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February 23, 2018

Mr. John Mefford, Cleanup Project Manager
Washington Department of Ecology
1250 W Alder St.
Union Gap, Washington 98903

Re:	Transmittal of the Final Remedial Investigation Work Plan Addendum Agreed Order DE 12897
Site Name:	BNSF Track Switching Facility aka Wishram Railyard
Site Address:	500 Main St., Wishram, Klickitat County
Facility/Site ID No.:	1625461
Cleanup Site ID No.:	230

Dear Mr. Mefford,

Enclosed is the Final Remedial Investigation Work Plan Addendum. We look forward to continuing our work with Ecology to complete the investigation at Wishram.

Sincerely,

Shane C. DeGross
Manager of Environmental Remediation

cc: Allyson Bazan, AGO Ecology Division
Brooke Kuhl, BNSF Railway Co.
Todd Miller, Kennedy/Jenks Consultants
Carrie Andrews, CH2M
Matthew Wells, Tupper Mack Wells PLLC

BNSF Track Switching Facility (aka BNSF Wishram Railyard) Remedial Investigation Work Plan Addendum

Wishram, Washington

23 February 2018

Prepared for

BNSF Railway Company
2454 Occidental Avenue South, Suite 1A
Seattle, Washington 98134

K/J Project No. 1796120.04

BNSF Track Switching Facility (aka BNSF Wishram Railyard)
Remedial Investigation Work Plan Addendum

Wishram, Washington

Ecology Agreed Order No. DE 12897

Prepared by:

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This report was prepared by the staff of Kennedy/Jenks Consultants, Inc. under the supervision of the engineer whose seal and signature appear below.

The findings, recommendations, specifications, or professional opinions presented in this report were prepared in accordance with the generally accepted professional engineering practice and within the scope of the project. No other warranty, either expressed or implied, is provided.

Ryan Hultgren, Project Engineer
WA PE License 51860

February 2018

K/J 1796120.04

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List of Acronyms

Acronym	Description
A.F.E.	Authorization for Expenditure
AO	Agreed Order
ARAR	applicable, relevant, and appropriate requirement
bgs	below ground surface
BNSF	BNSF Railway Company
BTEX	benzene, toluene, ethylbenzene, and xylenes
btoc	below top of casing
CAP	Cleanup Action Plan
COC	chemical of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSM	conceptual site model
DAHP	Washington Department of Archaeology and Historic Preservation
DOH	Washington State Department of Health
DOT	U.S. Department of Transportation
DRO	diesel-range organics
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EPA	United States Environmental Protection Agency
ESC	ESC Laboratories
FS	feasibility study
GPS	Global Positioning System
GRO	gasoline-range organics
HASP	Health and Safety Plan
IDW	investigation-derived wastes
LIF	laser-induced fluorescence
LNAPL	light non-aqueous phase liquid
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
MTCA	Model Toxics Control Act
NA	natural attenuation
NWOR	Northwest's Own Railway
NWTPH-Dx	Northwest Total Petroleum Hydrocarbons as Diesel and Oil Extended
NWTPH-Gx	Northwest Total Petroleum Hydrocarbons as Gasoline Extended
OHM	oil head monitoring

Acronym	Description
ORO	oil-range organics
PAH	polycyclic aromatic hydrocarbon
PCC	State of Washington Pollution Control Commission
PID	photoionization detector
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RGW	reconnaissance groundwater
RI	remedial investigation
SAP	Sampling and Analysis Plan
SGC	Silica Gel Cleanup
SIM	selective ion monitoring
SOG	Standard Operating Guideline
SOW	Scope of Work
SP&S Railway	Spokane, Portland, and Seattle Railway
TPH	total petroleum hydrocarbons
UST	underground storage tank
VOC	volatile organic compound
WAC	Washington Administrative Code

Section 1: Introduction and Background

The Remedial Investigation (RI) Work Plan (RI Work Plan) (Kennedy/Jenks Consultants 2016) for the BNSF Railway Company (BNSF) Track Switching Facility (aka BNSF Wishram Railyard) (site) located in Wishram, Washington (Figure 1) was approved by the Washington State Department of Ecology (Ecology) on 28 March 2016; and modified per Ecology's letter dated 3 February 2017 to BNSF. RI field investigation tasks were initiated in August 2016. The RI is being performed in accordance with the Ecology Model Toxics Control Act (MTCA) regulations published in Washington Administrative Code (WAC) 173-340 (Ecology 2007). The RI Work Plan is being implemented pursuant to an Agreed Order (AO, No. DE 12897) between Ecology and BNSF dated 7 October 2015.

The purpose of the RI is to investigate the nature and extent of chemicals of concern (COCs) in soil and groundwater at the site and evaluate related fate and transport mechanisms. The RI results will also allow modification to, and further development of, the conceptual site model (CSM) that will be used to support preparation of a feasibility study (FS) as part of the site remediation process. Analytical results for data collected during the RI (including data from subsequent phases as needed) will be compared to applicable cleanup standards provided in the AO and other applicable, relevant, and appropriate requirements (ARARs) identified for the site to evaluate the potential risks posed to human health or the environment and to support the development of appropriate cleanup approaches in a Remedial Investigation / Feasibility Study (RI/FS) report.

A letter from Ecology to BNSF dated 22 May 2017 provided Ecology's requirement for BNSF to prepare an addendum to the RI Work Plan to address data gaps identified by Ecology (Ecology 2017b). Additional email correspondence from Ecology to BNSF [John Mefford (Ecology), personal communications to Shane DeGross (BNSF), dated 27 April 2017, 13 June 2017, and 26 June 2017], further clarified Ecology's perception of the data gaps associated with the upland areas of the site. This RI Work Plan Addendum (Addendum) presents the scope of work for additional RI tasks at the site to address these data gaps associated with the upland area of the site.

This Addendum is organized as follows:

- The remainder of Section 1 summarizes the RI field tasks completed between August 2016 and December 2017 and presents the additional data gaps identified by Ecology in its 22 May 2017 letter to BNSF and subsequent email correspondences. Detailed information regarding the site location and description, a summary of local geology and hydrogeology, previous environmental investigations, remedial activities, and groundwater monitoring results performed prior to 2016, and a preliminary CSM are provided in Section 1 of the RI Work Plan. Current and historical site features are presented on Figures 2 and 3, respectively, of this Addendum. Former water supply well construction data are provided in Table 1, Addendum RI field tasks are summarized in Table 2, and existing well construction data are summarized in Table 3.

- Section 2 identifies the RI objectives and general approach and goals for field activities described in this Addendum. RI tasks include collecting soil and groundwater samples at

specific locations on the site to address data gaps as well as additional data needs and field- and office-based tasks associated with former water supply wells.

- Section 3 describes the investigative activities that will be performed as part of the additional RI activities. This section also identifies the approximate sampling locations, number of samples to be collected, and analytical methods for each sample matrix. Section 3 references the following documents which were included as Appendices in the RI Work Plan:

  - The site Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) (Appendix A of the RI Work Plan)

  - Kennedy/Jenks Consultants Standard Operating Guidelines (SOGs) updated for this project (Appendix B of the RI Work Plan).

  The current Site-Specific Health and Safety Plan (HASP) developed for the site is included as Appendix A to this Addendum.

- Section 4 summarizes the procedures for personnel and equipment decontamination and procedures for disposing of investigation-derived wastes (IDW).

- Section 5 summarizes the reporting activities associated with the RI and identifies the schedule and duration of field activities identified in this Addendum.

1.1 Status of Completed RI Field Tasks

RI field tasks conducted in accordance with the RI Work Plan between August 2016 and December 2017 include the following:

- Advancing 24 soil borings (B-16-01 through B-16-24) for lithologic logging and field hydrocarbons screening [photoionization detector (PID) and sheen tests], collecting soil samples, and installing temporary wells to collect reconnaissance groundwater (RGW) samples.

- Installing seven shallow monitoring wells (WMW-12 through WMW-18) and performing quarterly (January 2017 and November 2017) and/or semi-annual (November 2016, April 2017, and September 2017) groundwater sampling events as specified in Table 6 of the RI Work Plan. Monitoring well construction data is summarized in Table 3.

- Installing four deep riverside monitoring wells (RMD-1 through RMD-4) and performing three semi-annual groundwater sampling events (November 2016, April 2017, and September 2017) as specified in Table 6 of the RI Work Plan.

- Installing four oil head monitoring wells (OHM-1 through OHM-4), collecting light non-aqueous phase liquid (LNAPL) samples for laboratory testing, and performing periodic LNAPL monitoring.

- Continuous water level gauging with pressure transducers in selected monitoring wells and in the Columbia River adjacent to the site (ongoing).

- Performing slug tests in December 2016 to assess the hydraulic conductivity of the saturated zone in five shallow monitoring wells (WMW-5, WMW-7, WMW-9, WMW-15, and WMW-18) and two deep monitoring wells (RMD-1 and RMD-4).

- Collecting oil nodule samples from the surface of the Columbia River in August 2016, October 2016, August 2017, and September 2017 for laboratory analyses.

- Performing monthly bank (visual) inspections along the Columbia River.

Soil boring locations advanced during historical investigations (e.g., 2003, 2004, and 2012 to 2014) and RI-related tasks in 2016 are presented on Figure 4. Existing monitoring wells and reconnaissance groundwater sampling locations are presented on Figure 5.

Preliminary analytical laboratory results from samples collected during the RI in August, October, and November 2016 and January, April, September, and November 2017 were submitted periodically for Ecology's review through data submittals, correspondence, and conference call presentations, as well as by uploading results to Ecology's Environmental Information Management (EIM) database, in accordance with the AO. A comprehensive summary of RI field tasks and data collected will be provided in the RI/FS report, which is required to be completed within 120 days of receiving validated analytical data from the final phase of sampling events under the RI Work Plan and modifications or addenda hereto (including this Addendum), in accordance with the AO.

In January 2017, it was discovered that nearly half of the samples submitted in August, October, and November 2016 to ESC Lab Sciences of Mt. Juliet, Tennessee (ESC), were inadvertently prepared using the Silica Gel Cleanup (SGC) method prior to analysis of the samples for Northwest Total Petroleum Hydrocarbons as Diesel and Oil Extended (NWTPH-Dx). As specified in the RI Work Plan (Section 3.6), samples submitted for analysis by NWTPH-Dx were to be prepared without SGC. A total of 42 of 95 samples collected through November 2016 for NWTPH-Dx analysis were affected (including primary and field duplicate samples) including one oil nodule sample collected from the river in August 2016; 17 soil samples collected in August, October or November 2016; five reconnaissance groundwater samples collected in August 2016; and 19 groundwater monitoring well samples collected in November 2016. In accordance with the RI Work Plan, eight soil samples collected in October 2016 were analyzed by NWTPH-Dx with and without SGC. Ecology was notified by BNSF of this issue by telephone on 17 January 2017 [Shane DeGross (BNSF), personal communications to John Mefford (Ecology)].

A preliminary data summary for RI samples collected in August, October, and November 2016 was prepared by Kennedy/Jenks Consultants for BNSF and was subsequently submitted for Ecology's review on 14 February 2017 (Kennedy/Jenks Consultants 2017). Results were presented in tabulated form for all analyses performed and in map figures for soil and groundwater samples analyzed by NWTPH-Dx (with and without SGC) for total petroleum hydrocarbons (TPH) as diesel-range organics (DRO) and oil-range organics (ORO). The data summary included a discussion of the DRO and ORO results for samples prepared with and

without SGC, comparison to applicable MTCA cleanup levels, and summaries of corrective measures taken by project staff and ESC to prevent further issues.

Ecology stated in their response letter dated 3 March 2017 that "BNSF will adhere to the sampling and analysis protocol as established in the RI Work Plan and will perform resampling and analyses" (Ecology 2017a).

Soil and groundwater RI sample results for DRO and ORO (with or without SGC preparation), have provided information beneficial for characterizing the site, delineating the distribution of affected areas and identifying data gaps (including those addressed by this Addendum), and supporting the development of remedial alternatives.

In Section 3.2 of this Addendum, Kennedy/Jenks Consultants proposes several soil boring and groundwater sampling locations in the vicinity of the Former Engine House/Machine Shop and a Former Repair Shop, near which one or more sampling locations in 2016 had samples inadvertently prepared with SGC. The new locations are proposed to further characterize the nature and extent of COCs in these data gap areas. Rather than resampling all previous locations, a limited number of soil and groundwater samples near the previous locations will be analyzed by NWTPH-Dx with and without SGC preparation to further evaluate previously collected data. Ecology has not formally approved the deviation from the RI Work Plan of analyzing samples for NWTPH-Dx with SGC preparation only; however, as outlined in Ecology's 27 November 2017 comments to the Agency Review *Draft Remedial Investigation Work Plan Addendum Wishram, Washington* (Draft Addendum) (Kennedy/Jenks Consultants 2017) submitted by BNSF and Kennedy/Jenks Consultants, they do support analyzing samples pre- and post-SGC for comparison with historical data. Ecology's 3 March 2017 letter was the last written communication regarding this issue.

Regarding other affected samples, approximately half (19 of 42 samples) of the samples inadvertently analyzed by NWTPH-Dx with SGC preparation were from the baseline November 2016 groundwater monitoring well sampling event. Groundwater monitoring well samples collected in January 2017, April 2017, September 2017, and November 2017 were analyzed by NWTPH-Dx without SGC, in conformance with Ecology directives and the RI Work Plan. Groundwater samples collected in November 2017 were also analyzed by NWTPH-Dx with SGC for data comparison. Oil nodule/NAPL samples collected from the river in October 2016 (two samples) and August 2017 (two samples) were analyzed by NWTPH-Dx without SGC.

1.2 Additional Identified Data Gaps

Ecology's 22 May 2017 letter to BNSF and subsequent email correspondences and meetings identified the following additional data gaps to be addressed as part of the RI Addendum:

- Based on reconnaissance groundwater sampling results from August 2016, additional data gaps include areas east of the Bunker C and diesel fueling distribution line system, including areas in the vicinity of the Former Engine House, Former Wash Rack, rail area north of the Former Wash Rack, Former Repair Shop, Former Turntable, areas near two Former Oil Houses, and Former Oil/Water Separator. Based on review of laboratory analytical results from groundwater monitoring well sampling events conducted in November 2016, January 2017, and April 2017, further delineation of the nature and

extent of dissolved phase petroleum hydrocarbon impacts in shoreline areas to the southwest and southeast of the former fueling distribution line system is also warranted. Investigations in these areas will address potential impacts to soil (sorbed phase) and groundwater (dissolved and separate-phase product).

- Locating and assessing whether former water supply wells installed at the site in the early 1900s were properly decommissioned and whether the water wells provided lateral or vertical conduits for contaminant transport.

Ecology's 22 May 2017 letter referred to a roundhouse as a potential data gap area. According to The Northwest's Own Railway (NWOR) Fall 2014 publication describing the Wishram railyard (NWOR 2014), the original design for the railyard included a roundhouse for servicing locomotive engines; however, it was never constructed. Instead, a rectangular run through type engine house was built. The structure identified by Ecology in its 22 May 2017 letter is not a roundhouse, but a former Turntable, present between 1911 and 1922 (Figures 2 and 3).

Potential sources of COCs and areas warranting further investigation. Through performance of past investigative activities at the site, the primary COCs identified for the site include petroleum hydrocarbons; with diesel- and oil-range hydrocarbons being the primary COCs. Other associated COCs include polycyclic aromatic hydrocarbons (PAHs), including carcinogenic PAHs (cPAHs) at low concentrations. In addition, benzene, toluene, ethylbenzene, and xylenes (BTEX) and some metals (primarily arsenic and lead) have been reported at low concentrations in site soil and/or groundwater samples collected from the site. The RI/FS report will summarize RI field tasks and data collected and include a comparison of reported adsorbed and dissolved COC concentrations to applicable regulatory standards, including surface water standards based on water quality criteria in Chapter 173-201A WAC, Section 304 of the Clean Water Act and in the National Toxics Rule (40 CFR part 131), as appropriate.

Several areas to the east of the former Bunker C and diesel fueling areas were identified in Section 1.6 in the RI Work Plan as requiring additional data during the RI to further assess the potential for COCs to be present in soil and groundwater. In accordance with the RI Work Plan, 16 soil borings (B-16-09 through B-16-24) were advanced in these eastern areas in August 2016 (Figure 4). The frequency and depths of soil samples were collected in accordance with the RI Work Plan from each soil boring. Shallow temporary wells (typically screened from 10 to 15 feet bgs or 10 to 20 feet bgs) were installed to collect RGW samples from each location. Shallow (10 to 15 feet bgs) and deep (25 to 30 feet bgs) RGW samples were collected from location B-16-24.

Laboratory analytical results for total petroleum hydrocarbons (TPH) as gasoline-range organics (GRO), DRO, and ORO are described below. Analytical results for DRO and ORO in 2016 soil samples are presented on Figure 6 and Figure 7, respectively. Figure 8 summarizes the DRO and ORO results from RGW samples collected in February and April 2004, January and February 2012, and August 2016, and from the April 2017 groundwater monitoring well sampling event. Results for samples prepared with SGC are identified on Figures 6, 7, and 8 with the notation "(SGC)" in symbol labels. Soil and groundwater samples collected prior to 2016 for NWTPH-Dx analysis had been prepared using SGC (Section 3.2). Groundwater samples collected in April 2017 were analyzed by NWTPH-Dx without SGC preparation.

TPH constituents including GRO, DRO, and ORO were not detected above reporting limits in the soil samples collected from borings B-16-09 through B-16-24, including five samples inadvertently prepared with SGC prior to NWTPH-Dx analysis (Figures 6 and 7). GRO was reported in samples collected from one of the August 2016 RGW locations (B-16-20). DRO and/or ORO were reported in RGW samples from 14 of the 16 boring locations, including four of the five RGW samples prepared with SGC (Figure 8). Five of the RGW samples (including three samples prepared with SGC) collected near the Former Engine House/Machine Shop, contained DRO and/or ORO concentrations above the MTCA Method A cleanup level.

Based on the presence of DRO and ORO in the RGW samples, Ecology identified the following RI data gaps (presented on Figures 2 and 3) for further investigation through this Addendum:

- Former Repair Shop (West).
- Former Repair Shop (East) and Former Turntable.
- Former Wash Rack and area to the north of the Former Wash Rack.
- Former Engine House/Machine Shop area.
- Former Oil House east of the Signal Office.
- Former 5,000-gallon oil underground storage tank (UST) east of the Depot.
- Former Oil House located in the eastern portion of the railyard.
- Oil drain lines associated with the Former Engine House, Former Oil Sump, and Former Oil/Water Separator.
- Area near the river bank south-southeast of the Former Oil/Water Separator, Former Engine House, and Former Turntable areas.

In addition to the last data gap identified above by Ecology, characterization of the lateral and vertical extents of potential dissolved phase DRO and/or ORO concentrations above the MTCA Method A cleanup level is also needed to the west of existing wells WMW-10 and WMW-14 and east of well pair WMW-18 and RMD-4 along the shoreline (river bank area). As shown on Figure 8 (which illustrates April 2017 groundwater monitoring well sampling results) samples from shallow well WMW-10 and deep well RMD-4 contained ORO concentrations above the MTCA A cleanup level. As presented in Section 3.2, two additional shallow and two additional deep monitoring wells are proposed along the shoreline to address this data gap.

Ecology's 27 November 2017 comments to the Agency Review Draft Addendum (Kennedy/Jenks Consultants 2017) included a requirement for additional investigation under this Addendum to address the following:

- Extent of dissolved phase hydrocarbon impacts to the north of wells WMW-7 and WMW-8 near the existing Maintenance Shop and to the east near the Former Boiler House.

- Area of a former septic tank and septic drainage field located to the northeast of the main site area.

Ecology's 27 November 2017 comments also requested additional information regarding potential historical releases, based on 1950 and 1951 correspondences between Spokane, Portland and Seattle Railway (SP&S Railway) personnel and the State of Washington Pollution Control Commission (PCC), as well as internal SP&S Railway communications. The 1950 and 1951 documents, included in Appendix B, were included with a transmittal of historical documents from BNSF to Ecology on 27 September 2017 (BNSF 2017). The following summarizes the information contained in those historical documents.

On 12 September 1950, the PCC notified SP&S Railway of a complaint filed by the indigenous people of Celilo Falls claiming that the railyard was dumping "oil refuse" into a "small creek which empties into the Columbia River." In an internal 6 November 1950 letter, SP&S Railway personnel reported performing an inspection (date not reported) of the shoreline of the river and being "unable to find any signs of escaping oil from our storage facilities into the river." The letter indicated that "escaping oil from barges hauling on the river" upstream of the railyard oil installations may be the source of oil described in the complaint. Reference is also made to an oil/water separator that had not been used for its intended purpose since being constructed but rather as a booster cistern for pumping water into a water tank. A release is described in a 20 November 1950 letter from SP&S Railway to the PCC and in an internal 1 December 1950 SP&S Railway document as an accidental spill due to a broken valve on the service tank while fueling a locomotive that had occurred some years prior to 1950. The oil was trenched across the track to accumulate in a swamp and allowed to dry to the consistency of asphalt. The 1 December 1950 letter also notes evidence of a new oil spill just upstream from the power house since the 20 November 1950 letter.

A PCC Field Engineer, Alfred Neale, visited the railyard and in a letter dated 26 February 1951, noted three sewer outfalls that discharged wastes to the Columbia River. The documents record that Mr. Neale inspected the facility and observed waste oils on the banks of the Columbia in the vicinity of the outfall nearest to the oil/water separator. He also observed an open ditch a short distance downstream which had an outfall that terminated over 100 feet from the river for conveyance of sewage wastes to the river.

Without drawings or sketches, the locations of the features described in the 1950 and 1951 correspondence can only be approximated. The "small creek" described by the indigenous people of Celilo Falls could be the visible feature in the 1951 aerial photographs aligned with the concrete culvert sewer line which runs under railyard to Former Pump House #2 (see Figure B-1 in Appendix B). Visible in the 1951 aerial photograph is also an area southeast of the Former Power House that appears to be disturbed; whether this is the location of the "swamp" or the spill area upstream from the power house is unknown. These features, including the small creek, swamp, waste oils on banks of the Columbia River, and the open ditch are likely no longer present or accessible for sampling due to the construction of The Dalles Dam. As described in Section 3.2, one soil boring and reconnaissance groundwater sample location is proposed adjacent to the concrete platform for Former Pump House #2.

Former Water Supply Wells. Three water supply wells were installed on railyard property between 1918 and 1930 to provide water for railyard operations, as well as domestic use in Wishram, Washington. Ecology provided well construction data, excerpted from a report, for the

three wells in an email to BNSF dated 27 April 2017 along with a copy of a well log for a State of Washington registered well installed in 1926. Excerpts from the report, *Geology and Ground-Water Resources of the Dalles Region, Oregon* (Piper 1932) and the registered well log are included in Appendix C. Additional information about the well locations and well construction data was included with a transmittal of historical documents from BNSF to Ecology on 27 September 2017 (BNSF 2017). The former water supply wells were installed with uncased intervals (open hole) in water bearing zones and solid, cased intervals in other (less/non-productive) zones. Well construction details for the three former water supply wells (identified as Well #1, Well #2, and Well #3) are provided in Table 1. The approximate locations of the wells are shown on Figure 3.

Well #1 was constructed in 1918 and later abandoned on 20 December 1928 according to Authorization for Expenditure (A.F.E.) number 4924 (included in Appendix C). Construction of Well #1 in 1918 was complicated by sand entering the drill hole at multiple depths [e.g., 79 to 92 feet below ground surface (bgs), 107 feet bgs, and 176 feet bgs], resulting in the well casing being crooked (not straight vertically from top to bottom) at several depths (0 to 35 feet bgs, 107 feet bgs, and 224 to 238 feet bgs). A plan to straighten the 10-inch diameter steel inner casing from 0 to 35 feet bgs was documented in a correspondence dated 21 June 1920, but it is unknown whether these repairs were made. Based on well construction information, the 10-inch diameter inner casing had been set within an outer 13.5-inch steel casing from the ground surface to 79 feet bgs and within a 12-inch steel casing from 71 to 92 feet bgs. The crooked well casing limited the proper operation and depth to which pump rods could be set, thereby also limiting water production from the well.

Well #1 was further complicated by contamination of the well water by oil and sewage along with sand buildup in the well. The source of the oil and sewage to the well and the frequency at which it occurred is unclear; however, historical documentation indicates it was from the surface or surface water. According to Piper (1932), the well water "was contaminated by oil from [a] near-by waste pit" (the location or nature of this waste pit was not provided, nor means by which the well had been contaminated). SP&S Railway correspondence from 16 January 1926 indicates that contamination by oil or sewage was from the surface. The 1926 correspondence referred to "sand, as well as oil, sewage, etc." entering the well and included a recommendation to "thoroughly seal the present well [i.e., Well #1] to prevent further surface water contamination." (see Appendix C). The letter includes a further statement that the water from Well #1 would be "satisfactory for locomotive use, provided any surface contamination such as organic matter, oil, etc. is excluded."

Details on well abandonment procedures for Well #1 were not reported in A.F.E. 4924. On 20 September 2017, BNSF attempted to locate former water supply Well #1 to the extent possible using hand tools, after the area where it was reportedly installed was cleared of vegetation and debris. The effort revealed what appeared to be concrete footings for a former structure and an area mounded with concrete within which were observed what appeared to be mounting bolts. The area coincided with the approximate location of former water supply Well #1.

Well #2 and Well #3 were located at the site on 11 July 2017. Photographs of the wells are included in Appendix C. In Well #2, water was measured at a depth of 9.15 feet below the top of exposed steel casing (btoc). A flat, solid surface was measured at a depth of 51.5 feet btoc. The

original well was completed to a depth of 399 feet bgs (Table 1). Well #3 appeared to have been filled to the surface with concrete but the decommissioned procedures are unknown.

