY AND CHEVRON USA, INC.

PROJECT NUMBER
444428

LOCATION
CHUMSTICK HIGHWAY AND STATE HIGHWAY 2
LEAVENWORTH, WASHINGTON

DATE........ 1/5/22
DRAWN BY........ RMC
REVIEWED BY........ DK



Legend

- Groundwater-Bearing Zone Monitoring Well
- Shallow Transient Water Piezometer
- 1100.58 Groundwater Elevation
- 1,100.5 Groundwater Elevation Contour Line (ft NAVD88), Dashed where inferred
- Inferred Direction of Groundwater Flow

SOURCES:
AERIAL PHOTO: Google Earth, July 2017.
BASE PLAN: Groundwater Potentiometric Map by Kennedy/Jenks Consultants, December 2013, and site plans by Geo Engineers, March 2002.

NOTES:
Wells and piezometers surveyed in June 2021 by Erlandsen & Associates, East Wenatchee, Washington. Coordinate system: NAD83 Washington State Planes, North Zone, US foot.

Property boundary extends farther to the north east.

* = not used for contouring.

N

0 30 60 Feet

1:360

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FIGURE 5B

POTENTIOMETRIC SURFACE FOR DEEPER AQUIFER - JANUARY 2020

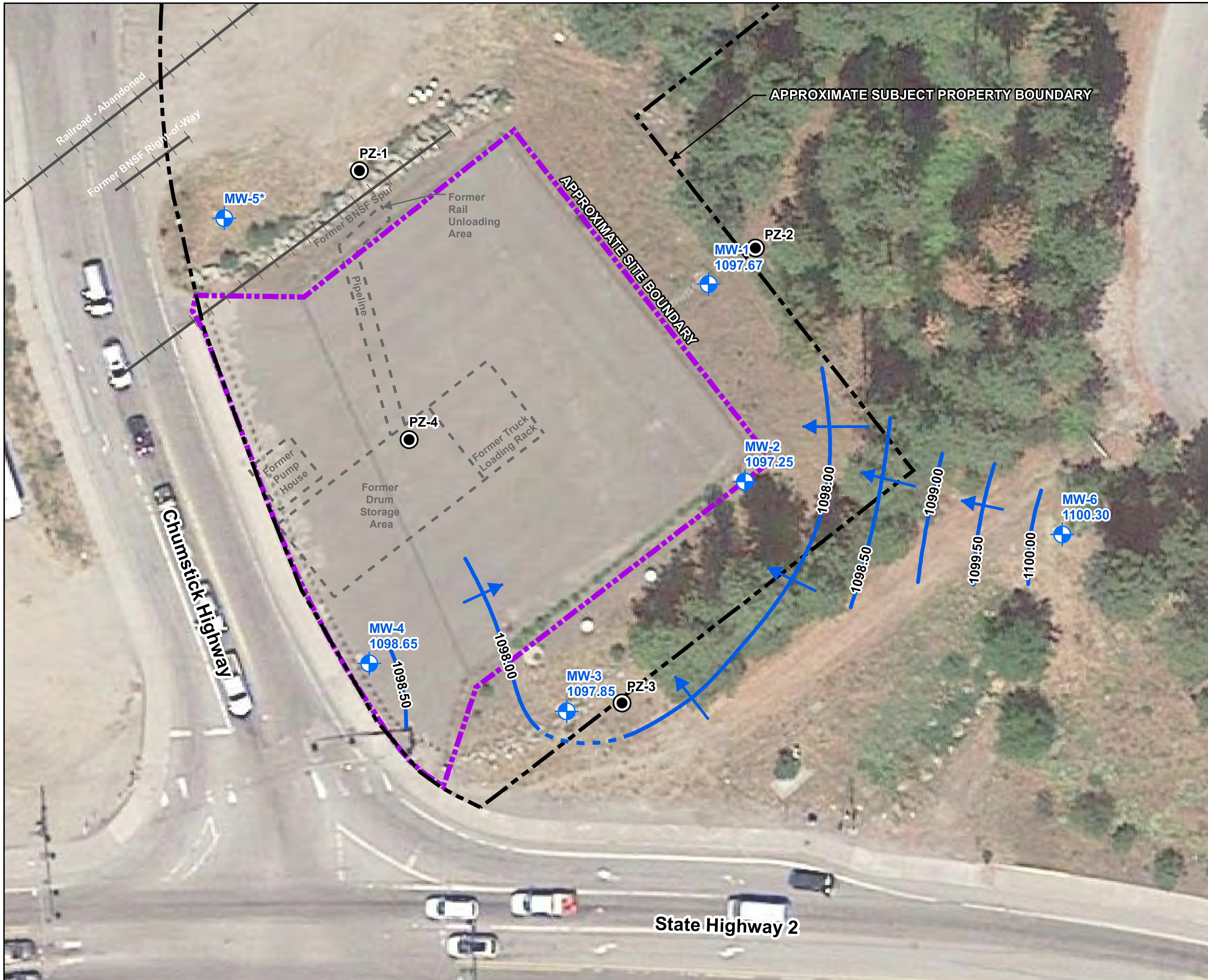
REPORT
SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

PREPARED FOR
BNSF RAILWAY COMPANY AND CHEVRON USA, INC.

PROJECT NUMBER
444428

LOCATION
CHUMSTICK HIGHWAY AND STATE HIGHWAY 2
LEAVENWORTH, WASHINGTON

DATE.. 1/5/22
DRAWN BY.......................................RMC
REVIEWED BY................................ DK



Legend

Groundwater-Bearing Zone Monitoring Well

Shallow Transient Water Piezometer

1100.30 Groundwater Elevation

1,100.0 Groundwater Elevation Contour Line (ft NAVD88), Dashed where inferred

Inferred Direction of Groundwater Flow

SOURCES:
AERIAL PHOTO: Google Earth, July 2017.
BASE PLAN:Groundwater Potentiometric Map by Kennedy/Jenks Consultants, December 2013, and site plans by Geo Engineers, March 2002.

NOTES:
Wells and piezometers surveyed in June 2021 by Erlandsen & Associates, East Wenatchee, Washington.
Coordinate system: NAD83 Washington State Planes, North Zone, US foot.

Property boundary extends farther to the north east.

* = not used for contouring.

N

0 30 60 Feet

1:360

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FIGURE 5C
POTENTIOMETRIC SURFACE FOR DEEPER AQUIFER - MARCH 2020

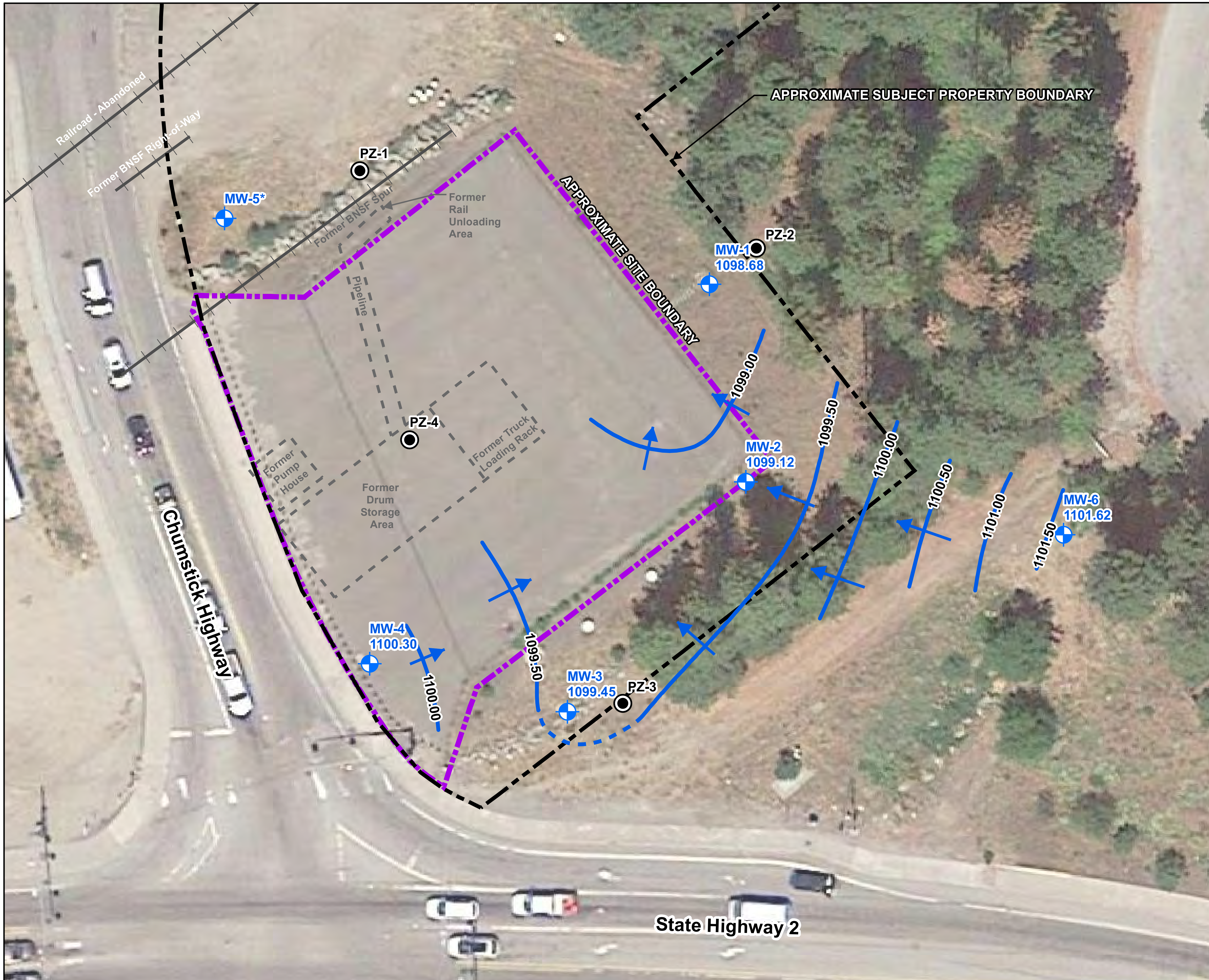
REPORT
SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

PREPARED FOR
BNSF RAILWAY COMPANY AND CHEVRON USA, INC.

PROJECT NUMBER
444428

LOCATION
CHUMSTICK HIGHWAY AND STATE HIGHWAY 2
LEAVENWORTH, WASHINGTON

DATE.......... 1/5/22
DRAWN BY.......... RMC
REVIEWED BY.......... DK



SOURCES:
AERIAL PHOTO: Google Earth, July 2017.
BASE PLAN:Groundwater Potentiometric Map by Kennedy/Jenks Consultants, December 2013, and site plans by Geo Engineers, March 2002.

NOTES:
Wells and piezometers surveyed in June 2021 by Erlandsen & Associates, East Wenatchee, Washington. Coordinate system: NAD83 Washington State Planes, North Zone, US foot.

Property boundary extends farther to the north east.

* = not used for contouring.

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FIGURE 5D
POTENTIOMETRIC SURFACE FOR DEEPER AQUIFER - JUNE 2020

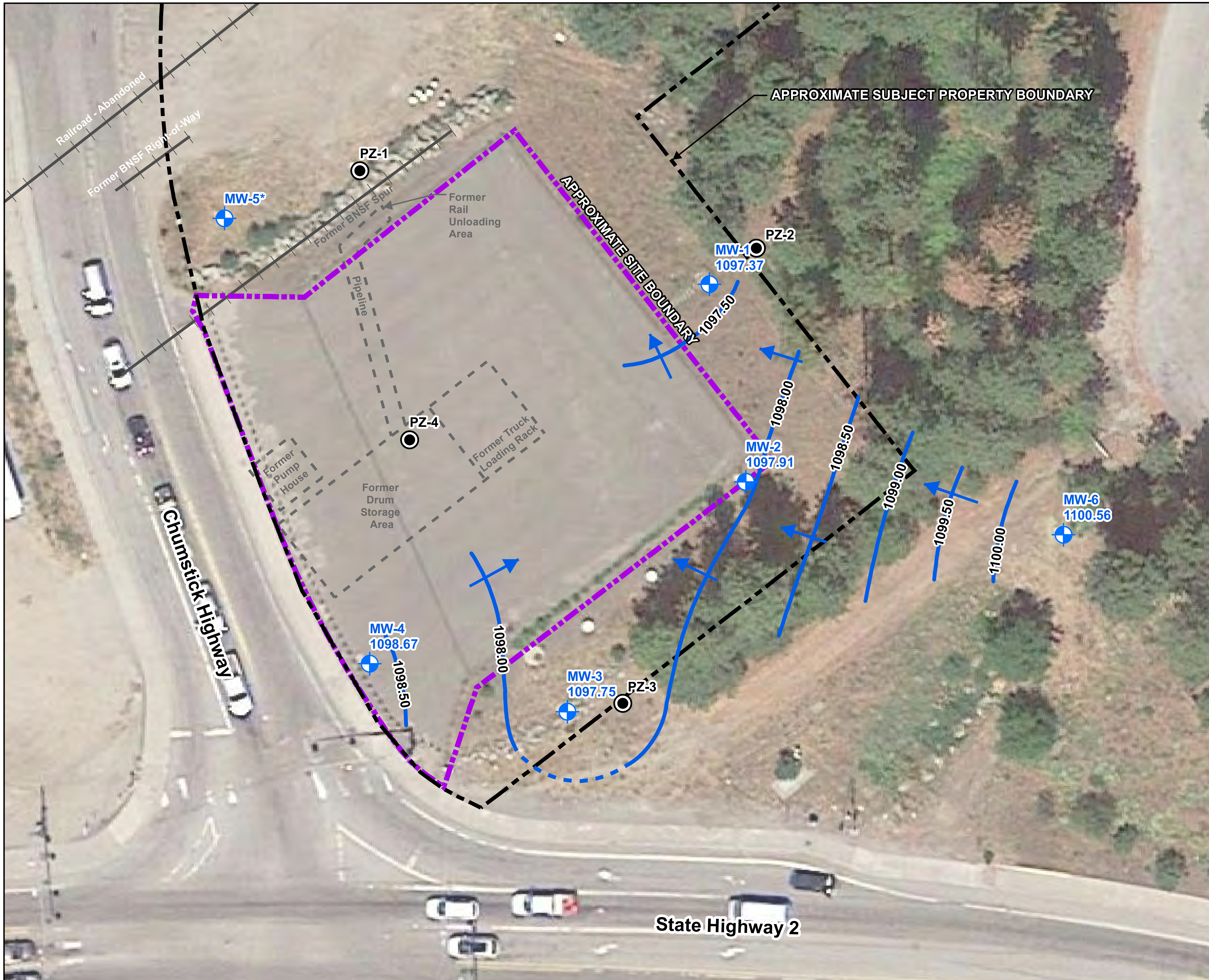
REPORT
SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

LOCATION
CHUMSTICK HIGHWAY AND STATE HIGHWAY 2
LEAVENWORTH, WASHINGTON

PREPARED FOR
BNSF RAILWAY COMPANY AND CHEVRON USA, INC.

PROJECT NUMBER
444428

DATE.. 1/5/22
DRAWN BY......................................RMC
REVIEWED BY................................ DK



Legend

- Groundwater-Bearing Zone Monitoring Well
- Shallow Transient Water Piezometer
- 1100.56 Groundwater Elevation
- 1,100.0 Groundwater Elevation Contour Line (ft NAVD88), Dashed where inferred
- Inferred Direction of Groundwater Flow

SOURCES:
AERIAL PHOTO: Google Earth, July 2017.
BASE PLAN:Groundwater Potentiometric Map by Kennedy/Jenks Consultants, December 2013, and site plans by Geo Engineers, March 2002.

NOTES:
Wells and piezometers surveyed in June 2021 by Erlandsen & Associates, East Wenatchee, Washington. Coordinate system: NAD83 Washington State Planes, North Zone, US foot.

Property boundary extends farther to the north east.

* = not used for contouring.

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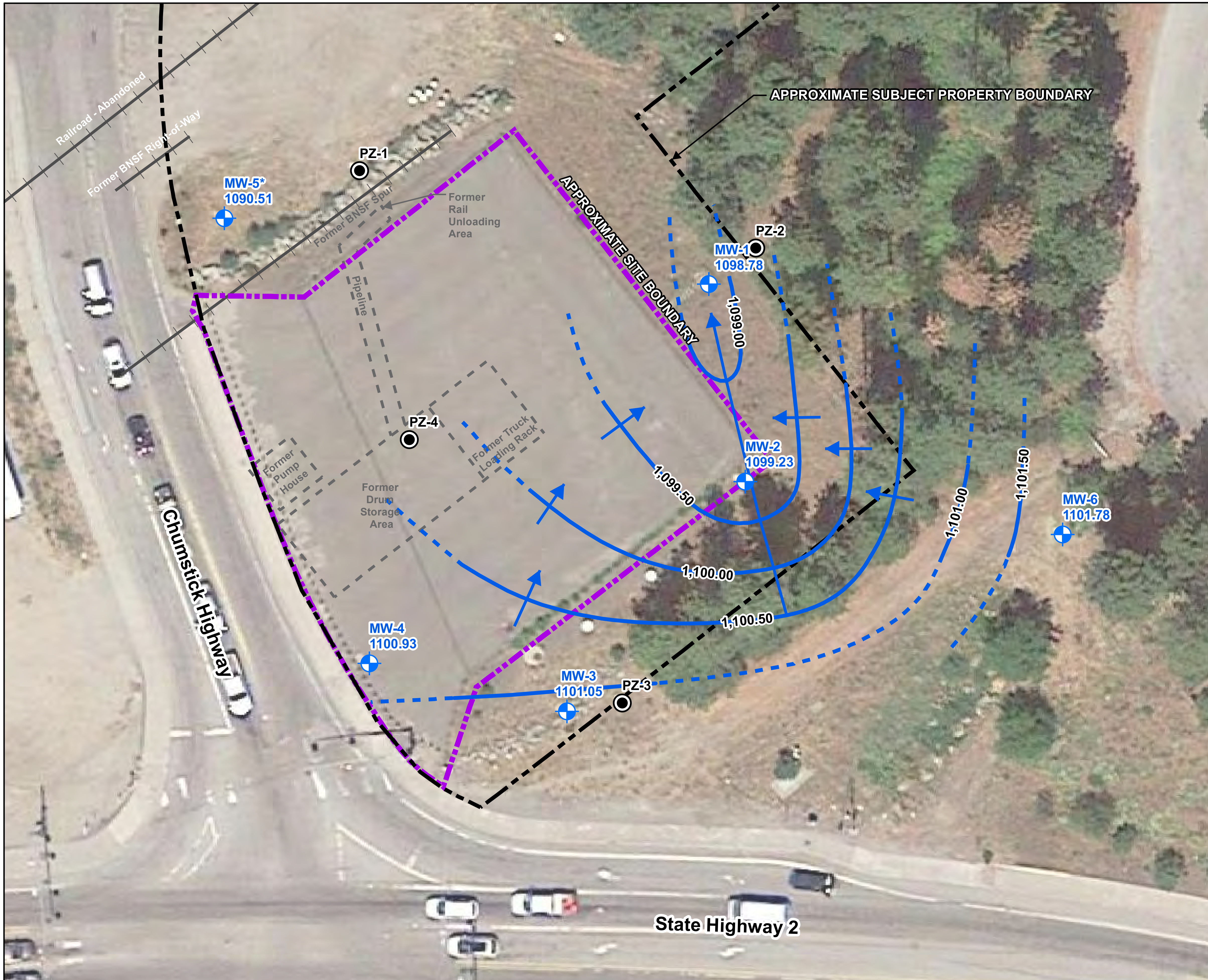
FIGURE 5E

POTENTIOMETRIC SURFACE FOR DEEPER AQUIFER - OCTOBER 2020

REPORT SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT	**PREPARED FOR** BNSF RAILWAY COMPANY AND CHEVRON USA, INC.
	PROJECT NUMBER 444428
LOCATION CHUMSTICK HIGHWAY AND STATE HIGHWAY 2 LEAVENWORTH, WASHINGTON	**DATE** 1/5/22 **DRAWN BY** RMC **REVIEWED BY** DK



Legend

- Groundwater-Bearing Zone Monitoring Well
- Shallow Transient Water Piezometer
- 1101.05 Groundwater Elevation
- 1,101.5 Groundwater Elevation Contour Line (ft NAVD88), Dashed where inferred
- Inferred Direction of Groundwater Flow

SOURCES:
AERIAL PHOTO: Google Earth, July 2017.
BASE PLAN:Groundwater Potentiometric Map by Kennedy/Jenks Consultants, December 2013, and site plans by Geo Engineers, March 2002.

NOTES:
Wells and piezometers surveyed in June 2021 by Erlandsen & Associates, East Wenatchee, Washington. Coordinate system: NAD83 Washington State Planes, North Zone, US foot.

Property boundary extends farther to the north east.

* = not used for contouring.

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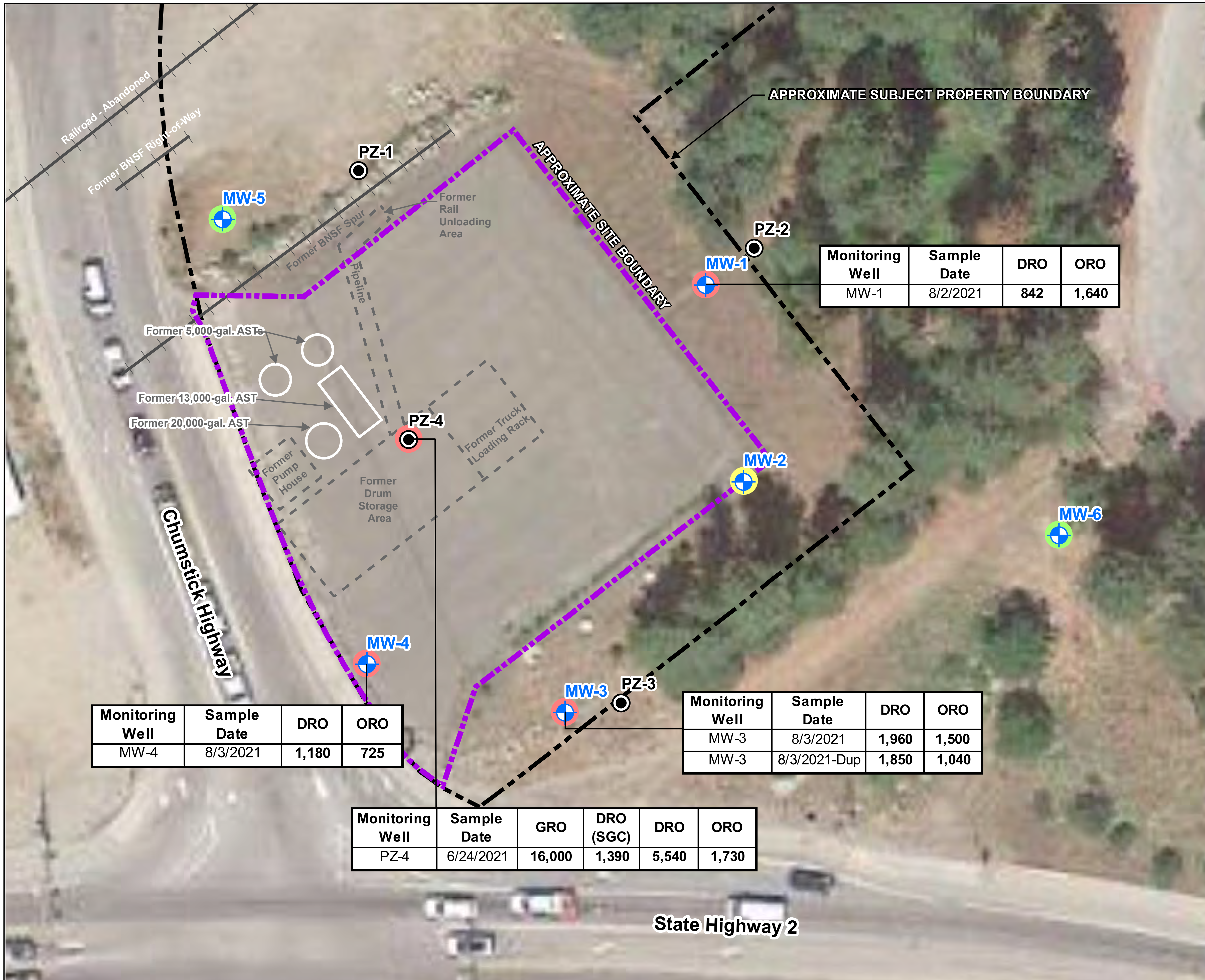
FIGURE 5F

POTENTIOMETRIC SURFACE FOR DEEPER AQUIFER - AUGUST 2021

REPORT SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT	*PREPARED FOR* BNSF RAILWAY COMPANY AND CHEVRON USA, INC.
	PROJECT NUMBER 444428
LOCATION CHUMSTICK HIGHWAY AND STATE HIGHWAY 2 LEAVENWORTH, WASHINGTON	*DATE*.......... 1/5/22 *DRAWN BY*.......... RMC *REVIEWED BY*.......... DK



Monitoring Well	Sample Date	DRO	ORO
MW-1	8/2/2021	**842**	**1,640**

Monitoring Well	Sample Date	DRO	ORO
MW-4	8/3/2021	**1,180**	**725**

Monitoring Well	Sample Date	DRO	ORO
MW-3	8/3/2021	**1,960**	**1,500**
MW-3	8/3/2021-Dup	**1,850**	**1,040**

Monitoring Well	Sample Date	GRO	DRO (SGC)	DRO	ORO
PZ-4	6/24/2021	**16,000**	**1,390**	**5,540**	**1,730**

Legend

Surveyed locations of:

- Groundwater-Bearing Zone Monitoring Well
- Shallow Transient Water Piezometer
- Indicates Sample Where One or More Constituent Concentrations Exceeded CULs
- Indicates Sample Where One or More Constituent Concentrations were greater than the DLs, but less than the CULs
- Indicates Sample has no Constituent Concentrations Exceeding the CULs or DLs

NOTES:
Results in bold denote concentrations detected at or greater than the applicable cleanup level.
PZ-1, PZ-2, and PZ-3 were dry and were not sampled.

ABBREVIATIONS:
Dup = duplicate sample
MTCA = Model Toxics Control Act
SGC = Silica Gel Cleanup
MW = Monitoring well
PZ = Piezometer
GRO = Gasoline Range Organics
ORO = Oil Range Organics
DRO = Diesel Range Organics
SGC = Sample analyzed with Silica Gel Cleanup
AST = aboveground storage tank
CUL = cleanup level
DL = laboratory detection limit

Wells and piezometers surveyed in June 2021 by Erlandsen & Associates, East Wenatchee, Washington. Coordinate system: NAD83 Washington State Planes, North Zone, US foot.

Property boundary extends farther to the north east.

SOURCES:
AERIAL PHOTO: Google Earth, July 2017.
BASE PLAN: Groundwater Potentiometric Map by Kennedy/Jenks Consultants, December 2013, and site plans by Geo Engineers, March 2002.

N

0 30 60 Feet

1:360

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FIGURE 6
SITE PLAN SHOWING CLEANUP LEVEL EXCEEDANCES IN GROUNDWATER

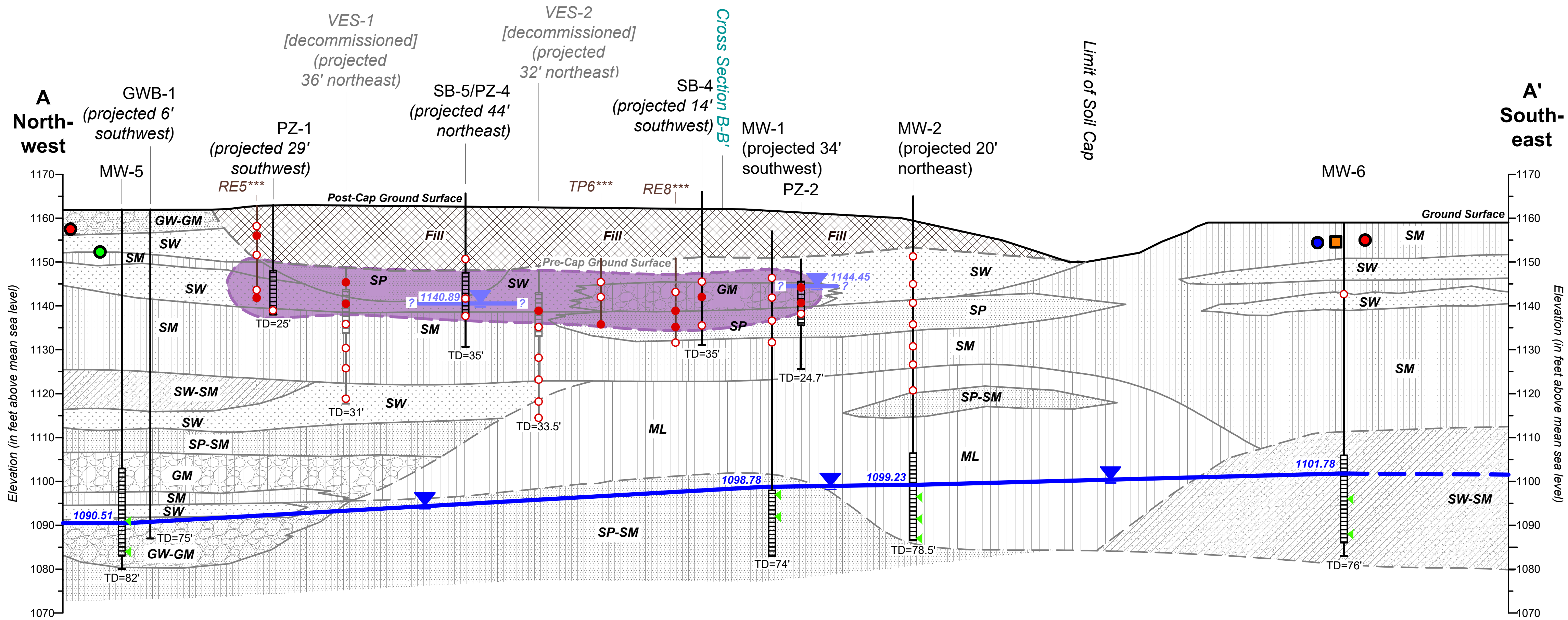
REPORT
SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

PREPARED FOR
BNSF RAILWAY COMPANY AND CHEVRON USA, INC.

PROJECT NUMBER
444428

LOCATION
CHUMSTICK HIGHWAY AND STATE HIGHWAY 2
LEAVENWORTH, WASHINGTON

DATE.. 1/5/22
DRAWN BY.................................... RMC
REVIEWED BY................................ DK



LEGEND

- Well / piezometer (surveyed)
- 1140.89 — Approximate groundwater elevation (ft NAVD88), in transient water piezometer on June 11, 2021
- 1098.78 — Approximate groundwater elevation (ft NAVD88), in deeper aquifer monitoring wells on August 2, 2021
- Soil sample depth with constituent concentration greater than MTCA Method A Cleanup Level
- Soil sample depth with constituent concentration less than MTCA Method A Cleanup Level
- Screen Interval
- Depth Discrete Sample Location
- Lithology line, dashed where inferred
- TD=78.5' — Total depth
- Approximate Area of Impacted Soil
- Telecom Line
- Sanitary Sewer Line
- Underground Power Line
- Water Line

LITHOLOGY KEY**:

	Fill
GM	Gravel with silty fine to coarse sand
GW-GM	Gravel with sand and silt
GP	Poorly-graded gravel with sand and trace silt
ML	Sandy silt / silt with sand
SM	Silty sand with gravel
SP-SM	Poorly-graded sand with silt and gravel
SP	Poorly-graded sand with silt
SW	Well-graded sands, gravelly sands, little or no fines
SW-SM	Well-graded sand with silt and gravel

NOTES:

See Figure 2 for locations of cross sections.
Well and piezometer elevations are to top of PVC based on June 2017 survey by Landline Surveyors, Leavenworth, Washington. Coordinate system: NAD83 Washington State Planes, North Zone, US foot. Vertical datum: NAVD 1988.
Pre-cap ground surface elevations based on Site Plan/ Temporary Erosion and Sedimentation Control Plan-Cleanup Action by GeoEngineers, January 2003.
Post-cap ground surface elevations based on Grading Plan and Cross-Sections-Cleanup Action by GeoEngineers, January 2003.

** = Lithologic units are consistent with the Unified Soil Classification System (USCS) classification from ASTM D-2487.

*** = Locations and depths are approximate.

SGC = silica gel cleanup
µg/L = micrograms per liter
Total petroleum hydrocarbons as:
DRO = Diesel-range organics
DRO (SGC) = Diesel-range organics with SGC
ORO = Oil-range organics
ORO (SGC) = Oil-range organics with SGC
BOLD = Analytical result is greater than or equal to Model Toxics Control Act (MTCA) Method A cleanup levels for GRO (800 µg/L), DRO (500 µg/L), ORO (500 µg/L) and benzene (5 µg/L)
MTCA (Model Toxics Control Act)

15'
15'
NO VERTICAL EXAGGERATION

HORIZONTAL SCALE (FEET)
0 30

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FIGURE 7
CROSS SECTION A-A'

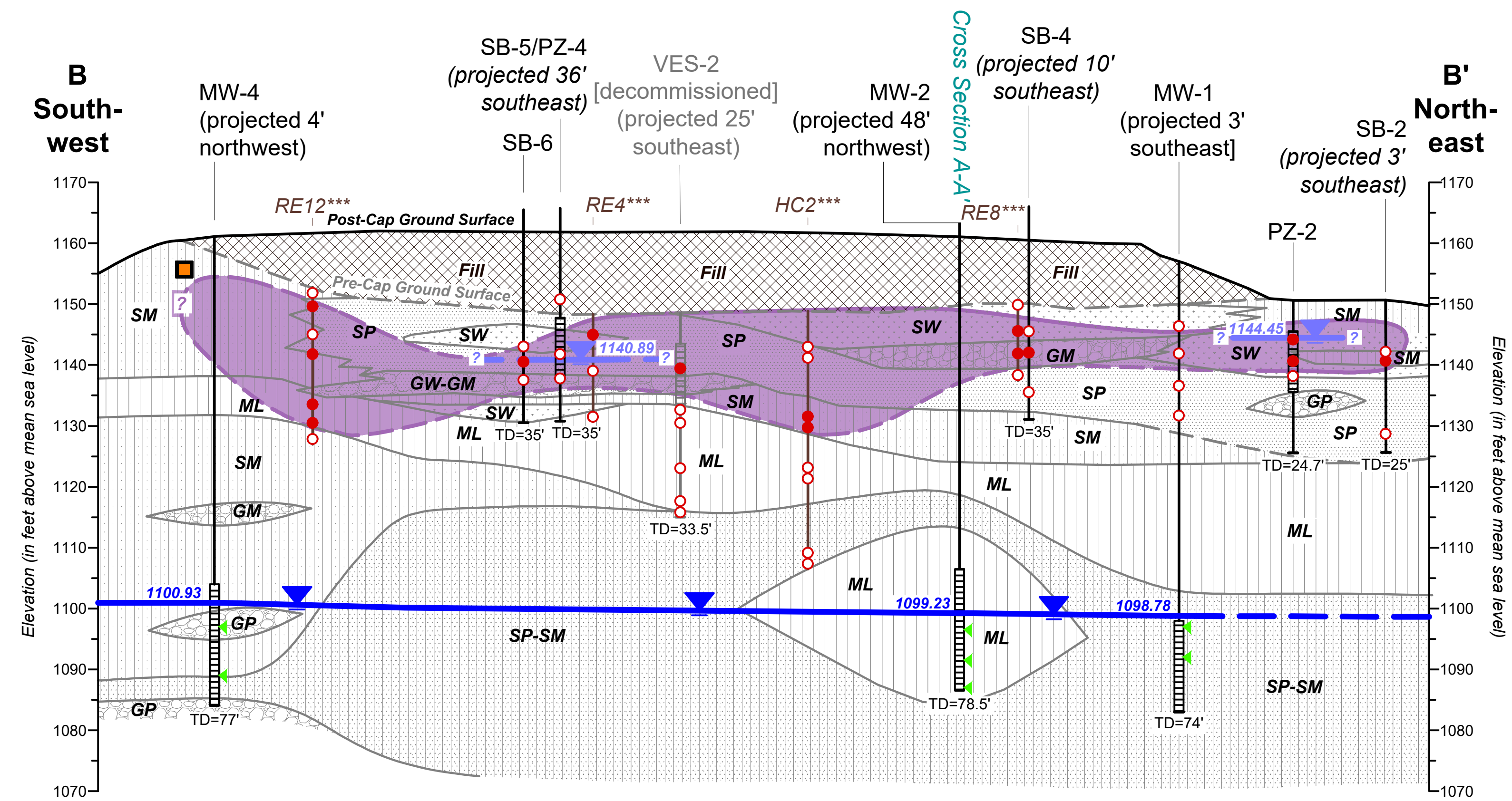
REPORT
SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

PREPARED FOR
BNSF RAILWAY COMPANY AND CHEVRON USA, INC.

PROJECT NUMBER
444428

LOCATION
CHUMSTICK HIGHWAY AND STATE HIGHWAY 2
LEAVENWORTH, WASHINGTON

DATE 11/10/21
DRAWN BY RMC
REVIEWED BY DK



LEGEND

Well / piezometer (surveyed)

1140.89 — Approximate groundwater elevation (ft NAVD88), in transient water piezometer on June 11, 2021

1098.78 — Approximate groundwater elevation (ft NAVD88), in deeper aquifer monitoring wells on August 2, 2021

Soil sample depth with constituent concentration greater than MTCA Method A Cleanup Level

Soil sample depth with constituent concentration less than MTCA Method A Cleanup Level

Screen Interval

Depth Discrete Sample Location

Lithology line, dashed where inferred

TD=78.5' — Total depth

Approximate Area of Impacted Soil

Telecom Line

*LITHOLOGY KEY***:*

	Fill	SM	Silty sand with gravel
GM	Gravel with silty fine to coarse sand	SP-SM	Poorly-graded sand with silt and gravel
GW-GM	Gravel with sand and silt	SP	Poorly-graded sand with silt
GP	Poorly-graded gravel with sand and trace silt	SW	Well-graded sands, gravelly sands, little or no fines
ML	Sandy silt / silt with sand		

NOTES:

See Figure 2 for locations of cross sections.
Well and piezometer elevations are to top of PVC based on June 2017 survey by Landline Surveyors, Leavenworth, Washington. Coordinate system: NAD83 Washington State Planes, North Zone, US foot. Vertical datum: NAVD 1988.
Pre-cap ground surface elevations based on Site Plan/ Temporary Erosion and Sedimentation Control Plan-Cleanup Action by GeoEngineers, January 2003.
Post-cap ground surface elevations based on Grading Plan and Cross-Sections-Cleanup Action by GeoEngineers, January 2003.

*** = Lithologic units are consistent with the Unified Soil Classification System (USCS) classification from ASTM D-2487.*

**** = Locations and depths are approximate.*

SGC = silica gel cleanup
µg/L = micrograms per liter
Total petroleum hydrocarbons as:
DRO = Diesel-range organics
DRO (SGC) = Diesel-range organics with SGC
ORO = Oil-range organics
ORO (SGC) = Oil-range organics with SGC
***BOLD** = Analytical result is greater than or equal to Model Toxics Control Act (MTCA) Method A cleanup levels for GRO (800 µg/L), DRO (500 µg/L), ORO (500 µg/L) and benzene (5 µg/L)*
MTCA (Model Toxics Control Act)

15'
15'
NO VERTICAL EXAGGERATION

HORIZONTAL SCALE (FEET)
0 30

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FIGURE 8
CROSS SECTION B-B'

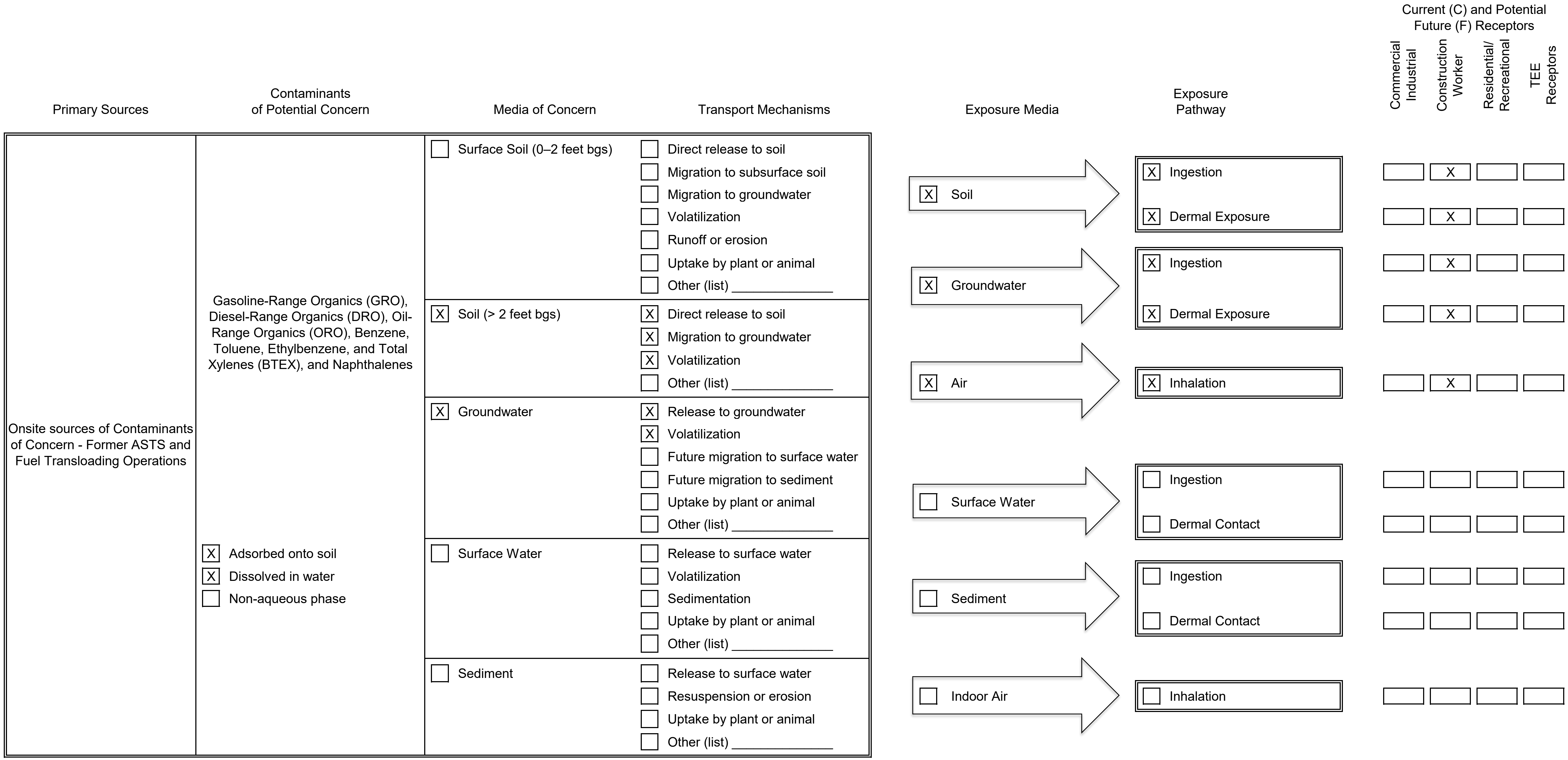
REPORT
SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

PREPARED FOR
BNSF RAILWAY COMPANY AND CHEVRON USA, INC.

PROJECT NUMBER
444428

LOCATION
CHUMSTICK HIGHWAY AND STATE HIGHWAY 2
LEAVENWORTH, WASHINGTON

DATE 11/10/21
DRAWN BY .... RMC
REVIEWED BY .... DK



NOTES:
bgs = below ground surface

FIGURE 9
CONCEPTUAL SITE MODEL

PREPARED BY	TRC
REPORT	SUPPLEMENTAL REMEDIAL INVESTIGATION
LOCATION	Glacier Park East Site Leavenworth, Washington
PREPARED FOR	BNSF Railway Company

DATE	DRAWN BY	REVIEWED BY	PROJECT NUMBER
09/28/2021	K. Woodburne	D. Kunkel	444428.0000.0000

Attachment A
Completed Terrestrial Ecological Evaluation Form

Voluntary Cleanup Program

Washington State Department of Ecology
Toxics Cleanup Program

DEPARTMENT OF ECOLOGY
State of Washington

TERRESTRIAL ECOLOGICAL EVALUATION FORM

Under the Model Toxics Control Act (MTCA), a terrestrial ecological evaluation is necessary if hazardous substances are released into the soils at a Site. In the event of such a release, you must take one of the following three actions as part of your investigation and cleanup of the Site:

1. Document an exclusion from further evaluation using the criteria in WAC 173-340-7491.
2. Conduct a simplified evaluation as set forth in WAC 173-340-7492.
3. Conduct a site-specific evaluation as set forth in WAC 173-340-7493.

When requesting a written opinion under the Voluntary Cleanup Program (VCP), you must complete this form and submit it to the Department of Ecology (Ecology). The form documents the type and results of your evaluation.

Completion of this form is not sufficient to document your evaluation. You still need to document your analysis and the basis for your conclusion in your cleanup plan or report.

If you have questions about how to conduct a terrestrial ecological evaluation, please contact the Ecology site manager assigned to your Site. For additional guidance, please refer to https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Terrestrial-ecological-evaluation.

Step 1: IDENTIFY HAZARDOUS WASTE SITE	
Please identify below the hazardous waste site for which you are documenting an evaluation.	
Facility/Site Name: Glacier Park East	
Facility/Site Address: NEof the intersection of U.S. Hwy 2 and Chumstick Highway, Leavenworth, WA	
Facility/Site No: 349	VCP Project No.: NA

Step 2: IDENTIFY EVALUATOR		
Please identify below the person who conducted the evaluation and their contact information.		
Name: Keith Woodburne	Title: Principal Geologist	
Organization: TRC		
Mailing address: 1180 NW Maple Street, Suite 310		
City: Issaquah	State: WA	Zip code: 98027
Phone: 425-395-0010	Fax:	E-mail: kwoodburne@trccompanies.com

Step 3: DOCUMENT EVALUATION TYPE AND RESULTS

A. Exclusion from further evaluation.

1. Does the Site qualify for an exclusion from further evaluation?

☒ Yes — *If you answered **"YES,"** then answer **Question 2**.*

☐ No or Unknown — *If you answered **"NO" or "UNKNOWN,"** then skip to **Step 3B** of this form.*

2. What is the basis for the exclusion? *Check all that apply. Then skip to **Step 4** of this form.*

Point of Compliance: WAC 173-340-7491(1)(a)

☐ All soil contamination is, or will be,* at least 15 feet below the surface.

☐ All soil contamination is, or will be,* at least 6 feet below the surface (or alternative depth if approved by Ecology), and institutional controls are used to manage remaining contamination.

Barriers to Exposure: WAC 173-340-7491(1)(b)

☐ All contaminated soil, is or will be,* covered by physical barriers (such as buildings or paved roads) that prevent exposure to plants and wildlife, and institutional controls are used to manage remaining contamination.

Undeveloped Land: WAC 173-340-7491(1)(c)

☐ There is less than 0.25 acres of contiguous# undeveloped± land on or within 500 feet of any area of the Site and any of the following chemicals is present: chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene.

☒ For sites not containing any of the chemicals mentioned above, there is less than 1.5 acres of contiguous# undeveloped± land on or within 500 feet of any area of the Site.

Background Concentrations: WAC 173-340-7491(1)(d)

☐ Concentrations of hazardous substances in soil do not exceed natural background levels as described in WAC 173-340-200 and 173-340-709.

* An exclusion based on future land use must have a completion date for future development that is acceptable to Ecology.

± "Undeveloped land" is land that is not covered by building, roads, paved areas, or other barriers that would prevent wildlife from feeding on plants, earthworms, insects, or other food in or on the soil.

"Contiguous" undeveloped land is an area of undeveloped land that is not divided into smaller areas of highways, extensive paving, or similar structures that are likely to reduce the potential use of the overall area by wildlife.

B. Simplified evaluation.	
1. Does the Site qualify for a simplified evaluation?	
☐ Yes	*If you answered **"YES,"** then answer **Question 2** below.*
☐ No or Unknown	*If you answered **"NO"** or **"UNKNOWN,"** then skip to **Step 3C** of this form.*
2. Did you conduct a simplified evaluation?	
☐ Yes	*If you answered **"YES,"** then answer **Question 3** below.*
☐ No	*If you answered **"NO,"** then skip to **Step 3C** of this form.*
3. Was further evaluation necessary?	
☐ Yes	*If you answered **"YES,"** then answer **Question 4** below.*
☐ No	*If you answered **"NO,"** then answer **Question 5** below.*
4. If further evaluation was necessary, what did you do?	
☐	Used the concentrations listed in Table 749-2 as cleanup levels. *If so, then skip to **Step 4** of this form.*
☐	Conducted a site-specific evaluation. *If so, then skip to **Step 3C** of this form.*
5. If no further evaluation was necessary, what was the reason? *Check all that apply. Then skip to **Step 4** of this form.*	
Exposure Analysis: WAC 173-340-7492(2)(a)	
☐	Area of soil contamination at the Site is not more than 350 square feet.
☐	Current or planned land use makes wildlife exposure unlikely. Used Table 749-1.
Pathway Analysis: WAC 173-340-7492(2)(b)	
☐	No potential exposure pathways from soil contamination to ecological receptors.
Contaminant Analysis: WAC 173-340-7492(2)(c)	
☐	No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations that exceed the values listed in Table 749-2.
☐	No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations that exceed the values listed in Table 749-2, and institutional controls are used to manage remaining contamination.
☐	No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays.
☐	No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays, and institutional controls are used to manage remaining contamination.

C. Site-specific evaluation. A site-specific evaluation process consists of two parts: (1) formulating the problem, and (2) selecting the methods for addressing the identified problem. Both steps require consultation with and approval by Ecology. *See* WAC 173-340-7493(1)(c).

1. Was there a problem? *See* WAC 173-340-7493(2).

☐ Yes *If you answered **"YES,"** then answer **Question 2** below.*

☐ No *If you answered **"NO,"** then identify the reason here and then skip to **Question 5** below:*

☐ No issues were identified during the problem formulation step.

☐ While issues were identified, those issues were addressed by the cleanup actions for protecting human health.

2. What did you do to resolve the problem? *See* WAC 173-340-7493(3).

☐ Used the concentrations listed in Table 749-3 as cleanup levels. *If so, then skip to **Question 5** below.*

☐ Used one or more of the methods listed in WAC 173-340-7493(3) to evaluate and address the identified problem. *If so, then answer **Questions 3 and 4** below.*

3. If you conducted further site-specific evaluations, what methods did you use?
Check all that apply. See WAC 173-340-7493(3).

☐ Literature surveys.

☐ Soil bioassays.

☐ Wildlife exposure model.

☐ Biomarkers.

☐ Site-specific field studies.

☐ Weight of evidence.

☐ Other methods approved by Ecology. If so, please specify:

4. What was the result of those evaluations?

☐ Confirmed there was no problem.

☐ Confirmed there was a problem and established site-specific cleanup levels.

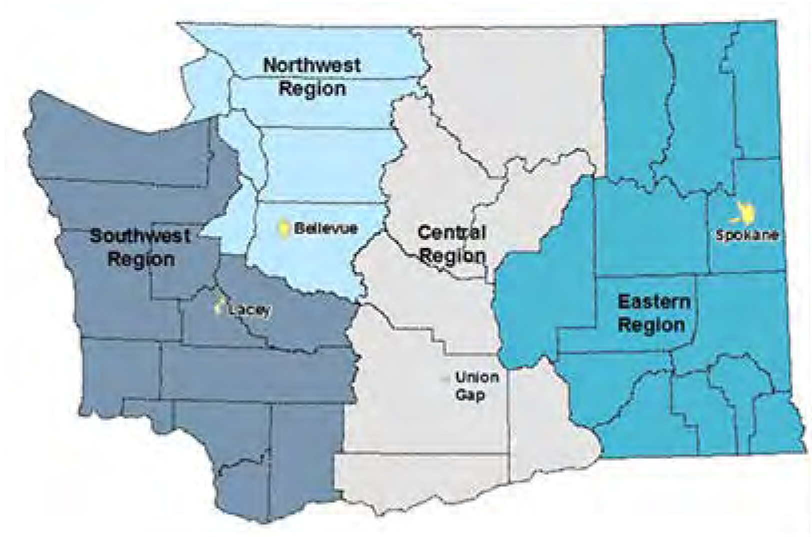
5. Have you already obtained Ecology's approval of both your problem formulation and problem resolution steps?

☐ Yes If so, please identify the Ecology staff who approved those steps:

☐ No

Step 4: SUBMITTAL

Please mail your completed form to the Ecology site manager assigned to your Site. If a site manager has not yet been assigned, please mail your completed form to the Ecology regional office for the County in which your Site is located.



Northwest Region:	Central Region:
Attn: VCP Coordinator 3190 160th Ave. SE Bellevue, WA 98008-5452	Attn: VCP Coordinator 1250 West Alder St. Union Gap, WA 98903-0009
Southwest Region:	**Eastern Region:**
Attn: VCP Coordinator P.O. Box 47775 Olympia, WA 98504-7775	Attn: VCP Coordinator N. 4601 Monroe Spokane WA 99205-1295

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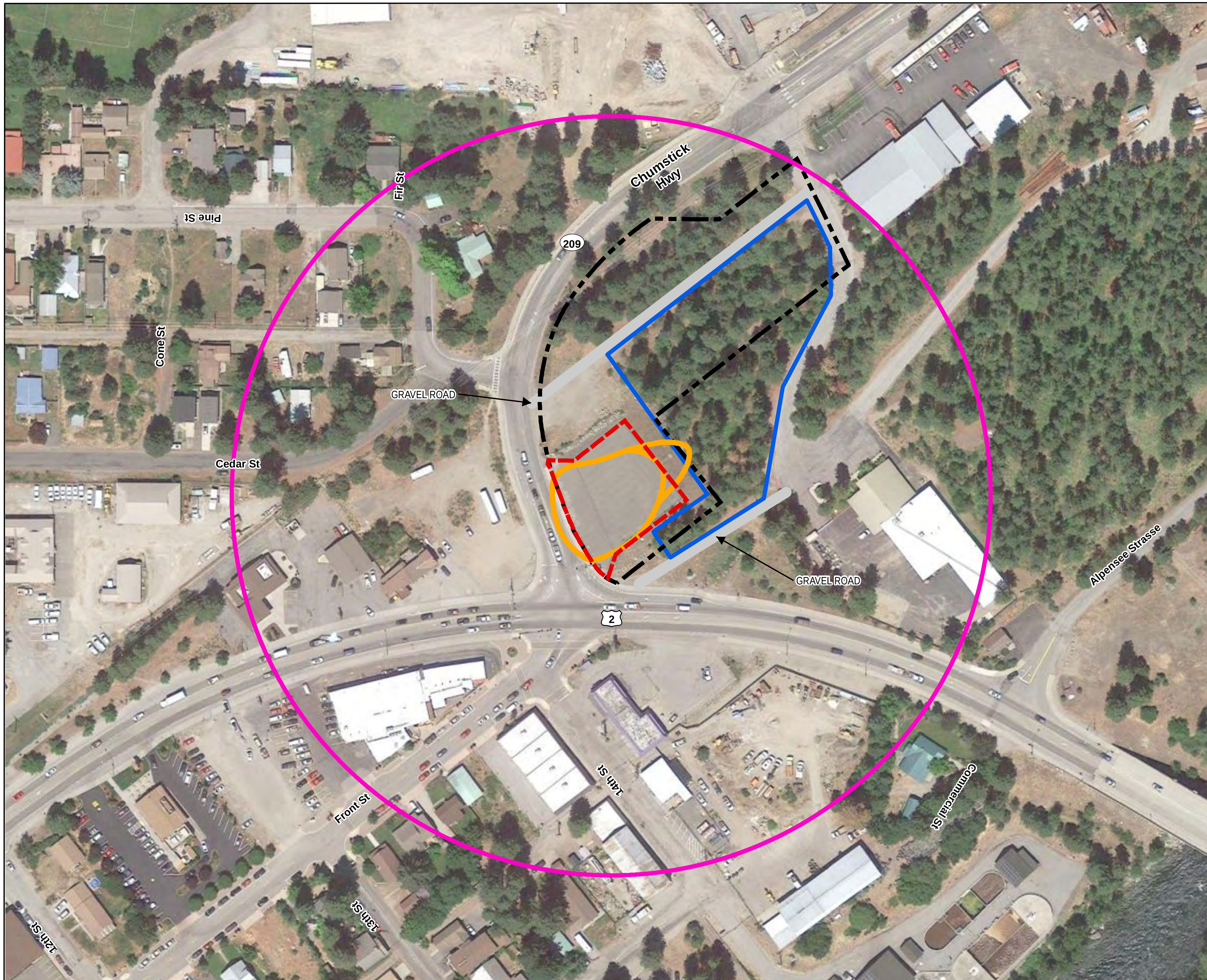


LEGEND

- APPROXIMATE SITE BOUNDARY
- 500 FOOT BOUNDARY FOR SIMPLIFIED TERRESTRIAL ECOLOGICAL EVALUATION
- APPROXIMATE AREA OF CONSTITUENTS OF CONCERN
- PARCEL BOUNDARY
- CONTIGUOUS UNDEVELOPED LAND ON THE SITE OR WITHIN 500 FEET OF ANY AREA OF THE SITE.

SOURCES:
AERIAL PHOTO: Google Earth, July 2017.
BASE PLAN:Groundwater Potentiometric Map by Kennedy/Jenks Consultants, December 2013, and site plans by Geo Engineers, March 2002.

N

0 150 300 Feet

1:1,500

TRC

1180 NW MAPLE ST, SUITE 310
ISSAQUAH, WA 98027
WWW.TRCCOMPANIES.COM
425.395.0010

FIGURE 1

SIMPLIFIED TERRESTRIAL ECOLOGICAL EVALUATION AREAS

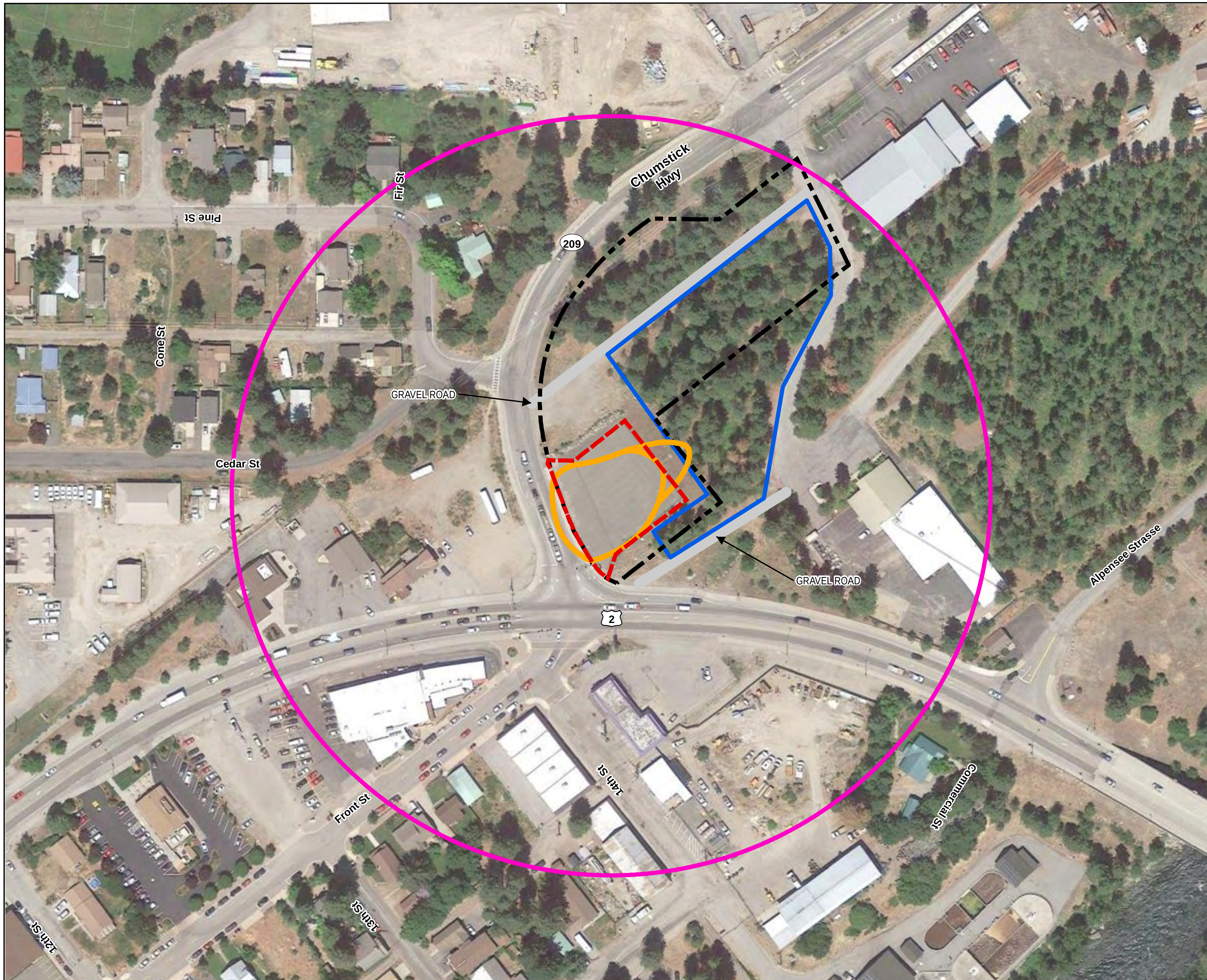
REPORT
SUPPLEMENTAL REMEDIAL INVESTIGATION

PREPARED FOR
BNSF GLACIER PARK EAST SITE

PROJECT NUMBER
444428

LOCATION
CHUMSTICK HIGHWAY AND STATE HIGHWAY 2
LEAVENWORTH, WASHINGTON

DATE............ 8/24/21
DRAWN BY............ RMC
REVIEWED BY............ KW



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1180 NW MAPLE ST, SUITE 310
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425.395.0010

FIGURE 1

SIMPLIFIED TERRESTRIAL ECOLOGICAL EVALUATION AREAS

REPORT SUPPLEMENTAL REMEDIAL INVESTIGATION	*PREPARED FOR* BNSF GLACIER PARK EAST SITE
	PROJECT NUMBER 444428
LOCATION CHUMSTICK HIGHWAY AND STATE HIGHWAY 2 LEAVENWORTH, WASHINGTON	*DATE*........ 8/24/21 *DRAWN BY*........ RMC *REVIEWED BY*........ KW

Table 749-1

Simplified Terrestrial Ecological Evaluation-Exposure Analysis Procedure

Estimate the area of contiguous (connected) undeveloped land on the site or within 500 feet of any area of the site to the nearest 1/2 acre (1/4 acre if the area is less than 0.5 acre).	
1) From the table below, find the number of points corresponding to the area and enter this number in the field to the right.	7
Area (acres) / Points: 0.25 or less – 4; 0.5 – 5; 1.0 – 6; 1.5 – 7; 2.0 – 8; 2.5 – 9; 3.0 – 10; 3.5 – 11; 4.0 or more – 12	
2) Is this an industrial or commercial property? If yes, enter a score of 3. If no, enter a score of 1	3
3)[a] Enter a score in the box to the right for the habitat quality of the site, using the following rating system[b]. High=1, Intermediate=2, Low=3	2
4) Is the undeveloped land likely to attract wildlife? If yes, enter a score of 1 in the box to the right. If no, enter a score of 2.[c]	1
5) Are there any of the following soil contaminants present: Chlorinated dioxins/furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, pentachlorobenzene? If yes, enter a score of 1 in the box to the right. If no, enter a score of 4.	4
6) Add the numbers in the boxes on lines 2-5 and enter this number in the box to the right. If this number is larger than the number in the box on line 1, the simplified evaluation may be ended.	17

Area (acres)	Points
0.25 or less	4
0.5	5
1.0	6
1.5	7
2.0	8
2.5	9
3.0	10
3.5	11
4.0 or more	12

Notes for Table 749-1

[a] It is expected that this habitat evaluation will be undertaken by an experienced field biologist. If this is not the case, enter a conservative score of (1) for questions 3 and 4.

[b] **Habitat rating system.** Rate the quality of the habitat as high, intermediate or low based on your professional judgment as a field biologist. The following are suggested factors to consider in making this evaluation:

> **Low:** Early successional vegetative stands; vegetation predominantly noxious, nonnative, exotic plant species or weeds. Areas severely disturbed by human activity, including intensively cultivated croplands. Areas isolated from other habitat used by wildlife.

High: Area is ecologically significant for one or more of the following reasons: Late-successional native plant communities present; relatively high species diversity; used by an uncommon or rare species; priority habitat (as defined by the Washington Department of fish and Wildlife); part of a larger area of habitat where size or fragmentation may be important for the retention of some species.

Intermediate: Area does not rate as either high or low.

[c] Indicate "yes" if the area attracts wildlife or is likely to do so. Examples: Birds frequently visit the area to feed; evidence of high use b mammals (tracks, scat, etc.); habitat "island" in an industrial area; unusual features of an area that make it important for feeding animals; heavy use during seasonal migrations.

[Area Calculation Aid] [Aerial Photo with Area Designations] [TEE Table 749-1] [Index of Tables]

[Exclusions Main] [TEE Definitions] [Simplified or Site-Specific?] [Simplified Ecological Evaluation] [Site-Specific Ecological Evaluation] [WAC 173-340-7493]

[TEE Home]

Technical Document:

Terrestrial Ecological Evaluations under the Model Toxics Control Act

February 2017

Publication no. 19-09-051

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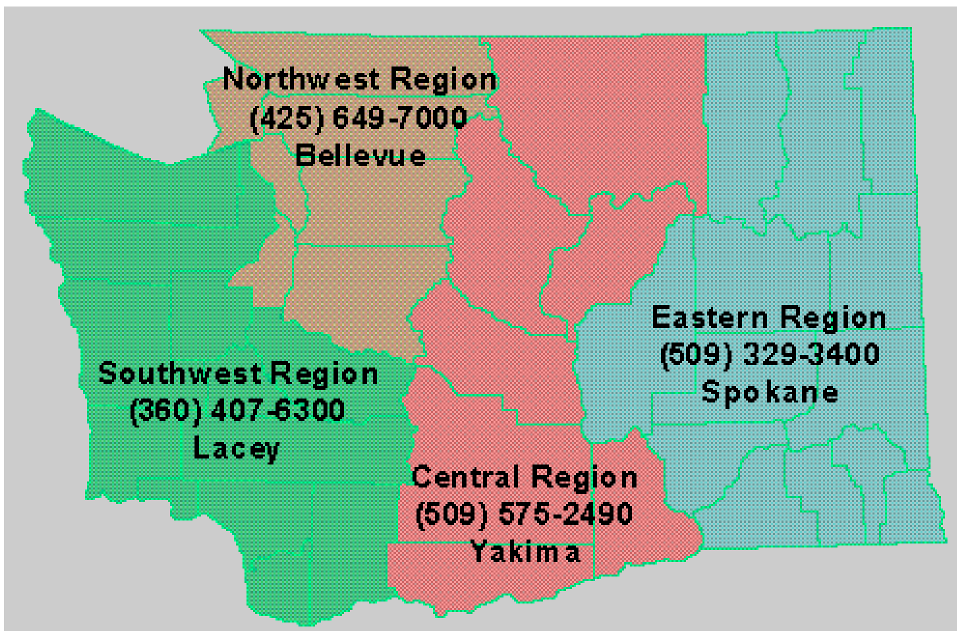

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Technical Document:

Terrestrial Ecological Evaluations under the Model Toxics Control Act

WAC 173-340

Toxics Cleanup Program

Washington State Department of Ecology

Olympia, Washington

Table of Contents

List of Acronyms Used

BAF	Bioaccumulation Factor
CAP	Cleanup Action Plan
CBA	Cost Benefit Analysis
EEC	Estimated Environmental Concentration
H_A	Alternative Hypothesis
HI	Hazard Index
HQ	Hazard Quotient
H_O	Null Hypothesis
ISIS	Integrated Site Information System
LOAEL	Lowest Observed Adverse Effects Level
MDL	Method Detection Limit
MTCA	Model Toxics Control Act
NEBA	Net Environmental Benefit Analysis
NFA	No Further Action
NOAEL	No Observed Adverse Effects Level
NRDA	Natural Resource Damage Assessment
PQL	Practical Quantitation Limit
RCW	Revised Code of Washington
RI/FS	Remedial Investigation/Feasibility Study
TEE	Terrestrial Ecological Evaluation
TEF	Toxicity Equivalency Factor
TPH	Total Petroleum Hydrocarbons
TRV	Toxicity Reference Value
VCP	Voluntary Cleanup Program
WAC	Washington Administrative Code

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Introduction

Washington State's Model Toxics Control Act (MTCA), Washington Administrative Code (WAC) 173-340 (see Compendium – Section A), applies to all facilities where there has been a release or threatened release of a hazardous substance that may pose a threat to human health or the environment. Soil contamination shall be evaluated for both human health and ecological threats, and those remedies selected to address soil contamination shall be protective of both human health and ecological receptors. The Terrestrial Ecological Evaluation (TEE) is a process that evaluates threats posed by contaminants to ecological receptors and is included in MTCA, specifically, WAC 173-340-7490 through 7494. These chapters define the goals and procedures the Washington State Department of Ecology (Ecology) will use for:

- Determining whether a release of hazardous substances to soil may pose a threat to the terrestrial environment.
- Characterizing existing or potential threats to soil biota and terrestrial plants and animals exposed to hazardous substances in soil.
- Establishing soil concentrations that are protective of soil biota and terrestrial plants and animals, and;
- Developing and evaluating cleanup action alternatives and selecting a cleanup action protective of soil biota and terrestrial plants and animals.

TEE's shall be conducted as part of the Remedial Investigation/Feasibility Study (RI/FS). Failure to complete the TEE during the RI/FS could result in unexpected additional cost and/or remediation efforts. A summary of the TEE process includes the following steps:

- Characterization of the site
- Exclusion evaluation, if no exclusion applies, then;
    - Selection of the appropriate evaluation method (simplified or site-specific TEE)
    - Conduct TEE, and then if required:
        - Selection of clean-up actions.
        - Implementation of cleanup actions, and;
        - Compliance monitoring requirements.

It is important to remember to provide documentation of steps and/or actions taken during this process. If the site may be excluded from the TEE process, then no further evaluation of ecological risk is necessary as long as the specific exclusion and its application to the site under investigation have been addressed in the RI/FS. If the site cannot be excluded from the TEE process, a simplified or site-specific TEE is required, in which case the TEE evaluation method and the TEE evaluation itself shall be included in the RI/FS. If cleanup actions/alternatives are required to meet requirements, the selection, implementation, and the compliance requirements of those cleanup actions shall also be included.

The TEE process is required at all MTCA sites where there has been a release or threatened release of a hazardous substance that may pose a threat to human health or the environment. This applies to sites that have formal Ecology oversight and also to those sites requiring a No Further Action (NFA) determination under the Voluntary Cleanup Program (VCP). This document was developed to help both Ecology personnel and the public as they navigate through the TEE process. This document provides an overview of the TEE process, lists exclusionary criteria, describes both the simplified and site-specific TEE, and also gives specifics in terms of examples and questions that have been brought up in the past.

The primary goal of this document is to clarify the range of options available, and to suggest efficient ways for meeting the requirements of MTCA. This document is not intended to provide an exhaustive review of every situation that may be encountered in evaluation of hazardous waste sites. Detailed descriptions of simplified and site-specific TEE's have been provided in the later chapters of this document. In addition, specific guidance has always been available by contacting Ecology staff directly.

Of equal importance is a compendium document that is referenced frequently in this technical assistance document. Frequently you will find the compendium reference in the body of this document. When referenced, it will be noted as; (see Compendium – Section XXX). The reader then has the ability to access the compendium documents directly by hyperlink, simply by left – clicking on the provided hyperlink, or by referencing Appendix A where the complete [url] is listed. Bound copies of the compendium document can also be found at each of the Washington State Department of Ecology regional offices (Northwest, Southwest, Central, Eastern, and Headquarters). An electronic version is available Ecology TEE internet website, under Toxics Cleanup Program:
http://www.ecy.wa.gov/programs/tcp/policies/terrestrial/TEEHome.htm

The purpose of the compendium document is to provide the reader with the references and resources that have been cited. For certain documents, such as private publications, Ecology is only able to provide a hyperlink that allows access to the document under certain conditions. In those circumstances, it would be the responsibility of the reader to obtain a copy for their own reference.

Please note that this document is not a substitute for the regulatory requirements in the MTCA cleanup regulation. Where there are any conflicts between this document and the regulations, users shall always comply with the regulations.

Limitations

When used appropriately, the TEE is an excellent tool that provides an ecological risk assessment for the potential threats of chemical contamination to ecological receptors in upland soil environments. The TEE is intended to be used as an ecological evaluation and not a Natural Resource Damage Assessment (NRDA). Additionally, it is not intended to provide risk assessment to ecological receptors in surface water, sediments, wetlands, or any other environments other that upland soils. Procedures for sediment evaluations are described in WAC 173-340-760 and Chapter 173-240 WAC (see Compendium – Section B), and for surface water evaluations in WAC 173-340-730. Procedures for wetland evaluations shall be determined by the department on a case-by-case basis.

Oftentimes cleanup sites contain multiple media (upland soils, sediments, wetlands) that require evaluation. In those cases, the TEE would only satisfy the requirements for the upland soil environments. MTCA provides the requirements on the implementation of some of the specific tools used in the TEE such as; administrative procedures (institutional controls, consent decrees, agreed orders, and enforcement orders), selection and implementation of cleanup actions, compliance monitoring, and Cost Benefit Analysis (CBA). These tools will be referred to frequently in this document; however, detailed descriptions of their implementation have not been included.