Proposed approaches for attempting to confirm the location of former water supply Well #1, investigating whether the wells are plugged and abandoned, and assessing for potential impacts to the potable groundwater supply are outlined in Section 3.

Section 2: Remedial Investigation (RI) Objectives and Approach

The principal objectives of the RI are to characterize the nature and extent of impacted soil and groundwater at the site, together with assessing potential fate and transport mechanisms, in order to evaluate the potential risks that the impacts may pose to human health and the environment; and to collect sufficient information to conduct a FS to evaluate and identify a remedial approach to address the adverse site conditions. The results of the RI and FS will be summarized in the RI/FS report following completion of the proposed Addendum activities. Based on results of the RI/FS, as well as regulatory and community input, a Cleanup Action Plan (CAP) will be developed for the site.

The RI Work Plan described specific activities that were identified in the Scope of Work (SOW) provided as Exhibit B of the AO. The SOW and RI Work Plan included the potential for BNSF, in consultation with Ecology, to identify and develop additional phases of work to be performed to complete the RI, based on the results of investigative activities identified in the RI Work Plan. In accordance with Task 2, Section D (*Detailed Schedule and Reporting*) of the SOW, additional phases of work, if required, will be identified in modifications or addendums to this RI Work Plan and submitted to Ecology for approval before performing the work. This Addendum has been prepared to address the data gaps identified by Ecology as presented in Section 1.2.

2.1 Soil Investigation

The objective for further soil characterization is to define the lateral and vertical distribution of impacted soils across the site. Following review of the results from the previous independent remedial investigations and actions conducted between 2002 and 2016, Ecology identified in its 22 May 2017 letter, and subsequent email correspondence, data gaps in several areas with respect to potential impacts to soil and groundwater (refer to Section 1.1 of this Addendum and Section 1.6 of the RI Work Plan). To address the data gaps identified by Ecology, additional soil sampling will be conducted. The additional sampling proposed in this Addendum will supplement the existing data set in the following ways:

- Evaluating the general distribution of petroleum hydrocarbon in soil around potential release areas and defining those areas where the COCs may exceed potential site soil cleanup levels, including those necessary for protection of groundwater.

- Evaluating areas of the site where petroleum hydrocarbon compounds or other COCs may have been used, stored, or distributed to assess potential impacts to site media. See Section 3.2 for a detailed discussion of the sufficiency of previous site assessments and proposed additional investigation.

2.2 Groundwater Investigation

The objective for further groundwater characterization is to collect adequate information to delineate the distribution of dissolved COC beneath the site. Further investigation of both groundwater chemistry and hydrogeologic conditions (i.e., groundwater flow gradients, flow

boundaries and river influence) is warranted to more fully evaluate fate and transport of COCs. Previous investigations at the site have yielded information about groundwater quality, but additional information is needed to support the RI, evaluate potential exposure pathways and assist with selection of remedial alternatives in the FS. Additional sampling and characterization as described in this Addendum will supplement the historical RI data (as described in Section 2.2 of the RI Work Plan) in the following ways:

- Assess possible dissolved COCs in groundwater in the vicinity of historical railyard features (Figure 3) east of the former Bunker C / diesel fueling distribution line system.

- Extend the monitoring well transect parallel to the adjacent Columbia River to further assess dissolved concentrations of COCs in site groundwater. The well transect extension will include the installation of five new shallow monitoring wells (one to the west of well WMW-14 and four to the east of WMW-18) to evaluate mass flux and natural attenuation (NA) in close proximity to the river. Wells installed to the east of WMW-18 along the shoreline (WMW-20 to WMW-23) will be positioned to address potential impacts toward the shoreline south-southeast of the Former Oil/Water Separator, Former Engine House, and Former Repair Shops. Additional wells installed further upland to the east of WMW-18 include six wells in the vicinity of the Former Engine House/Machine Shop (WMW-24 to WMW-29).

- Add two deep monitoring wells to the existing network installed in 2016 along the Columbia River to evaluate the potential for dissolved compounds associated with the submerged oil LNAPL. One deep well will be installed to the west of well RMD-1, and one deep well will be installed to the east of well RMD-4.

- Investigate the distribution of DRO and ORO in shallow groundwater in the eastern portions of the site.

- Investigate the presence of other potential COCs in groundwater at specific locations identified in the AO or by Ecology [e.g., PAHs, volatile organic compounds (VOCs), and metals].

- Evaluate the presence or absence of LNAPL in existing and new monitoring wells.

- Evaluate existing and new hydrogeologic data to adequately characterize groundwater conditions and the interaction of site groundwater with the river.

- Evaluate NA parameters in selected monitoring wells.

- Assess potential impacts to the basalt aquifer from former water supply wells installed on the railyard.

- Investigate the presence of potential COCs in groundwater associated with a former septic tank and septic drainage area.

The groundwater investigation under this Addendum will consist of collecting RGW samples, and installing and sampling new groundwater monitoring wells to further assess the nature and extent of dissolved-phase COCs.

Per subsections (3), (4), or (5) of WAC 173-340-720, the groundwater cleanup standards shall be evaluated as part of the Feasibility Study and selected in cooperation with Ecology to meet applicable state and federal laws. Establishing conditional points of compliance will be discussed with Ecology during the Feasibility Study phase and will adhere to WAC 173-340-720(8). Evaluation of applicable cleanup standards will take into consideration the groundwater to surface water pathway and compliance with surface water regulations.

Additional characterization of hydrogeologic conditions will also be performed as part of the RI to provide more detailed information on groundwater flow, interaction between the Columbia River and site groundwater, and potential petroleum hydrocarbon migration. Hydraulic characterization activities will include:

- Measuring water levels manually to assess the magnitude and direction of the hydraulic gradient and direction of groundwater flow.

- Performing slug test(s) in select wells to assess the hydraulic conductivity of the saturated zone, as needed.

Section 3: Additional RI Field Activities

This section presents the investigation procedures, proposed sampling locations, methods, sampling and frequencies, as well as chemical analyses. Proposed sampling locations are shown on Figures 9 through 12 and proposed sample analyses are summarized in Table 2. SOGs for the field activities that will be performed during this RI are provided in Appendix B of the RI Work Plan.

3.1 Pre-Field Activities

Invasive activities will be required to complete the scope of work outlined in this Addendum. Prior to invasive activities, a survey will be performed to evaluate the potential for underground utilities at each proposed soil boring/well location. The utility survey will augment information provided by BNSF regarding potential underground utilities. The utility location procedures will include:

- Coordinating with the Washington Utility Notification Center (public property only).
- Coordinating with BNSF trades regarding utilities at proposed sampling locations.
- Coordinating with a private utility locator to identify possible underground lines on private property.
- Using an air-knife or similar tool (where appropriate) to assess possible underground utilities.

When necessary, proposed boring/well locations will be adjusted in the field to accommodate possible underground and/or overhead utilities or other features that would present a hazard. A site HASP that documents the specific procedures to be used to protect the health and safety of Kennedy/Jenks Consultants personnel and subconsultants during the site investigation is included as Appendix A of this Addendum.

Prior to implementing the investigation described in this Addendum, BNSF will consult with Washington Department of Archaeology and Historic Preservation (DAHP) to identify sensitive sites in the Wishram Railyard area and obtain necessary permits. In consultation with DAHP, the Yakama Nation, and other potentially interested parties (e.g., Confederated Tribes of Umatilla Indian Reservation, Confederated Tribes of Warm Springs, Nez Perce Tribe), BNSF will develop an appropriate plan for conducting the work described in this Addendum. Ecology will be notified in a timely manner through email or by telephone about archaeological issues that may affect the performance and/or the schedule of any remedial work under the Agreed Order.

3.2 Additional Site Assessment Data Gaps

Although the bulk of the fueling activities took place in the western half of the site, other structures and storage tanks existed that may represent potential sources for COCs into the subsurface.

Proposed soil borings and monitoring well locations to address Ecology's identified data gaps and to further assess potential dissolved-phase DRO and ORO impacts along the shoreline are summarized below and in Table 2. Proposed laboratory analyses for soil and groundwater (RGW and monitoring well) samples and groundwater sampling frequency are summarized in Section 3.3 and in Table 2.

As presented in Section 3.2.1, with the possible exception of one soil boring, a RGW sample will be collected from each soil boring not converted into a monitoring well. The one exception is related to the two soil borings proposed upgradient and downgradient of the Former Oil/Water Separator. If field observations (visual, olfactory, PID, and sheen tests) do not indicate impacts in either of the two proposed soil borings, then an RGW sample will only be collected from the downgradient (closer to Columbia River) soil boring.

3.2.1 Additional Data Gaps

Thirty additional soil borings (B-17-01 to B-17-30), 14 shallow monitoring wells (WMW-19 through WMW-32), and two deep monitoring wells (RMD-5 and RMD-6) are proposed to address the data gaps identified by Ecology in the eastern portion of the site and/or to further evaluate the extents of potential impacts from the former fueling areas [wells WMW-19, WMW-20, RMD-5, and RMD-6, (see Section 3.2.2)].

Proposed shallow monitoring wells will be installed using direct-push drilling and pre-packed slotted casing (10 feet in length). Depths at which groundwater was observed in 2016 soil borings, in monitoring wells during quarterly groundwater monitoring events, and pressure transducer data recorded between December 2016 and December 2017 will be reviewed to evaluate seasonal groundwater table fluctuations across the site. As shown in Table 2, due to the change in ground surface elevations, the planned well screen intervals for shallow wells on the berm alongside the Columbia River (WMW-19 through WMW-23) are approximately 11 to 21 feet bgs and for shallow wells further upland (WMW-24 through WMW-32) are approximately 7 to 17 feet bgs. To the extent possible based on existing hydrogeologic data, shallow wells will be constructed such that the expected high and low groundwater table occurs within the screened portion of each well, with a minimum target water column height of approximately 5 feet to allow for groundwater sample collection.

The proposed deep monitoring wells (RMD-5 and RMD-6) will be installed using 20 feet of 0.040-inch slotted casing installed from approximately 30 to 50 feet bgs using either hollow stem auger or rotosonic drilling. The annulus around the casing will be backfilled with clean sand, bentonite, and neat cement to surface grade. A pre-packed well screen will not be used for the deep well. Well construction for the 14 new wells will be in accordance with the requirements for monitoring wells under WAC 173-160.

Previously collected soil and/or groundwater samples for TPH analyses are summarized below with respect to each identified data gap area. Samples collected prior to 2016 for NWTPH-Dx analysis were prepared with SGC. Soil and RGW samples collected in 2016 from soil borings B-16-09, B-16-12, B-16-18, and B-16-24 (located in the data gap areas identified below) were inadvertently analyzed by NWTPH-Dx with SGC; the remaining soil and RGW samples collected during 2016 were analyzed without SGC (Figures 6, 7, and 8).

Former Oil/Water Separator. Documentation is not available as to how the oil/water separator was removed or abandoned. A concrete footing is partially visible beneath soil and vegetation in the general area of where the former oil/water separator appears on historical station plat maps. SP&S Railway correspondence from 6 November 1950 and 1 December 1950 states that a concrete oil/water separator was installed at the time the railyard was constructed but was never used for that purpose in the 35 years (at the time of the record) of facility operations, but rather used as a booster cistern for pumping water into a water tank.

One soil boring (WSB-04-34) was advanced to the north of this area in 2004. DRO and ORO were not detected in a soil sample collected at 5 feet bgs nor in a RGW sample collected from 11 to 12 feet bgs (Figure 8). Two soil borings (B-17-19 and B-17-20) will be advanced to the north and south of the Former Oil/Water Separator. Soil samples will be collected from each boring and one RGW sample will be collected from an impacted boring (based on field observations) or the downgradient (southern) boring (B-17-19) if no impacts are observed in the two borings. If impacts are observed in both borings, then one RGW sample will be collected from each boring (two samples total). A third shallow boring (B-17-21) will be advanced adjacent to Former Pump House #2 (Figure 9), which may potentially have been connected to a western outlet of the Former Oil/Water Separator (Figure 2). Paired shallow (WMW-20) and deep (RMD-6) monitoring wells will also be installed to the south of the Former Oil/Water Separator along the shoreline. Soil and groundwater (RGW and monitoring well) samples will be collected to evaluate the potential for impacts from the Former Oil/Water Separator and from former fueling distribution system areas to the northwest (Figure 10).

Former Repair Shop (West). DRO and ORO were reported at concentrations below their respective MTCA Method A cleanup levels in the RGW sample (prepared with SGC) collected from B-16-09 located south of the Former Repair Shop. One soil boring (B-17-17) will be advanced to the north of the Former Repair Shop and one shallow monitoring well (WMW-21) will be installed along the shoreline to the south (Figure 10). Soil and groundwater (RGW and monitoring well) samples will be collected to further confirm the results from the RGW sample. The NWTPH-Dx analysis for the preliminary samples collected from this location will be analyzed both pre- and post-SGC.

Former Repair Shop (East) and Former Turntable. DRO and ORO were reported at concentrations below their respective MTCA Method A cleanup levels in RGW samples collected from locations B-16-10 and B-16-11, located south of this Former Repair Shop. One additional soil boring (B-17-22) will be advanced within the extents of the Former Repair Shop footprint and one shallow monitoring well (WMW-23) will be installed along the shoreline to the south (Figure 10). Soil and groundwater (RGW and monitoring well) samples will be collected from the two locations to further evaluate the distribution of DRO and ORO in this area.

Former Wash Rack and Rail Area North of Wash Rack. Previous shallow soil samples collected in 2004 did not contain GRO, DRO, or ORO above laboratory reporting limits. Two deeper soil

samples (30 to 35 feet bgs) collected in 2012 along the western edge of the Former Wash Rack contained DRO and ORO above their respective MTCA Method A cleanup levels. ORO was reported above its MTCA Method A cleanup level in the April 2017 groundwater sample from shallow well WMW-5; DRO was not detected in that sample. DRO and ORO were reported above their respective MTCA Method A cleanup levels in the RGW sample collected from 2016 soil boring B-16-12 along the eastern side of the Former Wash Rack. One soil boring (B-17-23) and one shallow monitoring well (WMW-24) will be installed in the eastern portion of the Former Wash Rack as shown on Figure 10. Soil and groundwater (RGW and monitoring well) samples collected to further evaluate the presence of DRO and ORO in these areas.

Former Engine House/Machine Shop. Five soil samples and one RGW sample had previously been collected in and around the vicinity of the Former Engine House/Machine Shop in 2004. DRO was not detected in 2004 soil samples and ORO was reported in only one sample collected from boring WSB-04-31 (at 2 feet bgs) at a concentration of 111 milligrams per kilogram (mg/kg). Seven borings were advanced in 2016, with eight RGW samples collected (seven shallow samples and one deep sample). DRO and/or ORO were reported in the seven shallow RGW samples. Five of the seven shallow RGW samples contained DRO and/or ORO above their respective MTCA Method A cleanup levels, including three samples analyzed by NWTPH-Dx with inadvertent SGC preparation. DRO and ORO were not detected in the deep RGW sample.

Eleven additional soil borings (B-17-01 to B-17-11) are proposed within the former footprint of the Former Engine House/Machine Shop area. Five additional shallow monitoring wells (WMW-25 through WMW-29) are also proposed within the vicinity of this area. To locate the additional borings, the Former Engine House/Machine Shop footprint was segmented into 15 50-foot by 50-foot quadrants. Soil borings are proposed in 11 of the quadrants that were either not previously investigated or where samples were not collected for a comprehensive set of laboratory analyses (Figures 9 and 10). A sixth shallow well (WMW-22) will be installed to the south of the Engine House along the shoreline. Soil and groundwater samples (RGW and monitoring well samples) will be collected from the proposed locations (Figure 10) to further evaluate the nature and extent of DRO and ORO in this area. A limited number of soil and groundwater samples will be collected and analyzed for NWTPH-Dx with and without SGC, based on field observations.

Former Oil House (East of Store House). DRO was reported at a concentration below the MTCA Method A cleanup level in the RGW sample from location B-16-13; ORO was not detected in the sample. DRO and ORO were not reported in the RGW sample collected from B-16-14. One shallow monitoring well (WMW-30) will be installed to the south of the Former Oil House (Figure 10) and soil and groundwater (quarterly for 1 year) samples will be collected to confirm the results obtained in 2016.

Former 5,000-gallon Oil UST. DRO and ORO were reported at concentrations below their respective MTCA Method A cleanup levels in the RGW sample collected from 2016 boring location B-16-17. One shallow monitoring well (WMW-31) will be installed near the former UST location (Figure 9) and soil and groundwater (quarterly for 1 year) samples will be collected to confirm the results obtained in 2016.

Former Oil House and 1,000-gallon Gasoline UST. Two borings (B-16-15 and B-16-16) were advanced in 2016 in this area. GRO was not detected in RGW samples from either location,

DRO and ORO were not detected in the RGW sample from B-16-16, and ORO was not detected in the RGW sample from B-16-15. DRO was reported at 108 micrograms per liter (µg/L) in the primary RGW sample from B-16-15 but not in the field duplicate sample (laboratory reporting limit of 100 µg/L). One shallow monitoring well (WMW-32) will be installed near the Former Oil House (Figure 10) and soil and groundwater (quarterly for 1 year) samples will be collected to confirm the results obtained in 2016.

Oil Drain Lines. The locations of oil drain lines associated with the Former Engine House, Former Oil Sump, and Former Oil/Water Separator are presented on Figure 3. Several previous investigations, including advancing soil borings and collecting soil samples in 2004, 2012, and 2014, as well as a laser-induced fluorescence (LIF) investigation and subsequent soil sampling in 2013 (refer to Section 1 of the Work Plan) have delineated the nature and extent of TPH impacts in the vicinity of the oil drain lines between the Former Oil Sump and Former Oil/Water Separator (Figures 4 and 5). Previous interim remedial actions in this area included the 2005 excavation and offsite disposal of impacted soil down to the water table in the vicinity of former site features including the Power House, oil drains, oil trough, and oil sump (Figures 2 and 3).

Potential impacts to soil and groundwater from portions of the oil drain between the Former Engine House and Former Oil/Water Separator will be addressed by advancing seven additional soil borings (B-17-12 to B-17-18), one approximately every 50 feet along the oil drain line, and constructing three new shallow monitoring wells (WMW-20, WMW-21, and WMW-22) along the shoreline. Additionally, one of the proposed soil borings in the Former Machine Shop area (B-17-10) will be advanced along the oil drain as shown on Figure 10. Soil borings B-17-10, B-17-12, and B-17-13 will be advanced to the east of the oil drain lines and soil borings B-17-14 to B-17-18 will be advanced to the south of the oil drain lines. Soil and groundwater (RGW and monitoring well) samples will be collected to further evaluate the presence of DRO, ORO, and other COCs in these locations.

In addition to addressing the oil drain lines data gap, two soil boring locations, B-17-14 and B-17-18, will be located near former water supply Wells #3 and #2, respectively, and soil boring B-17-17 will be located between the former oil drain and the western Former Repair Shop. Soil boring locations B-17-14 and B-17-18 are described further in Section 3.5.2 with regard to the former water supply wells.

Former Boiler House and Maintenance Shop. The inferred extent of dissolved phase DRO and/or ORO impacts in the vicinity of the Former Boiler House and existing Maintenance Shop (Figure 8) is based on soil confirmation samples following soil removal actions in 2002 and 2005, results from five reconnaissance groundwater sample locations (WSB-04-6, WSB-04-15, AS-12-1, AS-12-2, and AS-12-3) and groundwater samples from monitoring wells WMW-7 and WMW-8 (Figures 4 and 5).

The lateral extents of soil removal actions in 2002 and 2005 in this area are shown on Figure 2. As described in Section 1.3 of the RI Work Plan, a 30,000-gallon UST was discovered in 2002 adjacent to the western edge of the Former Boiler House. The UST and approximately 750 tons of petroleum-containing soil were removed in April 2002. Confirmation sampling indicated a thin layer of soil containing diesel- and oil-range hydrocarbons at concentrations exceeding MTCA Method A soil cleanup levels (for industrial properties) remained in place just above bedrock (depth of approximately 16 feet bgs) to the north, east, and south of the excavated area. In 2005, additional soil removal actions were performed down to the groundwater table (typically

10 to 12 feet bgs) to the west of the Maintenance Shop. Confirmation sampling of the excavation areas located west of the current Maintenance Shop indicated soil containing diesel-range petroleum hydrocarbons at concentrations above the MTCA Method A industrial soil cleanup level was left in place below the water table.

Two soil borings (B-17-24 and B-17-25), along with RGW sample collection, are proposed to further investigate these areas. Soil boring B-17-24 is positioned to evaluate the northern extent of dissolved phase hydrocarbon impacts near monitoring wells WMW-7 and WMW-8 and soil boring B-17-25 will address the eastern extent between the Former Boiler House and the Maintenance Shop.

Former Septic Tanks and Drainage Field. Included in Appendix D is the *Station Layout of Existing and Proposed Sewers and Disposal System at Wishram, Washington* prepared by SP&S Railway in December 1959 which shows proposed sewer lines extending from the Former Wash & Locker Room (located on the southeastern corner of the Former Engine House/Machine Shop) to five septic tanks and an associated septic drainage field. The station layout drawing also includes existing and proposed new piping running from the City of Wishram (for single-family homes, a hotel, restaurant, and depot) and either discharging directly to the Columbia River (through Former Pump Houses #1 and #2) or through the proposed septic disposal system. An aerial photograph from 1962 (Figure 11) includes features which appear to be the five proposed septic tanks and septic drainage field presented in the 1959 Station Layout diagram. The features appear to be present in historical aerial photographs from 1962, 1967, 1973, and possibly in 1975 but not in 1996. No additional information is currently available about the operation of the sewer disposal system. Five soil borings (B-17-26 to B-17-30), along with RGW sample collection, are proposed to investigate this area (Figures 11 and 12).

3.2.2 Additional Shoreline Monitoring Wells

Two shallow (WMW-19 and WMW-20) and two deep (RMD-5 and RMD-6) monitoring wells are proposed for installation along the shoreline, to the southwest (WMW-19 and RMD-5), and southeast (WMW-20 and RMD-6) of the former fueling distribution system (Figure 9). These wells are intended to further evaluate the nature and extent of DRO and ORO in this area.

Proposed shallow monitoring wells WMW-20, WMW-21, WMW-22, and WMW-23 (Section 3.2.1) will be located as shown on Figure 9 to address the identified data gap area towards the Columbia River shoreline south-southeast of the Former Oil/Water Separator, Former Engine House, and Former Turntable areas.

3.3 Laboratory Analyses and Sampling Schedule

Soil and groundwater samples will be collected for the laboratory analyses listed in Table 2 and submitted under chain-of-custody protocol to ESC (or equivalent laboratory). Samples will be analyzed on a standard turn-around basis (approximately 2 weeks). Sample handling, packing, and shipping procedures are presented in the SOGs provided in Appendix B of the RI Work Plan.

Laboratory analyses will be conducted in accordance with the SAP/QAPP presented in Appendix A of the RI Work Plan. Table 6 of the QAPP summarizes the analytical methods to be

used during sample analyses. Additional analyses may be requested based on field screening results or initial analytical results to provide further characterization of site conditions. Any changes to the laboratory analytical monitoring program will be proposed by BNSF in writing to Ecology for review and approval prior to implementing.

For initial characterization, four quarterly sampling events will be conducted on each of the fourteen (14) new shallow wells (WMW-19 through WMW-32). The sampling frequency and status of new shallow wells (WMW-19 through WMW-32) to be retained or decommissioned will be evaluated following completion of the initial four quarterly sampling events. Semi-annual sampling will be conducted on each of the two (2) new deep wells (RMD-5 and RMD-6). Any changes to the monitoring well sampling program will be proposed by BNSF in writing to Ecology for review and approval prior to implementing.

Groundwater wells will be purged and samples collected using low-flow sampling techniques in accordance with the SOG for groundwater sampling (Appendix B of the RI Work Plan). Samples for dissolved metals analyses will be field filtered. Monitoring wells containing LNAPL (measurable thickness, sheen, or sheen in purge water) will not be sampled.

In contrast with samples collected prior to 2016 investigation and monitoring activities, during this RI Addendum, most samples submitted for diesel and heavy oil-range total petroleum hydrocarbon analysis by method NWTPH-Dx will not be processed using the silica gel cleanup preparation method. A limited number of samples will be split and submitted for NWTPH-Dx analysis both pre- and post-SGC for comparison to historical nearby results [e.g., vicinity of the Former Engine House/Machine Shop and the western Former Repair Shop (Figure 10)].

3.3.1 Soil Samples

Soil borings, including those for monitoring well installation, will be advanced for lithologic logging and field hydrocarbons screening (PID and sheen tests). Two vadose zone soil samples will be collected from each boring and submitted for laboratory analysis: one from a target depth of approximately 5 feet bgs and the second from the capillary fringe, just above the water table (groundwater is typically measured in wells at depths between 10 and 15 feet bgs). The target depth may be adjusted based on field observations. Soil borings B-17-14 and B-17-18, proposed in vicinity of former water supply wells Well #3 and Well #2, respectively, will be advanced to bedrock to evaluate whether soil and groundwater is impacted at depth in these locations. Soil samples will be collected near the bedrock interface from each boring location. Additional soil samples may be submitted for analysis depending on the field observations (visual, olfactory, PID, and sheen tests).

Soil samples collected from proposed well locations WMW-19 and RMD-5, located to the southwest of the former fueling distribution system, will be submitted for analysis of DRO and ORO using NWTPH-Dx. Soil samples from well location RMD-5 will also be submitted for analysis of PAHs by United States Environmental Protection Agency (EPA) Method 8270 with selective ion monitoring (SIM). These scheduled analyses are in accordance with the RI Work Plan for shallow transect and deep riverside monitoring wells installed in this area in 2016.