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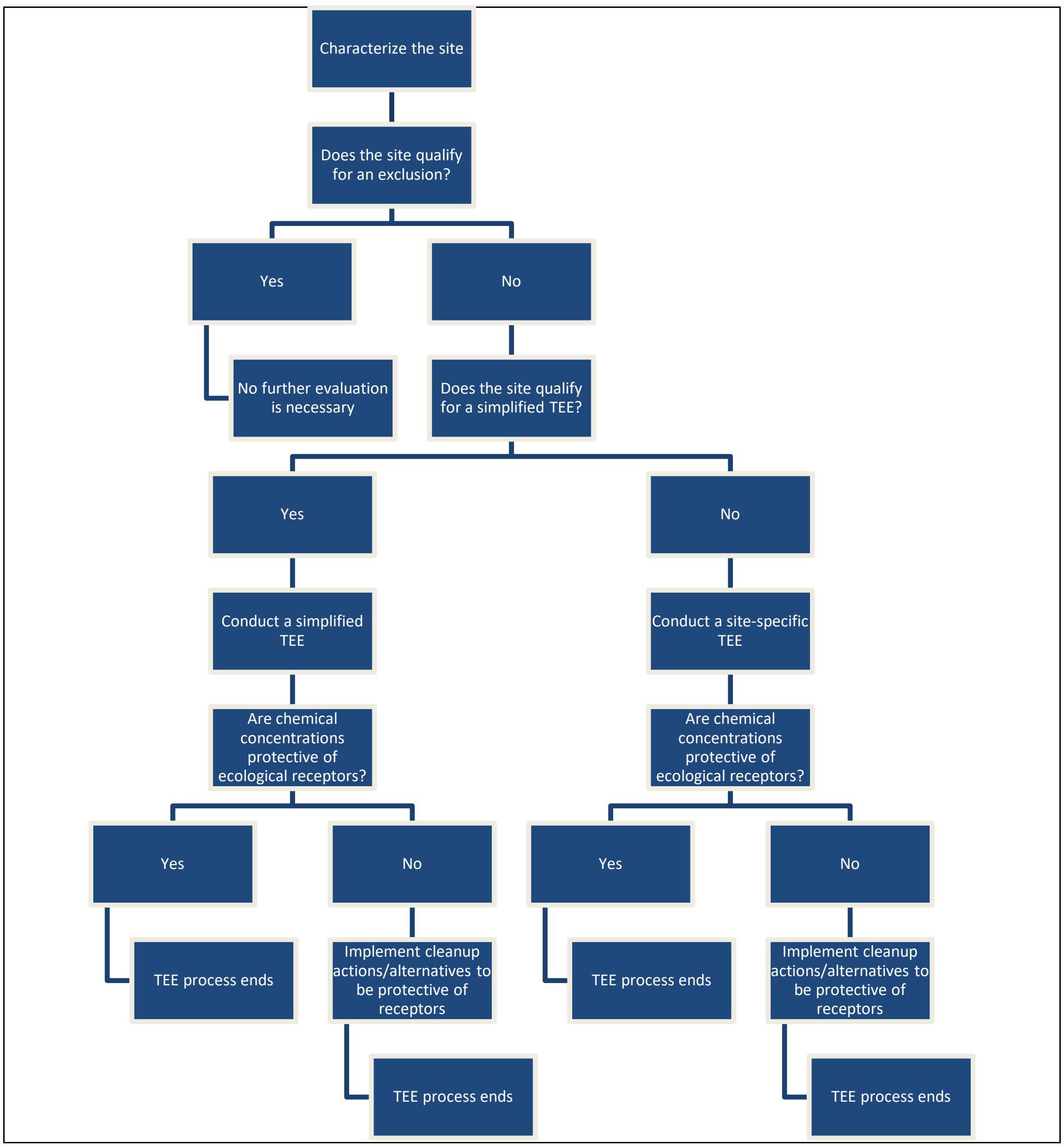
Chapter 1: Overview of the TEE Process

The TEE process is designed to allow the user to quickly identify those sites which have the potential to pose little or no threat to ecological receptors and it also identifies those sites which are of concern to those same ecological receptors. Sites that are of concern are then evaluated in terms of severity of potential threat to the receptors, and cleanup levels are then established based on severity. Cleanup action alternatives are then analyzed, and the selected cleanup action plan (CAP) is documented in the TEE as to how it adequately addresses protection of the ecological receptor (See Figure 1.1).

Figure 1.1: Summary of TEE Process



As Figure 1.1 illustrates, the process itself is not complicated. However, if the TEE process is not implemented during the initial phase of cleanup activities, the remediation efforts involved in a CAP for a site might not meet those requirements of MTCA that were designed to protect the ecological receptors. Oftentimes, the cleanup level of a chosen MTCA method (Methods A, B, or C) is not stringent enough to protect ecological receptors when one of the exclusions does not apply to the site. The result of which is that either a simplified or site-specific TEE would be required at the site, possibly impacting previously agreed upon cleanup levels.

A TEE shall be conducted as part of the RI/FS. The TEE process includes the following steps:

Step 1 – Characterization of the Site

In the remedial investigation, identify and define the extent of habitat at both the site and the surrounding areas, including; wetlands, parks, natural forested areas, riparian areas, greenbelts, buffer zones, and fish and wildlife habitat conservation areas. Also identify any state or federally designated "endangered" or "threatened" species and state "priority species", "species of concern" or "sensitive species" that may be present on or near the site (see Compendium – Section E).

Step 2 – Evaluation of Exclusions

Evaluate and document whether the site qualifies for an exclusion using the criteria specified in MTCA. Most sites located in intensively developed areas are expected to qualify for exclusion (See WAC 173-340-7491).

Step 3 – Select Evaluation Method

Evaluate whether the site qualifies for a simplified TEE using the criteria in MTCA (See WAC 173-340-7491(2)). The simplified TEE process is designed for addressing TEE risk at sites with limited quality habitat and limited potential for soil biota and terrestrial plants and animals to be exposed to hazardous substances.
Note: If the site does not meet the criteria for a simplified evaluation, a site-specific TEE must be conducted. The site-specific evaluation process is designed for addressing terrestrial ecological risk at any site, including sites with endangered or threatened species. The person conducting the evaluation may also voluntarily elect to conduct a site-specific TEE at any site.

Step 4 – Conduct the TEE

If the site is eligible for a simplified evaluation, conduct the evaluation using the procedures listed under Simplified Terrestrial Ecological Evaluation Procedures found in MTCA (WAC 173-340-7492).

- If the TEE can be "ended" due to exposure analysis, pathways analysis, or toxicity (contaminant) analysis, document this in the RI/FS and no further evaluation of terrestrial ecological risk is needed (See WAC 173-340-7492(2)).

Note: Institutional controls are necessary where the evaluation relies on physical barriers to keep plants and animals from being exposed to residual contamination, or a conditional point of compliance is used.

- If the evaluation cannot be "ended," use the simplified TEE table values found in Table 4.1 (MTCA Table 749-2) as screening levels in the remedial investigation to identify all areas of the site posing a potential terrestrial ecological risk. If no value for the contaminant has been provided in the table, conduct one of the site-specific evaluation methods (table values, soil bioassays, wildlife exposure modeling, site-specific field studies, weight of evidence, or literature surveys) to establish a screening level. The simplified TEE table values found in Table 4.1 (MTCA Table 749-2) may also be used as cleanup levels (WAC 173-340-7492(1) (d)).

If the site is ineligible for a simplified TEE, conduct a site-specific TEE using the procedures listed under Site-Specific Terrestrial Ecological Evaluation Procedures found in MTCA (WAC 173-340-7493).

- If the evaluation can be "ended" because the cleanup planned to address human health or aquatic impacts will also adequately protect terrestrial ecological receptors (soil biota, plants and animals), document that fact in the RI/FS. The result would be that no further evaluation of terrestrial ecological risk is needed (WAC 173-340-7493(1) (d) (i)), and;
- If the evaluation cannot be "ended," use the site-specific TEE table values found in Table 5.1 (MTCA Table 749-3) as screening levels to identify all areas of the site posing a potential terrestrial ecological risk. It is also optional to use any of the site-specific evaluation methods (literature surveys, soil bioassays, wildlife exposure model, biomarkers, site-specific field studies, or weight of evidence) to establish a screening level (See WAC 173-340-7493(3)). Alternatively, the site-specific TEE values found in Table 5.1 (MTCA Table 749-3) may also be used as cleanup levels.

Step 5 – Identify Areas of Potential Ecological Concern

The terrestrial ecological risks are just one exposure pathway that must be considered in a site cleanup. In many cases, concentrations needed to protect human health, aquatic organisms, or other media like groundwater will be more stringent than those needed to protect soil biota and terrestrial plants and animals. At these sites, cleanup alternatives addressing these other exposure pathways will usually also address terrestrial ecological risks. For substances or areas of the site where this is not the case, use the screening levels developed in Step 4 to identify cleanup alternatives to be evaluated in the feasibility study.

Step 6 – Conduct the Feasibility Study

Follow the process described in MTCA to identify, screen, and analyze cleanup action alternatives. If, at any time in the process, it is concluded that there are no feasible alternatives meeting the screening levels established under Steps 4 or 5 above, consider using other methods described for simplified or site-specific evaluations to establish different concentrations that are still protective of the terrestrial ecological exposure pathway.

Step 7 – Document the Process
In the feasibility study, document how the selected remedy adequately addresses the terrestrial ecological exposure pathway. For Ecology Site Managers the TEE process also needs to be documented in ISIS. An example of the electronic form that is filled out within ISIS has been provided (see Compendium – Section C). For consultants who are submitting a VCP cleanup report to Ecology, the TEE process must be filled out on a consultant form, which has been provided (see Compendium – Section D).

The purpose of the TEE process is to identify and provide an additional level of scrutiny to areas that contain significant habitat, wildlife populations, and/or species requiring an additional level of protection. In general, a site qualifies for exclusion from the TEE process if there is little or no threat to ecological receptors. A site qualifies for a simplified TEE if it does not contain significant habitat, sensitive areas, or threatened or endangered species. A site-specific TEE would be required if the contaminated site is located on, or directly adjacent to a natural area, if the site is used by a listed vulnerable species, if there is extensive habitat located on or near the site, or if Ecology determines that the site may present a risk to significant wildlife populations.

Ecological Receptors

The ecological receptor is the soil biota, plant, or animal that would have the potential to be effected by the chemical contamination. The TEE process is intended to protect terrestrial ecological receptors from exposure to contaminated soil when there is the potential to cause significant adverse effects. For species protected under the Endangered Species Act or other applicable laws that extend protection to individuals of a species, a significant adverse effect means an impact that would significantly disrupt the normal behavior patterns such as breeding, feeding, or sheltering. For all other species, significant adverse effects are effects that impair reproduction, growth, or survival.

An institutional control shall be required to preserve the habitat when the terrestrial remedy chosen to protect the ecological receptors leaves residual concentrations in excess of cleanup levels. Ecology may also require mitigation for the impacts on the environment (such as reduction in habitat productivity) resulting from residual contamination left on site.

Ecological Receptors Based on Land Use

For unrestricted land uses, the focus of the TEE shall be on the assessment and protection of terrestrial plants, wildlife, and the ecologically important functions of soil biota that could affect plants or wildlife. For industrial or commercial properties, the focus of the TEE shall be on assessment and protection of terrestrial wildlife protection unless the species is protected under the Federal Endangered Species Act (see Compendium – Section E), Title 77 RCW (see Compendium – Section F), or Title 79 RCW (see Compendium – Section G). This means that for any property that does not constitute an “industrial property” or “commercial property” as defined, all ecological receptors must be protected from exposure to soil contamination. “All ecological receptors” includes plants, soil biota, and wildlife. In addition, if the soil contamination is located on an area of an industrial or commercial property where vegetation must be maintained to comply with local government land use regulations, the focus of the TEE shall also address those local land use regulations.

An “industrial property” is defined as a property that currently is (or has been) characterized by, or is to be committed to traditional industrial uses such as processing or manufacturing of materials, marine terminal and transportation areas and facilities, fabrication, assembly, treatment, or distribution of manufactured products or storage of bulk materials. A “commercial property” is defined as a property that is currently zoned for commercial or industrial property use and that is characterized by or is committed to traditional commercial uses such as offices, retail and wholesale sales, professional services, consumer services, and warehousing (WAC 173-340-7490(3) (c)).

Any terrestrial remedy chosen to protect ecological receptors, including exclusions (if based on land use), shall include a completion date for future development acceptable to Ecology.

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Net Environmental Benefit Analysis

Net environmental benefits are the gains in environmental services or other ecological properties attained by remediation or ecological restoration, minus the environmental injuries caused by those actions (Efroymson et al., 2003). Ecosystems and natural resources (including wild animal and plant populations) can be thought of as environmental assets which provide people with a range of "services" which directly or indirectly contribute to our well-being. Decisions where there may be ecological tradeoffs, for example, clearing a vegetated site to access contaminated soil, needs to be balanced with the potential damage caused to the habitat, or "ecosystem" and the wider services that it provides (Deacon et al., 2010). Therefore, a Net Environmental Benefit Analysis (NEBA) would be the procedure of weighing the advantages of active cleanup (remediation) versus the impact that cleanup might have on potentially valuable ecological receptor habitat. Terrestrial ecological evaluation procedures should not create an incentive to cause harm through the destruction of habitat. As a result, WAC 173-340-7490 (5): "Additional measures. The department may require additional measures to evaluate potential threats to terrestrial ecological receptors notwithstanding the provisions in this and the following sections (when based upon a site – specific review), the department determines that such measures are necessary to protect the environment." (Ecology, 2007a).

Limitations: As stated in WAC 173-340-7490 (1) (c): "These procedures [Terrestrial Ecological Evaluation] are not intended to be used to evaluate potential threats to ecological receptors in sediments, surface water, or wetlands. Procedures for sediment evaluations are described in WAC 173-340-760, and for surface water evaluations in WAC 173-340-730. Procedures for wetland evaluations shall be determined by the department on a case-by-case basis." In addition, WAC 173-340 also defines Terrestrial ecological receptors as "plants and animals that live primarily or entirely on land." (Ecology, 2007a). As a result, the intent of this NEBA section is to clarify procedures that would further protect especially valuable habitat that supports terrestrial ecological receptors that would otherwise require remediation to attain cleanup levels. It is not the intent of this NEBA section to delineate between upland, surface water, sediment, and wetland environments.

Prior to performing a NEBA, the proposed non – remediated area needs to be defined as "especially valuable habitat." "Especially valuable habitat" can be designated through the use of one of the below proposed methods (Method 1 or Method 2):

<u>Method 1</u>: Site can be designated "<u>especially valuable habitat</u>" if:

- The site <u>is used</u> by a threatened or endangered species protected under the Federal Endangered Species Act, or;
- The site <u>is used</u> by a "priority species" or "species of concern" designated under Title 77 RCW, or;
- The site <u>is used</u> by a plant species classified as "endangered," "threatened," or "sensitive" under Title 79 RCW, or;
- Wetlands and Fish and Wildlife habitat conservation areas designated as critical areas under Chapter 36.70A.170 RCW. Other critical areas that might be found on the property, such as recharge areas, frequently flooded areas, geologically hazardous areas, steep slopes, and aquatic areas, are not immediately designated as "especially valuable habitat" unless they meet one of the previous criteria. These other types of critical areas must follow the Method 2 process.

Note: For animals, "used" means that individuals of a species have been observed to live, feed or breed at the site. For plants, "used" means that a plant species grows at the site or has been found growing at the site (Ecology, 2007a).

Method 2: Site can be designated "especially valuable habitat" if:

- An experienced field biologist must visit the site and document that:
  - The site can be potentially used by a threatened or endangered species protected under the Federal Endangered Species Act, or;
  - The site can be potentially used by a "priority species" or "species of concern" designated under Title 77 RCW, or;
  - The site can be potentially used by a plant species classified as "endangered," "threatened," or "sensitive" under Title 79 RCW

In addition to meeting the recommended requirements of Method 1 or Method 2, it is recommended that a depth-weighted receptor exposure adjustment is calculated for each contaminant, and that a field biologist (or other department approved individual) must document types of flora and fauna and signs of excessive uptake of the specific contaminants. This will help establish sustainability and whether or not native species occupy the habitat.

Depth Weighted Receptor Adjustment

It is recommended that natural areas that are proposed to be included in the NEBA (areas with native species) have additional sampling to allow for a better understanding of upland ecological receptor exposure to contamination. Depths recommended at each sampling point are:

- 0 – 6" bgs (including duff layer)
- 6 – 12" bgs
- 12 – 24" bgs
- 24 – 36" bgs

Depth Weighted Receptor Adjustment Equation:

$C_{ea} = (C_{c\,(1)} \times P_{r\,(1)}) + (C_{c\,(2)} \times P_{r\,(2)}) + (C_{c\,(i)} \times P_{r\,(i)})$

Where:

C_{ea}	=	Exposure adjusted contaminant concentration
$C_{c\,(1)}$	=	Soil contaminant concentration at sample depth 1 (i.e. 0 – 6")
$C_{c\,(i)}$	=	Soil contaminant concentration at sample depth (i)
$P_{r\,(1)}$	=	Proportion of Receptor found at sample depth 1 (i.e. 0 – 6")
$P_{r\,(i)}$	=	Proportion of Receptor found at sample depth (i)

The following is an example of a Depth – Weighted Receptor Exposure Adjustment:

For sample XXXX (As):

1. The soil contaminant concentration at sample depth (0 – 6") is 113 mg/kg
2. The depth weighted receptor adjustment is 0.3
3. The adjusted As level at sample depth (0 – 6") is 33.9 mg/kg
4. Repeat steps for sample depth (6 – 12", 12 – 24", and 24 – 36")

5. Add the four adjusted sample depth concentrations for a Depth – Weighted Receptor Exposure Adjustment total of 34.8 mg/kg (As)

The resulting Depth - Weighted Exposure Adjustment Concentration for Sample XXXX (As) is 34.8 mg/kg.

Justification for Exposure Adjustments

- Adjustment of 0.55 for sample depth 6 to 12”

Soil development is rarely uniform and processes such as erosion and deposition can influence the vertical distribution of biological activity across landscapes. Sampling strategies where a constant depth is collected may not accurately reflect site-specific exposures of environmental contamination to the soil biota. A horizon may not accurately represent contaminant exposure to soil biota, resulting in inaccurate risk estimates. If constant depths are utilized, [our] results suggest that samples should be collected to a depth of approximately 25 – 30 cm as opposed to shallower depths (USEPA, 2015). Result: the majority of receptor exposure to contamination is expected to be at sample depth of 6 to 12” (0.55 or 55%).

- Adjustment of 0.3 for sample depth 0 to 6” (including duff layer)

The organic matter which provides the food base for the earthworm community is vitally important in determining their distribution and abundance, and soil organic matter content can sometimes be a good predictor of earthworm abundance. For example, Hendrix et al. (1992) reported a highly significant correlation between earthworm density and soil organic content over a range of sites in Georgia, U.S.A., including a wide variety of soil and vegetation types and management histories (Curry, 1998). Result: it is assumed that the increased organic matter found at shallower depths (0 to 6”) would be the second most abundant vertical horizon for soil biota (0.3 or 33%).

- Adjustment of 0.1 for 12 to 24” and 0.05 for 24 to 36”

The main source or the organic matter on which earthworms feed is litter from above-ground plant parts in most ecosystems, although dead roots and rhizodeposition can also be important sources (Curry, 1998). Result: As depth increases, receptor exposure should decrease, so at 12 to 24” (0.1 or 10%) and at 24 to 36” (0.05 or 5%).

Additional Field Biologist Responsibilities

1. Document the species of plant, soil biota, and wildlife found at the specific site
   - Differentiate between those that are native and those that are invasive
2. Document if native plant life is well-established (i.e. primary or secondary growth)
3. Document if plant life show signs of contaminant uptake including (but not limited to) signs of:
   - Wilting
   - Chlorosis (pale, yellow or white plant tissue)
   - Browning
   - Excess mortality
   - Reduced growth, photosynthesis, mitosis, or water absorption (dehydration)
4. Document any signs of contaminant uptake in soil biota including (but not limited to):
   - Limited numbers
5. Document any signs of contaminant uptake in wildlife including (but not limited to):

    - Muscular incoordination
    - Debility
    - Slowness
    - Jerkiness
    - Falling
    - Hyperactivity
    - Fluffed feathers
    - Drooped eyelids
    - Seizures

If the above conditions have been met, the Ecology Site Manager (or designee) should then visit the site to make a final determination as to whether or not the proposed non – remediated area appears to be established, sustainable, and native habitat. In granting the request of non – remediation, the Ecology Site Manager (or designee) should consider the following factors prior to making a final decision:

- The rarity of the habitat for the geographic area in which the site is located.
- The size of the habitat.
- Whether the habitat functions as a wildlife corridor.
- Whether the habitat functions as a refuge or feeding area for migratory species.
- The structural diversity of the habitat.
- Surrounding habitat and land uses.
- Whether the habitat is manmade or natural.
- Whether the cleanup would significantly disturb the ecological functions of the habitat.
- The level of human activity in the area.
- The length of time for recovery of the habitat after cleanup.

If non-remediation is chosen as a cleanup action for "especially valuable habitat," then:

- Institutional controls are required that would demonstrably limit or prohibit activities that may interfere with an interim action or cleanup action or result in exposure to hazardous substances at the site. The purpose of institutional controls would be to reduce the risks of current human and/or future land use, and;
- Demonstrably reduce the risk of present or future releases or migration of the hazardous substance located at the site.

References:

Curry, J.P. (1998). *Factors Affecting Earthworm Abundance in Soil.* In: Earthworm Ecology. St Lucie Press. Pgs. 37 – 64.

Deacon, Goddard, and Eury (2010). *Assessing Risks to Ecosystems Using a Net Environmental Benefit Analysis Framework to Assist with Environmental Decision-making.* http://www.environcorp.com/EnvironCorp/media/environ/Files/NEBA_Deacon.pdf

Ecology. (2012). *Tacoma Smelter Plume Model Remedies Guidance. Sampling and cleanup of Arsenic and Lead Contaminated Soils.* Olympia, WA: Washington State Department of Ecology. Publication No. 12-09-086-A.

Ecology. (2013). *Model Toxics Control Act Regulation and Statute, Chapter 173-340 WAC.* (Ecology Publication No. 94-06). Lacey, WA: Washington State Department of Ecology, Toxics Cleanup Program.

Efroymson, Nicollette, and Suter (2003). *A Framework for Net Environmental Benefit Analysis for Remediation or Restoration of Petroleum –Contaminated Sites.* http://www.esd.ornl.gov/programs/ecorisk/documents/NEBA-petrol-s-report-RE.pdf

Franklin, J.F., and C.T. Dyrness. (1988). *Natural Vegetation of Oregon and Washington.* Originally published by the U.S. Forest Service in 1973. Reprinted with new bibliographic supplement by the OSU Press in 1988.

USEPA. (2015). *Determination of the Biologically Relevant Sampling Depth for Terrestrial and Aquatic Ecological Risk Assessments.* Cincinnati, OH: United States Environmental Protection Agency. Publication No. EPA/600/R-15/176.

Compliance

Points of Compliance

A point of compliance is the point (or points) where cleanup levels established in accordance with the MTCA requirements shall be attained. This term includes both the standard and conditional point of compliance. Specifically, the standard point of compliance for cleanup levels developed under the TEE process is throughout the soil at the site, from the ground surface to a depth of fifteen feet. This represents a reasonable estimate of the depth of soil that could be excavated and then re – distributed at the soil surface as a result of site development activities. The result of which is the potential for ecological receptors to be exposed to contamination.

Used in conjunction with institutional controls to prevent excavation of deeper soils, a conditional point of compliance may be set to a depth of six feet. This is assumed to be the depth at which the biologically active zone extends to. In addition, Ecology may approve a site – specific depth based on a demonstration that the alternative depth is more appropriate for the site. In making this demonstration, the following shall be considered:

- Depth to which soil macro-invertebrates are likely to occur.
- Depth to which soil turnover is likely to occur due to the activities of soil invertebrates.
- Depth to which animals likely to occur at the site are expected to burrow.
- Depth to which plant roots are likely to extend, and;
- The presence of a manmade subsurface biological barrier (such as a geomembrane cap or cobble barrier designed to limit penetration by plant roots and burrowing animals).

Determining Compliance

Demonstrating compliance with the cleanup levels established during the TEE process is the same as that which is required to demonstrate compliance with the soil cleanup standards for unrestricted land use (WAC 173-340-740(7)). When soil cleanup levels have been established at a site, sampling of the soil shall be conducted to determine if compliance with the established soil cleanup levels have been achieved. Ecology may approve of other sampling methods; however, the sampling and analytical procedures shall be defined in a compliance and monitoring plan prepared in compliance with MTCA requirements. The sample design shall provide data that are representative of the area where exposure to hazardous substances may occur.

Compliance with established cleanup levels shall be determined using the dry weight concentrations of samples based on total analysis of the soil fraction less than two millimeters (mm) in size. Ecology may require that soil cleanup standards also apply to soil particles larger than 2 mm when these particles are enriched with contaminants and ingestion, contact, or inhalation of these particles could result in a toxic dose. Once the appropriate data have been collected, it can be evaluated using direct comparison or statistical methods (see Data Evaluation Section of this Chapter).

When interpreting non – detect values, measurements below the method detection limit (MDL) shall be assigned a value equal to one – half the MDL. Measurements above the MDL but below the practical quantitation limit (PQL) shall be assigned a value equal to the PQL. Measurements below the MDL and/or the PQL may also be evaluated using the Kaplan – Meier method. If a hazardous substance has never been detected in any sample at a site and the substance is not suspected of being present at the site based on site history and other knowledge, then that hazardous substance may be excluded from the compliance analysis. Ecology may also approve alternate procedures for handling values below the MDL and/or PQL.

The MDL is the minimum concentration of a compound that can be measured and reported with ninety – nine percent (99%) confidence that the value is greater than zero. The PQL is the lowest concentration that can be reliably measured within specified limits of precision, accuracy, representativeness, completeness, and comparability during routine laboratory operating conditions, using department-approved methods.

Data Evaluation Using Direct Comparison

Direct comparison of soil sample concentrations to cleanup levels may be used to evaluate compliance with cleanup standards. When using this method, soil samples taken at the point of compliance after remediation are compared to the appropriate soil cleanup levels. Values at or below the soil cleanup level are in compliance. Values above the soil cleanup level are not in compliance. Direct comparison may be used when selective sampling of soil can be reliably expected to find suspected soil contamination, when there is documented reliable information that the soil samples have been taken from the appropriate locations, and it can be demonstrated that the basis used for selecting the soil sample locations provides a high probability that any existing areas of soil contamination have been found.

Data Evaluation Using Statistical Methods

Statistical methods for data evaluation must be conducted if the conditions required for direct comparison have not been met. When conducting a statistical analysis, soil samples taken at the point of compliance after remediation are used in the analysis. Statistical methods include the confidence limit method, non – parametric methods, and other methods approved by Ecology.

When using the confidence limit method, the upper one – sided ninety – five percent (95%) confidence limit on the true mean soil concentration shall be less than or equal to the established cleanup level. For lognormally distributed data, the upper one – sided ninety – five percent (95%) confidence limit shall be calculated using Land's method. The data shall be assumed to be lognormally distributed unless this assumption is rejected by a statistical test. If a lognormal distribution is inappropriate, data shall be assumed to be normally distributed unless this assumption is rejected by a statistical test. The W test, D'Agostino's test, or censored probability plots (as appropriate for the data) shall be the statistical methods used to determine whether the data are lognormally or normally distributed.

Non-parametric methods would be appropriate for determining compliance with established cleanup levels when the data conforms to neither a lognormal nor normal distribution. When using a non – parametric method to calculate an upper confidence limit, the upper ninety – fifth percentile (95%) shall be used to determine compliance.

The method limitations for determining compliance using statistical methods are:

- No single sample concentration shall be greater than two times the soil cleanup level. Higher exceedances to control false positive error rates at five percent (5%) may be approved by Ecology when the cleanup level is based on background concentrations, and;
- Less than ten percent (10%) of the sample concentrations shall exceed the soil cleanup level. Higher exceedances to control false positive error rates at five percent (5%) may be approved by the department when the cleanup level is based on background concentrations.

For more information regarding statistical methods, please see the Washington State Department of Ecology Guidance Document; Statistical Guidance for Site Managers (see Compendium – Section U).

Chapter 2: Exclusions

There are four primary criteria for excluding a contaminated site from further evaluation under the TEE process. As discussed earlier in this document, the site may be excluded from the TEE process and no further evaluation of ecological risk is necessary as long as the specific exclusion and its' application to the site under investigation have been addressed in the RI/FS. If the specifics of the site meet one of the exclusionary criteria, neither a simplified nor site – specific TEE would be required.

Note: Exclusion from performing either a simplified or site – specific TEE does not alleviate the other requirements of MTCA (WAC 173-340).

The four TEE exclusionary criteria are:

- Contamination below the point of compliance.
- Incomplete exposure pathway.
- Type of contamination and proximity to ecological receptors, and;
- Concentrations below background levels.

Contamination below the Point of Compliance

To qualify for an exclusion based on "contamination below the point of compliance," all soil contaminated with hazardous substances is (or will be) located below the established point of compliance. This means all soil contamination shall be below the standard point of compliance (ground surface to a depth of 15 feet), or below the conditional point of compliance (ground surface to a depth of 6 feet). The conditional point of compliance may only be used in conjunction with institutional controls which would prevent excavation of deeper soils. Ecology may approve another site – specific depth based on the demonstration that another depth is more appropriate for the site. In making this demonstration, the following shall be considered:

- Depth to which soil macro-invertebrates are likely to occur.

- Depth to which soil turnover is likely to occur due to the activities of soil invertebrates.
- Depth to which animals likely to occur at the site are expected to burrow.
- Depth to which plant roots are likely to extend, and;
- The presence of a manmade subsurface biological barrier (such as a geomembrane cap or cobble barrier designed to limit penetration by plant roots and burrowing animals).

An exclusion based on planned future land use shall include a completion date for such future development that is acceptable to Ecology.

Incomplete Exposure Pathway

To qualify for an exclusion based on "incomplete exposure pathway," all soil contaminated with hazardous substances is (or will be) covered by buildings, paved roads, pavement, or other physical barriers that will prevent plants or wildlife from being exposed to the soil contamination. These barriers may include engineered caps with geo-textile membranes or other engineered barriers which break the exposure pathway between the ecological receptors and the soil contaminants.

Ecology will make the final determination as to whether or not the barriers will be protective of soil biota, plants and/or wildlife at the site. To qualify for this exclusion, an institutional control shall be required by Ecology and the cleanup action must also comply with the MTCA requirements. An exclusion based on planned future land use shall include a completion date for such future development that is acceptable to Ecology.

Type of Contamination and Proximity to Ecological Receptors

To qualify for an exclusion based on "type of contamination and proximity to ecological receptors," the site must be located on or near a limited amount of undeveloped land. This exclusion would be based on one of the following two points:

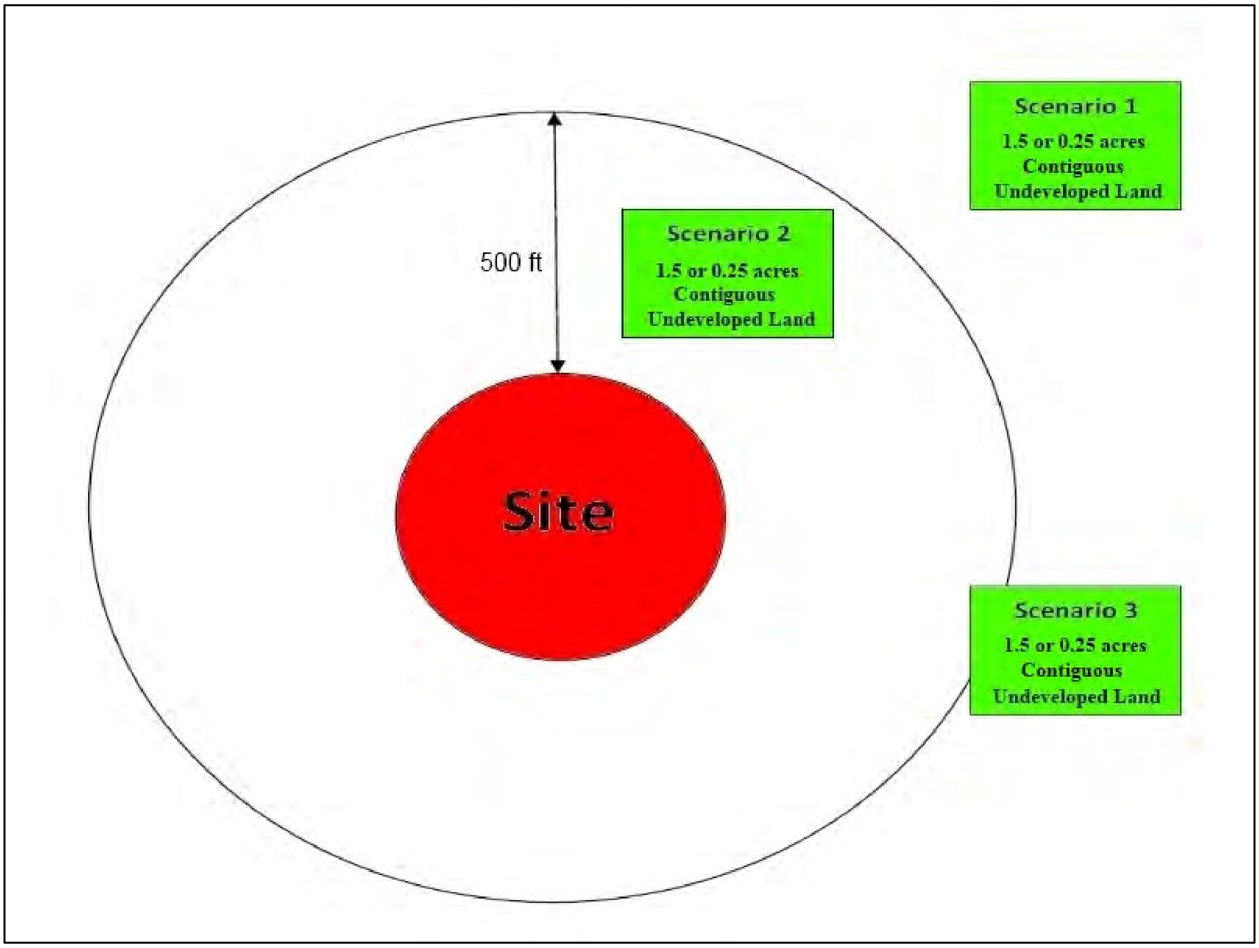
- For sites contaminated with hazardous substances other than those specified below; there must be less than 1.5 acres of contiguous undeveloped land on the site or within 500 feet of any area located on the site, or;
- For sites contaminated with one of the below substances; there must be less than one-quarter acre of contiguous undeveloped land on the site or within 500 feet of any area located on the site:
    - aldrin
    - benzene hexachloride
    - chlordane
    - chlorinated dioxins or furans
    - DDT, DDE, or DDD
    - dieldrin
    - endosulfan
    - endrin

- heptachlor or heptachlor epoxide
- hexachlorobenzene
- PCB mixtures
- pentachlorobenzene
- pentachlorophenol
- toxaphene

Note: This list does not imply that sampling must be conducted for each of these substances at every site. Sampling should be conducted for these substances when they might be present based on available information, such as current and past uses of these substances at the site.

An example of the application of this exclusion is shown in Figure 2.1. Of the three scenarios, Scenario 1and Scenario 3 would qualify for the above exclusion. However, if the contiguous undeveloped land in Scenario 2 was less than 1.5 acres (and none of the above listed contaminants are present) or 0.25 acres (in which any of the above listed contaminants are present) respectively, then it would also qualify for an exclusion.

Figure 2.1: Scenarios for an exclusion based on proximity to ecological receptors



Concentrations below Background Levels

To qualify for an exclusion based on “concentrations below background levels,” concentrations of all hazardous substances in soil should not exceed natural background levels based on the determining compliance methodology found in MTCA.

Chapter 3: Do I conduct a Simplified or Site Specific Terrestrial Ecological Evaluation?

Ecology expects the majority of sites to qualify for one of the four primary exclusion criteria mentioned in the previous chapter. For more information regarding those exclusions, please refer to Chapter 2. However, as a brief review, those exclusions are:

- Contamination below the point of compliance.
- Incomplete exposure pathway.
- Type of contamination and proximity to ecological receptors, and;
- Concentrations below background levels.

Once it has been established that none of the above-mentioned exclusionary criteria apply, either a simplified or site-specific terrestrial ecological evaluation is required. MTCA specifically refers to the process of determining the type of evaluation that is required (simplified or site-specific) as "Applicability of a Simplified Terrestrial Ecological Evaluation." The specific regulation that refers to this process can be found in WAC 173-340-7492; Applicability of a Simplified Terrestrial Ecological Evaluation. WAC 173-340-7492 lists four criteria that are to be used in that determination. If any of the below criteria apply to your site, then a site-specific terrestrial ecological evaluation is necessary. Those criteria are:

- Natural areas.
- Vulnerable species.
- Extensive habitat, and;
- Risk to significant wildlife populations.

Natural Areas

If the site is located on, or directly adjacent to an area where management or land use plans will maintain or restore native or semi-native vegetation, then a site-specific terrestrial ecological evaluation is necessary. Examples of these areas include:

- Green-belts.
- Protected wetlands.
- Forestlands.
- Riparian areas.
- Locally designated environmentally sensitive areas.
- Open space areas managed for wildlife, and;
- Some parks and outdoor recreation areas.

The "Some parks and outdoor recreation areas" bulleted item does not include areas used for intensive sporting activities such as baseball, football, or dog parks. For the purposes of this section, the following definitions apply:

Native Vegetation: Means any plant community native to the state of Washington. The following sources shall be used in making this determination: *Natural Vegetation of Oregon and Washington,* J.F. Franklin and C.T. Dyrness, Oregon State University Press, 1988 (see Compendium – Section L); and *Vascular Plants of the Pacific Northwest* (5 Volumes), A. Cronquist, 1955-1969 (see Compendium – Section K).

Semi-native Vegetation: Means a plant community that includes at least some vascular plant species native to the state of Washington. The following shall not be considered semi-native vegetation:

- Areas planted for ornamental or landscaping purposes.

- Areas planted for cultivated crops, and;
- Areas significantly disturbed and predominantly covered by noxious, introduced plant species or weeds (e.g., Scotch broom, Himalayan blackberry or knap-weed).

Vulnerable Species

If the site is used by vulnerable species, a site-specific terrestrial ecological evaluation is necessary. Examples of listed vulnerable species are:

- A threatened or endangered species protected under the Federal Endangered Species Act (see Compendium – Section E).
- A wildlife species classified by the Washington State Department of Fish and Wildlife as a "priority species" or "species of concern" under Title 77 RCW (see Compendium – Section F), and;
- A plant species classified by the Washington State Department of Natural Resources Natural Heritage Program as "endangered," "threatened," or "sensitive" under Title 79 RCW (see Compendium – Section G).

Note: For plants, "used" means that a plant species grows at the site or has been found growing at the site. For animals, "used" means that individuals of a species have been observed to live, feed or breed at the site.

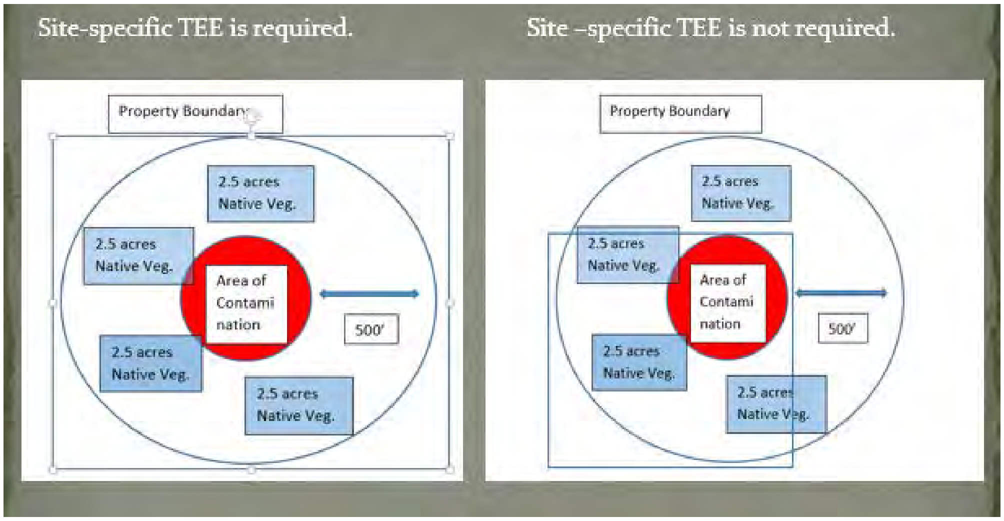
Please see the Compendium for lists of state or federally designated species that were listed at the time this document was completed:

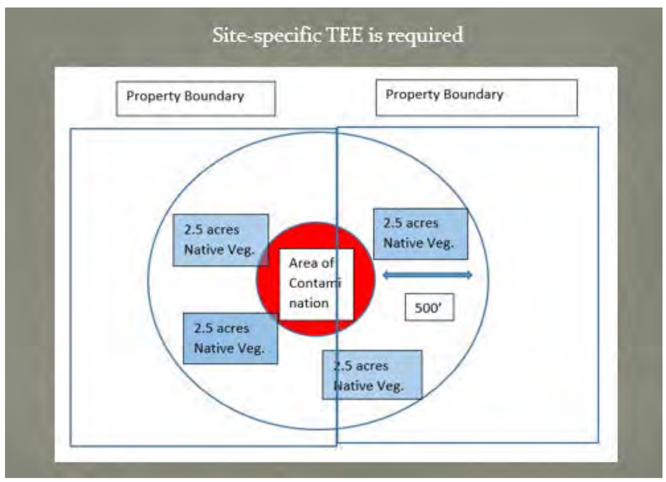
- Federal Endangered Species Act (Species) (see Compendium - Section E).
- Washington State Species of Concern (see Compendium – Section F), and;
- List of Rare Plant Species (see Compendium – Section G).

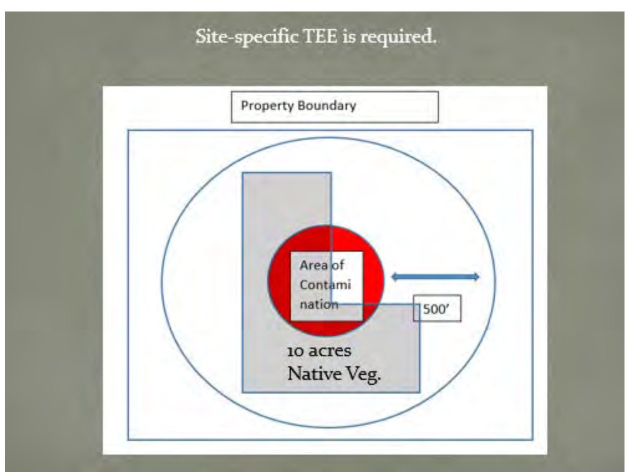
Extensive Habitat

If the site is located on a property that contains at least 10 acres of native vegetation within 500 feet of the site, not including vegetation beyond the property boundaries, a site-specific TEE is necessary. This total (ten acres) is applicable whether or not the native vegetation has been fragmented into smaller areas. See Figure 3.1 for a diagram explaining this section. Both scenarios depicted in figure 3 would require a site-specific terrestrial ecological evaluation.

Figure 3.1: Extensive Habitat Scenarios for Determination if a Site – Specific TEE is Necessary


Site-specific TEE is required.
Site –specific TEE is not required.
Property Boundary
2.5 acres Native Veg.
2.5 acres Native Veg.
Area of Contami nation
500'
2.5 acres Native Veg.
2.5 acres Native Veg.
Property Boundary
2.5 acres Native Veg.
2.5 acres Native Veg.
Area of Contami nation
500'
2.5 acres Native Veg.
2.5 acres Native Veg.


Site-specific TEE is required
Property Boundary
Property Boundary
2.5 acres Native Veg.
Area of Contami nation
2.5 acres Native Veg.
500'
2.5 acres Native Veg.
2.5 acres Native Veg.


Site-specific TEE is required.
Property Boundary
Area of Contami nation
500'
10 acres Native Veg.

Risk to Significant Wildlife Populations

If the department determines the contamination may present a risk to significant wildlife populations, a site – specific terrestrial ecological evaluation is necessary.

Chapter 4: The Simplified Terrestrial Ecological Evaluation

Once it has been established that none of the criteria requiring a site-specific TEE (as described in the “Applicability of a Simplified Terrestrial Ecological Evaluation”) apply to the site, a Simplified Terrestrial Ecological Evaluation (TEE) should fulfill the requirements of the MCTA regulations.

Note: At any point in time, a site-specific TEE may be performed to fulfill the requirements of this chapter.

The simplified TEE process (Figure 4.1) is intended to identify sites which are not likely to pose a significant threat to ecological receptors. For sites that qualify to perform a simplified TEE, the process described in WAC 173-340-7492 must be followed. This chapter is intended to provide guidance for sites performing a simplified TEE.

The simplified TEE can be ended and a determination can be made that the site does not pose a significant risk to the environment if any of the three criteria listed below are met (as described in the subsections of this chapter). Those three criteria are:

- Exposure analysis.
- Pathways analysis, and;
- Toxicity analysis.

Those three criteria will be explained in their own separate sub-chapters. However, it is important to note that if any one of those three criteria has been met, the TEE process can be ended. If none of those three criteria have been met, ecological protective soil concentrations must be established using bioassay techniques or by using the option of conducting a site - specific TEE under WAC 173-340-7493 (see “Establishing Ecological Protective Soil Concentrations” section of this chapter). Alternatively, Table 4.1 (MTCA Table 749-2) indicator soil concentrations may be used as long as the cleanup levels of the contaminants specific to the site have been provided in the referenced table.

Figure 4.1: Summary of the Simplified TEE Process

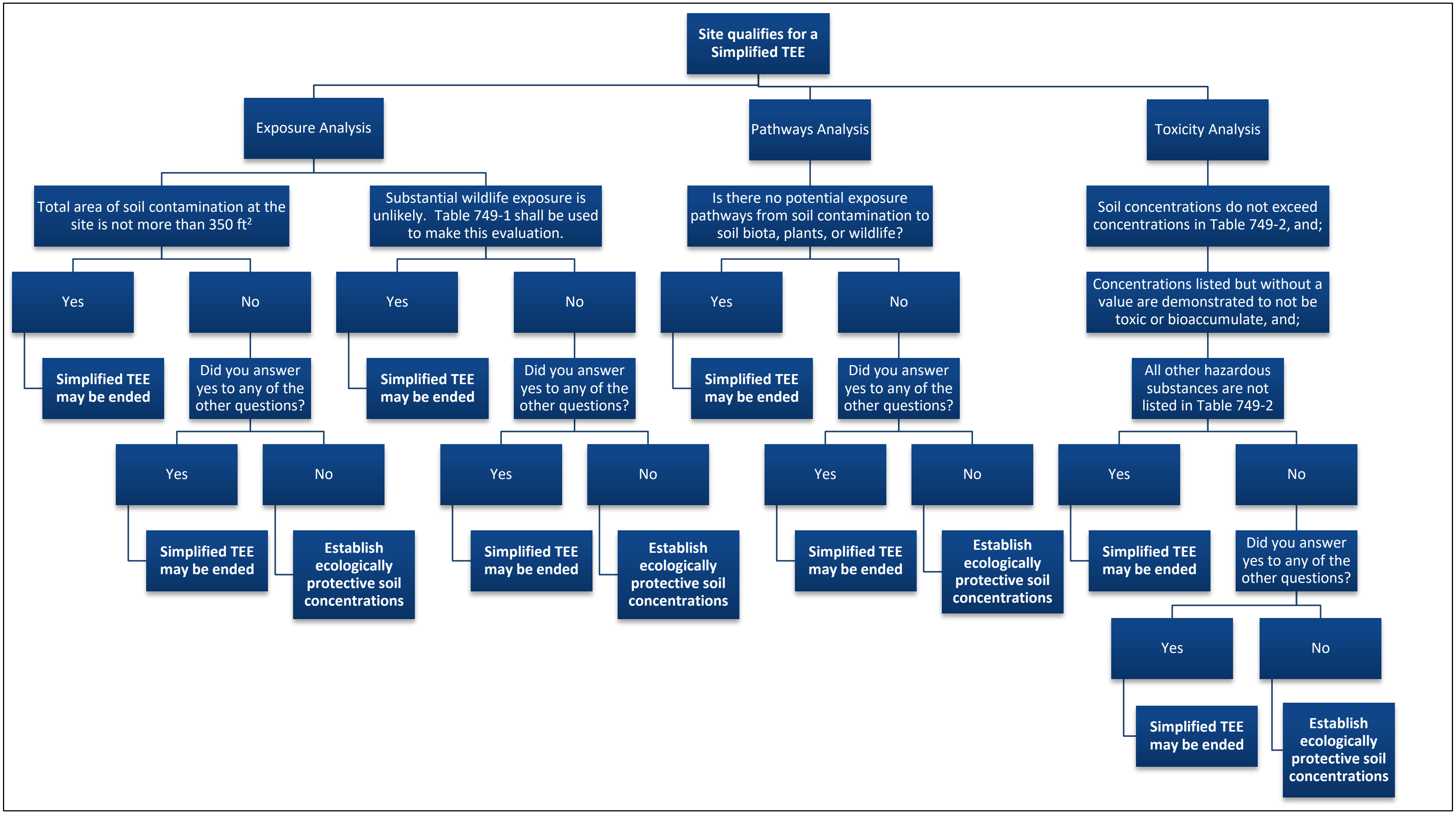


Table 4.1: Priority Contaminants of Ecological Concern for Sites that Qualify for the Simplified TEE[a]

Priority Contaminant	Unrestricted Land Use[b]	Industrial or Commercial Property	Priority Contaminant	Unrestricted Land Use[b]	Industrial or Commercial Property
Metals:[c]			Chlorpyrifos/chlorpyrifosmethyl (total)	See note d	See note d
Antimony	See note d	See note d	DDT/DDD/DDE (total)	1 mg/kg	1 mg/kg
Arsenic III	20 mg/kg	20 mg/kg	Dieldrin	0.17 mg/kg	0.17 mg/kg
Arsenic V	95 mg/kg	260 mg/kg	Endosulfan	See note d	See note d
Barium	1,250 mg/kg	1,320 mg/kg	Endrin	0.4 mg/kg	0.4 mg/kg
Beryllium	25 mg/kg	See note d	Heptachlor/heptachlor epoxide (total)	0.6 mg/kg	0.6 mg/kg
Cadmium	25 mg/kg	36 mg/kg	Hexachlorobenzene	31 mg/kg	31 mg/kg
Chromium (total)	42 mg/kg	135 mg/kg	Parathion/methyl parathion (total)	See note d	See note d
Cobalt	See note d	See note d	Pentachlorophenol	11 mg/kg	11 mg/kg
Copper	100 mg/kg	550 mg/kg	Toxaphene	See note d	See note d
Lead	220 mg/kg	220 mg/kg	Chlorinated dibenzofurans (total)[e]	3E-06 mg/kg	3E-06 mg/kg
Magnesium	See note d	See note d	Chlorinated dibenzo-p-dioxins (total)[e]	5E-06 mg/kg	5E-06 mg/kg
Manganese	See note d	23,500 mg/kg	Hexachlorophene	See note d	See note d
Mercury, inorganic	9 mg/kg	9 mg/kg	PCB mixtures (total)	2 mg/kg	2 mg/kg
Mercury, organic	0.7 mg/kg	0.7 mg/kg	Pentachlorobenzene	168 mg/kg	See note d
Molybdenum	See note d	See note d	**Other Non-Chlorinated Organics:**		
Nickel	100 mg/kg	1,850 mg/kg	Acenaphthene	See note d	See note d
Selenium	0.8 mg/kg	0.8 mg/kg	Benzo(a)pyrene	30 mg/kg	300 mg/kg
Silver	See note d	See note d	Bis (2-ethylhexyl) phthalate	See note d	See note d
Tin	275 mg/kg	See note d	Di-n-butyl phthalate	200 mg/kg	See note d
Vanadium	26 mg/kg	See note d	**Petroleum:**		
Zinc	270 mg/kg	570 mg/kg	Gasoline Range Organics	200 mg/kg	12,000 mg/kg[g]
Pesticides:			Diesel Range Organics[f]	460 mg/kg	15,000 mg/kg[g]
Aldicarb/aldicarb sulfone (total)	See note d	See note d			
Aldrin	0.17 mg/kg	0.17 mg/kg			
Benzene hexachloride (including lindane)	10 mg/kg	10/mg/kg			
Carbofuran	See note d	See note d			
Chlordane	1 mg/kg	7 mg/kg			

Footnotes:

a Caution on misusing these values. They have been developed for use at sites where a site-specific terrestrial ecological evaluation is not required. They are not intended to be protective of terrestrial ecological receptors at every site. Exceedances of the values in this table do not necessarily trigger requirements for cleanup action under this chapter. The table is not intended for purposes such as evaluating sludges or wastes. This list does not imply that sampling must be conducted for each of these chemicals at every site. Sampling should be conducted for those chemicals that might be present based on available information, such as current and past uses of chemicals at the site.

b Applies to any site that does not meet the definition of industrial or commercial property under WAC 173-340-200.

c For arsenic, use the valence state most likely to be appropriate for site conditions, unless laboratory information is available. Where soil conditions alternate between saturated, anaerobic and unsaturated aerobic states, resulting in the alternating presence of arsenic III and arsenic V, the arsenic III concentrations shall apply.

d Safe concentration has not yet been established. See WAC 173-340-7492(2) (c) for procedures for establishing values for these substances.

e These values represent a total toxic equivalent concentration of all furan or dioxin congeners. Use the toxicity equivalency factors in Table 749-6 to convert congener mixtures to a total toxic equivalent concentration.

f Diesel range organics includes the sum of diesel fuels and heavy oils measured using method the NWTPH-Dx method. Mineral oils are essentially non-toxic to plants and animals and do not need to comply with these values (see Compendium – Section V).

g Except that the concentration shall not exceed residual saturation.

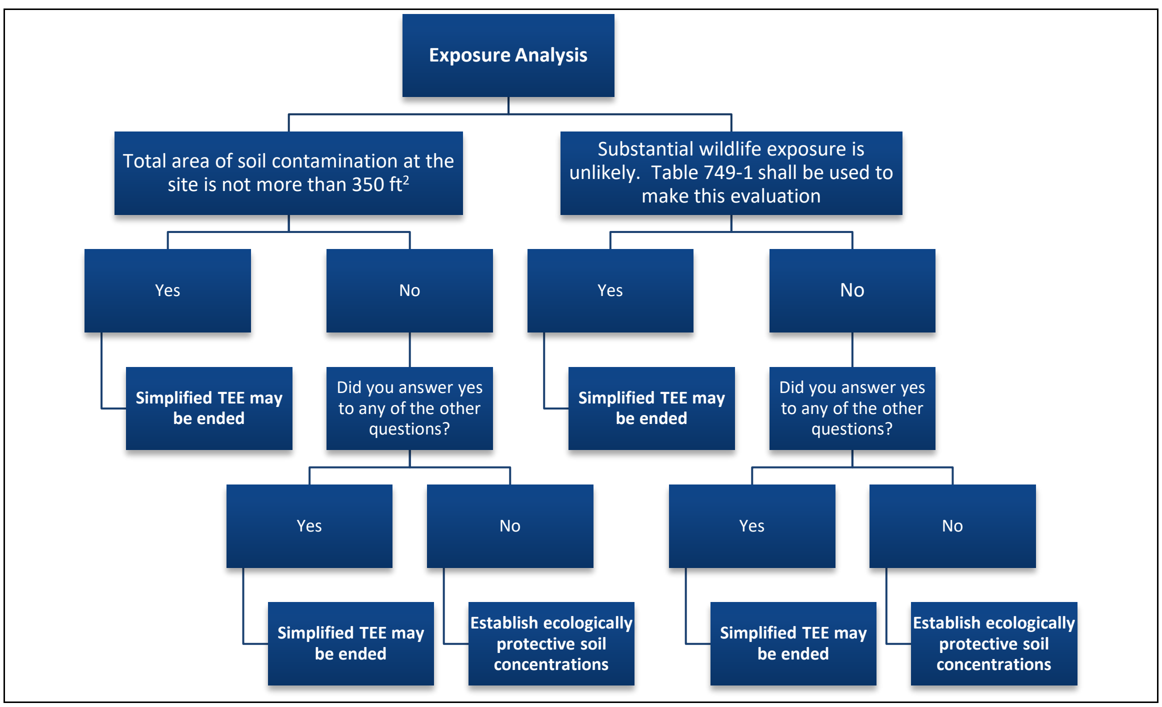
Exposure Analysis

The Exposure Analysis process (Figure 4.2) conducted while performing the simplified TEE is designed to determine the potential for significant exposure to ecological receptors that either use or inhabit sites. The TEE may be ended at a site where:

- The total area of soil contamination is not more than 350 square feet, or;
- Land use at the site and surrounding area make substantial wildlife exposure unlikely.

The determination of land use and wildlife exposure is made with the use of Table 4.2 (MTCA Table 749-1), which is provided for in the MTCA Regulations (WAC 173-340-900). Generally, an experienced field biologist should complete the habitat evaluation. In cases where Table 4.2 (MTCA Table 749-1) is completed by less experienced personnel, conservative assumptions should be made while completing the exposure analysis (Table 4.2 Footnote [a]). The presence of wildlife corridors on or adjacent to the site such as greenbelts, riparian zones, or water bodies should also be considered while determining whether or not a site is likely to attract wildlife. If it has been determined that there is significant potential for ecological receptors to be exposed to contaminants at the site, then an analysis of exposure pathways and/or contaminants must be completed. These procedures have been outlined in the Pathways Analysis and Toxicity Analysis sections. The process for setting cleanup levels for sites evaluated using the TEE has provided in the Establish Ecologically Protective Soil Concentrations section.

Figure 4.2: Summary of Exposure Analysis



Note: Answering (yes) to any of the other questions includes both the pathways analysis and toxicity analysis [sections].

Table 4.2: Simplified Terrestrial Ecological Evaluation – Exposure Analysis Procedures[a]

Estimate the area of contiguous (connected) undeveloped land on or within 500 feet of any area of the contaminated soil to the nearest ½ acre (1/4 acre if the area is less than 0.5 acre). "Undeveloped land" means land that is not covered by existing buildings, roads, paved areas or other barriers that will prevent wildfire from feeding on plants, earthworms, insects or other food in or on the soil.		
1) From the table below, find the number of points corresponding to the area and enter this number in the box to the right.		
Area (acres)	Points	
0.25 or less	4	
0.5	5	
1.0	6	
1.5	7	
2.0	8	
2.5	9	
3.0	10	
3.5	11	
4.0 or more	12	
2) Is this an industrial or commercial property? See the definition in WAC 173-340-200. If yes, enter a score of 3 in the box to the right. If no, enter a score of 1.		
3) Enter a score in the box to the right for the habitat quality of the contaminated soil and surrounding area, using the rating system shown below[b]. (High = 1, Intermediate = 2, Low = 3)		
4) Is the undeveloped land likely to attract wildlife? If yes, enter a score of 1 in the box to the right. If no, enter a score of 2[c].		
5) Are there any of the following soil hazardous substances present: Chlorinated dioxins/furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene? If yes, enter a score of 1 in the box to the right. If no, enter a score of 4.		
Add the numbers in the boxes on lines 2 through 5 and enter this number to the right. If this number is larger than the number in the box on line 1, the simplified TEE may be ended under WAC 173-340-7292(2) (a) (ii).		

Footnotes:

[a] It is expected that this habitat evaluation will be undertaken by an experienced field biologist. If this is not the case, enter a conservative score (1) for questions 3 and 4.

[b] **Habitat rating system.** Rate the quality of the habitat as high, intermediate, or low based on your professional judgment as a field biologist. The following are suggested factors to consider in making this evaluation:

- **Low:** Early successional vegetative stands; vegetation predominantly noxious, non-native, exotic plant species or weeds. Areas severely disturbed by human activity, including intensively cultivated croplands. Areas isolated from other habitat used by wildlife.
- **High:** Area is ecologically significant for one or more of the following reasons: Late successional native plant communities present; relatively high species diversity; used by an uncommon or rare species; priority habitat (as defined by the Washington Department of Fish and Wildlife); part of a larger area of habitat where size or fragmentation may be important for the retention of some species.
- **Intermediate:** Area does not rate as either high or low.

[c] Indicate "yes" if the area attracts wildlife or is likely to do so. Examples:

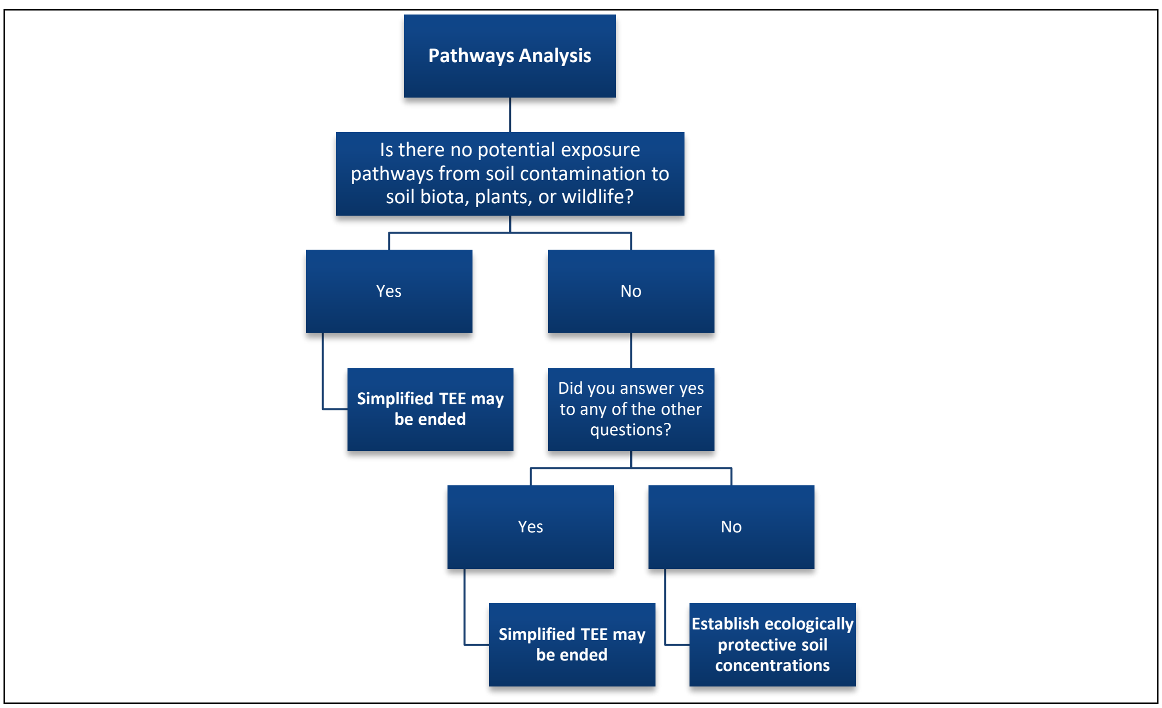
- Birds frequently visit the area to feed
- Evidence of high use by mammals (tracks, scat, etc…)
- Habitat "island" in an industrial area
- Unusual features of an area that make it important for feeding animals
- Heavy use during seasonal migrations
- Areas adjacent to wildlife corridors (i.e. greenbelts and waterways)

Pathways Analysis

The Pathways Analysis process (see Figure 4.3) conducted while performing the simplified TEE is designed to determine the exposure pathways from soil contamination to soil biota, plants or wildlife. For a commercial or industrial property, only potential exposure pathways to wildlife (e.g., small mammals, birds) need be considered. Only exposure pathways for priority chemicals of ecological concern listed in Table 4.1 (MTCA Table 749-2) at or above the concentrations provided must be considered. As a result, the toxicity analysis portion of the TEE should be performed concurrently with the pathways analysis. The results of the toxicity analysis are required to evaluate exposure pathways. Incomplete pathways may be due to the presence of man-made physical barriers, either currently existing or to be placed (future use) within a timeframe acceptable to the department, as part of a remedy or land use. These barriers may include, but are not limited to; parking lots, foundations, or geotextile membranes.

Conditional points of Compliance (See Chapter 1) may be changed to accommodate remedial alternatives provided that all of WAC 173-340-7490 (4) requirements have been satisfied. Barriers must break all significant exposure pathways and their design is dependent on site-specific environmental conditions and the chemical properties of contaminants. To ensure that such man-made barriers are maintained, a restrictive covenant shall be required by the department under WAC 173-340-440 under a consent decree, agreed order, or enforcement order, or as a condition to a written opinion regarding the adequacy of an independent remedial action.

Figure 4.3: Summary of Pathways Analysis



Note: Answering (yes) to any of the other questions includes both the exposure analysis and toxicity analysis [sections].

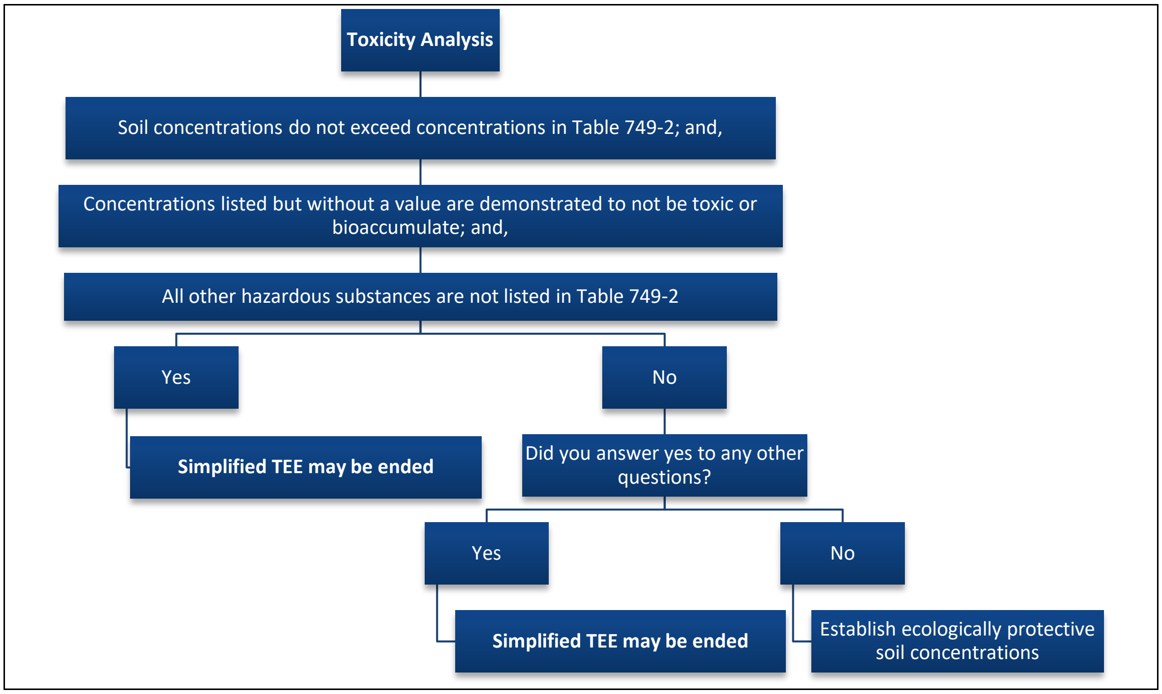
Toxicity Analysis

The Toxicity Analysis process (see Figure 4.4) conducted while performing the simplified TEE is designed to determine whether or not concentrations of toxicants are safe for ecological receptors using or inhabiting the site. The first step in the toxicity analysis process is to determine if site contaminants are listed and/or above Table 4.1 (MTCA Table 749-2) indicator soil concentrations. In cases where the table values are not provided and/or soil concentrations exceed the table values, a number of methods may be used to establish ecologically protective cleanup levels (see Establishing Ecologically Protective Soil Concentrations section). Otherwise, the Table 4.1 (MTCA Table 749-2) values may be used as cleanup levels. The TEE may be ended (without performing the exposure and pathway analyses) provided that cleanup plans are based on Table 4.1 (MTCA Table 749-2) values (provided that table values are available for all of the contaminants on site). Specifically, the evaluation may be ended if all of the following conditions are met at the site:

- For hazardous substances with a value listed in Table 4.1 (MTCA Table 749-2), soil concentrations at the point of compliance (see Chapter 1) do not exceed the applicable concentrations in this table;
- For hazardous substances listed in Table 4.1 (MTCA Table 749-2) but without a value, it is demonstrated that soil concentrations at the point of compliance are unlikely to be toxic or bioaccumulate based on bioassay procedures and wildlife exposure modeling and approved by the department; and,
- For other hazardous substances, the substances are not listed in Table 4.1 (MTCA Table 749-2).

Note: Whether a 6 foot conditional point of compliance is used or an alternative conditional point of compliance is deemed protective by Ecology, an institutional control is required if the contamination is within fifteen feet of the ground surface (see WAC 173-340-7490(4)(b)).

Figure 4.4: Summary of Toxicity Analysis



Note: Answering (yes) to any of the other questions includes both the pathways analysis and exposure analysis [sections]

Establishing Ecologically Protective Soil Concentrations

Establishing ecologically protective soil concentrations is required when the simplified TEE process cannot be ended under any of the simplified analysis criteria described in the previous subsections; exposure analysis, pathways analysis, or toxicity analysis. The ecologically protective soil concentrations can be established using the following methods:

- Use of the soil concentrations in Table 4.1 (MTCA Table 749-2).
- Derived soil concentrations using bioassay procedures described in WAC 173-340-7494(5) to determine concentrations toxic to soil biota and plants, and concentrations likely to bioaccumulate to toxic levels in animals as follows. Consult with the department before conducting bioassays;
    - For values in Table 4.1 (MTCA Table 749-2) based on toxicity to soil biota or plants, bioassays may be used to override the concentration in that table.
    - Bioassays may also be used to develop site-specific concentrations based on toxicity to soil biota and plants for substances listed in Table 4.1 (MTCA Table 749-2) but without a value.
    - For values in Table 4.1 (MTCA Table 749-2) based on modeling of bioaccumulation in wildlife and for substances listed in Table 4.1 (MTCA Table

749-2) but without a value, bioassays can be used to develop a site-specific earthworm bioaccumulation and/or plant uptake factor for use in the model described in Table 5.2 (MTCA Table 749-4). When using this model to develop protective soil concentrations for simplified ecological evaluations under this provision, all the other default values must be used; or

- The person conducting the evaluation may also voluntarily elect to develop protective soil concentrations using a site-specific terrestrial ecological evaluation under WAC 173-340-7494, instead of under this section.

Setting Cleanup Levels Based on TEE Tables

The indicator soil concentrations provided in Table 4.1 (MTCA Table 749-2) and Table 5.1 (MTCA Table 749-3) may be used as cleanup levels at any site conducting a simplified TEE. A combination of the values from both tables and the results of bioassays may also be used in cases where safe chemical concentrations for one of more of the ecological receptor groups have not been determined. While the use of these table values as cleanup levels is considered acceptable, please note that the values are conservative and those selected cleanup levels may be more stringent than required to protect ecological receptors on a specific site. Ecology chose to use conservative values in the absence of site-specific information. In many cases, the use of bioassays and empirical studies results in ecologically protective cleanup levels that are less stringent than the human-health based cleanup values, in which case, human health is the driving aspect controlling acceptable chemical concentrations.

Assessing Soil Toxicity with Bioassays

An alternative method to setting cleanup levels based on table values would be to derive concentrations using the bioassay procedures. This is completed to determine concentrations considered toxic to soil biota and plants, and those concentrations likely to bioaccumulate to toxic levels in animals. Bioassays may be used to:

- Determine a safe, yet less conservative value than Table 4.1 (MTCA Table 749-2) based on toxicity to soil biota or plants.
- Develop site – specific concentrations based on toxicity to soil biota and plants for substances listed in Table 4.1 (MTCA Table 749-2), but without a value.
- Develop a site – specific earthworm bioaccumulation and/or plant uptake factor for use in the model described in Table 5.2 (MTCA Table 749-4).

For issues where existing or potential threats to plant life are a concern, use the test described in *Early Seedling Growth Protocol for Soil Toxicity Screening*, Ecology Publication No. 96-324 (see Compendium – Section M). For sites where risks to soil biota are a concern, use the test described in *Earthworm Bioassay Protocol for Soil Toxicity Screening*, Ecology Publication No. 96-327 (see Compendium – Section N). A supporting document describing toxicity tests for receptors is *Protocols for Short Term Toxicity Screening of Hazardous Waste* Sites, Environmental Protection Agency Publication No. 600/3-88/029 (see Compendium – Section O).

Soil concentrations protective of soil biota or plants may also be established with soil bioassays that use species ecologically relevant to the site rather than standard test species. Species that do or could occur at the site are considered ecologically relevant.

Chapter 5: The Site – Specific Terrestrial Ecological Evaluation

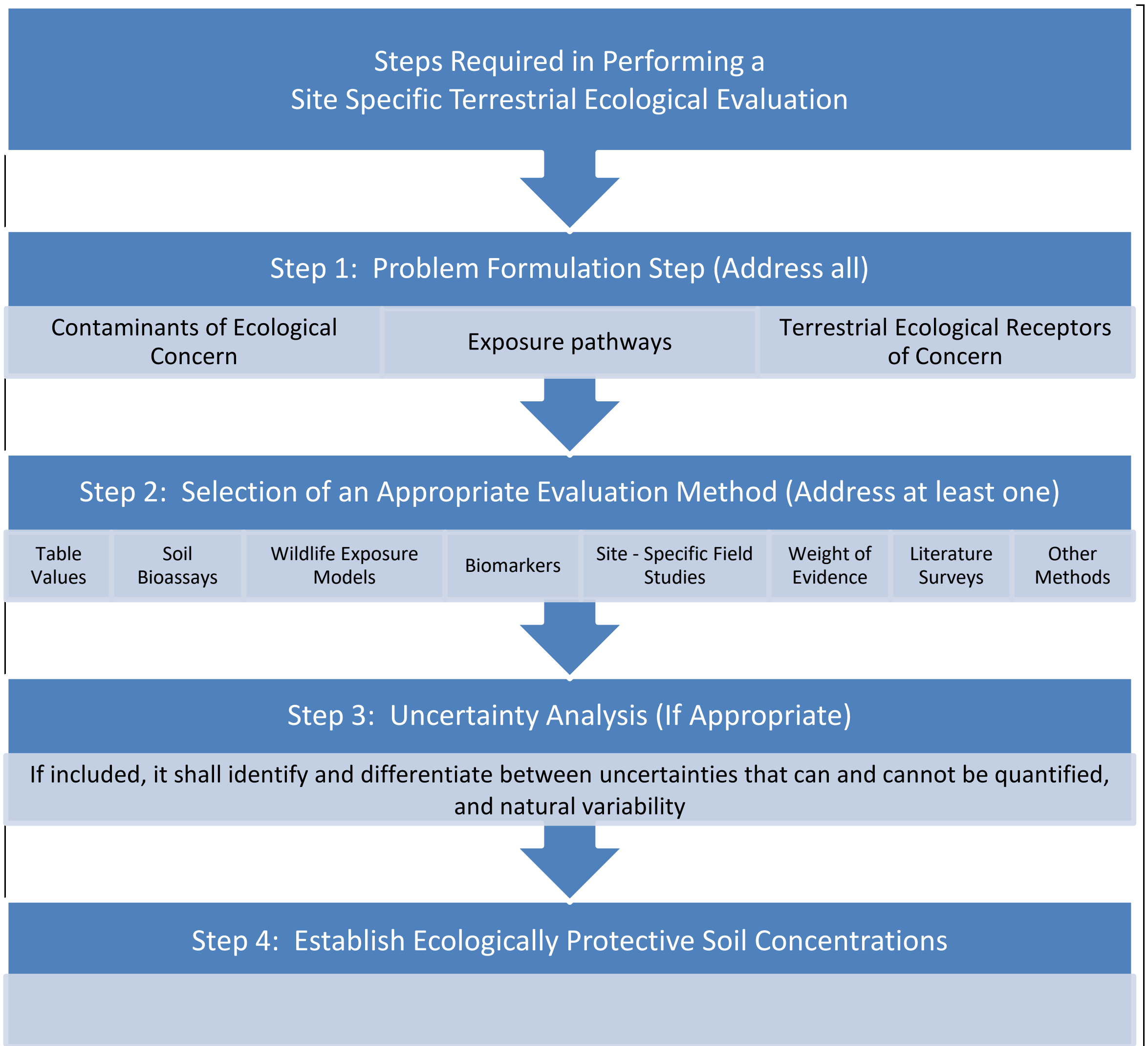
Chapter 3 describes the applicability of a simplified TEE. If it had been established that any one of the criteria described in the "Applicability of a Simplified Terrestrial Ecological Evaluation" section apply to the site, a site-specific TEE is required. The site-specific TEE process is designed to assess ecological risk at any site; including sites with protected status species (see Figure 5.1).

A site-specific TEE shall include the following steps:

- Problem formulation
- Selection of appropriate evaluation method(s)
- Conducting the evaluation
- Establish ecologically protective soil concentrations

Please note, after problem formulation, the department may (at its discretion) determine that the cleanup planned to address human health or possible aquatic impacts will also adequately protect soil biota, plants and animals. In these cases, no further evaluation of terrestrial ecological risk is required. Additionally, the department may determine that a simplified, rather than site-specific TEE may be conducted because a simplified TEE will adequately identify and address any existing or potential threats to ecological receptors.

Figure 5.1: Summary of Site – Specific TEE Procedures



Step 1: Problem Formulation

The purpose of problem formulation is to define the focus of the site-specific TEE. Three criteria are needed to be addressed to complete problem formulation. Those three criteria are:

- Contaminants of ecological concern
- Exposure pathways
- Terrestrial ecological receptors of concern

Contaminants of Ecological Concern

Identify the contaminants of ecological concern at the site. The person conducting the evaluation may eliminate hazardous substances from further consideration where the soil concentrations found at the site does not exceed the screening levels in Table 5.1 (MTCA Table 749-3). Please Note: See Chapter 1, for an explanation of statistical and other methods under "Determining Compliance." For industrial or commercial land uses, only the wildlife values need to be considered.

Any contaminant that exceeds the screening levels found in Table 5.1 (MTCA Table 749-3) shall be included as a contaminant of ecological concern in the evaluation unless it can be eliminated based on the factors listed in WAC 173-340-703. In summary, the department may eliminate from consideration those hazardous substances that contribute a small percentage of the overall threat to human health and the environment. The factors evaluated when eliminating individual hazardous substances from further consideration include (from WAC 173-340-703):

- The toxicological characteristics of the substance that influence its ability to adversely affect human health or the environment relative to the concentration of the substance at the site, including consideration of essential nutrient requirements;
- The chemical and physical characteristics of the substance which govern its tendency to persist in the environment;
- The chemical and physical characteristics of the hazardous substance which govern its tendency to move into and through environmental media;
- The natural background concentrations of the substance;
- The thoroughness of testing for the substance at the site;
- The frequency that the substance has been detected at the site; and
- Degradation by-products of the substance.

Table 5.1: EISC (mg/kg) for Protection of Terrestrial Plants and Animals.[a] For chemicals where a value is not provided see footnote b.

Note: These values represent soil concentrations that are expected to be protective at any MTCA site and are provided for use in eliminating hazardous substances from further consideration under WAC 173-340-7493(2)(a)(i). Where these values are exceeded, various options are provided for demonstrating that the hazardous substance does not pose a threat to ecological receptors at a site, or for developing site – specific remedial standards for eliminating threats to ecological receptors.

Hazardous Substance[b]	**Plants[c]**	**Soil Biota[d]**	**Wildlife[e]**	**Hazardous Substance[b]**	**Plants[c]**	**Soil Biota[d]**	**Wildlife[e]**
METALS:[f]				2,4,5 – Trichlorophenol	4	9	
Aluminum (soluble salts)	50			2,4,6 – Trichlorophenol		10	
Antimony	5			2,4 – Dichloroaniline		100	
Arsenic III			7	3,4 – Dichloroaniline		20	
Arsenic V	10	60	132	3,4 – Dichlorophenol	20	20	
Barium	500		102	3 – Chloroaniline	20	30	
Beryllium	10			3 – Chlorophenol	7	10	
Boron	0.5			Chlorinated Dibenzofurans (total)			2E-06
Bromine	10			Chloroacetamide		2	
Cadmium	4	20	14	Chlorobenzene		40	
Chromium (total)	42[g]	42[g]	67	Chlorinated dibenzo-p-dioxins (total)			2E-06
Cobalt	20			Hexachlorocyclopentadiene	10		
Copper	100	50	217	PCB mixtures (total)	40		0.65
Fluorine	200			Pentachloroaniline		100	
Iodine	4			Pentachlorobenzene		20	
Lead	50	500	118	**OTHER NONCHLORINATED ORGANICS:**			
Lithium	35[g]			2,4 – Dinitrophenol	20		
Manganese	1,100[g]		1,500	4 – Nitrophenol		7	
Mercury, inorganic	0.3	0.1	5.5	Acenaphthene	20		
Mercury, organic			0.4	Benzo(a)pyrene			12
Molybdenum	2		7	Biphenyl	60		
Nickel	30	200	980	Diethylphthalate	100		
Selenium	1	70	0.3	Dimethylphthalate		200	
Silver	2			Di-n-butyl phthalate	200		
Technetium	0.2			Fluorene		30	
Thallium	1			Furan	600		
Tin	50			Nitrobenzene		40	
Uranium	5			N – nitrosodiphenylamine		20	
Vanadium	2			Phenol	70	30	
Zinc	86[g]	200	360	Styrene	300		
PESTICIDES:				Toluene	200		
Aldrin			0.1	**PETROLEUM:**			
Benzene hexachloride (including lindane)			6	Gasoline Range Organics		100	5,000[h]
Chlordane		1	2.7	Diesel Range Organics[j]		200	6,000[i]
DDT/DDD/DDE (total)			0.75	***See Footnotes Section (Next Page)***			
Dieldrin			0.07				
Endrin			0.2				
Hexachlorobenzene			17				
Heptachlor/heptachlorepoxide (total)			0.4				
Pentachlorophenol	3	6	4.5				
OTHER CHLORINATED ORGANICS:							
1,2,3,4 – Tetrachlorobenzene		10					
1,2,3 – Trichlorobenzene		20					
1,2,4 – Trichlorobenzene		20					
1,2 – Dichloropropane		700					
1,4 – Dichlorobenzene		20					
2,3,4,5 – Tetrachlorophenol		20					
2,3,5,6 – Tetrachloroaniline	20	20					
2,4,5 – Trichloroaniline	20	20					

Footnotes:

a. Caution on misusing these ecological indicator concentrations. Exceedances of the values in this table do not necessarily trigger requirements for cleanup action under this chapter. Natural background concentrations may be substituted for ecological indicator concentrations provided in this table. The table is not intended for purposes such as evaluating sludges or wastes. This list does not imply that sampling must be conducted for each of these chemicals at every site. Sampling should be conducted for those chemicals that might be present based on available information, such as current and past uses of chemicals at the site.

b. For hazardous substances where a value is not provided, plant and soil biota indicator concentrations shall be based on a literature survey conducted in accordance with WAC 173-340-7493(4) and calculated using methods described in the publications listed below in footnotes c and d. Methods to be used for developing wildlife indicator concentrations are described in Tables 5.2 and 5.3 (MTCA Tables 749-4 and 749-5).

c. Based on benchmarks published in *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants: 1997 Revision*, Oak Ridge National Laboratory, 1997 (see Compendium – Section P).

d. Based on benchmarks published in *Toxicological Benchmarks for Potential Contaminants of Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process,* Oak Ridge National Laboratory, 1997 (see Compendium – Section Q).

e. Calculated using the exposure model provided in Table 5.2 (MTCA Table 749-4) and chemical-specific values provided in Table 5.3 (MTCA Table 749-5). Where both avian and mammalian values are available, the wildlife value is the lower of the two.

f. For arsenic, use the valence state most likely to be appropriate for site conditions, unless laboratory information is available. Where soil conditions alternate between saturated, anaerobic and unsaturated, aerobic states, resulting in the alternating presence of arsenic III and arsenic V, the arsenic III concentrations shall apply.

g. Benchmark replaced by Washington State natural background concentration.

h. 5,000 mg/kg except that the concentration shall not exceed residual saturation at the soil surface.

i. 6,000 mg/kg except that the concentration shall not exceed residual saturation at the soil surface.

j. Diesel range organics includes the sum of diesel fuels and heavy oils measured using method the NWTPH-Dx method. Mineral oils are essentially non-toxic to plants and animals and do not need to comply with these values (see Compendium – Section V).

Exposure Pathways

Identify any complete potential exposure pathways that would be expected for exposure of plants or animals to the contaminants of concern. If there are no complete exposure pathways then no further evaluation is necessary. Incomplete pathways may be due to the presence of man-made physical barriers, either currently existing or for future use within a timeframe acceptable to the department, as part of a remedy or land use.

Terrestrial Ecological Receptors of Concern

Identify current or potential future terrestrial ecological receptor groups reasonably likely to live or feed at the site. Groupings should represent taxonomically related species with similar exposure characteristics. Examples of potential terrestrial species groups include:

- Soil-associated invertebrates
- Vascular plants
- Ground-feeding birds
- Ground-feeding small mammal predators
- Herbivorous small mammals.

From these terrestrial species groups, select those groups to be included in the evaluation. If appropriate, individual terrestrial receptor species may also be included. In selecting species groups or individual species, the following shall be considered:

- Receptors that may be at most risk for significant adverse effects based on; the toxicological characteristics of the contaminants of concern, the sensitivity of the receptor, and the likely degree of exposure.
- Public comments.
- Species protected under applicable state or federal laws that may potentially be exposed to hazardous substances in the soil at the site (see Compendium – Section E) (see Compendium – Section F) (see Compendium – Section G).
- Receptors to be considered under different land uses (see Ecological Receptors Based on Land Use – Chapter 1), as described under WAC 173-340-7490(3).

Note: Surrogate species for which greater information is available, or that are more suitable for site –specific studies, may be used in the analysis when appropriate for addressing issues raised in the problem formulation step.

Toxicological Assessment

Identify significant adverse effects in the receptors of concern that may result from exposure to the contaminants of concern, based on information from the toxicological literature. Example:

Is dieldrin contamination a potential threat to reproduction in birds feeding on invertebrates and ingesting soil at the site? If so, what measures will eliminate any significant adverse effects?
If there are identified information needs for remedy selection, these should also be developed as issues for the problem formulation process. The use of assessment and measurement endpoints, as defined in USEPA *Ecological Risk Assessment Guidance for Superfund,* 1997 (see Compendium – Section T), shall be considered to clarify the logical structure of the site-specific TEE under this chapter. Assessment endpoints shall be consistent with the requirements in WAC 173-340-7490 (3) (see Chapter 1 – Ecological Receptors Based on Land Use). A recommendation for points that should be considered when completing a toxicological assessment includes:

- Relevant chemical information
- Uptake via routes of potential exposure
- Potential to bioaccumulate in plants, invertebrates and vertebrates
- Modes of action
- Range of toxicological endpoints and sensitive endpoints
- Sensitive receptor group (e.g., vascular plants, soil biota, ground-feeding small mammal predators, ground-feeding small mammal herbivores, and ground-feeding birds)
- Other additional information found in the review that may be important

Step 2: Selection of Appropriate Terrestrial Ecological Evaluation Methods

If it is determined during the problem formulation that further evaluation is necessary, one or more of the following methods shall be used to further evaluate terrestrial ecological effects and, if necessary, establish soil concentrations protective of terrestrial ecological receptors:

- Table values
- Soil Bioassays
- Wildlife exposure model
- Biomarkers
- Site – specific field studies
- Weight of evidence
- Literature surveys

When selecting a method, consideration shall be given to the relevance of the method to the issues identified during problem formulation. There is flexibility under the cleanup regulation both in selecting an approach for addressing issues raised problem formulation, and the criteria to be used for interpreting results from the selected approach. Because of this flexibility, it is important to consult with Ecology during the planning stages to insure that the completed site-specific TEE will be acceptable to the department.

There are two general categories of methods available for addressing concerns developed during problem formulation: Empirical studies and literature surveys. Empirical studies range from the characterization of physical or chemical properties of contaminated soil to measurements conducted on biota at the site. In some instances, the data from these studies may be used in conjunction with a wildlife exposure model that has been provided for (and discussed later in this chapter) in the regulations.

The other method is literature surveys. Literature surveys may be used to develop site-specific information, but will generally need to begin with some relevant site data. For example, if the chemical form of a site contaminant is known, there may be justification for substituting a literature-derived value for the default value provided for in the regulation.

Table Values

At the discretion of the person conducting the evaluation, the screening values in Table 5.1 (MTCA Table 749-3) may be used as the cleanup level when terrestrial ecological risk drives the cleanup level.

Soil Bioassays

Bioassays may use sensitive surrogate organisms not necessarily found at the site provided that the test adequately addresses the issues raised in the problem formulation. For issues where existing or potential threats to plant life are a concern, use the test described in *Early Seedling Growth Protocol for Soil Toxicity Screening*, Ecology Publication No. 96-324 (see Compendium – Section M). For sites where risks to soil biota are a concern, use the test described in *Earthworm Bioassay Protocol for Soil Toxicity Screening*, Ecology Publication No. 96-327 (see Compendium – Section N). Preparation of test soils and dilution factors can be found in the procedures listed in *Protocols for Short Term Toxicity Screening of Hazardous Waste Sites*, USEPA Publication No. 600/3-88/029 (see Compendium – Section O). Other bioassay tests approved by the department may also be used.

Soil concentrations protective of soil biota or plants may also be established with soil bioassays that use species ecologically relevant to the site rather than standard test species. Species that do or could occur at the site are considered ecologically relevant.

Wildlife Exposure Model

Modeling may be used to determine soil concentrations protective of terrestrial wildlife using the equations and exposure parameters in Tables 5.2 and 5.3 (MTCA Tables 749-4 and 749-5). Alternative values for parameters listed in Table 5.3 (MTCA Table 749-5) may be used if it can be demonstrated that the alternative values are more relevant to site-specific conditions (for example, the value is based on a chemical form of a hazardous substance actually present at the site). Alternative values obtained from the literature shall be supported by a literature survey conducted in accordance with the literature survey requirements and the requirements of:

- Burden of Proof – Demonstration to the department that requirements in this chapter have been met to ensure protection of human health and the environment. The department shall only approve of such proposals when it determines that this burden of proof is met.
- New Scientific Information – The department shall consider new scientific information when establishing cleanup levels and remediation levels for individual sites. Any proposal to use new scientific information shall meet the quality of information requirements described below. To minimize delay in cleanups, any proposal to use new scientific information should be introduced as early in the cleanup process as possible.
- Criteria for quality of information:
    - Whether the information is based on a theory or technique that has widespread acceptance within the relevant scientific community.
    - Whether the information was derived using standard testing methods or other widely accepted scientific methods.
    - Whether a review of relevant available information, both in support of and not in support of the proposed modification, has been provided along with the rationale explaining the reasons for the proposed modification.
    - Whether the assumptions used in applying the information to the facility are valid and would ensure the proposed modification would err on behalf of protection of human health and the environment.
    - Whether the information adequately addresses populations that are more highly exposed than the population as a whole and are reasonably likely to be present at the site.
    - Whether adequate quality assurance and quality control procedures have been used, and significant anomalies are adequately explained, the limitations of the information are identified, and the known or potential rate of error is acceptable.

For more information regarding substitution of screening values, please see Chapter 6: Substitution of Screening Values.

Receptor species of concern or exposure pathways identified in the problem formulation step may be added to the model if appropriate on a site-specific basis. Substitutions of receptor species and the associated values in the wildlife exposure model described in Table 5.2 (MTCA Table 749-4) may be made subject to the following conditions:

- There is scientifically supportable evidence that a receptor identified in Table 5.2 (MTCA Table 749-4) is not characteristic or a reasonable surrogate for a receptor that is characteristic of the ecoregion where the site is located. "Ecoregions" are defined using EPA's *Ecoregions of the Pacific Northwest* Document No. 600/3-86/033 July 1986 by Omerick and Gallant (see Compendium – Section S).
- The proposed substitute receptor is characteristic of the ecoregion where the site is located and will serve as a surrogate for wildlife species that are, or may become exposed to hazardous substances in the soil at the site. The selected surrogate shall be a species that is expected to be vulnerable to the effects of soil contamination relative to the current default species because of high exposure or known sensitivity to hazardous substances found in the soil at the site.
- Scientific studies concerning the proposed substitute receptor species are available in the literature to select reasonable maximum exposure estimates for variables listed in Table 5.2 (MTCA Table 749-4).

Note: In choosing among potential substitute receptor species that meet the criteria in the above two provisions, preference shall be given to the species most ecologically similar to the default receptor being replaced.

- Unless there is clear and convincing evidence that they are not characteristic of the ecoregion where the site is located, the following groups shall be included in the wildlife exposure model: A small mammalian predator on soil-associated invertebrates, a small avian predator on soil-associated invertebrates, and a small mammalian herbivore. Selected groups should have a small foraging range.
- To account for uncertainties in the level of protection provided to substitute receptor species and toxicologically sensitive species, the department may require any of the following:
  - Use of toxicity reference values (TRV) based on no observed adverse effects levels.
  - Use of uncertainty factors to account for extrapolations between species in toxicity or exposure parameter values; or
  - Use of a hazard index (HI) approach for multiple hazardous substances to account for additive toxic effects.

Table 5.2: Wildlife Exposure Model for Site – Specific Evaluations

Table 749-4
Wildlife Exposure Model for Site-specific Evaluations.[a]

PLANT	
K_{Plant}	Plant uptake coefficient (dry weight basis)
	Units: mg/kg plant / mg/kg soil
	Value: chemical-specific (see Table 749-5)
SOIL BIOTA Surrogate receptor: Earthworm	
BAF_{Worm}	Earthworm bioaccumulation factor (dry weight basis)
	Units: mg/kg worm / mg/kg soil
	Value: chemical-specific (see Table 749-5)
MAMMALIAN PREDATOR Surrogate receptor: Shrew (*Sorex*)	
$P_{SB\ (shrew)}$	Proportion of contaminated food (earthworms) in shrew diet
	Units: unitless
	Value: 0.50
$FIR_{Shrew,DW}$	Food ingestion rate (dry weight basis)
	Units: kg dry food / kg body weight – day
	Value: 0.45
$SIR_{Shrew,DW}$	Soil ingestion rate (dry weight basis)
	Units: kg dry soil / kg body weight – day
	Value: 0.0045
$RGAF_{Soil,\ shrew}$	Gut absorption factor for a hazardous substance in soil expressed relative to the gut absorption factor for the hazardous substance in food.
	Units: unitless
	Value: chemical-specific (see Table 749-5)
T_{Shrew}	Toxicity reference value for shrew
	Units: mg/kg - day
	Value: chemical-specific (see Table 749-5)
Home range	0.1 Acres
AVIAN PREDATOR Surrogate receptor: American robin (*Turdus migratorius*)	
$P_{SB\ (Robin)}$	Proportion of contaminated food (soil biota) in robin diet
	Unit: unitless
	Value: 0.52
$FIR_{Robin,DW}$	Food ingestion rate (dry weight basis)
	Units: kg dry food / kg body weight – day
	Value: 0.207
$SIR_{Robin,DW}$	Soil ingestion rate (dry weight basis)
	Units: kg dry soil / kg body weight – day
	Value: 0.0215
$RGAF_{Soil,\ robin}$	Gut absorption factor for a hazardous substance in soil expressed relative to the gut absorption factor for the hazardous substance in food.
	Units: unitless
	Value: chemical-specific (see Table 749-5)
T_{Robin}	Toxicity reference value for robin
	Units: mg/kg – day
	Value: chemical-specific (see Table 749-5)
Home range	0.6 acres
MAMMALIAN HERBIVORE Surrogate receptor: Vole (*Microtus*)	
$P_{Plant,\ vole}$	Proportion of contaminated food (plants) in vole diet
	Units: unitless
	Value: 1.0
$FIR_{Vole,DW}$	Food ingestion rate (dry weight basis)
	Units: kg dry food / kg body weight – day
	Value: 0.315
$SIR_{Vole,DW}$	Soil ingestion rate (dry weight basis)
	Units: kg dry soil / kg body weight – day
	Value: 0.0079
$RGAF_{Soil,\ vole}$	Gut absorption factor for a hazardous substance in soil expressed relative to the gut absorption factor for the hazardous substance in food.
	Units: unitless
	Value: chemical-specific (see Table 749-5)
T_{Vole}	Toxicity reference value for vole
	Units: mg/kg – day
	Value: chemical-specific (see Table 749-5)
Home range	0.08 acres

SOIL CONCENTRATIONS FOR WILDLIFE PROTECTION[b]

(1) Mammalian predator:

$SC_{MP} = (T_{Shrew})/[(FIR_{Shrew,DW} \times P_{SB\ (shrew)} \times BAF_{Worm}) + (SIR_{Shrew,DW} \times RGAF_{Soil,\ shrew})]$

(2) Avian predator:

$SC_{AP} = (T_{Robin})/[(FIR_{Robin,DW} \times P_{SB\ (Robin)} \times BAF_{Worm}) + (SIR_{Robin,DW} \times RGAF_{Soil,\ robin})]$

(3) Mammalian herbivore:

$SC_{MH} = (T_{Vole})/[(FIR_{Vole,DW} \times P_{Plant,vole} \times K_{Plant}) + (SIR_{Vole,DW} \times RGAF_{Soil,\ vole})]$

Footnotes:

a Substitutions for default receptors may be made as provided for in WAC 173-340-7493(7). If a substitute species is used, the values for food and soil ingestion rates, and proportion of contaminated food in the diet, may be modified to reasonable maximum exposure estimates for the substitute species based on a literature search conducted in accordance with WAC 173-340-7493(4).
Additional species may be added on a site-specific basis as provided in WAC 173-340-7493 (2)(a).
The department shall consider proposals for modifications to default values provided in this table based on new scientific information in accordance with WAC 173-340-702(14).

b Use the lowest of the three concentrations calculated as the wildlife value.

Table 5.3: Default Values for Substances for use with the Wildlife Exposure Model

Table 749-5
Default Values for Selected Hazardous Substances for use with the Wildlife Exposure Model in Table 749-4.[a]

Hazardous Substance	Toxicity Reference Value (mg/kg - d)				
	BAF_{Worm}	K_{Plant}	Shrew	Vole	Robin
METALS:					
Arsenic III	1.16	0.06	1.89	1.15	
Arsenic V	1.16	0.06	35	35	22
Barium	0.36		43.5	33.3	
Cadmium	4.6	0.14	15	15	20
Chromium	0.49		35.2	29.6	5
Copper	0.88	0.020	44	33.6	61.7
Lead	0.69	0.0047	20	20	11.3
Manganese	0.29		624	477	
Mercury, inorganic	1.32	0.0854	2.86	2.18	0.9
Mercury, organic	1.32		0.352	0.27	0.064
Molybdenum	0.48	1.01	3.09	2.36	35.3
Nickel	0.78	0.047	175.8	134.4	107
Selenium	10.5	0.0065	0.725	0.55	1
Zinc	3.19	0.095	703.3	537.4	131
PESTICIDES:					
Aldrin	4.77	0.007[b]	2.198	1.68	0.06
Benzene hexachloride (including lindane)	10.1				7
Chlordane	17.8	0.011[b]	10.9	8.36	10.7
DDT/DDD/DDE	10.6	0.004[b]	8.79	6.72	0.87
Dieldrin	28.8	0.029[b]	0.44	0.34	4.37
Endrin	3.6	0.038[b]	1.094	0.836	0.1
Heptachlor/heptachlor epoxide	10.9	0.027[b]	2.857	2.18	0.48
Hexachloro-benzene	1.08				2.4
Pentachloro-phenol	5.18	0.043[b]	5.275	4.03	
OTHER CHLORINATED ORGANICS:					
Chlorinated dibenzofurans	48				1.0E-05
Chlorinated dibenzo-p-dioxins	48	0.005[b]	2.2E-05	1.7E-05	1.4E-04
PCB mixtures	4.58	0.087[b]	0.668	0.51	1.8
OTHER NONCHLORINATED ORGANICS:					
Benzo(a)pyrene	0.43	0.011	1.19	0.91	

Footnotes:

a For hazardous substances not shown in this table, use the following default values. Alternatively, use values established from a literature survey conducted in accordance with WAC 173-340-7493(4) and approved by the department.

K_{Plant}:
- Metals (including metalloid elements): 1.01
- Organic chemicals: $K_{Plant} = 10^{(1.588-(0.578\log Kow))}$, where $\log K_{ow}$ is the logarithm of the octanol-water partition coefficient.

BAF_{Worm}:
- Metals (including metalloid elements): 4.6
- Nonchlorinated organic chemicals:
  $\log K_{ow} < 5$: 0.7
  $\log K_{ow} \geq 5$: 0.9
- Chlorinated organic chemicals:
  $\log K_{ow} < 5$: 4.7
  $\log K_{ow} \geq 5$: 11.8

$RGAF_{Soil}$ (all receptors): 1.0

Toxicity reference values (all receptors): Values established from a literature survey conducted in accordance with WAC 173-340-7493(4).

Site-specific values may be substituted for default values, as described below:

K_{Plant}: Value from a literature survey conducted in accordance with WAC 173-340-7493(4) or from empirical studies at the site.

BAF_{Worm}: Value from a literature survey conducted in accordance with WAC 173-340-7493(4) or from empirical studies at the site.

$RGAF_{Soil}$ (all receptors): Value established from a literature survey conducted in accordance with WAC 173-340-7493(4).

Toxicity reference values (all receptors): Default toxicity reference values provided in this table may be replaced by a value established from a literature survey conducted in accordance with WAC 173-340-7493(4).

b Calculated from $\log K_{ow}$ using formula in footnote a.

Biomarkers

Biomarker methods may be used if the measurements have clear relevance to issues raised in the problem formulation and the approach has a high probability of detecting a significant adverse effect if it is occurring at the site. The person conducting the evaluation may elect to use criteria such as biomarker effects that serve as a sensitive surrogate for significant adverse effects.

Biomarkers are another alternative to full-scale field studies. Animals from a site can be tested for a variety of symptoms to evaluate whether they are being affected by soil contaminants. Typically, these symptoms collectively termed "biomarkers" are sensitive, early indicators of exposure that may precede the onset of more damaging health effects. Biomarkers are most useful where they are chemical-specific and there are well established, relatively inexpensive laboratory tests available.

For site-specific evaluations where biomarkers are chosen to address issues raised in problem formulation, it is important to reach agreement in the planning stages as to how the testing results will be used. For example, if there is an agreement to use a biomarker as a surrogate for an adverse effect as defined in WAC 173-340-7490(3), positive results could be a criterion for proceeding with remediation.

Site – Specific Field Studies

Site-specific empirical studies that involve hypothesis testing should use a conventional "no difference" null hypothesis (that is, H_O: Earthworm densities are the same in the contaminated area and the reference [control] area. H_A: Earthworm densities are higher in the reference area than in the contaminated area). In preparing a work plan, consideration shall be given to the adequacy of the proposed study to detect an ongoing adverse effect and this issue shall be addressed in reporting results from the study.

Weight of Evidence

A weight of evidence approach shall include a balance in the application of literature, field, and laboratory data, recognizing that each has particular strengths and weaknesses. Site-specific data shall be given greater weight than default values or assumptions where appropriate.

Literature Surveys

A literature survey may be used to address the issues raised in the problem formulation. An analysis based on a literature survey may be used for:

- Developing a soil concentration for contaminants of concern not listed in Table 5.1 (MTCA Table 749-3).

- Identifying a soil concentration for the protection of plants or soil biota more relevant to site-specific conditions than the value listed in Table 5.1 (MTCA Table 749-3).
- Obtaining a value for any of the wildlife exposure model variables listed in Table 5.3 (MTCA Table 749-5) to calculate a soil concentration for the protection of wildlife more relevant to site-specific conditions than the values listed in Table 5.1 (MTCA Table 749-3).

When using a literature survey, the following requirements must be met:

- TRV or soil concentrations established from the literature shall represent the lowest relevant lowest observed adverse effects level (LOAEL) found in the literature. Bioaccumulation factor (BAF) values and plant uptake (K_{plant}) factors shall represent a reasonable maximum value from relevant information found in the literature. In assessing relevance, the following principals shall be considered:
  - Literature benchmark values should be obtained from studies that have test conditions as similar as possible to site conditions.
  - The literature benchmark values or TRV should correspond to the exposure route being assessed.
  - The TRV, BAF, or K_{plant} value shall be as appropriate as possible for the receptor being assessed. The toxicity reference value should be based on a significant endpoint, as described under “endpoints” of this chapter.
  - The literature benchmark value or TRV should preferably be based on chronic exposure.
  - The literature benchmark value, TRV, BAF, or K_{plant} should preferably correspond to the chemical form being assessed. Exceptions may apply for TRV’s where documented biological transformations occur following uptake of the chemical or where chemical transformations are known to occur in the environment under conditions appropriate to the site.

A list of relevant journals and other literature consulted in the survey shall be provided to the department. A table summarizing information from all relevant studies shall be provided to the department in a report, and the studies used to select a proposed value shall be identified. Copies of literature cited in the table that are not in the possession of the department shall be provided with the report. The department may identify relevant articles, books or other documents that shall be included in the survey.

A bioaccumulation factor (BAF) is obtained as the ratio of the chemical concentration in soil macroinvertebrates form the site (e.g., earthworms) to the concentration in soil samples from the site. Both measurements should be made on a dry weight basis. Depending on the macroinvertebrate abundance at the site and the quantity of biomass needed for laboratory analysis, it may be feasible to calculate an empirical BAF value. A variation on this approach involves the addition of laboratory-reared earthworms or other appropriate macroinvertebrates to soil samples and subsequent measurement of chemical concentrations in tissue and soil.

A plant uptake factor (K_{plant}) is calculated as the ratio of the chemical concentration in plants from the site to the concentration in soil samples from the site, with both measurements made on a dry weight basis. This parameter is needed for the calculation of a soil concentration for the protection of mammalian herbivores. In general, chemical concentrations should therefore be measured in grasses and forbs rather than woody shrubs or trees.

Other methods

The department may approve of other methods for conducting a TEE. This may include a qualitative evaluation if relevant toxicological data are not available and cannot be otherwise developed (e.g.., through soil bioassay testing).

Uncertainty Analysis

If a site-specific terrestrial ecological evaluation includes an uncertainty analysis, the discussion of uncertainty shall identify and differentiate between uncertainties that can and cannot be quantified and natural variability. The discussion shall describe the range of potential ecological risks from the hazardous substances present at the site, based on the toxicological characteristics of the hazardous substances present, and evaluate the uncertainty regarding these risks. Potential methods for reducing uncertainty shall also be discussed, such as additional studies or post-remedial monitoring. If multiple lines of independent evidence have been developed, a weight of evidence approach may be used in characterizing uncertainty.

Step 3: Establishing Ecologically Protective Soil Concentrations

Soil concentrations shall be established to protect soil biota and terrestrial plants and animals, as appropriate, at sites not meeting the criteria in the Ecological Receptors subsection of this chapter for ending the evaluation of conducting a simplified evaluation. The soil concentrations shall be established using one or a combination of the following methods as provided:

- The values in Table 5.1 (MTCA Table 749-3)
- Soil bioassays
- Wildlife exposure modeling
- Biomarkers
- Site-specific field studies
- Weight of evidence
- Literature survey
- Other methods approved by the department

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Chapter 6: Specifics

The Requirements for Substitution of Screening Values

The purpose of the Wildlife Exposure Model is to develop soil concentrations that are protective of wildlife receptors (see Chapter 5 – Wildlife Exposure Model). The screening levels that are protective of wildlife found in Table 5.1 (MTCA Table 749-3) were developed from the Wildlife Exposure Model using the default Toxicity Reference Values (BAF_{Worm}, K_{Plant}, Shrew, Vole, Robin) found in Table 5.3 (MTCA Table 5.3 (MTCA Table 749-5) and applying those values to the wildlife exposure models found in Table 5.2 (MTCA Table 749-4). Many of these values were obtained from Toxicological Benchmarks for Wildlife (Sample et al., 1996) (see Compendium – Section R). Substitution of alternate TRV's and BAF's in place of the default values can be performed by the use of a literature review. The results of the literature review should identify a soil concentration for protecting soil biota, plants, and wildlife more relevant to site-specific conditions than values listed in Table 5.1 (MTCA Table 749-3). The use of replacement values for default values shall be considered only when it can be verified that the proposed replacement value is considered new scientific information developed subsequent to publishing the MTCA rule (See Chapter 5 – Wildlife Exposure Model – Criteria for New Scientific Information).

The design of the approach of establishing criteria for the use of new scientific information is so that changes are not made to some of the underlying policy choices reflected in the Table 5.1 (MTCA Table 749-3). WAC 173-340-7493(4) (a) specifies that "…toxicity reference values or soil concentrations established from the literature shall represent the lowest relevant LOAEL found in the literature. Bioaccumulation factor values shall represent a reasonable maximum value from relevant information found in the literature…"

Alternately, bioassays may be performed to develop soil concentrations that are protective of plants and soil biota (see Chapter 5 – Bioassays). The screening levels that are protective of plants and soil biota found in Table 5.1 (MTCA Table 749-3) were developed from an extensive literature review prior to publishing the MCTA rule. However, Ecology recognizes the value in performing site-specific bioassays to develop site-specific protective concentrations. An example of such would be a 3% dilution series of site-specific soil contaminated with TPH under the guidelines of Protocols for Short Term Toxicity Screening of Hazardous Waste Sites (Greene et al., 1988).

Dioxins, Furans, and Dioxin-Like PCB Congeners: Addressing Non-Detects and Establishing PQLs for Ecological Risk Assessments in Upland Soil (Ecology, 2015)

This memorandum is an interpretation from Ecology for:

1) Evaluating detection limits and non-detects for the purposes of summing congeners for site evaluations; and
2) Establishing a PQL for dioxin-like congeners, specifically for:
    a. Chlorinated dibenzo-p-dioxins (PCDDs) (TCDD is a member of this class);
    b. Chlorinated dibenzofurans (PCDFs); and
    c. Dioxin-like polychlorinated biphenyls (PCBs).

This memorandum can be found at:
https://fortress.wa.gov/ecy/publications/SummaryPages/1609044.html

When to Use EPA Method 1668 for PCB Congener Analysis (Ecology, 2015)
This memorandum is an interpretation form Ecology for:

1) Describes the circumstances when Ecology may require or allow the use of EPA Method 1668 instead of the standard analytical method, EPA method 8082, to analyze PCB mixtures at contaminated sites being cleaned up under
    a. Chapter 173-340 WAC (MTCA rule); or
    b. Chapter 173-204 WAC (SMS rule).

This memorandum can be found at:
https://fortress.wa.gov/ecy/publications/SummaryPages/1509052.html

Dioxins, Furans, and Dioxin-Like PCB Congeners: Ecological Risk Calculation Methodology for Upland Soil (Ecology, 2016)

This memorandum is an interpretation from Ecology for:

1) Procedures that should be used to calculate site contaminant concentrations for three types of contaminants when conducting a Terrestrial Ecological Evaluation under the Model Toxics Control Act (WAC 173-340-7490 through 7494). The three contaminant types are:
    a. Chlorinated dibenzo-p-dioxins (PCDDs) (2,3,7,8-TCDD is a member of this class);
    b. Chlorinated dibenzofurans (PCDFs); an
    c. Polychlorinated biphenyls (PCBs) (includes both total PCBs and dioxin-like PCBs).
2) This memorandum can be found at:

https://fortress.wa.gov/ecy/publications/SummaryPages/1609044.html

Calculating Cleanup Levels and Compliance Monitoring for TPH

The process for calculating cleanup levels and compliance monitoring for Total Petroleum Hydrocarbons (TPH) is described in: Guidance for Remediation of Petroleum Contaminated Sites (Ecology, 2011). A summary of the screening levels for both simplified and site-specific TEE's are highlighted in Table 6.3 and Table 6.4. Residual saturation screening levels have been provided in Table 6.5. The respective screening levels shall be used with the required TEE (simplified or site – specific).

If those screening levels (Tables 6.3 and 6.4) have not been chosen as cleanup levels, bioassays may be performed to establish site – specific cleanup levels. The guidelines established in Early Seedling Growth Protocol for Soil Toxicity Screening (see Compendium – Section M), Earthworm Bioassay Protocol for Soil Toxicity Screening (see Compendium – Section N), and Protocols for Short Term Toxicity Screening of Hazardous Waste Sites (see Compendium – Section O) should be followed when performing bioassays.

Toxicity tests of soils contaminated with mixtures of contaminants (e.g., TPH) should follow the procedures listed in Protocols for Short Term Toxicity Screening of Hazardous Waste Sites (Greene et al., 1988) for earthworm (*Eisenia foetida*) survival, seed (*Lactuca sativa*) germination, and lettuce (*Lactuca sativa*) root elongation. Please consult with Ecology prior to performing bioassays.

Table 6.3: Simplified TEE Soil Screening Levels for Petroleum Products and Constituents[1]

Petroleum Products	Unrestricted Land Use	Industrial/Commercial Site[3]
Gasoline Range Organics	200 mg/kg	1,000 to 12,000 mg/kg[4]
Diesel Range Organics[2]	460 mg/kg	2,000 to 15,000 mg/kg[4]
PCB Mixtures[5]	2 mg/kg	2 mg/kg
Benzo(a)Pyrene	30 mg/kg	300 mg/kg

1 **Source:** WAC 173-340-900, Table 749-2
2 Diesel range organics includes the sum of diesel fuels and heavy oils measured using the NWTPH-Dx method. Mineral oils are essentially non-toxic to plants and animals and do not need to comply with these values.
3 Must have environmental covenant on property committing to commercial or industrial use.
4 Concentration at ground surface cannot exceed residual saturation. The lower end of the range shown is the default residual saturation concentration from Table 747-5. Where information can be provided demonstrating a higher site – specific residual saturation concentration, the screening level may go as high as the upper end of the range.
5 PCB's are included in this table because they can sometimes be a contaminant in petroleum mixtures, especially heavy oils and transformer fluids.

Table 6.4: Site-Specific TEE Soil Screening Levels for Petroleum Products and Constituents[1]

Petroleum Products	Plants	Soil Biota	Wildlife
Gasoline Range Organics	No value available	100 mg/kg	1,000 to 5,000 mg/kg[3]
Diesel Range Organics[2]	No value available	200 mg/kg	2,000 to 6,000 mg/kg[3]
PCB Mixtures[4]	40 mg/kg	No value available	0.65 mg/kg
Benzo(a)Pyrene	No value available	No value available	12 mg/kg

1 **Source:** WAC 173-340-900, Table 749-3
2 Diesel range organics includes the sum of diesel fuels and heavy oils measured using the NWTPH-Dx method. Mineral oils are essentially non-toxic to plants and animals and do not need to comply with these values.
3 Concentration at ground surface cannot exceed residual saturation. The lower end of the range shown is the default residual saturation concentration from Table 747-5. Where information can be provided demonstrating a higher site-specific residual saturation concentration, the screening level may go as high as the upper end of the range.
4 PCB's are included in this table because they can sometimes be a contaminant in petroleum mixtures, especially heavy oils and transformer fluids.

Table 6.5: Residual Saturation Screening Levels for TPH

Fuel	**Screening Level (mg/kg)**
Weathered Gasoline	1,000
Middle Distillates (e.g., Diesel No. 2 Fuel Oil)	2,000
Heavy Fuel Oils (e.g., No. 6 Fuel Oil)	2,000
Mineral Oil	4,000
Unknown Composition or Type	1,000

Note: The residual saturation screening levels for petroleum hydrocarbons specified in Table 747-5 (Table 6.4 of this document) are based on coarse sand and gravelly soils; however, they may be used for any soil type. Screening levels are based on the presumption that there are no preferential pathways for NAPL to flow downward to ground water. If such pathways exist, more stringent residual saturation screening levels need to be established.

Evaluation of Multiple Hazardous Substances

Adverse effects resulting from exposure to two or more hazardous substances with similar types of toxic response are assumed to be additive unless scientific evidence is available to demonstrate otherwise. As per MTCA (WAC 173-340-708 (5) …the health threats resulting from exposure to two or more hazardous substances with similar types of toxic response may be apportioned between those hazardous substances in any combination as long as the hazard index (HI) does not exceed (1). The HI is estimated using the hazard quotient (HQ) approach as described in Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (see Compendium – Section T).

Note: *Calculating cleanup levels for single hazardous substances or multiple hazardous substances with different types of toxic responses have been discussed in the earlier chapters (simplified or site-specific TEE).*

A quantitative screening-level risk can be estimated using the exposure estimates developed according to the HQ. The HQ approach compares point estimates of screening ecotoxicity values and exposure values. The HQ can be expressed as the ratio of a potential exposure level to the LOAEL.

$$HI = \frac{Dose}{LOAEL} \quad \text{or} \quad HI = \frac{EEC}{LOAEL}$$

HI = Hazard Index

Dose = Estimated contaminant intake at the site (e.g., mg contaminant/kg body weight per day)

EEC = Estimated Environmental Concentration at the site (e.g., mg contaminant/L water, mg contaminant/kg soil, mg contaminant/kg food)

LOAEL = Lowest Observed Adverse Effects Level (in units that match the dose or EEC)

When multiple contaminants of ecological concern exist at a site, it is appropriate to sum the HQs for receptors that could be simultaneously exposed to the contaminants that produce effects by the same toxic mechanism. The sum of the HQs is called a hazard index (HI). A HI less than one indicate that the group of contaminants is unlikely to cause adverse ecological effects.

$$HI = EEC_1/LOAEL_1 + EEC_2/LOAEL_2 + EEC_i/LOAEL_i$$

Or:

$$HI = HQ_1 + HQ_2 + HQ_i$$

HI	=	Hazard Index
HQ	=	Hazard Quotient
EEC	=	Estimated Environmental Concentration
LOAEL	=	Lowest Observed Adverse Effects Level

This risk calculation is a conservative estimate to ensure that the potential additive affects similar types of toxic contaminants could have on ecological receptors have been addressed. For more information on the use of the hazard quotient approach, see Compendium – Section T.

Using Bioassays to Evaluate the Toxicity of Complex Chemical Mixtures of Unknown Composition

A toxicity-based approach should be used to evaluate the toxicity of complex chemical mixtures of unknown composition in soil. For example, petroleum contamination is the most common type of hazardous substance encountered at contaminated sites in Washington State. However, if the person(s) responsible for the cleanup have chosen to develop cleanup levels other than those found in Tables 4.1 and 5.1 WAC 173-340 (MTCA Tables 749-2 and 749-3), the use of bioassays (specifically a toxicity-based approach) would be an appropriate method. In general, bioassays are a way to develop site-specific contaminant toxicity information.

Unlike toxicity tests with single compounds, which usually result in a regular progression in percent mortality or effect with increasing toxicant concentration, toxicity tests in soils with complex mixtures tend to yield all-or-nothing responses. Exposures to one or more of the higher sample concentrations (lower dilutions) result in 100% mortality of the test organisms, whereas exposures at lower concentrations (higher dilutions) all result in 100% survival. These results eliminate the use of some candidate methods for calculating the LC_{50} or EC_{50} at the recommended dilutions.

Earthworm Survival: The toxicity-based testing procedures for earthworm survival can be found in: A.8.5 EARTHWORM SURVIVAL (EISENIA FOETIDA) (Greene et al., 1988) (see Compendium – Section O). A dilution factor of 0.3 is commonly used which allows testing between 100% and 1% (100%, 30%, 10%, 3%, and 1%). Regression analysis may be used to approximate a final result (therefore eliminating some dilution factors); however, confirmation sampling at the approximation (dilution) is required. The effect measured during the toxicity tests is death. Data analysis indicating no significant difference from the control using applicable statistical procedures (e.g., T-Test at 0.05 α level) is required for the test to be considered a pass. A summary of recommended test conditions can be found in Table A-9 of the above document (Greene et al., 1988).

Lettuce Seed Germination: The toxicity-based testing procedures for lettuce seed germination can be found in A.8.6 LETTUCE SEED GERMINATION (LACTUCA SATIVA) (Greene et al., 1988) (see Compendium – Section O). A dilution factor of 0.3 is commonly used which allows testing between 100% and 1% (100%, 30%, 10%, 3%, and 1%). Regression analysis may be used to approximate a final result (therefore eliminating some dilution factors); however, confirmation sampling at the approximation (dilution) is required. The effect measured during the toxicity tests is germination. Data analysis indicating no significant difference from the control using applicable statistical procedures (e.g., T-Test at 0.05 α level) is required for the test to be considered a pass. A summary of recommended test conditions can be found in Table A-10 of the above document (Greene et al., 1988).

Lettuce Root Elongation: The toxicity-based testing procedures for lettuce rood elongation can be found in A.8.7 LETTUCE ROOT ELONGATION (LACTUCA SATIVA) (Greene et al., 1988) (see Compendium – Section O). A dilution factor of 0.3 is commonly used which allows testing between 100% and 1% (100%, 30%, 10%, 3%, and 1%). Regression analysis may be used to approximate a final result (therefore eliminating some dilution factors); however, confirmation sampling at the approximation (dilution) is required. The effect measured during the toxicity tests is percent inhibition of lettuce root elongation compared to controls. Data analysis indicating no significant difference from the control using applicable statistical procedures (e.g., T-Test at 0.05 α level) is required for the test to be considered a pass. A summary of recommended test conditions can be found in Table A-11 of the above document (Greene et al., 1988).

Results of the toxicity-based bioassay tests should be used in conjunction with other methods (e.g., Wildlife Exposure Modeling) to determine final concentrations of contaminants that are not expected to not have adverse effects on ecological receptors.

Using Literature Survey Data to Develop Ecological Indicator Soil Concentrations

The cleanup regulation defines methods to be used for establishing Ecological Indicator Soil Concentrations (EISC) from data obtained through a literature survey in Table 5.1 (MTCA Table 749-3 footnotes). These methods are used to calculate a value where none is provided in Table 5.1 (MTCA – Table 749-3) or where a chemical has not been listed in that table. They are also used to calculate substitute values for those provided in Table 5.1 (MTCA Table 749-3), using literature data shown to be more relevant to site – specific conditions.

Literature surveys must be objective, transparent, and thorough. The cleanup regulation sets standards for meeting this requirement (WAC 173-340-7493(4)). Submittals to Ecology that advocate a particular value without verification from data analysis and the literature review are not acceptable.

Where a value is not provided in Table 5.1 (MTCA Table 749-3), there is no assurance that a literature survey will locate the data needed to develop a value. If the search is unsuccessful, this should be reported together with a brief description of how the search was conducted. For example:

"To develop a Plant Ecological Indicator Soil Concentration for aldrin, a literature search was performed using Google Scholar (http://scholar.google.com/advanced_scholar_search?) and the search terms: (aldrin AND plant) AND (phytotoxic OR toxic). Approximately 1,160 citations were found (see enclosed CD). However, none of these publications provided LOEC data for plants grown in soil, and a plant Ecological Indicator Soil Concentration for aldrin could not be developed."

The following summarizes some details regarding the methods for using literature values to calculate Ecological Indicator Soil Concentrations. The calculated value may be replaced by the Washington State Natural background Concentration, if this value is higher (see Table 5.1 [MTCA Table 749-3] footnote g).

Plants: Use LOEC (lowest observed effect concentration) values from published plant toxicity data. Exclude data for plants grown in solution. Ecological Indicator Soil Concentration is the 10th percentile of the LOEC values. Other details can be found in Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision) (Efroymson et al., 1997) (see Compendium – Section P). The nonparametric 10th percentile is preferred over the judgmental method described in that publication. For a description of the nonparametric percentile calculation, see Statistical Guidance for Site Managers (Ecology, 1992) (see Compendium – Section U).

Soil Biota: Use LOEC (lowest observed effect concentration) values from published earthworm toxicity data. Ecological Indicator Soil Concentration is the 10th percentile of the LOEC values. Other details can be found in Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision (Efroymson et al., 1997) (see Compendium – Section Q). The nonparametric 10th percentile is preferred over the judgmental method described in that publication. For a description of the nonparametric percentile calculation, see Statistical Guidance for Site Managers (Ecology, 1992) (see Compendium – Section U).

For locations where earthworm are not naturally present, toxicity data for other soil invertebrates may be more relevant. Examples cited in Efroymson et al., 1997 include nematodes, collembolans, mites, isopods, and snails. Ground-feeding beetles (e.g., tenebrionids) are another possible example.

Wildlife: The wildlife Ecological Indicator Soil Concentration is the lowest of the values calculated that would provide protection for ecological receptors considered wildlife species. Representative species that were chosen are: small mammalian herbivore (vole), small mammalian predator (shrew), and ground feeding avian predator (robin). The values were calculated using the wildlife exposure model in Table 5.2 (MTCA Table 749-4). The model includes four variables whose values are chemical specific:

- K_{plant} (plant uptake factor) – used in calculations for small mammalian herbivores.
- BAF_{worm} (soil biota bioaccumulation factor) – used in calculations for small mammalian predators and ground feeding avian predators.
- $RGAF_{soil}$ (gut absorption factor for the chemical in ingested soil, expressed relative to the gut absorption factor for the chemical in food) – used in calculations for all three groups.
- TRV (toxicity reference value) – used in calculations for all three groups

For each of these variables, a literature survey can be used to develop wildlife Ecological Indicator Soil Concentrations for chemicals where none is provided in Table 5.1 (MTCA Table 749-3).

Plant uptake factor (K_{plant})

Requires multiple pair-wise data on chemical concentrations in soil and plant tissue from different locations. K_{plant} is calculated on a dry weight basis and is unitless but can be represented as $(mg/kg_{plant})/ (mg/kg_{soil})$. Data for plants likely to be used by small mammal ground feeding herbivores are preferable to other plants, such as trees. The cleanup regulation does not specify a method for calculating a value for this variable from literature data; however, values in Table 5.3 (MTCA Table 749-5) are the geometric means of chemical-specific uptake factors for forage grasses reported in USEPA (1992). The reported uptake slopes were converted from a kg/ha basis to mg/kg basis using the standard conversion (kg/ha) / 2 = mg/kg in soil.

Soil biota bioaccumulation factor (BAF_{worm})

Calculation of site-specific BAFs requires multiple pair-wise data on chemical concentrations in soil and earthworms from different locations. BAFs should be calculated on a dry weight basis. BAFs are unitless but can be represented as $(mg/kg_{worm})/ (mg/kg_{soil})$. The cleanup regulation does not specify a method for calculating a value for this variable from literature data. However, values in Table 5.3 (MTCA Table 749-5 are the arithmetic means of chemical-specific BAF values for reported in the literature.

This is the most suitable variable for making direct measurements at the site to calculate a site-specific wildlife Ecological Indicator Soil Concentration. Paired measurements of chemical concentrations in soil and earthworms from different locations could be used to calculate a BAF, or earthworms could be added to site soil samples under controlled laboratory testing conditions.

For locations where earthworms are not naturally present, BAF data for other soil invertebrates may be more relevant for calculating a site-specific BAF and wildlife Ecological Indicator Soil Concentration. Examples of other soil invertebrates include nematodes, collembolans, mites, isopods, snails or ground feeding beetles (e.g., tenebrionids). Data for these invertebrates might be obtained either from a literature survey of through sampling at the site.

Gut absorption factor ($RGAF_{soil}$)

Although chemical-specific toxicity benchmarks (LOAELs) are typically based on food ingestion and already reflect the degree of gut absorption, it is possible that absorption of the chemical from soil may be different than for food. If so, the $RGAF_{soil}$ value may be adjusted from the default value of 1 to a higher or lower value. For example, if bioavailability of the chemical in contaminated soil is only half that in contaminated food, $RGAF_{soil}$ could be set to 0.5. In practice, chemical – specific literature data for this variable are seldom available and direct site-specific measurements are rarely performed.

Toxicity reference value (T_{shrew}, T_{robin}, T_{vole})

Although the cleanup regulation specifies that the literature survey must be conducted in accordance with WAC 173-340-7493(4), it does not specify a method for using a literature values to calculate toxicity reference values. The recommended methods, used to calculate values for Table 4.1 (MTCA Table 749-2) and Table 5.1 (MTCA Table 749-3) are described in Sample et al. (1996). Some additional details are provided below:

- Although Sample et al. (1996) provide other additional benchmarks, only LOAELs based on food ingestion should be used.
- Candidate data for mammalian and avian LOAEL doses obtained from the literature survey should be succinctly summarized, as illustrated in Appendix [A] of Sample et al. (1996). Indicate which of the candidate values found in the literature was chosen and why.
- Toxicity reference values for the three surrogate species should be calculated with the allometric scaling equations used by Sample et al. (1996, section 3). Note that their avian scaling factor is 1, so an appropriate LOAEL dose from the literature for an avian species can be used for T_{robin} without further adjustments for body weight.

Specific Questions

Question 1: Is an evaluation required if the site is contaminated with a chemical that is not listed in Table 5.1 (MTCA Table 749-3)?

Answer: Yes. If the site meets the criteria for a site-specific TEE, the fact that a chemical is not included in Table 5.1 (MTCA Table 749-3) does not automatically mean that it can be dropped from consideration. This issue is addressed in the footnotes to Table 5.1 (MTCA Table 749-3). Even when insufficient information is available from the literature to calculate a safe soil concentration, if might still be appropriate to use an affects-based approach (e.g., bioassay) to conduct an evaluation of the contaminated soil.

Question 2: Can an ecological risk assessment be substituted for the requirements in MTCA Section 7493?

Answer: The procedures required under MTCA Section 7493 describe the required form of ecological risk assessment. They differ from older ecological risk assessments that were conducted at hazardous waste sites before regulatory policies have been established. In the absence of a regulatory framework, there was considerable flexibility for the risk assessor to make many decisions on subtle but important policy issues that could influence the outcome of the risk assessment. With the 1996 revisions to the cleanup regulation, the term "ecological evaluation" was introduced to distinguish ecological risk assessments conducted within the policy framework in MTCA Sections 7490 – 7494 from the older risk assessments that were previously conducted.

Question 3: Do I have to follow the TEE procedures at every site? What if it is a small area of contamination in the middle of an urban area?

Answer: Yes, the TEE procedures need to be followed at every site. It is very likely that a small area of contamination in the middle of an urban area would qualify for exclusion; however that exclusion still needs to be documented in the RI/FS. The TEE process includes multiple stages; the characterization, exclusion evaluation, applicability, the evaluation itself, cleanup actions and compliance monitoring. The specifics of the site are what determine how far (stages) into the TEE process must be investigated.

Question 4: Could the TEE procedures create an incentive to cause harm through the destruction of habitat?

Answer: If implemented correctly, the TEE procedures should not create an incentive to cause harm through the destruction of habitat. A cleanup action cannot be selected unless a determination is made that each of the minimum requirements in WAC 173-340-360(2) is met, including the requirements that the cleanup action protects the environment and uses permanent solutions to the maximum extent practicable. Determining whether a cleanup action is permanent to the maximum extent practicable further requires the use of a disproportionate cost analysis specified in WAC 173-340-360(3) (e). That analysis compares the costs and benefits of the cleanup action alternatives evaluated in the feasibility study.

One of the criteria that must be considered as part of the analysis is the overall protectiveness of the environment. Finally, as an additional safeguard, under WAC 173-340-7490(5), Ecology "may require additional measures to evaluate potential threats to terrestrial ecological receptors…, when based on a site-specific review, the department determines that such measures are necessary to protect the environment." Chapter one of this document includes a Net Environmental Benefit Analysis, the purpose of which is to evaluate the potential impact of cleanup on existing "especially valuable habitat."

Question 5: Should the TEE process determine contamination levels that provide protection for populations or individuals in terms of ecological receptors of concern?

Answer: Ecology has addressed the concept of population protection by defining "significant adverse effects" as "effects that impair reproduction, growth or survival" because these effects on individuals are generally considered to be relevant to the health of populations (e.g., EPA 1997 – see Compendium – Section T). Any of these effects is necessary and sufficient evidence of an adverse effect on the health of populations in a TEE, although some consideration for the scale of the effects is provided in the regulation (see e.g., 173-340-7491(1)(c), -7492(2) (a) (i), and -7492(2) (a) (ii)). Ecology believes that this approach meets the goals of providing a practical and objective basis for cleanup decisions, and this is consistent with the statutory mandate to ensure that site cleanups will restore a healthy environment.

Question 6: What constitutes "industrial property" and "commercial property" for the purposes of determining the categories of terrestrial ecological receptors that require protection?

Answer: For industrial and commercial properties, only wildlife (not soil biota or plants) must be protected from exposure to contaminated soil, except under certain circumstances identifies in WAC 173-340-7490(3) (b) (i-ii). Under those specified circumstances, not only must wildlife be protected, but soil biota and plants must also be protected. For the purposes of determining the categories of terrestrial ecological receptors that require protection, a definition of "industrial property" and "commercial property" have been included in this document (see Chapter 1 – Ecological Receptors based on Land Use). The underlying rationale of the categorical exemption focuses on "designated use" rather than "intensive use." The underlying rationale is that the properties that qualify for the exemption represent areas of land specifically designated for uses that may preclude growing plants and obviate the value of functions provided by soil biota. For example, land beneath an office building cannot be used to grow plants, and soil biota living beneath the building are assumed not to provide any benefits to plants or wildlife.

Question 7: Should agriculture or recreational land uses be considered categorically exempt, just as "industrial" and "commercial" properties, from the general requirement that not only wildlife, but also plants and soil biota must be protected from exposure to contaminated soil?

Answer: For any property that does not constitute an "industrial property" or "commercial property" as defined in WAC 173-340-7490(3) (c), all terrestrial ecological receptors must be protected from exposure to soil contamination (WAC 173-340-7490(3) (b)). The underlying rationale of the categorical exemption for "industrial" and "commercial" properties discussed in the previous response does not apply to properties with agricultural or recreational land uses.

Question 8: Should the standard point of compliance be established in the soils throughout the site from the ground surface to fifteen feet below the ground surface?

Answer: Unless a conditional point of compliance under WAC 173-340-7490(4) (a) is applicable, the requirement is the establishment of a standard point of compliance in the soils throughout the site from the ground surface to fifteen feet below the ground surface. WAC 173-340-7490(4) (b). Ecology believes fifteen feet "represents a reasonable estimate of the depth of sol that could be excavated and distributed at the soil surface as a result of site development activities, resulting in exposure by terrestrial ecological receptors." (WAC 173-340-7490(4) (b)). This determination reflects the determination that formed the basis for the point for compliance for soil cleanup levels based on human exposure through direct contact (WAC 173-340-740(6) (c).

Question 9: Where are the most appropriate locations depths to sample for conformational sampling (evaluation that the cleanup action is protective of ecological receptors)?

Answer: Conformational sampling should be done on a site specific basis. Under WAC 173-340-740(7) (b), it states that "Sampling and analytical procedures shall be defined in a compliance monitoring plan prepared under WAC 173-340-410. The sample design shall provide data that are representative of the area where exposure to hazardous substances may occur." There is potential for ecological receptors of concern to be exposed to hazardous substances at a variety of depths and locations. For example, soil biota (earthworm) feeds and inhabits a variety of depths. An avian predator (robin) feeds on soil biota, but is restricted to soil surface levels. Therefore, consultation with Ecology is recommended prior to submitting a compliance monitoring plan, so it can be verified and/or agreed upon that the confirmation locations/depths are representative to where exposure to hazardous substances might occur.

Question 10: If a hazardous substance listed in Table 4.1 (MTCA Table 749-2) does not have a value listed, what options are available?

Answer: Note that most sites are expected to be able to obtain an exclusion from conducting a simplified or site-specific TEE. Where the process cannot be ended by obtaining exclusion under WAC 173-340-7491, then the process includes the following options under the simplified TEE process in WAC 173-340-7492:

- The evaluation may be ended using the exposure analysis subsection
- The evaluation may be ended using the pathways analysis subsection
- The evaluation may be ended using the contaminants analysis subsection which requires a soil bioassay

Where the process cannot be ended under the simplified TEE process, the process includes the following options under the site-specific TEE process in WAC 173-340-7493:

- Using the concentrations specified in Table 5.1 (MTCA Table 749-3) as cleanup levels
- Ending the process or establishing cleanup levels using a site – specific TEE

Question 11: For contaminants without values for industrial or commercial sites in Table 4.1 (MTCA Table 749-2), may the values for unrestricted land use be substituted for the purposes of the contaminants analysis in WAC 173-340-7492(c) (i)?

Answer: Yes, for contaminants without values for industrial or commercial sites in Table 749-2, the values for unrestricted land use may be substituted for the purposes of the contaminants analysis in WAC 173-340-7492(2)(c)(i). However, note that the reverse is not true (i.e., the values specified in Table 749-2 for industrial and commercial sites cannot be substituted for the values for unrestricted land use).

Question 12: For contaminants with values in Table 749-2 or 749-3 that are below natural background levels, may the natural background levels be substituted for the purposes of the contaminants analysis in WAC 173-340-7492(2)(c) or for the purpose of establishing cleanup levels?

Answer: Yes, for contaminants with values in Table 749-2 or 749-3 that are below natural background levels, the natural background levels may be substituted for the purposes of the contaminants analysis in WAC 173-340-7492(2)(c), Table 4.1 (MTCA Table 749-2), or the purpose of establishing cleanup levels. Ecology attempted to insure that the values were below natural background levels. Note also that a site qualifies for exclusion under WAC 173-340-7491(1) (d) if "concentrations of hazardous substances in soil do not exceed natural background levels as determined under WAC 173-340-709." Furthermore, the regulation does not require the establishment of cleanup levels below natural background levels (see WAC 173-340-700(6)(d)).

Question 13: For independent remedial actions, must the elements in planning a site-specific terrestrial ecological evaluation identified in WAC 173-340-7493(1) (c) be conducted in consultation with and approved by Ecology?

Answer: Independent remedial actions do not require the elements in planning a TEE. However, if a consultation, approval, or determination is required from Ecology, then all applicable elements of a TEE are required. As provided in WAC 173-340-515(3) (b):

When this chapter requires a consultation with, or an approval or determination by the department, such a consultation, approval or determination is not necessary in order to conduct an independent remedial action. However, independent remedial actions must still meet the substantive requirements of this chapter.

Question 14: What is the purpose of the values specified in Table 5.1 (MTCA Table 749-3)? May the values be used as cleanup levels? What is the basis for those values?

Answer: The values for the hazardous substances listed in Table 5.1 (MTCA Table 749-3) are used to help narrow the focus of the site-specific TEE by identifying those substances that do not need to be addressed as part of that evaluation (see WAC 173-340-7493(2) (a) (i)). Note that the person conducting the evaluation may eliminate hazardous substances from further consideration where the maximum or the upper ninety-five percent confidence limit soil concentration found at the site does not exceed ecological indicator concentrations described in Table 5.1 (MTCA Table 749-3) (see WAC 173-340-7493(2)(a)(i)). Table 749-3 does not establish ecologically based cleanup levels. However, note that the values in Table 5.1 (MTCA Table 749-3) may be used for either a screening level or cleanup level to end the evaluation process at any stage in the process.

Ecological risk assessments typically include a step to narrow the focus of the assessment by eliminating from further consideration those site contaminants that do not exceed conservative risk based concentrations. If all of the site contaminants are eliminated, the risk assessment need not proceed any further. These reference concentrations are frequently described as "screening levels" or "benchmarks" (see Compendium – Section T). In ecological risk assessments conducted to date under MTCA, a variety of different generic "screening level" concentrations have been used by persons at different sites in the absence of guidance from Ecology. Consequently, a priority for Ecology in developing the rule amendments was to establish a consistent policy on the use of generic ecologically based soil concentrations that Ecology will accept as safe without further evaluation of terrestrial ecological risks.

Table 749-3 was developed for site at sites where a site-specific TEE is required or otherwise conducted. The values specified in the table are intended to be protective of terrestrial ecological receptors at any site. The values specified in Table 5.1 (MTCA Table 749-3) for conducting a site-specific evaluation were calculated based on a lower level of acceptable risk than the values specified in Table 4.1 (MTCA Table 749-2) for conducting a simplified evaluation. This is the baseline or default level of acceptable risk. A higher level of acceptable risk is allowed for conducting a simplified TEE.

The values specified in Table 5.1 (MTCA Table 749-3) were developed by Ecology in consultation with the MTCA Science Advisory Board Ecological Risk Subcommittee. Allowing for a lower level of risk, plant and soil biota values are based on the 10^{th} percentile (Q_{10}) of Lowest Observed Adverse Effect Concentrations (LOAECs) instead of the 50^{th} percentile (Q_{50}) used to calculate values in Table 4.1 (MTCA Table 749-2). Wildlife values are the lowest of three values calculated for different wildlife groups using standardized exposure assumptions and chemical-specific threshold reference values and uptake factors. The value for unrestricted land use is the lowest of the values specified for each of the three categories of terrestrial ecological receptors – plant, soil biota, and wildlife. The value for industrial and commercial land uses is the wildlife value.

Question 15: Should proposals for modifications to default values provided in WAC 173-340-7493 meet the requirements in WAC 173-340-702(14), (15) and (16) for new scientific information?

Answer: Yes. This requirement is consistent with the stated applicability of the referenced subsections (see Chapter 6: Specifics – The Requirements for Substitution of Screening Values).

References Cited

Butte Environmental Council. (2012). Dioxin Binding with Ah Receptor. Can be found at: www.becnet.org/sites/default/files/file-attachment/DioxinBindingWiththeAhReceptor.pdf

Deacon, S., A. Goddard, N. Eury, and J. Nicolette. (2010). Assessing Risks to Ecosystems and Using a Net Environmental Benefit Analysis Framework to Assist with Environmental Decision – Making. Found in; Restoration and Recovery: Regenerating Land and Communities. pg. 164 – 175.

Efroymson, R.A., J.P. Nicolette, and G.W. Suter II. (2003). A Framework for Net Environmental Benefit Analysis for Remediation or Restoration of Petroleum – Contaminated Sites. Prepared for U.S. Department of Energy, National Petroleum Technology Office.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. (1997). Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Prepared for the U.S. Department of Energy, Office of Environmental Management.

Efroymson, R.A., M.E. Will, and G.W. Suter II. (1997). Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Prepared for the U.S. Department of Energy, Office of Environmental Management.

Franklin, J.F., and C.T. Dyrness. (1973). Natural Vegetation of Oregon and Washington. USDA Forest Service General Technical Report PNW-8.

Greene, J.C., C.L. Bartels, W.J. Warren-Hicks, B.R. Parkhurst, G.L. Linder, S.A. Peterson and W.E. Miller. (1988). Protocols for Short Term Toxicity Screening of Hazardous Waste Sites. Developed for USEPA, EPA 600/3-88/029.

Gueguen M., Amiard, J.C., Arnich N., Badot, P.M., Claisse, D., Guerin, T., and J.P. Vernoux. (2011). Shellfish and Residual Chemical Contaminants: Hazards, Monitoring, and Health Risk Assessment along French Coasts. Rev Environ Contam Toxicol. 2011; 213: 55-111.

Helsel, D.R. (2006). Summing Nondetects: Incorporating Low-Level Contaminants in Risk Assessment. Integrated Environmental Assessment and Management. Volume 6, Number 3. Pp. 361-366.

Hitchcock, C.L., A. Cronquist, M. Ownbey, and J.W. Thompson. (1955 – 1969). Vascular Plants of the Pacific Northwest (5 Volumes). University of Washington Press, Seattle and London.

Sample, B.E., D.M. Opresko, and G.W. Suter II. (1996). Toxicological Benchmarks for Wildlife: 1996 Revision. Prepared for the U.S. Department of Energy, Office of Environmental Management.

Sholtz, T.G. and D.A. Flory. (1999). Clearing up the Confusion: Understanding Reporting Limits is Critical when Making Decisions Based on Laboratory Data. Environmental Protection Magazine. 10, 37-41.

Shepard, R.B. (2013). Extracting Correct Information from Censored Environmental Data. Applied Ecosystem Services, Inc.

Smith, D., E. Silver, and J. Harnly. (2006). Environmental Samples Below the Limits of Detection – Comparing Regression Methods to Predict Environmental Concentrations. California Department of Health Services. Environmental Health Investigations Branch.

USEPA (1992). Technical Support Document for Land Application of Sewage Sludge. Volume I-II. EPA 822/R-93-001.

USEPA (1986). Ecoregions of the Pacific Northwest. EPA/600/3-86/033. July, 1986.

USEPA (1997). Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. EPA 540-R-97-006. June 1997.

USEPA (2007). Method 8290A: Polychorinated Dibenzo-*p*-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromotography/High-Resolution Mass Spectrometry (HRGC/HRMS). Revision 1. No Publication Number.

USEPA (2008). Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment. EPA 100/R-08/004.

USEPA (2011a). USEPA Contract Laboratory Program (CLP): National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review. EPA-540-R-11-016.

USEPA (2011b). Uniform Federal Policy Quality Assurance Project Plan for Soils Assessment of Dioxin Sites. No Publication Number.

USEPA (2011c). Uniform Federal Policy Quality Assurance Project Plan Template for Soils Assessment of Dioxin Sites. No Publication Number.

US F&WS (2012). Species Reports. Environmental Conservation Online System. Listings and Occurrences for Washington. http://www.fws.gov

Van den Berg, M., Birnbaum, L., Bosveld, A., Brunstrom, B., Cook, P., Feeley, M., Giesy, J.P., Hanberg, A., Hasegawa, R., Kennedy, S.W., Kubiak, T., Larsen, J.C., Leeuwen, F.X., Djien Liem, A.K., Nolt, C., Peterson, R.E., Poellinger, L., Safe, S., Schrenk, D., Tillitt, D., Tysklind, M., Younes, M., Waern, F., and T. Zacharweski. (1998). Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife. Environmental Health Perspectives. Volume 106, Number 12, December 1998.

Van den Berg, M., Birnbaum, L., Denison, M., De Vito, M., Farland, W., Feeley, M., Fielder, H., Hakansson, H., Hanberg, A., Haws, L., Rose, M., Safe, S., Schrenk, D., Tohyama, C., Tritscher, A., Tuomisto, J., Tysklind, M., Walker, N., and R. Peterson. (2006). The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds. Toxicological Sciences 93(2), 223-241.

Washington State Department of Ecology. (1992). Statistical Guidance for Ecology Site Managers. Publication No. 92-54.

Washington State Department of Ecology (1995). Sediment Management Standards. Publication No. 96-252.

Washington State Department of Ecology. (1995a). *Guidance on Sampling and Data Analysis Methods*. Publication No. 94-49.

Washington State Department of Ecology. Voluntary Cleanup Program Site Manager TEE Form found in: Integrated Site Information System.

Washington State Department of Ecology. (1996). Early Seedling Growth Protocol for Soil Toxicity Screening. Publication No. 96-324.

Washington State Department of Ecology. (1996). Earthworm Bioassay Protocol for Soil Toxicity Screening. Publication No. 96-327.

Washington State Department of Ecology. (2001). Concise Explanatory Statement for the Amendments to the Model Toxics Control Act Cleanup Regulation, Chapter 173-340 WAC. Pub. No. 01-09-043.

Washington State Department of Ecology. (2007a). Model Toxics Control Act Statute and Regulation. Publication No. 94-06.

Washington State Department of Ecology. (2007b). Background Document for the Proposed Amendments to the Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC. Publication No. 07-09-050.

Washington State Department of Ecology. (2007c). Concise Explanatory Statement and Responsiveness Summary for the Amendment of Chapter 173-340 WAC, *Model Toxics Control Act Cleanup Regulation*. Publication No. 07-09-108.

Washington State Department of Ecology (2009). Voluntary Cleanup Program Consultant Terrestrial Ecological Evaluation Form. Publication No. 090-300.

Washington State Department of Ecology. (2010). Technical Memorandum #8: Natural Background for Dioxins/Furans in WA Soils. Publication No. 10-09-053.

Washington State Department of Ecology. (2011). Guidance for Remediation of Petroleum Contaminated Sites. Publication No. 10-09-057.

Washington State Department of Ecology. (2012). Memorandum to File: Establishing Practical Quantitation Limits (PQL) for Dioxin Mixtures, where Calculated Cleanup Levels and Background Concentrations are Below Quantifiable Levels. No Pub. No.

Washington State Department of Ecology. (2013a). Memorandum to Dave Bradley – *Dioxin/Furan/PCB (Laboratory Analysis and Non-Detected Values)*. No Publication No.

Washington State Department of Ecology. (2013b). Draft Sediment Cleanup Users Manual II. Pub. No. 12-09-057.