Soil samples collected from locations installed to the east of the former diesel and Bunker C fueling distribution system, including proposed soil borings (B-17-01 through B-17-30), shallow

wells (WMW-20 to WMW-32), and riverside deep monitoring well (RMD-6), will be analyzed for DRO and ORO using NWTPH-Dx without SGC, PAHs by EPA Method 8270-SIM, VOCs (including BTEX compounds) by EPA Method 8260, and total metals analyses for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver [referenced herein as Resource Conservation and Recovery Act (RCRA) 8 metals] by EPA 6000/7000 series methods. Soil samples from locations B-17-01, B-17-06, B-17-11, B-17-17, and B-17-23 will also be analyzed by NWTPH-Dx with SGC preparation, based on their proximity to soil samples collected in 2016, which were inadvertently analyzed by NWTPH-Dx with SGC preparation. Soil samples collected from the boring for monitoring well WMW-32, located near the Former Oil House and former 1,000-gallon gasoline UST, and from soil boring B-17-23 will also be analyzed for NWTPH as Gasoline Extended (NWTPH-Gx).

3.3.2 Reconnaissance Groundwater Samples

RGW samples will be collected from proposed soil borings B-17-01 through B-17-30, with an exception that in the vicinity of the Former Oil/Water Separator, a reconnaissance groundwater sample will only be collected from one of the two borings (B-17-19 and B-17-20) as described above. Temporary well casing with pre-packed slotted casing will be installed to approximately 5 to 10 feet below the water table. As indicated above, groundwater is typically measured at depths of approximately 10 to 15 feet bgs. The RGW samples will be analyzed for DRO and ORO using NWTPH-Dx without SGC, PAHs by EPA Method 8270-SIM, VOCs (including BTEX compounds) by EPA Method 8260, and dissolved RCRA 8 metals by EPA Method 6000/7000 series. RGW samples from locations B-17-01, B-17-06, B-17-11, B-17-17, and B-17-23 will also be analyzed by NWTPH-Dx with SGC preparation, based on close proximity to RGW samples collected in 2016 and inadvertently analyzed by NWTPH-Dx with SGC preparation. The RGW sample from location B-17-23 will also be analyzed by NWTPH-Gx.

3.3.3 Monitoring Well Groundwater Samples

The sampling frequency (quarterly or semi-annually) of proposed shallow and deep monitoring wells and scheduled laboratory analytical parameters for groundwater samples are described in this section and listed in Table 2.

Quarterly Monitoring – Shallow Well Samples. Shallow wells WMW-19 through WMW-32 will be constructed with pre-packed 10-foot long slotted casing and installed using direct-push technology drilling equipment. This installation approach will expedite the installation process and reduce IDW requiring archeological screening. Following installation and development, shallow monitoring wells WMW-24 through WMW-32 will be sampled on a quarterly basis for 1 year, after which their status will be evaluated. The evaluation will take into consideration comparison of quarterly sampling results to applicable site cleanup levels (to be evaluated as part of the FS), as well as the suitability of and need for data from those locations as part of future remedy selection and remedial activities.

Quarterly groundwater samples collected from these wells will be analyzed for DRO and ORO using NWTPH-Dx without SGC, VOCs by EPA Method 8260, and for geochemical indicators of NA, including nitrate, nitrite, ammonia, sulfate, sulfide, dissolved iron, manganese, and methane (refer to Table 6 of the RI Work Plan QAPP for analytical methods to be utilized).

Quarterly Monitoring – Shallow River Transect Well Samples. Following installation and development, shallow transect monitoring wells WMW-19 through WMW-23 will be sampled on a quarterly basis for 1 year. Quarterly groundwater samples collected from the wells will be analyzed for DRO and ORO using NWTPH-Dx without SGC, BTEX compounds by EPA Method 8260, and for geochemical indicators of NA.

Semi-Annual Monitoring – Deep Well Samples. Following installation and development, proposed deep monitoring wells RMD-5 and RMD-6 will be sampled on a semi-annual basis (typically during April and September). Groundwater samples collected from deep wells RMD-5 and RMD-6 will be analyzed for DRO and ORO using NWTPH-Dx with and without SGC, BTEX compounds by EPA Method 8260B, PAHs by EPA Method 8270-SIM, and geochemical indicators of NA.

PAHs, Metals, and NWTPH-Gx Analyses. During the first high and low groundwater level monitoring events (typically during April and May for high and during September and October for low groundwater levels), groundwater samples from the new shallow and deep monitoring wells (WMW-19 through WMW-32, RMD-5, and RMD-6) will be analyzed for PAHs by EPA Method 8270-SIM and either total and dissolved lead (WMW-19 and RMD-5) or total and dissolved RCRA 8 metals (WMW-20 through WMW-32 and RMD-6) by EPA 6000/7000 series methods. Groundwater samples from wells WMW-19 and RMD-5 are proposed to be analyzed for lead only in accordance with the RI Work Plan for shallow transect and deep riverside monitoring wells installed in this area in 2016. Samples for dissolved metals analyses will be field filtered. The groundwater sample collected during the first high and low groundwater level monitoring events of well WMW-32 will also be analyzed for GRO using NWTPH-Gx.

Total and dissolved lead (WMW-19 and RMD-5) or total and dissolved RCRA 8 metals (other proposed wells), NWTPH-Gx (WMW-32), and PAHs (WMW-19 through WMW-32, RMD-5, and RMD-6) analyses will be discontinued in applicable wells after two monitoring events (during typical high and low groundwater levels) if they are not detected in groundwater samples. If laboratory results show detections of one or more of these constituents, then further groundwater sampling will be performed to evaluate whether concentrations are compliant with the MTCA cleanup standards. Any changes to the laboratory analytical monitoring program will be proposed by BNSF in writing to Ecology for review and approval prior to implementing.

Historical data collected for the site indicate dissolved and total metals analyses result in similar concentrations in groundwater samples collected from site wells. Elimination of the requirement for dissolved metals analysis will be considered if the initial sampling event indicates the two concentrations (total and dissolved) are within 20 percent (relative percent difference). Any changes to the laboratory analytical program will be proposed by BNSF in writing to Ecology for review and approval prior to implementing.

NWTPH-Dx with and without SGC. As indicated above, soil and reconnaissance groundwater samples collected from borings B-17-01, B-17-06, B-17-11, B-17-17, and B-17-23 will be analyzed by NWTPH-Dx with and without SGC.

It is also proposed that the first high and low groundwater level monitoring event samples from the following wells be analyzed by NWTPH-Dx with and without SGC: Shallow wells WMW-3, WMW-5, WMW-9, WMW-14, WMW-16, WMW-18, WMW-21, WMW-22, WMW-26, and

WMW-30; and Deep wells RMD-1, RMD-2, RMD-4, RMD-5, and RMD-6. The list includes existing and proposed monitoring wells.

3.4 Well Surveying and Hydrogeologic Characterization

Monitoring wells and soil borings installed during the Addendum activities will be surveyed by a Washington licensed surveyor to determine their vertical elevation (using NAVD88 datum) and horizontal position (using Washington State Plane Coordinates, NAD 83/91) to the nearest 0.01 foot. In addition, the approximate horizontal position of soil borings and wells installed during the Addendum activities will be estimated using a hand-held Global Positioning System (GPS) unit with sub-meter accuracy.

Slug tests will be performed in accordance with SOGs (refer to Appendix B of the RI Work Plan) in six shallow wells and one deep well across in the eastern portion of the site to estimate the hydraulic conductivity of the unconsolidated sand aquifer. These data will supplement results of slug tests performed in 2016 in five shallow wells (WMW-5, WMW-7, WMW-9, WMW-15, and WMW-18) and two deep wells (RMD-1 and RMD-4) in western portions of the site.

Wells selected for slug testing and the rationale for selection are summarized in the following table:

Slug Testing

Well Designation	Total Planned Depth	Planned Screened Interval	Rationale for Selection
Two shallow transect wells (WMW-20 and WMW-22)	Approximately 21 feet	Approximately 11 to 21 feet	Evaluate hydraulic conductivity in shallow portion of the water table aquifer near the Columbia River.
One deep riverside well (RMD-6)	Approximately 50 feet	Approximately 30 to 50 feet deep.	Evaluate hydraulic conductivity in deep portion of water table aquifer near the Columbia River.
Four new shallow wells (WMW-26, WMW-28, WMW-30, and WMW-31)	Approximately 17 feet	Approximately 7 to 17 feet	Evaluate hydraulic conductivity in the shallow portions of the water table aquifer beneath the eastern portion of the site.

Three rising-head slug tests will be performed at each location where the static water level is below the top of the screened interval. Three rising-head and three falling-head tests will be performed at each location where the static water table is above the top of the screened interval. Slug test data will be analyzed with *Aqtesolv* processing software (or similar) using standard solution methods for unconsolidated water-table aquifers. Based on the analysis of these data, a mean hydraulic conductivity value will be estimated for each well tested. The hydraulic conductivity data will be used to help screen potential remedial options, evaluate mass

flux for selected COCs, estimate hydraulic and chemical fate and transport, and potentially other assessments.

3.5 Former Water Supply Wells

Identified data gaps associated with the former water supply wells include evaluating whether the wells were appropriately decommissioned, and developing recommendations for proper decommissioning, if necessary; and assessing whether the presence of the former water supply wells may have resulted in impacts to the basalt aquifer and/or potable water sources in the vicinity of the site.

3.5.1 Status of Former Water Supply Wells

The approximate locations of former water supply wells Well #1, Well #2, and Well #3 are shown on Figure 10. Currently known well construction information from historical railway documentation and correspondence and Piper (1932) is summarized in Table 1. Using approximate location measurements/distances from former features identified in Piper (1932) and available station maps for the site, former water supply wells Well #2 and Well #3 were located at the site on 11 July 2017. The location of Well #1 could not be confirmed as that area of the site was covered by blackberry bushes and was not accessible.

On 20 September 2017, further attempts were made to locate former water supply Well #1 by clearing the local area of blackberry bushes and debris, to the extent possible, with hand tools to expose the ground surface. A visual inspection was performed of the cleared area to identify the location of the well. Amongst what appeared to be concrete footings of former structures was an area mounded with concrete within which were observed possible mounting bolts. The area coincided with the approximate location of former water supply Well #1. A jack-hammer or concrete cutting equipment will be utilized to remove the mounded concrete to inspect the area further. If not found in this location, then it will be assumed the Well #1 surface casing is no longer present in the area.

Ecology's Central Region water resources well coordinator will be consulted prior to performing additional assessments of the decommissioned status of the three former water supply wells, as well as prior to conducting any additional decommissioning actions. A condition assessment will be conducted for each located former water supply well (including Well #2 and Well #3 found in July 2017). This assessment will include opening the top of the well casing, which may involve cutting off the top to assess the interior condition (e.g., Well #1); assessing the interior condition and any fill material inside the well; and evaluating whether or not the well was suitably abandoned. If evidence of cement/grout is visible within the well casing, it will be assumed the well was properly abandoned. In consultation with Ecology, Well #2 (and Well #1 if appropriate) will be video-logged with a downhole camera to assess the condition of the casing (approximate cased / open intervals) to the accessible depth of the well; and the means of previous decommissioning to the extent possible.

Ecology will be notified of the status of the three wells following the condition assessment. After consultation with Ecology, if additional decommissioning activities are warranted, work will be completed in accordance with WAC 173-160-381. A Washington State Licensed Well Driller will be contracted to conduct decommissioning.

The proposed soil borings in the vicinity of water supply Wells #2 and #3 will be advanced during the assessment period and prior to any water well decommissioning activities (see Section 3.5.2).

3.5.2 Field Investigation

Well #1. The nature and extent of potential impacts to soil and groundwater near former water supply Well #1 have been investigated previously through sampling a former monitoring well (WMW-2) and advancement of soil borings (MWD-3 and B-12-10) and TarGOST LIF borings (G5, CR5, and CR-5.5).

Monitoring well WMW-2, formerly located near the Former Power House (Figure 5), was installed in September 2003 and decommissioned in 2005 during an independent remedial action including the excavation and removal of petroleum-containing soil, debris, and concrete (Kennedy/Jenks Consultants 2007). During excavation activities, it was discovered that the well screen of WMW-2 had been constructed within a mass of oily timbers and within a few inches of the outside of the concrete walls of the former bunker fuel filled oil sump (Figure 5). Groundwater samples collected in 2003 and 2004 from well WMW-2 contained DRO and/or ORO, benzene, total carcinogenic PAHs (cPAHs), and arsenic at concentrations above MTCA Method A CULs. Approximately 700 tons of soil was removed from the area near the Former Power House and disposed at the Regional Disposal Company Landfill in Roosevelt, Washington (Roosevelt Landfill). Sixty pounds of ORC were mixed into the base of the excavation (including both stained soil and soil that collapsed from the sidewalls) and the excavated area was backfilled and compacted (Kennedy/Jenks Consultants 2007).

Petroleum hydrocarbon sheen and/or LNAPL were visually observed in soil boring MWD-3 (located 24 feet north of Well #1) from approximately 39 to 50 feet bgs. DRO and ORO concentrations were reported above MTCA Method A CULs in soil samples collected from MWD-3 at 39 feet bgs and 42.5 feet bgs, but below CULs in a sample from 69.5 feet bgs. There were no petroleum hydrocarbon impacts observed in soil boring B-12-10 (located 6 feet north of Well #1); BTEX, GRO, and DRO were not detected in the soil samples collected from the boring and ORO was reported at a concentration below the MTCA Method A CUL in the sample collected from 40 feet bgs. The LIF logs do not show potential hydrocarbon impacts in CR-5.5 (7.5 feet east, 63.5 feet total depth), below approximately 7 feet bgs in CR-05 (7.5 feet west, 51.76 feet total depth), and below 13 feet bgs in CR-G06 (22 feet east, 89.66 feet total depth). Sampling results for wells WMW-17 and RMD-3, located approximately 35 feet south of Well #1, are presented on Figures 6 and 7 for soil and Figure 8 for the April 2017 groundwater sampling event. No additional borings are planned at Well #1 to define nature or extent of COCs.

Wells #2 and #3. As presented in Sections 3.2.1 and 3.3, two soil borings, B-17-14 and B-17-18, will be located in close proximity to former water supply Wells #3 and #2, respectively, and advanced to the top of bedrock to assess potential impacts to soil and groundwater in the vicinity of these wells.

Three soil samples will be collected from each boring and submitted for laboratory analysis: one from a target depth of 5 feet bgs, the second from the capillary fringe, just above the water table (groundwater is typically measured in site wells at depths between 10 and 15 feet bgs), and a third just above the bedrock contact (estimated to be 60 feet bgs). The target depth may be

adjusted based on field observations. Additional soil samples may be submitted for analysis depending on the field hydrocarbons screening observations (visual and olfactory observations, PID readings, and sheen tests).

RGW samples will be collected from each boring. Temporary well casing will be installed to screen the upper approximately 5 to 10 feet of the water table. Groundwater is typically measured at depths of approximately 10 to 15 feet bgs. The RGW samples will be analyzed for DRO and ORO using NWTPH-Dx without SGC, PAHs by EPA Method 8270-SIM, VOCs (including BTEX compounds) by EPA Method 8260, and dissolved RCRA 8 metals by EPA 6000/7000 series methods.

3.5.3 Potential Impacts to Potable Water Sources

Wellhead protection zones are established around groundwater-supplied drinking water sources in order to help plan for and protect drinking water resources. According to the Washington State Department of Health (DOH), all Group A (providing service to 15 or more service connections, or 25 or more people per day for 60 or more days per year) public water systems that use wells or springs as a source of water must have a wellhead protection program, which should include a susceptibility assessment, a delineated wellhead protection area for each well or spring, and inventory of all potential contamination within the wellhead protection area, contingency plans for drinking water sources and emergency response, and documentation and distribution of the wellhead area and inventory to required entities (DOH 2010).

The presence or absence of potable water supply wells in the vicinity of Wishram will be evaluated as a desktop review, including review of Ecology well records and the DOH drinking water database. This review is expected to include a City of Wishram 550-foot deep water well installed in October 1993 (well tag #AFL-874) and identified in Ecology's 22 May 2017 letter to BNSF (Ecology 2017b). The City of Wishram commissioned the drilling of a new city well (well tag #AAR-991) to a depth of 450 feet; however, well #AFL-874 is still being maintained, i.e., it has not been decommissioned. The new well installed in July 2017 (#AAR-991) is fully cased throughout the entire length of the well with a well screen set between 423 and 448 feet bgs, whereas the well log for well #AFL-874 indicates that it was only cased to 29 feet bgs.

For DOH Wellhead Protection Area Zones, most systems can use a fixed radius method to delineate Wellhead Protection Areas. These zones are generally delineated using 1-, 5-, and 10-year time-of-travel factors. The radius used for the desktop review will be calculated using an approximate 10-year horizontal time-of-travel based on the estimated hydraulic parameters of formations observed at the site. Horizontal distances will be evaluated with respect to the distance from the former water supply wells. If available, well construction information, completion status (existing or decommissioned), and laboratory analytical data (if available), will be gathered for each water supply well within the radius of the site.

Section 4: Decontamination Procedures and Control of Investigation-Derived Wastes

4.1 Decontamination

Decontamination of sampling equipment helps minimize cross-contamination among sampling locations and helps ensure the integrity of samples collected at each sampling location. Equipment decontamination will vary depending on equipment used. Equipment decontamination procedures that will be followed by Kennedy/Jenks Consultants personnel and its subcontractors are detailed in the SOGs provided in Appendix B of the RI Work Plan.

4.2 Control of Investigation-Derived Wastes

Because IDW generated during this investigation may contain COCs, it will be containerized pending receipt of analytical results. IDW includes purge water from groundwater monitoring well development and sampling, soil cuttings from boreholes (when produced), and decontamination wastes. These materials will be placed in U.S. Department of Transportation (DOT)-approved 55-gallon drums and temporarily stored onsite. Drums will be labeled to identify its contents and the date and origin/location of the IDW.

Disposal of the IDW will be managed by Kennedy/Jenks Consultants on behalf of BNSF. Handling and disposal procedures that will be followed by Kennedy/Jenks Consultants personnel and its subcontractors are described in the SOGs presented in Appendix B of the RI Work Plan.

Section 5: Reporting and Schedule

5.1 Reporting

During performance of the RI activities, monthly reports will be provided to Ecology on or before the 15th of each month in accordance with Section VII (H) of the AO. The monthly reports will summarize the substantive activities performed and any problems that may have been encountered during the reporting period, and planned activities for the following month.

In accordance with Section VII (F) of the AO, following completion of the RI activities (including any subsequent follow-up phases of investigation activities developed in consultation with Ecology such as the tasks described in this Addendum), a RI report will be prepared that summarizes past investigations and the investigation results, in accordance with Task 4 of the SOW.

In addition, Section VII (F) requires BNSF to prepare a FS conforming to WAC 173-340-350. The FS will evaluate a range of remedial alternatives and provide recommendations for proposed remedial action (or interim actions) to address site conditions and support Ecology's eventual selection of an appropriate remedial action for the site. In consultation with Ecology, BNSF will determine whether to produce a combined RI/FS report, or to produce these reports sequentially.

5.2 Schedule

The additional RI activities described in this Addendum to the RI Work Plan, including subsequent phases if required, will be performed in accordance with the schedule (Exhibit C) provided in the AO for the site. The following table summarizes the planned schedule for performing the specific work activities identified in this Addendum. As with all field work, the actual schedule may vary depending on field conditions (including field observations and/or weather conditions), subcontractor availability, and a variety of other factors that may be beyond BNSF's control.

Field Work Duration

Field Activity Category	Duration to Complete Field Activities[a, b]
DAHP Permitting	3 months (90 days), from date application is submitted
Soil and Groundwater Investigations activities: • Pre-field activities • Soil Investigations (Soil boring, including reconnaissance groundwater sampling) • Installation of upland and shoreline deep and shallow monitoring wells • Well survey	4 to 5 months

Field Activity Category	Duration to Complete Field Activities[a, b]
Groundwater monitoring	Semi-annual (April and September) for 1 year following completion of well installation or four quarterly events for wells WMW-19 through WMW-24 and WMW-29 through WMW-32.
Assess Former Water Supply Wells • Pre-field activities • Desktop reviews of former water supply well construction data and potable water supply wells • Field inspection and electromagnetic survey • Invasive attempts to locate wells and collect groundwater samples (if wells found and not abandoned)	2 to 3 months (concurrent with investigation activities)
Prepare RI/FS report	120 days following receiving validated analytical data from final phase of RI sampling events under RI Work Plan and modifications or addenda hereto.

Notes:

(a) Approximate months to complete field and office-based work following approval of the Addendum by Ecology.
(b) Approximate duration does not include completion of sample analyses, follow-up field activities/analyses, subsequent phases of investigation, or data analysis/interpretation. Sample chemical analyses typically require 3 to 4 weeks for receipt of preliminary analytical results.

Kennedy/Jenks Consultants estimates that the Addendum activities will take up to 8 months to substantially complete, following receipt of Ecology's approval of this RI Work Plan Addendum. Groundwater quality monitoring activities will extend for 1 year following completion of well installations.

Preliminary analytical results from the above investigations will be uploaded to EIM following data validation and will be tabulated and provided to Ecology at regular intervals to update Ecology on the results of the additional investigation activities and guide future consultation with Ecology. Additionally, historical site investigation and remedial action data will be uploaded to EIM prior to submitting the RI/FS Report to Ecology.

References

BNSF Railway Company. 2017. Historical Documents Transmittal Agreed Order DE 12897. 27 September 2017.

Kennedy/Jenks Consultants. 2003. UST Site Assessment and Removal Report, Wishram, Washington. Prepared by Kennedy/Jenks Consultants for BNSF Railway Company. October 2003.

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Kennedy/Jenks Consultants. 2004b. Site Assessment Report, Wishram Railyard, Washington. Prepared by Kennedy/Jenks Consultants for BNSF Railway Company. August 2004.

Kennedy/Jenks Consultants. 2007. Remediation Documentation Report, Wishram, Washington. Prepared by Kennedy/Jenks Consultants for BNSF Railway Company. March 2007.

Kennedy/Jenks Consultants. 2010a. Supplemental Site Investigation – MW-7 Area, Wishram, Washington. Prepared by Kennedy/Jenks Consultants for BNSF Railway Company. September 2010.

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Kennedy/Jenks Consultants. 2017. Analytical Backup Request – Silica Gel Cleanup Issue Remedial Investigation. Prepared by Kennedy/Jenks Consultants for BNSF Railway Company. 14 February 2017.

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Washington State Department of Ecology. 2007. Model Toxics Control Act Statute and Regulation. Washington State Department of Ecology. Publication No. 94-06. Revised November 2007.

Washington State Department of Ecology. 2017a. Ecology decision on sampling / analytical error: BNSF Track Switching Facility aka Wishram Railyard. 3 March 2017.

Washington State Department of Ecology. 2017b. Ecology Requirement for Development of Addendum to Remedial Investigation Work Plan: BNSF Track Switching Facility aka Wishram Railyard. 22 May 2017.

Washington State Department of Health. 2010. Washington State Wellhead Protection Program Guidance Document. 105 pages. June 2010.

Tables

TABLE 1

FORMER WATER SUPPLY WELLS CONSTRUCTION DATA
BNSF Wishram

Well ID	Installation Date	Well Completion Details (depths, diameter, casing)	Total Well Depth (feet bgs)	Location	Abandoned Date	Lithology (Interval Depth and Description)	Notes
Well #1	July 31, 1918 *(1917-08-15)*	0-79': 13.5" diam. steel casing 79-92': 12" diam. steel casing 0-102': 10" diam. steel casing, 12" diam. hole 107-301': 10" diam. hole; Open hole	301	14 feet south and 3 feet west from southeastern corner of power house	December 20, 1928 *(1928-12-20)*	Alluvium: 0-92': Sand and gravel Yakima basalt: 92-172': Rock 172-176': Sand, water bearing; static level 38 feet 176-195': Shale, sandy 195-301': Basalt, creviced	Well #1 was potentially located on 20 September 2017. Further investigation required. Well #1 abandoned in 1928 due to poor well construction and water production. The well was replaced with Wells #2 and #3. Defects in well "permitted sand, as well as oil, sewage, etc." to enter the well. Proposed to thoroughly seal the well to prevent further surface water contamination and drill two replacement wells *(1926-1-16)*. Sketch of alignment showing angled/crooked hole between ground surface and 35 feet bgs *(1920-6-21)*.
Well #2	Dec 23, 1926 Dec 11, 1926 *(1926-11-5)*	0-75': 15.5" diam. casing 75-122': Open hole 122-154': 12.5" diam. casing 154-170': Open hole 170-220': 10" diam. casing 220-399': Open hole	399	About 285 feet east of power house	Unknown	Alluvium: 0-75': Sand Yakima basalt: 75-132': Basalt, black, hard 132-154': Clay, blue 154-180': Basalt, black, water bearing 180-215': Sandy shale and clay 215-325': Basalt, black, soft 325-367': Basalt, gray, hard 367-399': Basalt, black, porous, water bearing; static level 36 feet	Well #2 was located on 11 July 2017, photographs of well included in Appendix B. Measured depth to water at 9.15 feet below top of steel casing (btoc) with an interface probe. A solid bottom was measured at 51.5 feet btoc. Reported yield of 900 gallons per minute with drawdown of 19 feet.
Well #3	August 16, 1930 *(1930-8-16)*	0-38.6': 12" diam. casing 38.6-185': Open hole 185-242': 8" diam. casing 242-475': Open hole	475	About 400 feet east of power house near Wishram	Unknown	Alluvium: 0-28': Sand and gravel. Yakima basalt: 28-189': Basalt, varying between black and gray, dense at 50 to 61 feet 189-219': Clay, blue 219-221': Basalt 221-230': Sandstone, blue 230-457': Basalt, varying between black and gray, dense to very dense 457-467': Basalt, black, soft 467-472': Basalt, black, porous, water bearing; static level 49.5 feet bgs 472-475': Basalt, black, dense	Well #3 was located on 11 July 2017, photograph of well included in Appendix B. Steel casing in a concrete pad, well filled to surface with sand/gravel material. Reported yield of 750 gallons per minute with drawdown of 18 feet.

Notes:
Casing material for Wells 1, 2, and 3 was not identified in available records. Wells 2 and 3 located 11 July 2017 had steel casing to the surface.
bgs = below ground surface

Well construction data compiled from the following resources:
Piper, Arthur M. 1932. Geology and ground-water resources of the Dalles Region, Oregon. Water Supply Paper 659-B. U.S. Department of the Interior, Geological Survey.
State of Washington Department of Conservation and Development. 1927. Well Log for well drilled 23 December 1926 for Spokane, Portland & Seattle Railway Company.
(1919-1-10): Reference date for source of well construction information (SP&S Railway and/or Oregon Trunk Railroad). Documents provided to Ecology on 27 September 2017:
BNSF Railway Company 2017. Historical Documents Transmittal Agreed Order DE 12897. 27 September 2017.

TABLE 2

SUMMARY OF ADDENDUM INVESTIGATIVE ACTIVITIES
Wishram, Washington

Area/Description[a]	Work Plan Addendum Section Reference	Potential Chemicals of Concern[b]	Planned Investigation Activities	Number of New Soil Borings/Wells	Samples to be Collected for Analysis[c] / Sampling Frequency	Depth of Sampling Interval(s) (bgs)	Analyses to be Performed[d][e][f]	Field Screening to be Performed	Proposed Well / Boring Location IDs
Additional Deep Riverside Wells	3.2	Petroleum Hydrocarbons	Installation of deep monitoring wells, dissolved phase monitoring, soil sample analysis based on field screening	2 Wells	2 Wells Semi-Annual Water[e] 4 Soil	Approximately 30 to 50 feet (screened interval) Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	Groundwater: see Deep Wells – Semi-Annual Monitoring Soil (RMD-5): NWTPH-Dx, PAHs Soil (RMD-6): NWTPH-Dx, PAHs, VOCs, RCRA 8 Metals	HS, ST, VI	RMD-5, RMD-6
Shallow Well Transect Parallel to River Along Potential Diesel Impact Area – Additional Shallow Well	3.2	Petroleum Hydrocarbons	Installation of shallow monitoring well, dissolved phase monitoring, soil sample analysis based on field screening	1 Well	Quarterly Water (1 year)[e] 2 Soil	Approximately 11 to 21 feet (screened interval) Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	Groundwater: see Shallow River Transect Wells – Quarterly Monitoring Soil: NWTPH-Dx	HS, ST, VI	WMW-19
Former Oil/Water Separator / Former Pump House #2	3.2	Petroleum Hydrocarbons, VOCs/BTEX, PAHs, Metals (RCRA 8)	Direct-push drilling, installation of temporary well for RGW sampling, soil sample analysis based on field screening	3 Borings	2 RGW[g] 6 Soil	RGW: 10 to 15 feet Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	RGW: NWTPH-Dx, VOCs, PAHs, Dissolved RCRA 8 Metals Soil: NWTPH-Dx, VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	B-17-19, B-17-20, B-17-21
Former Oil/Water Separator / Shallow Well Transect Parallel to River	3.2	Petroleum Hydrocarbons, VOCs/BTEX, PAHs, Metals (RCRA 8)	Installation of shallow monitoring well, dissolved phase monitoring, soil sample analysis based on field screening	1 Well	Quarterly Water (1 year)[e] 2 Soil	Approximately 11 to 21 feet (screened interval) Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	Groundwater: see Shallow River Transect Wells – Quarterly Monitoring Soil: NWTPH-Dx, VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	WMW-20
Former Repair Shop (West) / Shallow Well Transect Parallel to River	3.2	Petroleum Hydrocarbons, VOCs/BTEX, PAHs, Metals (RCRA 8)	Installation of shallow monitoring well, dissolved phase monitoring, soil sample analysis based on field screening	1 Well	Quarterly Water (1 year)[e][f] 2 Soil	Approximately 11 to 21 feet (screened interval) Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	Groundwater: see Shallow River Transect Wells – Quarterly Monitoring Soil: NWTPH-Dx[f], VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	WMW-21
Former Repair Shop (East) and Former Turntable	3.2	Petroleum Hydrocarbons, VOCs/BTEX, PAHs, Metals (RCRA 8)	Direct-push drilling, installation of temporary well for RGW sampling, soil sample analysis based on field screening	1 Boring	1 RGW 2 Soil	RGW: 10 to 15 feet Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	RGW: NWTPH-Dx, VOCs, PAHs, Dissolved Metals (RCRA 8) Soil: NWTPH-Dx, VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	B-17-22
Former Repair Shop (East) and Former Turntable / Shallow Well Transect Parallel to River	3.2	Petroleum Hydrocarbons, VOCs/BTEX, PAHs, Metals (RCRA 8)	Installation of shallow monitoring well, dissolved phase monitoring, soil sample analysis based on field screening	1 Well	Quarterly Water (1 year)[e] 2 Soil	Approximately 11 to 21 feet (screened interval) Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	Groundwater: see Shallow River Transect Wells – Quarterly Monitoring Soil: NWTPH-Dx, VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	WMW-23
North of Former Wash Rack	3.2	Petroleum Hydrocarbons, BTEX, PAHs, VOCs, Metals (RCRA 8)	Direct-push drilling, installation of temporary well for RGW sampling, soil sample analysis based on field screening	1 Boring	1 RGW 2 Soil	RGW: 10 to 15 feet Soil: Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	RGW: NWTPH-Gx, NWTPH-Dx, VOCs, PAHs, Dissolved RCRA 8 Metals Soil: NWTPH-Gx, NWTPH-Dx[f], VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	B-17-23
Former Wash Rack	3.2	Petroleum Hydrocarbons, BTEX, PAHs, VOCs, Metals (RCRA 8)	Installation of shallow monitoring well, dissolved phase monitoring, soil sample analysis based on field screening	1 Well	Quarterly Water (1 year)[e] 2 Soil	Approximately 7 to 17 feet (screened interval) Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	Groundwater: see Shallow Wells – Quarterly Monitoring Soil: NWTPH-Dx, VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	WMW-24

TABLE 2

SUMMARY OF ADDENDUM INVESTIGATIVE ACTIVITIES
Wishram, Washington

Area/Description[a]	Work Plan Addendum Section Reference	Potential Chemicals of Concern[b]	Planned Investigation Activities	Number of New Soil Borings/Wells	Samples to be Collected for Analysis[c] / Sampling Frequency	Depth of Sampling Interval(s) (bgs)	Analyses to be Performed[d][e][f]	Field Screening to be Performed	Proposed Well / Boring Location IDs
Former Oil House (East of Signal Office/ Store House)	3.2	Petroleum hydrocarbons, BTEX, PAHs, lead	Installation of shallow monitoring well, dissolved phase monitoring, soil sample analysis based on field screening	1 Well	Quarterly Water (1 year)[e] 2 Soil	Approximately 7 to 17 feet (screened interval) Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	Groundwater: see Shallow Wells – Quarterly Monitoring Soil: NWTPH-Dx[f], VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	WMW-30
Former 5,000-gallon Oil UST	3.2	Petroleum hydrocarbons, PAHs, lead	Installation of shallow monitoring wells, dissolved phase monitoring, soil sample analysis based on field screening	1 Well	Quarterly Water (1 year)[e] 2 Soil	Approximately 7 to 17 feet (screened interval) Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	Groundwater: see Shallow Wells – Quarterly Monitoring Soil: NWTPH-Dx, VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	WMW-31
Former Engine House/Machine Shop	3.2	Petroleum Hydrocarbons, BTEX/VOCs, PAHs, Metals (RCRA 8)	Direct-push drilling, installation of temporary wells for RGW sampling, soil sample analysis based on field screening	11 Borings	11 RGW 22 Soil	RGW: 10 to 15 feet Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	RGW: NWTPH-Dx, VOCs, PAHs, Dissolved RCRA 8 Metals Soil: NWTPH-Dx[f], VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	B-17-01 to B-17-11
Former Engine House/Machine Shop / Shallow Well Transect Parallel to River	3.2	Petroleum Hydrocarbons, BTEX/VOCs, PAHs, Metals (RCRA 8)	Installation of shallow monitoring wells, dissolved phase monitoring, soil sample analysis based on field screening	6 Wells	Quarterly Water (1 year)[e] 12 Soil	Approximately 11 to 21 feet (WMW-22), 7 to 17 feet (others screened interval) Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	Groundwater: see Shallow Wells – Quarterly Monitoring Soil: NWTPH-Dx[f], VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	WMW-22, and WMW-25 to WMW-29
Former Oil House (eastern end) and 1,000-gallon Gasoline UST	3.2	Petroleum hydrocarbons, BTEX, PAHs, lead	Installation of shallow monitoring well, dissolved phase monitoring, soil sample analysis based on field screening	1 Well	Quarterly Water (1 year)[e] 2 Soil	Approximately 7 to 17 feet (screened interval) Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	Groundwater: see Shallow Wells – Quarterly Monitoring Soil: NWTPH-Gx, NWTPH-Dx, VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	WMW-32
Oil Drain Lines	3.2	Petroleum Hydrocarbons, BTEX/VOCs, PAHs, Metals (RCRA 8)	Direct-push drilling, installation of temporary wells for RGW sampling, soil sample analysis based on field screening	5 Borings	5 RGW 10 Soil	RGW: 10 to 15 feet Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	RGW: NWTPH-Dx, VOCs, PAHs, Dissolved RCRA 8 Metals Soil: NWTPH-Dx[f], VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	B-17-12, B-17-13, B-17-15 to B-17-17
Oil Drain Lines, Former Water Supply Wells #2 and #3	3.2	Petroleum Hydrocarbons, BTEX/VOCs, PAHs, Metals (RCRA 8)	Direct-push drilling, installation of temporary wells for RGW sampling, soil sample analysis based on field screening	2 Borings	2 RGW 6 Soil	RGW: 10 to 15 feet Soil: TBD in field. Estimated 5 and 10 feet bgs and near top of bedrock at each location.	RGW: NWTPH-Dx, VOCs, PAHs, Dissolved RCRA 8 Metals Soil: NWTPH-Dx, VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	B-17-14 and B-17-18
Former Boiler House and Maintenance Shop	3.2	Petroleum Hydrocarbons	Direct-push drilling, installation of temporary wells for RGW sampling, soil sample analysis based on field screening	2 Borings	2 RGW 4 Soil	RGW: 10 to 15 feet Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	RGW: NWTPH-Dx, VOCs, PAHs, Dissolved RCRA 8 Metals Soil: NWTPH-Dx, VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	B-17-24 and B-17-25
Former Septic Tanks and Septic Drain Field	3.2	Petroleum Hydrocarbons, VOCs	Direct-push drilling, installation of temporary wells for RGW sampling, soil sample analysis based on field screening	5 Borings	5 RGW 10 Soil	RGW: 10 to 15 feet Soil: TBD in field. Estimated 5 and 10 feet bgs at each location.	RGW: NWTPH-Dx, VOCs, PAHs, Dissolved RCRA 8 Metals Soil: NWTPH-Dx, VOCs, PAHs, RCRA 8 Metals	HS, ST, VI	B-17-26 to B-17-30

TABLE 2

SUMMARY OF ADDENDUM INVESTIGATIVE ACTIVITIES
Wishram, Washington

Area/Description[a]	Work Plan Addendum Section Reference	Potential Chemicals of Concern[b]	Planned Investigation Activities	Number of New Soil Borings/Wells	Samples to be Collected for Analysis[c] / Sampling Frequency	Depth of Sampling Interval(s) (bgs)	Analyses to be Performed[d][e][f]	Field Screening to be Performed	Proposed Well / Boring Location IDs
GROUNDWATER MONITORING PROGRAM – ADDENDUM MONITORING WELLS									
Shallow Wells[e] – Quarterly Groundwater Monitoring	3.3	Petroleum Hydrocarbons, Metals (RCRA 8)	Low flow sampling of new (Addendum) shallow wells	9 Wells	9 Wells per event; 4 quarterly events[e]	Shallow Wells Approximately 7 to 17 feet (screened interval)	All water samples: NWTPH-Dx[f], VOCs, MNA. PAHs and Total and Dissolved RCRA 8 Metals for two events[d] Well WMW-32: Add NWTPH-Gx for two events[d]	LNAPL, ST	WMW-24 to WMW-32
Shallow River Transect Wells[f] – Quarterly Groundwater Monitoring	3.3	Petroleum Hydrocarbons, Metals (lead) or Metals (RCRA 8)	Low flow sampling of new (Addendum) shallow wells along shoreline	5 Wells	5 Wells per event; 4 quarterly events[e]	Shallow Wells Approximately 11 to 21 feet (screened interval)	All water samples: NWTPH-Dx[f], BTEX, MNA. PAHs and Total and Dissolved Lead (WMW-19) or RCRA 8 Metals (other wells) for two events[d]	LNAPL, ST	WMW-19 to WMW-23
Deep Wells - Semi-Annual Groundwater Monitoring[e]	3.3	Petroleum Hydrocarbons, Metals (lead) or Metals (RCRA 8)	Low flow sampling of new (Addendum) shallow and deep wells	2 Wells	2 Wells per event; 2 semi-annual events[e]	Deep wells: 30 to 50 feet (screened interval)	All water samples: NWTPH-Dx, BTEX, and MNA. PAHs and Total and Dissolved Lead (RMD-5) or RCRA 8 Metals (RMD-6) for two events[d]	LNAPL, ST	RMD-5 and RMD-6

Notes:

(a) Refer to Figures 7 and 8 for approximate sampling locations.

(b) Potential issues of concern and chemicals of concern based on previous investigations, site walk, interviews, and historical aerial photographs and maps.

(c) Estimated sample analyses to be included in Addendum RI. Actual number and type of analyses performed will be dependent upon site conditions and field monitoring results (headspace monitoring, hydrocarbon sheen test, odor, visual conditions). Assume approximately one sample submitted for analysis from each sampling location unless otherwise specified. However, other opportunistic samples may be collected based on field conditions encountered or preliminary analytical results.

(d) Total and dissolved lead (WMW-19 and RMD-5) or total and dissolved RCRA 8 metals (all other proposed wells), NWTPH-Gx (WMW-32), and PAHs (WMW-19 through WMW-32, RMD-5 and RMD-6) analyses will be discontinued in applicable wells after two monitoring events (during typical high and low groundwater levels) if not detected in groundwater samples. If laboratory results show detections of one or more of these constituents, then further groundwater sampling will be performed to evaluate whether concentrations are compliant with the MTCA cleanup standards. Historical data collected for the site indicate dissolved and total metals analyses result in similar concentrations in groundwater samples collected from site wells. Elimination of the requirement for dissolved metals analysis will be considered if the initial two sampling events indicate the two concentrations (total and dissolved) are within 20 percent (relative percent difference). Any changes to the laboratory analytical program will be proposed by BNSF in writing to Ecology for review and approval prior to implementing.

(e) For initial characterization, four quarterly sampling events will be conducted on each of the fourteen (14) new shallow wells (WMW-19 through WMW-32). The sampling frequency and status of new shallow wells (WMW-19 through WMW-32) to be retained or decommissioned will be evaluated following completion of the initial four quarterly sampling events. Semi-annual sampling will be conducted on each of the two (2) new deep wells (RMD-5 and RMD-6). Wells containing LNAPL (measurable thickness, sheen, or sheen in purge water) will not be sampled. Any changes to the monitoring well sampling program will be proposed by BNSF in writing to Ecology for review and approval prior to implementing.

(f) Soil and RGW samples from locations B-17-01, B-17-06, B-17-11, B-17-17, and B-17-23 will include analyses for NWTPH-Dx with and without silica gel cleanup (SGC). Groundwater samples collected during the first high and low groundwater level monitoring events from the following wells will be analyzed by NWTPH-Dx with and without SGC: Shallow wells WMW-3, WMW-5, WMW-9, WMW-14, WMW-16, WMW-18, WMW-21, WMW-22, WMW-26, and WMW-30; and Deep wells RMD-1, RMD 2, RMD-4, RMD-5, and RMD-6. The list includes existing and proposed monitoring wells.

(g) One reconnaissance groundwater sample will be collected from one of the two borings (B-17-19 and B-17-20) in the vicinity of the Former Oil/Water Separator based on field screening. If impacts are observed in both borings, then one RGW sample will be collected from each boring (two samples total).

Abbreviations:

bgs – below ground surface
BTEX – benzene, toluene, ethylbenzene, and xylenes
EPH – extractable petroleum hydrocarbons
HS - Head-space VOC screening of soils
LNAPL – light non-aqueous phase liquid
PAHs - polycyclic aromatic hydrocarbons
RGW – reconnaissance groundwater
RI – remedial investigation
SGC – silica gel cleanup
ST - hydrocarbon sheen test of soils
TBD – to be determined
TPH - total petroleum hydrocarbons
UST - underground storage tank
VI - visual inspection of soils
VOCs - volatile organic compounds

Analyses:

NWTPH-Dx – Diesel- and oil- range TPH [without silica gel cleanup (SGC), except for field-selected split samples indicated under note (f)]
NWTPH-Gx – Gasoline-range TPH.
PAHs – Polycyclic aromatic hydrocarbons by U.S. Environmental Protection Agency (EPA) 8270D with selective ion monitoring (SIM).
Metals – Resource Conservation and Recovery Act (RCRA 8) metals (As, Ba, Cd, Cr, Pb, Hg, Se, Ag) by EPA 6000/7000 series.
VOCs – Volatile organic compounds by EPA 8260.
MNA - Monitored natural attenuation. Geochemical indicators of natural attenuation (nitrate/nitrite, ammonia, sulfate, sulfide, dissolved iron, manganese, and methane).

TABLE 3

MONITORING WELL CONSTRUCTION SUMMARY
BNSF Wishram Rail Yard, Wishram, Washington

Well ID	Installation Date	Ecology Well Tag ID No.	Northing (feet)	Easting (feet)	Top of Casing Elevation[b] (feet amsl)	Flushmount Lid Elevation (feet amsl)	Well Depth (feet bgs)	Well Screen Diameter and Material[c]	Screen Interval (feet bgs)	Screen Interval (feet amsl)	Screen Length (feet)
Shallow Monitoring Wells[a]											
WMW-1	09/12/2003	AHQ578	118101.05	1520597.16	172.42	172.98	20	2-inch PVC	10 - 20	162.98 - 152.98	10
WMW-3	09/12/2003	AHQ580	118194.16	1520598.29	172.97	173.44	20	2-inch PVC	10 - 20	163.44 - 153.44	10
WMW-5	04/05/2004	AKS192	118234.80	1520759.98	172.61	172.99	25	2-inch PVC	15 - 25	157.99 - 147.99	10
WMW-7	04/05/2004	AKS194	118349.93	1520548.97	174.12	174.71	20	2-inch PVC	10 - 20	164.71 - 154.71	10
WMW-8 [d]	02/03/2012	RE06703	118297.12	1520437.09	173.65	174.18	22	2-inch PVC	7 - 22	167.18 - 152.18	15
WMW-9 [d]	02/02/2012	RE06703	118150.38	1520456.83	173.12	173.80	23.5	2-inch PVC	8.5 - 23.5	165.30 - 150.30	15
WMW-10 [d]	02/02/2012	RE06703	118082.76	1520444.31	172.96	173.53	22.5	2-inch PVC	7.5 - 22.5	166.03 - 151.03	15
WMW-11 [d]	02/03/2012	RE06703	118082.47	1520522.35	172.89	173.35	22	2-inch PVC	7 - 22	166.35 - 151.35	15
WMW-12	10/11/2016	BJX218	118232.55	1520334.13	173.25	173.58	25	2-inch PVC	6 - 21	167.58 - 152.58	15
WMW-13	10/11/2016	BJX219	118115.77	1520385.06	173.58	173.84	25	2-inch PVC	6 - 21	167.84 - 152.84	15
WMW-14	10/18/2016	BJX228	118058.74	1520450.04	177.15	177.58	30	2-inch PVC	12 - 27	165.58 - 150.58	15
WMW-15	10/18/2016	BJX227	118060.70	1520514.17	176.99	177.35	30	2-inch PVC	12 - 27	165.35 - 150.35	15
WMW-16	10/17/2016	BJX222	118055.77	1520597.43	176.74	176.94	30	2-inch PVC	11.33 - 26.33	165.61 - 150.61	15
WMW-17	10/13/2016	BJX224	118048.42	1520674.59	176.54	177.01	30	2-inch PVC	12 - 27	165.01 - 150.01	15
WMW-18	10/12/2016	BJX220	118060.67	1520761.30	176.72	177.05	30	2-inch PVC	12 - 27	165.05 - 150.05	15
Deep Monitoring Wells[b]											
RMD-1	10/12/2016	BJX223	118060.335	1520519.17	176.89	177.30	44.6	2-inch PVC	29.6 - 44.6	147.70 - 132.70	15
RMD-2	10/14/2016	BJX226	118055.391	1520602.01	176.59	176.82	50	2-inch PVC	30 - 50	146.82 - 126.82	20
RMD-3	10/14/2016	BJX225	118048.231	1520679.29	176.90	177.18	60	2-inch PVC	40 - 60	137.18 - 117.18	20
RMD-4	10/12/2016	BJX221	118060.86	1520765.8	176.79	177.11	65	2-inch PVC	45 - 65	132.11 - 112.11	20
Oil Head Monitoring Wells											
OHM-1	11/02/2016	BJX232	118166.15	1520658.80	172.68	173.05	80.5	4-inch PVC	15 - 80	158.05 - 93.05	65
OHM-2	10/27/2016	BJX230	118183.98	1520688.80	172.73	173.04	51.5	4-inch PVC	16 - 51	157.04 - 122.04	35
OHM-3	10/28/2016	BJX229	118245.91	1520690.92	172.82	173.12	42.2	4-inch PVC	16.8 - 41.8	156.32 - 131.32	25
OHM-4 [e]	10/20/2016	BJX231	118158.29	1520505.62	173.51	173.80	25.8	4-inch Steel	20.4 - 25.4	153.40 - 148.40	5

Notes:

(a) Shallow monitoring well screens constructed with 2-inch diameter Schedule 40 polyvinyl chloride (PVC) screen with 0.010-inch slot size.

(b) Deep monitoring well screens constructed with 2-inch diameter Schedule 40 PVC screen with 0.020-inch slot size.

(c) Oil head monitoring well screens constructed with 4-inch diameter Schedule 40 PVC pre-packed screen with 0.040-inch slot size.

(d) Well ID tag numbers unknown / not assigned for wells WMW-8 through WMW-11. Notice of intent numbers shown.

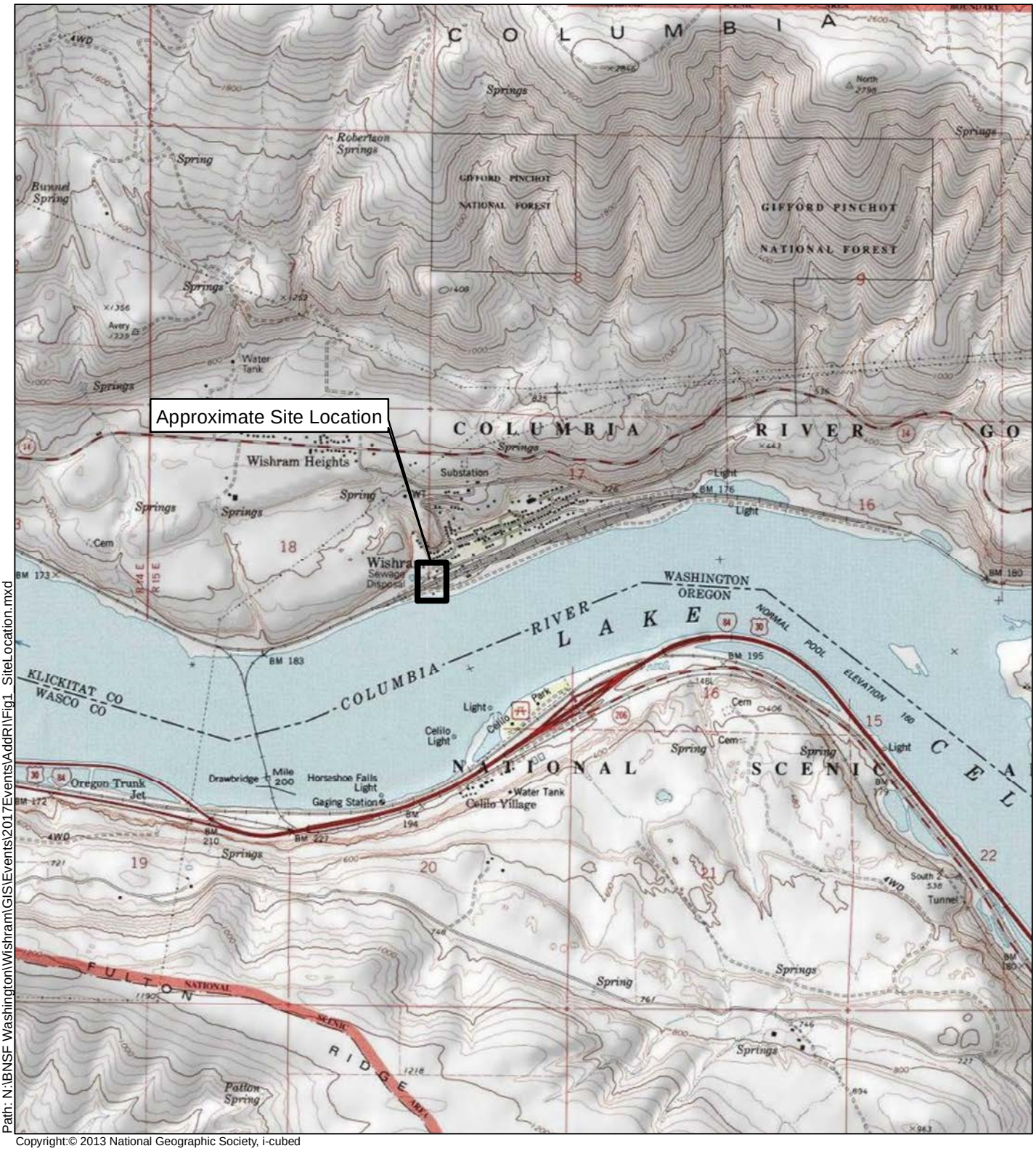
(e) OHM-4 well screen constructed with 4-inch diameter type 304 stainless steel screen with 0.040-inch slot size.