Washington State Department of Fish and Wildlife (2012). Washington State Species of Concern Lists. Species of Concern in Washington State. http://wdfw.wa.gov/conservation/endangered/All/

Washington State Department of Natural Resources (2010). Washington Natural Heritage information System List of Known Occurrences of Rare Plants in Washington, November 2010. http://www1dnr.wa.gov/nhp/refdesk/lists/plantsxco/

Washington State Legislature (2012). RCW 36.70A.170 Natural resource lands and critical areas – Designations. http://apps.leg.wa.gov/rcw/default.aspx?cite=36.70A.170

Appendix A: Hyperlink Page

Reference/Resource	**Section**
Model Toxics Control Act – WAC 173-340: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-340	**A**
Sediment Management Standards – WAC 173-204: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-204	**B**
Current Rule Making Activity can be found at: https://www.ecy.wa.gov/Spills-Cleanup/Contamination-cleanup/Rules-directing-our-cleanup-work/Model-Toxics-Control-Act	
Voluntary Cleanup Program Site Manager TEE Form: https://www.ecy.wa.gov/Spills-Cleanup/Contamination-cleanup/Cleanup-process/Cleanup-options/Voluntary-cleanup-program	**C**
Voluntary Cleanup Program Consultant TEE Form: https://www.ecy.wa.gov/Spills-Cleanup/Contamination-cleanup/Cleanup-process/Cleanup-options/Voluntary-cleanup-program	**D**
Federal Endangered Species Act: http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902	**E**
Washington State Species of Concern – Title 77 RCW: http://wdfw.wa.gov/conservation/endangered/	**F**
County List of Rare Plants – Title 79 RCW: https://www.dnr.wa.gov/NHPlists	**G**
Natural Resource Lands and Critical Areas – RCW 36.70A.170: http://apps.leg.wa.gov/rcw/default.aspx?cite=36.70A.170	**H**
A Framework for Net Environmental Benefit Analysis for Remediation or Restoration of Petroleum – Contaminated Sites: http://esanalysis.colmex.mx/Sorted%20Papers/2004/2004%20USA%20-3F%20Interd%203.pdf	**I**
Restoration and Recovery: Regenerating Land and Communities: http://www.api.org/~/media/Files/EHS/Clean_Water/Oil_Spill_Prevention/NEBA/NEBA-Net-Environmental-Benefit-Analysis-July-2013.pdf	**J**

Vascular Plants of the Pacific Northwest: **K**
http://www.jstor.org/discover/10.2307/1217932?uid=3739960&uid=2&uid=4&uid=3739256&sid=47699053777847

Natural Vegetation of Oregon and Washington: **L**
http://www.treesearch.fs.fed.us/pubs/26203

Early Seedling Growth Protocol for Soil Toxicity Screening: **M**
https://fortress.wa.gov/ecy/publications/summarypages/96324.html

Earthworm Bioassay Protocol for Soil Toxicity Screening: **N**
https://fortress.wa.gov/ecy/publications/summarypages/96327.html

Protocols for Short Term Toxicity Screening of Hazardous Waste Sites: **O**
http://nepis.epa.gov/Exe/ZyNET.exe/2000HUXX.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1986+Thru+1990&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C86thru90%5CTxt%5C00000007%5C2000HUXX.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p%7Cf&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL

Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision: **P**
http://rais.ornl.gov/documents/tm85r3.pdf

Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision: **Q**
http://rais.ornl.gov/documents/tm126r21.pdf

Toxicological Benchmarks for Wildlife: 1996 Revision: **R**
http://rais.ornl.gov/documents/tm86r3.pdf

Ecoregions of the Pacific Northwest: **S**
http://nepis.epa.gov/Exe/ZyNET.exe/2000IAS8.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1986+Thru+1990&Docs=&Query=FNAME%3D2000IAS8.TXT%20or%20(%20ecoregions%20or%20the%20or%20pacific%20or%20northwest)&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&UseQField=&IntQFieldOp=1&ExtQFieldOp=1&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C86thru90%5CTxt%5C00000007%5C2000IAS8.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=10&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p%7Cf&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL

Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments: **T**

https://www.epa.gov/risk/ecological-risk-assessment-guidance-superfund-process-designing-and-conducting-ecological-risk

Statistical Guidance for Site Managers: **U**
https://fortress.wa.gov/ecy/publications/summarypages/9254.html

Guidance for Remediation of Petroleum Contaminated Sites: **V**
https://fortress.wa.gov/ecy/publications/summarypages/1009057.html

Voluntary Cleanup Program

Washington State Department of Ecology
Toxics Cleanup Program

TERRESTRIAL ECOLOGICAL EVALUATION FORM

Under the Model Toxics Control Act (MTCA), a terrestrial ecological evaluation is necessary if hazardous substances are released into the soils at a Site. In the event of such a release, you must take one of the following three actions as part of your investigation and cleanup of the Site:

1. Document an exclusion from further evaluation using the criteria in WAC 173-340-7491.
2. Conduct a simplified evaluation as set forth in WAC 173-340-7492.
3. Conduct a site-specific evaluation as set forth in WAC 173-340-7493.

When requesting a written opinion under the Voluntary Cleanup Program (VCP), you must complete this form and submit it to the Department of Ecology (Ecology). The form documents the type and results of your evaluation.

Completion of this form is not sufficient to document your evaluation. You still need to document your analysis and the basis for your conclusion in your cleanup plan or report.

If you have questions about how to conduct a terrestrial ecological evaluation, please contact the Ecology site manager assigned to your Site. For additional guidance, please refer to https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Terrestrial-ecological-evaluation.

Step 1: IDENTIFY HAZARDOUS WASTE SITE	
Please identify below the hazardous waste site for which you are documenting an evaluation.	
Facility/Site Name:	
Facility/Site Address:	
Facility/Site No:	VCP Project No.:

Step 2: IDENTIFY EVALUATOR		
Please identify below the person who conducted the evaluation and their contact information.		
Name:		Title:
Organization:		
Mailing address:		
City:	State:	Zip code:
Phone:	Fax:	E-mail:

Step 3: DOCUMENT EVALUATION TYPE AND RESULTS

A. Exclusion from further evaluation.

1. Does the Site qualify for an exclusion from further evaluation?

☐ Yes — *If you answered **"YES,"** then answer **Question 2**.*

☐ No or Unknown — *If you answered **"NO" or "UNKNOWN,"** then skip to **Step 3B** of this form.*

2. What is the basis for the exclusion? *Check all that apply. Then skip to **Step 4** of this form.*

Point of Compliance: WAC 173-340-7491(1)(a)

☐ All soil contamination is, or will be,* at least 15 feet below the surface.

☐ All soil contamination is, or will be,* at least 6 feet below the surface (or alternative depth if approved by Ecology), and institutional controls are used to manage remaining contamination.

Barriers to Exposure: WAC 173-340-7491(1)(b)

☐ All contaminated soil, is or will be,* covered by physical barriers (such as buildings or paved roads) that prevent exposure to plants and wildlife, and institutional controls are used to manage remaining contamination.

Undeveloped Land: WAC 173-340-7491(1)(c)

☐ There is less than 0.25 acres of contiguous# undeveloped± land on or within 500 feet of any area of the Site and any of the following chemicals is present: chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene.

☐ For sites not containing any of the chemicals mentioned above, there is less than 1.5 acres of contiguous# undeveloped± land on or within 500 feet of any area of the Site.

Background Concentrations: WAC 173-340-7491(1)(d)

☐ Concentrations of hazardous substances in soil do not exceed natural background levels as described in WAC 173-340-200 and 173-340-709.

* An exclusion based on future land use must have a completion date for future development that is acceptable to Ecology.

± "Undeveloped land" is land that is not covered by building, roads, paved areas, or other barriers that would prevent wildlife from feeding on plants, earthworms, insects, or other food in or on the soil.

\# "Contiguous" undeveloped land is an area of undeveloped land that is not divided into smaller areas of highways, extensive paving, or similar structures that are likely to reduce the potential use of the overall area by wildlife.

B. Simplified evaluation.

1. Does the Site qualify for a simplified evaluation?

☐ Yes — *If you answered **"YES,"** then answer **Question 2** below.*

☐ No or Unknown — *If you answered **"NO"** or **"UNKNOWN,"** then skip to **Step 3C** of this form.*

2. Did you conduct a simplified evaluation?

☐ Yes — *If you answered **"YES,"** then answer **Question 3** below.*

☐ No — *If you answered **"NO,"** then skip to **Step 3C** of this form.*

3. Was further evaluation necessary?

☐ Yes — *If you answered **"YES,"** then answer **Question 4** below.*

☐ No — *If you answered **"NO,"** then answer **Question 5** below.*

4. If further evaluation was necessary, what did you do?

☐ Used the concentrations listed in Table 749-2 as cleanup levels. *If so, then skip to **Step 4** of this form.*

☐ Conducted a site-specific evaluation. *If so, then skip to **Step 3C** of this form.*

5. If no further evaluation was necessary, what was the reason? *Check all that apply. Then skip to **Step 4** of this form.*

Exposure Analysis: WAC 173-340-7492(2)(a)

☐ Area of soil contamination at the Site is not more than 350 square feet.

☐ Current or planned land use makes wildlife exposure unlikely. Used Table 749-1.

Pathway Analysis: WAC 173-340-7492(2)(b)

☐ No potential exposure pathways from soil contamination to ecological receptors.

Contaminant Analysis: WAC 173-340-7492(2)(c)

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations that exceed the values listed in Table 749-2.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations that exceed the values listed in Table 749-2, and institutional controls are used to manage remaining contamination.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays, and institutional controls are used to manage remaining contamination.

C. Site-specific evaluation. A site-specific evaluation process consists of two parts: (1) formulating the problem, and (2) selecting the methods for addressing the identified problem. Both steps require consultation with and approval by Ecology. *See* WAC 173-340-7493(1)(c).

1. Was there a problem? *See* WAC 173-340-7493(2).

☐ Yes — *If you answered **"YES,"** then answer **Question 2** below.*

☐ No — *If you answered **"NO,"** then identify the reason here and then skip to **Question 5** below:*

- ☐ No issues were identified during the problem formulation step.
- ☐ While issues were identified, those issues were addressed by the cleanup actions for protecting human health.

2. What did you do to resolve the problem? *See* WAC 173-340-7493(3).

☐ Used the concentrations listed in Table 749-3 as cleanup levels. *If so, then skip to **Question 5** below.*

☐ Used one or more of the methods listed in WAC 173-340-7493(3) to evaluate and address the identified problem. *If so, then answer **Questions 3 and 4** below.*

3. If you conducted further site-specific evaluations, what methods did you use?
Check all that apply. See WAC 173-340-7493(3).

☐ Literature surveys.

☐ Soil bioassays.

☐ Wildlife exposure model.

☐ Biomarkers.

☐ Site-specific field studies.

☐ Weight of evidence.

☐ Other methods approved by Ecology. If so, please specify:

4. What was the result of those evaluations?

☐ Confirmed there was no problem.

☐ Confirmed there was a problem and established site-specific cleanup levels.

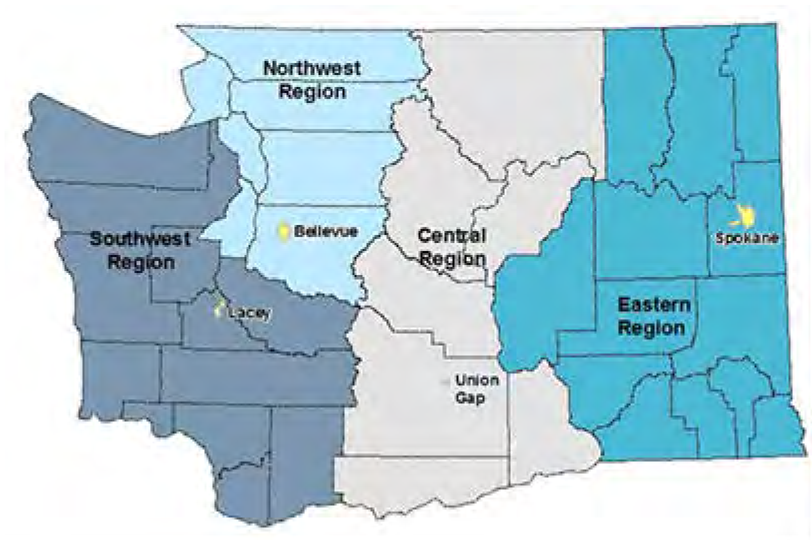
5. Have you already obtained Ecology's approval of both your problem formulation and problem resolution steps?

☐ Yes — If so, please identify the Ecology staff who approved those steps:

☐ No

Step 4: SUBMITTAL

Please mail your completed form to the Ecology site manager assigned to your Site. If a site manager has not yet been assigned, please mail your completed form to the Ecology regional office for the County in which your Site is located.



Northwest Region:	Central Region:
Attn: VCP Coordinator 3190 160th Ave. SE Bellevue, WA 98008-5452	Attn: VCP Coordinator 1250 West Alder St. Union Gap, WA 98903-0009
Southwest Region:	**Eastern Region:**
Attn: VCP Coordinator P.O. Box 47775 Olympia, WA 98504-7775	Attn: VCP Coordinator N. 4601 Monroe Spokane WA 99205-1295

Voluntary Cleanup Program

Washington State Department of Ecology
Toxics Cleanup Program

TERRESTRIAL ECOLOGICAL EVALUATION FORM

Under the Model Toxics Control Act (MTCA), a terrestrial ecological evaluation is necessary if hazardous substances are released into the soils at a Site. In the event of such a release, you must take one of the following three actions as part of your investigation and cleanup of the Site:

1. Document an exclusion from further evaluation using the criteria in WAC 173-340-7491.
2. Conduct a simplified evaluation as set forth in WAC 173-340-7492.
3. Conduct a site-specific evaluation as set forth in WAC 173-340-7493.

When requesting a written opinion under the Voluntary Cleanup Program (VCP), you must complete this form and submit it to the Department of Ecology (Ecology). The form documents the type and results of your evaluation.

Completion of this form is not sufficient to document your evaluation. You still need to document your analysis and the basis for your conclusion in your cleanup plan or report.

If you have questions about how to conduct a terrestrial ecological evaluation, please contact the Ecology site manager assigned to your Site. For additional guidance, please refer to https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Terrestrial-ecological-evaluation.

Step 1: IDENTIFY HAZARDOUS WASTE SITE	
Please identify below the hazardous waste site for which you are documenting an evaluation.	
Facility/Site Name: Glacier Park East	
Facility/Site Address: NEof the intersection of U.S. Hwy 2 and Chumstick Highway, Leavenworth, WA	
Facility/Site No: 349	VCP Project No.: NA

Step 2: IDENTIFY EVALUATOR		
Please identify below the person who conducted the evaluation and their contact information.		
Name: Keith Woodburne		Title: Principal Geologist
Organization: TRC		
Mailing address: 1180 NW Maple Street, Suite 310		
City: Issaquah	State: WA	Zip code: 98027
Phone: 425-395-0010	Fax:	E-mail: kwoodburne@trccompanies.com

Step 3: DOCUMENT EVALUATION TYPE AND RESULTS

A. Exclusion from further evaluation.

1. Does the Site qualify for an exclusion from further evaluation?

☒ Yes — *If you answered **"YES,"** then answer **Question 2**.*

☐ No or Unknown — *If you answered **"NO" or "UNKNOWN,"** then skip to **Step 3B** of this form.*

2. What is the basis for the exclusion? *Check all that apply. Then skip to **Step 4** of this form.*

Point of Compliance: WAC 173-340-7491(1)(a)

☐ All soil contamination is, or will be,* at least 15 feet below the surface.

☐ All soil contamination is, or will be,* at least 6 feet below the surface (or alternative depth if approved by Ecology), and institutional controls are used to manage remaining contamination.

Barriers to Exposure: WAC 173-340-7491(1)(b)

☐ All contaminated soil, is or will be,* covered by physical barriers (such as buildings or paved roads) that prevent exposure to plants and wildlife, and institutional controls are used to manage remaining contamination.

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☒ There is less than 0.25 acres of contiguous# undeveloped± land on or within 500 feet of any area of the Site and any of the following chemicals is present: chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene.

☐ For sites not containing any of the chemicals mentioned above, there is less than 1.5 acres of contiguous# undeveloped± land on or within 500 feet of any area of the Site.

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☐ Concentrations of hazardous substances in soil do not exceed natural background levels as described in WAC 173-340-200 and 173-340-709.

* An exclusion based on future land use must have a completion date for future development that is acceptable to Ecology.

± "Undeveloped land" is land that is not covered by building, roads, paved areas, or other barriers that would prevent wildlife from feeding on plants, earthworms, insects, or other food in or on the soil.

\# "Contiguous" undeveloped land is an area of undeveloped land that is not divided into smaller areas of highways, extensive paving, or similar structures that are likely to reduce the potential use of the overall area by wildlife.

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☐ No or Unknown — *If you answered **"NO"** or **"UNKNOWN,"** then skip to **Step 3C** of this form.*

2. Did you conduct a simplified evaluation?

☐ Yes — *If you answered **"YES,"** then answer **Question 3** below.*

☐ No — *If you answered **"NO,"** then skip to **Step 3C** of this form.*

3. Was further evaluation necessary?

☐ Yes — *If you answered **"YES,"** then answer **Question 4** below.*

☐ No — *If you answered **"NO,"** then answer **Question 5** below.*

4. If further evaluation was necessary, what did you do?

☐ Used the concentrations listed in Table 749-2 as cleanup levels. *If so, then skip to **Step 4** of this form.*

☐ Conducted a site-specific evaluation. *If so, then skip to **Step 3C** of this form.*

5. If no further evaluation was necessary, what was the reason? *Check all that apply. Then skip to **Step 4** of this form.*

Exposure Analysis: WAC 173-340-7492(2)(a)

☐ Area of soil contamination at the Site is not more than 350 square feet.

☐ Current or planned land use makes wildlife exposure unlikely. Used Table 749-1.

Pathway Analysis: WAC 173-340-7492(2)(b)

☐ No potential exposure pathways from soil contamination to ecological receptors.

Contaminant Analysis: WAC 173-340-7492(2)(c)

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations that exceed the values listed in Table 749-2.

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- ☐ No issues were identified during the problem formulation step.
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☐ Used the concentrations listed in Table 749-3 as cleanup levels. *If so, then skip to **Question 5** below.*

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Check all that apply. See WAC 173-340-7493(3).

☐ Literature surveys.

☐ Soil bioassays.

☐ Wildlife exposure model.

☐ Biomarkers.

☐ Site-specific field studies.

☐ Weight of evidence.

☐ Other methods approved by Ecology. If so, please specify:

4. What was the result of those evaluations?

☐ Confirmed there was no problem.

☐ Confirmed there was a problem and established site-specific cleanup levels.

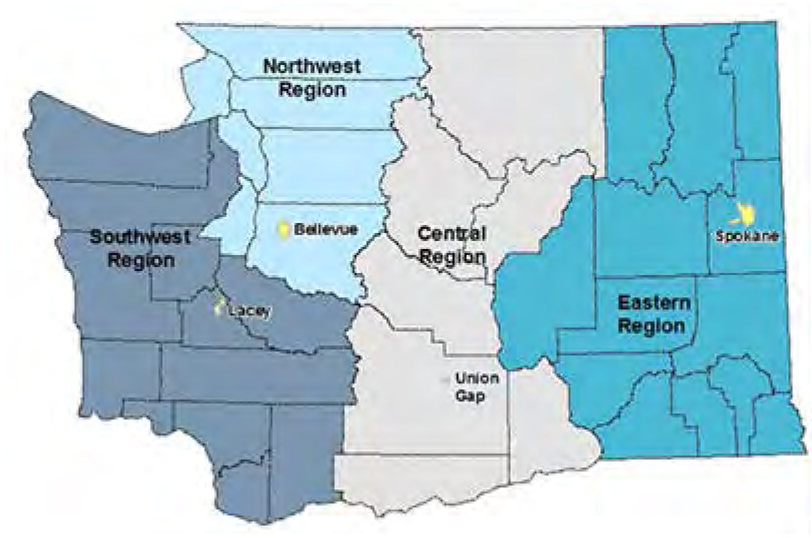
5. Have you already obtained Ecology's approval of both your problem formulation and problem resolution steps?

☐ Yes — If so, please identify the Ecology staff who approved those steps:

☐ No

Step 4: SUBMITTAL

Please mail your completed form to the Ecology site manager assigned to your Site. If a site manager has not yet been assigned, please mail your completed form to the Ecology regional office for the County in which your Site is located.



Northwest Region:	Central Region:
Attn: VCP Coordinator 3190 160th Ave. SE Bellevue, WA 98008-5452	Attn: VCP Coordinator 1250 West Alder St. Union Gap, WA 98903-0009
Southwest Region: Attn: VCP Coordinator P.O. Box 47775 Olympia, WA 98504-7775	**Eastern Region:** Attn: VCP Coordinator N. 4601 Monroe Spokane WA 99205-1295

If you need this publication in an alternate format, please call the Toxics Cleanup Program at 360-407-7170. People with hearing loss can call 711 for Washington Relay Service. People with a speech disability can call 877-833-6341.

Attachment B
Summary Tables of Historical Soil and Groundwater Data

DRAFT

TABLE 1
SUMMARY OF SOIL
PHYSICAL TESTING RESULTS[1]
GLACIER PARK EAST

Sample Designation	Date Sampled	Sample Depth (Feet Below Ground Surface)	Soil Classification[3]	Moisture Content	Grain Size Analysis[2]					
					Percent Gravel	Percent Sand				Percent Fines
						Fine Grain	Medium Grain	Coarse Grain	Total Sand	
RE1-18	11/20/95	18	Silty Sand	20%	1.24%	40.21%	6.84%	2.59%	49.55%	49.21%
RE4-7	11/20/95	7	Silty Sand	15%	1.83%	26.44%	34.44%	2.40%	63.28%	34.89%
RE9-8	11/20/95	8	Sand with Silt	10%	13.26%	19.78%	33.03%	23.09%	76.04%	10.70%

Notes:

[1]Samples were analyzed by GeoEngineers, Inc.

[2]Conducted in accordance with American Society for Testing and Materials (ASTM) D2487-90.

[3]Soil classification based on ASTM D2487-90.

DRAFT

TABLE 2
SUMMARY OF
GROUND WATER ELEVATIONS
GLACIER PARK EAST

Well Designation	Top of Monument Elevation[1]	Date	Depth to Water[2]	Ground Water Elevation[1]
HC-2[3]	92.14	11/17/95	62.62	29.52
		04/18/96	60.16	31.98
		08/15/96	61.84	30.30
		11/03/96	63.93	28.21
MW-1	91.19	11/17/95	55.35	35.84
		04/18/96	53.35	37.84
		08/15/96	52.47	38.72
		11/03/96	53.62	37.57
MW-2	92.13	11/17/95	60.34	31.79
		04/18/96	54.76	37.37
		08/15/96	51.92	40.21
		11/03/96	53.30	38.83

Notes:

[1]Elevations are given in feet and are referenced to assumed site datum of 100 feet on manhole cover located in eastern portion of the site.

[2]Depth (in feet) to water is measured from top of polyvinyl chloride well casing.

[3]HC-2 installed by Hart Crowser in 1990.

DRAFT

TABLE 4
SUMMARY OF SOIL CHEMICAL ANALYTICAL DATA[1]
TEST PITS
GLACIER PARK EAST

Sample Number[2]	Date Sampled	Depth of Sample (feet)	Total Petroleum Hydrocarbons WTPH-G[3] (mg/kg)	WTPH-D[4] (mg/kg)
RE1-4S	10/23/95	4	10 U	20 U
RE1-7N	10/23/95	7	10 U	20 U
RE1-8E	10/23/95	8	10 U	20 U
RE1-11E	10/23/95	11	10 U (10 U)	20 U (20 U)
RE1-14W	10/23/95	14	10 U	20 U
RE1-14W2	10/23/95	14	10 U (10 U)	20 U (20 U)
RE1-18W	10/23/95	18	10 U	20 U
RE2-11.5S	10/23/95	11.5	10 U	20 U
RE2-17S	10/23/95	17	10 U	20 U
RE2-21S	10/23/95	21	10 U	20 U
RE3-5N	10/24/95	5	10 U	20 U
RE3-7W	10/24/95	7	610	8,350
RE3-10W	10/24/95	10	471	5,820
RE3-14W	10/24/95	14	10 U	20 U
RE3-16W	10/24/95	16	10 U	20 U
RE4-4N	10/24/95	4	2,270	6,460
RE4-10N	10/24/95	10	10 U	20 U
RE4-18N	10/24/95	18	10 U	20 U
RE5-4N	10/24/95	4	10 U (10 U)	196 (208)
RE5-7N	10/24/95	7	1,250	2,190
RE5-10N	10/24/95	10	28	82
RE5-15.5N	10/24/95	15.5	550	998
RE5-17.5W	10/24/95	17.5	10 U	20 U
RE5-20N	10/25/95	20	219	662
RE6-4E	10/24/95	4	10 U	83
RE6-8N	10/24/95	8	1,770	3,260
RE6-15S	10/24/95	15	1,170	3,200
RE7-4N	10/26/95	4	10 U	20 U
RE7-8W	10/24/95	8	10 U (10 U)	20 U (20 U)
RE7-12N	10/24/95	12	10 U	20 U
RE7-15N	10/24/95	15	10 U	20 U

Notes appear on page 2 of 2.

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TABLE 4 Page 2 of 2

Sample Number[2]	Date Sampled	Depth of Sample (feet)	Total Petroleum Hydrocarbons WTPH-G[2] (mg/kg)	Total Petroleum Hydrocarbons WTPH-D[3] (mg/kg)
RE8-4N	10/26/95	4	10 U	20 U
RE8-8N	10/24/95	8	3,070 (2,810)	4,020 (3,590)
RE8-12N	10/24/95	12	1,140	1,600
RE8-18N	10/25/95	18	10 U	20 U
RE9-5E	10/25/95	5	10 U	20 U
RE9-8E	10/25/95	8	757	412
RE9-16.5S	10/25/95	16.5	10 U	20 U
RE9-20E	10/25/95	20	10 U	20 U
RE10-4E	10/25/95	4	10 U	32
RE10-9S	10/25/95	9	2,330	2,700
RE10-13.5N	10/26/95	13.5	147	539
RE10-17W	10/25/95	17	67 (59)	364 (318)
RE10-18.5N	10/25/95	18.5	63	358
RE10-20E	10/25/95	20	10 U	114
RE10-22W	10/25/95	22	10 U (10 U)	20 U (20 U)
RE11-1.5E	10/25/95	1.5	10 U	121
RE11-4N	10/25/95	4	811	5,530
RE11-10W	10/25/95	10	2,190	4,930
RE11-18E	10/25/95	18	10 U	65
RE11-20W	10/25/95	20	10 U	20 U
RE12-1.5E	10/26/95	1.5	10 U	20 U
RE12-4N	10/26/95	4	467	3,400
RE12-8W	10/26/95	8	10 U (10 U)	112 (115)
RE12-11.5N	10/26/95	11.5	1,230	1,590
RE12-17.5W	10/25/95	17.5	829	3,390
RE12-21E	10/25/95	21	108	670
RE12-24N	10/25/95	24	10 U (10 U)	20 U (20 U)

Notes:

[1]Chemical analysis conducted by Transglobal Environmental Geosciences, Northwest. Laboratory reports are presented in Appendix B.

[2]Sample number indicates sample location (RE1 through RE12), sample depth (1 to 24 feet below ground surface), and relative lateral location (North [N], South [S], East [E], or West [W]) of the sample.

[2]Washington State Department of Ecology methodology for gasoline-range hydrocarbons.

[3]Washington State Department of Ecology methodology for diesel-range hydrocarbons.

U = Indicates analyte was not detected at the specified detection limit.

Duplicate analytical results are presented in parenthesis.

mg/kg = milligrams per kilogram

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TABLE 5
SUMMARY OF NUTRIENT AND MICROBIAL CONTENT[1]
CHEMICAL ANALYTICAL DATA
GLACIER PARK EAST

Sample Number	Date Sampled	Moisture Content (percent)	Laboratory Analysis (mg/kg)							
			Ammonia (EPA 350.3)	Nitrate (EPA 300)	Soluble Reactive Phosphorus (EPA 300)	Total Kjeldahl Nitrogen (EPA 351.1)	Total Organic Carbon (EPA Method 9060) (Modified)	Microbial Content (CFU/g sample)[2]		
								Total Heterotrophs	Degraders	
									Gasoline	Diesel
RE1-18	11/03/95	NA	NA	NA	NA	NA	560	2.8+/-9.7	4.3+/-1.0	3.4+/-0.98
	11/20/95	20	2.0 U	1.0 U	1.0 U	100 U	450	NA	NA	NA
RE4-7	11/03/95	NA	NA	NA	NA	NA	470	33+/-6.4	16+/-2.6	2.8+/-1.4
	11/20/95	15	2.0 U	1.0 U	1.0 U	100 U	640	NA	NA	NA
RE9-8	11/03/95	NA	NA	NA	NA	NA	950	27+/-2.9	13+/-2.2	2.7+/- 1.0
	11/20/95	10	2.0 U	1.1	1.0 U	100 U	890	NA	NA	NA

Notes:

[1]Chemical analysis conducted by North Creek Analytical, Inc and RETEC. Laboratory reports are presented in Appendix B.

CFU/g = colony forming unit per gram

NA = Not analyzed

TABLE 6
SUMMARY OF FIELD SCREENING AND CHEMICAL ANALYTICAL DATA[1]
SOIL BORINGS
GLACIER PARK EAST

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Sample Identification	Date Sampled	Sample Depth (feet)	Field Screening Results[2] Headspace Vapors (ppm)	Field Screening Results[2] Sheen	Total Petroleum Hydrocarbons[3] (WTPH-HCID, -G, -D) (mg/kg) Gasoline	Diesel	Heavier Oil
MW1-2.5	10/26/95	2.5	NA	SS	10 U	20 U	NA
MW1-7.5	10/26/95	7.5	NA	MS	10 U	20 U	NA
MW1-12.5	10/26/95	12.5	NA	SS	10 U (10 U)	20 U (20 U)	NA
MW1-17.5	10/26/95	17.5	NA	SS	10 U	20 U	NA
MW2-1	11/10/95	2.5	<100	NS	20 U	50 U	100 U
MW2-2	11/10/95	7.5	<100	SS	20 U	50 U	100 U
MW2-3	11/10/95	12.5	<100	NS	20 U	50 U	100 U
MW2-4	11/10/95	17.5	<100	NS	20 U	50 U	100 U
MW2-5	11/10/95	22.5	<100	NS	20 U	50 U	100 U
MW2-6	11/10/95	27.5	<100	NS	20 U	50 U	100 U
MW2-7	11/10/95	32.5	<100	NS	20 U	50 U	100 U
VES1-1	11/15/95	2.5	300	SS	320	1,900	100 U
VES1-2	11/15/95	7.5	4,600	HS	4,800	7,900	100 U
VES1-3	11/15/95	12.5	<100	SS	20 U	440	100 U
VES1-4	11/15/95	17.5	<100	SS	20 U	50 U	100 U
VES1-5	11/15/95	22.5	<100	SS	20 U	50 U	100 U
VES1-6	11/15/95	30	<100	NS	20 U	50 U	100 U
VES2-1	11/16/95	7.5	<100	MS	1,100	1,200	100 U
VES2-2	11/16/95	12.5	<100	SS	20 U	50 U	100 U
VES2-3	11/17/95	17.5	160	NS	20 U	50 U	100 U
VES2-4	11/17/95	22.5	<100	SS	20 U	60	100 U
VES2-5	11/17/95	27.5	<100	NS	20 U	50 U	100 U
VES2-6	11/17/95	32.5	<100	SS	20 U	50 U	100 U

Notes:

[1]Soil samples collected from boring MW-1 were submitted to Transglobal Environmental Geosciences Northwest, Inc. for analysis. All other soil samples were analyzed by North Creek Analytical, Inc. Laboratory reports are presented in Appendix B.

[2]See Appendix A for a description of field screening methods.
NS = no sheen, SS = slight sheen, MS = moderate sheen, HS = heavy sheen

[3]Soil samples were submitted for hydrocarbon identification by Washington State Department of Ecology method WTPH-HCID, for gasoline-range quantification by WTPH-G and diesel-range quantification by WTPH-D. Heavier oil-range hydrocarbons were detected by WTPH-HCID

ppm = parts per million

mg/kg = milligrams per kilogram

U = Indicates analyte was not detected at the specified detection limit.

NA = Not analyzed.

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TABLE 7
SUMMARY OF GROUND WATER CHEMICAL ANALYTICAL DATA[1]
GLACIER PARK EAST

Sample Identification	HC-2			MW-1			MW-2		
Date Sampled	10/30/95	08/15/96	11/03/96	11/16/95	08/15/96[2]	11/03/96[2]	11/17/95	08/15/96	11/03/96
Total Petroleum Hydrocarbons (WTPH-G and -D extended)[3] (micrograms per liter)									
Gasoline-range	580	1,180	744	98	170 (176)	128 (142)	1,200	3,920	2,030
Diesel-range	2,500	1,930	2,000	2,700	1,070 (1,630)	1,340 (1,380)	960	1,220	1,070
Heavier Oil-range	950	1,130	1,020	1,800	984 (2,540)	1,060 (1,100)	1,100	750 (U)	750 (U)
Total	4,030	4,240	3,764	4,598	2,224 (4,346)	2,528 (2,622)	3,260	5,140	3,100
BETX (EPA Method 8020)[4] (micrograms per liter)									
Benzene	24	41.4	35.1	2.4	3.87 (3.95)	4.27 (4.34)	29	94.7	40.7
Toluene	1.4	2.75	1.52	0.50 U	0.50 U (0.50 U)	0.50 U (0.50 U)	59	16.2	3.3
Ethylbenzene	0.84	6.45	2.82	0.50 U	0.50 U (0.50 U)	0.50 U (0.50 U)	39	43.3	30.5
Xylene	4.5	4.15	3.29	1.0 U	1.0 U (1.0 U)	1.0 U (1.0 U)	47	171	15.6
Total Metals (micrograms per liter)									
Iron	2,500	NA	NA	11,000	NA	NA	300	NA	NA
Lead	200 U	2.0 U	2.0 U	2.2	2.62 (2.0 U)	5.24 (5.24)	50	23.7	20.9
Manganese	2,800	NA	NA	1,700	NA	NA	1,200	NA	NA
Dissolved Metals[5] (micrograms per liter									
Lead	2.0 U	2.0 U	2.0 U	2.0 U (2.0 U	2.0 U (2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Notes

[1]Chemical analysis conducted by North Creek Analytical, Inc. Analytes of interest were not detected in rinsate and trip blank samples submitted for analysis. Laboratory reports are presented in Appendix B. All concentrations are reported in micrograms per liter. Duplicate sample results are shown in parentheses.

[2]Duplicate samples identified as sample MW-3 in laboratory reports.

[3]Washington State Department of Ecology methodology for gasoline- and diesel-range hydrocarbons.

[4]Benzene, ethylbenzene, toluene and xylenes, analyzed by EPA Method 8020.

[5]Dissolved samples were field-filtered with 0.45 micron in-line filters.

NA = Not Analyzed

U = Indicates analyte was not detected at the specified detection limit.

TABLE 1
GROUND WATER ELEVATION DATA
GLACIER PARK EAST SITE

Monitoring Well	Ground Surface Elevation (feet above mean sea level)	Depth to Ground Water (feet)	Ground Water Elevation (feet above mean sea level)
MW-1	1,149.84	59.12	1,090.72
MW-2	1,150.95	64.02	1,086.93
MW-3	1,151.20	60.38	1,090.82
MW-4	1,155.29	64.03	1,091.26
MW-5	1,158.11	75.57	1,082.54

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TABLE 2
GROUND WATER CHEMICAL ANALYTICAL DATA [1]
GLACIER PARK EAST SITE

Sample Identification [2]	Date Sampled	Total Petroleum Hydrocarbons Gasoline-Range (μg/l)	Total Petroleum Hydrocarbons Diesel-Range (μg/l)	Total Petroleum Hydrocarbons Lube Oil-Range (μg/l)	Benzene (μg/l)	Ethylbenzene (μg/l)	Toluene (μg/l)	Total Xylenes (μg/l)
MW-1	10/04/01	<50	<281 J	<562 J	<0.500	<0.500	1.79	<1.00
MW-2	10/04/01	<50	NA	NA	<0.500	<0.500	<0.500	<1.00
MW-3	10/05/01	1,280 J	1,730	<500	28.1 J	51.6 J	11.2 J	4.52 J
MW-4	10/05/01	149	1,940	<561	<0.500	<0.500	2.17	<1.00
MW-4 (duplicate)	10/05/01	140	2,180	<561	<0.500	<0.500	2.08	<1.00
MW-5	10/05/01	<50	NA	NA	<0.500	<0.500	<0.500	<1.00

Notes:
[1] Chemical analyses by North Creek Analytical, Inc. Laboratory reports and chain-of-custody records are presented in Appendix B.
[2] Approximate sample locations are shown on Figure 2.
J = Concentration reported is estimated.
NA = not analyzed
μg/l = micrograms per liter
"<" = less than the listed reporting limit

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TABLE 1
GROUND WATER ELEVATION DATA
GLACIER PARK EAST SITE

Monitoring Well	Ground Surface Elevation (feet above mean sea level)	Depth to Ground Water (feet)	Ground Water Elevation (feet above mean sea level)
MW-1	1,149.84	59.12	1,090.72
MW-2	1,150.95	64.02	1,086.93
MW-3	1,151.20	60.38	1,090.82
MW-4	1,155.29	64.03	1,091.26
MW-5	1,158.11	75.57	1,082.54

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TABLE 2
GROUND WATER CHEMICAL ANALYTICAL DATA [1]
GLACIER PARK EAST SITE

Sample Identification [2]	Date Sampled	Total Petroleum Hydrocarbons Gasoline-Range (µg/l)	Diesel-Range (µg/l)	Lube Oil-Range (µg/l)	Benzene (µg/l)	Ethylbenzene (µg/l)	Toluene (µg/l)	Total Xylenes (µg/l)
MW-1	10/04/01	<50	<281 J	<562 J	<0.500	<0.500	1.79	<1.00
MW-2	10/04/01	<50	NA	NA	<0.500	<0.500	<0.500	<1.00
MW-3	10/05/01	1,280 J	1,730	<500	28.1 J	51.6 J	11.2 J	4.52 J
MW-4	10/05/01	149	1,940	<561	<0.500	<0.500	2.17	<1.00
MW-4 (duplicate)	10/05/01	140	2,180	<561	<0.500	<0.500	2.08	<1.00
MW-5	10/05/01	<50	NA	NA	<0.500	<0.500	<0.500	<1.00

Notes:
[1] Chemical analyses by North Creek Analytical, Inc. Laboratory reports and chain-of-custody records are presented in Appendix B.
[2] Approximate sample locations are shown on Figure 2.
J = Concentration reported is estimated.
NA = not analyzed
µg/l = micrograms per liter
"<" = less than the listed reporting limit

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TABLE 1
SUMMARY OF SOIL PHYSICAL TESTING RESULTS[1]
GLACIER PARK EAST

Sample Designation	Date Sampled	Sample Depth (Feet Below Ground Surface)	Soil Classification[3]	Moisture Content	Grain Size Analysis[2]					
					Percent Gravel	Percent Sand				Percent Fines
						Fine Grain	Medium Grain	Coarse Grain	Total Sand	
RE1-18	11/20/95	18	Silty Sand	20%	1.24%	40.21%	6.84%	2.59%	49.55%	49.21%
RE4-7	11/20/95	7	Silty Sand	15%	1.83%	26.44%	34.44%	2.40%	63.28%	34.89%
RE9-8	11/20/95	8	Sand with Silt	10%	13.26%	19.78%	33.03%	23.09%	76.04%	10.70%

Notes:

[1]Samples were analyzed by GeoEngineers, Inc.

[2]Conducted in accordance with American Society for Testing and Materials (ASTM) D2487-90.

[3]Soil classification based on ASTM D2487-90.

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TABLE 2
SUMMARY OF
GROUND WATER ELEVATIONS
GLACIER PARK EAST

Well Designation	Top of Monument Elevation[1]	Date	Depth to Water[2]	Ground Water Elevation[1]
HC-2[3]	92.14	11/17/95	62.62	29.52
		04/18/96	60.16	31.98
		08/15/96	61.84	30.30
		11/03/96	63.93	28.21
MW-1	91.19	11/17/95	55.35	35.84
		04/18/96	53.35	37.84
		08/15/96	52.47	38.72
		11/03/96	53.62	37.57
MW-2	92.13	11/17/95	60.34	31.79
		04/18/96	54.76	37.37
		08/15/96	51.92	40.21
		11/03/96	53.30	38.83

Notes:

[1]Elevations are given in feet and are referenced to assumed site datum of 100 feet on manhole cover located in eastern portion of the site.

[2]Depth (in feet) to water is measured from top of polyvinyl chloride well casing.

[3]HC-2 installed by Hart Crowser in 1990.

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TABLE 4
SUMMARY OF SOIL CHEMICAL ANALYTICAL DATA[1]
TEST PITS
GLACIER PARK EAST

Sample Number[2]	Date Sampled	Depth of Sample (feet)	Total Petroleum Hydrocarbons WTPH-G[3] (mg/kg)	Total Petroleum Hydrocarbons WTPH-D[4] (mg/kg)
RE1-4S	10/23/95	4	10 U	20 U
RE1-7N	10/23/95	7	10 U	20 U
RE1-8E	10/23/95	8	10 U	20 U
RE1-11E	10/23/95	11	10 U (10 U)	20 U (20 U)
RE1-14W	10/23/95	14	10 U	20 U
RE1-14W2	10/23/95	14	10 U (10 U)	20 U (20 U)
RE1-18W	10/23/95	18	10 U	20 U
RE2-11.5S	10/23/95	11.5	10 U	20 U
RE2-17S	10/23/95	17	10 U	20 U
RE2-21S	10/23/95	21	10 U	20 U
RE3-5N	10/24/95	5	10 U	20 U
RE3-7W	10/24/95	7	610	8,350
RE3-10W	10/24/95	10	471	5,820
RE3-14W	10/24/95	14	10 U	20 U
RE3-16W	10/24/95	16	10 U	20 U
RE4-4N	10/24/95	4	2,270	6,460
RE4-10N	10/24/95	10	10 U	20 U
RE4-18N	10/24/95	18	10 U	20 U
RE5-4N	10/24/95	4	10 U (10 U)	196 (208)
RE5-7N	10/24/95	7	1,250	2,190
RE5-10N	10/24/95	10	28	82
RE5-15.5N	10/24/95	15.5	550	998
RE5-17.5W	10/24/95	17.5	10 U	20 U
RE5-20N	10/25/95	20	219	662
RE6-4E	10/24/95	4	10 U	83
RE6-8N	10/24/95	8	1,770	3,260
RE6-15S	10/24/95	15	1,170	3,200
RE7-4N	10/26/95	4	10 U	20 U
RE7-8W	10/24/95	8	10 U (10 U)	20 U (20 U)
RE7-12N	10/24/95	12	10 U	20 U
RE7-15N	10/24/95	15	10 U	20 U

Notes appear on page 2 of 2.

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TABLE 4 Page 2 of 2

Sample Number[2]	Date Sampled	Depth of Sample (feet)	Total Petroleum Hydrocarbons WTPH-G[2] (mg/kg)	Total Petroleum Hydrocarbons WTPH-D[3] (mg/kg)
RE8-4N	10/26/95	4	10 U	20 U
RE8-8N	10/24/95	8	3,070 (2,810)	4,020 (3,590)
RE8-12N	10/24/95	12	1,140	1,600
RE8-18N	10/25/95	18	10 U	20 U
RE9-5E	10/25/95	5	10 U	20 U
RE9-8E	10/25/95	8	757	412
RE9-16.5S	10/25/95	16.5	10 U	20 U
RE9-20E	10/25/95	20	10 U	20 U
RE10-4E	10/25/95	4	10 U	32
RE10-9S	10/25/95	9	2,330	2,700
RE10-13.5N	10/26/95	13.5	147	539
RE10-17W	10/25/95	17	67 (59)	364 (318)
RE10-18.5N	10/25/95	18.5	63	358
RE10-20E	10/25/95	20	10 U	114
RE10-22W	10/25/95	22	10 U (10 U)	20 U (20 U)
RE11-1.5E	10/25/95	1.5	10 U	121
RE11-4N	10/25/95	4	811	5,530
RE11-10W	10/25/95	10	2,190	4,930
RE11-18E	10/25/95	18	10 U	65
RE11-20W	10/25/95	20	10 U	20 U
RE12-1.5E	10/26/95	1.5	10 U	20 U
RE12-4N	10/26/95	4	467	3,400
RE12-8W	10/26/95	8	10 U (10 U)	112 (115)
RE12-11.5N	10/26/95	11.5	1,230	1,590
RE12-17.5W	10/25/95	17.5	829	3,390
RE12-21E	10/25/95	21	108	670
RE12-24N	10/25/95	24	10 U (10 U)	20 U (20 U)

Notes:

[1]Chemical analysis conducted by Transglobal Environmental Geosciences, Northwest. Laboratory reports are presented in Appendix B.

[2]Sample number indicates sample location (RE1 through RE12), sample depth (1 to 24 feet below ground surface), and relative lateral location (North [N], South [S], East [E], or West [W]) of the sample.

[2]Washington State Department of Ecology methodology for gasoline-range hydrocarbons.

[3]Washington State Department of Ecology methodology for diesel-range hydrocarbons.

U = Indicates analyte was not detected at the specified detection limit.

Duplicate analytical results are presented in parenthesis.

mg/kg = milligrams per kilogram

TABLE 5
SUMMARY OF NUTRIENT AND MICROBIAL CONTENT[1]
CHEMICAL ANALYTICAL DATA
GLACIER PARK EAST

Sample Number	Date Sampled	Moisture Content (percent)	Laboratory Analysis (mg/kg)							
			Ammonia (EPA 350.3)	Nitrate (EPA 300)	Soluble Reactive Phosphorus (EPA 300)	Total Kjeldahl Nitrogen (EPA 351.1)	Total Organic Carbon (EPA Method 9060) (Modified)	Microbial Content (CFU/g sample)[2]		
								Total Heterotrophs	Degraders	
									Gasoline	Diesel
RE1-18	11/03/95	NA	NA	NA	NA	NA	560	2.8+/-9.7	4.3+/-1.0	3.4+/-0.98
	11/20/95	20	2.0 U	1.0 U	1.0 U	100 U	450	NA	NA	NA
RE4-7	11/03/95	NA	NA	NA	NA	NA	470	33+/-6.4	16+/-2.6	2.8+/-1.4
	11/20/95	15	2.0 U	1.0 U	1.0 U	100 U	640	NA	NA	NA
RE9-8	11/03/95	NA	NA	NA	NA	NA	950	27+/-2.9	13+/-2.2	2.7+/- 1.0
	11/20/95	10	2.0 U	1.1	1.0 U	100 U	890	NA	NA	NA

Notes:

[1]Chemical analysis conducted by North Creek Analytical, Inc and RETEC. Laboratory reports are presented in Appendix B.

CFU/g = colony forming unit per gram

NA = Not analyzed

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TABLE 6
SUMMARY OF FIELD SCREENING AND CHEMICAL ANALYTICAL DATA[1]
SOIL BORINGS
GLACIER PARK EAST

Sample Identification	Date Sampled	Sample Depth (feet)	Field Screening Results[2]		Total Petroleum Hydrocarbons[3] (WTPH-HCID, -G, -D) (mg/kg)		
			Headspace Vapors (ppm)	Sheen	Gasoline	Diesel	Heavier Oil
MW1-2.5	10/26/95	2.5	NA	SS	10 U	20 U	NA
MW1-7.5	10/26/95	7.5	NA	MS	10 U	20 U	NA
MW1-12.5	10/26/95	12.5	NA	SS	10 U (10 U)	20 U (20 U)	NA
MW1-17.5	10/26/95	17.5	NA	SS	10 U	20 U	NA
MW2-1	11/10/95	2.5	<100	NS	20 U	50 U	100 U
MW2-2	11/10/95	7.5	<100	SS	20 U	50 U	100 U
MW2-3	11/10/95	12.5	<100	NS	20 U	50 U	100 U
MW2-4	11/10/95	17.5	<100	NS	20 U	50 U	100 U
MW2-5	11/10/95	22.5	<100	NS	20 U	50 U	100 U
MW2-6	11/10/95	27.5	<100	NS	20 U	50 U	100 U
MW2-7	11/10/95	32.5	<100	NS	20 U	50 U	100 U
VES1-1	11/15/95	2.5	300	SS	320	1,900	100 U
VES1-2	11/15/95	7.5	4,600	HS	4,800	7,900	100 U
VES1-3	11/15/95	12.5	<100	SS	20 U	440	100 U
VES1-4	11/15/95	17.5	<100	SS	20 U	50 U	100 U
VES1-5	11/15/95	22.5	<100	SS	20 U	50 U	100 U
VES1-6	11/15/95	30	<100	NS	20 U	50 U	100 U
VES2-1	11/16/95	7.5	<100	MS	1,100	1,200	100 U
VES2-2	11/16/95	12.5	<100	SS	20 U	50 U	100 U
VES2-3	11/17/95	17.5	160	NS	20 U	50 U	100 U
VES2-4	11/17/95	22.5	<100	SS	20 U	60	100 U
VES2-5	11/17/95	27.5	<100	NS	20 U	50 U	100 U
VES2-6	11/17/95	32.5	<100	SS	20 U	50 U	100 U

Notes:

[1]Soil samples collected from boring MW-1 were submitted to Transglobal Environmental Geosciences Northwest, Inc. for analysis. All other soil samples were analyzed by North Creek Analytical, Inc. Laboratory reports are presented in Appendix B.

[2]See Appendix A for a description of field screening methods.
NS = no sheen, SS = slight sheen, MS = moderate sheen, HS = heavy sheen

[3]Soil samples were submitted for hydrocarbon identification by Washington State Department of Ecology method WTPH-HCID, for gasoline-range quantification by WTPH-G and diesel-range quantification by WTPH-D. Heavier oil-range hydrocarbons were detected by WTPH-HCID

ppm = parts per million
mg/kg = milligrams per kilogram
U = Indicates analyte was not detected at the specified detection limit.
NA = Not analyzed.

DRAFT

TABLE 7
SUMMARY OF GROUND WATER CHEMICAL ANALYTICAL DATA[1]
GLACIER PARK EAST

Sample Identification	HC-2			MW-1			MW-2		
Date Sampled	10/30/95	08/15/96	11/03/96	11/16/95	08/15/96[2]	11/03/96[2]	11/17/95	08/15/96	11/03/96
Total Petroleum Hydrocarbons (WTPH-G and -D extended)[3] (micrograms per liter)									
Gasoline-range	580	1,180	744	98	170 (176)	128 (142)	1,200	3,920	2,030
Diesel-range	2,500	1,930	2,000	2,700	1,070 (1,630)	1,340 (1,380)	960	1,220	1,070
Heavier Oil-range	950	1,130	1,020	1,800	984 (2,540)	1,060 (1,100)	1,100	750 (U)	750 (U)
Total	4,030	4,240	3,764	4,598	2,224 (4,346)	2,528 (2,622)	3,260	5,140	3,100
BETX (EPA Method 8020)[4] (micrograms per liter)									
Benzene	24	41.4	35.1	2.4	3.87 (3.95)	4.27 (4.34)	29	94.7	40.7
Toluene	1.4	2.75	1.52	0.50 U	0.50 U (0.50 U)	0.50 U (0.50 U)	59	16.2	3.3
Ethylbenzene	0.84	6.45	2.82	0.50 U	0.50 U (0.50 U)	0.50 U (0.50 U)	39	43.3	30.5
Xylene	4.5	4.15	3.29	1.0 U	1.0 U (1.0 U)	1.0 U (1.0 U)	47	171	15.6
Total Metals (micrograms per liter)									
Iron	2,500	NA	NA	11,000	NA	NA	300	NA	NA
Lead	200 U	2.0 U	2.0 U	2.2	2.62 (2.0 U)	5.24 (5.24)	50	23.7	20.9
Manganese	2,800	NA	NA	1,700	NA	NA	1,200	NA	NA
Dissolved Metals[5] (micrograms per liter									
Lead	2.0 U	2.0 U	2.0 U	2.0 U (2.0 U	2.0 U (2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Notes

[1]Chemical analysis conducted by North Creek Analytical, Inc. Analytes of interest were not detected in rinsate and trip blank samples submitted for analysis. Laboratory reports are presented in Appendix B. All concentrations are reported in micrograms per liter. Duplicate sample results are shown in parentheses.

[2]Duplicate samples identified as sample MW-3 in laboratory reports.

[3]Washington State Department of Ecology methodology for gasoline- and diesel-range hydrocarbons.

[4]Benzene, ethylbenzene, toluene and xylenes, analyzed by EPA Method 8020.

[5]Dissolved samples were field-filtered with 0.45 micron in-line filters.

NA = Not Analyzed

U = Indicates analyte was not detected at the specified detection limit.

Attachment C
Boring Logs

SOIL BORING LOG

TRC

BORING NO. GWB-1

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
BNSF Glacier Park East SRI	06/02/2021	06/03/2021	444428

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Holocene Drilling	Sonic	1162.1	---	75.0	6

Boring Location:	Personnel	Drilling Equipment:
North of Cap STATE PLANE N: 218809.4 E: 1684596.8	Logged By - E.Stata Driller - C. Thrash	Geoprobe 8140 C

Civil Town/City/or Village:	County:	State:	Borehole Comments:
Leavenworth	Chelan	Washginton	Decommissioned with 3/8" Bentonite holeplug with sluff on top. Total depth 75 feet due to damaged drilling string.

SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	PID (PPM)	COMMENTS
	100		Well-graded GRAVEL with sand and silt, moist, brown, subrounded to angular. No odor or staining. Grading into:	GW-GM		
			Well-graded SAND with silt, moist, brown,subrounded to subangular. Abundant angular to rounded cobbles and boulders. No odor or staining.	SM		Hand cleared to 5 ft. below ground surface (bgs).
	100	5	Well-graded SAND with gravel, silt, moist, brown, subrounded to subangular, with crystals and lithic fragments. No odor or staining.	SW	0.0	
	100	10	Silty SAND with minor gravel, moist, dark brown, fine-grained, ∇ with few coarse-grained sand. gravel is well-graded, subround to subangular. No odor or staining. As above, wet, dark brown, with roots.	SM	0.0 0.7	
			Well-graded SAND with gravel, moist, light brown. No odor or staining.	SW	1.1	Boulder.
	100	15	Well-graded SAND with trace clay, moist, reddish-brown, loose. No odors or staining.	SW	0.2 0.4	Weathered fragmented rock. Boulder.
			Poorly-graded SAND with silt, trace gravel, moist, red-brown, fine-grained. No odor or staining..	SP-SM	0.6	
			Well-graded SAND with trace clay, moist, reddish-brown, loose. No odors or staining. Weathered fragmented rock.	SW	0.1	
GWB-1:25	100	20	Silty SAND with gravel, moist, brown, fine-grained, dense, few SR coarse-grained sand. No No odor or staining.	SM	1.2 2.5 2.0 0.8 2.1	

Signature:

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Phone 425-395-0010

SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	PID (PPM)	COMMENTS
	100			SM		0.6, 1.0, 2.1	
GWB-1:35	100	30				2.1, 1.5, 1.5, 2.0, 1.5	
	100	35	Well-graded SAND with silt and gravel, moist, brown, dense, fine to coarse-grained, subrounded. No odor or staining.	SW-SM		2.2, 3.2, 3.8, 4.2	
	100	40				3.2, 4.3, 3.9	
	100	45	Well-graded SAND with gravel and trace silt at top of section, moist, greyish brown, dense, fine to medium-grained with few coarse-grained subrounded. Gravel well-graded, rounded to subangular. Few cobbles and boulders. No odor or staining.	SW		2.6, 1.1, 2.4	Boulder.
	100	50	Silty SAND with gravel, moist, greyish brown, dense, well-graded, subrounded. Gravel well-graded, subrounded to subangular. No odor or staining.	SM		1.4	
			Well-graded SAND with gravel and trace silt, moist, grayish brown, dense, subrounded to subangular. Gravel well-graded, subrounded to subangular. No odor or staining.	SW			
			Poorly-graded SAND, with silt and gravel, moist, grayish brown, dense, fine-grained. No odor or staining.	SP		1.5	
			Sandy SILT with gravel, moist, brown, stiff, gravel layer at base of section. No odor no staining.	ML			
			Poorly-graded SAND with silt and gravel, moist, brown, dense, fine-grained, few coarse-grained subrounded sand. Gravel well graded, subrounded to subangular. No odors or staining. Silt increasing at base of section.	SP-SM		2.3	
	100	55		GM		0.7, 1.4	

SOIL BORING LOG

BORING NO. GWB-1

SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	PID (PPM)	COMMENTS
			Silty GRAVEL with sand, moist, brown, dense, well-graded, subrounded to rounded. No odor or staining.	GM		0.9	
	100	60				1.8	
						1.6	
						4.7	Boulder.
	100	65	Silty SAND with gravel, moist, brown, dense, well-graded. gravel well-graded, subrounded to subangular. No odor or staining.	SM		2.0	
						2.2	
		▼	Well-graded SAND with gravel, wet, brown, dense. Gravel well-graded, subrounded to subangular. No odor or staining.	SW		2.5	Boulder.
	100	70	Well graded GRAVEL with sand and silt, wet, brown, dense, rounded to subangular. Sand well-graded, subangular to angular, lithic fragments and crystals. No odor or staining.	GW-GM		1.4	Boulder.
						0.9	
						1.5	
		75	End of boring at 75 feet.				
		80					
		85					
		90					

SOIL BORING LOG

BORING NO. SB-1

Facility/Project Name: BNSF Glacier Park East SRI	Date Drilling Started: 06/03/2021	Date Drilling Completed: 06/03/2021	Project Number: 444428
Drilling Firm: Holocene Drilling	Drilling Method: Sonic	Surface Elev. (ft): 1150.7	TOC Elevation (ft): ---
Total Depth (ft bgs): 25.0	Borehole Dia. (in): 6		
Boring Location: City ROW to east of site; STATE PLANE N: 218819.0 E: 1684740.5	Personnel: Logged By - E.Stata; Driller - C. Thrash	Drilling Equipment: Geoprobe 8140 C	
Civil Town/City/or Village: Leavenworth	County: Chelan	State: Washginton	Borehole Comments: Decommissioned with 3/8" Bentonite holeplug with sluff on top.

SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	PID (PPM)	SHEEN	COMMENTS
	100	0–1.5	Silty SAND with gravel, moist, dark brown, well-graded, loose, rooty with organic material. No odor or staining.	SM			
		1.5–5.5	Well-graded SAND with gravel and silt, moist, red-brown. Gravel subround to subangular. Larger clasts up to boulder size are abundant. No odor or staining.	SW-SM			Hand cleared to 5 ft. below ground surface (bgs). Boulder.
SB-1:6	100	5.5–6.2	Silty SAND, moist, brown, fine-grained, dense. Large cobble at base of section. No odor or staining.	SM	810.6	Yes	
		6.2–8	Well-graded SAND with gravel, moist, red-brown, angular, loose, Mild odor, no staining.	SW	16.2	Mild	
		8–10	Well-graded GRAVEL with sand and silt, moist, dark grey, well-graded, subrounded to angular. Strong odor and staining.	GW-GM	4.0	No	
SB-1:12	100	10–18.5	Well-graded SAND with gravel and trace silt, moist, dark grey, dense. Gravels are well graded, subrounded to rounded. Strong odor and staining. As above, brown, dense. Mild odor, no staining.	SW	22.4 1.4 0.7	 No No	Boulder.
SB-1:19	100	18.5–22	Well-graded SAND with gravel and silt, moist, red-brown, dense. Mild odor, no staining.	SW-SM	1.9 6.0	No	Boulder.
	100	22–25	Silty SAND with gravel, moist, brown, very dense, well-graded. Gravel well-graded, subrounded to angular. No odor or staining. End of boring at 25 feet.	SM	2.5 0.7 2.7	 No	

Signature:

Firm: TRC
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Phone 425-395-0010

SOIL BORING LOG

BORING NO. SB-2

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
BNSF Glacier Park East SRI	06/04/2021	06/04/2021	444428

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Holocene Drilling	Sonic	1150.7	---	25.0	6

Boring Location:	Personnel	Drilling Equipment:
City ROW to east of site STATE PLANE N: 218809.3 E: 1684763.1	Logged By - E.Stata Driller - C. Thrash	Geoprobe 8140 C

Civil Town/City/or Village:	County:	State:	Borehole Comments:
Leavenworth	Chelan	Washginton	Decommissioned with 3/8" Bentonite holeplug with sluff on top.

SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	PID (PPM)	SHEEN	COMMENTS
	100		Silty SAND with gravel, moist, dark brown, well graded, loose, abundant roots, organics. No odor or staining.	SM				
			Silty SAND with gravel, moist, reddish brown, well graded, loose. Mostly large cobbles to boulders with some silty sand. No odor or staining.	SM				Hand cleared to 5 ft. below ground surface (bgs).
	100	5	SILT with sand, moist, brown, stiff, high moisture content, organics, roots. Sand is angular, mica-rich. No odor or staining.	ML		1.5		
			Well-graded SAND with gravel, moist, brown, subrounded to subangular, loose. No odor or staining.	SW				Boulder.
SB-2:8.5			Well-graded SAND with silt and gravel, moist, red-brown, rounded to subangular. Gravel few, well-graded, rounded to subrounded. Silt few. Faint odor at bottom, no staining.	SW-SM		0.7 9.3	No	
SB-2:10	100	10	Silty SAND with gravel, moist, grey, fine-grained, dense. Odor, staining.	SM		244	Yes	
			Poorly-graded SAND with gravel and silt, moist, brown, fine-grained. Gravel well-graded, subround to subangular. No odor or staining.	SP		0.7		
			Well-graded SAND, moist, brown, angular. No odor or staining.	SW		3.0	No	
	100	15	Poorly-graded SAND with silt, moist, red-brown, fine-grained, dense, few subrounded to rounded coarse-grained sand. Trace organics. Gravel well-graded, subround to subangular. Mild odor, no staining. As above, no organics.	SP		2.9 1.1 1.8 0.5	No	No organics past 15 ft. bgs
SB-2:22	100	20	As above with no odor or staining.			0.4 0.2 0.7	No No	
			End of boring at 25 feet.			0.8	No	

Signature:

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SOIL BORING LOG

BORING NO. SB-3

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
BNSF Glacier Park East SRI	06/03/2021	06/03/2021	444428

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Holocene Drilling	Sonic	1151.7	---	25.0	6

Boring Location:	Personnel	Drilling Equipment:
City ROW to east of site STATE PLANE N: 218769.6 E: 1684785.5	Logged By - E.Stata Driller - C. Thrash	Geoprobe 8140 C

Civil Town/City/or Village:	County:	State:	Borehole Comments:
Leavenworth	Chelan	Washgington	Decommissioned with 3/8" Bentonite holeplug with sluff on top.

SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	PID (PPM)	COMMENTS
	100	0–5	Silty SAND with gravel, moist, dark brown, well-graded, loose, rooty with abundant organics. Abundant cobbles, boulders. No odor or staining.	SM			Hand cleared to 5 ft. below ground surface (bgs).
			Well-graded SAND with silt and gravel, moist, reddish-brown. Gravel is well-graded, subrounded to subangular. Abundant cobbles and boulders. No odor or staining.	SW-SM			
	100	5–10	Poorly-graded SAND with silt and gravel, moist, reddish-brown, fine-grained, loose, with trace subrounded fine-grained sand. Gravel is well-graded, subrounded to subangular. No odor or staining.	SP-SM		8.1	
						2.0	
			As above, dense.				
SB-3:12	100	10–15	Poorly-graded SAND with trace clay, few gravel, moist, grey, fine-grained, rooty, striated. No odor or staining.	SP		1.8	
			Silty SAND with gravel, moist, red-brown, fine-grained, trace coarse-grained sand. Gravel poorly-graded, fine-grained, subrounded to subangular. No odor or staining.	SM		1.6	
						1.5	
	100	15–20	Sandy SILT with gravel, moist, brown, stiff. Sand, fine-grained, trace coarse gravel. No odor or staining.	ML			
			Well-graded SAND with gravel, moist, brown, angular, dense. No odor or staining.	SW		2.1	Decomposed granitic rock - grus.
			Poorly-graded SAND with silt and gravel, moist, brown, fine-grained with trace rounded coarse-grained sand, dense. Gravel well-graded, subrounded to subangular, up to cobbles. No odor or staining.	SP-SM		0.7	
						1.1	
	100	20–25				0.5	
			As above, with faint odor, no staining.				
			As above, no odor or staining.			0.7	
						0.0	
SB-3:25		25	End of boring at 25 feet.			0.0	

Signature:

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SOIL BORING LOG

BORING NO. SB-4

Facility/Project Name:	BNSF Glacier Park East SRI
Date Drilling Started:	06/02/2021
Date Drilling Completed:	06/02/2021
Project Number:	444428
Drilling Firm:	Holocene Drilling
Drilling Method:	Sonic
Surface Elev. (ft)	1166.1
TOC Elevation (ft)	---
Total Depth (ft bgs)	35.0
Borehole Dia. (in)	6
Boring Location:	Through Cap STATE PLANE N: 218771.9 E: 1684716.9
Personnel	Logged By - E.Stata Driller - C. Thrash
Drilling Equipment:	Geoprobe 8140 C
Civil Town/City/or Village:	Leavenworth
County:	Chelan
State:	Washginton
Borehole Comments:	Decommissioned with 3/8" Bentonite holeplug with concrete patch in existing asphalt surface.

SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	PID (PPM)	SHEEN	COMMENTS
		0	Asphalt Cap				
			Silty GRAVEL with sand, moist, brown, well-graded, angular, dense. Angular cobbles. No odor or staining.				Hand cleared to 5 ft. below ground surface (bgs).
		5					
					1.6		
					1.8		Engineered cap 0-14 ft. bgs.
					1.9		
					1.5		
		10					
					1.1		
					2.0		
					0.8		
					1.0		
		15	Well-graded SAND with trace silt and gravel, wet, dark grey. Abundant plant material at top 2 feet, roots throughout section. Gravel well graded, subrounded to subangular. No odor or staining.	SW	1.8		
					2.7		
					2.8		
			As above, moist.		0.0		Grus - fragmented boulder.
		20	Silty GRAVEL with sand, moist, dark brown, poorly-graded, angular. Roots. No odor or staining.	GM			
SB-4:20.5					17.2	No	
					31.0		Boulder.
SB-4:24				SW	1847	No	

Signature:

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SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	PID (PPM)	SHEEN	COMMENTS
			Well-graded SAND with gravel, moist, dark grey, subgrounded to rounded, trace roots. Gravel well-graded, subround to angular. Strong odor, staining.	SW		1024		
			Poorly-graded SAND with gravel, moist, dark gray, fine-grained with few coarse-grained subrounded grains, dense. Gravel well-graded, subround to subangular. Strong odor, staining.	SP		1121		
						106.3	No	
						7.2		
SB-4:30.5		30	As above, brown, with trace silt. No odor or staining.			1.2		
			Silty SAND with some gravel, moist, light brown, fine-grained. Gravel well-graded, subround to subangular. No odor or staining.	SM		3.4		
						2.9	No	
						1.3		
		35	End of boring at 35 feet.					
		40						
		45						
		50						
		55						

WELL CONSTRUCTION LOG

TRC

WELL NO. SB-5/PZ-4

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
BNSF Glacier Park East SRI	06/01/2021	06/02/2021	444428

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Holocene Drilling	Sonic	1166.2	1165.86	35.0	6

Boring Location:	Personnel	Drilling Equipment:
Through Cap STATE PLANE N: 218737.3 E: 1684646.4	Logged By - E.Stata Driller - C. Thrash	Geoprobe 8140 C

Civil Town/City/or Village:	County:	State:	Borehole Comments:
Leavenworth	Chelan	Washginton	Well PZ-4 installed, with flush-mount monument. WA well ID BMT-402

SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	PID (PPM)	SHEEN	COMMENTS
		0	Asphalt				
	100		Silty GRAVEL, trace sand, moist, brown, angular, well graded, angular to subangular, loose. Clasts present up to cobble size. No odor or staining.				Hand cleared to 5 ft. below ground surface (bgs).
		5			1.8		
	100						Engineered cap 0-14 ft. bgs.
					0.6		
		10			0.0		
	100						
SB-5:15			Sandy SILT, moist, black, soft, abundant woody debris. Odor, staining.	ML	3.4	No	
		15	Silty SAND, some gravel, moist, brown, well-graded, loose. No odor or staining.	SM			
	100		Poorly-graded SAND with some gravel, moist, black, fine-grained, medium-dense. Odor, staining.	SP	23.8		
			Well-graded SAND, with trace gravel, moist, grey, subround to subangular, strong odor, staining.	SW	957 1,248		
		20	Poorly-graded SAND, moist, grey, fine-grained, loose. Strong odor, staining.	SP	827	No	
	100				1,523		
SB-5:24					990	No	
				SW			

Signature:	Firm: TRC 1180 NW Maple St #310 Issaquah, WA 98027	Phone 425-395-0010

WELL CONSTRUCTION LOG

WELL NO. SB-5/PZ-4

SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	PID (PPM)	SHEEN	COMMENTS
SB-5:28	100		Well-graded SAND, moist, grey, loose, subrounded. Strong odor, staining.	SW			769		
			Well-graded SAND with gravel, trace silt, moist, brown, subround to subangular. Gravel coarse. Odor, no staining.				580.1	No	
			Well-graded SAND with silt, trace gravel. Moist, dark grey, subrounded to subangular. Gravel increasing to some at bottom of section. Odor, no staining.	SW-SM			8.8	No	
	100	30	Poorly-graded SAND with gravel and some silt, fine-grained with some coarse-grained sand, rounded, dense. Gravel well-graded, subround to subangular. No odor or staining.	SP			18.2	No	
							11		
							16.5	No	
		35	End of boring at 35 feet.						
		40							
		45							
		50							
		55							

SOIL BORING LOG

BORING NO. SB-6

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
BNSF Glacier Park East SRI	06/02/2021	06/02/2021	444428

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Holocene Drilling	Sonic	1165.6	---	35.0	6

Boring Location:	Personnel	Drilling Equipment:
Through Cap STATE PLANE N: 218705.6 E: 1684666.3	Logged By - E.Stata Driller - C. Thrash	Geoprobe 8140 C

Civil Town/City/or Village:	County:	State:	Borehole Comments:
Leavenworth	Chelan	Washginton	Decommissioned with 3/8" Bentonite holeplug with concrete patch in existing asphalt surface.

SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	PID (PPM)	SHEEN	COMMENTS
	100	0	Asphalt					
			Well-graded GRAVEL with sand and silt, moist, brown, angular, dense. No odor or staining.					Hand cleared to 5 ft. below ground surface (bgs).
	100	5				0.0		
						0.9		Engineered fill 0-16.5 ft. bgs.
						0.1		
	100	10				1.3	No	
						0.0		
	100	15				0.1		
			Well-graded GRAVEL with sand and trace silt, moist, light grey, fine to medium, subround to subangular. No odor or staining.	GW		0.3	No	
			Poorly-graded SAND with trace gravel, some silt, moist, dark brown, few coarse grained rounded sand. Gravel well graded, rounded to angular. No odor or staining.	SP		2.7		
			Well-graded GRAVEL with sand and some silt, moist, grayish brown, subangular to angular, sand adhered to gravel. Mild odor, staining.	GW		2.3	No	
SB-6:22.5	100	20	Well-graded SAND with gravel and some silt, moist, brown, angular. Gravel fine to medium, angular. Mild odor.	SW		16.7		
						47.5	No	Boulder, odor.
			As above, grey, strong odor, staining.			788		
			Poorly-graded SAND with some gravel, moist, grey. Gravel well-graded, rounded to subangular. Strong odor, staining.	SP				

Signature:	Firm: TRC 1180 NW Maple St #310 Issaquah, WA 98027	Phone 425-395-0010

SOIL BORING LOG

BORING NO. SB-6

SAMPLE ID	RECOVERY (%)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	PID (PPM)	SHEEN	COMMENTS
SB-6:25			Clayey SAND, moist, brown, poorly graded. Strong odor.	SC		1905	No	
			Well-graded GRAVEL with sand, moist, grey, well graded, subrounded to angular. Sand well-graded. Odor, staining.	GW		50.1 390		
SB-6:28	100		Well-graded GRAVEL with some silt, moist, brown, rounded to subrounded, loose. No odor or staining. As above, with sand, dense.	GW-GM		6.8 0.6 3.9	No	
	100	30	Well-graded SAND with gravel and trace silt, moist, greyish brown, well-graded. Gravel well-graded, subround to subangular. No odor or staining.	SW		1.5 2.8 17.5 5.4		
		35	End of boring at 35 feet.					
		40						
		45						
		50						
		55						

Attachment D
Supplemental Remedial Investigation Laboratory Analytical Results
(electronic format only)

ANALYTICAL REPORT

September 14, 2021

Revised Report

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

TRC - BNSF Region 1

Sample Delivery Group:	L1363323
Samples Received:	06/05/2021
Project Number:	444428
Description:	BNSF Leavenworth - Glacier Park East
Report To:	Eric Stata 1180 NW Maple St, Ste 310 Issaquah, WA 98027

Entire Report Reviewed By:

Mark W. Beasley
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

Pace Analytical National
12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

TABLE OF CONTENTS

SB-5:15 L1363323-01 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/01/21 15:15	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685227	1	06/10/21 12:18	06/10/21 12:50	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686152	25	06/01/21 15:15	06/10/21 16:36	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686439	1	06/01/21 15:15	06/11/21 03:35	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686300	1	06/10/21 16:26	06/11/21 09:27	JDG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688720	1	06/10/21 16:26	06/15/21 21:22	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1685554	1	06/09/21 15:16	06/10/21 02:31	AAT	Mt. Juliet, TN

SB-5:24 L1363323-02 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/01/21 16:00	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685227	1	06/10/21 12:18	06/10/21 12:50	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686152	25	06/01/21 16:00	06/10/21 16:58	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686439	1	06/01/21 16:00	06/11/21 03:54	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686300	1	06/10/21 16:26	06/10/21 23:06	JDG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688720	1	06/10/21 16:26	06/15/21 21:35	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1685554	1	06/09/21 15:16	06/10/21 02:49	AAT	Mt. Juliet, TN

SB-5:28 L1363323-03 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/01/21 16:30	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685227	1	06/10/21 12:18	06/10/21 12:50	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686152	25	06/01/21 16:30	06/10/21 17:20	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686439	1.19	06/01/21 16:30	06/11/21 04:13	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:28	06/11/21 14:20	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/11/21 14:20	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1685554	1	06/09/21 15:16	06/10/21 03:07	AAT	Mt. Juliet, TN

SB-6:22.5 L1363323-04 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/02/21 10:15	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685227	1	06/10/21 12:18	06/10/21 12:50	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686152	25.5	06/02/21 10:15	06/10/21 17:42	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686439	1	06/02/21 10:15	06/11/21 04:32	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:28	06/11/21 14:33	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/15/21 11:46	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1685554	1	06/09/21 15:16	06/10/21 03:25	AAT	Mt. Juliet, TN

SB-6:25 L1363323-05 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/02/21 10:09	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685227	1	06/10/21 12:18	06/10/21 12:50	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1687682	500	06/02/21 10:09	06/14/21 03:09	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686439	1	06/02/21 10:09	06/11/21 04:51	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:28	06/11/21 14:46	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/15/21 11:59	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 00:40	AAT	Mt. Juliet, TN

SB-6:28 L1363323-06 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/02/21 10:56	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685227	1	06/10/21 12:18	06/10/21 12:50	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686152	25	06/02/21 10:56	06/10/21 19:45	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686439	1	06/02/21 10:56	06/11/21 05:10	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:28	06/11/21 14:59	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/11/21 14:59	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 01:00	AAT	Mt. Juliet, TN

SB-4:20.5 L1363323-07 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/02/21 13:10	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685228	1	06/10/21 11:54	06/10/21 12:10	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686152	25	06/02/21 13:10	06/10/21 20:07	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686439	1.09	06/02/21 13:10	06/11/21 05:29	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:30	06/11/21 16:18	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/15/21 12:50	CLG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 05:20	AAT	Mt. Juliet, TN

SB-4:24 L1363323-08 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/02/21 13:18	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685228	1	06/10/21 11:54	06/10/21 12:10	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686815	500	06/02/21 13:18	06/12/21 14:40	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686439	1	06/02/21 13:18	06/11/21 05:48	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:28	06/11/21 15:13	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/15/21 12:12	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 01:20	AAT	Mt. Juliet, TN

SB-4:30.5 L1363323-09 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/02/21 13:31	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685228	1	06/10/21 11:54	06/10/21 12:10	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1687682	25	06/02/21 13:31	06/14/21 02:44	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686439	1	06/02/21 13:31	06/11/21 06:07	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:28	06/11/21 15:52	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/11/21 15:52	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 01:40	AAT	Mt. Juliet, TN

TRIP BLANK L1363323-10 GW

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/02/21 00:00	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1688024	1	06/14/21 21:41	06/14/21 21:41	ADM	Mt. Juliet, TN

GWB-1:25 L1363323-11 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/04/21 10:25	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685228	1	06/10/21 11:54	06/10/21 12:10	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686815	25	06/04/21 10:25	06/12/21 13:11	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686439	1	06/04/21 10:25	06/11/21 06:27	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:30	06/11/21 16:05	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/11/21 16:05	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 02:00	AAT	Mt. Juliet, TN

GWB-1:35 L1363323-12 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/04/21 10:30	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685228	1	06/10/21 11:54	06/10/21 12:10	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686815	26.5	06/04/21 10:30	06/12/21 13:34	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686439	1	06/04/21 10:30	06/11/21 06:46	JAH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:30	06/11/21 17:37	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/29/21 15:15	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 02:20	AAT	Mt. Juliet, TN

SB-3:12 L1363323-13 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/03/21 14:13	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685228	1	06/10/21 11:54	06/10/21 12:10	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686815	25	06/03/21 14:13	06/12/21 13:56	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686512	1	06/03/21 14:13	06/11/21 02:03	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1687881	1	06/03/21 14:13	06/14/21 06:06	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:30	06/13/21 11:59	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/29/21 14:49	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 02:40	AAT	Mt. Juliet, TN

SB-3:25 L1363323-14 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/03/21 14:20	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685228	1	06/10/21 11:54	06/10/21 12:10	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686815	25	06/03/21 14:20	06/12/21 14:18	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686512	1	06/03/21 14:20	06/11/21 02:22	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1687881	1	06/03/21 14:20	06/14/21 06:25	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:30	06/11/21 18:03	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/11/21 18:03	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 03:00	AAT	Mt. Juliet, TN

SB-1:6 L1363323-15 Solid

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/03/21 16:20	06/05/21 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685228	1	06/10/21 11:54	06/10/21 12:10	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1686815	500	06/03/21 16:20	06/12/21 15:03	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686512	1	06/03/21 16:20	06/11/21 02:41	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:30	06/11/21 18:17	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/29/21 13:57	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 03:20	AAT	Mt. Juliet, TN

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/03/21 16:25	06/05/21 09:30

SB-1:12 L1363323-16 Solid

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685228	1	06/10/21 11:54	06/10/21 12:10	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1687392	25	06/03/21 16:25	06/13/21 14:48	JHH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686512	1	06/03/21 16:25	06/11/21 03:26	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1687881	1	06/03/21 16:25	06/14/21 06:44	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:30	06/11/21 18:30	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/11/21 18:30	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 03:40	AAT	Mt. Juliet, TN

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/03/21 16:30	06/05/21 09:30

SB-1:19 L1363323-17 Solid

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685228	1	06/10/21 11:54	06/10/21 12:10	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1687392	25	06/03/21 16:30	06/13/21 15:10	JHH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686512	1	06/03/21 16:30	06/11/21 04:16	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:30	06/11/21 18:43	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/11/21 18:43	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 04:00	AAT	Mt. Juliet, TN

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/04/21 09:59	06/05/21 09:30

SB-2:8.5 L1363323-18 Solid

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685294	1	06/09/21 09:11	06/09/21 09:23	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1687392	25	06/04/21 09:59	06/13/21 15:32	JHH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686512	1	06/04/21 09:59	06/11/21 04:35	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:30	06/11/21 18:56	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/11/21 18:56	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 04:20	AAT	Mt. Juliet, TN

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/04/21 10:08	06/05/21 09:30

SB-2:10 L1363323-19 Solid

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685294	1	06/09/21 09:11	06/09/21 09:23	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1687392	25	06/04/21 10:08	06/13/21 15:54	JHH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686512	1	06/04/21 10:08	06/11/21 04:55	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:30	06/11/21 19:09	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/29/21 14:23	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 04:40	AAT	Mt. Juliet, TN

Collected by	Collected date/time	Received date/time
Rebela O'Dell	06/04/21 10:15	06/05/21 09:30

SB-2:22 L1363323-20 Solid

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685294	1	06/09/21 09:11	06/09/21 09:23	CMK	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1687392	25	06/04/21 10:15	06/13/21 16:16	JHH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1686512	1	06/04/21 10:15	06/11/21 05:14	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1686301	1	06/10/21 21:30	06/11/21 19:22	JN	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1688684	1	06/10/21 21:30	06/11/21 19:22	CAG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E-SIM	WG1685557	1	06/09/21 15:49	06/10/21 05:00	AAT	Mt. Juliet, TN

			Collected by	Collected date/time	Received date/time	
WASTE COMP L1363323-21 Solid			Rebela O'Dell	06/04/21 11:00	06/05/21 09:30	

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1685294	1	06/09/21 09:11	06/09/21 09:23	CMK	Mt. Juliet, TN
Mercury by Method 7471B	WG1685633	1	06/10/21 10:00	06/10/21 18:14	BMF	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1685700	1	06/14/21 15:34	06/16/21 14:43	KMG	Mt. Juliet, TN

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Project Manager

Report Revision History

Level II Report - Version 1: 06/29/21 21:50
Level II Report - Version 2: 08/04/21 18:56

Project Narrative

Removed extra sample
Add 1-methylnaphthalene and 2-methylnaphthalene

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	90.0		1	06/10/2021 12:50	WG1685227

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	28.2		3.13	25	06/10/2021 16:36	WG1686152
(S) a,a,a-Trifluorotoluene(FID)	*100*		*77.0-120*		*06/10/2021 16:36*	WG1686152

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.0110		0.00124	1	06/11/2021 03:35	WG1686439
Toluene	0.0381		0.00621	1	06/11/2021 03:35	WG1686439
Ethylbenzene	0.161		0.00310	1	06/11/2021 03:35	WG1686439
Total Xylenes	0.335		0.00807	1	06/11/2021 03:35	WG1686439
(S) Toluene-d8	*106*		*75.0-131*		*06/11/2021 03:35*	WG1686439
(S) 4-Bromofluorobenzene	*85.2*		*67.0-138*		*06/11/2021 03:35*	WG1686439
(S) 1,2-Dichloroethane-d4	*101*		*70.0-130*		*06/11/2021 03:35*	WG1686439

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	38.8		4.44	1	06/11/2021 09:27	WG1686300
Residual Range Organics (RRO)	72.5		11.1	1	06/11/2021 09:27	WG1686300
(S) o-Terphenyl	*42.0*		*18.0-148*		*06/11/2021 09:27*	WG1686300

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	34.9		4.44	1	06/15/2021 21:22	WG1688720
Residual Range Organics (RRO)	35.7		11.1	1	06/15/2021 21:22	WG1688720
(S) o-Terphenyl	*49.5*		*18.0-148*		*06/15/2021 21:22*	WG1688720

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	0.156		0.0222	1	06/10/2021 02:31	WG1685554
1-Methylnaphthalene	0.0988		0.0222	1	06/10/2021 02:31	WG1685554
2-Methylnaphthalene	0.321		0.0222	1	06/10/2021 02:31	WG1685554
(S) p-Terphenyl-d14	*108*		*23.0-120*		*06/10/2021 02:31*	WG1685554
(S) Nitrobenzene-d5	*93.2*		*14.0-149*		*06/10/2021 02:31*	WG1685554
(S) 2-Fluorobiphenyl	*81.3*		*34.0-125*		*06/10/2021 02:31*	WG1685554

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	80.6		1	06/10/2021 12:50	WG1685227

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	69.7		3.86	25	06/10/2021 16:58	WG1686152
(S) a,a,a-Trifluorotoluene(FID)	*100*		*77.0-120*		*06/10/2021 16:58*	WG1686152

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00149	1	06/11/2021 03:54	WG1686439
Toluene	ND		0.00746	1	06/11/2021 03:54	WG1686439
Ethylbenzene	0.419		0.00373	1	06/11/2021 03:54	WG1686439
Total Xylenes	0.579		0.00969	1	06/11/2021 03:54	WG1686439
(S) Toluene-d8	*106*		*75.0-131*		*06/11/2021 03:54*	WG1686439
(S) 4-Bromofluorobenzene	*87.8*		*67.0-138*		*06/11/2021 03:54*	WG1686439
(S) 1,2-Dichloroethane-d4	*105*		*70.0-130*		*06/11/2021 03:54*	WG1686439

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	71.8		4.96	1	06/10/2021 23:06	WG1686300
Residual Range Organics (RRO)	ND		12.4	1	06/10/2021 23:06	WG1686300
(S) o-Terphenyl	*48.2*		*18.0-148*		*06/10/2021 23:06*	WG1686300

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	87.4		4.96	1	06/15/2021 21:35	WG1688720
Residual Range Organics (RRO)	ND		12.4	1	06/15/2021 21:35	WG1688720
(S) o-Terphenyl	*60.5*		*18.0-148*		*06/15/2021 21:35*	WG1688720

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	0.107		0.0248	1	06/10/2021 02:49	WG1685554
1-Methylnaphthalene	0.0532		0.0248	1	06/10/2021 02:49	WG1685554
2-Methylnaphthalene	0.103		0.0248	1	06/10/2021 02:49	WG1685554
(S) p-Terphenyl-d14	*73.9*		*23.0-120*		*06/10/2021 02:49*	WG1685554
(S) Nitrobenzene-d5	*75.1*		*14.0-149*		*06/10/2021 02:49*	WG1685554
(S) 2-Fluorobiphenyl	*58.2*		*34.0-125*		*06/10/2021 02:49*	WG1685554

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	92.3		1	06/10/2021 12:50	WG1685227

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	7.20		2.95	25	06/10/2021 17:20	WG1686152
(S) a,a,a-Trifluorotoluene(FID)	*97.4*		*77.0-120*		*06/10/2021 17:20*	WG1686152

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00137	1.19	06/11/2021 04:13	WG1686439
Toluene	ND		0.00686	1.19	06/11/2021 04:13	WG1686439
Ethylbenzene	0.0161		0.00343	1.19	06/11/2021 04:13	WG1686439
Total Xylenes	0.0208		0.00893	1.19	06/11/2021 04:13	WG1686439
(S) Toluene-d8	*104*		*75.0-131*		*06/11/2021 04:13*	WG1686439
(S) 4-Bromofluorobenzene	*87.6*		*67.0-138*		*06/11/2021 04:13*	WG1686439
(S) 1,2-Dichloroethane-d4	*96.9*		*70.0-130*		*06/11/2021 04:13*	WG1686439

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.33	1	06/11/2021 14:20	WG1686301
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 14:20	WG1686301
(S) o-Terphenyl	*32.9*		*18.0-148*		*06/11/2021 14:20*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.33	1	06/11/2021 14:20	WG1688684
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 14:20	WG1688684
(S) o-Terphenyl	*32.9*		*18.0-148*		*06/11/2021 14:20*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0217	1	06/10/2021 03:07	WG1685554
1-Methylnaphthalene	ND		0.0217	1	06/10/2021 03:07	WG1685554
2-Methylnaphthalene	ND		0.0217	1	06/10/2021 03:07	WG1685554
(S) p-Terphenyl-d14	*111*		*23.0-120*		*06/10/2021 03:07*	WG1685554
(S) Nitrobenzene-d5	*95.7*		*14.0-149*		*06/10/2021 03:07*	WG1685554
(S) 2-Fluorobiphenyl	*80.4*		*34.0-125*		*06/10/2021 03:07*	WG1685554

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	92.5		1	06/10/2021 12:50	WG1685227

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	54.3		2.96	25.5	06/10/2021 17:42	WG1686152
(S) a,a,a-Trifluorotoluene(FID)	*98.1*		*77.0-120*		*06/10/2021 17:42*	WG1686152

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00117	1	06/11/2021 04:32	WG1686439
Toluene	ND		0.00586	1	06/11/2021 04:32	WG1686439
Ethylbenzene	0.0104		0.00293	1	06/11/2021 04:32	WG1686439
Total Xylenes	ND		0.00762	1	06/11/2021 04:32	WG1686439
(S) Toluene-d8	*107*		*75.0-131*		*06/11/2021 04:32*	WG1686439
(S) 4-Bromofluorobenzene	*99.9*		*67.0-138*		*06/11/2021 04:32*	WG1686439
(S) 1,2-Dichloroethane-d4	*95.8*		*70.0-130*		*06/11/2021 04:32*	WG1686439

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	25.1		4.32	1	06/11/2021 14:33	WG1686301
Residual Range Organics (RRO)	60.4		10.8	1	06/11/2021 14:33	WG1686301
(S) o-Terphenyl	*43.7*		*18.0-148*		*06/11/2021 14:33*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	25.4		4.32	1	06/15/2021 11:46	WG1688684
Residual Range Organics (RRO)	63.1		10.8	1	06/15/2021 11:46	WG1688684
(S) o-Terphenyl	*50.2*		*18.0-148*		*06/15/2021 11:46*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0216	1	06/10/2021 03:25	WG1685554
1-Methylnaphthalene	0.0598		0.0216	1	06/10/2021 03:25	WG1685554
2-Methylnaphthalene	ND		0.0216	1	06/10/2021 03:25	WG1685554
(S) p-Terphenyl-d14	*111*		*23.0-120*		*06/10/2021 03:25*	WG1685554
(S) Nitrobenzene-d5	*123*		*14.0-149*		*06/10/2021 03:25*	WG1685554
(S) 2-Fluorobiphenyl	*84.1*		*34.0-125*		*06/10/2021 03:25*	WG1685554

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	77.4		1	06/10/2021 12:50	WG1685227

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	2820		83.3	500	06/14/2021 03:09	WG1687682
(S) a,a,a-Trifluorotoluene(FID)	*90.3*		*77.0-120*		*06/14/2021 03:09*	WG1687682

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00164	1	06/11/2021 04:51	WG1686439
Toluene	0.0136		0.00819	1	06/11/2021 04:51	WG1686439
Ethylbenzene	1.41		0.00410	1	06/11/2021 04:51	WG1686439
Total Xylenes	0.154		0.0107	1	06/11/2021 04:51	WG1686439
(S) Toluene-d8	*71.7*	J2	*75.0-131*		*06/11/2021 04:51*	WG1686439
(S) 4-Bromofluorobenzene	*118*		*67.0-138*		*06/11/2021 04:51*	WG1686439
(S) 1,2-Dichloroethane-d4	*124*		*70.0-130*		*06/11/2021 04:51*	WG1686439

Sample Narrative:

L1363323-05 WG1686439: Surrogate failure due to matrix interference.

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	45.3		5.17	1	06/11/2021 14:46	WG1686301
Residual Range Organics (RRO)	ND		12.9	1	06/11/2021 14:46	WG1686301
(S) o-Terphenyl	*46.7*		*18.0-148*		*06/11/2021 14:46*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	43.4		5.17	1	06/15/2021 11:59	WG1688684
Residual Range Organics (RRO)	ND		12.9	1	06/15/2021 11:59	WG1688684
(S) o-Terphenyl	*51.7*		*18.0-148*		*06/15/2021 11:59*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	0.177		0.0258	1	06/10/2021 00:40	WG1685557
1-Methylnaphthalene	0.305		0.0258	1	06/10/2021 00:40	WG1685557
2-Methylnaphthalene	0.262		0.0258	1	06/10/2021 00:40	WG1685557
(S) p-Terphenyl-d14	*95.9*		*23.0-120*		*06/10/2021 00:40*	WG1685557
(S) Nitrobenzene-d5	*0.000*	J2	*14.0-149*		*06/10/2021 00:40*	WG1685557
(S) 2-Fluorobiphenyl	*66.3*		*34.0-125*		*06/10/2021 00:40*	WG1685557

Sample Narrative:

L1363323-05 WG1685557: Surrogate failure due to matrix interference

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	96.5		1	06/10/2021 12:50	WG1685227

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		2.70	25	06/10/2021 19:45	WG1686152
(S) a,a,a-Trifluorotoluene(FID)	*97.9*		*77.0-120*		*06/10/2021 19:45*	WG1686152

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00107	1	06/11/2021 05:10	WG1686439
Toluene	ND		0.00537	1	06/11/2021 05:10	WG1686439
Ethylbenzene	0.00370		0.00269	1	06/11/2021 05:10	WG1686439
Total Xylenes	ND		0.00698	1	06/11/2021 05:10	WG1686439
(S) Toluene-d8	*105*		*75.0-131*		*06/11/2021 05:10*	WG1686439
(S) 4-Bromofluorobenzene	*81.1*		*67.0-138*		*06/11/2021 05:10*	WG1686439
(S) 1,2-Dichloroethane-d4	*102*		*70.0-130*		*06/11/2021 05:10*	WG1686439

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.14	1	06/11/2021 14:59	WG1686301
Residual Range Organics (RRO)	ND		10.4	1	06/11/2021 14:59	WG1686301
(S) o-Terphenyl	*37.2*		*18.0-148*		*06/11/2021 14:59*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.14	1	06/11/2021 14:59	WG1688684
Residual Range Organics (RRO)	ND		10.4	1	06/11/2021 14:59	WG1688684
(S) o-Terphenyl	*37.2*		*18.0-148*		*06/11/2021 14:59*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0207	1	06/10/2021 01:00	WG1685557
1-Methylnaphthalene	ND		0.0207	1	06/10/2021 01:00	WG1685557
2-Methylnaphthalene	ND		0.0207	1	06/10/2021 01:00	WG1685557
(S) p-Terphenyl-d14	*115*		*23.0-120*		*06/10/2021 01:00*	WG1685557
(S) Nitrobenzene-d5	*70.5*		*14.0-149*		*06/10/2021 01:00*	WG1685557
(S) 2-Fluorobiphenyl	*77.2*		*34.0-125*		*06/10/2021 01:00*	WG1685557

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	90.2		1	06/10/2021 12:10	WG1685228

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		3.10	25	06/10/2021 20:07	WG1686152
(S) a,a,a-Trifluorotoluene(FID)	*97.9*		*77.0-120*		*06/10/2021 20:07*	WG1686152

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00132	1.09	06/11/2021 05:29	WG1686439
Toluene	ND		0.00658	1.09	06/11/2021 05:29	WG1686439
Ethylbenzene	ND		0.00330	1.09	06/11/2021 05:29	WG1686439
Total Xylenes	ND		0.00855	1.09	06/11/2021 05:29	WG1686439
(S) Toluene-d8	*102*		*75.0-131*		*06/11/2021 05:29*	WG1686439
(S) 4-Bromofluorobenzene	*88.4*		*67.0-138*		*06/11/2021 05:29*	WG1686439
(S) 1,2-Dichloroethane-d4	*109*		*70.0-130*		*06/11/2021 05:29*	WG1686439

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	21.7		4.43	1	06/11/2021 16:18	WG1686301
Residual Range Organics (RRO)	84.5		11.1	1	06/11/2021 16:18	WG1686301
(S) o-Terphenyl	*30.6*		*18.0-148*		*06/11/2021 16:18*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	20.6		4.43	1	06/15/2021 12:50	WG1688684
Residual Range Organics (RRO)	87.3		11.1	1	06/15/2021 12:50	WG1688684
(S) o-Terphenyl	*28.0*		*18.0-148*		*06/15/2021 12:50*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0222	1	06/10/2021 05:20	WG1685557
1-Methylnaphthalene	ND		0.0222	1	06/10/2021 05:20	WG1685557
2-Methylnaphthalene	ND		0.0222	1	06/10/2021 05:20	WG1685557
(S) p-Terphenyl-d14	*101*		*23.0-120*		*06/10/2021 05:20*	WG1685557
(S) Nitrobenzene-d5	*62.4*		*14.0-149*		*06/10/2021 05:20*	WG1685557
(S) 2-Fluorobiphenyl	*72.6*		*34.0-125*		*06/10/2021 05:20*	WG1685557

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	88.6		1	06/10/2021 12:10	WG1685228

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	936		64.7	500	06/12/2021 14:40	WG1686815
(S) a,a,a-Trifluorotoluene(FID)	*94.7*		*77.0-120*		*06/12/2021 14:40*	WG1686815

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00129	1	06/11/2021 05:48	WG1686439
Toluene	ND		0.00645	1	06/11/2021 05:48	WG1686439
Ethylbenzene	1.97		0.00323	1	06/11/2021 05:48	WG1686439
Total Xylenes	2.47		0.00839	1	06/11/2021 05:48	WG1686439
(S) Toluene-d8	*143*	J1	*75.0-131*		*06/11/2021 05:48*	WG1686439
(S) 4-Bromofluorobenzene	*428*	J1	*67.0-138*		*06/11/2021 05:48*	WG1686439
(S) 1,2-Dichloroethane-d4	*118*		*70.0-130*		*06/11/2021 05:48*	WG1686439

Sample Narrative:

L1363323-08 WG1686439: Surrogate failure due to matrix interference.

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	186	J3 J5	4.52	1	06/11/2021 15:13	WG1686301
Residual Range Organics (RRO)	18.6		11.3	1	06/11/2021 15:13	WG1686301
(S) o-Terphenyl	*41.5*		*18.0-148*		*06/11/2021 15:13*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	180	J3 J5	4.52	1	06/15/2021 12:12	WG1688684
Residual Range Organics (RRO)	14.8		11.3	1	06/15/2021 12:12	WG1688684
(S) o-Terphenyl	*41.2*		*18.0-148*		*06/15/2021 12:12*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	0.124		0.0226	1	06/10/2021 01:20	WG1685557
1-Methylnaphthalene	0.217		0.0226	1	06/10/2021 01:20	WG1685557
2-Methylnaphthalene	ND		0.0226	1	06/10/2021 01:20	WG1685557
(S) p-Terphenyl-d14	*103*		*23.0-120*		*06/10/2021 01:20*	WG1685557
(S) Nitrobenzene-d5	*0.000*	J2	*14.0-149*		*06/10/2021 01:20*	WG1685557
(S) 2-Fluorobiphenyl	*66.2*		*34.0-125*		*06/10/2021 01:20*	WG1685557

Sample Narrative:

L1363323-08 WG1685557: Surrogate failure due to matrix interference

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	93.3		1	06/10/2021 12:10	WG1685228

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	20.3		2.91	25	06/14/2021 02:44	WG1687682
(S) a,a,a-Trifluorotoluene(FID)	*90.5*		*77.0-120*		*06/14/2021 02:44*	WG1687682

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00116	1	06/11/2021 06:07	WG1686439
Toluene	ND		0.00582	1	06/11/2021 06:07	WG1686439
Ethylbenzene	ND		0.00291	1	06/11/2021 06:07	WG1686439
Total Xylenes	ND		0.00757	1	06/11/2021 06:07	WG1686439
(S) Toluene-d8	*95.9*		*75.0-131*		*06/11/2021 06:07*	WG1686439
(S) 4-Bromofluorobenzene	*90.8*		*67.0-138*		*06/11/2021 06:07*	WG1686439
(S) 1,2-Dichloroethane-d4	*99.3*		*70.0-130*		*06/11/2021 06:07*	WG1686439

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.29	1	06/11/2021 15:52	WG1686301
Residual Range Organics (RRO)	ND		10.7	1	06/11/2021 15:52	WG1686301
(S) o-Terphenyl	*47.4*		*18.0-148*		*06/11/2021 15:52*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.29	1	06/11/2021 15:52	WG1688684
Residual Range Organics (RRO)	ND		10.7	1	06/11/2021 15:52	WG1688684
(S) o-Terphenyl	*47.4*		*18.0-148*		*06/11/2021 15:52*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0214	1	06/10/2021 01:40	WG1685557
1-Methylnaphthalene	ND		0.0214	1	06/10/2021 01:40	WG1685557
2-Methylnaphthalene	ND		0.0214	1	06/10/2021 01:40	WG1685557
(S) p-Terphenyl-d14	*107*		*23.0-120*		*06/10/2021 01:40*	WG1685557
(S) Nitrobenzene-d5	*64.5*		*14.0-149*		*06/10/2021 01:40*	WG1685557
(S) 2-Fluorobiphenyl	*73.8*		*34.0-125*		*06/10/2021 01:40*	WG1685557

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Acetone	ND		50.0	1	06/14/2021 21:41	WG1688024
Acrolein	ND	C3	50.0	1	06/14/2021 21:41	WG1688024
Acrylonitrile	ND		10.0	1	06/14/2021 21:41	WG1688024
Benzene	ND		1.00	1	06/14/2021 21:41	WG1688024
Bromobenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
Bromodichloromethane	ND		1.00	1	06/14/2021 21:41	WG1688024
Bromoform	ND		1.00	1	06/14/2021 21:41	WG1688024
Bromomethane	ND		5.00	1	06/14/2021 21:41	WG1688024
n-Butylbenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
sec-Butylbenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
tert-Butylbenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
Carbon tetrachloride	ND		1.00	1	06/14/2021 21:41	WG1688024
Chlorobenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
Chlorodibromomethane	ND		1.00	1	06/14/2021 21:41	WG1688024
Chloroethane	ND		5.00	1	06/14/2021 21:41	WG1688024
Chloroform	ND		5.00	1	06/14/2021 21:41	WG1688024
Chloromethane	ND		2.50	1	06/14/2021 21:41	WG1688024
2-Chlorotoluene	ND		1.00	1	06/14/2021 21:41	WG1688024
4-Chlorotoluene	ND		1.00	1	06/14/2021 21:41	WG1688024
1,2-Dibromo-3-Chloropropane	ND		5.00	1	06/14/2021 21:41	WG1688024
1,2-Dibromoethane	ND		1.00	1	06/14/2021 21:41	WG1688024
Dibromomethane	ND		1.00	1	06/14/2021 21:41	WG1688024
1,2-Dichlorobenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
1,3-Dichlorobenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
1,4-Dichlorobenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
Dichlorodifluoromethane	ND		5.00	1	06/14/2021 21:41	WG1688024
1,1-Dichloroethane	ND		1.00	1	06/14/2021 21:41	WG1688024
1,2-Dichloroethane	ND		1.00	1	06/14/2021 21:41	WG1688024
1,1-Dichloroethene	ND		1.00	1	06/14/2021 21:41	WG1688024
cis-1,2-Dichloroethene	ND		1.00	1	06/14/2021 21:41	WG1688024
trans-1,2-Dichloroethene	ND		1.00	1	06/14/2021 21:41	WG1688024
1,2-Dichloropropane	ND		1.00	1	06/14/2021 21:41	WG1688024
1,1-Dichloropropene	ND		1.00	1	06/14/2021 21:41	WG1688024
1,3-Dichloropropane	ND		1.00	1	06/14/2021 21:41	WG1688024
cis-1,3-Dichloropropene	ND		1.00	1	06/14/2021 21:41	WG1688024
trans-1,3-Dichloropropene	ND		1.00	1	06/14/2021 21:41	WG1688024
2,2-Dichloropropane	ND		1.00	1	06/14/2021 21:41	WG1688024
Di-isopropyl ether	ND		1.00	1	06/14/2021 21:41	WG1688024
Ethylbenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
Hexachloro-1,3-butadiene	ND		1.00	1	06/14/2021 21:41	WG1688024
Isopropylbenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
p-Isopropyltoluene	ND		1.00	1	06/14/2021 21:41	WG1688024
2-Butanone (MEK)	ND		10.0	1	06/14/2021 21:41	WG1688024
Methylene Chloride	ND		5.00	1	06/14/2021 21:41	WG1688024
4-Methyl-2-pentanone (MIBK)	ND		10.0	1	06/14/2021 21:41	WG1688024
Methyl tert-butyl ether	ND		1.00	1	06/14/2021 21:41	WG1688024
Naphthalene	ND		5.00	1	06/14/2021 21:41	WG1688024
n-Propylbenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
Styrene	ND		1.00	1	06/14/2021 21:41	WG1688024
1,1,1,2-Tetrachloroethane	ND		1.00	1	06/14/2021 21:41	WG1688024
1,1,2,2-Tetrachloroethane	ND		1.00	1	06/14/2021 21:41	WG1688024
Tetrachloroethene	ND		1.00	1	06/14/2021 21:41	WG1688024
Toluene	ND		1.00	1	06/14/2021 21:41	WG1688024
1,2,3-Trichlorobenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
1,2,4-Trichlorobenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
1,1,1-Trichloroethane	ND		1.00	1	06/14/2021 21:41	WG1688024

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
1,1,2-Trichloroethane	ND		1.00	1	06/14/2021 21:41	WG1688024
Trichloroethene	ND		1.00	1	06/14/2021 21:41	WG1688024
Trichlorofluoromethane	ND		5.00	1	06/14/2021 21:41	WG1688024
1,2,3-Trichloropropane	ND		2.50	1	06/14/2021 21:41	WG1688024
1,2,4-Trimethylbenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
1,3,5-Trimethylbenzene	ND		1.00	1	06/14/2021 21:41	WG1688024
Vinyl chloride	ND		1.00	1	06/14/2021 21:41	WG1688024
Xylenes, Total	ND		3.00	1	06/14/2021 21:41	WG1688024
(S) Toluene-d8	*102*		*80.0-120*		*06/14/2021 21:41*	WG1688024
(S) 4-Bromofluorobenzene	*101*		*77.0-126*		*06/14/2021 21:41*	WG1688024
(S) 1,2-Dichloroethane-d4	*103*		*70.0-130*		*06/14/2021 21:41*	WG1688024

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	92.3		1	06/10/2021 12:10	WG1685228

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		2.97	25	06/12/2021 13:11	WG1686815
(S) a,a,a-Trifluorotoluene(FID)	*91.1*		*77.0-120*		*06/12/2021 13:11*	WG1686815

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00117	1	06/11/2021 06:27	WG1686439
Toluene	ND		0.00583	1	06/11/2021 06:27	WG1686439
Ethylbenzene	ND		0.00292	1	06/11/2021 06:27	WG1686439
Total Xylenes	ND		0.00758	1	06/11/2021 06:27	WG1686439
(S) Toluene-d8	*102*		*75.0-131*		*06/11/2021 06:27*	WG1686439
(S) 4-Bromofluorobenzene	*88.9*		*67.0-138*		*06/11/2021 06:27*	WG1686439
(S) 1,2-Dichloroethane-d4	*109*		*70.0-130*		*06/11/2021 06:27*	WG1686439

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.33	1	06/11/2021 16:05	WG1686301
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 16:05	WG1686301
(S) o-Terphenyl	*44.2*		*18.0-148*		*06/11/2021 16:05*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.33	1	06/11/2021 16:05	WG1688684
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 16:05	WG1688684
(S) o-Terphenyl	*44.2*		*18.0-148*		*06/11/2021 16:05*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0217	1	06/10/2021 02:00	WG1685557
1-Methylnaphthalene	ND		0.0217	1	06/10/2021 02:00	WG1685557
2-Methylnaphthalene	ND		0.0217	1	06/10/2021 02:00	WG1685557
(S) p-Terphenyl-d14	*113*		*23.0-120*		*06/10/2021 02:00*	WG1685557
(S) Nitrobenzene-d5	*69.2*		*14.0-149*		*06/10/2021 02:00*	WG1685557
(S) 2-Fluorobiphenyl	*74.9*		*34.0-125*		*06/10/2021 02:00*	WG1685557

Cp Tc Ss Cn Sr Qc Gl Al Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	93.5		1	06/10/2021 12:10	WG1685228

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		3.01	26.5	06/12/2021 13:34	WG1686815
(S) a,a,a-Trifluorotoluene(FID)	*90.6*		*77.0-120*		*06/12/2021 13:34*	WG1686815

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00114	1	06/11/2021 06:46	WG1686439
Toluene	ND		0.00572	1	06/11/2021 06:46	WG1686439
Ethylbenzene	ND		0.00286	1	06/11/2021 06:46	WG1686439
Total Xylenes	ND		0.00744	1	06/11/2021 06:46	WG1686439
(S) Toluene-d8	*103*		*75.0-131*		*06/11/2021 06:46*	WG1686439
(S) 4-Bromofluorobenzene	*90.2*		*67.0-138*		*06/11/2021 06:46*	WG1686439
(S) 1,2-Dichloroethane-d4	*102*		*70.0-130*		*06/11/2021 06:46*	WG1686439

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	13.9		4.28	1	06/11/2021 17:37	WG1686301
Residual Range Organics (RRO)	59.2		10.7	1	06/11/2021 17:37	WG1686301
(S) o-Terphenyl	*36.9*		*18.0-148*		*06/11/2021 17:37*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	10.2		4.28	1	06/29/2021 15:15	WG1688684
Residual Range Organics (RRO)	46.3		10.7	1	06/29/2021 15:15	WG1688684
(S) o-Terphenyl	*31.2*		*18.0-148*		*06/29/2021 15:15*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0214	1	06/10/2021 02:20	WG1685557
1-Methylnaphthalene	ND		0.0214	1	06/10/2021 02:20	WG1685557
2-Methylnaphthalene	ND		0.0214	1	06/10/2021 02:20	WG1685557
(S) p-Terphenyl-d14	*109*		*23.0-120*		*06/10/2021 02:20*	WG1685557
(S) Nitrobenzene-d5	*71.2*		*14.0-149*		*06/10/2021 02:20*	WG1685557
(S) 2-Fluorobiphenyl	*78.3*		*34.0-125*		*06/10/2021 02:20*	WG1685557

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	90.7		1	06/10/2021 12:10	WG1685228

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		3.08	25	06/12/2021 13:56	WG1686815
(S) a,a,a-Trifluorotoluene(FID)	*90.8*		*77.0-120*		*06/12/2021 13:56*	WG1686815

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00123	1	06/11/2021 02:03	WG1686512
Toluene	ND		0.00616	1	06/11/2021 02:03	WG1686512
Ethylbenzene	ND		0.00308	1	06/14/2021 06:06	WG1687881
Total Xylenes	ND		0.00801	1	06/14/2021 06:06	WG1687881
(S) Toluene-d8	*111*		*75.0-131*		*06/11/2021 02:03*	WG1686512
(S) Toluene-d8	*106*		*75.0-131*		*06/14/2021 06:06*	WG1687881
(S) 4-Bromofluorobenzene	*103*		*67.0-138*		*06/11/2021 02:03*	WG1686512
(S) 4-Bromofluorobenzene	*97.2*		*67.0-138*		*06/14/2021 06:06*	WG1687881
(S) 1,2-Dichloroethane-d4	*93.3*		*70.0-130*		*06/11/2021 02:03*	WG1686512
(S) 1,2-Dichloroethane-d4	*90.9*		*70.0-130*		*06/14/2021 06:06*	WG1687881

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	4.75		4.41	1	06/13/2021 11:59	WG1686301
Residual Range Organics (RRO)	16.5		11.0	1	06/13/2021 11:59	WG1686301
(S) o-Terphenyl	*43.8*		*18.0-148*		*06/13/2021 11:59*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.41	1	06/29/2021 14:49	WG1688684
Residual Range Organics (RRO)	ND		11.0	1	06/29/2021 14:49	WG1688684
(S) o-Terphenyl	*25.6*		*18.0-148*		*06/29/2021 14:49*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0221	1	06/10/2021 02:40	WG1685557
1-Methylnaphthalene	ND		0.0221	1	06/10/2021 02:40	WG1685557
2-Methylnaphthalene	ND		0.0221	1	06/10/2021 02:40	WG1685557
(S) p-Terphenyl-d14	*107*		*23.0-120*		*06/10/2021 02:40*	WG1685557
(S) Nitrobenzene-d5	*67.5*		*14.0-149*		*06/10/2021 02:40*	WG1685557
(S) 2-Fluorobiphenyl	*72.6*		*34.0-125*		*06/10/2021 02:40*	WG1685557

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	92.3		1	06/10/2021 12:10	WG1685228

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		2.99	25	06/12/2021 14:18	WG1686815
(S) a,a,a-Trifluorotoluene(FID)	*90.1*		*77.0-120*		*06/12/2021 14:18*	WG1686815

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00120	1	06/11/2021 02:22	WG1686512
Toluene	ND		0.00598	1	06/11/2021 02:22	WG1686512
Ethylbenzene	ND		0.00299	1	06/14/2021 06:25	WG1687881
Total Xylenes	ND		0.00777	1	06/14/2021 06:25	WG1687881
(S) Toluene-d8	*110*		*75.0-131*		*06/11/2021 02:22*	WG1686512
(S) Toluene-d8	*106*		*75.0-131*		*06/14/2021 06:25*	WG1687881
(S) 4-Bromofluorobenzene	*109*		*67.0-138*		*06/11/2021 02:22*	WG1686512
(S) 4-Bromofluorobenzene	*99.7*		*67.0-138*		*06/14/2021 06:25*	WG1687881
(S) 1,2-Dichloroethane-d4	*95.9*		*70.0-130*		*06/11/2021 02:22*	WG1686512
(S) 1,2-Dichloroethane-d4	*91.4*		*70.0-130*		*06/14/2021 06:25*	WG1687881

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.34	1	06/11/2021 18:03	WG1686301
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 18:03	WG1686301
(S) o-Terphenyl	*33.7*		*18.0-148*		*06/11/2021 18:03*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.34	1	06/11/2021 18:03	WG1688684
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 18:03	WG1688684
(S) o-Terphenyl	*33.7*		*18.0-148*		*06/11/2021 18:03*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0217	1	06/10/2021 03:00	WG1685557
1-Methylnaphthalene	ND		0.0217	1	06/10/2021 03:00	WG1685557
2-Methylnaphthalene	ND		0.0217	1	06/10/2021 03:00	WG1685557
(S) p-Terphenyl-d14	*108*		*23.0-120*		*06/10/2021 03:00*	WG1685557
(S) Nitrobenzene-d5	*61.5*		*14.0-149*		*06/10/2021 03:00*	WG1685557
(S) 2-Fluorobiphenyl	*71.4*		*34.0-125*		*06/10/2021 03:00*	WG1685557

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	69.7		1	06/10/2021 12:10	WG1685228

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	1190		97.3	500	06/12/2021 15:03	WG1686815
(S) a,a,a-Trifluorotoluene(FID)	*92.2*		*77.0-120*		*06/12/2021 15:03*	WG1686815

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00195	1	06/11/2021 02:41	WG1686512
Toluene	ND		0.00973	1	06/11/2021 02:41	WG1686512
Ethylbenzene	ND		0.00486	1	06/11/2021 02:41	WG1686512
Total Xylenes	0.247		0.0126	1	06/11/2021 02:41	WG1686512
(S) Toluene-d8	*126*		*75.0-131*		*06/11/2021 02:41*	WG1686512
(S) 4-Bromofluorobenzene	*143*	J1	*67.0-138*		*06/11/2021 02:41*	WG1686512
(S) 1,2-Dichloroethane-d4	*95.5*		*70.0-130*		*06/11/2021 02:41*	WG1686512

Sample Narrative:

L1363323-15 WG1686512: Surrogate failure due to matrix interference

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	93.0		5.74	1	06/11/2021 18:17	WG1686301
Residual Range Organics (RRO)	ND		14.4	1	06/11/2021 18:17	WG1686301
(S) o-Terphenyl	*44.9*		*18.0-148*		*06/11/2021 18:17*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	74.1		5.74	1	06/29/2021 13:57	WG1688684
Residual Range Organics (RRO)	ND		14.4	1	06/29/2021 13:57	WG1688684
(S) o-Terphenyl	*39.2*		*18.0-148*		*06/29/2021 13:57*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	0.0879		0.0287	1	06/10/2021 03:20	WG1685557
1-Methylnaphthalene	0.0403		0.0287	1	06/10/2021 03:20	WG1685557
2-Methylnaphthalene	0.0508		0.0287	1	06/10/2021 03:20	WG1685557
(S) p-Terphenyl-d14	*86.7*		*23.0-120*		*06/10/2021 03:20*	WG1685557
(S) Nitrobenzene-d5	*70.5*		*14.0-149*		*06/10/2021 03:20*	WG1685557
(S) 2-Fluorobiphenyl	*65.2*		*34.0-125*		*06/10/2021 03:20*	WG1685557

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	92.7		1	06/10/2021 12:10	WG1685228

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		2.90	25	06/13/2021 14:48	WG1687392
(S) a,a,a-Trifluorotoluene(FID)	*93.5*		*77.0-120*		*06/13/2021 14:48*	WG1687392

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00116	1	06/11/2021 03:26	WG1686512
Toluene	ND		0.00580	1	06/11/2021 03:26	WG1686512
Ethylbenzene	0.0144		0.00290	1	06/14/2021 06:44	WG1687881
Total Xylenes	0.00935		0.00754	1	06/14/2021 06:44	WG1687881
(S) Toluene-d8	*114*		*75.0-131*		*06/11/2021 03:26*	WG1686512
(S) Toluene-d8	*106*		*75.0-131*		*06/14/2021 06:44*	WG1687881
(S) 4-Bromofluorobenzene	*110*		*67.0-138*		*06/11/2021 03:26*	WG1686512
(S) 4-Bromofluorobenzene	*94.1*		*67.0-138*		*06/14/2021 06:44*	WG1687881
(S) 1,2-Dichloroethane-d4	*96.1*		*70.0-130*		*06/11/2021 03:26*	WG1686512
(S) 1,2-Dichloroethane-d4	*87.6*		*70.0-130*		*06/14/2021 06:44*	WG1687881

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.32	1	06/11/2021 18:30	WG1686301
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 18:30	WG1686301
(S) o-Terphenyl	*45.3*		*18.0-148*		*06/11/2021 18:30*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.32	1	06/11/2021 18:30	WG1688684
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 18:30	WG1688684
(S) o-Terphenyl	*45.3*		*18.0-148*		*06/11/2021 18:30*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0216	1	06/10/2021 03:40	WG1685557
1-Methylnaphthalene	ND		0.0216	1	06/10/2021 03:40	WG1685557
2-Methylnaphthalene	ND		0.0216	1	06/10/2021 03:40	WG1685557
(S) p-Terphenyl-d14	*115*		*23.0-120*		*06/10/2021 03:40*	WG1685557
(S) Nitrobenzene-d5	*70.3*		*14.0-149*		*06/10/2021 03:40*	WG1685557
(S) 2-Fluorobiphenyl	*78.5*		*34.0-125*		*06/10/2021 03:40*	WG1685557

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	92.4		1	06/10/2021 12:10	WG1685228

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		2.96	25	06/13/2021 15:10	WG1687392
(S) a,a,a-Trifluorotoluene(FID)	*92.7*		*77.0-120*		*06/13/2021 15:10*	WG1687392

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00119	1	06/11/2021 04:16	WG1686512
Toluene	ND		0.00593	1	06/11/2021 04:16	WG1686512
Ethylbenzene	ND		0.00296	1	06/11/2021 04:16	WG1686512
Total Xylenes	ND		0.00771	1	06/11/2021 04:16	WG1686512
(S) Toluene-d8	*113*		*75.0-131*		*06/11/2021 04:16*	WG1686512
(S) 4-Bromofluorobenzene	*112*		*67.0-138*		*06/11/2021 04:16*	WG1686512
(S) 1,2-Dichloroethane-d4	*94.0*		*70.0-130*		*06/11/2021 04:16*	WG1686512

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.33	1	06/11/2021 18:43	WG1686301
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 18:43	WG1686301
(S) o-Terphenyl	*51.7*		*18.0-148*		*06/11/2021 18:43*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.33	1	06/11/2021 18:43	WG1688684
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 18:43	WG1688684
(S) o-Terphenyl	*51.7*		*18.0-148*		*06/11/2021 18:43*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0216	1	06/10/2021 04:00	WG1685557
1-Methylnaphthalene	ND		0.0216	1	06/10/2021 04:00	WG1685557
2-Methylnaphthalene	ND		0.0216	1	06/10/2021 04:00	WG1685557
(S) p-Terphenyl-d14	*107*		*23.0-120*		*06/10/2021 04:00*	WG1685557
(S) Nitrobenzene-d5	*68.1*		*14.0-149*		*06/10/2021 04:00*	WG1685557
(S) 2-Fluorobiphenyl	*72.4*		*34.0-125*		*06/10/2021 04:00*	WG1685557

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	92.3		1	06/09/2021 09:23	WG1685294

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		2.95	25	06/13/2021 15:32	WG1687392
(S) a,a,a-Trifluorotoluene(FID)	*93.5*		*77.0-120*		*06/13/2021 15:32*	WG1687392

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00118	1	06/11/2021 04:35	WG1686512
Toluene	ND		0.00591	1	06/11/2021 04:35	WG1686512
Ethylbenzene	ND		0.00295	1	06/11/2021 04:35	WG1686512
Total Xylenes	ND		0.00768	1	06/11/2021 04:35	WG1686512
(S) Toluene-d8	*113*		*75.0-131*		*06/11/2021 04:35*	WG1686512
(S) 4-Bromofluorobenzene	*111*		*67.0-138*		*06/11/2021 04:35*	WG1686512
(S) 1,2-Dichloroethane-d4	*97.7*		*70.0-130*		*06/11/2021 04:35*	WG1686512

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.34	1	06/11/2021 18:56	WG1686301
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 18:56	WG1686301
(S) o-Terphenyl	*32.6*		*18.0-148*		*06/11/2021 18:56*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.34	1	06/11/2021 18:56	WG1688684
Residual Range Organics (RRO)	ND		10.8	1	06/11/2021 18:56	WG1688684
(S) o-Terphenyl	*32.6*		*18.0-148*		*06/11/2021 18:56*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0217	1	06/10/2021 04:20	WG1685557
1-Methylnaphthalene	ND		0.0217	1	06/10/2021 04:20	WG1685557
2-Methylnaphthalene	ND		0.0217	1	06/10/2021 04:20	WG1685557
(S) p-Terphenyl-d14	*116*		*23.0-120*		*06/10/2021 04:20*	WG1685557
(S) Nitrobenzene-d5	*68.6*		*14.0-149*		*06/10/2021 04:20*	WG1685557
(S) 2-Fluorobiphenyl	*76.9*		*34.0-125*		*06/10/2021 04:20*	WG1685557

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	93.9		1	06/09/2021 09:23	WG1685294

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	166		2.86	25	06/13/2021 15:54	WG1687392
(S) a,a,a-Trifluorotoluene(FID)	*92.1*		*77.0-120*		*06/13/2021 15:54*	WG1687392

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00114	1	06/11/2021 04:55	WG1686512
Toluene	ND		0.00572	1	06/11/2021 04:55	WG1686512
Ethylbenzene	0.00719		0.00286	1	06/11/2021 04:55	WG1686512
Total Xylenes	ND		0.00744	1	06/11/2021 04:55	WG1686512
(S) Toluene-d8	*125*		*75.0-131*		*06/11/2021 04:55*	WG1686512
(S) 4-Bromofluorobenzene	*183*	J1	*67.0-138*		*06/11/2021 04:55*	WG1686512
(S) 1,2-Dichloroethane-d4	*102*		*70.0-130*		*06/11/2021 04:55*	WG1686512

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	109		4.26	1	06/11/2021 19:09	WG1686301
Residual Range Organics (RRO)	ND		10.6	1	06/11/2021 19:09	WG1686301
(S) o-Terphenyl	*44.6*		*18.0-148*		*06/11/2021 19:09*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	74.8		4.26	1	06/29/2021 14:23	WG1688684
Residual Range Organics (RRO)	ND		10.6	1	06/29/2021 14:23	WG1688684
(S) o-Terphenyl	*26.7*		*18.0-148*		*06/29/2021 14:23*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	0.0407		0.0213	1	06/10/2021 04:40	WG1685557
1-Methylnaphthalene	ND		0.0213	1	06/10/2021 04:40	WG1685557
2-Methylnaphthalene	ND		0.0213	1	06/10/2021 04:40	WG1685557
(S) p-Terphenyl-d14	*114*		*23.0-120*		*06/10/2021 04:40*	WG1685557
(S) Nitrobenzene-d5	*392*	J1	*14.0-149*		*06/10/2021 04:40*	WG1685557
(S) 2-Fluorobiphenyl	*71.7*		*34.0-125*		*06/10/2021 04:40*	WG1685557

Sample Narrative:

L1363323-19 WG1685557: Surrogate failure due to matrix interference

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	93.9		1	06/09/2021 09:23	WG1685294

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		2.87	25	06/13/2021 16:16	WG1687392
(S) a,a,a-Trifluorotoluene(FID)	*93.0*		*77.0-120*		*06/13/2021 16:16*	WG1687392

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00115	1	06/11/2021 05:14	WG1686512
Toluene	ND		0.00574	1	06/11/2021 05:14	WG1686512
Ethylbenzene	ND		0.00287	1	06/11/2021 05:14	WG1686512
Total Xylenes	ND		0.00746	1	06/11/2021 05:14	WG1686512
(S) Toluene-d8	*113*		*75.0-131*		*06/11/2021 05:14*	WG1686512
(S) 4-Bromofluorobenzene	*109*		*67.0-138*		*06/11/2021 05:14*	WG1686512
(S) 1,2-Dichloroethane-d4	*86.5*		*70.0-130*		*06/11/2021 05:14*	WG1686512

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.26	1	06/11/2021 19:22	WG1686301
Residual Range Organics (RRO)	ND		10.7	1	06/11/2021 19:22	WG1686301
(S) o-Terphenyl	*44.7*		*18.0-148*		*06/11/2021 19:22*	WG1686301

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		4.26	1	06/11/2021 19:22	WG1688684
Residual Range Organics (RRO)	ND		10.7	1	06/11/2021 19:22	WG1688684
(S) o-Terphenyl	*44.7*		*18.0-148*		*06/11/2021 19:22*	WG1688684

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM/8270E-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0213	1	06/10/2021 05:00	WG1685557
1-Methylnaphthalene	ND		0.0213	1	06/10/2021 05:00	WG1685557
2-Methylnaphthalene	ND		0.0213	1	06/10/2021 05:00	WG1685557
(S) p-Terphenyl-d14	*118*		*23.0-120*		*06/10/2021 05:00*	WG1685557
(S) Nitrobenzene-d5	*71.5*		*14.0-149*		*06/10/2021 05:00*	WG1685557
(S) 2-Fluorobiphenyl	*75.4*		*34.0-125*		*06/10/2021 05:00*	WG1685557

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	88.7		1	06/09/2021 09:23	WG1685294

Mercury by Method 7471B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Mercury	ND		0.0451	1	06/10/2021 18:14	WG1685633

Metals (ICP) by Method 6010D

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Arsenic	ND		2.26	1	06/16/2021 14:43	WG1685700
Barium	159		0.564	1	06/16/2021 14:43	WG1685700
Cadmium	ND		0.564	1	06/16/2021 14:43	WG1685700
Chromium	43.4		1.13	1	06/16/2021 14:43	WG1685700
Lead	7.26		0.564	1	06/16/2021 14:43	WG1685700
Selenium	ND		2.26	1	06/16/2021 14:43	WG1685700
Silver	ND		1.13	1	06/16/2021 14:43	WG1685700

QUALITY CONTROL SUMMARY

L1363323-01,02,03,04,05,06

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3666076-1 06/10/21 12:50

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000			

L1363323-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1363323-01 06/10/21 12:50 • (DUP) R3666076-3 06/10/21 12:50

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	90.0	89.6	1	0.457		10

Laboratory Control Sample (LCS)

(LCS) R3666076-2 06/10/21 12:50

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	100	85.0-115	

Method Blank (MB)

(MB) R3666070-1 06/10/21 12:10

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000			

L1363323-12 Original Sample (OS) • Duplicate (DUP)

(OS) L1363323-12 06/10/21 12:10 • (DUP) R3666070-3 06/10/21 12:10

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	93.5	93.8	1	0.324		10

Laboratory Control Sample (LCS)

(LCS) R3666070-2 06/10/21 12:10

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	100	85.0-115	

Method Blank (MB)

(MB) R3665212-1 06/09/21 09:23

	MB Result	MB Qualifier	MB MDL	MB RDL
Analyte	%		%	%
Total Solids	0.000			

L1363107-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1363107-03 06/09/21 09:23 • (DUP) R3665212-3 06/09/21 09:23

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	%	%		%		%
Total Solids	84.6	84.0	1	0.776		10

Laboratory Control Sample (LCS)

(LCS) R3665212-2 06/09/21 09:23

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Analyte	%	%	%	%	
Total Solids	50.0	50.0	100	85.0-115	

Method Blank (MB)

(MB) R3665822-1 06/10/21 16:23

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Mercury	U		0.0180	0.0400

Laboratory Control Sample (LCS)

(LCS) R3665822-2 06/10/21 16:55

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Mercury	0.500	0.559	112	80.0-120	

L1362557-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1362557-06 06/10/21 16:58 • (MS) R3665822-3 06/10/21 17:00 • (MSD) R3665822-4 06/10/21 17:03

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Mercury	0.578	ND	0.617	0.608	107	105	1	75.0-125			1.46	20

Method Blank (MB)

(MB) R3668269-1 06/16/21 13:15

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Arsenic	U		0.518	2.00
Barium	U		0.0852	0.500
Cadmium	U		0.0471	0.500
Chromium	U		0.133	1.00
Lead	U		0.208	0.500
Selenium	U		0.764	2.00
Silver	U		0.127	1.00

Laboratory Control Sample (LCS)

(LCS) R3668269-2 06/16/21 13:17

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Arsenic	100	96.4	96.4	80.0-120	
Barium	100	102	102	80.0-120	
Cadmium	100	98.0	98.0	80.0-120	
Chromium	100	99.3	99.3	80.0-120	
Lead	100	98.8	98.8	80.0-120	
Selenium	100	99.3	99.3	80.0-120	
Silver	20.0	19.5	97.4	80.0-120	

L1362797-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1362797-05 06/16/21 13:20 • (MS) R3668269-5 06/16/21 13:29 • (MSD) R3668269-6 06/16/21 13:32

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Arsenic	122	7.03	129	119	99.7	91.6	1	75.0-125			7.93	20
Barium	122	54.3	186	179	108	102	1	75.0-125			4.06	20
Cadmium	122	ND	124	114	101	93.2	1	75.0-125			8.12	20
Chromium	122	36.3	159	146	100	89.7	1	75.0-125			8.32	20
Lead	122	19.6	152	138	109	97.2	1	75.0-125			9.63	20
Selenium	122	ND	125	116	102	94.7	1	75.0-125			7.37	20
Silver	24.5	ND	25.1	22.9	103	93.5	1	75.0-125			9.33	20

Method Blank (MB)

(MB) R3665979-2 06/10/21 14:57

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Gasoline Range Organics-NWTPH	U		0.0339	0.100
(S) a,a,a-Trifluorotoluene(FID)	*98.2*			*77.0-120*

Laboratory Control Sample (LCS)

(LCS) R3665979-1 06/10/21 13:43

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Gasoline Range Organics-NWTPH	5.50	5.12	93.1	71.0-124	
(S) a,a,a-Trifluorotoluene(FID)			*104*	*77.0-120*	

Method Blank (MB)

(MB) R3666507-2 06/12/21 11:20

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Gasoline Range Organics-NWTPH	U		0.0339	0.100
(S) a,a,a-Trifluorotoluene(FID)	*90.6*			*77.0-120*

Laboratory Control Sample (LCS)

(LCS) R3666507-1 06/12/21 10:35

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Gasoline Range Organics-NWTPH	5.50	5.02	91.3	71.0-124	
(S) a,a,a-Trifluorotoluene(FID)			*105*	*77.0-120*	

Method Blank (MB)

(MB) R3666979-1 06/13/21 12:57

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Gasoline Range Organics-NWTPH	U		0.0339	0.100
(S) a,a,a-Trifluorotoluene(FID)	*93.3*			*77.0-120*

Laboratory Control Sample (LCS)

(LCS) R3666979-2 06/13/21 13:19

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Gasoline Range Organics-NWTPH	5.50	5.21	94.7	71.0-124	
(S) a,a,a-Trifluorotoluene(FID)			*97.7*	*77.0-120*	

Method Blank (MB)

(MB) R3667524-2 06/14/21 01:35

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Gasoline Range Organics-NWTPH	U		0.0339	0.100
(S) a,a,a-Trifluorotoluene(FID)	*92.2*			*77.0-120*

Laboratory Control Sample (LCS)

(LCS) R3667524-1 06/14/21 00:51

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Gasoline Range Organics-NWTPH	5.50	5.25	95.5	71.0-124	
(S) a,a,a-Trifluorotoluene(FID)			*105*	*77.0-120*	

Method Blank (MB)

(MB) R3667135-2 06/11/21 00:24

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000467	0.00100
Ethylbenzene	U		0.000737	0.00250
Toluene	U		0.00130	0.00500
Xylenes, Total	U		0.000880	0.00650
(S) Toluene-d8	*104*			*75.0-131*
(S) 4-Bromofluorobenzene	*86.1*			*67.0-138*
(S) 1,2-Dichloroethane-d4	*94.3*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R3667135-1 06/10/21 23:27

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.125	0.111	88.8	70.0-123	
Ethylbenzene	0.125	0.100	80.0	74.0-126	
Toluene	0.125	0.106	84.8	75.0-121	
Xylenes, Total	0.375	0.322	85.9	72.0-127	
(S) Toluene-d8			*98.0*	*75.0-131*	
(S) 4-Bromofluorobenzene			*90.5*	*67.0-138*	
(S) 1,2-Dichloroethane-d4			*115*	*70.0-130*	

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3666619-3 06/10/21 21:54

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000467	0.00100
Ethylbenzene	U		0.000737	0.00250
Toluene	U		0.00130	0.00500
Xylenes, Total	U		0.000880	0.00650
(S) Toluene-d8	*115*			*75.0-131*
(S) 4-Bromofluorobenzene	*106*			*67.0-138*
(S) 1,2-Dichloroethane-d4	*87.1*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3666619-1 06/10/21 20:37 • (LCSD) R3666619-2 06/10/21 20:56

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	0.125	0.111	0.111	88.8	88.8	70.0-123			0.000	20
Ethylbenzene	0.125	0.142	0.149	114	119	74.0-126			4.81	20
Toluene	0.125	0.132	0.135	106	108	75.0-121			2.25	20
Xylenes, Total	0.375	0.412	0.411	110	110	72.0-127			0.243	20
(S) Toluene-d8				*113*	*110*	*75.0-131*				
(S) 4-Bromofluorobenzene				*104*	*105*	*67.0-138*				
(S) 1,2-Dichloroethane-d4				*93.6*	*93.5*	*70.0-130*				

L1363602-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1363602-02 06/10/21 22:51 • (MS) R3666619-4 06/11/21 05:52 • (MSD) R3666619-5 06/11/21 06:11

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzene	1.07	0.0424	0.497	1.05	42.7	94.7	8	10.0-149		J3	71.6	37
Ethylbenzene	1.07	0.156	0.613	1.58	42.9	134	8	10.0-160		J3	88.4	38
Toluene	1.07	0.695	0.790	1.60	8.85	84.7	8	10.0-156	J6	J3	67.7	38
Xylenes, Total	3.20	0.351	1.87	4.43	47.6	127	8	10.0-160		J3	81.1	38
(S) Toluene-d8					*107*	*122*		*75.0-131*				
(S) 4-Bromofluorobenzene					*90.1*	*103*		*67.0-138*				
(S) 1,2-Dichloroethane-d4					*97.2*	*102*		*70.0-130*				

Method Blank (MB)

(MB) R3667045-3 06/14/21 00:17

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Ethylbenzene	U		0.000737	0.00250
Xylenes, Total	U		0.000880	0.00650
(S) Toluene-d8	*106*			*75.0-131*
(S) 4-Bromofluorobenzene	*93.3*			*67.0-138*
(S) 1,2-Dichloroethane-d4	*87.8*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3667045-1 06/13/21 23:01 • (LCSD) R3667045-2 06/13/21 23:20

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Ethylbenzene	0.125	0.111	0.114	88.8	91.2	74.0-126			2.67	20
Xylenes, Total	0.375	0.351	0.347	93.6	92.5	72.0-127			1.15	20
(S) Toluene-d8				*102*	*104*	*75.0-131*				
(S) 4-Bromofluorobenzene				*101*	*98.8*	*67.0-138*				
(S) 1,2-Dichloroethane-d4				*99.2*	*93.1*	*70.0-130*				

Method Blank (MB)

(MB) R3667226-3 06/14/21 21:22

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Acetone	U		11.3	50.0
Acrolein	U		2.54	50.0
Acrylonitrile	U		0.671	10.0
Benzene	U		0.0941	1.00
Bromobenzene	U		0.118	1.00
Bromodichloromethane	U		0.136	1.00
Bromoform	U		0.129	1.00
Bromomethane	U		0.605	5.00
n-Butylbenzene	U		0.157	1.00
sec-Butylbenzene	U		0.125	1.00
tert-Butylbenzene	U		0.127	1.00
Carbon tetrachloride	U		0.128	1.00
Chlorobenzene	U		0.116	1.00
Chlorodibromomethane	U		0.140	1.00
Chloroethane	U		0.192	5.00
Chloroform	U		0.111	5.00
Chloromethane	U		0.960	2.50
2-Chlorotoluene	U		0.106	1.00
4-Chlorotoluene	U		0.114	1.00
1,2-Dibromo-3-Chloropropane	U		0.276	5.00
1,2-Dibromoethane	U		0.126	1.00
Dibromomethane	U		0.122	1.00
1,2-Dichlorobenzene	U		0.107	1.00
1,3-Dichlorobenzene	U		0.110	1.00
1,4-Dichlorobenzene	U		0.120	1.00
Dichlorodifluoromethane	U		0.374	5.00
1,1-Dichloroethane	U		0.100	1.00
1,2-Dichloroethane	U		0.0819	1.00
1,1-Dichloroethene	U		0.188	1.00
cis-1,2-Dichloroethene	U		0.126	1.00
trans-1,2-Dichloroethene	U		0.149	1.00
1,2-Dichloropropane	U		0.149	1.00
1,1-Dichloropropene	U		0.142	1.00
1,3-Dichloropropane	U		0.110	1.00
cis-1,3-Dichloropropene	U		0.111	1.00
trans-1,3-Dichloropropene	U		0.118	1.00
2,2-Dichloropropane	U		0.161	1.00
Di-isopropyl ether	U		0.105	1.00
Ethylbenzene	U		0.137	1.00
Hexachloro-1,3-butadiene	U		0.490	1.00

Method Blank (MB)

(MB) R3667226-3 06/14/21 21:22

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Isopropylbenzene	U		0.105	1.00
p-Isopropyltoluene	U		0.120	1.00
2-Butanone (MEK)	U		1.19	10.0
Methylene Chloride	U		0.430	5.00
4-Methyl-2-pentanone (MIBK)	U		0.478	10.0
Methyl tert-butyl ether	U		0.101	1.00
Naphthalene	U		1.00	5.00
n-Propylbenzene	U		0.0993	1.00
Styrene	U		0.118	1.00
1,1,1,2-Tetrachloroethane	U		0.147	1.00
1,1,2,2-Tetrachloroethane	U		0.133	1.00
Tetrachloroethene	U		0.300	1.00
Toluene	U		0.278	1.00
1,2,3-Trichlorobenzene	U		0.230	1.00
1,2,4-Trichlorobenzene	U		0.481	1.00
1,1,1-Trichloroethane	U		0.149	1.00
1,1,2-Trichloroethane	U		0.158	1.00
Trichloroethene	U		0.190	1.00
Trichlorofluoromethane	U		0.160	5.00
1,2,3-Trichloropropane	U		0.237	2.50
1,2,4-Trimethylbenzene	U		0.322	1.00
1,3,5-Trimethylbenzene	U		0.104	1.00
Vinyl chloride	U		0.234	1.00
Xylenes, Total	U		0.174	3.00
(S) Toluene-d8	*102*			*80.0-120*
(S) 4-Bromofluorobenzene	*101*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*102*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3667226-1 06/14/21 20:25 • (LCSD) R3667226-2 06/14/21 20:44

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acetone	25.0	21.8	22.4	87.2	89.6	19.0-160			2.71	27
Acrolein	25.0	14.2	14.8	56.8	59.2	10.0-160			4.14	26
Acrylonitrile	25.0	22.3	22.6	89.2	90.4	55.0-149			1.34	20
Benzene	5.00	4.67	4.62	93.4	92.4	70.0-123			1.08	20
Bromobenzene	5.00	4.90	4.76	98.0	95.2	73.0-121			2.90	20
Bromodichloromethane	5.00	4.90	4.86	98.0	97.2	75.0-120			0.820	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3667226-1 06/14/21 20:25 • (LCSD) R3667226-2 06/14/21 20:44

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Bromoform	5.00	4.48	4.50	89.6	90.0	68.0-132			0.445	20
Bromomethane	5.00	5.24	5.00	105	100	10.0-160			4.69	25
n-Butylbenzene	5.00	4.63	4.56	92.6	91.2	73.0-125			1.52	20
sec-Butylbenzene	5.00	4.73	4.60	94.6	92.0	75.0-125			2.79	20
tert-Butylbenzene	5.00	4.94	4.80	98.8	96.0	76.0-124			2.87	20
Carbon tetrachloride	5.00	5.06	4.92	101	98.4	68.0-126			2.81	20
Chlorobenzene	5.00	4.94	4.87	98.8	97.4	80.0-121			1.43	20
Chlorodibromomethane	5.00	5.04	5.00	101	100	77.0-125			0.797	20
Chloroethane	5.00	4.56	5.00	91.2	100	47.0-150			9.21	20
Chloroform	5.00	4.71	4.56	94.2	91.2	73.0-120			3.24	20
Chloromethane	5.00	5.27	4.98	105	99.6	41.0-142			5.66	20
2-Chlorotoluene	5.00	4.90	4.74	98.0	94.8	76.0-123			3.32	20
4-Chlorotoluene	5.00	4.77	4.71	95.4	94.2	75.0-122			1.27	20
1,2-Dibromo-3-Chloropropane	5.00	4.52	4.61	90.4	92.2	58.0-134			1.97	20
1,2-Dibromoethane	5.00	5.05	5.06	101	101	80.0-122			0.198	20
Dibromomethane	5.00	4.95	4.84	99.0	96.8	80.0-120			2.25	20
1,2-Dichlorobenzene	5.00	4.70	4.61	94.0	92.2	79.0-121			1.93	20
1,3-Dichlorobenzene	5.00	4.80	4.74	96.0	94.8	79.0-120			1.26	20
1,4-Dichlorobenzene	5.00	4.81	4.70	96.2	94.0	79.0-120			2.31	20
Dichlorodifluoromethane	5.00	4.50	4.36	90.0	87.2	51.0-149			3.16	20
1,1-Dichloroethane	5.00	4.77	4.56	95.4	91.2	70.0-126			4.50	20
1,2-Dichloroethane	5.00	4.96	4.86	99.2	97.2	70.0-128			2.04	20
1,1-Dichloroethene	5.00	4.95	4.75	99.0	95.0	71.0-124			4.12	20
cis-1,2-Dichloroethene	5.00	4.89	4.66	97.8	93.2	73.0-120			4.82	20
trans-1,2-Dichloroethene	5.00	5.05	4.82	101	96.4	73.0-120			4.66	20
1,2-Dichloropropane	5.00	4.73	4.77	94.6	95.4	77.0-125			0.842	20
1,1-Dichloropropene	5.00	4.75	4.60	95.0	92.0	74.0-126			3.21	20
1,3-Dichloropropane	5.00	4.80	4.84	96.0	96.8	80.0-120			0.830	20
cis-1,3-Dichloropropene	5.00	4.76	4.78	95.2	95.6	80.0-123			0.419	20
trans-1,3-Dichloropropene	5.00	4.92	4.86	98.4	97.2	78.0-124			1.23	20
2,2-Dichloropropane	5.00	5.18	4.98	104	99.6	58.0-130			3.94	20
Di-isopropyl ether	5.00	4.58	4.51	91.6	90.2	58.0-138			1.54	20
Ethylbenzene	5.00	4.88	4.66	97.6	93.2	79.0-123			4.61	20
Hexachloro-1,3-butadiene	5.00	4.72	4.31	94.4	86.2	54.0-138			9.08	20
Isopropylbenzene	5.00	4.92	4.92	98.4	98.4	76.0-127			0.000	20
p-Isopropyltoluene	5.00	4.92	4.77	98.4	95.4	76.0-125			3.10	20
2-Butanone (MEK)	25.0	23.9	24.2	95.6	96.8	44.0-160			1.25	20
Methylene Chloride	5.00	5.16	5.00	103	100	67.0-120			3.15	20
4-Methyl-2-pentanone (MIBK)	25.0	23.8	23.9	95.2	95.6	68.0-142			0.419	20
Methyl tert-butyl ether	5.00	4.67	4.46	93.4	89.2	68.0-125			4.60	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3667226-1 06/14/21 20:25 • (LCSD) R3667226-2 06/14/21 20:44

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Naphthalene	5.00	4.66	4.74	93.2	94.8	54.0-135			1.70	20
n-Propylbenzene	5.00	4.76	4.70	95.2	94.0	77.0-124			1.27	20
Styrene	5.00	4.94	4.95	98.8	99.0	73.0-130			0.202	20
1,1,1,2-Tetrachloroethane	5.00	4.35	4.60	87.0	92.0	75.0-125			5.59	20
1,1,2,2-Tetrachloroethane	5.00	4.67	4.74	93.4	94.8	65.0-130			1.49	20
Tetrachloroethene	5.00	5.12	4.99	102	99.8	72.0-132			2.57	20
Toluene	5.00	4.66	4.60	93.2	92.0	79.0-120			1.30	20
1,2,3-Trichlorobenzene	5.00	4.30	4.38	86.0	87.6	50.0-138			1.84	20
1,2,4-Trichlorobenzene	5.00	4.49	4.50	89.8	90.0	57.0-137			0.222	20
1,1,1-Trichloroethane	5.00	4.96	4.78	99.2	95.6	73.0-124			3.70	20
1,1,2-Trichloroethane	5.00	4.71	4.71	94.2	94.2	80.0-120			0.000	20
Trichloroethene	5.00	5.11	4.94	102	98.8	78.0-124			3.38	20
Trichlorofluoromethane	5.00	5.02	4.85	100	97.0	59.0-147			3.44	20
1,2,3-Trichloropropane	5.00	4.65	4.85	93.0	97.0	73.0-130			4.21	20
1,2,4-Trimethylbenzene	5.00	4.85	4.79	97.0	95.8	76.0-121			1.24	20
1,3,5-Trimethylbenzene	5.00	4.93	4.74	98.6	94.8	76.0-122			3.93	20
Vinyl chloride	5.00	5.74	5.81	115	116	67.0-131			1.21	20
Xylenes, Total	15.0	14.9	14.4	99.3	96.0	79.0-123			3.41	20
(S) Toluene-d8				*102*	*102*	*80.0-120*				
(S) 4-Bromofluorobenzene				*101*	*99.4*	*77.0-126*				
(S) 1,2-Dichloroethane-d4				*104*	*105*	*70.0-130*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3666182-1 06/10/21 21:50

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Diesel Range Organics (DRO)	U		1.33	4.00
Residual Range Organics (RRO)	U		3.33	10.0
(S) o-Terphenyl	*66.4*			*18.0-148*

Laboratory Control Sample (LCS)

(LCS) R3666182-2 06/10/21 22:02

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Diesel Range Organics (DRO)	50.0	35.2	70.4	50.0-150	
(S) o-Terphenyl			*81.4*	*18.0-148*	

L1362797-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1362797-05 06/11/21 09:52 • (MS) R3666182-3 06/11/21 10:05 • (MSD) R3666182-4 06/11/21 10:18

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	59.8	20.4	72.7	53.9	87.3	56.1	1	50.0-150		J3	29.6	20
(S) o-Terphenyl					*51.5*	*50.9*		*18.0-148*				

Method Blank (MB)

(MB) R3666351-1 06/11/21 06:02

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Diesel Range Organics (DRO)	U		1.33	4.00
Residual Range Organics (RRO)	U		3.33	10.0
(S) o-Terphenyl	*48.9*			*18.0-148*

Laboratory Control Sample (LCS)

(LCS) R3666351-2 06/11/21 06:15

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Diesel Range Organics (DRO)	50.0	36.3	72.6	50.0-150	
(S) o-Terphenyl			*70.4*	*18.0-148*	

L1363323-08 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1363323-08 06/11/21 15:13 • (MS) R3666351-3 06/11/21 15:26 • (MSD) R3666351-4 06/11/21 15:39