Ecology Well Tag ID No. = Unique well tag ID assigned by State of Washington Department of Ecology.

amsl = above mean sea level

bgs = below ground surface

Figures



Path: N:\BNSF Washington\Wishram\GIS\Events\2017Events\AddR\IFig1_SiteLocation.mxd

N

0 0.5 1

Miles

Note:

1. Locations are approximate.

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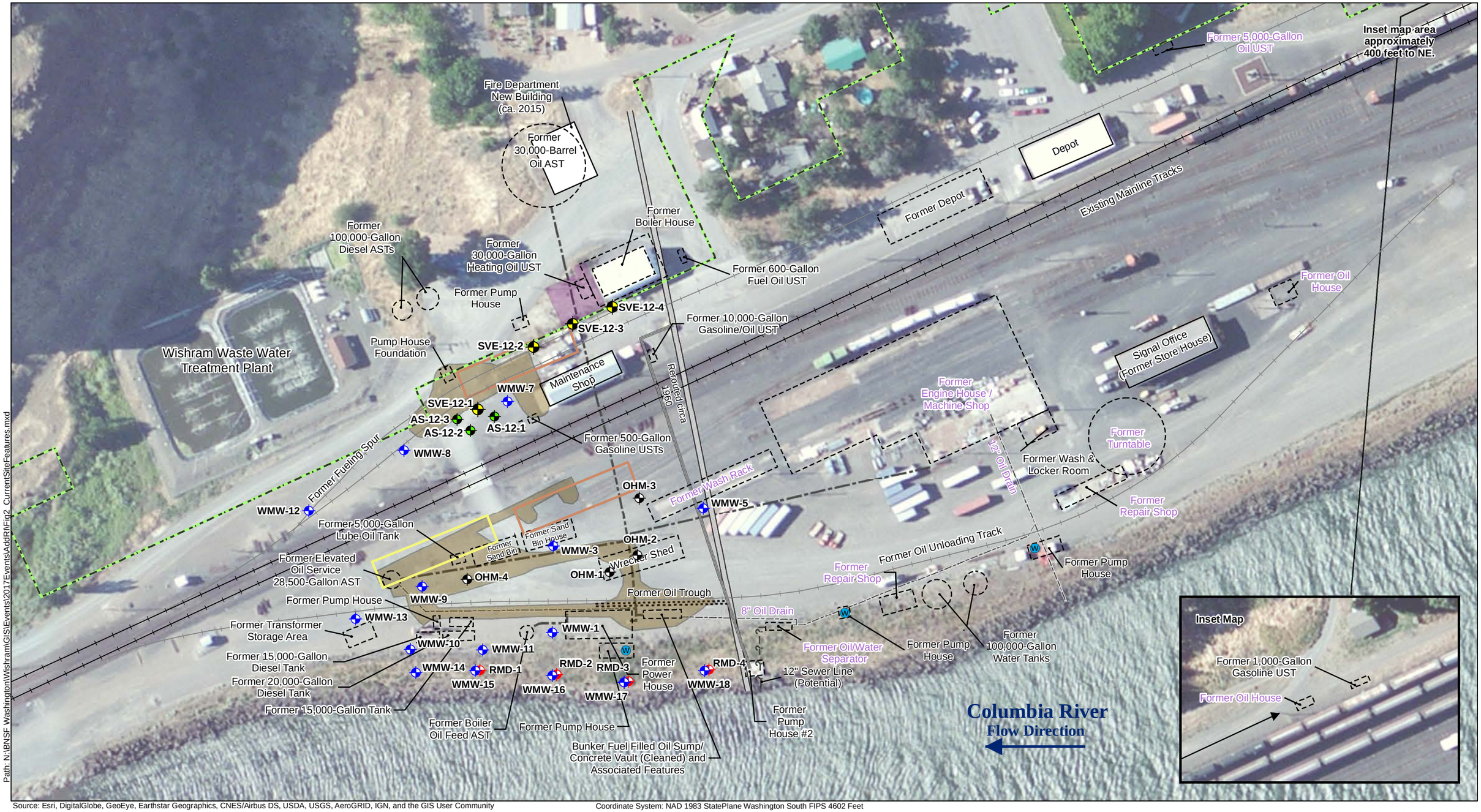
BNSF Wishram Railyard
Wishram, Washington

Site Location Map

1796120.04
February 2018

Figure 1



Path: N:\BNSF Washington\Wishram\GIS\Events\2017Events\AddlFig2_CurrentSiteFeatures.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

- Bioventing Injection Well
- Air Sparge (AS) Well
- Shallow Monitoring Well
- Deep Monitoring Well
- Oil Head Monitoring Well
- Former Water Supply Well (Approximate)
- Approximate BNSF Property Line
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)
- Suspected Diesel Fueling Area
- Suspected Oil Fueling Area
- Approximate Previous Excavation Area
- Approximate Previous Excavation Area
- Existing Site Feature
- Former Site Feature

Former Engine House / Machine Shop — Data gap identified by Ecology

Note:
1. Locations are approximate.

N

0 50 100

Scale: Feet

Kennedy/Jenks Consultants

BNSF Wishram Railyard
Wishram, Washington

Current and Historical Site Features

1796120.04
February 2018

Figure 2

Wishram Waste Water Treatment Plant
Fire Department New Building (ca. 2015)
Former 30,000-Barrel Oil AST
Former 100,000-Gallon Diesel ASTs
Former 30,000-Gallon Heating Oil UST
Former Pump House
Pump House Foundation
Former Boiler House
Former 600-Gallon Fuel Oil UST
Former 10,000-Gallon Gasoline/Oil UST
Maintenance Shop
Rerouted circa 1960
Former 500-Gallon Gasoline USTs
Former Fueling Spur
Former Wash Rack
Former 5,000-Gallon Lube Oil Tank
Former Sand Bin
Former Sand Bin House
Former Elevated Oil Service 28,500-Gallon AST
Wrecker Shed
Former Pump House
Former Transformer Storage Area
Former 15,000-Gallon Diesel Tank
Former 20,000-Gallon Diesel Tank
Former 15,000-Gallon Tank
Former Boiler Oil Feed AST
Former Pump House
Former Oil Trough
Well 1
Former Power House
Bunker Fuel Filled Oil Sump/ Concrete Vault (Cleaned) and Associated Features
8" Oil Drain
12" Sewer Line (Potential)
Former Pump House #2
Well 2
Former Oil/Water Separator
Former Pump House
Former Oil Unloading Track
Former Repair Shop
Former 100,000-Gallon Water Tanks
Depot
Former Depot
Existing Mainline Tracks
Former 5,000-Gallon Oil UST
Inset map area approximately 400 feet to NE.
Former Oil House
Signal Office (Former Store House)
Former Engine House / Machine Shop
Former Turntable
Former Wash & Locker Room
12" Oil Drain
Former Repair Shop
Well 3
Former Pump House

Inset Map
Former 1,000-Gallon Gasoline UST
Former Oil House

Path: N:\BNSF Washington\Wishram\GIS\Events\2017Events\AddR1\Fig3_HistoricalSiteFeatures.mxd

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

- Former Water Supply Well (Approximate)
- Former Railroad Tracks
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)
- Approximate BNSF Property Line
- Suspected Diesel Fueling Area
- Suspected Oil Fueling Area
- Existing Site Feature
- Former Site Feature

Former Engine House / Machine Shop — Data gap identified by Ecology

Notes:
1. Locations are approximate.
2. Background image from U.S. Army Corps of Engineers, 1951.

N

0 50 100
Scale: Feet

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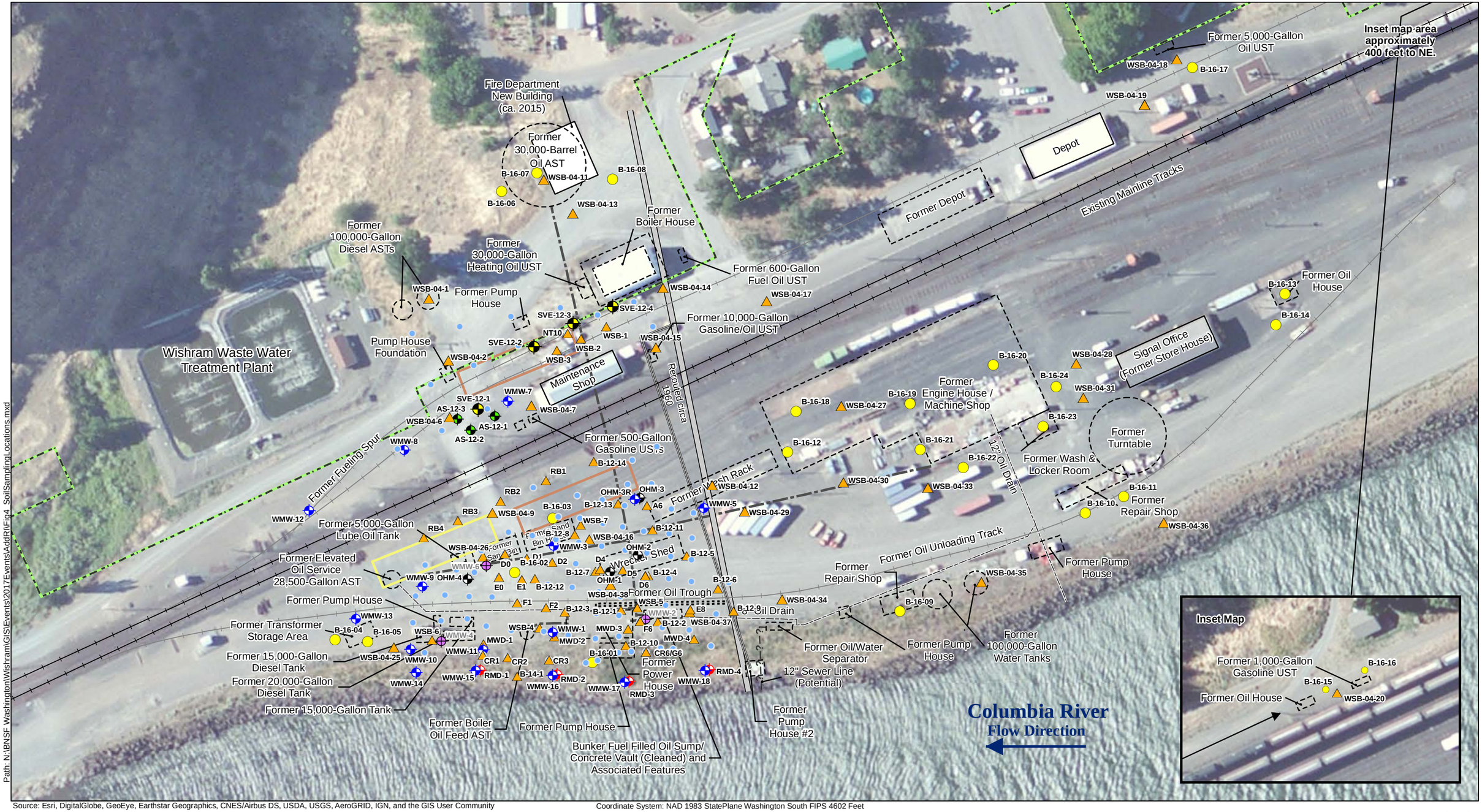
BNSF Wishram Railyard
Wishram, Washington

Historical Site Features

1796120.04
February 2018

Figure 3



Path: N:\BNSF Washington\Wishram\GIS\Events\2017Events\Add'l\Fig4_SoilSamplingLocations.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

- Bioventing Injection Well
- Air Sparge (AS) Well
- Shallow Monitoring Well
- Deep Monitoring Well
- Oil Head Monitoring Well
- Abandoned Monitoring Well
- Soil Boring Location (2016)
- Soil Boring Location (2003-2014)
- LIF Survey Location (2013)
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)
- Approximate BNSF Property Line
- Suspected Diesel Fueling Area
- Suspected Oil Fueling Area
- Existing Site Feature
- Former Site Feature

Note:
1. Locations are approximate.

N

0 50 100

Scale: Feet

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BNSF Wishram Railyard
Wishram, Washington

Soil Boring Locations

1796120.04
February 2018

Figure 4

Path: N:\BNSF Washington\Wishram\GIS\Events\2017Events\AddRFig5_GWSamplingLocations.mxd

Inset map area approximately 400 feet to NE.

Fire Department New Building (ca. 2015)
Former 30,000-Barrel Oil AST
Former 5,000-Gallon Oil UST
Former 100,000-Gallon Diesel ASTs
Former 30,000-Gallon Heating Oil UST
Former Boiler House
Former 600-Gallon Fuel Oil UST
Former Depot
Depot
Existing Mainline Tracks
Former Pump House
Former 10,000-Gallon Gasoline/Oil UST
Former Oil House
Pump House Foundation
Wishram Waste Water Treatment Plant
Maintenance Shop
Signal Office (Former Store House)
Former Engine House / Machine Shop
Former Turntable
Former Wash & Locker Room
Former Repair Shop
Former Fueling Spur
Former 500-Gallon Gasoline USTs
Former Wash Rack
Former 5,000-Gallon Lube Oil Tank
Former Sand Bin House
Former Sand Bin
Former Elevated Oil Service 28,500-Gallon AST
Wrecker Shed
Former Oil Unloading Track
Former Pump House
Former Transformer Storage Area
Former 15,000-Gallon Diesel Tank
Former 20,000-Gallon Diesel Tank
Former 15,000-Gallon Tank
Former Oil/Water Separator
Former 100,000-Gallon Water Tanks
Former Power House
Former Boiler Oil Feed AST
Former Pump House
Former Pump House #2
Bunker Fuel Filled Oil Sump/ Concrete Vault (Cleaned) and Associated Features

B-16-17
B-16-13
B-16-14
B-16-20
B-16-24
B-16-18
B-16-19
B-16-23
B-16-12
B-16-21
B-16-22
B-16-11
B-16-10
B-16-09
WSB-04-15
WSB-04-27
WSB-04-06
WSB-04-25
WSB-04-16
WSB-04-26
WSB-04-34
WSB-04-35
AS-12-3
AS-12-1
AS-12-2
WMW-07
WMW-08
WMW-12
WMW-13
WMW-10
WMW-11
WMW-4
WMW-14
WMW-15
WMW-16
WMW-17
WMW-18
WMW-1
WMW-2
WMW-3
WMW-5
WMW-6
WMW-9
OHM-1
OHM-2
OHM-3
OHM-4
RB1
RB2
RB3
RB4
RMD-1
RMD-2
RMD-3
RMD-4
Well 1
Well 2
Well 3

Columbia River
Flow Direction

Inset Map
Former 1,000-Gallon Gasoline UST
Former Oil House
B-16-16
B-16-15

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

- Shallow Monitoring Well
- Deep Monitoring Well
- Oil Head Monitoring Well
- Abandoned Monitoring Well
- Former Water Supply Well (Approximate)
- Recon GW Sample (2004-2012)
- Recon GW Sample (2016)
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)
- Approximate BNSF Property Line
- Suspected Diesel Fueling Area
- Suspected Oil Fueling Area
- Existing Site Feature
- Former Site Feature

Note:
1. Locations are approximate.

N

0 50 100
Scale: Feet

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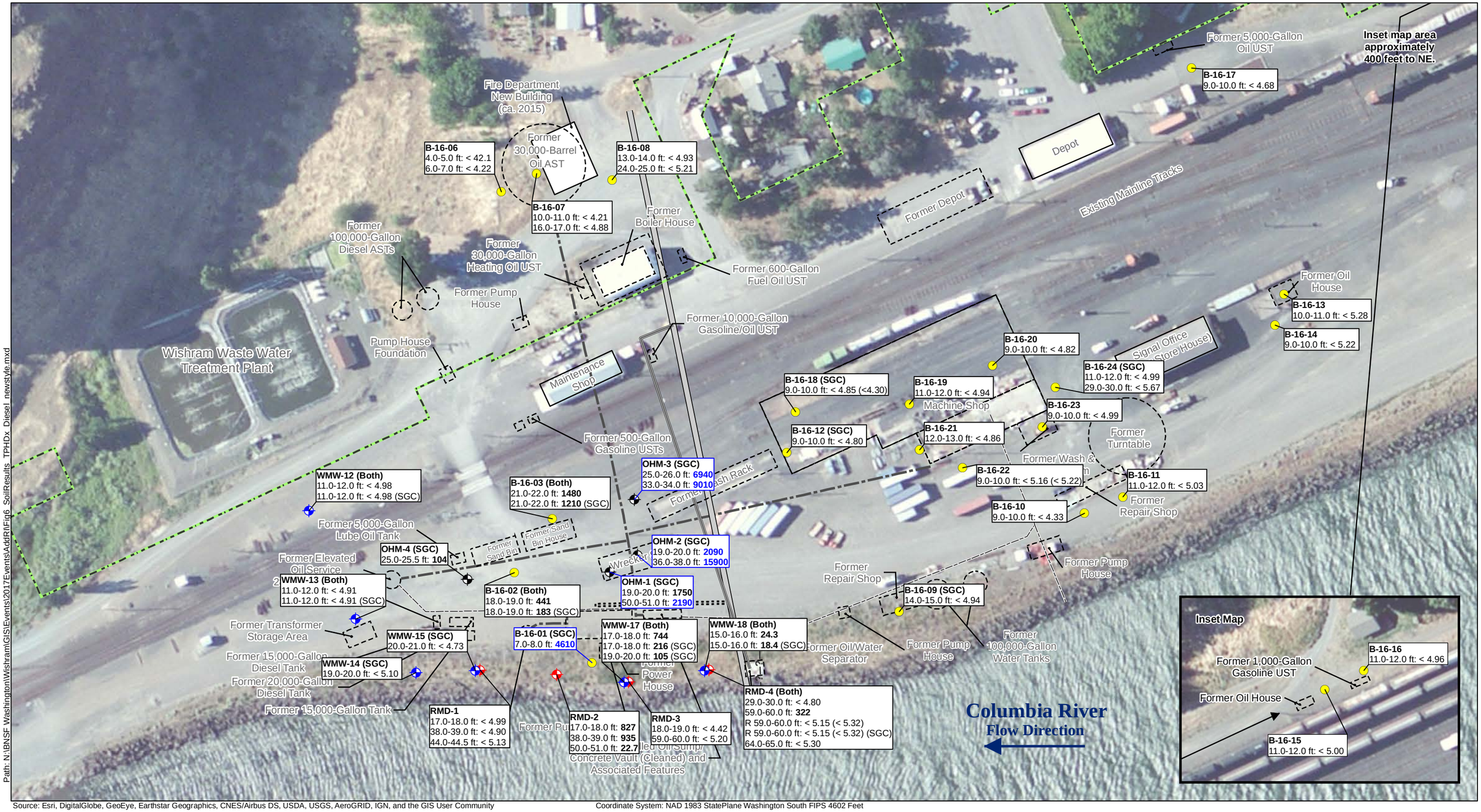
Wishram, Washington

Groundwater Monitoring Locations

1796120.04
February 2018

Figure 5



Path: N:\BNSF Washington\Wishram\GIS\Events\2017Events\AddFlnFig6_SoilResults_TPHDx_Diesel_newstyle.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

- Soil Boring (2016)
- Shallow Monitoring Well
- Deep Monitoring Well
- Oil Head Monitoring Well
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)
- Approximate BNSF Property Line

OHM-2 (SGC)
19.0-20.0 ft: **2090**
36.0-38.0 ft: **15900**

- Location Name
- Sample Interval in feet (ft) below ground surface
- Concentration of Diesel-Range Organics in soil in milligrams per kilogram (mg/kg)
- **Bold** = Detected Result
- **Bold Blue** = Detected Result above MTCA Method A Cleanup Level (2000 mg/kg).

Notes:
1. Locations are approximate.
2. "<" denotes analyte was not detected at the indicated method reporting limit.
3. Field duplicate sample results are shown in parentheses ( ) after primary sample result.
4. Label boxes with "(Both)" indicate samples analyzed using NWTPH-Dx with and without silica gel cleanup (SGC). Sample results followed by "(SGC)" indicate samples analyzed with SGC.

N

0 50 100

Scale: Feet

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BNSF Wishram Railyard
Wishram, Washington

Diesel-Range Organics Distribution in Subsurface Soil

1796120.04
February 2018

Figure 6

Path: N:\BNSF Washington\Wishram\GIS\Events\2017\Events\AddR\Fig7_SoilResults_TPHDx_Oil_newstyle.mxd

Inset map area approximately 400 feet to NE.

Fire Department New Building (ca. 2015)

Former 30,000-Barrel Oil AST

B-16-06
4.0-5.0 ft: **113**
6.0-7.0 ft: < 10.6

B-16-07
10.0-11.0 ft: < 10.5
16.0-17.0 ft: < 12.2

B-16-08
13.0-14.0 ft: < 12.3
24.0-25.0 ft: < 13.0

Former 100,000-Gallon Diesel ASTs

Former 30,000-Gallon Heating Oil UST

Former Boiler House

Former 600-Gallon Fuel Oil UST

Former Pump House

Former 10,000-Gallon Gasoline/Oil UST

Pump House Foundation

Wishram Waste Water Treatment Plant

Maintenance Shop

Former 500-Gallon Gasoline USTs

Depot

Former Depot

Existing Mainline Tracks

Former 5,000-Gallon Oil UST

B-16-17
9.0-10.0 ft: < 11.7

Former Oil House

B-16-13
10.0-11.0 ft: < 13.2

B-16-14
9.0-10.0 ft: < 13.1

B-16-20
9.0-10.0 ft: < 12.1

Signal Office Store House)

B-16-24 (SGC)
11.0-12.0 ft: < 12.5
29.0-30.0 ft: < 14.2

B-16-18 (SGC)
9.0-10.0 ft: < 12.1 (<10.7)

B-16-19
11.0-12.0 ft: < 12.3

Machine Shop

B-16-23
9.0-10.0 ft: < 12.5

B-16-12 (SGC)
9.0-10.0 ft: < 12.0

B-16-21
12.0-13.0 ft: < 12.1

Former Turntable

Former Wash & [illegible]

B-16-22
9.0-10.0 ft: < 12.9 (< 13.1)

B-16-11
11.0-12.0 ft: < 12.6

Former Repair Shop

B-16-10
9.0-10.0 ft: < 10.8

Former Pump House

WMW-12 (Both)
11.0-12.0 ft: < 12.4
11.0-12.0 ft: < 12.5 (SGC)

B-16-03 (Both)
21.0-22.0 ft: **136**
21.0-22.0 ft: **121** (SGC)

OHM-3 (SGC)
25.0-26.0 ft: **6910**
33.0-34.0 ft: **9670**

Former Wash Rack

Former 5,000-Gallon Lube Oil Tank

Former Sand Bin

Former Sand Bin House

OHM-4 (SGC)
25.0-25.5 ft: **113**

Former Elevated Oil Service

Wrecker Shed

OHM-2 (SGC)
19.0-20.0 ft: **1720**
36.0-38.0 ft: **16100**

WMW-13 (Both)
11.0-12.0 ft: < 12.3
11.0-12.0 ft: < 12.3 (SGC)

B-16-02 (Both)
18.0-19.0 ft: **233**
18.0-19.0 ft: **103** (SGC)

OHM-1 (SGC)
19.0-20.0 ft: **1560**
50.0-51.0 ft: **2000**

Former Repair Shop

B-16-09 (SGC)
14.0-15.0 ft: < 12.4

Former Transformer Storage Area

WMW-15 (SGC)
20.0-21.0 ft: < 11.8

B-16-01 (SGC)
7.0-8.0 ft: **12600**

WMW-17 (Both)
17.0-18.0 ft: **108**
17.0-18.0 ft: **38.2** (SGC)
19.0-20.0 ft: **57.1** (SGC)

WMW-18 (Both)
15.0-16.0 ft: **90**
15.0-16.0 ft: **64.9** (SGC)

Former Oil/Water Separator

Former Pump House

Former 100,000-Gallon Water Tanks

Former 15,000-Gallon Diesel Tank

WMW-14 (SGC)
19.0-20.0 ft: < 12.8

Former 20,000-Gallon Diesel Tank

Former 15,000-Gallon Tank

Former Power House

RMD-4 (Both)
29.0-30.0 ft: < 12.0
59.0-60.0 ft: **1610**
R 59.0-60.0 ft: < 12.9 (< 13.3)
R 59.0-60.0 ft: < 12.9 (< 13.3) (SGC)
64.0-65.0 ft: < 13.2

RMD-1
17.0-18.0 ft: < 12.5
38.0-39.0 ft: < 12.2
44.0-44.5 ft: < 12.8

RMD-2
17.0-18.0 ft: **1330**
38.0-39.0 ft: **70.6**
50.0-51.0 ft: **23.5**

RMD-3
18.0-19.0 ft: < 11.0
59.0-60.0 ft: < 13.0

Former Fuel Pump Vault (Cleaned) and Associated Features

Columbia River
Flow Direction

Inset Map

Former 1,000-Gallon Gasoline UST

B-16-16
11.0-12.0 ft: < 12.4

Former Oil House

B-16-15
11.0-12.0 ft: < 12.5

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

- Soil Boring (2016)
- Shallow Monitoring Well
- Deep Monitoring Well
- Oil Head Monitoring Well
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)
- Approximate BNSF Property Line

OHM-2 (SGC)
19.0-20.0 ft: **1720**
36.0-38.0 ft: **16100**

- Location Name
- Sample Interval in feet (ft) below ground surface
- Concentration of Oil-Range Organics in soil in milligrams per kilogram (mg/kg)
- **Bold** = Detected Result
- **Bold Blue** = Detected Result above MTCA Method A Cleanup Level (2000 mg/kg).

Notes:
1. Locations are approximate.
2. "<" denotes analyte was not detected at the indicated method reporting limit.
3. Field duplicate sample results are shown in parentheses ( ) after primary sample result.
4. Label boxes with "(Both)" indicate samples analyzed using NWTPH-Dx with and without silica gel cleanup (SGC). Sample results followed by "(SGC)" indicate samples analyzed with SGC.

N

0 50 100

Scale: Feet

Kennedy/Jenks Consultants

BNSF Wishram Railyard
Wishram, Washington

Oil-Range Organics Distribution in Subsurface Soil

1796120.04
February 2018

Figure 7

Notes:
1. Locations are approximate.
2. "<" denotes analyte was not detected at the indicated method reporting limit.
3. Field duplicate sample results are shown in parentheses ( ) after primary sample result.
4. "LNAPL - NS" denotes no groundwater sample collected due to light non-aqueous phase liquid (LNAPL) measured in well. OHM-# wells not scheduled for sample collection.
5. Reconnaissance groundwater samples collected February and April 2004, January and February 2012, and August 2016.
6. Groundwater monitoring well samples collected April 2017.
7. Location names with "(SGC)" indicate sample analyzed by NWTPH-Dx with silica gel cleanup (SGC).

Path: N:\BNSF Washington\Wishram\GIS\Events\2017Events\Add'l\Fig8_DissolvedPhase_Oil_dataflags.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

- Shallow MW (2016-2017), Above CUL
- Shallow MW (2016-2017), Below CUL
- Deep MW (2016-2017), Above CUL
- Deep MW (2016-2017), Below CUL
- Oil Head Monitoring Well
- Former Water Supply Well (Approximate)
- Recon GW (2004-2012), Above CUL
- Recon GW (2004-2012), Below CUL
- Recon GW (2016), Above CUL
- Recon GW (2016), Below CUL
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)
- Approximate BNSF Property Line
- Approximate historical lateral extent of Dissolved-Phase Diesel- and/or Oil-Range Organics above the MTCA Method A groundwater cleanup level (CUL) (500 µg/L)
- Approximate Lateral Extent of Oil

B-16-18 (SGC)
10-15 ft
Diesel: **336**
Oil: **945**

- Location Name
- Sample Interval in feet (ft) below ground surface
- Concentration of Diesel-Range (Diesel) and Oil-Range Organics (Oil) in groundwater in micrograms per liter (µg/L)
- **Bold** = Detected Result
- **Bold Blue** = Detected Result above MTCA Method A Cleanup Level (500 µg/L).

N

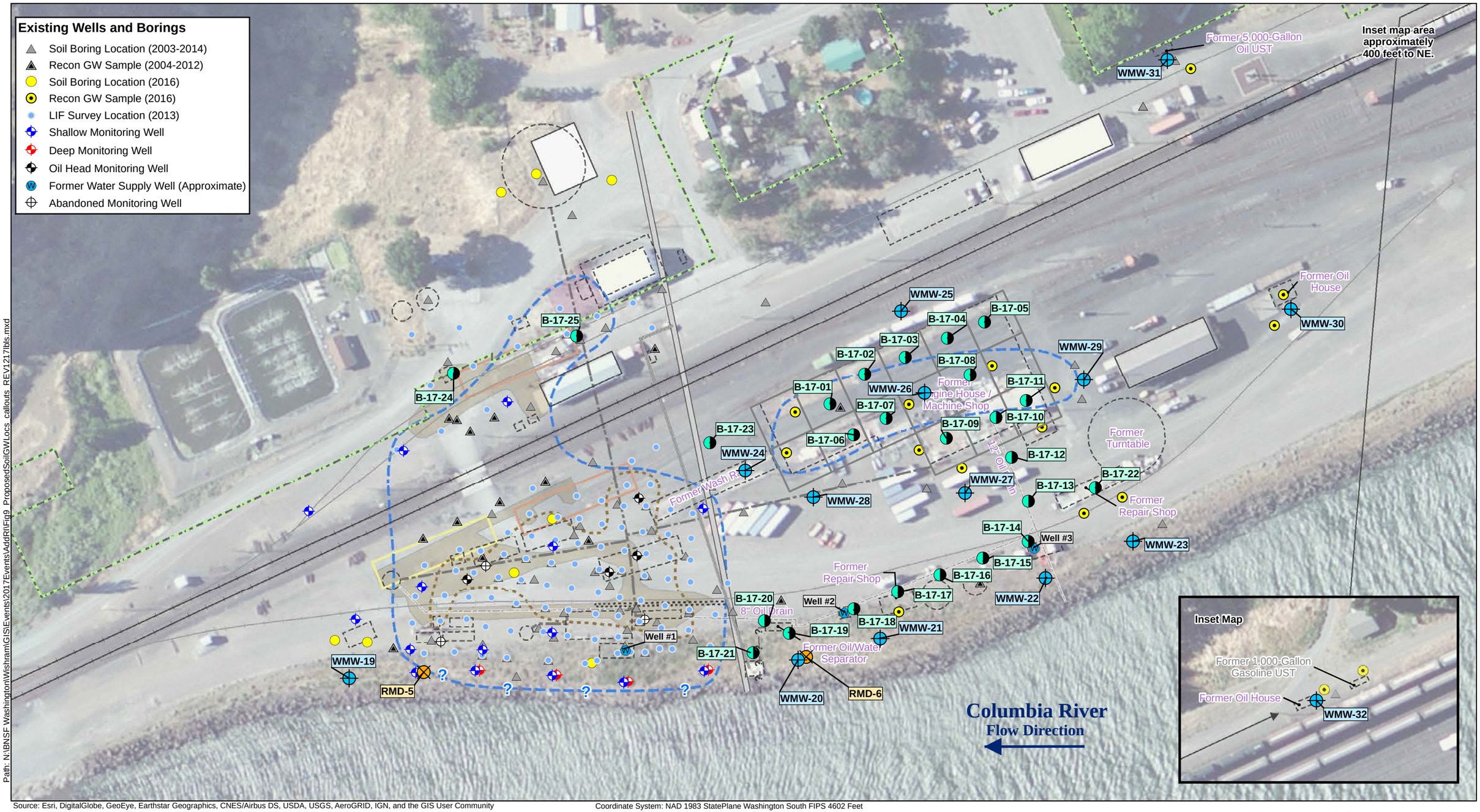
0 50 100
Scale: Feet

Kennedy/Jenks Consultants
BNSF Wishram Railyard
Wishram, Washington

Dissolved Phase and Oil Distribution Summary

1796120.04
February 2018

Figure 8



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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

- WMW-19 — Proposed Shallow Monitoring Well
- RMD-5 — Proposed Deep Monitoring Well
- B-17-01 — Proposed Soil Boring
- Approximate BNSF Property Line
- Approximate historical lateral extent of Dissolved-Phase Diesel- and/or Oil-Range Organics above the MTCA Method A groundwater cleanup level (CUL) (500 µg/L)
- Approximate Lateral Extent of Oil
- Suspected Diesel Fueling Area
- Suspected Oil Fueling Area
- Approximate Previous Excavation Area (2002)
- Approximate Previous Excavation Area (2005/2010)
- Existing Site Feature
- Former Site Feature
- Engine House 50-ft Grid
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)

Former Engine House / Machine Shop — Data gap identified by Ecology

Note:
1. Locations are approximate.

N

0 50 100

Scale: Feet

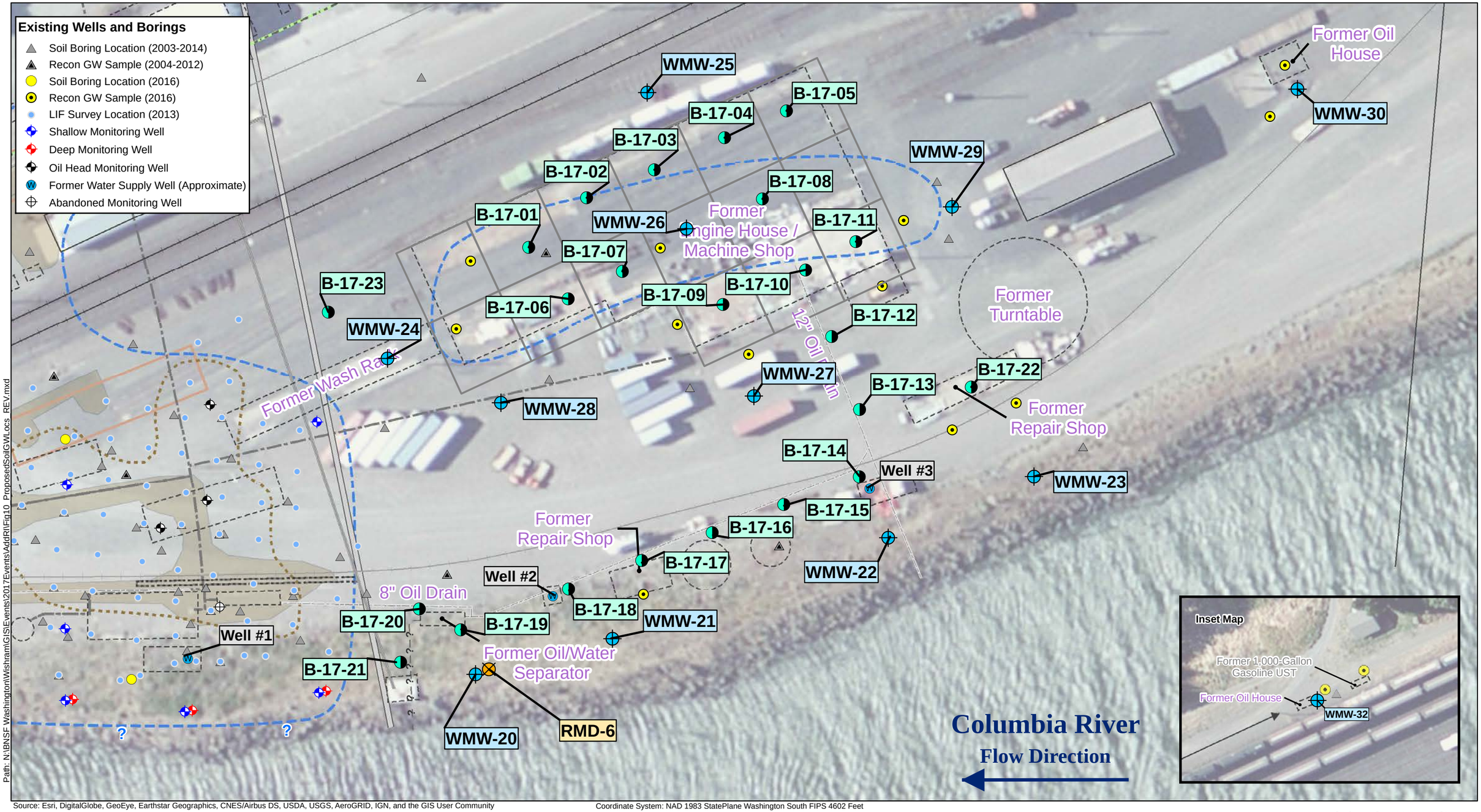
Kennedy/Jenks Consultants

BNSF Wishram Railyard
Wishram, Washington

Proposed Soil Boring and Groundwater Monitoring Well Locations

1796120.04
February 2018

Figure 9



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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

- WMW-19 — Proposed Shallow Monitoring Well
- RMD-5 — Proposed Deep Monitoring Well
- B-17-01 — Proposed Soil Boring
- Approximate BNSF Property Line
- Approximate historical lateral extent of Dissolved-Phase Diesel- and/or Oil-Range Organics above the MTCA Method A groundwater cleanup level (CUL) (500 µg/L)
- Approximate Lateral Extent of Oil
- Suspected Diesel Fueling Area
- Suspected Oil Fueling Area
- Approximate Previous Excavation Area (2002)
- Approximate Previous Excavation Area (2005/2010)
- Existing Site Feature
- Former Site Feature
- Engine House 50-ft Grid
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)

Former Engine House / Machine Shop — Data gap identified by Ecology

Note:
1. Locations are approximate.

N

0 30 60

Scale: Feet

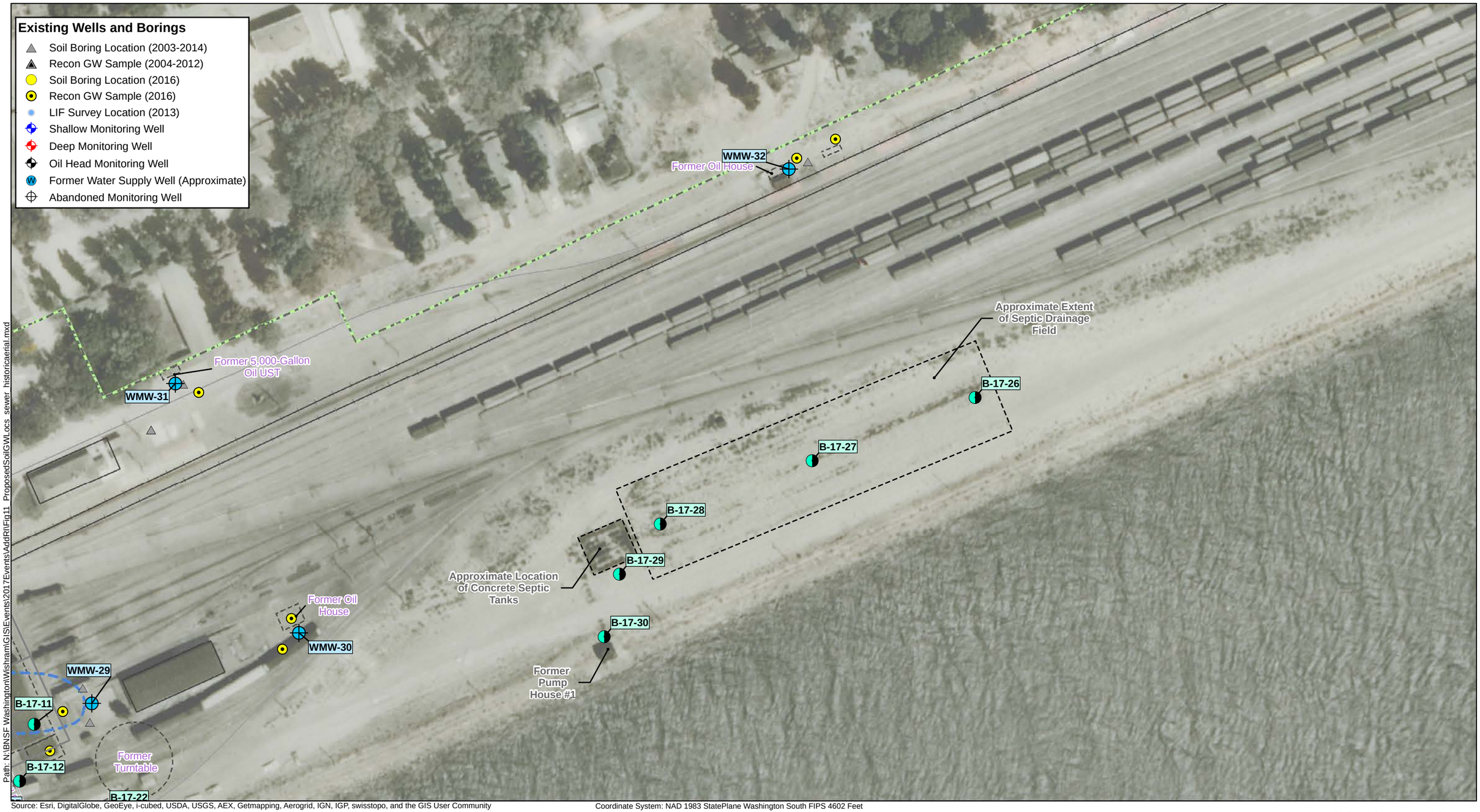
Kennedy/Jenks Consultants

BNSF Wishram Railyard
Wishram, Washington

Proposed Soil Boring and Groundwater Monitoring Well Locations (Eastern Areas)

1796120.04
February 2018

Figure 10



Path: N:\BNSF Washington\Wishram\GIS\Events\2017Events\AddRIFig11_ProposedSoilGWLocs_sewer_historicaerial.mxd

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

- WMW-19 — Proposed Shallow Monitoring Well
- RMD-5 — Proposed Deep Monitoring Well
- B-17-01 — Proposed Soil Boring
- Approximate BNSF Property Line
- Approximate historical lateral extent of Dissolved-Phase Diesel- and/or Oil-Range Organics above the MTCA Method A groundwater cleanup level (CUL) (500 µg/L)
- Existing Site Feature
- Former Site Feature
- Engine House 50-ft Grid
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)

Former Engine House / Machine Shop — Data gap identified by Ecology

Notes:
1. Locations are approximate.
2. Background image from U.S. Army Corps of Engineers, 1962.

N

0 50 100

Scale: Feet

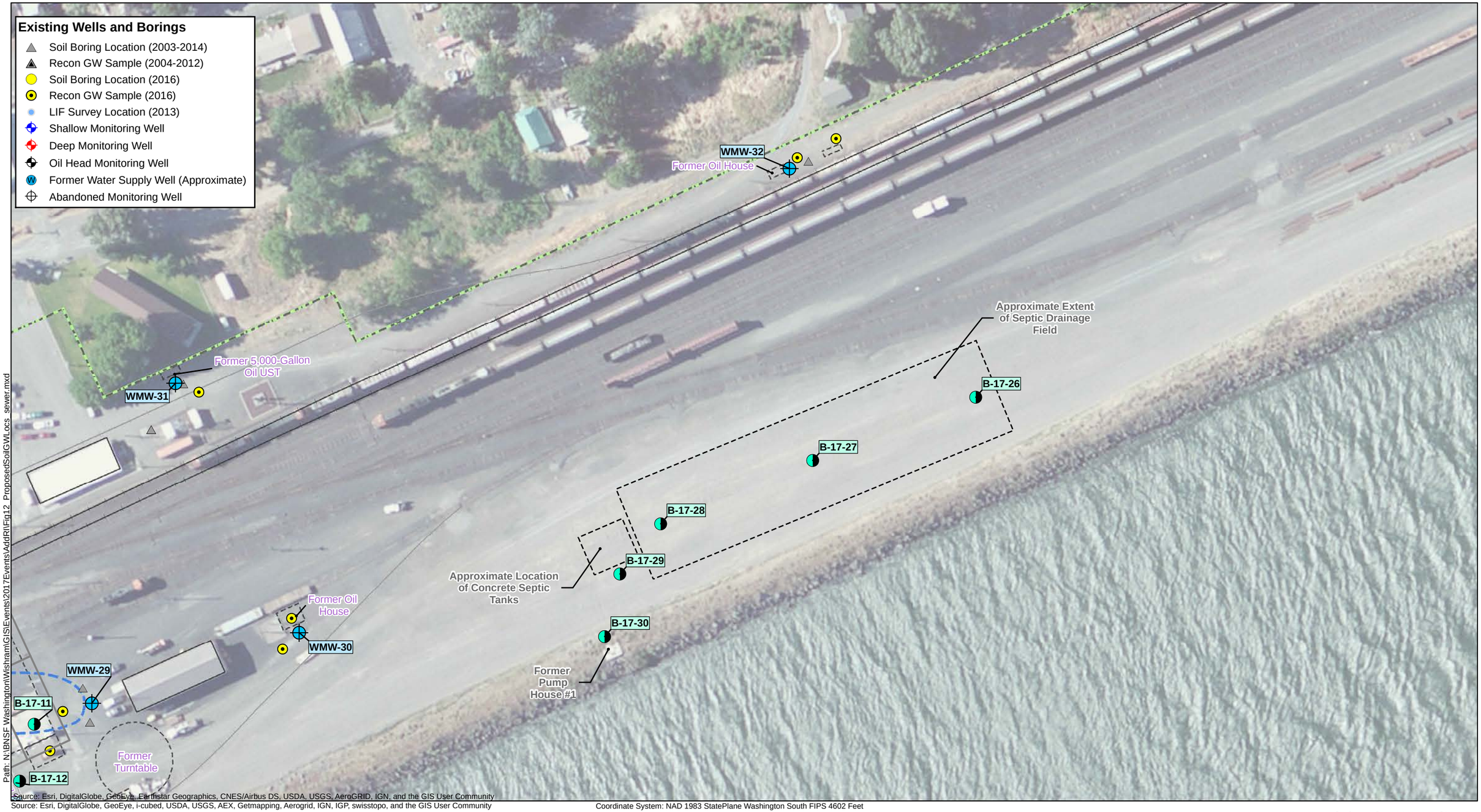
Kennedy/Jenks Consultants

BNSF Wishram Railyard
Wishram, Washington

Proposed Soil Boring Locations in Former Septic Field Area (Historical)

1796120.04
February 2018

Figure 11



Path: N:\BNSF Washington\Wishram\GIS\Events\2017\Events\AddR\Fig12_ProposedSoilGWLocs_sewer.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

- WMW-19 — Proposed Shallow Monitoring Well
- RMD-5 — Proposed Deep Monitoring Well
- B-17-01 — Proposed Soil Boring
- Approximate BNSF Property Line
- Approximate historical lateral extent of Dissolved-Phase Diesel- and/or Oil-Range Organics above the MTCA Method A groundwater cleanup level (CUL) (500 µg/L)
- Existing Site Feature
- Former Site Feature
- Engine House 50-ft Grid
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)

Former Engine House / Machine Shop — Data gap identified by Ecology

Notes:
1. Locations are approximate.

N

0 50 100

Scale: Feet

Kennedy/Jenks Consultants

BNSF Wishram Railyard
Wishram, Washington

Proposed Soil Boring Locations in Former Septic Field Area (Current)

1796120.04
February 2018

Figure 12

Appendix A

Site-Specific Health and Safety Plan

Kennedy/Jenks Consultants

32001 32nd Avenue South, Ste 100
Federal Way, WA
253-835-6400
FAX: 253-952-3435

Site-Specific
Health and Safety Plan (HASP)
BNSF Wishram Railyard
Wishram, Washington

11 January 2018

Prepared for

BNSF Railway Company
605 Puyallup Ave
Tacoma, Washington 98421

Project No. 1896120*00

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Health and Safety Plan (HASP) Summary

Project Name	BNSF Wishram Railyard	**Project No.**	1896120*00
Prepared by	Tom Haskins	**Date**	11 January 2018
Project Manager	Ryan Hultgren	**Office**	Federal Way, WA

Field Services Description

Field Services Date(s)	January 2018 through January 2019		
Site Name	BNSF Wishram Railyard		
Location	500 Bridgeway Road, Wishram, WA 98673		
Client Site Contact	Shane DeGross	**Client Site Telephone**	253-591-2567 (office) 253-208-9043 (cell)
	Jamie Richardson, Foreman		360-601-1847

Type of Investigation:

Sampling Investigation:
- ☒ Hand Auger
- ☒ Drilling
- ☐ Trenching
- ☒ Well Installation
- ☒ Soil Sampling
- ☒ Groundwater Sampling
- ☐ Other:

Site Remediation:
- ☐ Excavation
- ☒ Treatment System Installation/O&M
- ☐ Underground Storage Tank (UST) Removal

- ☐ Site Walk-through
- ☒ Other: Monthly SVE and Bank Inspections

Section 1: Introduction

This Site-Specific Health and Safety Plan (SSHSP), also referred to as a Health and Safety Plan (HASP), developed in accordance with Occupational Safety and Health Administration (OSHA) standards for hazardous waste operations (29 CFR 1910.120) and Washington Department of Safety and Health (DOSH) Standards [Washington Administrative Code (WAC)] Chapter 296-843, establishes general health and safety protocols for Kennedy/Jenks Consultants personnel at BNSF Burlington Rail Depot located in the **500 Bridgeway Road, Wishram, Washington**. As needed, addenda containing activity-specific health and safety protocols will be prepared and attached to this HASP prior to the initiation of each additional field activity. The HASP and activity-specific addenda, as a minimum, contain the following information:

- Names of key personnel and alternates responsible for site health and safety and appointment of a Site Safety Officer (SSO).
- A job hazard analysis (JHA) for each site task and operation (see Appendix A for applicable JHAs).
- Personal protective equipment (PPE) to be used by employees for each site task and operations being conducted.
- Medical surveillance requirements.
- Frequency and types of air monitoring, personal monitoring, and environmental sampling techniques and instrumentation to be used. Methods of maintenance and calibration of monitoring and sampling equipment to be used.
- Site control measures.
- Decontamination procedures.
- An Emergency Response Plan that addresses effective site response to emergencies.
- Procedures to report injuries or illness, property damage, or near miss incidents

For informational purposes only, this plan may be provided to subcontractors of Kennedy/Jenks Consultants involved in activities at the site, interested regulatory agencies, or others. However, entities and personnel other than Kennedy/Jenks Consultants shall be solely responsible for their own health and safety and shall independently assess onsite conditions and develop their own health and safety protocols to meet the minimum health and safety requirements.

Kennedy/Jenks Consultants has developed a Health & Safety Operations Manual (Kennedy/Jenks Consultants, Corporate Health and Safety Program, March 2015). The Corporate Health & Safety Program, upon which the manual is based, complies with current health and safety regulations, including OSHA 29 CFR 1910.120 and Hazardous Waste Operations and Emergency Response. Many of the protocols of the corporate program are conducted on a routine basis (general training, respirator fit testing, general medical record keeping, etc.) and are not repeated herein. The Health and Safety Operations Manual is

available to Kennedy/Jenks Consultants employees upon request during normal business hours. Questions regarding the program should be referred to the Kennedy/Jenks Consultants Industrial/Environmental Business Unit Health & Safety Manager (H&S Manager) John Jindra, or the Director of Health, Safety, and Environment (Director of HS&E) Bert Drews.

A copy of this HASP, along with any addenda containing activity-specific health and safety information, will be kept in a conspicuous location at all times while work is being conducted at the site.