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	53.1	186	242	448	104	489	1	50.0-150		E J3 J5	59.9	20
(S) o-Terphenyl					*56.5*	*73.6*		*18.0-148*				

Method Blank (MB)

(MB) R3667734-1 06/15/21 11:21

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Diesel Range Organics (DRO)	U		1.33	4.00
Residual Range Organics (RRO)	U		3.33	10.0
(S) o-Terphenyl	*64.6*			*18.0-148*

Laboratory Control Sample (LCS)

(LCS) R3667734-2 06/15/21 11:34

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Diesel Range Organics (DRO)	50.0	37.1	74.2	50.0-150	
(S) o-Terphenyl			*83.6*	*18.0-148*	

Method Blank (MB)

(MB) R3667735-1 06/15/21 20:57

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Diesel Range Organics (DRO)	U		1.33	4.00
Residual Range Organics (RRO)	U		3.33	10.0
(S) o-Terphenyl	*77.8*			*18.0-148*

Laboratory Control Sample (LCS)

(LCS) R3667735-2 06/15/21 21:09

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Diesel Range Organics (DRO)	50.0	49.1	98.2	50.0-150	
(S) o-Terphenyl			*102*	*18.0-148*	

Method Blank (MB)

(MB) R3665503-2 06/09/21 22:57

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Naphthalene	U		0.00408	0.0200
1-Methylnaphthalene	U		0.00449	0.0200
2-Methylnaphthalene	U		0.00427	0.0200
(S) Nitrobenzene-d5	*90.2*			*14.0-149*
(S) 2-Fluorobiphenyl	*83.0*			*34.0-125*
(S) p-Terphenyl-d14	*115*			*23.0-120*

Laboratory Control Sample (LCS)

(LCS) R3665503-1 06/09/21 22:39

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Naphthalene	0.0800	0.0659	82.4	50.0-120	
1-Methylnaphthalene	0.0800	0.0734	91.8	51.0-121	
2-Methylnaphthalene	0.0800	0.0683	85.4	50.0-120	
(S) Nitrobenzene-d5			*121*	*14.0-149*	
(S) 2-Fluorobiphenyl			*91.4*	*34.0-125*	
(S) p-Terphenyl-d14			*115*	*23.0-120*	

L1362797-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1362797-05 06/10/21 04:18 • (MS) R3665503-3 06/10/21 04:36 • (MSD) R3665503-4 06/10/21 04:54

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Naphthalene	0.0954	ND	0.0654	0.0500	68.6	52.7	1	10.0-135			26.7	27
1-Methylnaphthalene	0.0954	ND	0.0702	0.0559	73.6	58.9	1	10.0-142			22.7	28
2-Methylnaphthalene	0.0954	ND	0.0653	0.0526	68.5	55.4	1	10.0-137			21.6	28
(S) Nitrobenzene-d5					*101*	*85.9*		*14.0-149*				
(S) 2-Fluorobiphenyl					*75.8*	*60.0*		*34.0-125*				
(S) p-Terphenyl-d14					*101*	*82.7*		*23.0-120*				

Method Blank (MB)

(MB) R3665591-2 06/09/21 22:00

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Naphthalene	U		0.00408	0.0200
1-Methylnaphthalene	U		0.00449	0.0200
2-Methylnaphthalene	U		0.00427	0.0200
(S) Nitrobenzene-d5	*66.2*			*14.0-149*
(S) 2-Fluorobiphenyl	*74.3*			*34.0-125*
(S) p-Terphenyl-d14	*105*			*23.0-120*

Laboratory Control Sample (LCS)

(LCS) R3665591-1 06/09/21 21:40

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Naphthalene	0.0800	0.0596	74.5	50.0-120	
1-Methylnaphthalene	0.0800	0.0620	77.5	51.0-121	
2-Methylnaphthalene	0.0800	0.0561	70.1	50.0-120	
(S) Nitrobenzene-d5			*85.0*	*14.0-149*	
(S) 2-Fluorobiphenyl			*84.2*	*34.0-125*	
(S) p-Terphenyl-d14			*111*	*23.0-120*	

L1363010-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1363010-02 06/09/21 22:40 • (MS) R3665591-3 06/09/21 23:00 • (MSD) R3665591-4 06/09/21 23:20

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Naphthalene	0.0764	ND	0.0359	0.0381	47.0	49.4	1	10.0-135			5.95	27
1-Methylnaphthalene	0.0764	ND	0.0345	0.0383	45.2	49.6	1	10.0-142			10.4	28
2-Methylnaphthalene	0.0764	ND	0.0311	0.0343	40.7	44.4	1	10.0-137			9.79	28
(S) Nitrobenzene-d5					*56.0*	*60.2*		*14.0-149*				
(S) 2-Fluorobiphenyl					*51.0*	*56.8*		*34.0-125*				
(S) p-Terphenyl-d14					*65.2*	*72.3*		*23.0-120*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
RDL (dry)	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
C3	The reported concentration is an estimate. The continuing calibration standard associated with this data responded low. Method sensitivity check is acceptable.
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
J1	Surrogate recovery limits have been exceeded; values are outside upper control limits.
J2	Surrogate recovery limits have been exceeded; values are outside lower control limits.
J3	The associated batch QC was outside the established quality control range for precision.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

TRC - BNSF Region 1

1180 NW Maple St, Ste 310
Issaquah, WA 98027

Billing Information:
Accounts Payable
1180 NW Maple St, Ste 310
Issaquah, WA 98027

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 3

Pace Analytical®
National Center for Testing & Innovation

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

Report to:
Eric Stata, Keith Woodburne

Email To:
estata@trccompanies.com,

Project Description:
BNSF Leavenworth - Glacier Park East

City/State Collected: Leavenworth, WA

Please Circle: PT MT CT ET

Phone: 415-497-1947

Client Project #
444428

Lab Project #
BNSF1TRC-GLACIER

Site/Facility ID #

P.O. #

Collected by (print):
REBECA O'DELL

Collected by (signature):
Rebecca Odell

Immediately Packed on Ice N ___ Y _X_

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

SDG # L1363323

Table #

Acctnum:

Template:

Prelogin:

PM:

PB:

Shipped Via:

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No. of Cntrs	MRCRA8	NWTPHDX	NWTPHGX	SV8270PAHSIM - NAPHTHALENES	V8260 40mlAmb-HCl	V8260BTEX 40mlAmb - MeOH10ml					Remarks	Sample # (lab only)
SB-5:15	G	SS	15	6/1/21	1515	3		X	X	X		X						-01
SB-5:24	G	SS	24		1600	3		X	X	X		X						-02
SB-5:28	G		28		1630	3		X	X	X		X						-03
SB-6:22.5			22.5	6/2/21	1015	3		X	X	X		X						-04
SB-6:25			25		1009	3		X	X	X		X						-05
SB-6:28			28		1056	3		X	X	X		X						-06
SB-4:20.5			20.5		1310	3		X	X	X		X						-07
SB-4:24			24		1318	3		X	X	X		X						-08
SB-4:30.5			30.5		1331	3		X	X	X		X						-09
TRIP BLANK		GW				1					X							-10

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other ________

Remarks:

pH ______ Temp ______

Flow ______ Other ______

Samples returned via:
__ UPS __ FedEx __ Courier __ ______

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: _NP _Y _X N
COC Signed/Accurate: _X Y _N
Bottles arrive intact: _X Y _N
Correct bottles used: _X Y _N
Sufficient volume sent: _X Y _N
If Applicable
VOA Zero Headspace: _Y _N
Preservation Correct/Checked: _Y _X N
RAD Screen <0.5 mR/hr: _X Y _N

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)		
E Stata	6/4/21	1528		Trip Blank Received: Yes / No HCL / MeoH TBR	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp: 3.9 °C	Bottles Received: 59
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 6/5/21	Time: 0930

If preservation required by Login: Date/Time

Hold:

Condition: NCF / OK

TRC - BNSF Region 1 1180 NW Maple St, Ste 310 Issaquah, WA 98027	Billing Information: Accounts Payable 1180 NW Maple St, Ste 310 Issaquah, WA 98027	Pres Chk
Report to: Eric Stata, Keith Woodburne	Email To: estata@trccompanies.com,	
Project Description: BNSF Leavenworth - Glacier Park East	City/State Collected: Leavenworth, WA	Please Circle: PT MT CT ET
Phone: 415-497-1947	Client Project # 444428	Lab Project # BNSF1TRC-GLACIER
Collected by (print): Rebeca O'DELL	Site/Facility ID #	P.O. #
Collected by (signature): Rebeca Odell Immediately Packed on Ice N___ Y X	*Rush?* (Lab MUST Be Notified) ___ Same Day ___ Five Day ___ Next Day ___ 5 Day (Rad Only) ___ Two Day ___ 10 Day (Rad Only) ___ Three Day	Quote # Date Results Needed

Chain of Custody Page 2 of 3

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National Center for Testing & Innovation

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone 615-758-5858
Phone 800-767-5859
Fax 615-758-5859

SDG # L1363323

Table #

Acctnum:

Template:

Prelogin:

PM:

PB:

Shipped Via:

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No. of Cntrs	MRCRA8	NWTPHDX	NWTPHGX	SV8270PAHSIM - NAPHTHALENES	V8260 40mlAmb-HCl	V8260BTEX 40mlAmb - MeOH10ml					Remarks	Sample # (lab only)
GWB-1; 25	grab	SS	25	6/4/21	1025	3		X	X	X		X						-11
GWB-1: 35			35		1030	3		X	X	X		X						-12
SB-3: 12			12	6/3/21	1413	3		X	X	X		X						-13
SB-3: 25			25		1420	3		X	X	X		X						-14
SB-1: 6			6		1620	3		X	X	X		X						-15
SB-1; 12			12		1625	3		X	X	X		X						-16
SB-1: 19			19		1630	3		X	X	X		X						-17
SB-2: 8.5			8.5	6/4/21	0959	3		X	X	X		X						-18
SB-2: 10			10		1008	3		X	X	X		X						-19
SB-2; 22			22.5		1015	3		X	X	X		X						-20

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other________

Remarks:

pH ______ Temp ______

Flow ______ Other ______

Samples returned via:
__ UPS __ FedEx __ Courier __ ______

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: NP _Y _N
COC Signed/Accurate: Y _N
Bottles arrive intact: Y _N
Correct bottles used: Y _N
Sufficient volume sent: Y _N
If Applicable
VOA Zero Headspace: _Y _N
Preservation Correct/Checked: _Y _N
RAD Screen <0.5 mR/hr: Y _N

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeOH TBR
C. Stata	6/4/21	1528		
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp: 3.9 °C Bottles Received: 59
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 6/5/21 Time: 0930

If preservation required by Login: Date/Time

Hold:

Condition: NCF / OK

TRC - BNSF Region 1 1180 NW Maple St, Ste 310 Issaquah, WA 98027	Billing Information: Accounts Payable 1180 NW Maple St, Ste 310 Issaquah, WA 98027	Pres Chk
Report to: Eric Stata, Keith Woodburne	Email To: estata@trccompanies.com,	
Project Description: BNSF Leavenworth - Glacier Park East	City/State Collected: Leavenworth, WA	Please Circle: PT MT CT ET
Phone: 415-497-1947	Client Project # 444428	Lab Project # BNSF1TRC-GLACIER
Collected by (print): ERIC STATA	Site/Facility ID #	P.O. #
Collected by (signature): E. Stata Immediately Packed on Ice N ___ Y X	Rush? (Lab MUST Be Notified) ___ Same Day ___ Five Day ___ Next Day ___ 5 Day (Rad Only) ___ Two Day ___ 10 Day (Rad Only) ___ Three Day	Quote # Date Results Needed

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No. of Cntrs	MRCRA8	NWTPHDX	NWTPHGX	SV8270PAHSIM - NAPHTHALENES	V8260 40mlAmb-HCl	V8260BTEX 40mlAmb - MeOH10ml				Remarks	Sample # (lab only)
WASTE COMP	comp	SS	—	6/4/21	1100	2	X										-21

Chain of Custody Page 3 of 3

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SDG # L1363323

Table #

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SS - Soil AIR - Air F - Filter
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DW - Drinking Water
OT - Other________

Remarks:

pH ______ Temp ______
Flow ______ Other ______

Samples returned via:
___ UPS ___ FedEx ___ Courier ___ ______

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: NP _Y _N
COC Signed/Accurate: Y _N
Bottles arrive intact: Y _N
Correct bottles used: Y _N
Sufficient volume sent: Y _N
If Applicable
VOA Zero Headspace: _Y _N
Preservation Correct/Checked: _Y _N
RAD Screen <0.5 mR/hr: _Y _N

Relinquished by : (Signature) E Stata	Date: 6/4/21	Time: 1528	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR 1	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 3.9 °C Bottles Received: 59	If preservation required by Login: Date/Time
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 6/5/21 Time: 0930	Hold: Condition: NCF / OK

L1363323 BNSF1TRC NCF HM

R5

Time estimate: 0h **Time spent:** 0h

Members

HM Hailey Melson (responsible) MB Mark Beasley

- [ ] Login Clarification needed
- [ ] Chain of custody is incomplete
- [ ] Please specify Metals requested
- [ ] Please specify TCLP requested
- [ ] Received additional samples not listed on COC
- [ ] Sample IDs on containers do not match IDs on COC
- [ ] Client did not "X" analysis
- [x] Chain of Custody is missing
- [x] If no COC: Received by:_B. Barnes__________________
- [x] If no COC: Date/Time:_06/05/21 @ 0930__________________
- [x] If no COC: Temp./Cont.Rec./pH:_3.9______________
- [x] If no COC: Carrier:_FedEx______________
- [x] If no COC: Tracking #:_501612310948_______________
- [ ] Client informed by call
- [ ] Client informed by Email
- [ ] Client informed by Voicemail
- [ ] Date/Time:_____6/7/2021_______________
- [ ] PM initials:_______MB___________
- [ ] Client Contact:_____Eric Stata_______________

Comments

Hailey Melson *5 June 2021 8:18 PM*

P851206, T188336

Received IDs: SB-1:12, SB-5:15, SB-1:6, SB-5:28, GW-1:25, SB-2:22, SB-4:20.4, SB-6:25, SB-4:35, SB-5:24, SB-6:22.5, SB-2:8.5, SB-3:12, SB-6:28, SB-1:19, SB-4:30.5, SB-4:25, GWB-1:35, Waste Comp, Trip blank

Mark Beasley *7 June 2021 2:55 PM*

See attached COC. Log for NWTPHDXLVINOSGT

L1363323 BNSF1TRC NCF HM

R5

Time estimate: 0h **Time spent:** 0h

Members

HM Hailey Melson (responsible) MB Mark Beasley

- [ ] Login Clarification needed
- [ ] Chain of custody is incomplete
- [ ] Please specify Metals requested
- [ ] Please specify TCLP requested
- [ ] Received additional samples not listed on COC
- [ ] Sample IDs on containers do not match IDs on COC
- [ ] Client did not "X" analysis
- [x] Chain of Custody is missing
- [x] If no COC: Received by:_B. Barnes__________________
- [x] If no COC: Date/Time:_06/05/21 @ 0930__________________
- [x] If no COC: Temp./Cont.Rec./pH:_3.9______________
- [x] If no COC: Carrier:_FedEx_____________
- [x] If no COC: Tracking #:_501612310948______________
- [ ] Client informed by call
- [ ] Client informed by Email
- [ ] Client informed by Voicemail
- [ ] Date/Time:_____6/7/2021______________
- [ ] PM initials:_______MB__________
- [ ] Client Contact:_____Eric Stata_______________

Comments

Hailey Melson *5 June 2021 8:18 PM*

P851206, T188336

Received IDs: SB-1:12, SB-5:15, SB-1:6, SB-5:28, GW-1:25, SB-2:22, SB-4:20.4, SB-6:25, SB-4:35, SB-5:24, SB-6:22.5, SB-2:8.5, SB-3:12, SB-6:28, SB-1:19, SB-4:30.5, SB-4:25, GWB-1:35, Waste Comp, Trip blank

Mark Beasley *7 June 2021 2:55 PM*

See attached COC. Log for NWTPHDXLVINOSGT

Hailey Melson *8 June 2021 5:05 PM*

Received ID: SB-4:35 @1300 not listed on the COC provided.

Mark Beasley *8 June 2021 5:30 PM*

Add to COC and run

ANALYTICAL REPORT

July 19, 2021

Revised Report

TRC - BNSF Region 1

Sample Delivery Group:	L1369947
Samples Received:	06/23/2021
Project Number:	427977
Description:	BNSF Leavenworth - Glacier Park East
Report To:	Eric Stata 1180 NW Maple St, Ste 310 Issaquah, WA 98027

Entire Report Reviewed By:

Mark W. Beasley
Project Manager

Pace Analytical National

12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

TABLE OF CONTENTS

Collected by	Collected date/time	Received date/time
E. Stata	06/21/21 09:42	06/23/21 09:00

MW-6:63 L1369947-01 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698520	1	07/01/21 11:04	07/01/21 11:04	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1695731	1	06/26/21 17:30	06/26/21 17:30	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/05/21 20:38	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/05/21 20:38	AEG	Mt. Juliet, TN

Collected by	Collected date/time	Received date/time
E. Stata	06/21/21 09:47	06/23/21 09:00

MW-6:71 L1369947-02 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698520	1	07/01/21 11:27	07/01/21 11:27	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1695731	1	06/26/21 17:49	06/26/21 17:49	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/05/21 21:01	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/05/21 21:01	AEG	Mt. Juliet, TN

Collected by	Collected date/time	Received date/time
E. Stata	06/21/21 10:18	06/23/21 09:00

MW-2:68.5 L1369947-03 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698520	1	07/01/21 11:50	07/01/21 11:50	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1695731	1	06/26/21 18:08	06/26/21 18:08	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/05/21 21:24	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/08/21 18:46	AEG	Mt. Juliet, TN

Collected by	Collected date/time	Received date/time
E. Stata	06/21/21 10:23	06/23/21 09:00

MW-2:73.5 L1369947-04 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698520	1	07/01/21 12:13	07/01/21 12:13	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1695731	1	06/26/21 18:27	06/26/21 18:27	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/05/21 21:46	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/08/21 19:09	AEG	Mt. Juliet, TN

Collected by	Collected date/time	Received date/time
E. Stata	06/21/21 10:30	06/23/21 09:00

MW-2:78 L1369947-05 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698520	1	07/01/21 12:37	07/01/21 12:37	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1695731	1	06/26/21 18:45	06/26/21 18:45	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/05/21 22:09	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/08/21 19:31	AEG	Mt. Juliet, TN

Collected by	Collected date/time	Received date/time
E. Stata	06/21/21 11:22	06/23/21 09:00

MW-1:70 L1369947-06 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698520	1	07/01/21 13:00	07/01/21 13:00	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1695731	1	06/26/21 19:04	06/26/21 19:04	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/05/21 22:32	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/08/21 19:54	AEG	Mt. Juliet, TN

MW-1:75 L1369947-07 GW

Collected by: E. Stata | Collected date/time: 06/21/21 11:30 | Received date/time: 06/23/21 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698520	1	07/01/21 13:23	07/01/21 13:23	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1696156	1	06/28/21 05:03	06/28/21 05:03	ACG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/05/21 22:54	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/08/21 20:40	AEG	Mt. Juliet, TN

MW-5:71 L1369947-08 GW

Collected by: E. Stata | Collected date/time: 06/21/21 12:05 | Received date/time: 06/23/21 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698520	1	07/01/21 14:16	07/01/21 14:16	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1696156	1	06/28/21 05:22	06/28/21 05:22	ACG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/05/21 23:17	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/05/21 23:17	AEG	Mt. Juliet, TN

MW-5:78 L1369947-09 GW

Collected by: E. Stata | Collected date/time: 06/21/21 12:10 | Received date/time: 06/23/21 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698551	1	07/02/21 10:27	07/02/21 10:27	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1696156	1	06/28/21 05:42	06/28/21 05:42	ACG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/05/21 23:40	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/08/21 21:03	AEG	Mt. Juliet, TN

TRIP BLANK L1369947-10 GW

Collected by: E. Stata | Collected date/time: 06/21/21 00:00 | Received date/time: 06/23/21 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1696156	1	06/28/21 04:43	06/28/21 04:43	ACG	Mt. Juliet, TN

MW-3:63 L1369947-11 GW

Collected by: E. Stata | Collected date/time: 06/21/21 12:30 | Received date/time: 06/23/21 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698551	1	07/02/21 10:50	07/02/21 10:50	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1696156	1	06/28/21 06:02	06/28/21 06:02	ACG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/06/21 00:02	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/08/21 21:25	AEG	Mt. Juliet, TN

MW-3:69 L1369947-12 GW

Collected by: E. Stata | Collected date/time: 06/21/21 12:35 | Received date/time: 06/23/21 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698551	1	07/02/21 11:13	07/02/21 11:13	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1696156	1	06/28/21 06:22	06/28/21 06:22	ACG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/06/21 03:05	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/08/21 21:48	AEG	Mt. Juliet, TN

	Collected by	Collected date/time	Received date/time
MW-3:75 L1369947-13 GW	E. Stata	06/21/21 12:40	06/23/21 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698551	1	07/02/21 11:37	07/02/21 11:37	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1696156	1	06/28/21 06:42	06/28/21 06:42	ACG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/06/21 03:27	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/08/21 22:11	AEG	Mt. Juliet, TN

	Collected by	Collected date/time	Received date/time
MW-4:64 L1369947-14 GW	E. Stata	06/21/21 13:10	06/23/21 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698551	1	07/02/21 12:00	07/02/21 12:00	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1696156	1	06/28/21 07:02	06/28/21 07:02	ACG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/06/21 03:50	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/09/21 00:05	AEG	Mt. Juliet, TN

	Collected by	Collected date/time	Received date/time
MW-4:72 L1369947-15 GW	E. Stata	06/21/21 13:15	06/23/21 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1698551	1	07/02/21 12:23	07/02/21 12:23	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1696156	1	06/28/21 07:22	06/28/21 07:22	ACG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/06/21 06:28	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 11:55	07/09/21 00:27	AEG	Mt. Juliet, TN

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Project Manager

Report Revision History

Level II Report - Version 1: 07/12/21 13:05

Sample Delivery Group (SDG) Narrative

pH outside of method requirement.

Lab Sample ID	Project Sample ID	Method
L1369947-12	MW-3:69	NWTPHGX
L1369947-15	MW-4:72	NWTPHDX-NO SGT, NWTPHDX-SGT

Cp Tc Ss Cn Sr Qc Gl Al Sc

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/01/2021 11:04	WG1698520
(S) a,a,a-Trifluorotoluene(FID)	*103*		*78.0-120*		*07/01/2021 11:04*	WG1698520

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/26/2021 17:30	WG1695731
(S) Toluene-d8	*102*		*80.0-120*		*06/26/2021 17:30*	WG1695731
(S) 4-Bromofluorobenzene	*99.7*		*77.0-126*		*06/26/2021 17:30*	WG1695731
(S) 1,2-Dichloroethane-d4	*112*		*70.0-130*		*06/26/2021 17:30*	WG1695731

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	07/05/2021 20:38	WG1697190
Residual Range Organics (RRO)	ND		250	1	07/05/2021 20:38	WG1697190
(S) o-Terphenyl	*98.4*		*52.0-156*		*07/05/2021 20:38*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/05/2021 20:38	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/05/2021 20:38	WG1697201
(S) o-Terphenyl	*98.4*		*52.0-156*		*07/05/2021 20:38*	WG1697201

Sample Narrative:

L1369947-01 WG1697201: Reporting from non-silica gel data due to non-detect to the RDL.

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/01/2021 11:27	WG1698520
(S) a,a,a-Trifluorotoluene(FID)	*104*		*78.0-120*		*07/01/2021 11:27*	WG1698520

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/26/2021 17:49	WG1695731
(S) Toluene-d8	*101*		*80.0-120*		*06/26/2021 17:49*	WG1695731
(S) 4-Bromofluorobenzene	*102*		*77.0-126*		*06/26/2021 17:49*	WG1695731
(S) 1,2-Dichloroethane-d4	*114*		*70.0-130*		*06/26/2021 17:49*	WG1695731

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	07/05/2021 21:01	WG1697190
Residual Range Organics (RRO)	ND		250	1	07/05/2021 21:01	WG1697190
(S) o-Terphenyl	*105*		*52.0-156*		*07/05/2021 21:01*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/05/2021 21:01	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/05/2021 21:01	WG1697201
(S) o-Terphenyl	*105*		*52.0-156*		*07/05/2021 21:01*	WG1697201

Sample Narrative:

L1369947-02 WG1697201: Reporting from non-silica gel data due to non-detect to the RDL.

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	103		100	1	07/01/2021 11:50	WG1698520
(S) a,a,a-Trifluorotoluene(FID)	*100*		*78.0-120*		*07/01/2021 11:50*	WG1698520

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/26/2021 18:08	WG1695731
(S) Toluene-d8	*99.4*		*80.0-120*		*06/26/2021 18:08*	WG1695731
(S) 4-Bromofluorobenzene	*99.0*		*77.0-126*		*06/26/2021 18:08*	WG1695731
(S) 1,2-Dichloroethane-d4	*108*		*70.0-130*		*06/26/2021 18:08*	WG1695731

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	300		200	1	07/05/2021 21:24	WG1697190
Residual Range Organics (RRO)	ND		250	1	07/05/2021 21:24	WG1697190
(S) o-Terphenyl	*87.9*		*52.0-156*		*07/05/2021 21:24*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/08/2021 18:46	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/08/2021 18:46	WG1697201
(S) o-Terphenyl	*67.4*		*52.0-156*		*07/08/2021 18:46*	WG1697201

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/01/2021 12:13	WG1698520
(S) a,a,a-Trifluorotoluene(FID)	*101*		*78.0-120*		*07/01/2021 12:13*	WG1698520

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/26/2021 18:27	WG1695731
(S) Toluene-d8	*99.9*		*80.0-120*		*06/26/2021 18:27*	WG1695731
(S) 4-Bromofluorobenzene	*97.3*		*77.0-126*		*06/26/2021 18:27*	WG1695731
(S) 1,2-Dichloroethane-d4	*110*		*70.0-130*		*06/26/2021 18:27*	WG1695731

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	283		200	1	07/05/2021 21:46	WG1697190
Residual Range Organics (RRO)	ND		250	1	07/05/2021 21:46	WG1697190
(S) o-Terphenyl	*98.4*		*52.0-156*		*07/05/2021 21:46*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/08/2021 19:09	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/08/2021 19:09	WG1697201
(S) o-Terphenyl	*52.6*		*52.0-156*		*07/08/2021 19:09*	WG1697201

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/01/2021 12:37	WG1698520
(S) a,a,a-Trifluorotoluene(FID)	*101*		*78.0-120*		*07/01/2021 12:37*	WG1698520

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/26/2021 18:45	WG1695731
(S) Toluene-d8	*101*		*80.0-120*		*06/26/2021 18:45*	WG1695731
(S) 4-Bromofluorobenzene	*99.2*		*77.0-126*		*06/26/2021 18:45*	WG1695731
(S) 1,2-Dichloroethane-d4	*111*		*70.0-130*		*06/26/2021 18:45*	WG1695731

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	434		200	1	07/05/2021 22:09	WG1697190
Residual Range Organics (RRO)	ND		250	1	07/05/2021 22:09	WG1697190
(S) o-Terphenyl	*95.8*		*52.0-156*		*07/05/2021 22:09*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/08/2021 19:31	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/08/2021 19:31	WG1697201
(S) o-Terphenyl	*78.4*		*52.0-156*		*07/08/2021 19:31*	WG1697201

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/01/2021 13:00	WG1698520
(S) a,a,a-Trifluorotoluene(FID)	*101*		*78.0-120*		*07/01/2021 13:00*	WG1698520

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/26/2021 19:04	WG1695731
(S) Toluene-d8	*99.9*		*80.0-120*		*06/26/2021 19:04*	WG1695731
(S) 4-Bromofluorobenzene	*98.8*		*77.0-126*		*06/26/2021 19:04*	WG1695731
(S) 1,2-Dichloroethane-d4	*112*		*70.0-130*		*06/26/2021 19:04*	WG1695731

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	797		200	1	07/05/2021 22:32	WG1697190
Residual Range Organics (RRO)	580		250	1	07/05/2021 22:32	WG1697190
(S) o-Terphenyl	*104*		*52.0-156*		*07/05/2021 22:32*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/08/2021 19:54	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/08/2021 19:54	WG1697201
(S) o-Terphenyl	*67.4*		*52.0-156*		*07/08/2021 19:54*	WG1697201

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/01/2021 13:23	WG1698520
(S) a,a,a-Trifluorotoluene(FID)	*102*		*78.0-120*		*07/01/2021 13:23*	WG1698520

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/28/2021 05:03	WG1696156
(S) Toluene-d8	*108*		*80.0-120*		*06/28/2021 05:03*	WG1696156
(S) 4-Bromofluorobenzene	*100*		*77.0-126*		*06/28/2021 05:03*	WG1696156
(S) 1,2-Dichloroethane-d4	*87.6*		*70.0-130*		*06/28/2021 05:03*	WG1696156

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	556		200	1	07/05/2021 22:54	WG1697190
Residual Range Organics (RRO)	366		250	1	07/05/2021 22:54	WG1697190
(S) o-Terphenyl	*110*		*52.0-156*		*07/05/2021 22:54*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/08/2021 20:40	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/08/2021 20:40	WG1697201
(S) o-Terphenyl	*48.5*	J2	*52.0-156*		*07/08/2021 20:40*	WG1697201

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/01/2021 14:16	WG1698520
(S) a,a,a-Trifluorotoluene(FID)	*99.6*		*78.0-120*		*07/01/2021 14:16*	WG1698520

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/28/2021 05:22	WG1696156
(S) Toluene-d8	*109*		*80.0-120*		*06/28/2021 05:22*	WG1696156
(S) 4-Bromofluorobenzene	*99.1*		*77.0-126*		*06/28/2021 05:22*	WG1696156
(S) 1,2-Dichloroethane-d4	*87.7*		*70.0-130*		*06/28/2021 05:22*	WG1696156

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	07/05/2021 23:17	WG1697190
Residual Range Organics (RRO)	ND		250	1	07/05/2021 23:17	WG1697190
(S) o-Terphenyl	*88.9*		*52.0-156*		*07/05/2021 23:17*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/05/2021 23:17	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/05/2021 23:17	WG1697201
(S) o-Terphenyl	*88.9*		*52.0-156*		*07/05/2021 23:17*	WG1697201

Sample Narrative:

L1369947-08 WG1697201: Reporting from non-silica gel data due to non-detect to the RDL.

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/02/2021 10:27	WG1698551
(S) a,a,a-Trifluorotoluene(FID)	*101*		*78.0-120*		*07/02/2021 10:27*	WG1698551

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/28/2021 05:42	WG1696156
(S) Toluene-d8	*112*		*80.0-120*		*06/28/2021 05:42*	WG1696156
(S) 4-Bromofluorobenzene	*99.1*		*77.0-126*		*06/28/2021 05:42*	WG1696156
(S) 1,2-Dichloroethane-d4	*85.7*		*70.0-130*		*06/28/2021 05:42*	WG1696156

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	319		200	1	07/05/2021 23:40	WG1697190
Residual Range Organics (RRO)	ND		250	1	07/05/2021 23:40	WG1697190
(S) o-Terphenyl	*97.9*		*52.0-156*		*07/05/2021 23:40*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/08/2021 21:03	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/08/2021 21:03	WG1697201
(S) o-Terphenyl	*81.1*		*52.0-156*		*07/08/2021 21:03*	WG1697201

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/28/2021 04:43	WG1696156
(S) Toluene-d8	*109*		*80.0-120*		*06/28/2021 04:43*	WG1696156
(S) 4-Bromofluorobenzene	*99.5*		*77.0-126*		*06/28/2021 04:43*	WG1696156
(S) 1,2-Dichloroethane-d4	*88.4*		*70.0-130*		*06/28/2021 04:43*	WG1696156

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/02/2021 10:50	WG1698551
(S) a,a,a-Trifluorotoluene(FID)	*103*		*78.0-120*		*07/02/2021 10:50*	WG1698551

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/28/2021 06:02	WG1696156
(S) Toluene-d8	*109*		*80.0-120*		*06/28/2021 06:02*	WG1696156
(S) 4-Bromofluorobenzene	*98.5*		*77.0-126*		*06/28/2021 06:02*	WG1696156
(S) 1,2-Dichloroethane-d4	*85.9*		*70.0-130*		*06/28/2021 06:02*	WG1696156

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	1890		200	1	07/06/2021 00:02	WG1697190
Residual Range Organics (RRO)	1060		250	1	07/06/2021 00:02	WG1697190
(S) o-Terphenyl	*102*		*52.0-156*		*07/06/2021 00:02*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/08/2021 21:25	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/08/2021 21:25	WG1697201
(S) o-Terphenyl	*73.2*		*52.0-156*		*07/08/2021 21:25*	WG1697201

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/02/2021 11:13	WG1698551
(S) a,a,a-Trifluorotoluene(FID)	*100*		*78.0-120*		*07/02/2021 11:13*	WG1698551

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/28/2021 06:22	WG1696156
(S) Toluene-d8	*107*		*80.0-120*		*06/28/2021 06:22*	WG1696156
(S) 4-Bromofluorobenzene	*97.6*		*77.0-126*		*06/28/2021 06:22*	WG1696156
(S) 1,2-Dichloroethane-d4	*85.8*		*70.0-130*		*06/28/2021 06:22*	WG1696156

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	1830		200	1	07/06/2021 03:05	WG1697190
Residual Range Organics (RRO)	995		250	1	07/06/2021 03:05	WG1697190
(S) o-Terphenyl	*95.3*		*52.0-156*		*07/06/2021 03:05*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/08/2021 21:48	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/08/2021 21:48	WG1697201
(S) o-Terphenyl	*72.1*		*52.0-156*		*07/08/2021 21:48*	WG1697201

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/02/2021 11:37	WG1698551
(S) a,a,a-Trifluorotoluene(FID)	*100*		*78.0-120*		*07/02/2021 11:37*	WG1698551

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/28/2021 06:42	WG1696156
(S) Toluene-d8	*109*		*80.0-120*		*06/28/2021 06:42*	WG1696156
(S) 4-Bromofluorobenzene	*96.6*		*77.0-126*		*06/28/2021 06:42*	WG1696156
(S) 1,2-Dichloroethane-d4	*87.2*		*70.0-130*		*06/28/2021 06:42*	WG1696156

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	1970		200	1	07/06/2021 03:27	WG1697190
Residual Range Organics (RRO)	1140		250	1	07/06/2021 03:27	WG1697190
(S) o-Terphenyl	*108*		*52.0-156*		*07/06/2021 03:27*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/08/2021 22:11	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/08/2021 22:11	WG1697201
(S) o-Terphenyl	*88.9*		*52.0-156*		*07/08/2021 22:11*	WG1697201

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/02/2021 12:00	WG1698551
(S) a,a,a-Trifluorotoluene(FID)	*99.2*		*78.0-120*		*07/02/2021 12:00*	WG1698551

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/28/2021 07:02	WG1696156
(S) Toluene-d8	*107*		*80.0-120*		*06/28/2021 07:02*	WG1696156
(S) 4-Bromofluorobenzene	*97.3*		*77.0-126*		*06/28/2021 07:02*	WG1696156
(S) 1,2-Dichloroethane-d4	*90.1*		*70.0-130*		*06/28/2021 07:02*	WG1696156

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	616		200	1	07/06/2021 03:50	WG1697190
Residual Range Organics (RRO)	519		250	1	07/06/2021 03:50	WG1697190
(S) o-Terphenyl	*89.5*		*52.0-156*		*07/06/2021 03:50*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/09/2021 00:05	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/09/2021 00:05	WG1697201
(S) o-Terphenyl	*70.5*		*52.0-156*		*07/09/2021 00:05*	WG1697201

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	07/02/2021 12:23	WG1698551
(S) a,a,a-Trifluorotoluene(FID)	*103*		*78.0-120*		*07/02/2021 12:23*	WG1698551

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	06/28/2021 07:22	WG1696156
(S) Toluene-d8	*111*		*80.0-120*		*06/28/2021 07:22*	WG1696156
(S) 4-Bromofluorobenzene	*98.3*		*77.0-126*		*06/28/2021 07:22*	WG1696156
(S) 1,2-Dichloroethane-d4	*91.6*		*70.0-130*		*06/28/2021 07:22*	WG1696156

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	596		200	1	07/06/2021 06:28	WG1697190
Residual Range Organics (RRO)	469		250	1	07/06/2021 06:28	WG1697190
(S) o-Terphenyl	*86.8*		*52.0-156*		*07/06/2021 06:28*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND	J3	200	1	07/09/2021 00:27	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/09/2021 00:27	WG1697201
(S) o-Terphenyl	*76.3*		*52.0-156*		*07/09/2021 00:27*	WG1697201

Method Blank (MB)

(MB) R3674997-2 07/01/21 09:46

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Gasoline Range Organics-NWTPH	U		31.6	100
(S) a,a,a-Trifluorotoluene(FID)	*101*			*78.0-120*

Laboratory Control Sample (LCS)

(LCS) R3674997-1 07/01/21 08:46

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Gasoline Range Organics-NWTPH	5500	5840	106	70.0-124	
(S) a,a,a-Trifluorotoluene(FID)			*102*	*78.0-120*	

QUALITY CONTROL SUMMARY

Method Blank (MB)

(MB) R3675399-2 07/02/21 09:50

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Gasoline Range Organics-NWTPH	U		31.6	100
(S) a,a,a-Trifluorotoluene(FID)	*102*			*78.0-120*

Laboratory Control Sample (LCS)

(LCS) R3675399-1 07/02/21 08:40

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Gasoline Range Organics-NWTPH	5500	6420	117	70.0-124	
(S) a,a,a-Trifluorotoluene(FID)			*101*	*78.0-120*	

Method Blank (MB)

(MB) R3674494-2 06/26/21 10:37

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Benzene	U		0.0941	1.00
(S) Toluene-d8	*100*			*80.0-120*
(S) 4-Bromofluorobenzene	*102*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*112*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R3674494-1 06/26/21 09:59

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	5.00	5.39	108	70.0-123	
(S) Toluene-d8			*102*	*80.0-120*	
(S) 4-Bromofluorobenzene			*99.4*	*77.0-126*	
(S) 1,2-Dichloroethane-d4			*112*	*70.0-130*	

Method Blank (MB)

(MB) R3673450-2 06/28/21 04:23

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Benzene	U		0.0941	1.00
(S) Toluene-d8	*112*			*80.0-120*
(S) 4-Bromofluorobenzene	*106*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*86.0*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R3673450-1 06/28/21 03:43

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	5.00	4.95	99.0	70.0-123	
(S) Toluene-d8			*107*	*80.0-120*	
(S) 4-Bromofluorobenzene			*101*	*77.0-126*	
(S) 1,2-Dichloroethane-d4			*90.1*	*70.0-130*	

L1370526-21 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1370526-21 06/28/21 10:21 • (MS) R3673450-3 06/28/21 11:21 • (MSD) R3673450-4 06/28/21 11:41

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzene	5.00	ND	5.37	5.48	107	110	1	17.0-158			2.03	27
(S) Toluene-d8					*108*	*104*		*80.0-120*				
(S) 4-Bromofluorobenzene					*98.6*	*99.2*		*77.0-126*				
(S) 1,2-Dichloroethane-d4					*92.6*	*90.9*		*70.0-130*				

Method Blank (MB)

(MB) R3675819-1 07/05/21 11:38

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Diesel Range Organics (DRO)	U		66.7	200
Residual Range Organics (RRO)	U		83.3	250
(S) o-Terphenyl	*109*			*52.0-156*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3675819-2 07/05/21 12:01 • (LCSD) R3675819-3 07/05/21 12:23

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	1500	1800	1910	120	127	50.0-150			5.93	20
(S) o-Terphenyl				*113*	*121*	*52.0-156*				

Method Blank (MB)

(MB) R3675820-1 07/05/21 12:46

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Diesel Range Organics (DRO)	U		66.7	200
Residual Range Organics (RRO)	U		83.3	250
(S) o-Terphenyl	*79.5*			*52.0-156*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3675820-2 07/05/21 13:09 • (LCSD) R3675820-3 07/05/21 13:32

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	1500	1440	1070	96.0	71.3	50.0-150		J3	29.5	20
(S) o-Terphenyl				*54.5*	*53.0*	*52.0-156*				

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J2	Surrogate recovery limits have been exceeded; values are outside lower control limits.
J3	The associated batch QC was outside the established quality control range for precision.

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Company Name/Address:
TRC - BNSF Region 1

1180 NW Maple St, Ste 310
Issaquah, WA 98027

Billing Information:
Accounts Payable
1180 NW Maple St, Ste 310
Issaquah, WA 98027

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 2

Pace Analytical®

12065 Lebanon Rd Mount Juliet, TN 37122
Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at: https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

Report to:
Eric Stata

Email To:
EStata@trccompanies.com;MPiovesan@trccom

Project Description: **BNSF Leavenworth - Glacier Park East**

City/State Collected: LEAVENWORTH, WA

Please Circle: PT MT CT ET

Phone: **425-489-1938**

Client Project #: **427977**

Lab Project #: **BNSF1TRC-GLACIER**

SDG # L1369947

H170

Acctnum: **BNSF1TRC**
Template: **T189405**
Prelogin: **P854279**
PM: **134 - Mark W. Beasley**
PB:
Shipped Via: **FedEX Ground**

Collected by (print): E. STATA

Site/Facility ID #

P.O. #: **167055**

Collected by (signature): E. Stata

Immediately Packed on Ice N___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	NWTPHDX w/ SGT 40mlAmb-HCl-BT	NWTPHDX w/o SGT 40mlAmb-HCl-BT	NWTPHGX 40mlAmb HCl	V8260BTEXC 40mlAmb-HCl						Remarks	Sample # (lab only)
MW-6: 63	G	GW	63	6/21/21	0942	7	X	X	X	X							-01
MW-6: 71		GW	71		0947	8	X	X	X	X							02
MW-2: 68.5		GW	68.5		1018	6	X	X	X	X							03
MW-2: 73.5		GW	73.5		1023	8	X	X	X	X							04
MW-2: 78		GW	78		1030	8	X	X	X	X							05
MW-1: 70		GW	70		1122	7											06
MW-1: 75		GW	75		1130	8											07
~~MW-5: 71~~		GW	71		1205	8	X	X	X	X							08
MW-5: 78		GW	78		1210	8	X	X	X	X							09
TRIP BLANK	—	GW	—	6/21/21	—	1				X							10

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other________

Remarks:
V8260BTEX = Benzene only

pH ______ Temp ______
Flow ______ Other ______

Samples returned via:
__ UPS __ FedEx __ Courier ______

Tracking # 5016 1231 0168

Sample Receipt Checklist
COC Seal Present/Intact: ✓ NP __Y __N
COC Signed/Accurate: ✓Y __N
Bottles arrive intact: ✓Y __N
Correct bottles used: ✓Y __N
Sufficient volume sent: ✓Y __N
If Applicable
VOA Zero Headspace: ✓Y __N
Preservation Correct/Checked: ✓Y __N
RAD Screen <0.5 mR/hr: ✓Y __N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR	
E. Stata	6/21/21	1730		A601	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: .7+1=.8 °C / Bottles Received: 105	If preservation required by Login: Date/Time
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature) Jasmine Fuqua	Date: 6/23/21 Time: 900	Hold: / Condition: NCF / OK

Company Name/Address:
TRC - BNSF Region 1
1180 NW Maple St, Ste 310
Issaquah, WA 98027

Billing Information:
Accounts Payable
1180 NW Maple St, Ste 310
Issaquah, WA 98027

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page 2 of 2

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Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at: https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

Report to: Eric Stata

Email To: EStata@trccompanies.com;~~MPlovesan@trccom~~

Project Description: BNSF Leavenworth - Glacier Park East

City/State Collected: Leavenworth, WA

Please Circle: PT MT CT ET

Phone: ~~425-489-1938~~ 425-395-0010

Client Project #: 427977

Lab Project #: BNSF1TRC-GLACIER

Collected by (print): E. STATA

Site/Facility ID #:

P.O. #: 167055

Collected by (signature): E. Stata

Immediately Packed on Ice N___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

SDG # L1369947

Table #

Acctnum: BNSF1TRC
Template: T189405
Prelogin: P854279
PM: 134 - Mark W. Beasley
PB:
Shipped Via: FedEX Ground

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	NWTPHDX w/ SGT 40mlAmb-HCl-BT	NWTPHDX w/o SGT 40mlAmb-HCl-BT	NWTPHGX 40mlAmb HCl	V8260BTEXC 40mlAmb-HCl	Remarks	Sample # (lab only)
MW-3:63	G	GW	63	6-21-21	1230	8	X	X	X	X		-11
MW-3:69	G		69		1235	6	X	X	X	X		12
MW-3:75	G		75		1240	8	X	X	X	X		13
MW-4:64	G		64		1310	7	X	X	X	X		14
MW-4:72	G		72		1315	8	X	X	X	X		15

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other________

Remarks:
V8260BTEX = Benzene only

pH ______ Temp ______
Flow ______ Other ______

Samples returned via:
__ UPS __ FedEx __ Courier ________

Tracking # " "

Sample Receipt Checklist
COC Seal Present/Intact: ✓NP _Y _N
COC Signed/Accurate: ✓Y _N
Bottles arrive intact: ✓Y _N
Correct bottles used: ✓Y _N
Sufficient volume sent: ✓Y _N
If Applicable
VOA Zero Headspace: ✓Y _N
Preservation Correct/Checked: _Y _N
RAD Screen <0.5 mR/hr: ✓Y _N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No " " HCL / MeoH TBR
E. Stata	6/21/21	1730		

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: ~~Atcot~~ °C	Bottles Received:	If preservation required by Login: Date/Time
				.7+.1=.8	105	

Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date:	Time:	Hold:	Condition: NCF / OK
			Jasmine Fuqua	6/23/21	900		

L1369947 BNSF1TRC NCF

R5

Time estimate: 0h **Time spent:** 0h

Members

V Jeremy Watkins (responsible) MB Mark Beasley

- [ ] Login Clarification needed
- [ ] Chain of custody is incomplete
- [ ] Please specify Metals requested
- [ ] Please specify TCLP requested
- [ ] Received additional samples not listed on COC
- [ ] Sample IDs on containers do not match IDs on COC
- [x] Client did not "X" analysis
- [ ] Chain of Custody is missing
- [ ] If no COC: Received by:____________________
- [ ] If no COC: Date/Time:____________________
- [ ] If no COC: Temp./Cont.Rec./pH:_______________
- [ ] If no COC: Carrier:_______________
- [ ] If no COC: Tracking #:________________
- [ ] Client informed by call
- [ ] Client informed by Email
- [ ] Client informed by Voicemail
- [ ] Date/Time:_____6/23/21_______________
- [ ] PM initials:______MB____________
- [ ] Client Contact:_____Eric Stata_______________

Comments

Jeremy Watkins *23 June 2021 3:23 PM*

Analysis not marked for MW-1:70 or MW-1:75

Mark Beasley *23 June 2021 3:28 PM*

Log for same analysis as the other samples

Jeremy Watkins *23 June 2021 3:30 PM*

Done

ANALYTICAL REPORT

August 30, 2021

Revised Report

TRC - BNSF Region 1

Sample Delivery Group:	L1387209
Samples Received:	08/05/2021
Project Number:	444428
Description:	BNSF - Leavenworth
Report To:	Keith Woodburne 1180 NW Maple St, Ste 310 Issaquah, WA 98027

Entire Report Reviewed By:

Mark W. Beasley
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

Pace Analytical National
12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

TABLE OF CONTENTS

MW-1-20210802 L1387209-01 GW

Collected by: D. Verret | Collected date/time: 08/02/21 17:25 | Received date/time: 08/05/21 13:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9060A	WG1718339	1	08/07/21 03:31	08/07/21 03:31	VRP	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1718975	1	08/06/21 22:31	08/06/21 22:31	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1719329	1	08/07/21 18:54	08/07/21 18:54	JCP	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1719578	1	08/09/21 23:35	08/11/21 07:56	DMG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1720133	1	08/07/21 11:33	08/10/21 23:36	DMG	Mt. Juliet, TN

MW-2-20210802 L1387209-02 GW

Collected by: D. Verret | Collected date/time: 08/02/21 13:48 | Received date/time: 08/05/21 13:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9060A	WG1718339	1	08/07/21 03:57	08/07/21 03:57	VRP	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1718975	1	08/06/21 22:53	08/06/21 22:53	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1719329	1	08/07/21 19:14	08/07/21 19:14	JCP	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1719578	1	08/09/21 23:35	08/11/21 08:22	DMG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1720133	1	08/07/21 11:33	08/11/21 01:47	DMG	Mt. Juliet, TN

MW-3-20210803 L1387209-03 GW

Collected by: D. Verret | Collected date/time: 08/03/21 09:40 | Received date/time: 08/05/21 13:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9060A	WG1718339	1	08/07/21 04:26	08/07/21 04:26	VRP	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1718975	1	08/06/21 23:14	08/06/21 23:14	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1719329	1	08/07/21 19:34	08/07/21 19:34	JCP	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1720622	1	08/12/21 16:18	08/17/21 10:01	JAS	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1721750	1	08/15/21 12:02	08/17/21 07:45	DMG	Mt. Juliet, TN

MW-4-20210803 L1387209-04 GW

Collected by: D. Verret | Collected date/time: 08/03/21 12:05 | Received date/time: 08/05/21 13:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9060A	WG1718339	1	08/07/21 04:54	08/07/21 04:54	VRP	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1718975	1	08/06/21 23:36	08/06/21 23:36	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1719329	1	08/07/21 19:54	08/07/21 19:54	JCP	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1720622	1	08/12/21 16:18	08/17/21 09:20	JAS	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1720133	1	08/07/21 11:33	08/11/21 02:39	DMG	Mt. Juliet, TN

MW-5-20210803 L1387209-05 GW

Collected by: D. Verret | Collected date/time: 08/03/21 10:55 | Received date/time: 08/05/21 13:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9060A	WG1718339	1	08/07/21 05:17	08/07/21 05:17	VRP	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1718975	1	08/06/21 23:58	08/06/21 23:58	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1719329	1	08/07/21 20:14	08/07/21 20:14	JCP	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1720622	1	08/12/21 16:18	08/17/21 09:00	JAS	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1720133	1	08/07/21 11:33	08/11/21 03:05	DMG	Mt. Juliet, TN

MW-6-20210803 L1387209-06 GW

Collected by	Collected date/time	Received date/time
D. Verret	08/03/21 13:50	08/05/21 13:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9060A	WG1719812	1	08/09/21 16:11	08/09/21 16:11	MJA	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1718975	1	08/07/21 00:19	08/07/21 00:19	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1719341	1	08/07/21 21:52	08/07/21 21:52	JCP	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1720622	1	08/12/21 16:18	08/17/21 08:40	JAS	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1720133	1	08/07/21 11:33	08/11/21 03:31	DMG	Mt. Juliet, TN

DUP-1-20210803 L1387209-07 GW

Collected by	Collected date/time	Received date/time
D. Verret	08/03/21 00:00	08/05/21 13:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9060A	WG1719812	1	08/09/21 17:34	08/09/21 17:34	MJA	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1718975	1	08/07/21 00:41	08/07/21 00:41	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1719341	1	08/07/21 22:12	08/07/21 22:12	JCP	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1720622	1	08/12/21 16:18	08/17/21 09:40	JAS	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1720133	1	08/07/21 11:33	08/11/21 03:57	DMG	Mt. Juliet, TN

TRIP BLANK L1387209-08 GW

Collected by	Collected date/time	Received date/time
D. Verret	08/02/21 00:00	08/05/21 13:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1718975	1	08/06/21 22:09	08/06/21 22:09	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1719341	1	08/07/21 21:31	08/07/21 21:31	JCP	Mt. Juliet, TN

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Project Manager

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Report Revision History

Level II Report - Version 1: 08/18/21 17:54

Sample Delivery Group (SDG) Narrative

pH outside of method requirement.

Lab Sample ID	Project Sample ID	Method
L1387209-03	MW-3-20210803	NWTPHDX-NO SGT
L1387209-04	MW-4-20210803	NWTPHDX-NO SGT

Wet Chemistry by Method 9060A

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	3060	B	1000	1	08/07/2021 03:31	WG1718339

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	08/06/2021 22:31	WG1718975
(S) a,a,a-Trifluorotoluene(FID)	*96.3*		*78.0-120*		*08/06/2021 22:31*	WG1718975

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	08/07/2021 18:54	WG1719329
Toluene	ND		1.00	1	08/07/2021 18:54	WG1719329
Ethylbenzene	ND		1.00	1	08/07/2021 18:54	WG1719329
o-Xylene	ND		1.00	1	08/07/2021 18:54	WG1719329
m&p-Xylene	ND		2.00	1	08/07/2021 18:54	WG1719329
(S) Toluene-d8	*114*		*80.0-120*		*08/07/2021 18:54*	WG1719329
(S) 4-Bromofluorobenzene	*99.4*		*77.0-126*		*08/07/2021 18:54*	WG1719329
(S) 1,2-Dichloroethane-d4	*88.9*		*70.0-130*		*08/07/2021 18:54*	WG1719329

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	381		200	1	08/11/2021 07:56	WG1719578
Residual Range Organics (RRO)	308		250	1	08/11/2021 07:56	WG1719578
(S) o-Terphenyl	*108*		*52.0-156*		*08/11/2021 07:56*	WG1719578

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	08/10/2021 23:36	WG1720133
Residual Range Organics (RRO)	ND		250	1	08/10/2021 23:36	WG1720133
(S) o-Terphenyl	*64.2*		*52.0-156*		*08/10/2021 23:36*	WG1720133

Wet Chemistry by Method 9060A

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	4820	B	1000	1	08/07/2021 03:57	WG1718339

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	08/06/2021 22:53	WG1718975
(S) a,a,a-Trifluorotoluene(FID)	*95.4*		*78.0-120*		*08/06/2021 22:53*	WG1718975

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	08/07/2021 19:14	WG1719329
Toluene	ND		1.00	1	08/07/2021 19:14	WG1719329
Ethylbenzene	ND		1.00	1	08/07/2021 19:14	WG1719329
o-Xylene	ND		1.00	1	08/07/2021 19:14	WG1719329
m&p-Xylene	ND		2.00	1	08/07/2021 19:14	WG1719329
(S) Toluene-d8	*108*		*80.0-120*		*08/07/2021 19:14*	WG1719329
(S) 4-Bromofluorobenzene	*101*		*77.0-126*		*08/07/2021 19:14*	WG1719329
(S) 1,2-Dichloroethane-d4	*86.6*		*70.0-130*		*08/07/2021 19:14*	WG1719329

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	842		200	1	08/11/2021 08:22	WG1719578
Residual Range Organics (RRO)	1640		250	1	08/11/2021 08:22	WG1719578
(S) o-Terphenyl	*97.0*		*52.0-156*		*08/11/2021 08:22*	WG1719578

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	08/11/2021 01:47	WG1720133
Residual Range Organics (RRO)	ND		250	1	08/11/2021 01:47	WG1720133
(S) o-Terphenyl	*80.0*		*52.0-156*		*08/11/2021 01:47*	WG1720133

Wet Chemistry by Method 9060A

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	11200		1000	1	08/07/2021 04:26	WG1718339

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	08/06/2021 23:14	WG1718975
(S) a,a,a-Trifluorotoluene(FID)	*94.8*		*78.0-120*		*08/06/2021 23:14*	WG1718975

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	08/07/2021 19:34	WG1719329
Toluene	ND		1.00	1	08/07/2021 19:34	WG1719329
Ethylbenzene	ND		1.00	1	08/07/2021 19:34	WG1719329
o-Xylene	ND		1.00	1	08/07/2021 19:34	WG1719329
m&p-Xylene	ND		2.00	1	08/07/2021 19:34	WG1719329
(S) Toluene-d8	*117*		*80.0-120*		*08/07/2021 19:34*	WG1719329
(S) 4-Bromofluorobenzene	*102*		*77.0-126*		*08/07/2021 19:34*	WG1719329
(S) 1,2-Dichloroethane-d4	*91.3*		*70.0-130*		*08/07/2021 19:34*	WG1719329

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	1960		200	1	08/17/2021 10:01	WG1720622
Residual Range Organics (RRO)	1500		250	1	08/17/2021 10:01	WG1720622
(S) o-Terphenyl	*91.0*		*52.0-156*		*08/17/2021 10:01*	WG1720622

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	08/17/2021 07:45	WG1721750
Residual Range Organics (RRO)	ND		250	1	08/17/2021 07:45	WG1721750
(S) o-Terphenyl	*76.3*		*52.0-156*		*08/17/2021 07:45*	WG1721750

Wet Chemistry by Method 9060A

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	8730		1000	1	08/07/2021 04:54	WG1718339

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	08/06/2021 23:36	WG1718975
(S) a,a,a-Trifluorotoluene(FID)	*94.5*		*78.0-120*		*08/06/2021 23:36*	WG1718975

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	08/07/2021 19:54	WG1719329
Toluene	ND		1.00	1	08/07/2021 19:54	WG1719329
Ethylbenzene	ND		1.00	1	08/07/2021 19:54	WG1719329
o-Xylene	ND		1.00	1	08/07/2021 19:54	WG1719329
m&p-Xylene	ND		2.00	1	08/07/2021 19:54	WG1719329
(S) Toluene-d8	*114*		*80.0-120*		*08/07/2021 19:54*	WG1719329
(S) 4-Bromofluorobenzene	*101*		*77.0-126*		*08/07/2021 19:54*	WG1719329
(S) 1,2-Dichloroethane-d4	*91.5*		*70.0-130*		*08/07/2021 19:54*	WG1719329

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	1180		200	1	08/17/2021 09:20	WG1720622
Residual Range Organics (RRO)	725		250	1	08/17/2021 09:20	WG1720622
(S) o-Terphenyl	*80.5*		*52.0-156*		*08/17/2021 09:20*	WG1720622

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	08/11/2021 02:39	WG1720133
Residual Range Organics (RRO)	ND		250	1	08/11/2021 02:39	WG1720133
(S) o-Terphenyl	*57.9*		*52.0-156*		*08/11/2021 02:39*	WG1720133

Wet Chemistry by Method 9060A

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	1780	B	1000	1	08/07/2021 05:17	WG1718339

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	08/06/2021 23:58	WG1718975
(S) a,a,a-Trifluorotoluene(FID)	*96.6*		*78.0-120*		*08/06/2021 23:58*	WG1718975

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	08/07/2021 20:14	WG1719329
Toluene	ND		1.00	1	08/07/2021 20:14	WG1719329
Ethylbenzene	ND		1.00	1	08/07/2021 20:14	WG1719329
o-Xylene	ND		1.00	1	08/07/2021 20:14	WG1719329
m&p-Xylene	ND		2.00	1	08/07/2021 20:14	WG1719329
(S) Toluene-d8	*112*		*80.0-120*		*08/07/2021 20:14*	WG1719329
(S) 4-Bromofluorobenzene	*99.3*		*77.0-126*		*08/07/2021 20:14*	WG1719329
(S) 1,2-Dichloroethane-d4	*90.4*		*70.0-130*		*08/07/2021 20:14*	WG1719329

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	08/17/2021 09:00	WG1720622
Residual Range Organics (RRO)	ND		250	1	08/17/2021 09:00	WG1720622
(S) o-Terphenyl	*76.0*		*52.0-156*		*08/17/2021 09:00*	WG1720622

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	08/11/2021 03:05	WG1720133
Residual Range Organics (RRO)	ND		250	1	08/11/2021 03:05	WG1720133
(S) o-Terphenyl	*65.3*		*52.0-156*		*08/11/2021 03:05*	WG1720133

Wet Chemistry by Method 9060A

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	ND		1000	1	08/09/2021 16:11	WG1719812

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	08/07/2021 00:19	WG1718975
(S) a,a,a-Trifluorotoluene(FID)	*95.8*		*78.0-120*		*08/07/2021 00:19*	WG1718975

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	08/07/2021 21:52	WG1719341
Toluene	ND		1.00	1	08/07/2021 21:52	WG1719341
Ethylbenzene	ND		1.00	1	08/07/2021 21:52	WG1719341
o-Xylene	ND		1.00	1	08/07/2021 21:52	WG1719341
m&p-Xylene	ND		2.00	1	08/07/2021 21:52	WG1719341
(S) Toluene-d8	*96.6*		*80.0-120*		*08/07/2021 21:52*	WG1719341
(S) 4-Bromofluorobenzene	*91.3*		*77.0-126*		*08/07/2021 21:52*	WG1719341
(S) 1,2-Dichloroethane-d4	*103*		*70.0-130*		*08/07/2021 21:52*	WG1719341

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	08/17/2021 08:40	WG1720622
Residual Range Organics (RRO)	ND		250	1	08/17/2021 08:40	WG1720622
(S) o-Terphenyl	*79.0*		*52.0-156*		*08/17/2021 08:40*	WG1720622

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	08/11/2021 03:31	WG1720133
Residual Range Organics (RRO)	ND		250	1	08/11/2021 03:31	WG1720133
(S) o-Terphenyl	*70.0*		*52.0-156*		*08/11/2021 03:31*	WG1720133

Wet Chemistry by Method 9060A

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	10400		1000	1	08/09/2021 17:34	WG1719812

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	08/07/2021 00:41	WG1718975
(S) a,a,a-Trifluorotoluene(FID)	*94.4*		*78.0-120*		*08/07/2021 00:41*	WG1718975

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	08/07/2021 22:12	WG1719341
Toluene	ND		1.00	1	08/07/2021 22:12	WG1719341
Ethylbenzene	ND		1.00	1	08/07/2021 22:12	WG1719341
o-Xylene	ND		1.00	1	08/07/2021 22:12	WG1719341
m&p-Xylene	ND		2.00	1	08/07/2021 22:12	WG1719341
(S) Toluene-d8	*95.6*		*80.0-120*		*08/07/2021 22:12*	WG1719341
(S) 4-Bromofluorobenzene	*91.7*		*77.0-126*		*08/07/2021 22:12*	WG1719341
(S) 1,2-Dichloroethane-d4	*110*		*70.0-130*		*08/07/2021 22:12*	WG1719341

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	1850		200	1	08/17/2021 09:40	WG1720622
Residual Range Organics (RRO)	1040		250	1	08/17/2021 09:40	WG1720622
(S) o-Terphenyl	*91.0*		*52.0-156*		*08/17/2021 09:40*	WG1720622

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	ND		200	1	08/11/2021 03:57	WG1720133
Residual Range Organics (RRO)	ND		250	1	08/11/2021 03:57	WG1720133
(S) o-Terphenyl	*60.5*		*52.0-156*		*08/11/2021 03:57*	WG1720133

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	ND		100	1	08/06/2021 22:09	WG1718975
(S) a,a,a-Trifluorotoluene(FID)	*95.8*		*78.0-120*		*08/06/2021 22:09*	WG1718975

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	08/07/2021 21:31	WG1719341
Toluene	ND		1.00	1	08/07/2021 21:31	WG1719341
Ethylbenzene	ND		1.00	1	08/07/2021 21:31	WG1719341
o-Xylene	ND		1.00	1	08/07/2021 21:31	WG1719341
m&p-Xylene	ND		2.00	1	08/07/2021 21:31	WG1719341
(S) Toluene-d8	*103*		*80.0-120*		*08/07/2021 21:31*	WG1719341
(S) 4-Bromofluorobenzene	*98.1*		*77.0-126*		*08/07/2021 21:31*	WG1719341
(S) 1,2-Dichloroethane-d4	*110*		*70.0-130*		*08/07/2021 21:31*	WG1719341

Method Blank (MB)

(MB) R3689141-2 08/06/21 20:32

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
TOC (Total Organic Carbon)	841	J	102	1000

L1386619-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1386619-02 08/06/21 22:16 • (DUP) R3689141-5 08/06/21 22:33

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
TOC (Total Organic Carbon)	1400	ND	1	39.2	P1	20

Laboratory Control Sample (LCS)

(LCS) R3689141-1 08/06/21 20:14

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75000	82000	109	85.0-115	

L1386619-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1386619-01 08/06/21 20:48 • (MS) R3689141-3 08/06/21 21:17 • (MSD) R3689141-4 08/06/21 21:49

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TOC (Total Organic Carbon)	50000	ND	49200	50500	97.3	100	1	80.0-120			2.75	20

L1387170-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1387170-01 08/07/21 02:05 • (MS) R3689141-6 08/07/21 02:34 • (MSD) R3689141-7 08/07/21 03:01

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TOC (Total Organic Carbon)	50000	9330	57900	61100	97.1	103	1	80.0-120			5.33	20

QUALITY CONTROL SUMMARY

L1387209-06,07

Method Blank (MB)

(MB) R3689986-2 08/09/21 13:19

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
TOC (Total Organic Carbon)	301	J	102	1000

L1387209-07 Original Sample (OS) • Duplicate (DUP)

(OS) L1387209-07 08/09/21 17:34 • (DUP) R3689986-5 08/09/21 17:58

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
TOC (Total Organic Carbon)	10400	10400	1	0.0960		20

Laboratory Control Sample (LCS)

(LCS) R3689986-1 08/09/21 12:58

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75000	77700	104	85.0-115	

L1387209-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1387209-06 08/09/21 16:11 • (MS) R3689986-3 08/09/21 16:40 • (MSD) R3689986-4 08/09/21 17:07

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TOC (Total Organic Carbon)	50000	ND	49600	49700	97.8	98.1	1	80.0-120			0.302	20

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3690542-2 08/06/21 21:24

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Gasoline Range Organics-NWTPH	U		31.6	100
(S) a,a,a-Trifluorotoluene(FID)	*96.1*			*78.0-120*

Laboratory Control Sample (LCS)

(LCS) R3690542-1 08/06/21 20:32

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Gasoline Range Organics-NWTPH	5500	5550	101	70.0-124	
(S) a,a,a-Trifluorotoluene(FID)			*105*	*78.0-120*	

Method Blank (MB)

(MB) R3691325-2 08/07/21 13:02

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Benzene	U		0.0941	1.00
Ethylbenzene	U		0.137	1.00
Toluene	U		0.278	1.00
o-Xylene	U		0.174	1.00
m&p-Xylenes	U		0.430	2.00
(S) Toluene-d8	*112*			*80.0-120*
(S) 4-Bromofluorobenzene	*96.4*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*87.4*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R3691325-1 08/07/21 12:22

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	5.00	4.75	95.0	70.0-123	
Ethylbenzene	5.00	5.56	111	79.0-123	
Toluene	5.00	5.15	103	79.0-120	
o-Xylene	5.00	5.64	113	80.0-122	
m&p-Xylenes	10.0	10.7	107	80.0-122	
(S) Toluene-d8			*109*	*80.0-120*	
(S) 4-Bromofluorobenzene			*101*	*77.0-126*	
(S) 1,2-Dichloroethane-d4			*91.9*	*70.0-130*	

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3691447-3 08/07/21 21:11

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Benzene	U		0.0941	1.00
Ethylbenzene	U		0.137	1.00
Toluene	U		0.278	1.00
o-Xylene	U		0.174	1.00
m&p-Xylenes	U		0.430	2.00
(S) Toluene-d8	*97.5*			*80.0-120*
(S) 4-Bromofluorobenzene	*93.8*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*93.6*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3691447-1 08/07/21 20:10 • (LCSD) R3691447-2 08/07/21 20:30

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	5.00	4.90	5.18	98.0	104	70.0-123			5.56	20
Ethylbenzene	5.00	4.53	4.44	90.6	88.8	79.0-123			2.01	20
Toluene	5.00	4.97	4.85	99.4	97.0	79.0-120			2.44	20
o-Xylene	5.00	4.35	4.48	87.0	89.6	80.0-122			2.94	20
m&p-Xylenes	10.0	8.83	8.94	88.3	89.4	80.0-122			1.24	20
(S) Toluene-d8				*90.4*	*98.1*	*80.0-120*				
(S) 4-Bromofluorobenzene				*93.2*	*93.3*	*77.0-126*				
(S) 1,2-Dichloroethane-d4				*105*	*112*	*70.0-130*				

Method Blank (MB)

(MB) R3690381-1 08/10/21 10:33

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Diesel Range Organics (DRO)	U		66.7	200
Residual Range Organics (RRO)	U		83.3	250
(S) o-Terphenyl	*103*			*52.0-156*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3690381-2 08/10/21 12:17 • (LCSD) R3690381-3 08/10/21 12:43

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	1500	1420	1410	94.7	94.0	50.0-150			0.707	20
(S) o-Terphenyl				*117*	*121*	*52.0-156*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3691752-1 08/13/21 06:22

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Diesel Range Organics (DRO)	U		66.7	200
Residual Range Organics (RRO)	U		83.3	250
(S) o-Terphenyl	*66.5*			*52.0-156*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3691752-2 08/13/21 06:42 • (LCSD) R3691752-3 08/13/21 07:02

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	1500	1450	1490	96.7	99.3	50.0-150			2.72	20
(S) o-Terphenyl				*77.0*	*77.5*	*52.0-156*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3690672-1 08/10/21 21:26

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Diesel Range Organics (DRO)	U		66.7	200
Residual Range Organics (RRO)	U		83.3	250
(S) o-Terphenyl	*59.5*			*52.0-156*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3690672-2 08/10/21 21:52 • (LCSD) R3690672-3 08/10/21 22:18

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	1500	1290	1220	86.0	81.3	50.0-150			5.58	20
(S) o-Terphenyl				*79.5*	*73.5*	*52.0-156*				

Method Blank (MB)

(MB) R3692707-1 08/16/21 16:08

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Diesel Range Organics (DRO)	U		66.7	200
Residual Range Organics (RRO)	U		83.3	250
(S) o-Terphenyl	*78.0*			*52.0-156*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3692707-2 08/16/21 16:34 • (LCSD) R3692707-3 08/16/21 17:00

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	1500	1200	1140	80.0	76.0	50.0-150			5.13	20
(S) o-Terphenyl				*94.0*	*88.0*	*52.0-156*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
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Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
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Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
B	The same analyte is found in the associated blank.
J	The identification of the analyte is acceptable; the reported value is an estimate.
P1	RPD value not applicable for sample concentrations less than 5 times the reporting limit.

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Company Name/Address:	Billing Information:	Pres Chk
TRC - BNSF Region 1 1180 NW Maple St, Ste 310 Issaquah, WA 98027	Accounts Payable 1180 NW Maple St, Ste 310 Issaquah, WA 98027	

Report to: ~~Amanda Meugniot~~ Keith Woodburne

Email To: Kwoodburne ~~ameugniot~~@trcsolutions.com;EStata@trccompa

Project Description: BNSF - Leavenworth

City/State Collected: Leavenworth, WA

Please Circle: PT MT CT ET

Phone: 425-489-1938

Client Project #: 444428

Lab Project #: BNSF1TRC-LEAVENWORTH

Collected by (print): D. Verret

Site/Facility ID #

P.O. #

Collected by (signature):

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Immediately Packed on Ice N ___ Y ✓

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

Pace Analytical®

12065 Lebanon Rd Mount Juliet, TN 37122
Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at: https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

SDG # 1387209

A098

Acctnum: BNSF1TRC
Template: T192383
Prelogin: P864257
PM: 134 - Mark W. Beasley
PB: 7/29/21
Shipped Via: FedEX Ground

N 8/27/21

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	NWTPHDXLVI w SGT 40mlAmb-HCl-BT (2)	NWTPHDXLVI w/o SGT 40mlAmb-HCl-BT (2)	NWTPHGX 40mlAmb HCl (3)	TOC 250mlHDPE-HCl (1)	V8260BTEXC 40mlAmb-HCl (3)	Remarks	Sample # (lab only)	
MW-2-20210802	G	GW	X	8-2-21	1348	11	X	X	X	X	X		~~-01~~	-02
MW-1-20210802	G	GW		8-2-21	17:25								~~-02~~	-01
MW-3-20210803		GW		8-3-21	0940	9 STS							~~-03~~	-03
MW-5-20210803		GW		8-3-21	1055								~~-04~~	-05
MW-4-20210803		GW		8-3-21	1205								~~-05~~	-04
MW-6-20210803		GW		8-3-21	1350								~~-06~~	-06
DUP-1-20210803		GW		8-3-21									~~-07~~	-07
		GW												
		GW												
Trip Blank		GW					X	X	X	X	X		-08	

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other ________

Remarks:

pH ______ Temp ______

Flow ______ Other ______

Samples returned via: ___ UPS X FedEx ___ Courier ________

Tracking # 5217 3307 1933

Sample Receipt Checklist
COC Seal Present/Intact: __NP __Y __N
COC Signed/Accurate: ✓Y __N
Bottles arrive intact: ✓Y __N
Correct bottles used: ✓Y __N
Sufficient volume sent: ✓Y __N
If Applicable
VOA Zero Headspace: ✓Y __N
Preservation Correct/Checked: ✓Y __N
RAD Screen <0.5 mR/hr: __Y __N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)		
Laithan Briant	08-04-21	1100		Trip Blank Received: Yes / No HCL / MeoH TBR ATPA 4	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 4.1+0=4.1 °C Bottles Received: 75	If preservation required by Login: Date/Time
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 8/5/21 Time: 13:30	Hold: Condition: NCF / OK

8/5-NCF-L1387209-BNSF1TRC PM

R5

Time estimate: 0h **Time spent:** 0h

Members

Paul Minnich (responsible)

- [x] Empty containers
- [ ] Parameter(s) past holding time
- [ ] Temperature not in range
- [ ] Improper container type
- [ ] pH not in range
- [ ] Insufficient sample volume
- [ ] Sample is biphasic
- [ ] Vials received with headspace
- [ ] Broken container
- [ ] Sufficient sample remains
- [ ] If broken container: Insufficient packing material around container
- [ ] If broken container: Insufficient packing material inside cooler
- [ ] If broken container: Improper handling by carrier:_______________
- [ ] If broken container: Sample was frozen
- [ ] If broken container: Container lid not intact
- [ ] Client informed by Call
- [ ] Client informed by Email
- [ ] Client informed by Voicemail
- [ ] Date/Time:_______________
- [ ] PM initials:_______________
- [ ] Client Contact:__________________

Comments

Paul Minnich *6 August 2021 12:37 AM*

MW-3 received two empty vials.