Section 2: Key Health and Safety Personnel

Kennedy/Jenks Consultants SSO will be designated by the Deputy Project Manager, as appropriate. The current SSO for the project is Joe Sawdey. In the absence of the SSO during field activities, a member of the field investigation team will be designated as Kennedy/Jenks Consultants SSO. The SSO is responsible for the following.

- Conducting daily job safety briefings (JSBs) for Kennedy/Jenks Consultants personnel at the beginning of each workday, as tasks are completed, and at the end of the workday and documenting that subcontractors are also conducting JSBs. Kennedy/Jenks Consultants staff may combine JSBs with the subcontractor in lieu of conducting separate safety meetings. Combined JSB meetings will be led by the subcontractor and must include emphasis provided by the subcontractor relative to the subcontractor's work. Other participants, including Kennedy/Jenks Consultants and any regulatory personnel in attendance, should also discuss their respective health and safety issues and oversight specific to their activities. The JSB Record is attached to this HASP as Appendix B, and a copy of each day's executed form for Kennedy/Jenks Consultants' JSB must be obtained for the project files, signed by all Kennedy/Jenks employees attending the JSB meeting. Any subcontractors must provide the SSO with a daily copy of the subcontractor's own safety briefing form for the project file.

- Observing field activities for compliance with this HASP, applicable addenda, and Kennedy/Jenks Consultants Health and Safety Operations Manual.

- Maintaining onsite medical surveillance, if required, and emergency medical treatment programs, and assisting in onsite emergencies.

- Modifying health and safety protocols or terminating field work when unsafe work conditions exist.

- Assuring all project team members participating in field activities have read and signed this HASP and have had the opportunity to ask safety-related questions regarding this project.

- Familiarizing personnel with health and safety protocols.

- Observing field personnel wear appropriate PPE.

- Recording data from direct reading instruments on field logs (as appropriate) and evaluating potential hazards.

- Monitoring decontamination procedures.

- Recording occurrence of any site injury, illness, property damage or near miss incident.

If unsafe conditions are encountered, if illness or injury occurs, or if the level of protection needs to be changed, the SSO will consult, in a timely manner, with the Deputy Project Manager, Ryan Hultgren; the H&S Manager, John Jindra, or the Director of HS&E, Bert Drews.

Section 3: Site Description and History

The site includes a depot building (BNSF and Amtrak), maintenance building, and several small ancillary structures. A main BNSF rail line (two tracks, potentially active at all times) is present onsite, as are limited number of side spurs (two in work area, currently inactive). The work area is approximately 3 acres, and is roughly rectangular in shape.

The site is adjacent to the Columbia River. Monthly inspections require personnel to walk the rip-rap bank along the length of the river shoreline.

Section 4: Planned Site Activities

Type of Investigation:

Sampling Investigation:
- ☒ Hand Auger
- ☒ Drilling
- ☐ Trenching
- ☒ Well Installation
- ☒ Soil Sampling
- ☒ Groundwater Sampling
- ☐ Other: Soil Gas/Indoor Air Sampling

Site Remediation:
- ☐ Excavation
- ☒ Treatment System Installation/O&M
- ☐ UST Removal

☐ Site Walk-through

☒ SVE system inspections

☐ Onsite Inspection or Construction-Related Services

☐ Entry into a Confined Space or Excavation[1]

☐ Work Along a Leading Edge Requiring Fall Protection

☐ Entry into an Excavation or Trench with a Depth of 4 feet or Greater

☐ Field Investigation Requiring
- ☐ a. Entry into (potentially) hazardous area
- ☐ b. Interruption of vehicular traffic
- ☐ c. Interruption of plant processes
- ☐ d. Operation of pilot plant

☐ Chemical Use[2]

☒ River bank inspections

[1] Completion of Kennedy/Jenks Consultants Confined Space Pre-entry Checklist and Entry Authorization is required or review of Client's Confined Space Procedures.

[2] A Field Chemical Use Plan must be completed.

Potential Hazards:

- ☒ Organics
- ☐ Inorganics
- ☐ Metals
- ☐ Acids
- ☐ Solvents
- ☐ Pesticides
- ☐ Other: _____
- ☐ Bases
- ☐ Fire/Explosion

Personal Protective Equipment:

- ☐ Level C
- ☒ Level D

Flagger required within 25 feet of track centerline. Temperatures can exceed 100°F in summer – bring water, onsite resources are limited. Life jacket must be worn if working near Columbia River. Lock Out/Tag Out (LOTO) procedures have been developed for the SVE system at the site. A LOTO kit is located in the BNSF MOW building onsite.

Section 5: Hazard Assessment

5.1 Potential Physical & Environmental Hazards

Every job must be scrutinized for potential hazards, which may cause an injury, illness, property damage, or an near miss incident. The preferred method of assessing a job for hazards is to break down each job into smaller tasks. Each task may then be scrutinized by performing a JHA.

The JHA process is intended to provide a brief, consistent means of identifying and addressing known and unknown hazards, which are applicable to the proposed scope of work. All applicable site specific JHAs are included as Appendix A. JHAs for some activities are available on the SafetyZone JHA Library. Revise an existing JHA or complete a new JHA for any task or activity not included in the JHA Library. A blank JHA is available in the JHA Library to be used for any task not listed.

Potential hazards may include, but are not limited to, the following:

- Heavy equipment
- Excavations and Trench work
- Chemical exposure
- Fire/explosion hazard
- Tripping and falling hazards
- Heat stress
- Cold exposure Train and/or equipment movements.
- Train and/or equipment movements.

5.1.1 Heavy Equipment

Field personnel should be cognizant of potential physical hazards associated with use of heavy equipment and electrical equipment during field operations. Appropriate precautions include the following:

- American National Standards Institute (ANSI)-approved hardhats, Class II reflective safety vests (when outside), safety glasses or goggles, and safety-toe boots will be worn.
- Loose clothing that may catch in moving parts will not be worn.

- Hearing protection will be worn if a preliminary noise survey or past experience indicates maximum noise levels will exceed 85 decibels at any time during site operations or if sound levels become uncomfortable or prevent conversation at normal levels.

- Maintain visual contact with the equipment operator at all times within or near the equipment operating radius.

Prior to conducting drilling, a survey shall be conducted and discussed in the JSB to identify overhead electrical hazards and potential ground hazards, such as hazardous agents in the soil or underground utilities. Kennedy/Jenks Consultant's staff will stay at least 25 feet from active drilling rig when possible. Coordinate collection of samples with equipment operator. Wear hearing protection when equipment is operating.

5.1.2 Excavation

Field personnel should enter an excavation or trench only as a last resort. Any excavation or trench exceeding 4 feet in depth must be properly shored, braced, or sloped, and a safety ladder must be provided for ready access or egress.

5.1.3 Tripping and Falling Hazards

Other potential physical hazards include falling and tripping on slippery, uneven, or unpaved surfaces.

Extra care should be taken in the event of frozen or wet ground, sleet, or snow. Modify walking activities accordingly, paying close attention to exposed bare surfaces, such as stairs, platforms, concrete walkways, truck beds, etc.

5.1.4 Heat Stress

Adverse climate conditions, primarily heat, are important considerations in planning and conducting site operations. Maximum daytime temperature may exceed 95 degrees Fahrenheit (°F) at the site, and heat stress is an associated concern. Provisions of Kennedy/Jenks Consultants Heat Illness Prevention Program, Corporate Health and Safety Operations Manual (March 2015), will be applied to all projects when Kennedy/Jenks Consultants employees are subjected to sustained temperatures of 85 °F or greater.

Preventative measures include the following:

- Water and/or commercial electrolyte solutions will be available, and drinking these fluids will be encouraged. When temperatures exceed 85 °F, sufficient water will be provided to accommodate each employee with 1 quart of water per hour. Water will be kept cool by means of a portable cooler with ice or similar means.

- Suitable acclimation periods will be provided for workers to gradually establish their resistance to heat stress.

Personnel exhibiting symptoms of heat stress (nausea, cramps, dizziness, clammy skin) will be removed from the work area, cooled, and provided with water, and the personnel will be

observed (see Appendix C, Heat Stress Fact Sheet). Personnel exhibiting symptoms of heat stroke (hot dry skin, mental confusion, unconsciousness) will be immediately cooled and taken to the hospital. A map and written directions to the local medical facility are included as Attachment 1.

5.1.5 Cold Exposure

Cold injury (e.g., frostbite and hypothermia) and impaired ability to work are dangers encountered at low temperatures and high wind-chill factors. To guard against these conditions, if cold weather is an important consideration at this site, field personnel should wear appropriate clothing, have access to readily available warm shelter, take carefully scheduled work and rest periods, and monitor physical conditions of other workers. See Appendix D, Cold Stress Fact Sheet.

5.1.6 Train Movement/Railyard Hazards

Personnel must **exercise extreme caution when working near railroad tracks**.

- When working near the active tracks to the south of the site, personnel should expect the movement of trains, engines, cars, and other moving equipment at any time, on any track, and in either direction.
- **No work will be performed without appropriate On-Track Safety Protection (OTS) if personnel and/or equipment are within the "foul zone" of the track (i.e., 4 feet of nearest rail) or have the potential to inadvertently enter the foul zone during performance of planned work.**
- **DO NOT MOVE, MODIFY, OR IN ANY WAY TOUCH RAILROAD EQUIPMENT.**
- **DO NOT WALK, STEP, SIT, OR STAND ON A RAIL.**
- Maintain adequate clearance around on-track railroad equipment. Do not cross between railcars/locomotives, and do not attempt to climb underneath or over railcars to reach the other side of the track.
- When passing in front of standing on-track railroad equipment, allow 25 feet of clearance.
- Crossing immediately in front of moving equipment is prohibited. Do not make any movement toward an oncoming train or move any equipment in a manner that may lead the train engineer to think that you are about to foul the track.
- Maintain 25 feet of OTS from the centerline of the track as directed by the responsible BNSF railroad representative.
- Do not leave unattended equipment within 25 feet of the track centerline unless the responsible BNSF representative has given specific approval, and equipment in no way can foul the track.

- All equipment left onsite overnight must be equipped and locked out with a master battery lockout switch or equivalent.

- Come to a complete stop and verify clearance in both directions before driving across internal maintenance crossings that do not have automatic warning devices. Keep in mind that the angle of vehicle approach, doorpost design and width, trees, and structures can affect your ability to clearly spot on-track traffic at a glance. Carefully look both ways, then look both ways again.

- Avoid shifting gears when crossing tracks in vehicles.

- Yield the right-of-way to railroad vehicles.

Kennedy/Jenks Consultants personnel will obey all posted speed and warning signs both on and off railroad property.

5.1.7 Underground/Overhead Utilities

The site may contain underground and aboveground utilities, including buried electrical, natural gas, water, sewer and fuel lines, and aboveground utilities, such as high-voltage transmission lines. These utilities present a potential hazard if they are struck or can arc if equipment is located too close to them. Kennedy/Jenks Consultants will use the following notification, documentation and clearance procedures to clear all boring or excavation locations of utilities prior to subsurface invasive activities. Subsurface invasive work includes excavations, borings, surface grading, and hand augering soil samples when depths penetrate more than 6 inches below ground surface (bgs). Work is not to proceed where there is doubt regarding the location of underground utilities or obstructions. Invasive Activities – Utility Location Standard Operating Procedures are included as Appendix E.

Notification Procedures: Notification is made through the One-Call Center (811) for all subsurface invasive work located on public property. Kennedy/Jenks Consultants or its designated subcontractor will call for a universal underground notice at least 2 business days before drilling or subsurface invasive activities are to begin.

Document time of the call, names of utilities to be contacted, and obtain a ticket number for the call on Kennedy/Jenks Consultants Utility Location and Acknowledgement Form included as Appendix F. On private property not covered by the Utilities Underground Location Center, Kennedy/Jenks Consultants may be required to contact and receive utility clearance approval from a combination of other public and private entities, as well as private landowners, City officials, and State of Washington entities to obtain clearance approval who may have underground utilities in the work area.

Documentation: All proposed subsurface excavations, boring, and well locations are to be marked on the ground surface using **white** paint in accordance with American Public Works as shown on the American Public Works Association (APWA) Uniform Color Code. A Kennedy/Jenks Consultants Utility Location and Acknowledgement Form must be filled out for each proposed well, boring, or excavation location. Obtain signatures from each private or public utility owner to document clearance on the each form, as required.

At all locations where drilling, probing, or well installation will be performed, an air knife or similar form of suction potholing will be performed to assess possible underground utilities in the upper 6 to 8 feet of soils (depending on local conditions and expected depth of utilities). Potholing is required at **all drilling locations**, except in remote areas where the likelihood of encountering underground utilities is very low and only as approved by a Risk Manager, Resource/Operations Manager or Officer of the company familiar with underground utilities. (Note: Use of an air knife will be appropriate for most invasive drilling and probing work, but may not be appropriate for certain activities like very shallow borings (less than 1-foot deep), certain hand-auger borings, remedial injections using probe equipment, and test pitting.) Case-by-case exceptions for activities may be provided.

Should an underground line or pipe or other obstruction be encountered unexpectedly or disturbed (broken, damaged, or undermined) immediately discontinue invasive activities and contact the Project Manager. If the Project Manager cannot be reached, contact an officer of Kennedy/Jenks Consultants. Secure the area to prevent further disturbance/damage.

When clearing the site for utilities, **ALWAYS REMEMBER TO LOOK UP for overhead utilities**. Kennedy/Jenks Consultants will direct its subcontractors to limit the proximity of equipment to overhead power transmission lines according to the following schedule:

Power Line	Distance from Power Line
50 kilovolts (kV) or below	10 feet
50 KV - 200 kV	15 feet
200 KV - 350 kV	20 feet
350 KV - 500 kV	25 feet
500 kV - 750 kV	35 feet
750 kV – 1,000 kV	45 feet

If the voltage of a power line is unknown, assume it is 1,000 kV.

5.1.8 Other Safety Considerations

When working at the site, personnel should be aware of the following situations or activities:

- Vehicle, truck, and equipment traffic on residential streets and nearby service roads. Use barricades, signage, and/or a traffic control plan, where appropriate. Kennedy/Jenks Consultants personnel are NOT trained in and are NOT authorized to set up traffic control or work as a highway flagger.

- Working with hand and small power tools. Utilize tools only for the purpose for which they were designed. Inspect all tools and equipment before they are used. Immediately remove from service any tool or piece of equipment that is damaged. Be aware of the potential of a burning hazard should equipment get hot during use.

- Do not wear any jewelry (including finger rings) or loose fitting clothes that may get caught in equipment while conducting field activities.

- Personnel should be aware of the potential presence of black widow spiders, wasp/hornets, or snakes in wellhead or other enclosures.

- When driving, personnel should be aware of the potential for wildlife to be on the road, or run into the road. Driving after dark should be limited as much as possible.

- When driving, personnel should be aware of the potential of falling asleep at the wheel and take rest stops and breaks, at regular intervals or as needed. Do not drive to and from the site if weather conditions make road travel unsafe.

5.2 Potential Chemical Hazards

Diesel-, heavy oil-, and gasoline-range hydrocarbons, and benzene, toluene, ethylbenzene, and total xylenes (BTEX) have been detected in groundwater and soil samples collected at the site. Field personnel could potentially be exposed to petroleum hydrocarbons at the site by direct contact with soil or groundwater, through inhalation of dusts containing organic chemicals or through inhalation of organic chemical vapors. Field personnel will minimize potential chemical hazards by 1) avoiding direct contact with groundwater and soil, 2) performing air monitoring to determine necessary level of personal protective equipment, and 3) avoiding generation of dust. Ingestion of particulate matter containing chemicals is another general exposure route. However, for site personnel, the potential for this type of exposure is minimal. Safe work practices, including restriction of eating, drinking, or smoking to certain times and places, will be enforced at the work site.

5.2.1 Groundwater Samples

Chemicals detected in groundwater from the site and the highest detected concentrations are listed in Table 1.

5.2.2 Soil Samples

Diesel- and residual -range hydrocarbons have been detected in subsurface soil samples collected at the site. The highest reported concentrations are listed in Table 2.

Available Threshold Limit Values (TLV) or Permissible Exposure Limits (PEL) published for the chemicals detected in soil and groundwater are listed in Table 3.

5.2.3 Chemical Use Plan and Safety Data Sheets (SDS)/Hazard Communication

In addition to site-related chemicals, Kennedy/Jenks Consultants field personnel may work with compressed gasses, decontamination materials, and other materials that present potential health and safety issues. Typical chemicals that may be brought to the site are listed below.

- Simple Green

- Hydrochloric acid (HCl)

- Sulfuric acid (H_2SO_4)

Kennedy/Jenks Consultants has a "cradle to grave" policy regarding the purchase, storage, use, transportation, and disposal of chemicals used in the field. The Chemical Use Policy and Procedures are attached as Appendix G to provide guidance on the proper protocols for chemical use in the field. The Chemical Use Plan (see Appendix F) is not required to be completed for the three chemicals (Simple Green, HCl, and H_2SO_4) that will be brought onto the site.

Kennedy/Jenks Consultants has a Hazard Communication Written Program and training programs that cover these materials. Personnel conducting field activities must complete a review of the Hazard Communication Written Program and site-related chemical hazards prior to starting field activities.

The Hazard Communication Written Program is part of Kennedy/Jenks Consultants Health and Safety Operations Manual.

Copies of the SDS for chemicals listed in this section are provided in Appendix G.

Section 6: Community Hazard Analysis

Generally, insignificant particulate and vapor emissions are generated during routine soil and groundwater sampling activities. During construction-related activities, particulate and vapor emissions may increase above concentrations generated during routine soil and groundwater sampling activities. Therefore, activity-specific health and safety addenda will be developed for activities where elevated particulate and vapor emissions may develop. Onsite worker exposure to chemicals at concentrations of concern is not expected. Potential exposures to the surrounding community will likely be much less than potential onsite worker exposure and is, therefore, also not expected to be of concern.

Use of barricades, caution tape, or signage to keep the general public away from working areas should be used where and when appropriate. At a minimum, keep public and non-essential personnel at least 50 feet away from an active drilling area. This can be accomplished using barricades, cones, vehicles, and caution tape.

Section 7: Protective Actions

7.1 PPE

Field personnel will wear equipment to protect against potential physical and chemical hazards, which have been identified herein and those that become apparent in the field. Guidelines for Contaminants Commonly Encountered at Kennedy/Jenks Consultants Sites provide guidance in assessing potential hazards and selecting the appropriate protection. Level D protection will be required at a minimum for field activities at the site. Level D personal protective equipment to be used may include all items on the following list that are denoted by an asterisk (*).

The level of protection employed may be upgraded, as deemed necessary by the SSO. If non-routine field activities are initiated, the level of protection will be specified in the activity-specific health and safety addenda.

Personal Protective Equipment (PPE) and Monitoring Equipment

Eyes: ☒ Safety Glasses* ☐ Face Shield
Boots: ☒ Safety-Toe* ☐ Work ☐ Rubber ☐ Other
☒ Class II High-Visibility Reflective Safety Vest*
☒ Hard hat (six-point suspension)*
☒ Ear Muffs/Plugs
☒ Work Gloves ☐ *Neoprene* ☐ *Rubber* ☒ *Nitrile*
☐ Suits: ☐ *Cotton* ☐ *Tyvek* ☐ *Nylon* ☐ *Other*

☐ Respirator: (Type/Cartridge: *specify)*
☒ Emergency Eyewash Bottles
☐ Spill Kit
☒ Fire Extinguisher
☒ First Aid Kit
☒ Life Jackets
☐ Safety Belt/Harness/Tripod
☒ Lights *(type: Flashlight)*
☒ Camera/Video
☒ Cell Phone

☒ Lockout Tags and Locks
☐ Ventilator/Fan
☐ Volt/Ampere Meter
☐ Four Gas Meter *(calibration date: specify)*
☐ OVA *(calibration date: specify)*
☐ OVM *(calibration date: specify)*
☐ Hydrogen Sulfide Meter *(calibration date: specify)*
☐ Draeger Detection Tubes
☒ Soil Sampling Kit
☐ pH Meter/Paper
☐ Conductivity/Temperature Meter
☐ Metal Detector
☒ Interface Probe
☒ Peristaltic Pump
☒ YSI
☐ Other: specify

7.2 Work Zones

Work zones, including designation of an Exclusion Zone, a Contamination Reduction Zone, and a Support Zone, will be established for any field activity that requires Level C protection or greater. Work zones will be clearly marked in the field. Work zones may vary depending on the proposed field activity and will be established in the activity-specific health and safety addenda.

7.3 Monitoring

7.3.1 Hazardous Substances

As appropriate, field personnel will perform air monitoring with a direct reading organic vapor analyzer (OVA, OVM, or HNU) in the breathing zone at each work location. All readings shall be recorded in field logs. All direct reading instruments shall be calibrated according to the manufacturer's specifications. The following action levels will be used.

- If OVA readings for a particular work area consistently exceed 5 parts per million (ppm) above background, then sampling will cease and personnel will withdraw from the work area.
- If concentrations persist above 5 ppm, then Level C protection will be required if work is to continue.
- If OVA readings exceed 10 ppm in the breathing zone while workers are in Level C protection, then work will cease, and the source of the emission will be determined and eliminated before work continues.
- Periodic measurements of the area will be taken before re-entry to ensure lower exposure limit (LEL) has been reduced to safe working levels.

7.3.2 Explosive Limits

If conditions encountered during drilling or sampling suggest potentially explosive conditions may exist, the SSO will direct explosimeter monitoring be conducted. The following explosimeter monitoring action levels will be used:

- If gas or vapor concentration is less than 10 percent of its LEL, continue investigation.
- If concentrations are between 10 and 25 percent of its LEL, continuously monitor site and continue investigation with extreme caution.
- If concentrations are greater than 25 percent of LEL, withdraw from area immediately.

7.3.3 Noise

Field personnel will initially monitor noise levels associated with equipment and machinery with a direct reading portable noise level monitor unless based on experience, it is known that hearing protection is not necessary. Readings will be taken within the normal worker hearing zone. If maximum noise levels exceed 85 decibels at any time during site operations, hearing protection will be worn.

The OSHA permissible noise exposure limit is 90 decibels as an average exposure over an 8-hour work period. If an employee's 8-hour time-weighted average noise exposure for any day is in excess of 85 decibels, the employee must participate in a hearing conservation program. For most field activities, it is unlikely the employee exposure in excess of 85 decibels for 8 hours will occur. Although a written hearing conservation program is not required, Kennedy/Jenks

Consultants will provide field personnel with appropriate hearing protection (i.e., earmuffs or plugs) whenever noise levels have the potential to exceed 85 decibels.

All contractors are responsible to ensure whether a hearing conservation program is warranted per site conditions and are to ensure compliance with applicable OSHA regulations.

7.4 Site Control

Work zones will not be established for Level D activities. Individuals not directly involved in ongoing work will be requested to stay at least 50 feet away from Level D activities. For work inside a building, access will be controlled using building access control.

7.5 Decontamination

For activities requiring Level D protection and modified Level C protection without established work zones, it is unlikely major decontamination will be necessary. At the conclusion of each day or work period, disposable gloves and coveralls will be removed and disposed of in onsite containers.

If full Level C protection is required, minimum decontamination procedures associated with Level C protection will be followed and established within the Contamination Reduction Zone. These procedures are presented in Table 4.

7.6 Training

Kennedy/Jenks Consultants personnel participating in field activities will have completed the Hazardous Waste Operations and Emergency Response 40-hour health and safety training course (29 CFR 1910.120), or have equivalent training, and have undergone annual 8-hour refresher training. Training requirements are discussed in Kennedy/Jenks Consultants Health and Safety Operation Manual. Prior to each work day, a JSB meeting will be held at the site to familiarize personnel with health and safety issues, protective equipment, emergency information, and supplies and to discuss special topics.

7.7 Medical Monitoring

Kennedy/Jenks Consultants personnel participating in field activities will be included in a medical monitoring program. The program includes a baseline physical examination, pulmonary function test, and blood and urine tests. Periodic (annual) examinations will be provided to employees who are exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year. Annual examinations will also be provided to Kennedy/Jenks Consultants employees who wear a respirator for 30 days or more a year or as required by 1910.134. Details of the medical program are included in the Kennedy/Jenks Consultants Health and Safety Operations Manual.

7.8 Sanitation and Illumination

The site may have drinking water, washing water, and restroom facilities available. If drinking water is not available at the site, a sufficient amount of water will be provided to accommodate each employee with 1 quart of water per hour. The water will be kept cool by means of a portable cooler with ice or similar means.

No eating, drinking, smoking, or gum or tobacco chewing is allowed in restricted areas.

Activities will take place during daylight hours. Because natural illumination (approximately 50- to 200-foot candles) will be sufficient to meet the 5-foot candle requirement for general site areas, no additional illumination will be required.

Section 8: Emergency Response Plan

Hazard recognition is an essential part of the Emergency Response Plan. Initiation of the contingency plan relies on the employee's ability to recognize an emergency or potential for an emergency. The following is a list of events that will immediately initiate emergency procedures:

- Explosion
- Fire
- Release of organic vapors or particulate above the action levels
- Personal injury
- Failure or expected failure of runon/runoff control measures
- Natural occurrences (i.e., lightning, tornado, high winds, etc.)
- Spills

8.1 Emergency Communications

Emergency communications will consist of two methods.

8.1.1 Verbal Communication

Verbal communication will be the primary method of emergency communication between onsite personnel, distance permitting.

8.1.2 Telephones

Telephones are used for routine communication and to notify offsite agencies of incidents and request assistance. Emergency telephone numbers are given in Section 9.

8.2 Emergency Protocol

When an event recognized as an emergency occurs, verbal communication will be used to notify personnel. As soon as the alarm is activated, the SSO will be notified.

The SSO will take into account the following information:

- Nature of emergency
- Wind direction
- Location of personnel

- Monitoring results
- Emergency equipment available
- Offsite population.