ANALYTICAL REPORT

July 09, 2021

Revised Report

TRC - BNSF Region 1

Sample Delivery Group:	L1371284
Samples Received:	06/25/2021
Project Number:	444428.0000.0000
Description:	BNSF - Glacier Park East
Report To:	Eric Stata
	1180 NW Maple St, Ste 310
	Issaquah, WA 98027

Entire Report Reviewed By:

Mark W. Beasley
Project Manager

Pace Analytical National

12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

TABLE OF CONTENTS

SAMPLE SUMMARY

	Collected by	Collected date/time	Received date/time
PZ4-20210624 L1371284-01 GW	David Verret	06/24/21 11:05	06/25/21 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 9060A	WG1697540	1	06/30/21 22:26	06/30/21 22:26	MJA	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method NWTPHGX	WG1700000	10	07/05/21 20:43	07/05/21 20:43	JAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260D	WG1697837	1	07/01/21 00:29	07/01/21 00:29	TJJ	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1697190	1	07/04/21 11:55	07/06/21 04:13	AEG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1697201	1	07/04/21 12:01	07/08/21 09:32	AEG	Mt. Juliet, TN

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Project Manager

Report Revision History

Level II Report - Version 1: 07/08/21 20:56

Project Narrative

Sample ID corrected

Wet Chemistry by Method 9060A

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
TOC (Total Organic Carbon)	17300		1000	1	06/30/2021 22:26	WG1697540

Volatile Organic Compounds (GC) by Method NWTPHGX

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Gasoline Range Organics-NWTPH	16000		1000	10	07/05/2021 20:43	WG1700000
(S) a,a,a-Trifluorotoluene(FID)	*97.5*		*78.0-120*		*07/05/2021 20:43*	WG1700000

Volatile Organic Compounds (GC/MS) by Method 8260D

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	07/01/2021 00:29	WG1697837
(S) Toluene-d8	*79.2*	J2	*80.0-120*		*07/01/2021 00:29*	WG1697837
(S) 4-Bromofluorobenzene	*87.1*		*77.0-126*		*07/01/2021 00:29*	WG1697837
(S) 1,2-Dichloroethane-d4	*99.8*		*70.0-130*		*07/01/2021 00:29*	WG1697837

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	5540		200	1	07/06/2021 04:13	WG1697190
Residual Range Organics (RRO)	1730		250	1	07/06/2021 04:13	WG1697190
(S) o-Terphenyl	*105*		*52.0-156*		*07/06/2021 04:13*	WG1697190

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Diesel Range Organics (DRO)	1390	J3	200	1	07/08/2021 09:32	WG1697201
Residual Range Organics (RRO)	ND		250	1	07/08/2021 09:32	WG1697201
(S) o-Terphenyl	*72.6*		*52.0-156*		*07/08/2021 09:32*	WG1697201

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3674299-2 06/30/21 18:14

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
TOC (Total Organic Carbon)	727	J	102	1000

L1370937-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1370937-02 06/30/21 20:40 • (DUP) R3674299-5 06/30/21 20:53

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
TOC (Total Organic Carbon)	1430	1320	1	8.06		20

Laboratory Control Sample (LCS)

(LCS) R3674299-1 06/30/21 18:01

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TOC (Total Organic Carbon)	75000	80600	107	85.0-115	

L1370937-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1370937-01 06/30/21 19:30 • (MS) R3674299-3 06/30/21 19:58 • (MSD) R3674299-4 06/30/21 20:25

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TOC (Total Organic Carbon)	50000	1070	47600	48200	93.1	94.2	1	80.0-120			1.13	20

L1371343-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1371343-01 06/30/21 22:40 • (MS) R3674299-6 06/30/21 23:03 • (MSD) R3674299-7 06/30/21 23:30

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TOC (Total Organic Carbon)	50000	ND	47400	48400	92.9	94.9	1	80.0-120			2.07	20

Method Blank (MB)

(MB) R3675973-2 07/05/21 16:42

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Gasoline Range Organics-NWTPH	50.4	J	31.6	100
(S) a,a,a-Trifluorotoluene(FID)	*98.4*			*78.0-120*

Laboratory Control Sample (LCS)

(LCS) R3675973-1 07/05/21 15:58

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Gasoline Range Organics-NWTPH	5500	5290	96.2	70.0-124	
(S) a,a,a-Trifluorotoluene(FID)			*104*	*78.0-120*	

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3675190-2 06/30/21 20:43

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Benzene	U		0.0941	1.00
(S) Toluene-d8	*102*			*80.0-120*
(S) 4-Bromofluorobenzene	*95.2*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*100*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R3675190-1 06/30/21 20:02

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	5.00	4.90	98.0	70.0-123	
(S) Toluene-d8			*103*	*80.0-120*	
(S) 4-Bromofluorobenzene			*102*	*77.0-126*	
(S) 1,2-Dichloroethane-d4			*96.5*	*70.0-130*	

Method Blank (MB)

(MB) R3675819-1 07/05/21 11:38

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Diesel Range Organics (DRO)	U		66.7	200
Residual Range Organics (RRO)	U		83.3	250
(S) o-Terphenyl	*109*			*52.0-156*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3675819-2 07/05/21 12:01 • (LCSD) R3675819-3 07/05/21 12:23

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	1500	1800	1910	120	127	50.0-150			5.93	20
(S) o-Terphenyl				*113*	*121*	*52.0-156*				

Method Blank (MB)

(MB) R3675820-1 07/05/21 12:46

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Diesel Range Organics (DRO)	U		66.7	200
Residual Range Organics (RRO)	U		83.3	250
(S) o-Terphenyl	*79.5*			*52.0-156*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3675820-2 07/05/21 13:09 • (LCSD) R3675820-3 07/05/21 13:32

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	1500	1440	1070	96.0	71.3	50.0-150		J3	29.5	20
(S) o-Terphenyl				*54.5*	*53.0*	*52.0-156*				

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SDG	Sample Delivery Group.
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Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.
J2	Surrogate recovery limits have been exceeded; values are outside lower control limits.
J3	The associated batch QC was outside the established quality control range for precision.

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Com[redacted]e/Address:
TRC - BNSF Region 1

1180 NW Maple St, Ste 310
Issaquah, WA 98027

Billing Information:
Accounts Payable
1180 NW Maple St, Ste 310
Issaquah, WA 98027

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

Pace Analytical®

12065 Lebanon Rd Mount Juliet, TN 37122
Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at: https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

Report to: Eric Stata

Email To: alesher@trccompanies.com;cmoon@trccompan

Project Description: BNSF - Glacier Park East

City/State Collected:

Please Circle: PT MT CT ET

Phone: 503-407-0734

Client Project # 444428.0000.0000

Lab Project # BNSF1TRC-GLACIERPHII

SDG # L1371284

Table # F097

Collected by (print): David Verret

Site/Facility ID #

P.O. # 167720

Acctnum: BNSF1TRC
Template: T189413
Prelogin: P854293
PM: 134 - Mark W. Beasley
PB:
Shipped Via: FedEX Ground

Collected by (signature):

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Immediately Packed on Ice N ___ Y ✓

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	MRCRA8 250mlHDPE-HNO3	NWTPHDXLVI w/ SGT 40mlAmb-HCl-BT	NWTPHDXLVI w/o SGT 40mlAmb-HCl-BT	NWTPHGX 40mlAmb HCl	TOC 250mlHDPE-HCl	V8260BTEXC 40mlAmb-HCl	Remarks	Sample # (lab only)
P24-20210624	grab	GW	—	6-24-21	1105	10		X	X	X	X	X		-01
		GW												
		GW												
		GW												
		GW												
		GW												
		GW												
		GW												
		GW												
		GW												

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other ________

Remarks: V8260BTEXC= Benzene only

pH ______ Temp ______
Flow ______ Other ______

Samples returned via:
__ UPS __ FedEx __ Courier ________

Tracking # 1329 2022 7419

Sample Receipt Checklist
COC Seal Present/Intact: __NP ✓Y __N
COC Signed/Accurate: ✓Y __N
Bottles arrive intact: ✓Y __N
Correct bottles used: ✓Y __N
Sufficient volume sent: __Y __N
If Applicable
VOA Zero Headspace: ✓Y __N
Preservation Correct/Checked: ✓Y __N
RAD Screen <0.5 mR/hr: ✓Y __N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCl / MeoH TBR	
[signature]	6-24-21	1530		1	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 2+.1=2.0 °C	Bottles Received: 10
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 6/25/21	Time: 9:00
			[signature]		

If preservation required by Login: Date/Time

Hold:

Condition: NCF / OK

L1371284 BNSF1TRC NCF

R5

Time estimate: 0h **Time spent:** 0h **Grouping date:** 25 June 2021

Members

Cole Medley (responsible)

- [ ] Parameter(s) past holding time
- [ ] Temperature not in range
- [ ] Improper container type
- [ ] pH not in range
- [ ] Insufficient sample volume
- [ ] Sample is biphasic
- [ ] Vials received with headspace
- [x] Broken container
- [ ] Sufficient sample remains
- [ ] If broken container: Insufficient packing material around container
- [ ] If broken container: Insufficient packing material inside cooler
- [ ] If broken container: Improper handling by carrier:________________
- [ ] If broken container: Sample was frozen
- [ ] If broken container: Container lid not intact
- [ ] Client informed by Call
- [ ] Client informed by Email
- [ ] Client informed by Voicemail
- [ ] Date/Time:________________
- [ ] PM initials:________________
- [ ] Client Contact:___________________

Comments

Cole Medley *25 June 2021 6:09 PM*

Received 1 40mlAmb-HCl broken.

Cole Medley *25 June 2021 6:09 PM*

Done.

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

TRC
Keith Woodburne
1180 NW Maple St. Ste 310
Issaquah, WA 98074

RE: BNSF Leavenworth GPE
Work Order Number: 2106463

June 29, 2021

Attention Keith Woodburne:

Fremont Analytical, Inc. received 1 sample(s) on 6/24/2021 for the analyses presented in the following report.

E.coli by m-ColiBlue24® (MF Count)

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.3 for Environmental Testing
ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing
Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910

CLIENT:	TRC
Project:	BNSF Leavenworth GPE
Work Order:	2106463

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2106463-001	P24-20210624	06/24/2021 11:05 AM	06/24/2021 3:45 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Case Narrative

WO#: **2106463**

Date: **6/29/2021**

CLIENT: TRC
Project: BNSF Leavenworth GPE

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported in Colony Forming Units (CFU).

The validity of the analytical procedures for which data is reported in this analytical report is determined by the Method Blank (MB). The MB is processed with the samples to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below. Fremont Analytical, Inc. currently holds accreditation for E.Coli in water by method E.coli by m-ColiBlue24® (MF Count) per Washington Department of Ecology regulations. Total Coliform count is provided for informational purposes only (by SM 9222 J).

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **2106463**
Date Reported: **6/29/2021**

Client: TRC
Collection Date: 6/24/2021 11:05:00 AM
Project: BNSF Leavenworth GPE
Lab ID: 2106463-001
Matrix: Water
Client Sample ID: P24-20210624

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
E.coli by m-ColiBlue24® (MF Count)				Batch ID: R68237		Analyst: WC
Coliform, Total	2,000	100	D	CFU/100ml	100	6/24/2021 5:17:00 PM
E. coli	ND	100	D	CFU/100ml	100	6/24/2021 5:17:00 PM

Original

Date: *6/29/2021*

Work Order: 2106463
CLIENT: TRC
Project: BNSF Leavenworth GPE

QC SUMMARY REPORT

E.coli by m-ColiBlue24® (MF Count)

Sample ID: **MB1-R68237** SampType: **MBLK** Units: **CFU/100ml** Prep Date: **6/24/2021** RunNo: **68237**
Client ID: **MBLKW** Batch ID: **R68237** Analysis Date: **6/24/2021** SeqNo: **1377770**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Coliform, Total	ND	1.00									
E. coli	ND	1.00									

Sample ID: **MB2-R68237** SampType: **MBLK** Units: **CFU/100ml** Prep Date: **6/24/2021** RunNo: **68237**
Client ID: **MBLKW** Batch ID: **R68237** Analysis Date: **6/24/2021** SeqNo: **1377772**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Coliform, Total	ND	1.00									
E. coli	ND	1.00									

Sample Log-In Check List

Client Name:	**TRCI**	Work Order Number:	**2106463**
Logged by:	**Carissa True**	Date Received:	**6/24/2021 3:45:00 PM**

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☑	No ☐	Not Present ☐
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
7.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
10.	Are samples properly preserved?	Yes ☑	No ☐	
11.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
14.	Does paperwork match bottle labels?	Yes ☑	No ☐	
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
16.	Is it clear what analyses were requested?	Yes ☑	No ☐	
17.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

18.	Was client notified of all discrepancies with this order?	Yes ☐	No ☐	NA ☑

Person Notified: Date:

By Whom: Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding:

Client Instructions:

19. Additional remarks:

Item Information

Item #	Temp ºC
Sample 1	3.4

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Fremont Analytical

3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790
Fax: 206-352-7178

Chain of Custody Record & Laboratory Services Agreement

Date: 6-24-21 Page: 1 of: 1

Laboratory Project No (internal): 2106463

Project Name: BNSF Leavenworth GPE

Special Remarks:

Client: TRC

Project No: 444428 phase 00TA03

Address: 1180 NW Maple St. suite 300

Collected by: D. Verret

City, State, Zip: Issaquah, WA

Location:

Telephone: 425-395-0010

Report To (PM): Keith Woodburne

Sample Disposal: ☐ Return to client ☐ Disposal by lab (after 30 days)

Fax:

PM Email: Kwoodburne@TRCcompanies.com; alesher@trccompanies.com

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8)	Total (T) / Dissolved (D)	Anions (IC)***	EDB (8011)	Total Coliform / E. Coli				Comments
1	PZ4-20210624	6-24-21	1105	W	1													X				
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:

☐ Standard ☐ Next Day

☐ 3 Day ☐ Same Day

☐ 2 Day (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x [signature]	David Verret	6-24-21/1520	x Clair Anderson	Claire Anderson	6/24/21 1545
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

TRC
Keith Woodburne
1180 NW Maple St. Ste 310
Issaquah, WA 98074

RE: BNSF Leavenworth GPE
Work Order Number: 2108033

August 10, 2021

Attention Keith Woodburne:

Fremont Analytical, Inc. received 2 sample(s) on 8/3/2021 for the analyses presented in the following report.

Fecal Coliform by SM 9222D

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.3 for Environmental Testing
ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing
Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910

Date: *08/10/2021*

CLIENT:	TRC
Project:	BNSF Leavenworth GPE
Work Order:	2108033

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2108033-001	MW-3-20210803	08/03/2021 9:40 AM	08/03/2021 3:25 PM
2108033-002	MW-5-20210803	08/03/2021 10:55 AM	08/03/2021 3:25 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Fremont Analytical

Case Narrative

WO#: **2108033**

Date: **8/10/2021**

CLIENT: TRC

Project: BNSF Leavenworth GPE

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported in Colony Forming Units (CFU).

The validity of the analytical procedures for which data is reported in this analytical report is determined by the Method Blank (MB). The MB is processed with the samples to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **2108033**
Date Reported: **8/10/2021**

CLIENT: TRC
Project: BNSF Leavenworth GPE

Lab ID: 2108033-001 **Collection Date:** 8/3/2021 9:40:00 AM
Client Sample ID: **MW-3-20210803** **Matrix:** Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R69123		Analyst: TN
Coliform, Fecal	ND	10.0	DH	CFU/100ml	10	8/3/2021 4:49:00 PM

Lab ID: 2108033-002 **Collection Date:** 8/3/2021 10:55:00 AM
Client Sample ID: **MW-5-20210803** **Matrix:** Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R69123		Analyst: TN
Coliform, Fecal	ND	10.0	D	CFU/100ml	10	8/3/2021 4:49:00 PM

Fremont Analytical

Date: *8/10/2021*

Work Order: 2108033
CLIENT: TRC
Project: BNSF Leavenworth GPE

QC SUMMARY REPORT

Fecal Coliform by SM 9222D

Sample ID: **MB1-R69123**	SampType: **MBLK**				Units: **CFU/100ml**		Prep Date: **8/3/2021**			RunNo: **69123**		
Client ID: **MBLKW**	Batch ID: **R69123**						Analysis Date: **8/3/2021**			SeqNo: **1399596**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	
Coliform, Fecal	ND	1.00										

Sample ID: **MB2-R69123**	SampType: **MBLK**				Units: **CFU/100ml**		Prep Date: **8/3/2021**			RunNo: **69123**		
Client ID: **MBLKW**	Batch ID: **R69123**						Analysis Date: **8/3/2021**			SeqNo: **1399607**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	
Coliform, Fecal	ND	1.00										

Fremont Analytical

Sample Log-In Check List

Client Name:	**TRCI**	Work Order Number:	**2108033**
Logged by:	**Gabrielle Coeuille**	Date Received:	**8/3/2021 3:25:00 PM**

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
7.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
10.	Are samples properly preserved?	Yes ☑	No ☐	
11.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
14.	Does paperwork match bottle labels?	Yes ☑	No ☐	
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
16.	Is it clear what analyses were requested?	Yes ☑	No ☐	
17.	Were all holding times able to be met?	Yes ☐	No ☑	

Special Handling (if applicable)

18.	Was client notified of all discrepancies with this order?	Yes ☑	No ☐	NA ☐

Person Notified:	Keith Woodburne	Date:	8/3/2021
By Whom:	Gabrielle Coeuille	Via:	☑ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:	Ok to proceed out of hold?		
Client Instructions:	Proceed.		

19. Additional remarks:

Item Information

Item #	Temp ºC
Sample 1	3.8

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Fremont Analytical
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790
Fax: 206-352-7178

Chain of Custody Record & Laboratory Services Agreement

Client: TRC	Date: 8-3-21 Page: 1 of: 1
Address: 1180 NW Maple St. ~~#300~~ 310	Project Name: BNSF Leavenworth GPE
City, State, Zip: Issaquah, WA 98027	Project No: 444428
Telephone: 425-395-0010	Collected by: D. Verret
Fax:	Location: Leavenworth, WA
	Report To (PM): Keith Woodburne
	PM Email: KWoodburne@trccompanies.com

Laboratory Project No (internal): 2108033

Special Remarks:

Sample Disposal: ☐ Return to client ☐ Disposal by lab (after 30 days)

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8)	Total (T) / Dissolved (D)	Anions (IC)***	EDB (8011)	Total Coliform/E.Col.			Comments
1	MW-3-20210803	8-3-21	0940	GW	1													X			
2	MW-5-20210803	8-3-21	1055	GW	1													X			
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☐ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day ______ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x [signature]	David Verret	13:00	x [signature]	Keith Woodburn	8/3/2021 13:00
x [signature]	Keith Woodburn	1523 8/3/21	x [signature]	Justine Mantz	8/3 15:23

Chain of Custody Record & Laboratory Services Agreement

Fremont Analytical
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790
Fax: 206-352-7178

Date: 8-3-21	Page: 1 of: 1
Project Name: BNSF Leavenworth GPE	
Project No: 444428	
Collected by: D. Verret	
Location: Leavenworth, WA	
Report To (PM): Keith Woodburne	
PM Email: Kwoodburne@trccompanies.com	

Laboratory Project No (internal): 2108033

Special Remarks:

Update per KW 8/3/21- gac

Sample Disposal: ☐ Return to client ☐ Disposal by lab (after 30 days)

Client: TRC
Address: 180 NW Maple St. ~~#300~~ 310
City, State, Zip: Issaquah, WA 98027
Telephone: 425-395-0010
Fax:

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8)	Total (T) / Dissolved (D)	Anions (IC)***	EDB (8011)	~~Total Coliform~~				Comments
1	MW-3-20210803	8-3-21	0940	GW	1													X				Fecal Coliform
2	MW-5-20210803	8-3-21	1055	GW	1													X				Fecal Coliform
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time: ☐ Standard ☐ Next Day ☐ 3 Day ☐ Same Day ☐ 2 Day ____ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x [signature]	David Verret	13:00	x [signature]	Keith Woodburn	8/3/2021 13:00
x [signature]	Keith Woodburn	1523 8/3/21	x [signature]	Justine Mantz	8/3 15:23

www.fremontanalytical.com

COC 1.3 - 11.06.20

Attachment E
Supplemental Remedial Investigation
Field Data Sheets

GROUNDWATER SAMPLING RECORD

TRC

WELL ID PZ-4

Sheet 1 of 1

Project Number: 444428

Date: 6-24-21

Project Name: Leavenworth - GPE

Personnel: D. Verrel

Weather: 85° - Sunny

Well Construction	
Casing Material:	PVC
Casing Diameter:	4"
Completion Type:	flush
Screened Interval:	

Well Integrity	
Concrete Collar:	good
Well Cap:	good
Security Lock:	no
Standing Water:	no

Well Volume	
Initial DTW (ft btoc)	25.45
Measured Total Depth (ft btoc)	
Height of water Column (ft)	
Casing Volume (gal)	

Sampling Method:	peri pump
Intake Depth (ft btoc):	26.5'

Field Water Quality Measurements

Time	DTW (ft/btoc)	Temp. (C°)	pH	Specific Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Turbidity (visual)	Color (visual)	Flow Rate (mL/min)	Cum. Vol. (mL)
3 consecutive readings, 3 minutes apart			+/- 0.1	+/- 3%	+/- 0.3	+/- 10	+/-10% or <10 NTUs	N/A	N/A	100 to 150	N/A
1045	25.50	21.6	6.15	1.07	12.92	49.1	5.17				
1048	25.57	20.3	6.07	1.04	10.99	37.1	4.98				
1051	25.62	19.5	6.02	1.05	11.83	22.3	1.91				
1053	25.67	19.3	6.03	1.04	2.02	13.7	1.75				
1056	25.71	19.2	6.06	1.04	1.18	9.1	1.69				
1059	25.76	19.1	6.07	1.04	1.07	4.4	1.86				

Sample Name	PZ4-20210624
Sample Time	1105

Comments: Aerated water - Bubbles affecting DO readings.
Gasoline odor present

DEPTH TO WATER FIELD FORM

Project No.: 444428

Site Name: Leavenworth - GPE

TRC Personnel: D. Verret & L. Briant

Date: 8-2-21

Well Number	Screen Interval	Depth to Water	Depth to Product	Free Product Thickness (ft)	Free Product Recovery	Total Depth	Comments
MW-1		58.35	–	–	–	67.10	
MW-2		65.94	–	–	–	80.95	
MW-3		59.19	–	–	–	74.45	
MW-4		59.88	–	–	–	75.00	
MW-5		71.50	–	–	–	81.73	
MW-6		57.44	–	–	–	73.80	
PZ-1		24.60	–	–	–	24.65	
PZ-2		15.54	–	–	–	15.71	
PZ-3		23.83	–	–	–	23.90	
PZ-4		27.45	–	–	–	27.45	
	= Dry						

GROUNDWATER SAMPLING RECORD

TRC

WELL ID

Sheet 1 **of** 1

Project Number: 444428

Project Name: BNSF GPE Leavenworth

Date: 8-2-21

Personnel: D. Verret & L. Briant

Weather: HOT & Smokey

Well Construction	
Casing Material:	PVC
Casing Diameter:	2"
Completion Type:	flush
Screened Interval:	63-83

Well Integrity	
Concrete Collar:	OK
Well Cap:	OK
Security Lock:	no
Standing Water:	No

Well Volume	
Initial DTW (ft btoc)	65.94
Measured Total Depth (ft btoc)	80.95
Height of water Column (ft)	
Casing Volume (gal)	

Sampling Method:	Bladder pump
Intake Depth (ft btoc):	71'

Field Water Quality Measurements

Time	DTW (ft/btoc)	Temp. (C°)	pH	Specific Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Turbidity (visual)	Color (visual)	Flow Rate (mL/min)	Cum. Vol. (mL)
3 consecutive readings, 3 minutes apart			+/- 0.1	+/- 3%	+/- 0.3	+/- 10	+/-10% or <10 NTUs	N/A	N/A	100 to 150	N/A
1514	NM	21.0	7.23	0.460	8.06	210.8	1000	milky	None		
1517		15.4	6.99	0.94	2.46	187.6	575				
1520		13.4	7.05	0.92	0.99	170.8	78.8	clear			
1523		13.1	7.05	0.93	1.14	157.9	38.8				
1526		13.1	7.06	0.94	0.91	148.7	27.2				
1529		13.2	7.08	0.95	0.89	137.5	20.8				
1532		13.3	7.15	0.94	0.94	122.7	21.8				
1535		13.5	7.21	0.94	0.49	115.2	19.1				
1538		13.3	7.22	0.94	0.52	114.2	16.1				
1541		13.4	7.25	0.94	0.46	105.6	15.5				
1544		13.5	7.28	0.94	0.42	98.8	15.8				

Sample Name	MW-2-20210802
Sample Time	1548

Comments:

GROUNDWATER SAMPLING RECORD

TRC

WELL ID

Sheet 1 of 1

Project Number: 444428

Project Name: BNSF Leavenworth GPE

Date: 8-2-21

Personnel: D. Verret + C. Briant

Weather: 90s - Smokey

Well Construction	
Casing Material:	PVC
Casing Diameter:	2"
Completion Type:	Flush
Screened Interval:	62-77

Well Integrity	
Concrete Collar:	Poor
Well Cap:	OK
Security Lock:	no
Standing Water:	no

Well Volume	
Initial DTW (ft btoc)	58.35
Measured Total Depth (ft btoc)	67.0
Height of water Column (ft)	
Casing Volume (gal)	

Sampling Method:	bladder pump
Intake Depth (ft btoc):	64'

Field Water Quality Measurements

Time	DTW (ft/btoc)	Temp. (C°)	pH	Specific Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Turbidity (visual)	Color (visual)	Flow Rate (mL/min)	Cum. Vol. (mL)
3 consecutive readings, 3 minutes apart			+/- 0.1	+/- 3%	+/- 0.3	+/- 10	+/-10% or <10 NTUs	N/A	N/A	100 to 150	N/A
17:04	NM	22.0	6.92	0.80	4.50	6.64	84.5	clear	none		
17:07		17.0	6.57	0.79	1.88	168.8	27.8				
17:10		15.3	6.67	0.78	1.47	163.2	13.2				
17:13		15.2	6.71	0.78	1.49	159.7	7.9				
17:16		14.8	6.77	0.78	1.09	152.6	10.7				
17:19		14.8	6.81	0.78	1.05	148.6	7.83				

Sample Name	17:25
Sample Time	MW-1-20210802

Comments:

GROUNDWATER SAMPLING RECORD

TRC

WELL ID MW-3

Sheet 1 of 1

Project Number: 44428

Date: 8-3-21

Project Name: BNSF Leavenworth GPE

Personnel: D. Verret & L. Briant

Weather:

Well Construction	
Casing Material:	PVC
Casing Diameter:	2"
Completion Type:	flush
Screened Interval:	58-78

Well Integrity	
Concrete Collar:	N/A
Well Cap:	good
Security Lock:	no
Standing Water:	no

Well Volume	
Initial DTW (ft btoc)	59.19
Measured Total Depth (ft btoc)	74.45
Height of water Column (ft)	
Casing Volume (gal)	

Sampling Method:	bladder pump
Intake Depth (ft btoc):	69'

Field Water Quality Measurements

Time	DTW (ft/btoc)	Temp. (C°)	pH	Specific Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Turbidity (visual)	Color (visual)	Flow Rate (mL/min)	Cum. Vol. (mL)
3 consecutive readings, 3 minutes apart			+/- 0.1	+/- 3%	+/- 0.3	+/- 10	+/-10% or <10 NTUs	N/A	N/A	100 to 150	N/A
921	NM	14.4	6.70	0.84	2.13	164.8	5.97	clear	none		
924		14.0	6.74	0.83	2.27	160.7	4.00				
927		13.8	6.77	0.84	2.09	156.6	5.88				
930		13.7	6.79	0.84	1.58	152.8	4.91				
933		13.7	6.82	0.85	1.51	149.5	4.12				
	59.5										

Sample Name	MW-3-20210803
Sample Time	0940

Comments: Duplicate taken Dup-1-20210803

GROUNDWATER SAMPLING RECORD

TRC

WELL ID MW-5

Sheet 1 of 1

Project Number: 444428

Date: 8-3-21

Project Name: BNSF Leavenworth GPE

Personnel: D Verret & L Briant

Weather: 80s - partly cloudy

Well Construction	
Casing Material:	PVC
Casing Diameter:	2"
Completion Type:	flush
Screened Interval:	60.5-80.5

Well Integrity	
Concrete Collar:	good
Well Cap:	good
Security Lock:	no
Standing Water:	no

Well Volume	
Initial DTW (ft btoc)	71.5
Measured Total Depth (ft btoc)	81.73
Height of water Column (ft)	
Casing Volume (gal)	

Sampling Method:	bladder pump
Intake Depth (ft btoc):	76'

Field Water Quality Measurements

Time	DTW (ft/btoc)	Temp. (C°)	pH	Specific Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Turbidity (visual)	Color (visual)	Flow Rate (mL/min)	Cum. Vol. (mL)
3 consecutive readings, 3 minutes apart			+/- 0.1	+/- 3%	+/- 0.3	+/- 10	+/-10% or <10 NTUs	N/A	N/A	100 to 150	N/A
1037	NM	19.6	6.93	1.71	5.18	182.7	33.1				
1040		15.2	6.80	1.70	4.13	182.6	13.5				
1043		14.1	6.85	1.70	4.26	180.3	7.92				
1046		13.8	6.89	1.68	4.09	178.1	6.26				
1049		13.7	6.91	1.69	4.23	177.6	5.39				

Sample Name	MW-5-20210803
Sample Time	1055

Comments:

GROUNDWATER SAMPLING RECORD

TRC

WELL ID MW-4

Sheet 1 **of** 1

Project Number: 444428

Project Name: BNSF Leavenworth GPE

Date: 8-3-21

Personnel: D. Verret & L. Briant

Weather: 90s-

Well Construction	
Casing Material:	PVC
Casing Diameter:	2"
Completion Type:	flush
Screened Interval:	54-74

Well Integrity	
Concrete Collar:	ok
Well Cap:	ok
Security Lock:	no
Standing Water:	no

Well Volume	
Initial DTW (ft btoc)	59.88
Measured Total Depth (ft btoc)	75'
Height of water Column (ft)	
Casing Volume (gal)	

Sampling Method:	bladder pump
Intake Depth (ft btoc):	70'

Field Water Quality Measurements

Time	DTW (ft/btoc)	Temp. (C°)	pH	Specific Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Turbidity (visual)	Color (visual)	Flow Rate (mL/min)	Cum. Vol. (mL)
3 consecutive readings, 3 minutes apart			+/- 0.1	+/- 3%	+/- 0.3	+/- 10	+/-10% or <10 NTUs	N/A	N/A	100 to 150	N/A
1137	NM	20.9	7.06	1.17	3.26	186.2	24.3	black sediment present	none		
1140		16.6	6.85	1.15	2.51	195.3	20.3				
1143		16.0	6.90	1.15	2.32	193.4	17.8				
1146		15.7	6.91	1.15	1.90	192.1	15.1				
1149		15.5	6.94	1.14	1.90	190.6	12.9				
1152		15.6	6.97	1.14	2.33	188.4	9.88				
1155		15.4	7.06	1.14	2.26	187.9	7.76				
	60.33										

Sample Name	MW-4-20210803
Sample Time	12:05

Comments:

GROUNDWATER SAMPLING RECORD

TRC

WELL ID MW-6

Sheet 1 of 1

Project Number: 444428

Project Name: BNSF Leavenworth GPE

Date: 8-3-21

Personnel: D Vernet

Weather: 90s – Cloudy

Well Construction	
Casing Material:	PVC
Casing Diameter:	2"
Completion Type:	flush
Screened Interval:	53-73

Well Integrity	
Concrete Collar:	OK
Well Cap:	OK
Security Lock:	No
Standing Water:	No

Well Volume	
Initial DTW (ft btoc)	57.44
Measured Total Depth (ft btoc)	73.80
Height of water Column (ft)	
Casing Volume (gal)	

Sampling Method:	bladder pump
Intake Depth (ft btoc):	66'

Field Water Quality Measurements

Time	DTW (ft/btoc)	Temp. (C°)	pH	Specific Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Turbidity (visual)	Color (visual)	Flow Rate (mL/min)	Cum. Vol. (mL)
3 consecutive readings, 3 minutes apart			+/- 0.1	+/- 3%	+/- 0.3	+/- 10	+/-10% or <10 NTUs	N/A	N/A	100 to 150	N/A
1325	NM	15.1	6.52	0.585	1.84	215.4	61.7	murky	None		
1328		13.4	6.53	0.575	0.92	206.5	60.8				
1331		13.7	6.66	0.577	0.99	199.8	38.1	clear			
1334		13.3	6.69	0.577	0.84	192.8	27.4				
1337		13.5	6.75	0.575	0.76	187.3	27.4				
1340		13.3	6.76	0.575	0.76	185.3	24.8				
1343		13.4	6.79	0.577	0.73	182.8	20.5				
1346		13.1	6.84	0.578	0.70	180.7	17.6				
1349		13.2	6.84	0.575	0.71	181.1	20.1				
	58.40										

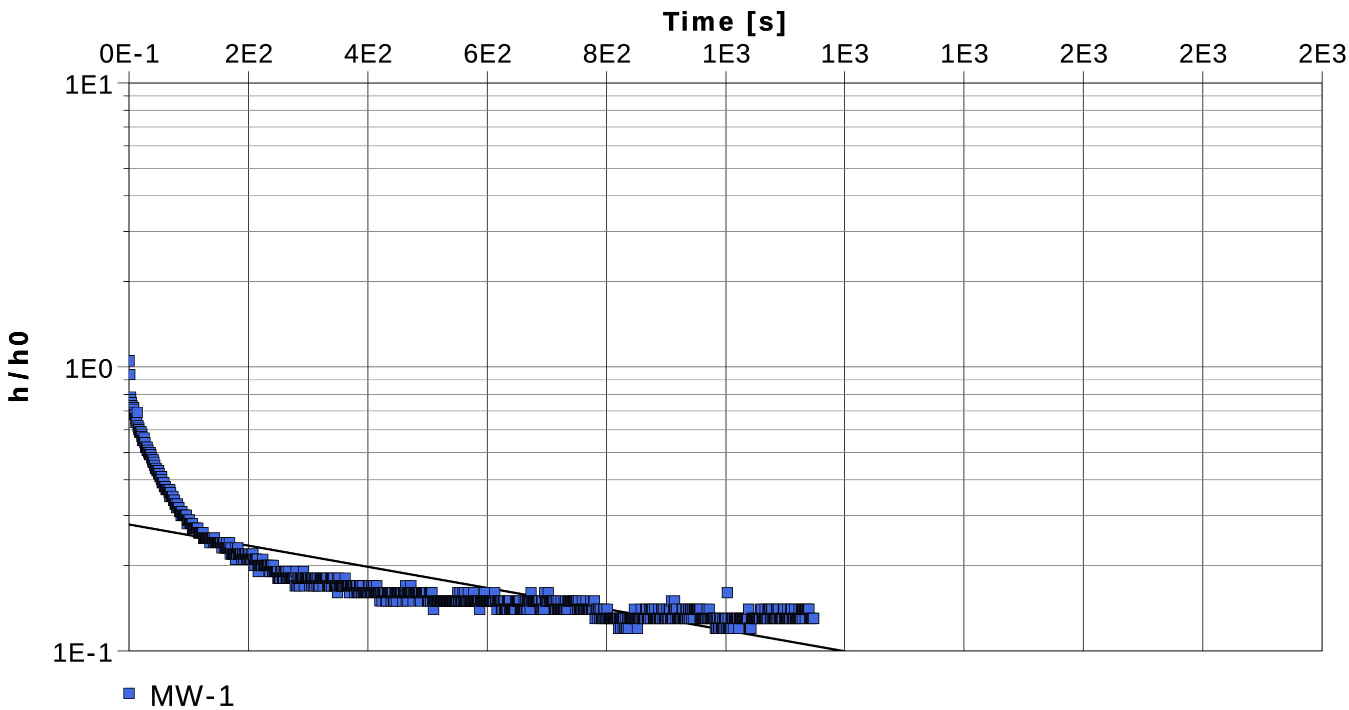
Sample Name	MW-6-20210803
Sample Time	1350

Comments:

Attachment F
Aquifer Testing Output

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-1, Test 1	Test Well: MW-1
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	Slug Test 1	Analysis Date: 9/1/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-1	2.76×10^{-5}	

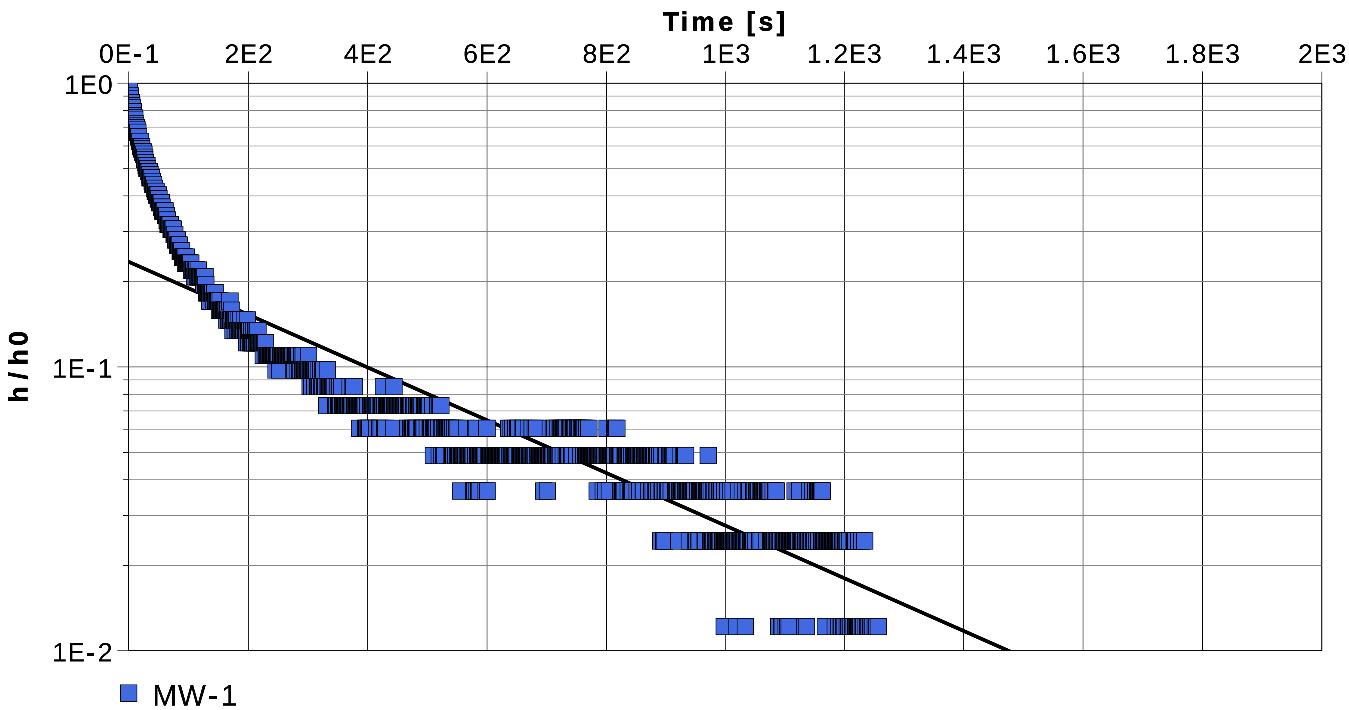
TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test - Analyses Report** Project: BNSF - GPE Number: 444428.0000 Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-1, Test 1	Test Well: MW-1
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	Slug Test 1	J. Boyd	9/1/2021	Hvorslev	MW-1		2.76×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-1, Test 2	Test Well: MW-1
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-1, Test 2	Analysis Date: 9/1/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]
MW-1	6.90×10^{-5}

TRC Environmental Corporation
1180 NW Maple Street; Suite 310
Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

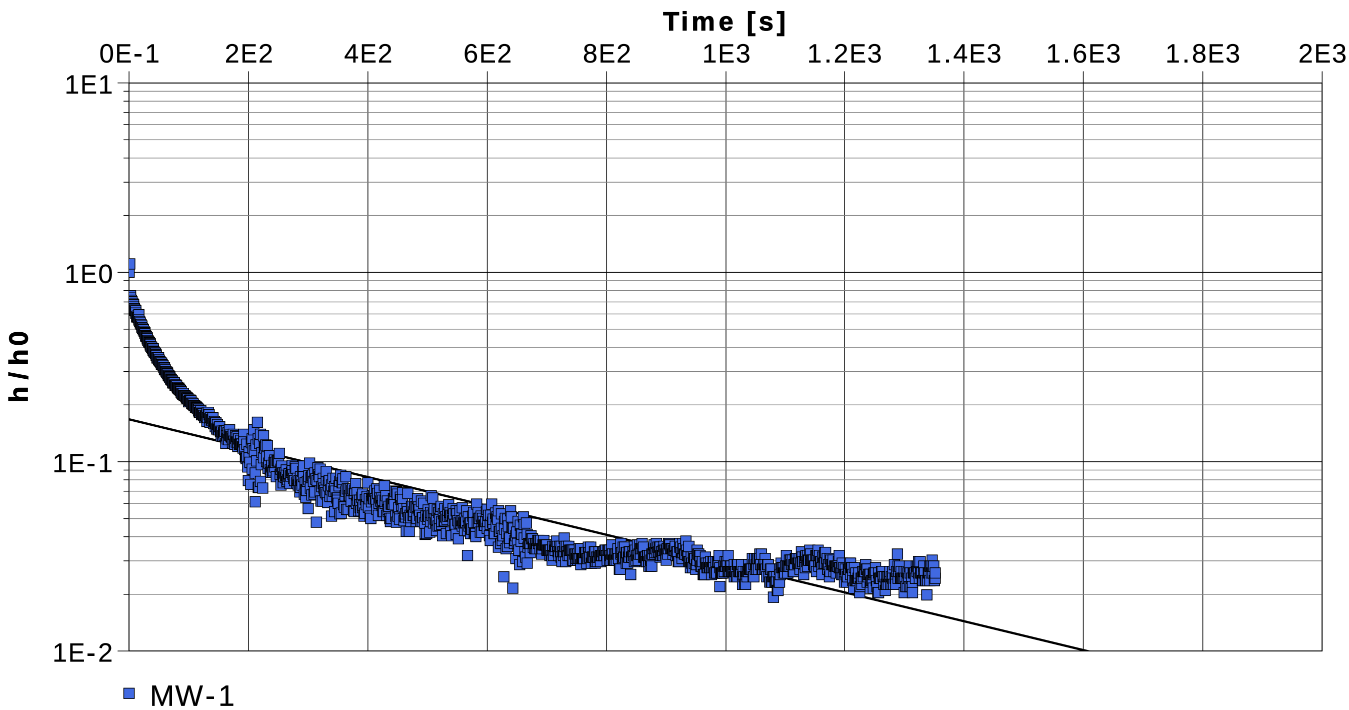
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-1, Test 2	Test Well: MW-1
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-1, Test 2	J. Boyd	9/1/2021	Hvorslev	MW-1		6.90×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-1, Test 3	Test Well: MW-1
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-1, Test 3	Analysis Date: 9/1/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-1	5.66×10^{-5}	

TRC Environmental Corporation
1180 NW Maple Street; Suite 310
Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

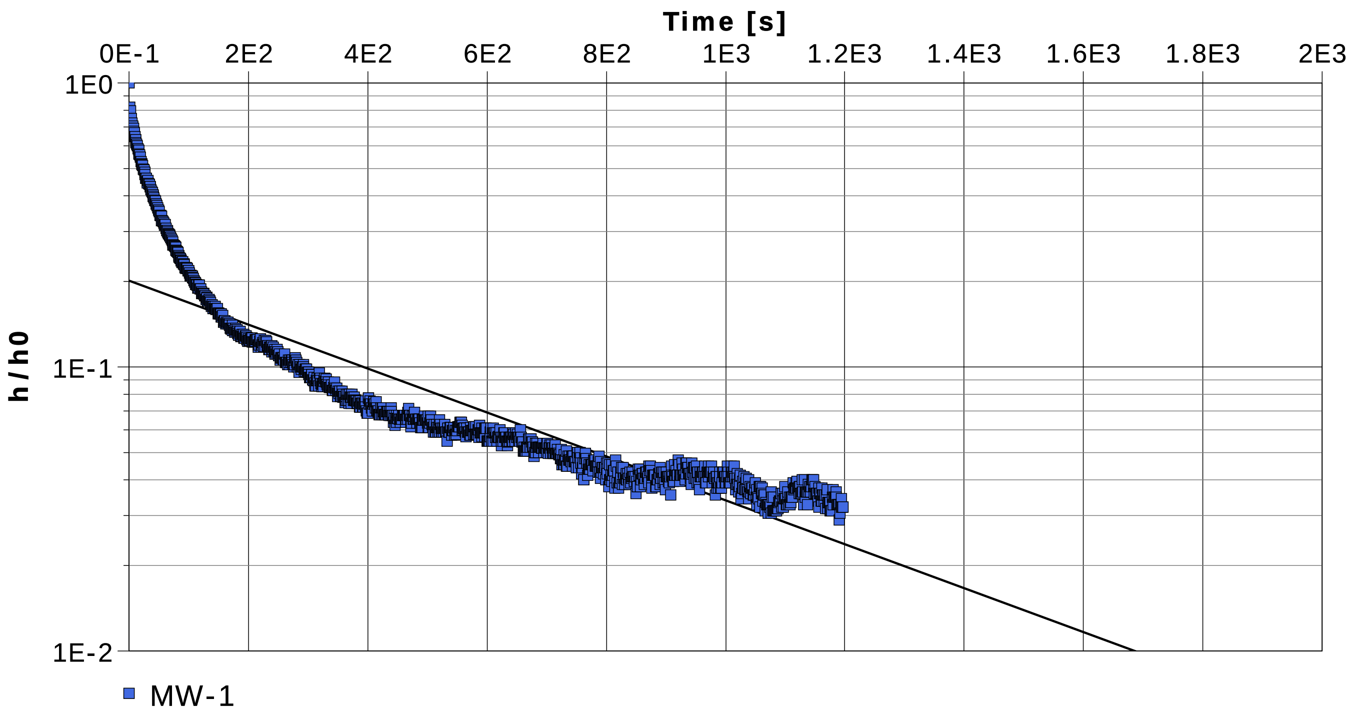
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-1, Test 3	Test Well: MW-1
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-1, Test 3	J. Boyd	9/1/2021	Hvorslev	MW-1		5.66×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report** Project: BNSF - GPE Number: 444428.0000 Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-1, Test 4	Test Well: MW-1
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-1, Test 4	Analysis Date: 9/1/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-1	5.75×10^{-5}	

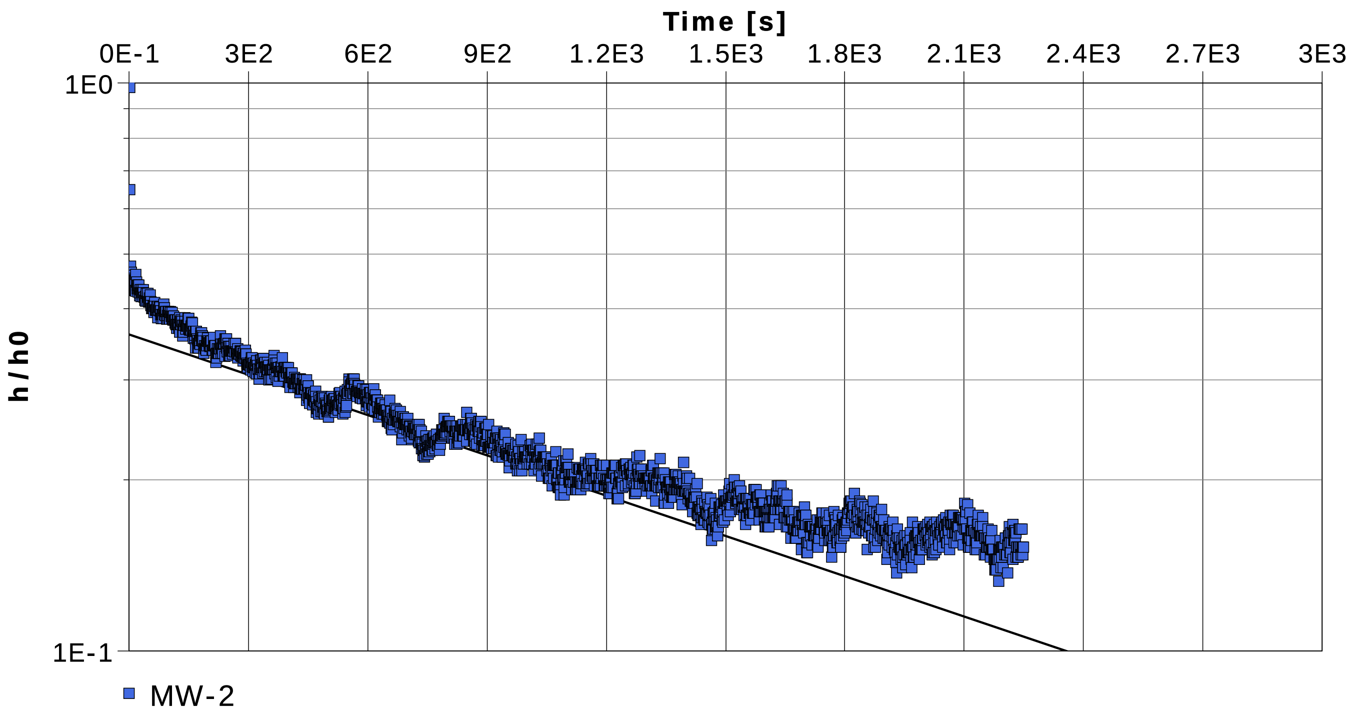
TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test - Analyses Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-1, Test 4	Test Well: MW-1
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-1, Test 4	J. Boyd	9/1/2021	Hvorslev	MW-1		5.75×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report** Project: BNSF - GPE Number: 444428.0000 Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-2, Test 1	Test Well: MW-2
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-2, Test 1	Analysis Date: 9/1/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-2	1.40×10^{-5}	

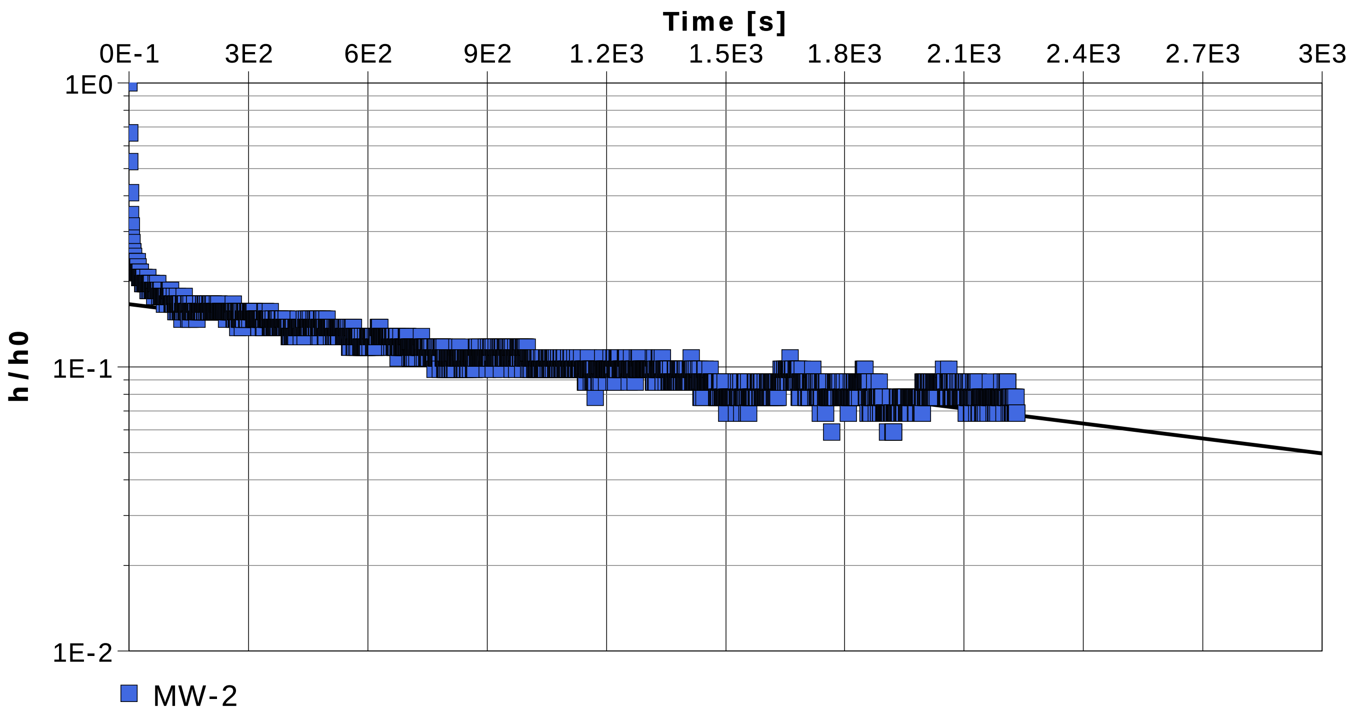
TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test - Analyses Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-2, Test 1	Test Well: MW-2
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-2, Test 1	J. Boyd	9/1/2021	Hvorslev	MW-2		1.40×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-2, Test 2	Test Well: MW-2
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-2, Test 2	Analysis Date: 9/1/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-2	1.03×10^{-5}	

TRC Environmental Corporation
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Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

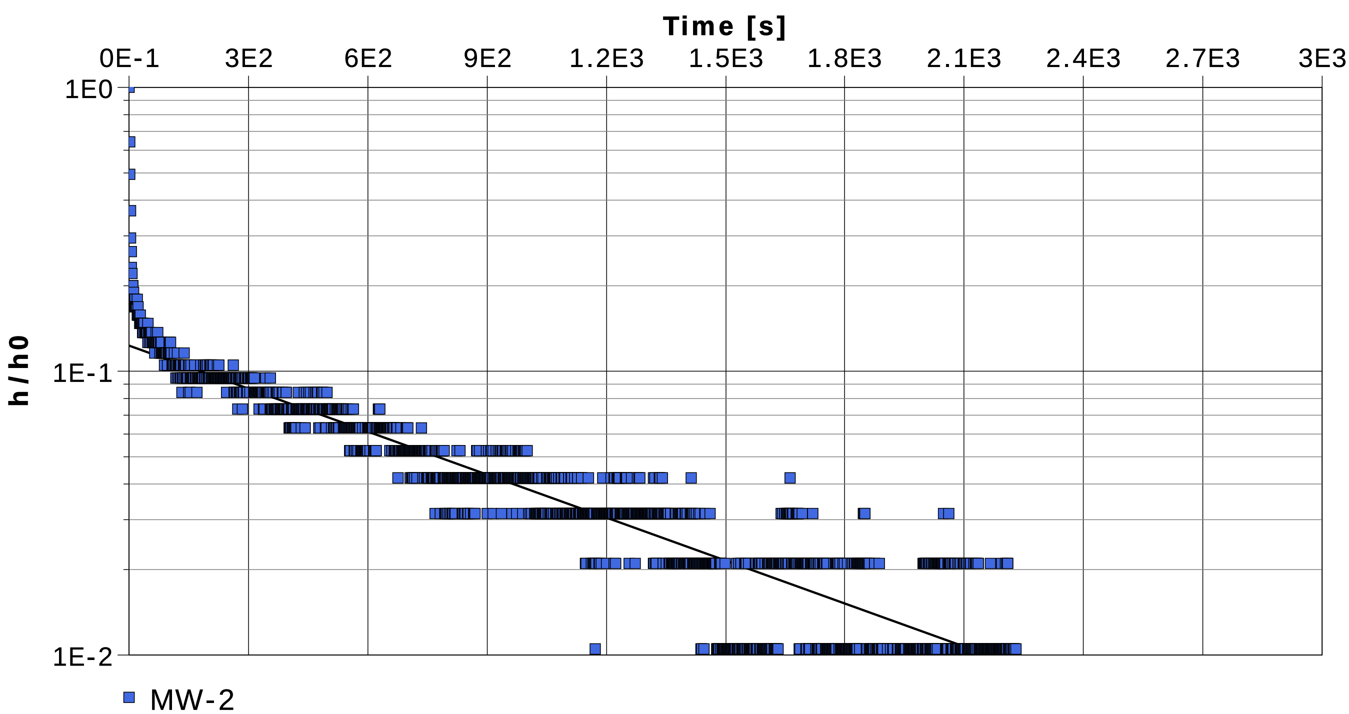
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-2, Test 2	Test Well: MW-2
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-2, Test 2	J. Boyd	9/1/2021	Hvorslev	MW-2		1.03×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-2, Test 3	Test Well: MW-2
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-2, Test 3	Analysis Date: 9/1/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [ft/d]	
MW-2	8.48×10^{-2}	

TRC Environmental Corporation
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Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

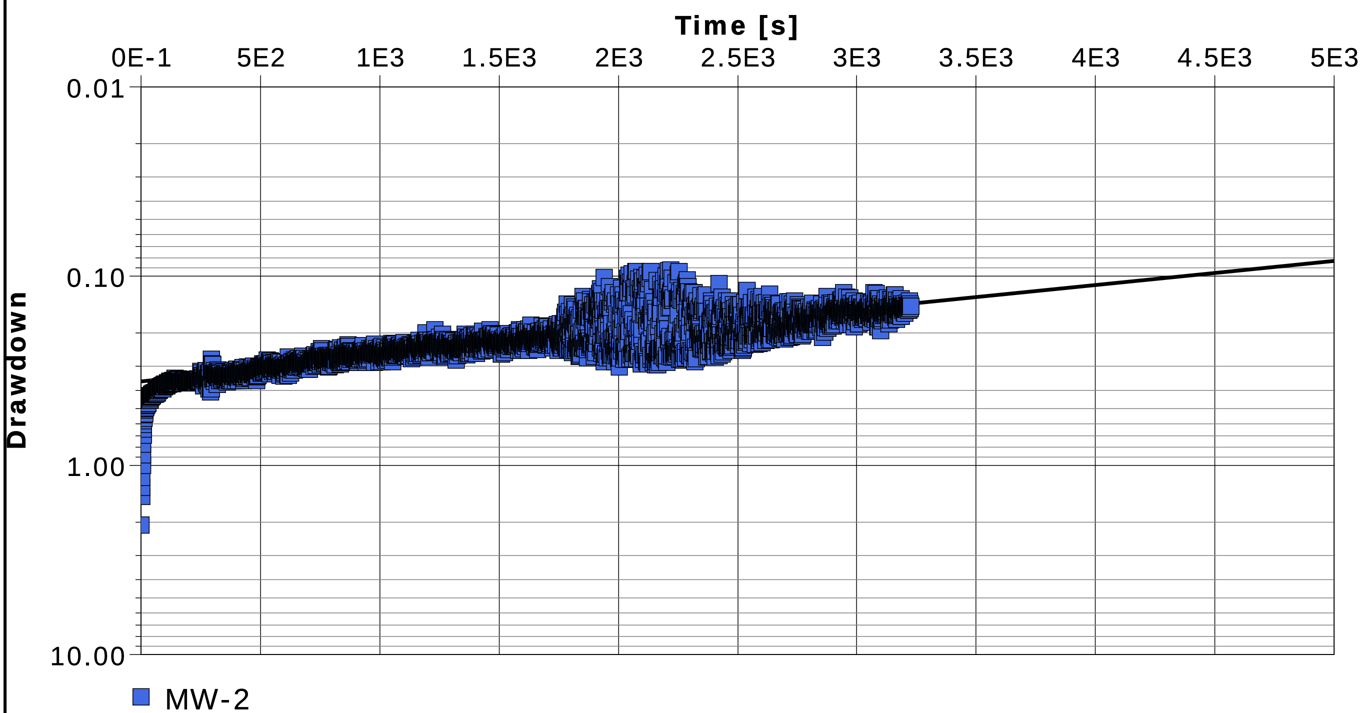
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-2, Test 3	Test Well: MW-2
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [ft²/d]	K [ft/d]	S
1	MW-2, Test 3	J. Boyd	9/1/2021	Hvorslev	MW-2		8.48×10^{-2}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report** Project: BNSF - GPE Number: 444428.0000 Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-2, Test 4	Test Well: MW-2
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-2, Test 4	Analysis Date: 9/1/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [ft/d]
MW-2	2.14×10^{-2}

TRC Environmental Corporation
1180 NW Maple Street; Suite 310
Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

Client: BNSF

Location: Leavenworth, WA | Slug Test: MW-2, Test 4 | Test Well: MW-2

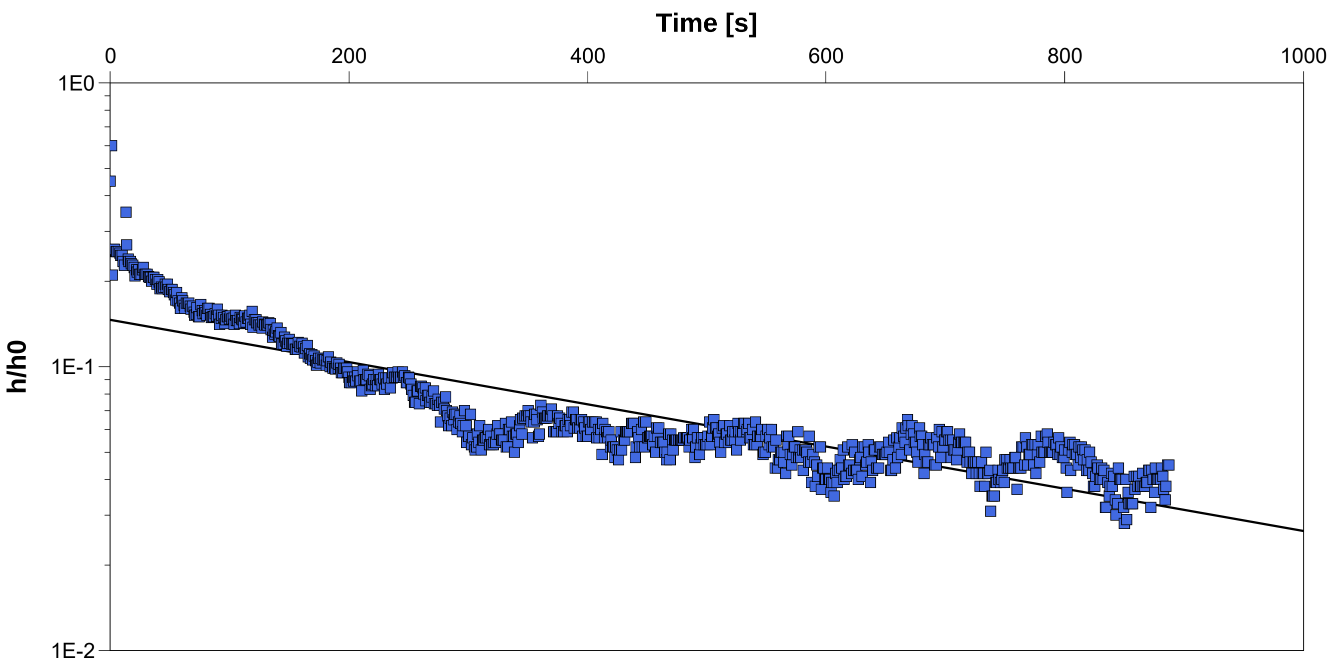
Test Conducted by: E. Stata | Test Date: 7/13/2021

Aquifer Thickness: 20.00 ft

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [ft²/d]	K [ft/d]	S
1	MW-2, Test 4	J. Boyd	9/1/2021	Hvorslev	MW-2		2.14×10^{-2}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-3, Test 1	Test Well: MW-3
Test Conducted by: E. Stata		Test Date: 7/12/2021
Analysis Performed by: J. Boyd	MW-3, Test 3	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-3	4.41×10^{-5}	

TRC Environmental Corporation
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Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

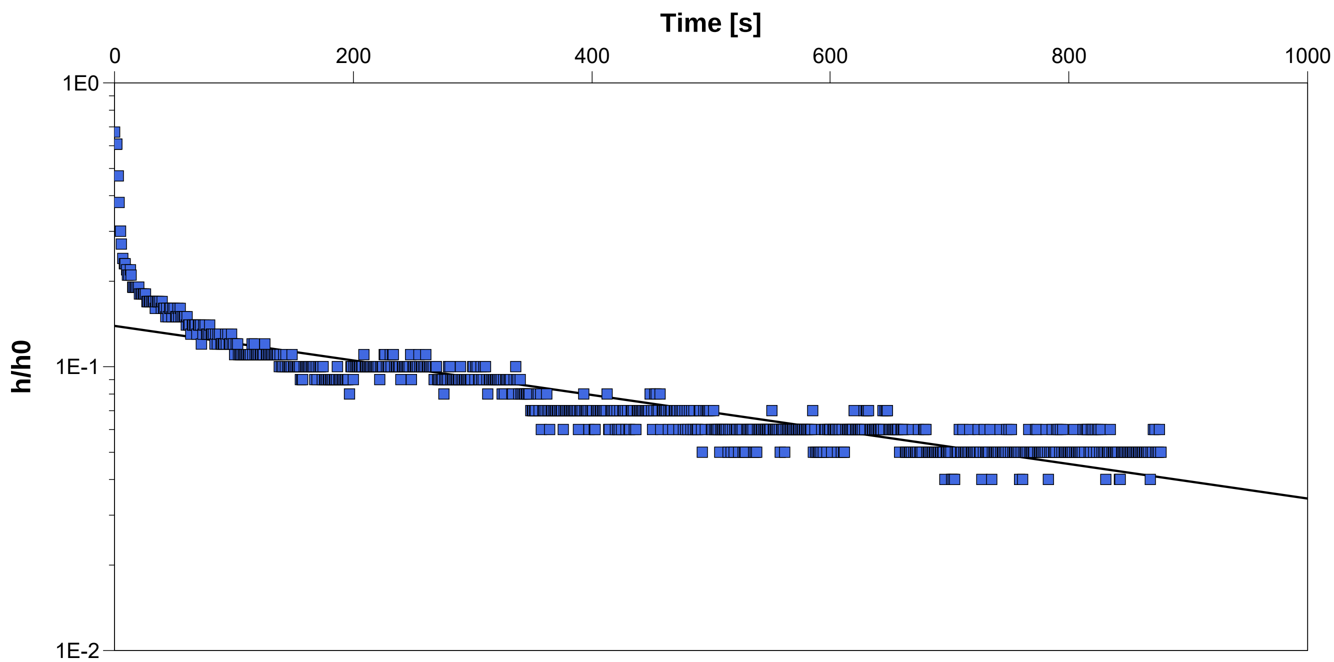
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-3, Test 1	Test Well: MW-3
Test Conducted by: E. Stata		Test Date: 7/12/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-3, Test 3	J. Boyd	9/2/2021	Hvorslev	MW-3		4.41×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-3, Test 2	Test Well: MW-3
Test Conducted by: E Stata		Test Date: 7/12/2021
Analysis Performed by: J. Boyd	MW-3, Test 2	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-3	3.59×10^{-5}	

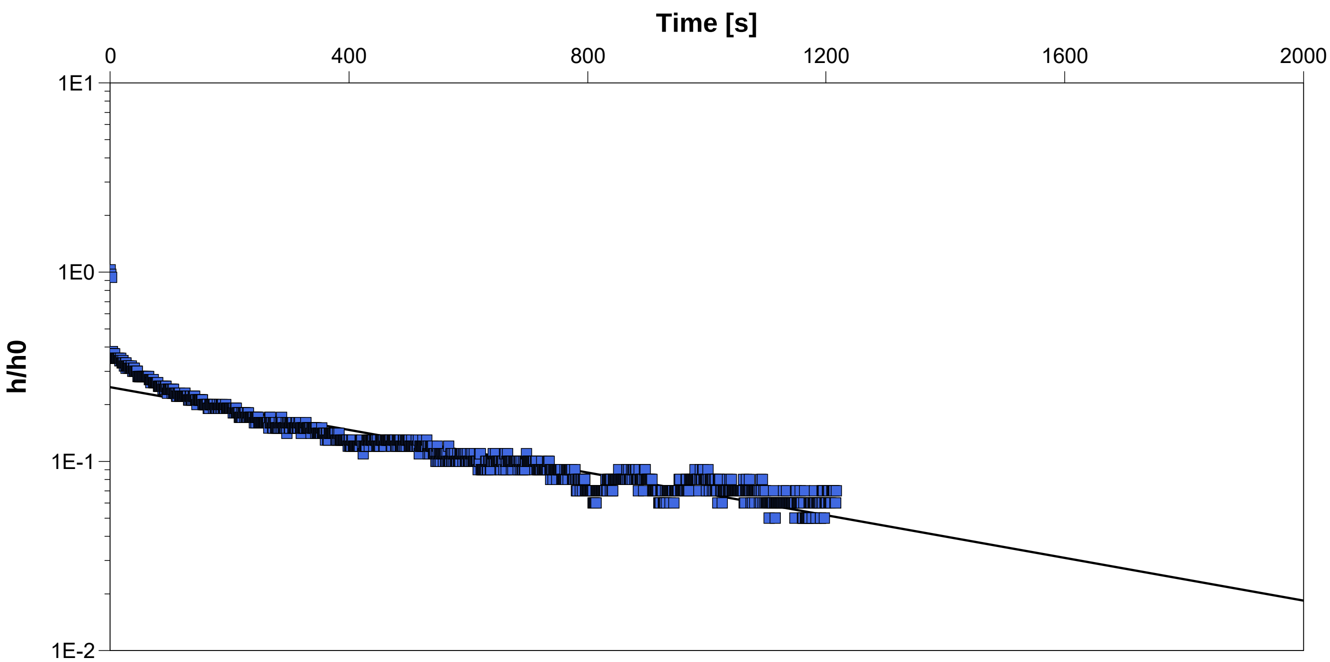
TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test - Analyses Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-3, Test 2	Test Well: MW-3
Test Conducted by: E Stata		Test Date: 7/12/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-3, Test 2	J. Boyd	9/2/2021	Hvorslev	MW-3		3.59×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-3, Test 3	Test Well: MW-3
Test Conducted by: E. Stata		Test Date: 7/12/2021
Analysis Performed by: J. Boyd	MW-3, Test 3	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-3	3.33×10^{-5}	

TRC Environmental Corporation
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Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

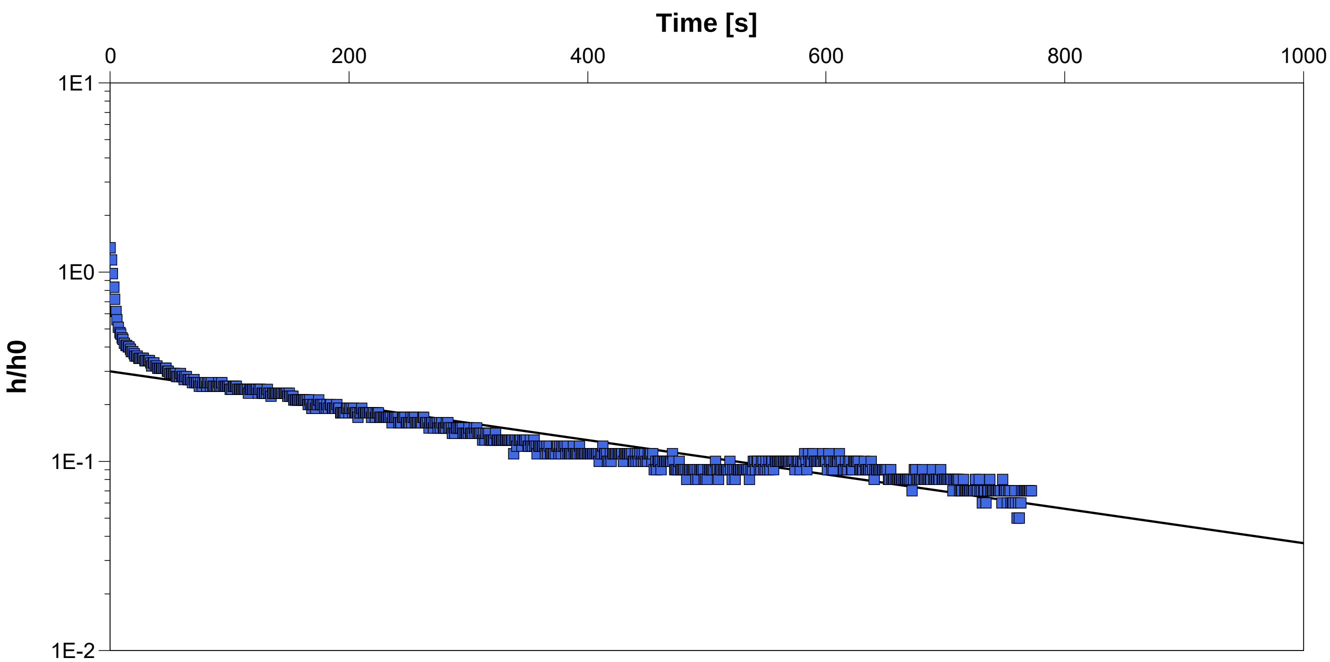
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-3, Test 3	Test Well: MW-3
Test Conducted by: E. Stata		Test Date: 7/12/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-3, Test 3	J. Boyd	9/2/2021	Hvorslev	MW-3		3.33×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report** Project: BNSF - GPE Number: 444428.0000 Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-3, Test 4	Test Well: MW-3
Test Conducted by: E. Stata		Test Date: 7/12/2021
Analysis Performed by: J. Boyd	MW-3, Test 4	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-3	5.37×10^{-5}	

TRC Environmental Corporation
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Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

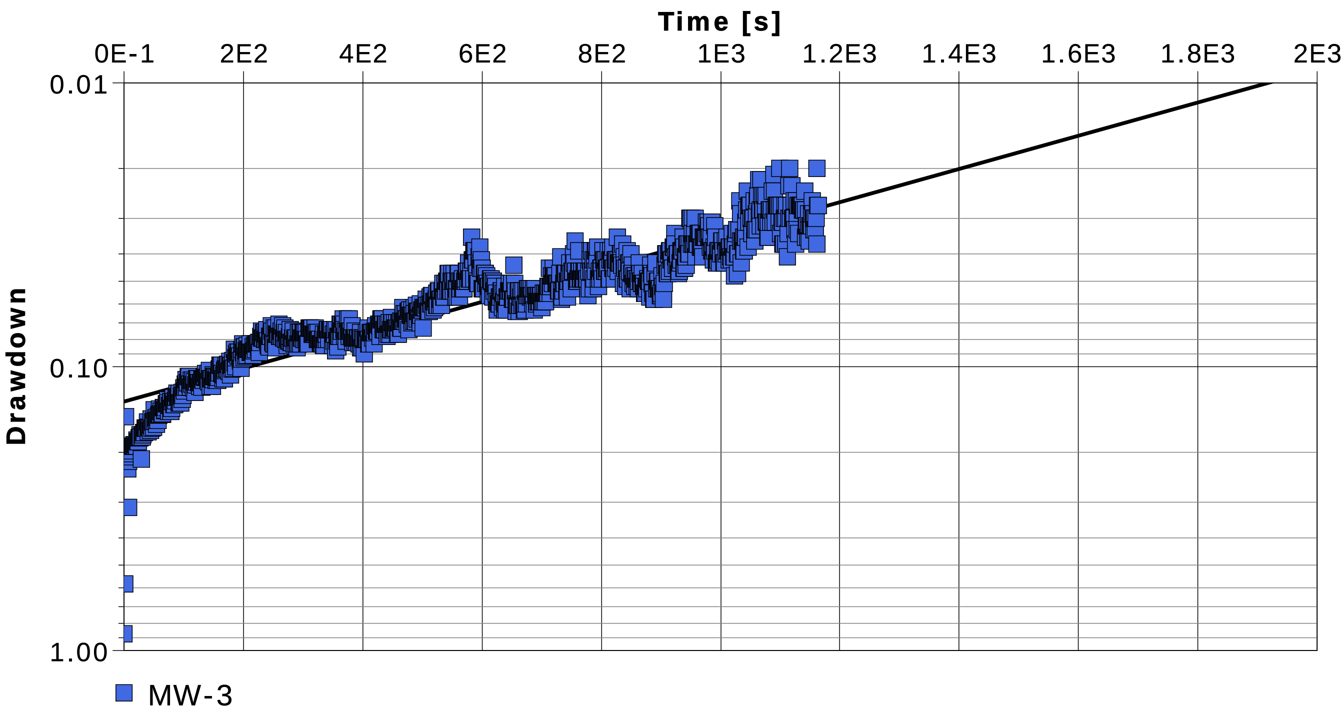
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-3, Test 4	Test Well: MW-3
Test Conducted by: E. Stata		Test Date: 7/12/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-3, Test 4	J. Boyd	9/2/2021	Hvorslev	MW-3		5.37×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-4, Test 1	Test Well: MW-3
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-4, Test 1	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-3	3.47×10^{-5}	

TRC Environmental Corporation
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Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

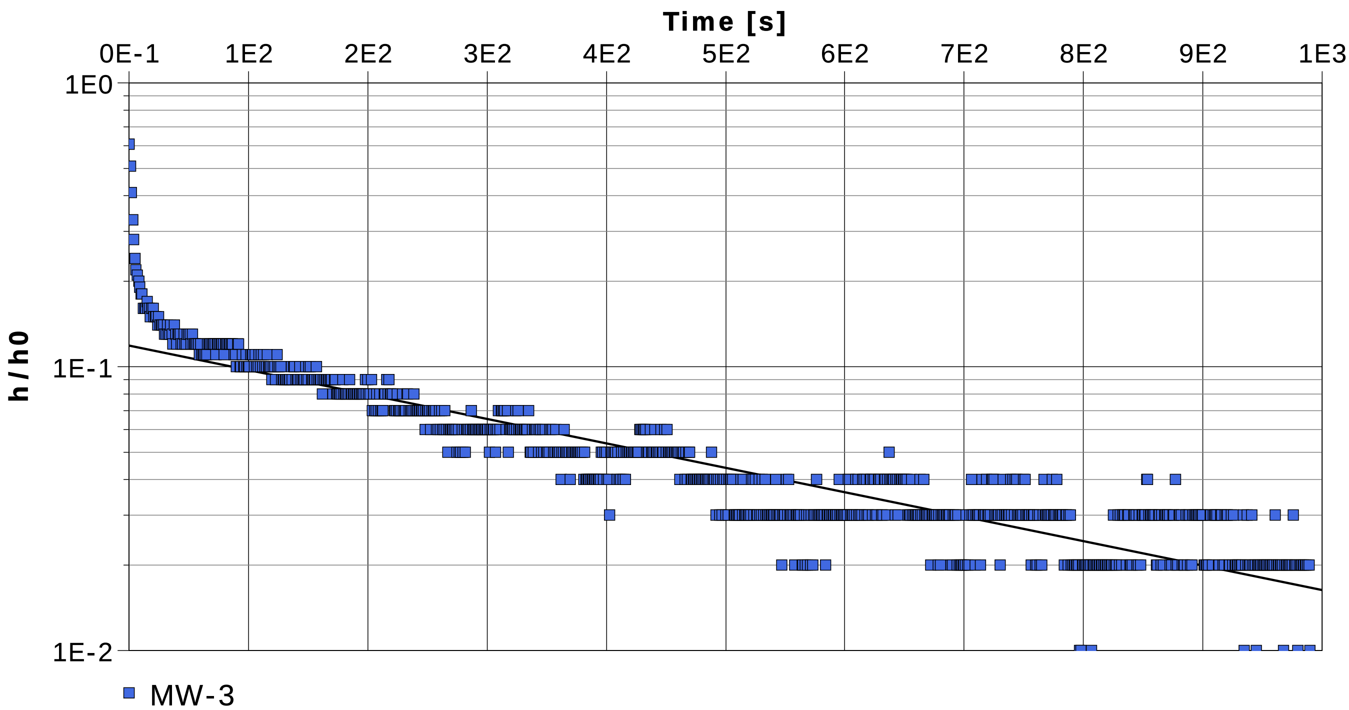
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-4, Test 1	Test Well: MW-3
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-4, Test 1	J. Boyd	9/2/2021	Hvorslev	MW-3		3.47×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-4, Test 2	Test Well: MW-3
Test Conducted by:		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-4, Test 2	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-3	5.09×10^{-5}	

TRC Environmental Corporation
1180 NW Maple Street; Suite 310
Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

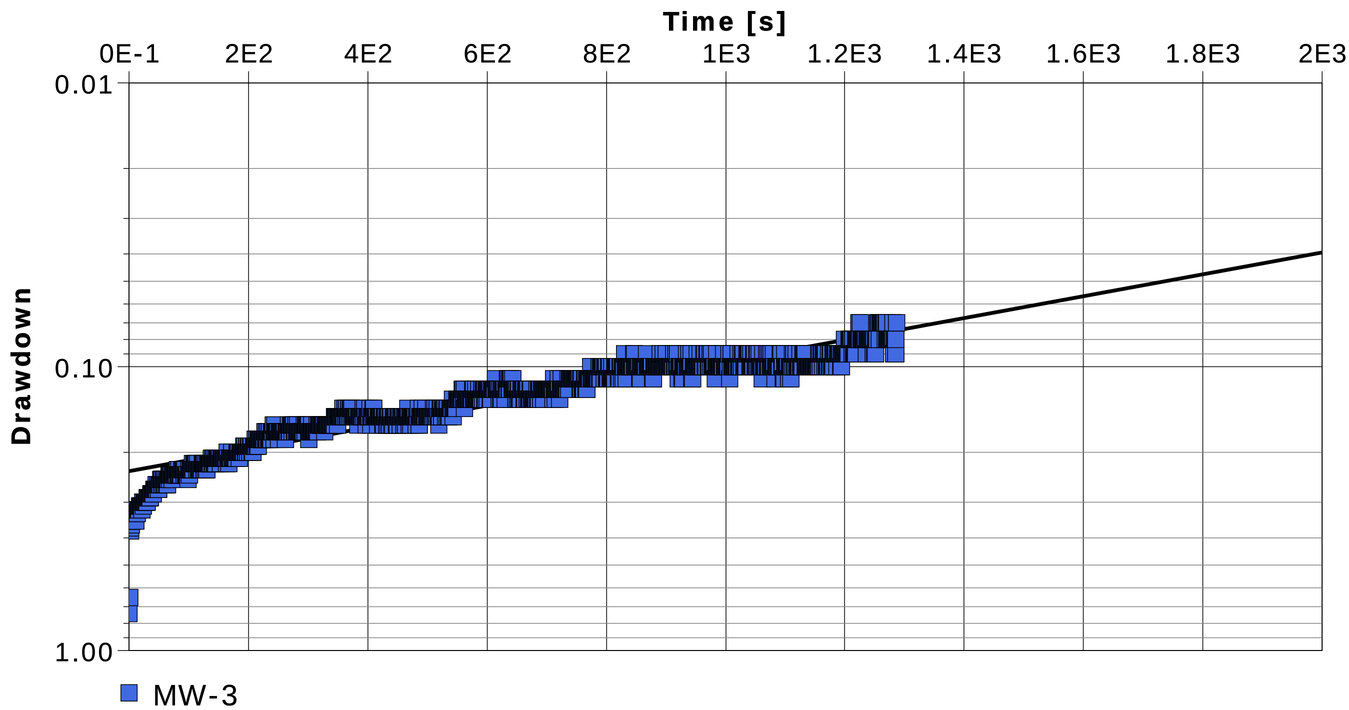
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-4, Test 2	Test Well: MW-3
Test Conducted by:		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-4, Test 2	J. Boyd	9/2/2021	Hvorslev	MW-3		5.09×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report** Project: BNSF - GPE Number: 444428.0000 Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-4, Test 3	Test Well: MW-3
Test Conducted by:		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-4, Test 3	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-3	2.28×10^{-5}	

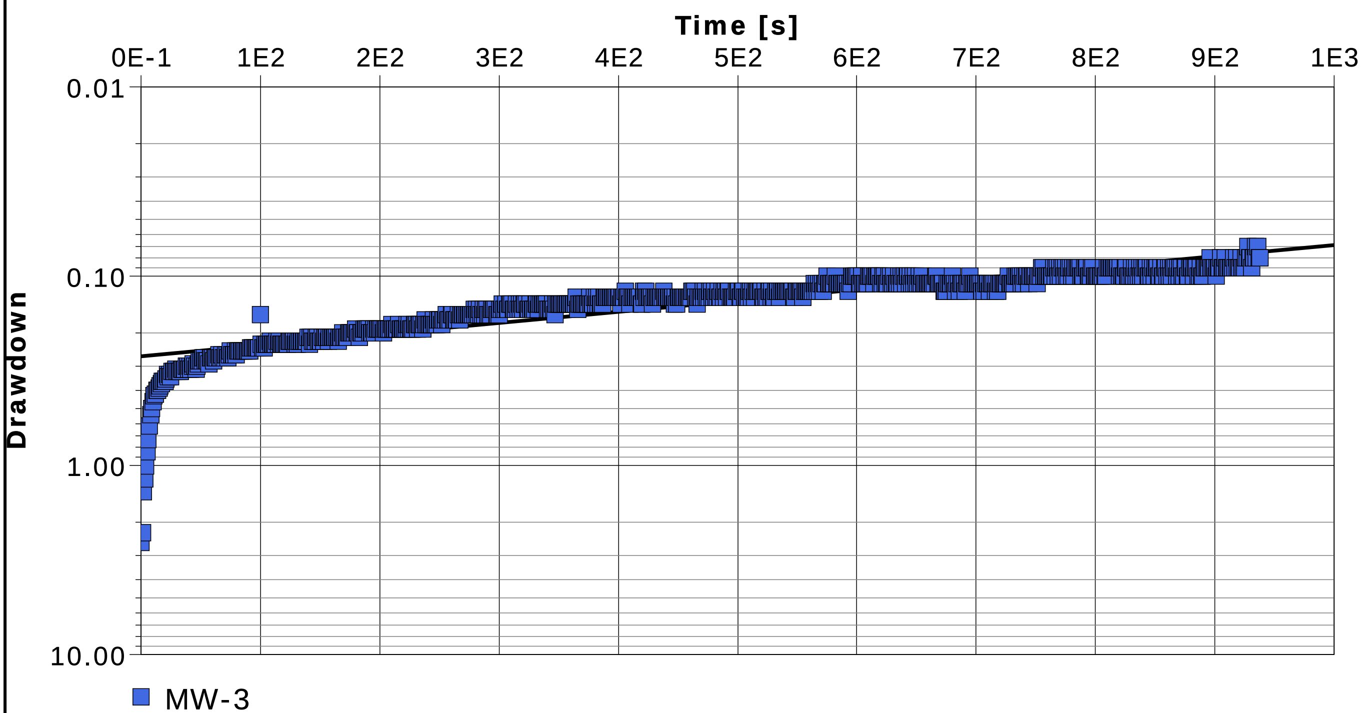
TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test - Analyses Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-4, Test 3	Test Well: MW-3
Test Conducted by:		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-4, Test 3	J. Boyd	9/2/2021	Hvorslev	MW-3		2.28×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-4, Test 4	Test Well: MW-3
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-4, Test 4	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-3	3.48×10^{-5}	

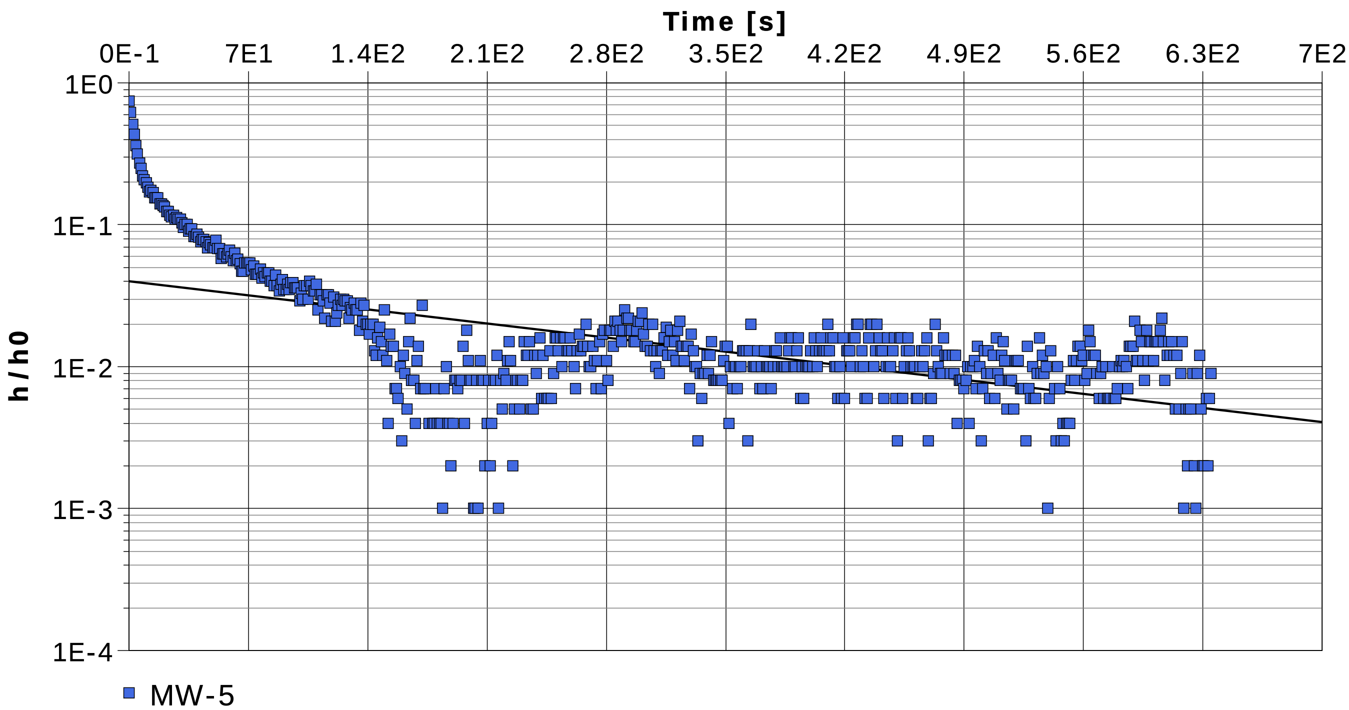
TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test - Analyses Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-4, Test 4	Test Well: MW-3
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-4, Test 4	J. Boyd	9/2/2021	Hvorslev	MW-3		3.48×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-5, Test 1	Test Well: MW-5
Test Conducted by: E. Stata		Test Date: 7/12/2021
Analysis Performed by: J. Boyd	MW-5, Test 1	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-5	8.36×10^{-5}	

TRC Environmental Corporation
1180 NW Maple Street; Suite 310
Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

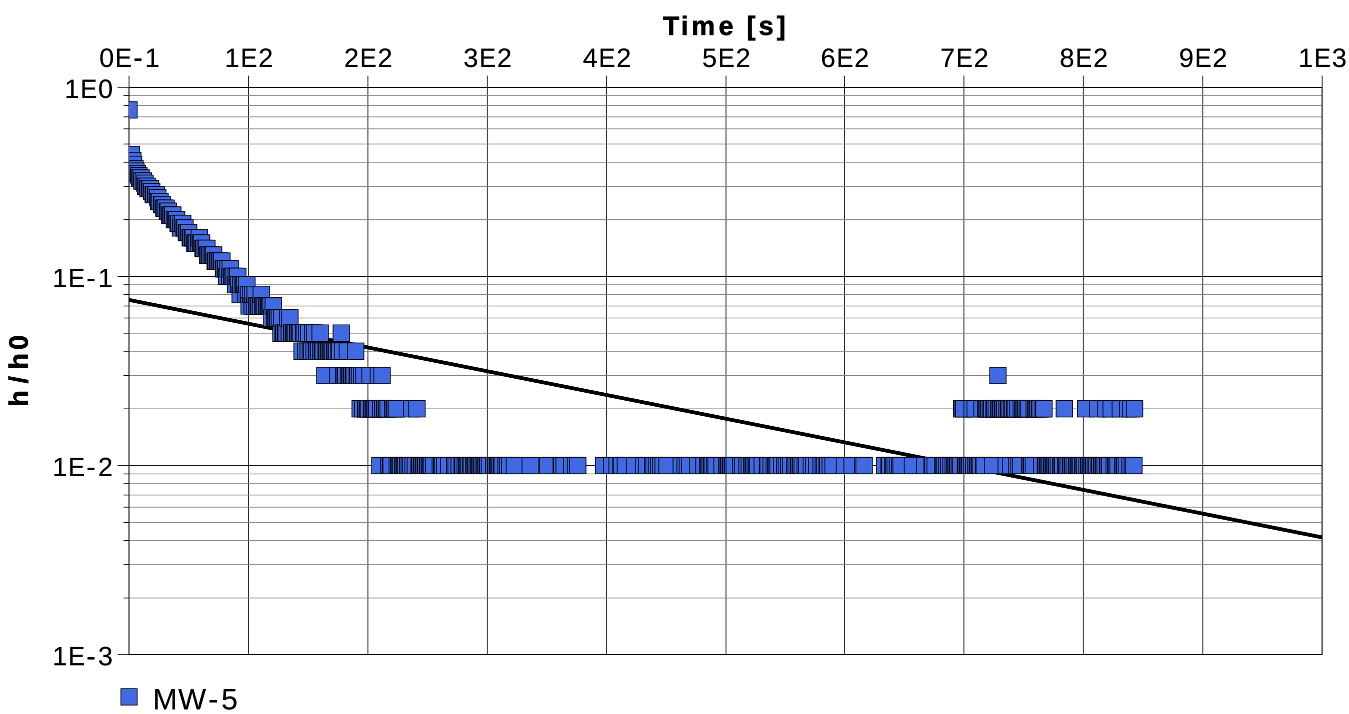
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-5, Test 1	Test Well: MW-5
Test Conducted by: E. Stata		Test Date: 7/12/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-5, Test 1	J. Boyd	9/2/2021	Hvorslev	MW-5		8.36×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-5, Test 2	Test Well: MW-5
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-5, Test 2	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-5	7.43×10^{-5}	

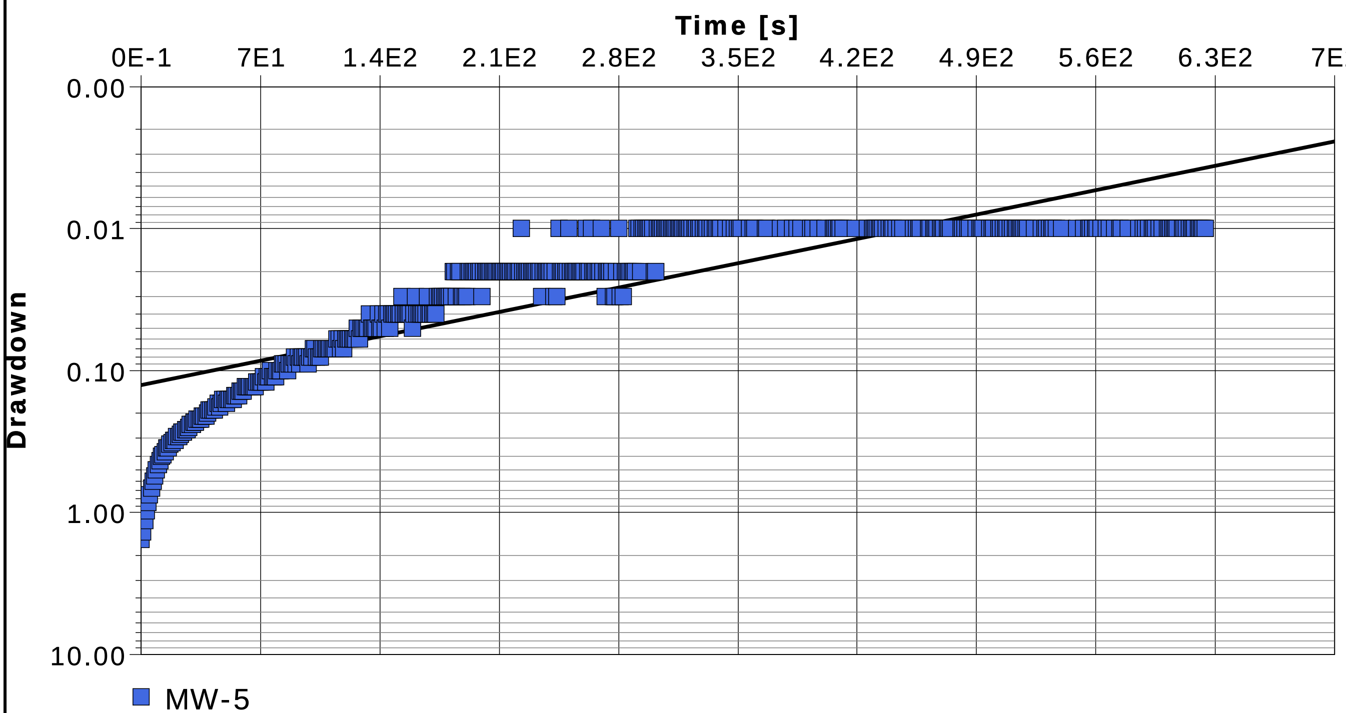
TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test - Analyses Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-5, Test 2	Test Well: MW-5
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-5, Test 2	J. Boyd	9/2/2021	Hvorslev	MW-5		7.43×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report** Project: BNSF - GPE Number: 444428.0000 Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-5, Test 3	Test Well: MW-5
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-5, Test 3	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-5	1.45×10^{-4}	

TRC Environmental Corporation
1180 NW Maple Street; Suite 310
Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

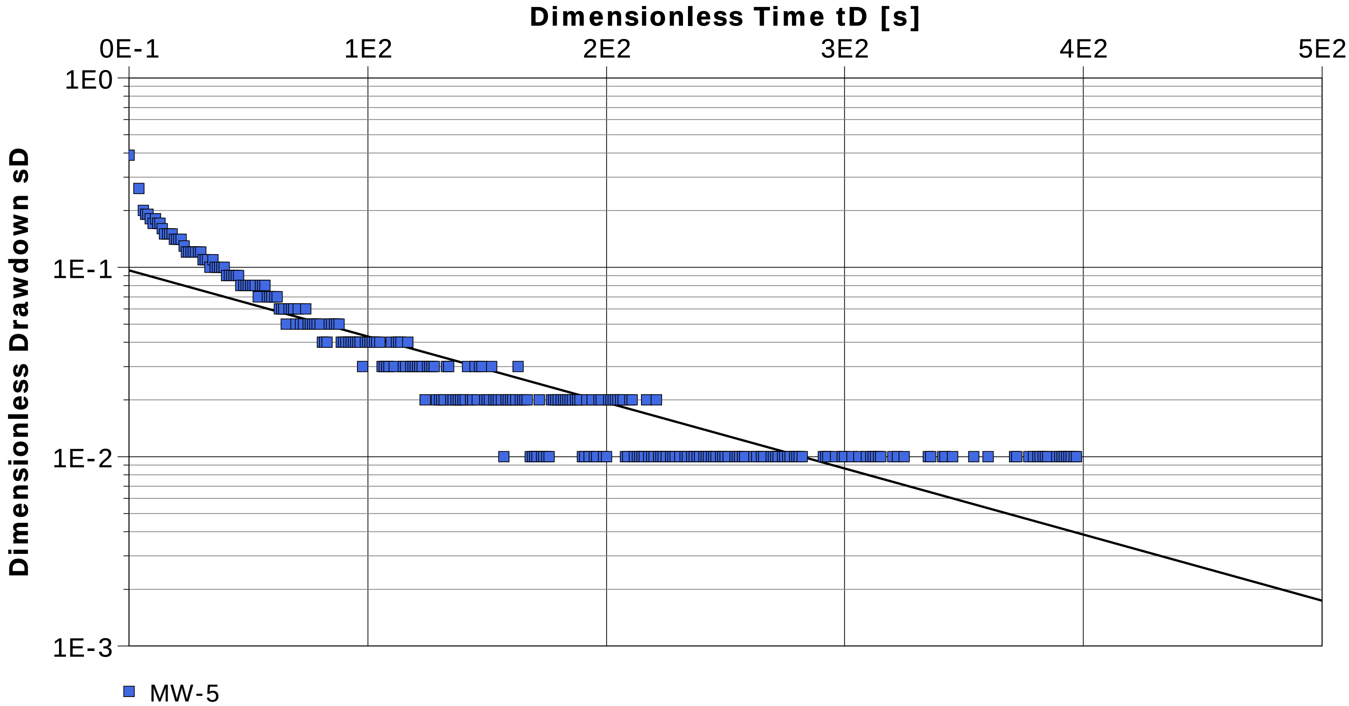
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-5, Test 3	Test Well: MW-5
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-5, Test 3	J. Boyd	9/2/2021	Hvorslev	MW-5		1.45×10^{-4}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-5, Test 4	Test Well: MW-5
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-5, Test 4	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

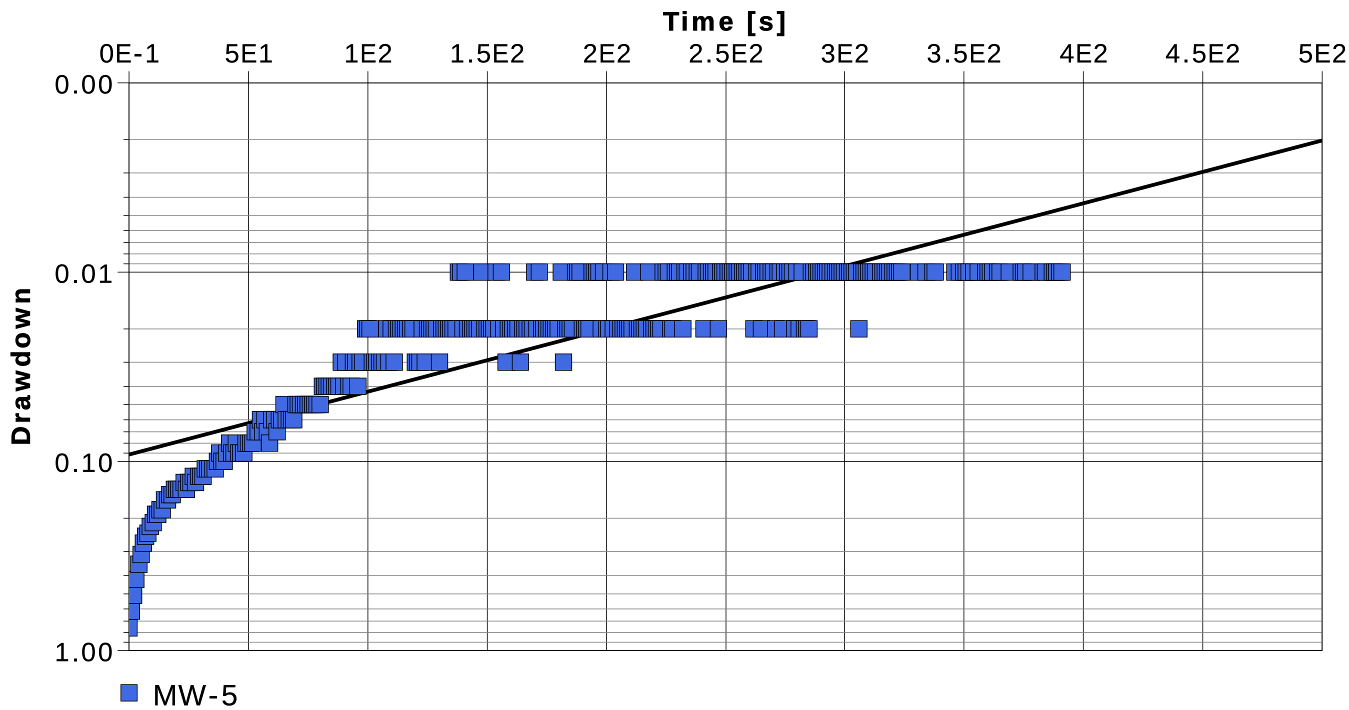
Observation Well	Hydraulic Conductivity [ft/d]	
MW-5	5.85×10^{-1}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test - Analyses Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-5, Test 4	Test Well: MW-5
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [ft²/d]	K [ft/d]	S
1	MW-5, Test 4	J. Boyd	9/2/2021	Hvorslev	MW-5		5.85×10^{-1}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110		**Slug Test Analysis Report** Project: BNSF - GPE Number: 444428.0000 Client: BNSF
Location: Leavenworth, WA	Slug Test: MW-5, Test 5	Test Well: MW-5
Test Conducted by: E. Stata		Test Date: 9/2/2021
Analysis Performed by: E. Stata	MW-5, Test 5	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]
MW-5	1.96×10^{-4}

TRC Environmental Corporation
1180 NW Maple Street; Suite 310
Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

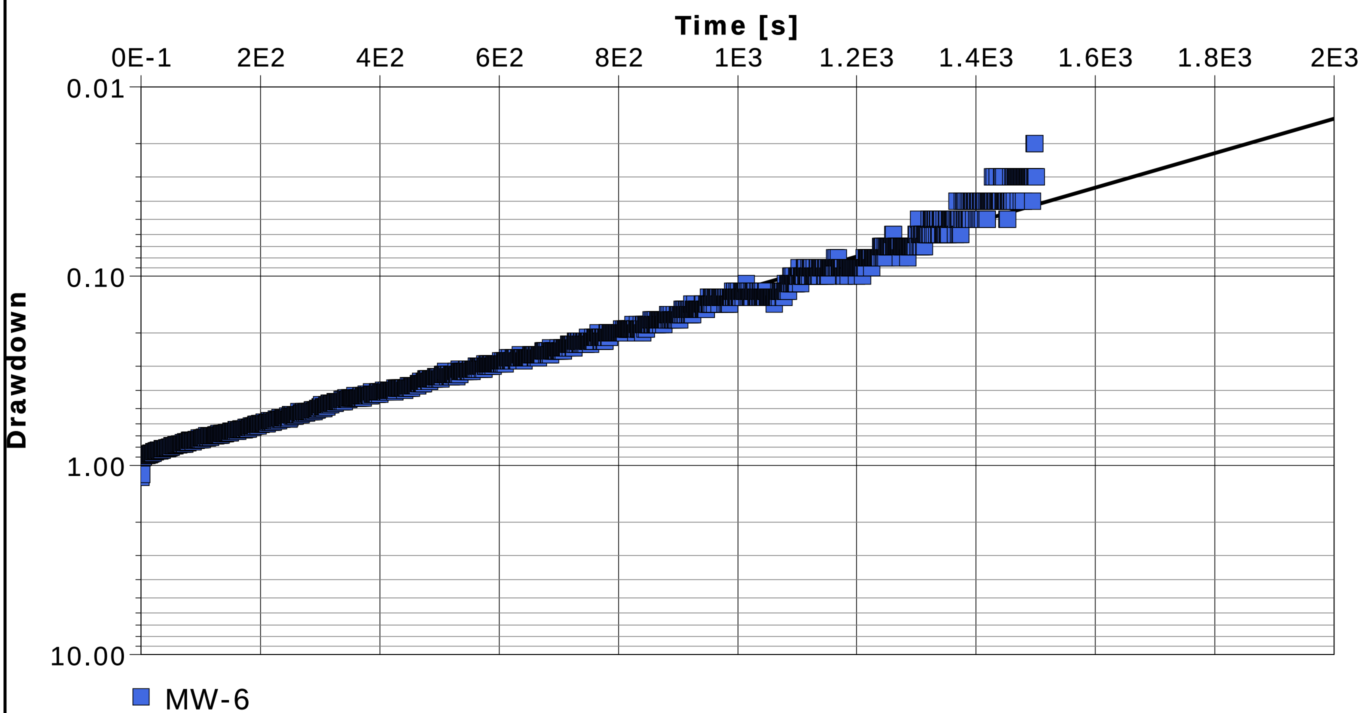
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-5, Test 5	Test Well: MW-5
Test Conducted by: E. Stata		Test Date: 9/2/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-5, Test 5	E. Stata	9/2/2021	Hvorslev	MW-5		1.96×10^{-4}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-6, Test 1	Test Well: MW-6
Test Conducted by: E. Stata		Test Date: 7/12/2021
Analysis Performed by: J. Boyd	MW-6, Test 1	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-6	5.38×10^{-5}	

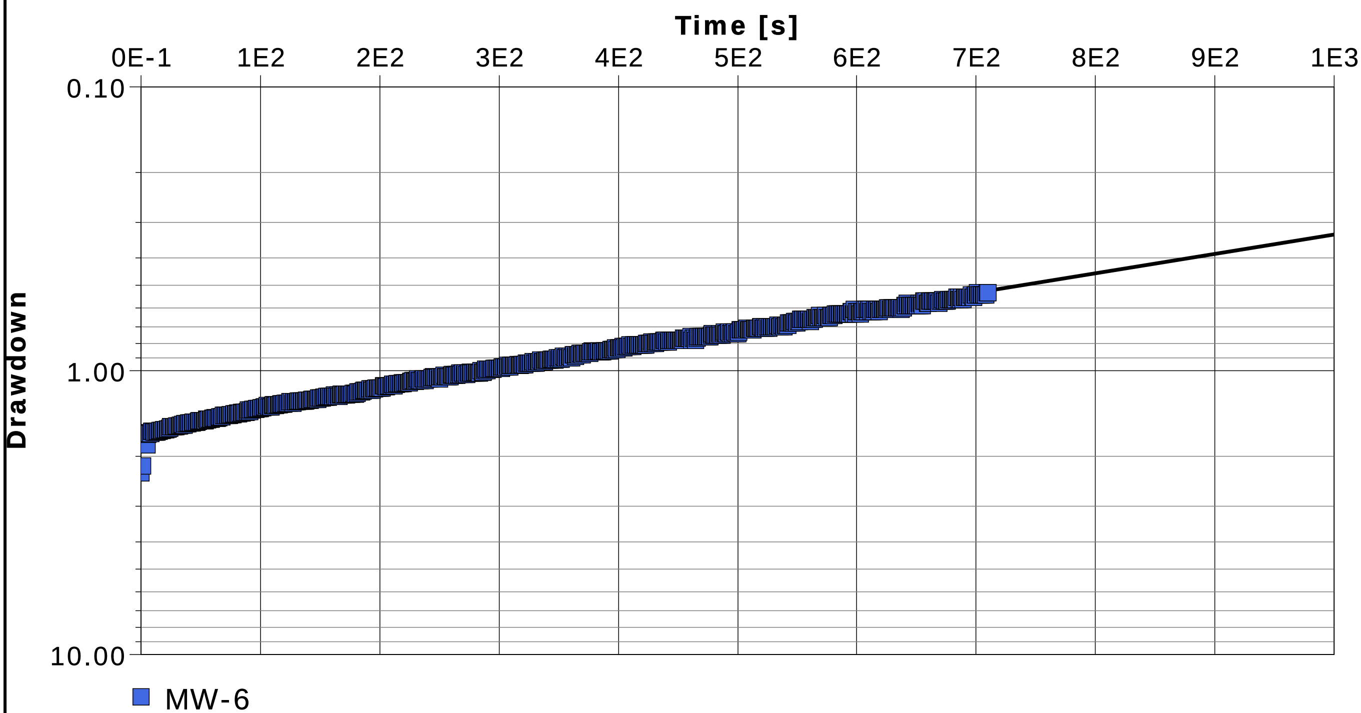
TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test - Analyses Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-6, Test 1	Test Well: MW-6
Test Conducted by: E. Stata		Test Date: 7/12/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-6, Test 1	J. Boyd	9/2/2021	Hvorslev	MW-6		5.38×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-6, Test 3	Test Well: MW-6
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-6, Test 3	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-6	4.03×10^{-5}	

TRC Environmental Corporation
1180 NW Maple Street; Suite 310
Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

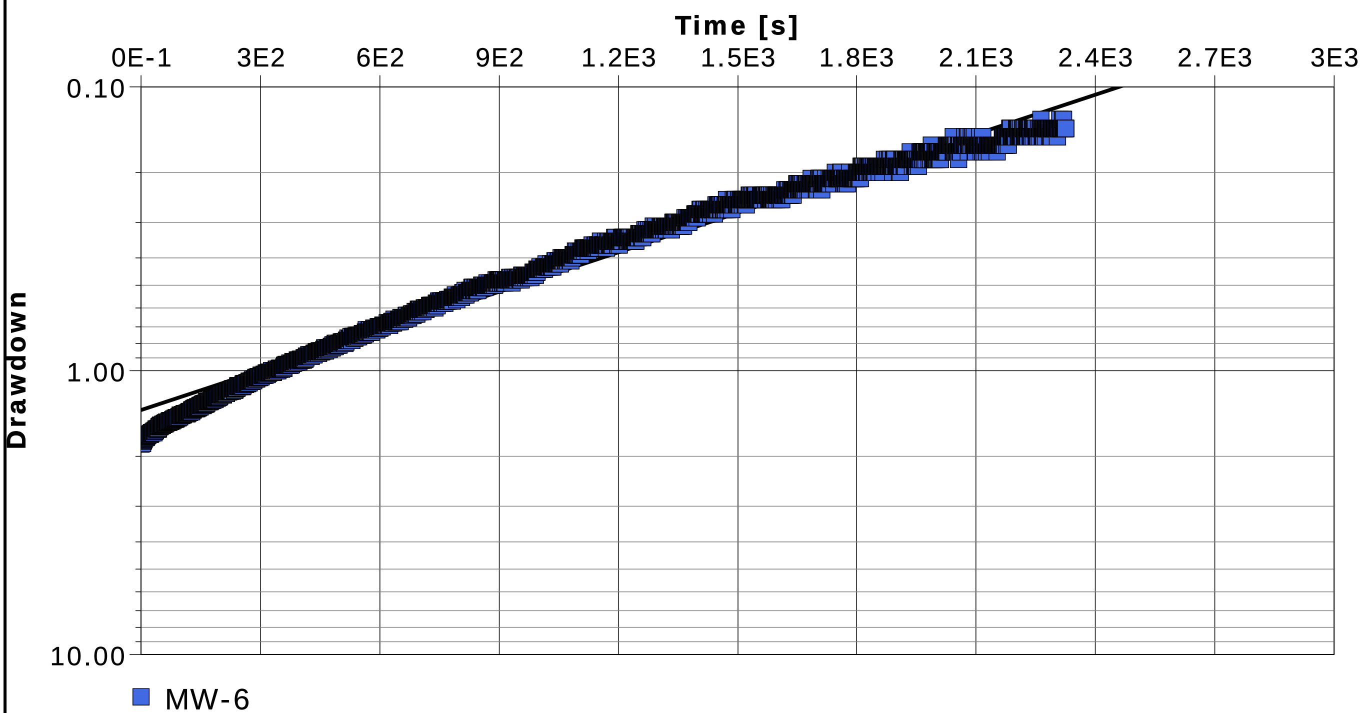
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-6, Test 3	Test Well: MW-6
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-6, Test 3	J. Boyd	9/2/2021	Hvorslev	MW-6		4.03×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-6, Test 4	Test Well: MW-6
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-6, Test 4	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-6	2.74×10^{-5}	

TRC Environmental Corporation
1180 NW Maple Street; Suite 310
Issaquah, Washington 98110

Slug Test - Analyses Report

Project: BNSF - GPE

Number: 444428.0000

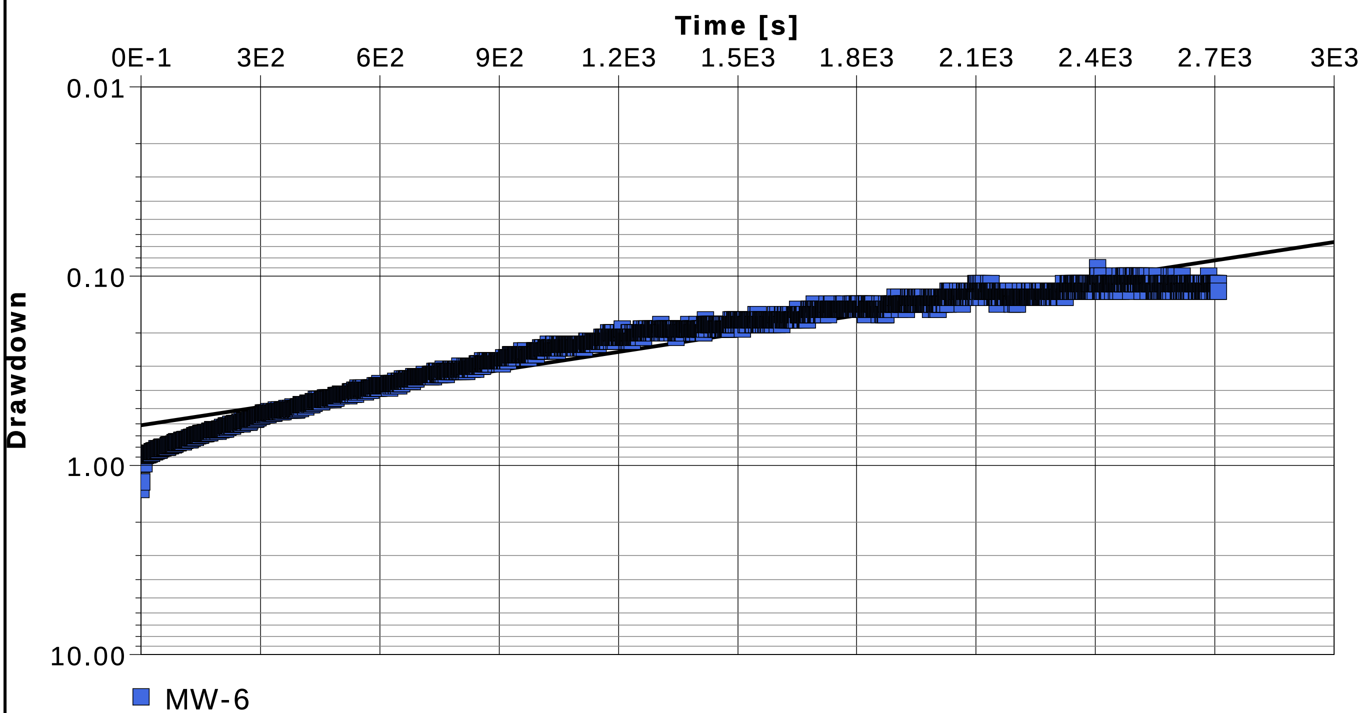
Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-6, Test 4	Test Well: MW-6
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-6, Test 4	J. Boyd	9/2/2021	Hvorslev	MW-6		2.74×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test Analysis Report**
	Project: BNSF - GPE
	Number: 444428.0000
	Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-6, Test 5	Test Well: MW-6
Test Conducted by: E. Stata		Test Date: 7/13/2021
Analysis Performed by: J. Boyd	MW-6, Test 5	Analysis Date: 9/2/2021
Aquifer Thickness: 20.00 ft		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [cm/s]	
MW-6	1.91×10^{-5}	

TRC Environmental Corporation 1180 NW Maple Street; Suite 310 Issaquah, Washington 98110	**Slug Test - Analyses Report** Project: BNSF - GPE Number: 444428.0000 Client: BNSF

Location: Leavenworth, WA	Slug Test: MW-6, Test 5	Test Well: MW-6
Test Conducted by: E. Stata		Test Date: 7/13/2021
Aquifer Thickness: 20.00 ft		

	Analysis Name	Analysis Performed b	Analysis Date	Method name	Well	T [cm²/s]	K [cm/s]	S
1	MW-6, Test 5	J. Boyd	9/2/2021	Hvorslev	MW-6		1.91×10^{-5}	

Attachment G
Survey Report

DATUM:

HORIZONTAL DATUM: NORTH AMERICAN DATUM (NAD) 83/96

VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM (NAVD) 88

0 20 40

SCALE IN FEET

NOTE: SCALE BAR IS ESTABLISHED FOR FULL SIZE WITH SCALE BAR EQUAL TO 2"

TRC

GLACIER PARK EAST SITE

MONITERING WELL EXHIBIT SITE

811 Know what's below. Call before you dig.

NO:	DESCRIPTION:	DATE:

SHEET OF

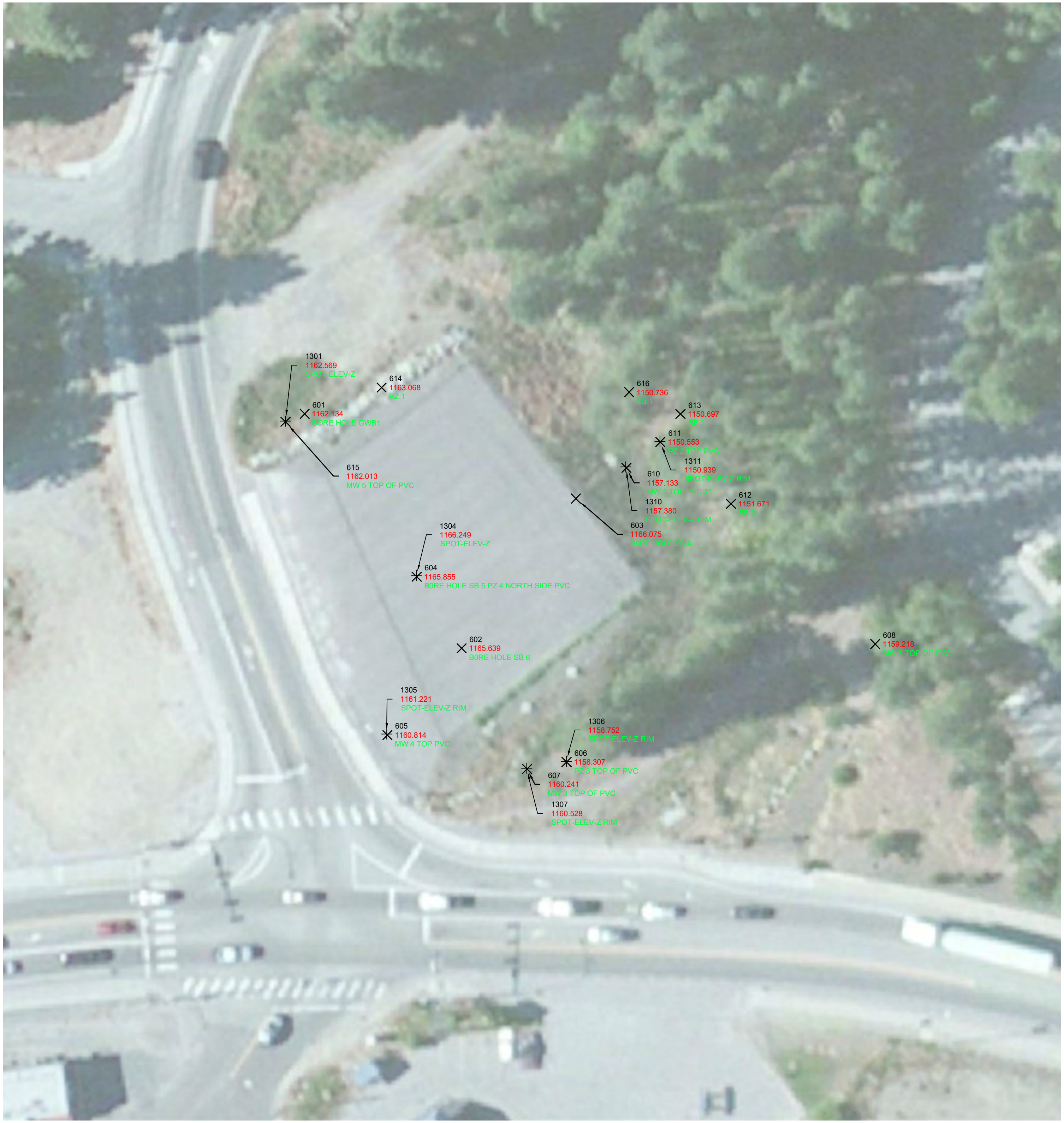
SHEET 1 OF 1

http://www.erlandsen.com

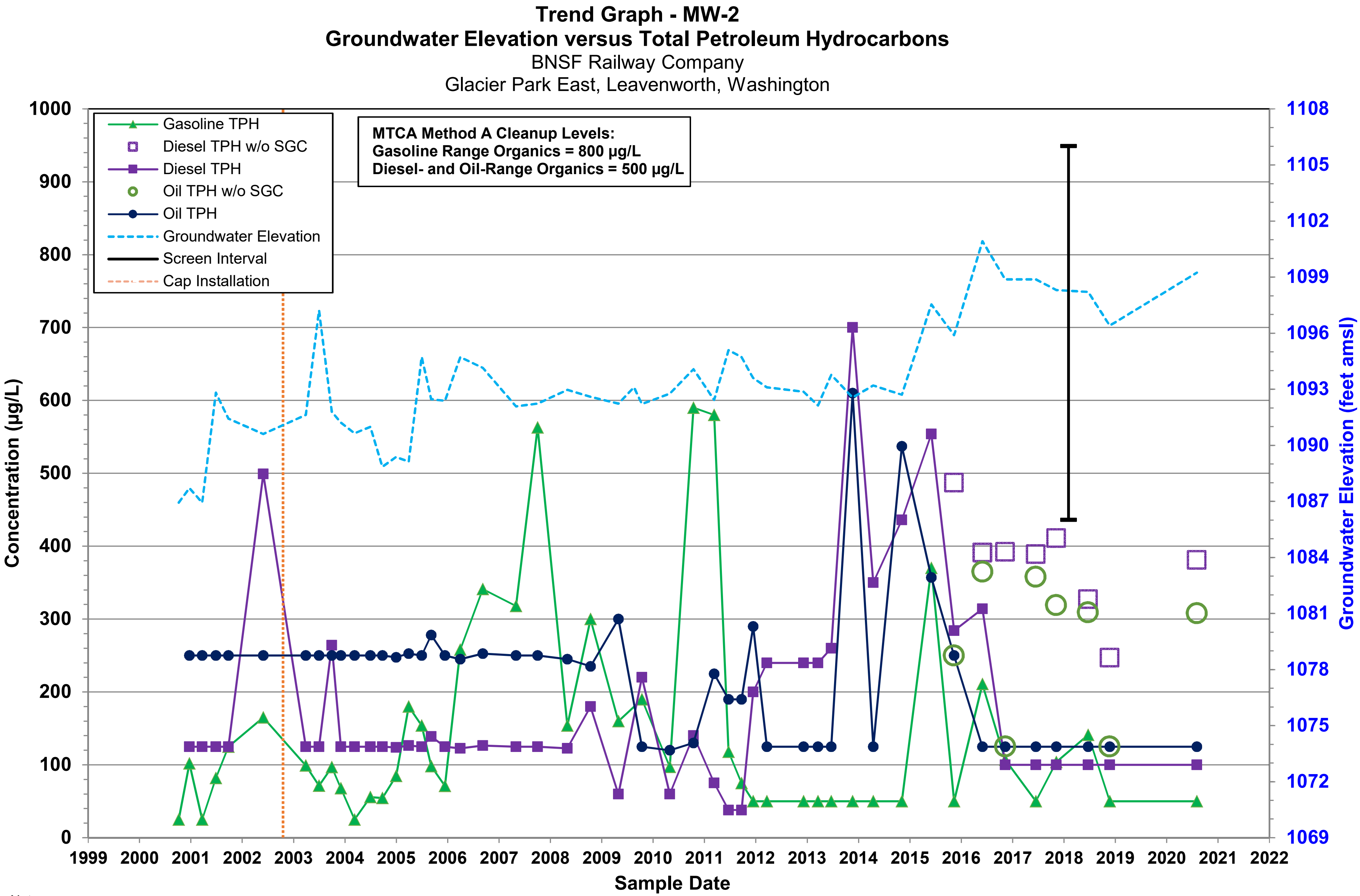
ERLANDSEN
250 SIMON ST. SE
EAST WENATCHEE, WA 98802
PH: 509.884.2562
TOLL FREE (800) 732-7442

Erlandsen
SURVEYING | PLANNING | ENGINEERING

DRAWN BY: JB
DATE: 9/24/2021
SCALE: AS NOTED
LAYOUT: 11X17
FILE NO: 20160282.0000WK.DWG
JOB NO: 20160282.0000

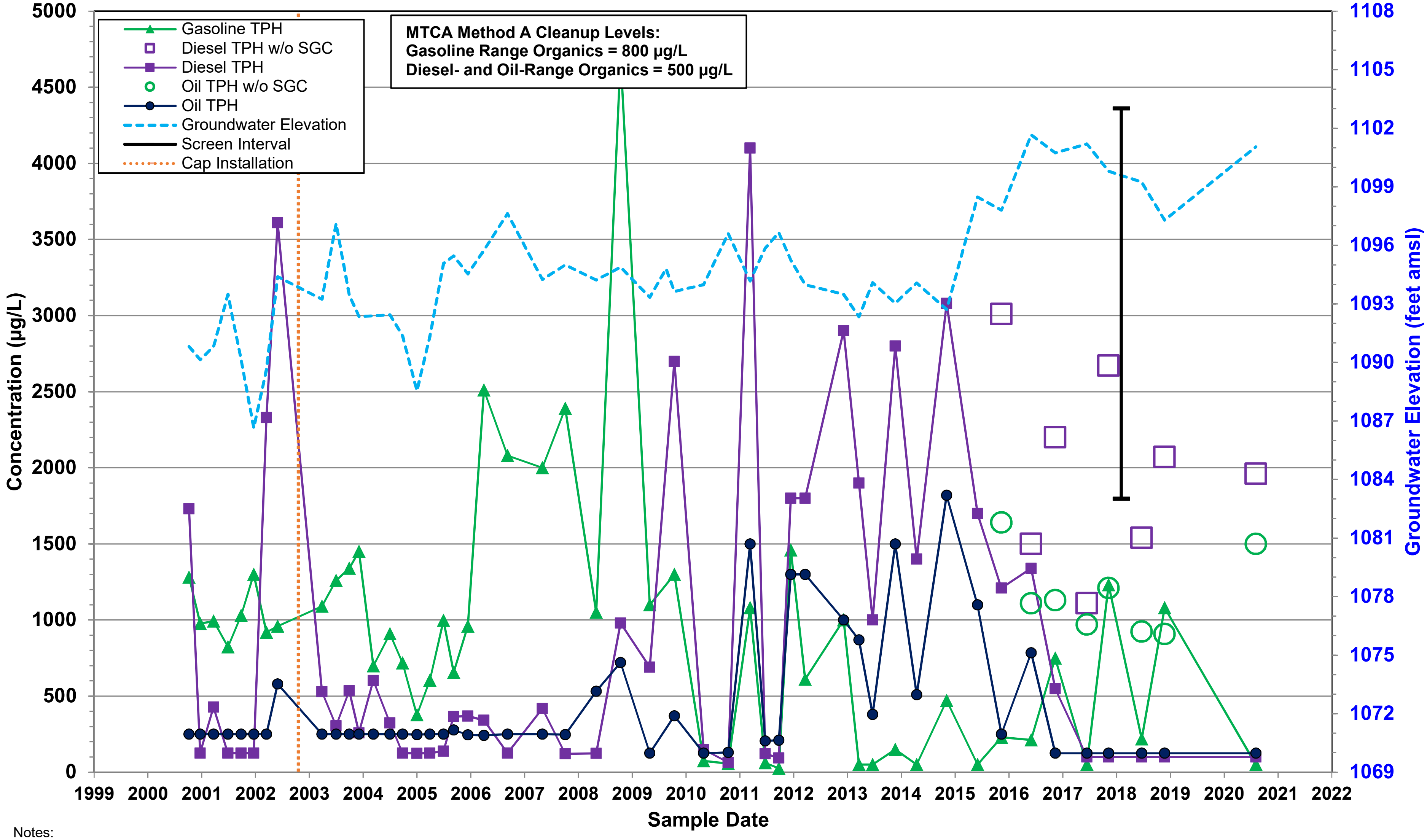

1301
1162.569
SPOT-ELEV-Z
614
1163.068
PZ 1
601
1162.134
BORE HOLE GWB1
615
1162.013
MW 5 TOP OF PVC
616
1150.736
SB 1
613
1150.697
SB 2
611
1150.553
PZ 2 TOP PVC
1311
1150.939
SPOT-ELEV-Z RIM
610
1157.133
MW 1 TOP PVC 2"
1310
1157.380
SPOT-ELEV-Z RIM
612
1151.671
SB 3
603
1166.075
B0RE HOLE SB 4
1304
1166.249
SPOT-ELEV-Z
604
1165.855
B0RE HOLE SB 5 PZ 4 NORTH SIDE PVC
608
1159.218
MW 6 TOP OF PVC
602
1165.639
B0RE HOLE SB 6
1305
1161.221
SPOT-ELEV-Z RIM
605
1160.814
MW 4 TOP PVC
1306
1158.752
SPOT-ELEV-Z RIM
606
1158.307
PZ 3 TOP OF PVC
607
1160.241
MW 3 TOP OF PVC
1307
1160.528
SPOT-ELEV-Z RIM

Attachment H
Trend Graphs

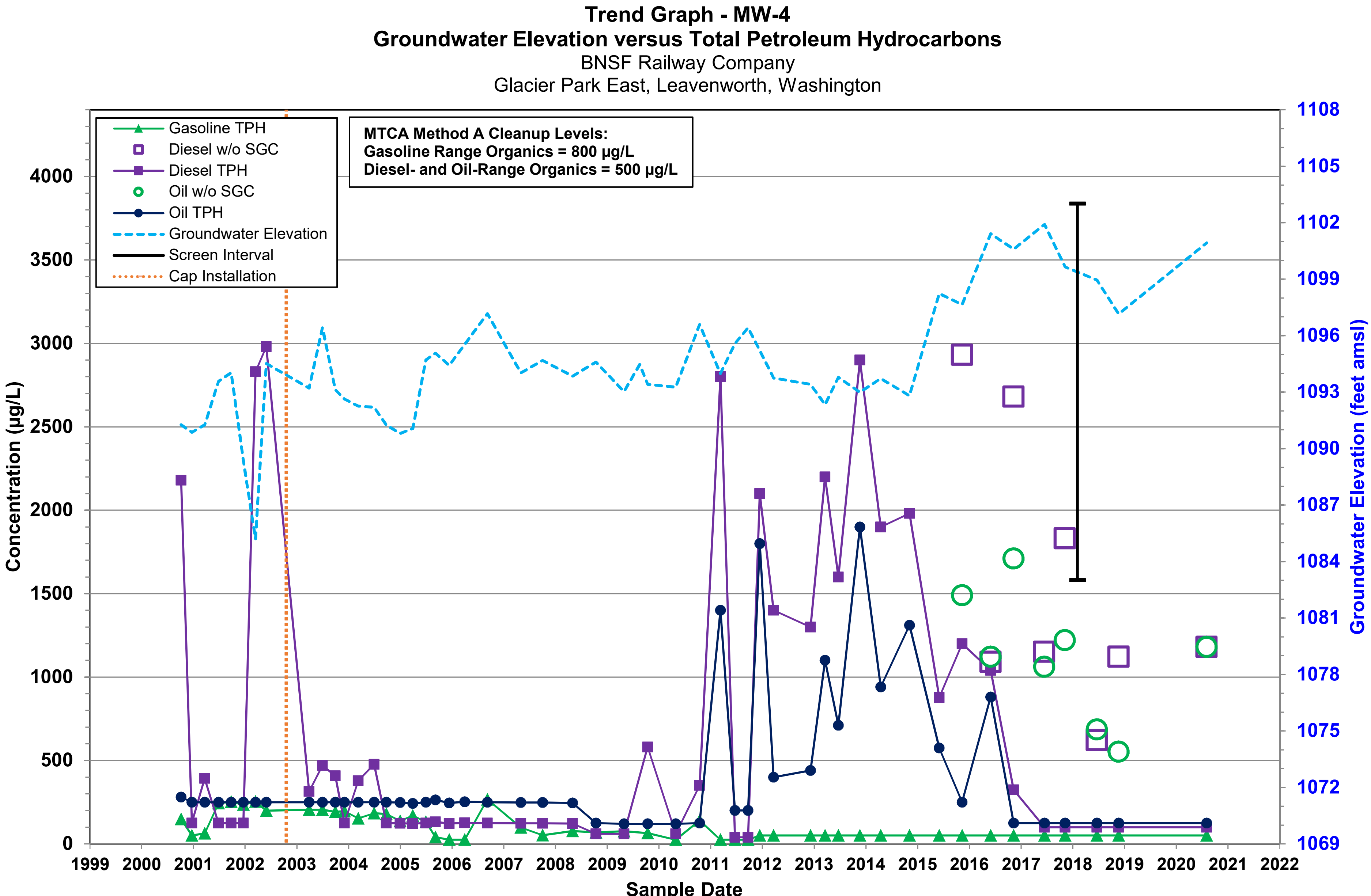


Notes:
1. Non-detect (ND) results shown as half the laboratory reporting limit.
2. SGC = silica gel cleanup

Trend Graph - MW-3
Groundwater Elevation versus Total Petroleum Hydrocarbons
BNSF Railway Company
Glacier Park East, Leavenworth, Washington

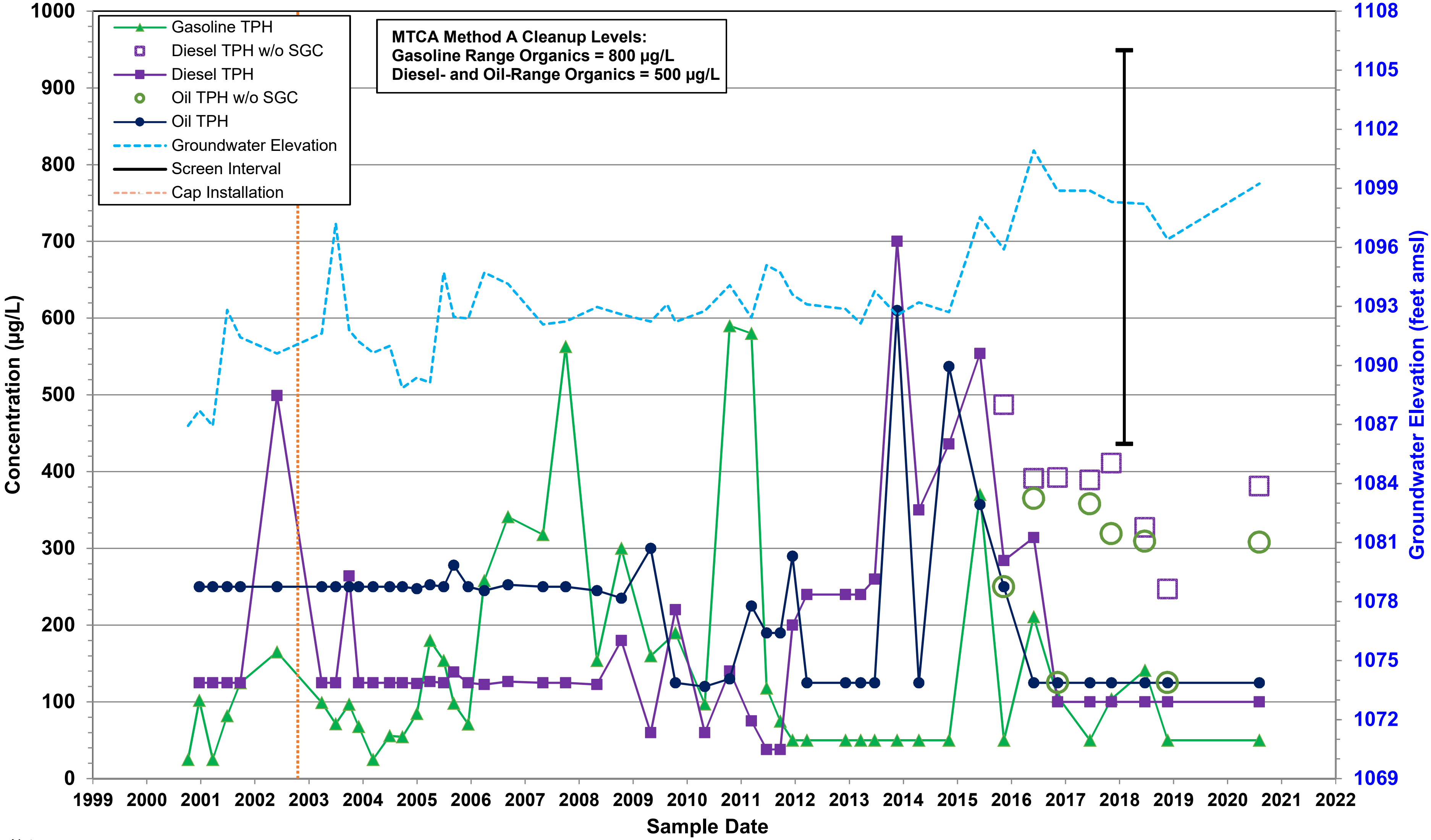


Notes:
1. Non-detect (ND) results shown as half the laboratory reporting limit.
2. SGC = silica gel cleanup

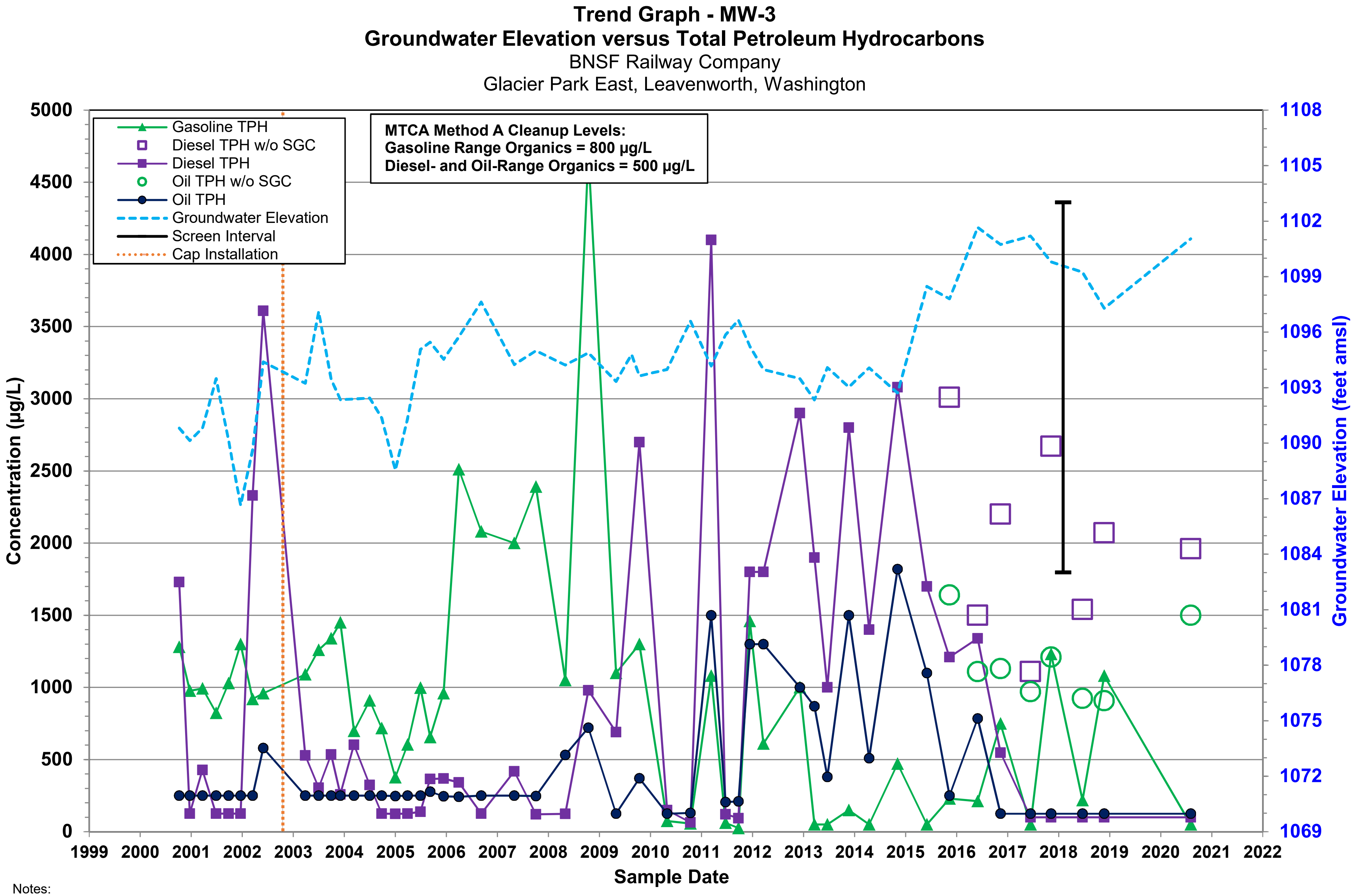


Notes:
1. Non-detect (ND) results shown as half the laboratory reporting limit.
2. SGC = silica gel cleanup

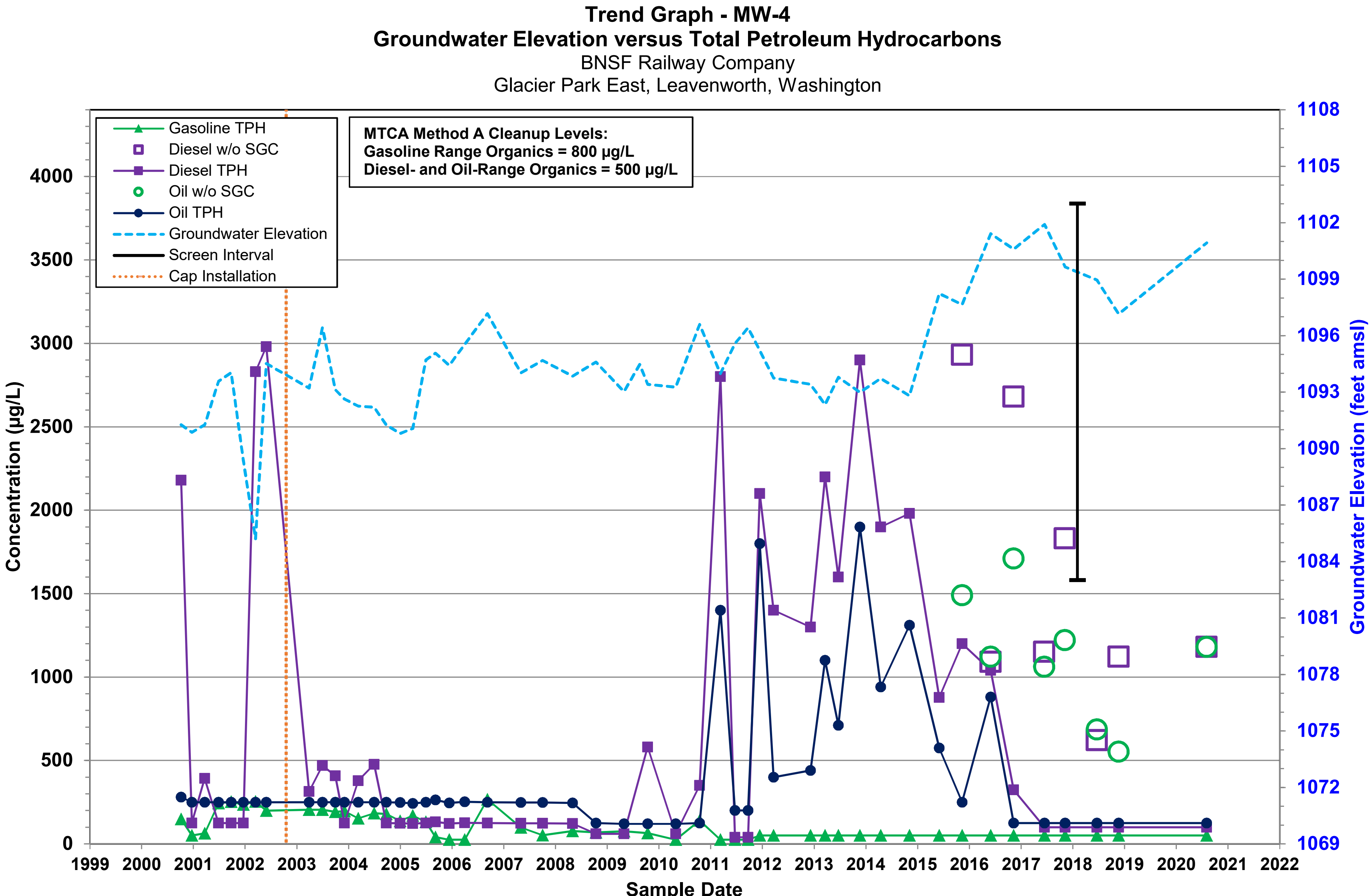
Trend Graph - MW-2
Groundwater Elevation versus Total Petroleum Hydrocarbons
BNSF Railway Company
Glacier Park East, Leavenworth, Washington



Notes:
1. Non-detect (ND) results shown as half the laboratory reporting limit.
2. SGC = silica gel cleanup



Notes:
1. Non-detect (ND) results shown as half the laboratory reporting limit.
2. SGC = silica gel cleanup



Notes:
1. Non-detect (ND) results shown as half the laboratory reporting limit.
2. SGC = silica gel cleanup