Based on this information, the SSO will direct appropriate emergency action and agency notification. After the emergency has been controlled and the site is considered safe to re-enter, the SSO, in coordination with the Project Manager, will direct remedial action to restore the site to full operating condition.

The SSO will investigate the nature and cause of the incident so work procedures can be modified to minimize the likelihood of the incident's recurrence.

All incidents must be reported in a timely, appropriate manner to the Director of HS&E or H&S Manager. An incident is any unplanned event resulting in injury, damage, loss of assets, adverse publicity, or which requires notification of a regulatory agency, regardless of severity. All Kennedy/Jenks Consultants personnel should report an incident to the SSO. The SSO will report to the Project Manager, who is responsible for notifying the Director of HS&E or H&S Manager..

Each incident will be investigated and a Root Cause Analysis Report will be generated and forwarded to the Project Manager and the H&S Manager.

If work zones are established, the Exclusion Zone will have several emergency exits, which will allow safe egress in multiple directions from any point onsite. The exit selection will be based on the emergency location, type of emergency, and wind direction. Upon hearing the evacuation signal or otherwise being notified of an evacuation, employees will immediately travel to the assembly area located at the decontamination station.

Employees will follow a route that avoids locations downwind from the emergency. If emergency exits are used, employees will proceed to the assembly area by the quickest route possible. When the assembly area is reached, employees will immediately check in with the SSO. The site will remain evacuated until the all clear signal has been given.

8.3 Emergency Supplies

The following is a list of emergency equipment available to take to the site:

- Portable emergency eye wash bottles
- First aid supplies
- Fire extinguisher.

All personnel will have a thorough understanding of the HASP before starting work. It will be reviewed periodically to keep it current with new or changing site conditions or information.

8.4 Injury Response

In the event of an employee injury in a contaminated area, consideration must be given before moving the injured and contaminated employee to outside the restricted contamination area. The nature of the injury, hazards posing an immediate danger, and other factors must all be weighed before moving an injured employee who is wearing contaminated PPE. Initial responders should follow directions from 9-1-1 personnel or the Director of HS&E or H&S Manager.

Section 9: Section 9: Reporting (Injury/Illness, Property Damage, or Near Miss)

9.1 Injury/Illness Care and Notification Procedures

9.1.1 Emergency Services (9-1-1)

Call 9-1-1 for critical injuries or illnesses (i.e., head injuries, uncontrolled bleeding, difficulty breathing, chest pain, or altered level of consciousness) or if an employee or his/her supervisor has immediate concerns about an injury or illness.

9.1.2 Injury/Illness Intervention

Kennedy/Jenks Consultants has retained WorkCare, a team of occupational physicians, to provide our employees with effective treatment of non-critical work-related injuries and illnesses. WorkCare provides on the spot, 24/7 employee consultations at the time an on-the-job incident occurs, as well as post-accident follow-up and consultation.

9.1.3 When to Call WorkCare

In the instance of a non-critical workplace injury or illness, an employee should call WorkCare at (888) 449-7787 to receive instruction on how to contact one of its clinicians and contact their immediate supervisor as soon as possible. Common non-critical workplace injuries/illnesses include:

- Back sprains
- Slips, trips, falls
- Shoulder strains
- Contact with a harmful substance.

9.1.4 Employee Role

The injured employee, if able, must do the following:

- Report any non-critical injuries/illness to WorkCare at (888) 449-7787 and, as soon as possible, to their immediate supervisor. WorkCare will notify the Director of HS&E and the H&S Manager of the injury or illness. The Director of HS&E will immediately notify the appropriate Business Unit President and Director of Operational Excellence of the injury or illness.

- If WorkCare determines medical attention is required, transportation must be provided for the injured employee. An injured employee must not transport himself/herself to a facility for medical treatment. If a co-worker is not available to transport the injured employee, an ambulance, a taxi, or other means of transportation must be provided, unless the employee is working in a remote area and no other form of transportation is available. WorkCare will send the employee to an approved local facility and inform the treating physician the injury is work related.

9.1.5 Deputy Project Manager Role

The Deputy Project Manager must do the following:

- Make sure the injured employee contacts WorkCare and is provided transportation to immediately obtain any required medical care from an approved doctor or hospital, if required.
- Provide emergency ambulance service if needed for critical injuries or illnesses, if required.
- Notify the Director of HS&E and Business Unit H&S Manager of the injury or illness.

9.1.6 Injured Subcontractor or Other Non-Kennedy/Jenks Consultants Employee

In the case of injuries or illness to non-employees, the appropriate staff member should ensure they receive proper medical attention and their supervisor and the Director of HS&E are notified immediately. The Director of HS&E will notify senior management.

9.2 Property Damage and Near Miss Incident Investigation

All work-related property damage and near miss incidents will be investigated by Kennedy/Jenks Consultants in a timely manner. Minor incidents and "near misses" will also be investigated so the risk of serious occurrences can be reduced in the future. All serious incidents and serious "near misses" will be investigated by the Director of HS&E or the H&S Manager.

- Near Miss. Incidents where no property was damaged and no personal injury sustained, but where, given a slight shift in time or position, damage and/or injury easily could have occurred.
- Rule of Thumb. If you need to ask yourself if the incident was a near miss or not, you have answered the question, and it is a near miss.

Forms

The Injury/Illness, Property Damage Incident, and Near Miss Reporting Forms are included as Appendix H.

Section 10: Emergency/Team Contacts & Approvals

Emergency Telephone Numbers

	Name	Phone
Client Site Contact	Shane DeGross	253-591-2567 (office) 253-208-9043 (cell)
WorkCare (Non-Critical Injuries)	WorkCare	888-449-7787
Fire Department[1]		9-1-1
Hospital:[2] Mid-Columbia Medical Center	1700 E 19th Street, The Dalles, OR 97058	541-296-1111
Directions to hospital[2]: See attached map		
Ambulance		9-1-1
Police Department		9-1-1
Kennedy/Jenks Consultants:		
Deputy Project Manager	Ryan Hultgren	253-835-6432 (office) 253-549-9725 (cell)
Business Unit Health and Safety Manager	John Jindra	253-835-6466 (office) 253-254-1079 (cell)
Site Safety Officer	Joe Sawdey	253-835-6406 (office) 952-607-6788 (cell)
Director of Health, Safety and Environment	Bert Drews	415-243-2526 (office) 415-350-7804 (cell)

[1] The local fire department prefers the public use 911 to assure the proper assistance in case of accident or injury.
[2] Attach written directions and map showing route to urgent care and hospital (see Attachment 1).

Project Team Members Participating in Field Activities

Name	Affiliation	Responsibility	Signature/Date
Joe Sawdey	K/J	Field Geologist/SSO	Joseph Sawdey 1/22/18
Alice Robinson	K/J	Field Engineer	Alice Robinson 1/19/18
Julia Schwarz	K/J	Field Geologist	Julia Schwarz 1/22/18
Tom Haskins	K/J	Field Geologist	Thomas Haskins 1/19/2018
Katie Teague	K/J	Field Geologist	Katie Teague 1/19/18

Approvals

	Name	Signature/Date
Project Manager	Ryan Hultgren	
Business Unit Health and Safety Manager	John Jindra	John P Jindra 1/19/18

CC: Project File
PM Portal

Tables

Table 1: Chemicals Detected In Groundwater Monitoring Samples

Chemical	Maximum Concentrations (µg/L)	Sample Location
Diesel-range hydrocarbon	17,000	WMW-3
Residual-range hydrocarbon	8,300	WMW-3

Notes:
µg/L = micrograms per liter

Table 2: Chemicals Detected in Soil Samples

Chemical	Maximum Concentrations (mg/kg)	Sample Location
Diesel-range hydrocarbon	52,000	B-12-11
Residual-range hydrocarbon	71,000	B-12-2

Notes:
mg/kg = milligrams per kilogram

Table 3: Chemical Allowable Exposure Values and Exposure Symptoms

Chemical	TLV TWA[a]	STEL[b]	PEL[b]	Acute Exposure Symptoms[c]	Target Organs[c]
Diesel/Heavy Oil	100 ppm	N/A	N/A	Irritant to eyes, nose, and throat	Eyes, skin[d], liver, kidneys, respiratory system, CNS

Notes:

(a) TLV TWA = threshold limit value – 8-hour time-weighted average.
STEL = short term exposure limit.
American Conference of Governmental Industrial Hygienists. TLV and Biological Exposure Indices for 1997.
TLV TWA reported in ppm represents parts of vapor per million parts of air by volume at 25 degrees Celsius (°C) and 760 torr. TLV - TWA reported in milligrams per cubic meter (mg/m^3) represents milligrams of substance per cubic meter of air.

(b) PEL = Federal Occupational Safety and Health Administration (OSHA) (29 CFR 1910 Subpart Z) Permissible Exposure Level based on 8-hour time weighted average.

(c) Source: U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards. June 1994. Sittig, Marshall. 1985. Handbook of Toxic and Hazardous Chemicals and Carcinogens. Park Ridge, New Jersey. Noyes Publications.

(d) Skin notation indicates route of exposure through cutaneous absorption.

(e) CNS = central nervous system.

Table 4: Measures for Level C Decontamination

Station	Description
1	**Equipment Drop** Deposit equipment used onsite (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
2	**Outer Garment, Boots, and Gloves Wash and Rinse** Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
3	**Outer Boot and Glove Removal** Remove outer boots and gloves. Deposit in container with plastic liner.
4	**Canister or Mask Change** If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
5	**Boot, Gloves and Outer Garment Removal** Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
6	**Face Piece Removal** Face piece is removed. Avoid touching face with fingers. Face piece is deposited on plastic sheet.
7	**Field Wash** Hands and face are thoroughly washed. Shower as soon as possible.

Attachment 1

Map and Written Directions to Local Hospital

bing maps

From: Bridgeway Rd, Wishram, WA 98673

To: 1700 E 19th St, The Dalles, OR 97058

Notes: Type your route notes here

32 min, 16.5 mi

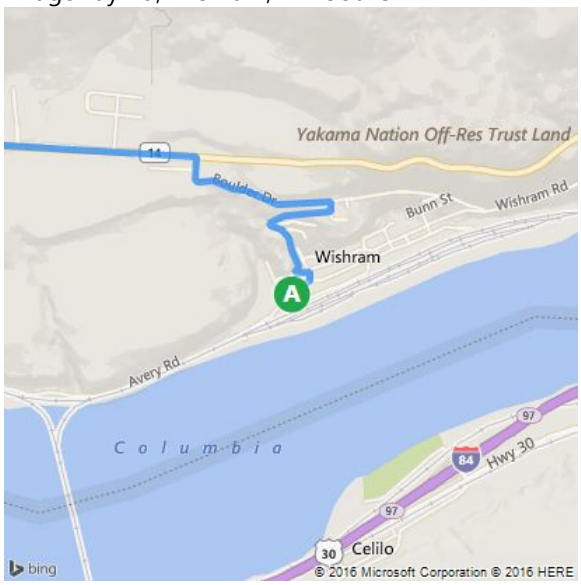
Light traffic
28 min without traffic
Via WA-14, US-197

Bridgeway Rd, Wishram, WA 98673

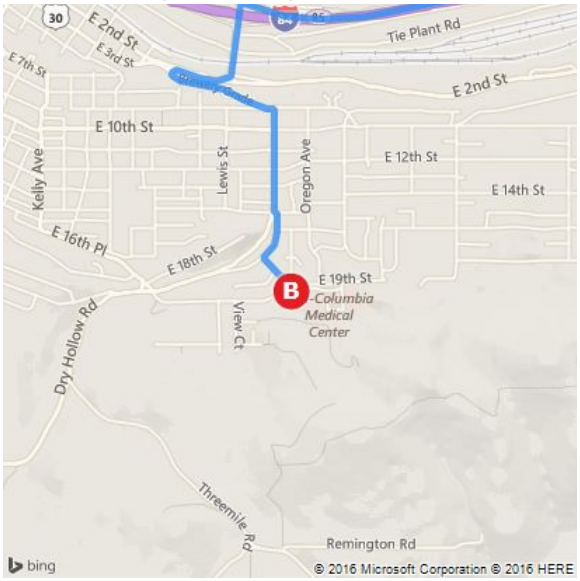
↑	1.	Depart **Bridgeway Rd** toward Main St	108 ft
↱	2.	Bear **right** onto **Main St**	397 ft
↰	3.	Turn **left** onto **Holschuh St**, and then immediately turn **right** onto **Bluff Rd**	0.4 mi
↰	4.	Turn **left** onto **Ross St**, and then immediately turn **left** onto **Boulder Dr**	0.5 mi
↰	5.	Turn **left** onto **WA-14**	9.2 mi
↰	6.	Turn **left** onto **US-197** • *Entering Oregon*	3.4 mi
84	7.	Take ramp **right** for **I-84 West** toward **Portland**	1.3 mi
↱	8.	At exit **85**, take ramp **right** toward **The Dalles / National Hist. Districts / City Center**	0.2 mi
↰	9.	Turn **left** toward **US-30 / E 2nd St**	0.3 mi
↱	10.	Turn **right** onto **US-30 / E 2nd St**	0.1 mi
⟳	11.	At roundabout **2nd** exit onto **Brewery Grade**	0.3 mi
↖	12.	Bear **left** onto **E 9th St**, and then immediately turn **right** onto **Dry Hollow Rd**	0.3 mi
↰	13.	Turn **left** onto **E 14th St**, and then immediately turn **right** onto **Montana St**	0.2 mi
↰	14.	Turn **left** onto **E 17th St**	0.1 mi
↱	15.	Turn **right** onto **Nevada St**	200 ft
	16.	Arrive at **Nevada St** The last intersection is E 17th St If you reach E 19th St, you've gone too far	

1700 E 19th St, The Dalles, OR 97058

Bridgeway Rd, Wishram, WA 98673



1700 E 19th St, The Dalles, OR 97058



Attachment 2

BNSF Safety Action Plan (SAP)

Print

CONTRACTOR SAFETY ACTION PLAN

1. INTRODUCTION

The purpose of a Safety Action Plan (SAP) is to facilitate and organize employer and employee actions and be prepared in event of a workplace emergency. Well-developed plans and proper employee training that helps employees understand their roles and responsibilities will result in fewer and less severe employee injuries and less equipment damage. Putting together a comprehensive SAP that deals with those issues specific to your worksite is not difficult. It involves workplace evaluation and describing how employees will respond to different types of emergencies, taking into account your specific worksite layout, structural features, and emergency systems.

SAFETY MANAGEMENT SYSTEM (SMS)

A Safety Management System (SMS) is an over-arching document that contains all of the Environmental, Health (Industrial Hygiene), and Safety programs within your company. It provides a systematic way to identify hazards and control risks while maintaining assurance that these risk controls are effective. The Safety Action Plan is a component of the Safety Management System.

The American National Standards Institute (ANSI) standard ANSI Z10 describes minimum requirements for an occupational safety and health management system and applies to organizations of all sizes and kinds. There other resources available for assistance in developing a SMS such as your insurance carrier, or the National Safety Council.

BNSF Railway CONTRACTORS ARE REQUIRED to complete a BNSF Railway Contractor Safety Action Plan. The Safety Action Plan Form is available for download at **http://bnsfcontractor.com. (http://bnsfcontractor.com)**

2. GENERAL INFORMATION

Document	**Recipients**
Your Name:	Tom Haskins
Your Title/Position:	Staff Geologist
Company Name:	Kennedy / Jenks Consultants
Company contact information:	32001 32nd Avenue South, Suite 100 Federal Way, Washington 98001
Your employee in charge (EIC) onsite:	Joe Sawdey
EIC contactinformation:	952-607-6788
Work site location:	BSNF Wishram Railyard, 500 Bridgeway Road, Wishram, Washington
Type of work being performed:	Groundwater monitoring and subsurface investigation activities
Primary BNSF point of contact:	Shane DeGross
General or subcontractor:	General Contractor
Other: (optional)	

3. CONTRACTOR REQUIREMENTS

CONTRACTOR COMPLIANCE

Suppliers working for or with BNSF Railway Work Groups are REQUIRED to complete a Safety Action Plan (SAP).

The number of SAP’s submitted by a particular supplier during a calendar year will vary based on factors such as number of work locations and the nature of the work to be performed.

General Contractors may submit one Safety Action Plan to include sub-contractors on a project, or require each sub-contractor to submit their own completed Safety Action Plan form. The General Contractor must clearly indicate on a Safety Action Plan form that sub-contractors are included in coverage, when applicable.

A copy of the Safety Action Plan form is available for download at http://bnsfcontractor.com. (http://bnsfcontractor.com)

Do you need to submit a Safety Action Plan?

Example 1: Service contractors, utility firms and Department of Public Work Groups that work at fixed locations during the course of a year would only need to submit ONE Safety Action Plan form per calendar year, unless key information changes during the course of the year.

Example 2: Engineering - Construction Contractors and public project contractors would submit project specific Safety Action Plans. It is possible that a large contractor may have several projects underway at the same time across the BNSF system requiring one Safety Action Plan per project.

Example 3: Fiber Optics firms and service contractors, who are constantly on the move during the course of the work week, or during the course of the project, would need to indicate this in the Safety Action Plan form that emergency response information is updated as necessary, maintained on-site and communicated during daily job safety briefings.

SAFETY ACTION PLAN RETENTION & MAINTENANCE

Your company must maintain an ELECTRONIC COPY of the Safety Action Plan:

- An electronic copy shall be uploaded in the BNSF Contractor Orientation web site at http://bnsfcontractor.com (http://bnsfcontractor.com)

Your company must maintain HARD COPY of the Safety Action Plan:

- Submit a hardcopy of your completed Safety Action Plan to your BNSF Project Manager or Employee in Charge (EIC).
- Maintain a hard copy of your completed Safety Action Plan on-site with each of your work groups.

You may also provide your BNSF Project Manager or EIC and work groups with additional detailed information to support the Safety Action Plan.

COMPANY INJURY HISTORY

Contractors must provide the **"Frequency and Severity Rates"** for each of the PREVIOUS THREE CALENDAR YEARS. Frequency and severity rates data is used to estimate the organizational performance on safety.

Frequency Rate

Experience on BNSF = # of Recordable Injuries x 200,000 divided by the # of Actual Hours Worked for BNSF

Severity Rate

Severity Rate = # of Lost Days x 200,000 divided by the Actual Hours Worked for BNSF

Year	Frequency/Incident Rate	Severity/Lost Workday Rate
2017	4.93	0
2016	0	0
2015	0	0

CORRECTIVE ACTIONS FOR PAST INJURY EXPERIENCE

Please attach as an Addendum to the Safety Action Plan.

The safe operations and prevention of incidents and injuries is priorities in the BNSF culture. The feedback of Contractors' past experiences plays a major role and Contractors must have a system in place to identify the lessons learned and implement effective actions to prevent incidents.

ATTACH AN ADDENDUM OF CORRECTIVE ACTIONS TO THE SAP.

4. EMERGENCY PREPAREDNESS

ON SITE EMERGENCY INFORMATION

Written Emergency Preparedness information needs to be at the job site with work groups.

Work groups performing work on project(s) in a fixed work location must complete the information below for the fixed location.

Work groups that will be on the move during the course of a project must update this information as necessary and retained and maintained with each work group.

The BNSF 24-hour Emergency Phone Number is 1-800-832-5452

Emergency preparedness plans must be developed by the contractor and communicated to the contractor's/subcontractor's employees. In some cases, contractors may need to interface with BNSF Railway Project Manager or EICs to obtain specific addresses, the names of local, responsible fire/medical/police agencies.

Please provide the following information:

PROJECT/WORK LOCATION	BNSF Wishram Railyard - 500 Bridgeway Road, Wishram, Washington
CONTACT	Shane DeGross and Jamie Richardson
Who is CPR qualified?	Alice Robinson, Diane Rauch, Joe Sawdey, John Jindra, Julia Schwarz, Katie Teague, Ryan Hultgren, Steve Misner, Tom Haskins, Ty Schreiner, Todd Miller, Jarod Fisher, Matt Biondolillo
Who is First Aid qualified?	Alice Robinson, Diane Rauch, Joe Sawdey, John Jindra, Julia Schwarz, Katie Teague, Ryan Hultgren, Steve Misner, Tom Haskins, Ty Schreiner, Todd Miller, Jarod Fisher, Matt Biondolillo
What are the numbers for emergency services and estimated response times?	
Medical Phone:	911
Medical Response Time:	Approximately 20 minutes
Fire Phone:	911

Fire Response time:	Approximately 20 minutes
Police Phone:	911
Police Response Time:	Approximately 25 minutes
Is there cellular, radio and/or land-line contact? *If not, establish this contact.	Yes
Who is responsible for making the emergency call? (include contact information)	Joe Sawdey 952-607-6788 or Alice Robinson 626-390-7298
Provide written directions to job site (latitude/longituderecommended)	Site is located south of intersection of Coffield Canyon Road and Railroad Avenue and north of the Columbia River (45.656667, -120.967522)
Who is assigned to meet emergency response personnel? (include contact information)	Joe Sawdey 952-607-6788 or Alice Robinson 626-390-7298

5. SAFETY ACTION PLAN ELEMENTS

SAFETY ACTION PLAN AFFIRMATION

A copy of your completed Safety Action Plan shall be uploaded (http://bnsfcontractor.com) into this BNSF Contractor Orientation site. Additionally, you should print a copy of this Safety Action Plan, keep a Master Copy, and provide a copy to your BNSF Project Manager and EIC, as well as each of your on-site work groups.

The below statements in each row **SHALL BE CHECKED** and implemented within your safety plan; by selecting the Program In Place option you affirm that the training will be accomplished. If these elements do not apply please select the OPT Out option.

This Safety Action Plan will not be accepted unless each element is checked.

Selected Option	Safety Program Element	Regulatory Reference
	Asbestos	OSHA 1910.1001 & 1926.1101
	Arc Flash/Electrical Worker	NFPA 70E & OSHA Subpart S
	Confined Space Entry	OSHA 1910.146
	DOT Training	DOT – 390-399
Yes	**Environmental/Hazardous Waste**	OSHA 1910.120
	Excavation (Trenching & Shoring)	OSHA 1926.650-652
	Fall Protection/Bridge Worker Safety	OSHA 1926.500-503 & 1926.760; FRA 214.101, .103, .105, .107 & Subpart B
Yes	**FRA Roadway Worker Protection OnTrack Safety**	BNSF MWOR Chapters 11 & 12
Yes	**Hazard Communications**	OSHA 1910.1200
Yes	**Hearing Conservation**	OSHA 1910.95
	Lead Safety	OSHA 1910.1025
	Lockout/Tagout (Hazardous Energy Control)	OSHA 1910.147
	Radiation Safety	OSHA 1910.97 & 1910.1096
	Respiratory Protection	OSHA 1910.134
Yes	**Personal Protective Equipment**	OSHA 1910.132, .133, .135, .136, .137, .138; FRA 214.111, .113, .115, .117
	Other Safety Program Element:	**Other Regulatory Reference:**

6. EMPLOYEE TRAINING

TRAINING PROGRAMS & REGULATORY COMPLIANCE

This program & training summary shall cover/support the provisions of potential work that your company has contracted to perform for BNSF or its General Contractor(s), including Competent or Qualified Worker (http://www.osha.gov/sltc/competentperson/index.html) training.

- Your company is responsible for this determination in compliance with your BNSF contract.

- Safety Training shall be conducted by/through the Contractor's Company. All regulatory references are OSHA – 29CFR 19XX.XX; FRA – 49 CFR243; DOT – 49CFRXXX
- Employee non-compliance shall result in their removal from BNSF property.
- Copies of training programs do not need to be provided to BNSF Railway.
- BNSF does not conduct safety training for personnel other than BNSF employees

Check below, the applicable, required safety programs provided for in your Safety Action Plan and the related training that your company has provided to your employees, who will be working on BNSF property.

If your company does not provide work requiring a specific program please leave the input fields blank.

Safety Programs	Training Completed	Enter Name of Competent/Qualified Person if applicable
Asbestos	☐	
Arc Flash/Electrical Worker	☐	
Confined Space	☐	
DOT Training	☐	
Environmental/Hazardous Worker	☑	Alice Robinson, Diane Rauch, Joe Sawdey, John Jindra, Julia Schwarz, Katie Teague, Ryan Hultgren, Steve Misner, Tom Haskins, Ty Schreiner, Todd Miller, Jarod Fisher, Matt Biondolillo
Excavation (Trenching/Shoring)	☐	
Fall Protection	☐	
FRA Bridge Worker Safety	☐	
FRA Roadway Worker Protection - On-Track Safety	☑	Alice Robinson, Diane Rauch, Joe Sawdey, John Jindra, Julia Schwarz, Katie Teague, Ryan Hultgren, Steve Misner, Tom Haskins, Ty Schreiner, Todd Miller, Jarod Fisher, Matt Biondolillo
Hazard Communications	☑	Alice Robinson, Diane Rauch, Joe Sawdey, John Jindra, Julia Schwarz, Katie Teague, Ryan Hultgren, Steve Misner, Tom Haskins, Ty Schreiner, Todd Miller, Jarod Fisher, Matt Biondolillo
Hearing Conservation	☑	Alice Robinson, Diane Rauch, Joe Sawdey, John Jindra, Julia Schwarz, Katie Teague, Ryan Hultgren, Steve Misner, Tom Haskins, Ty Schreiner, Todd Miller, Jarod Fisher, Matt Biondolillo
Lockout/Tagout	☐	
Lead Safety	☐	
Respiratory Protection	☐	
Personal Protective Equipment	☑	Alice Robinson, Diane Rauch, Joe Sawdey, John Jindra, Julia Schwarz, Katie Teague, Ryan Hultgren, Steve Misner, Tom Haskins, Ty Schreiner, Todd Miller, Jarod Fisher, Matt Biondolillo
Other Safety Training Programs:		Competent/Qualified Person: if applicable
	☐	

7. PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE COMPLIANCE

Your Company's contract may require a variety of work and tasks in different environments. Contract employers must ensure that all employees have the proper PPE to use for the tasks that they will or may be involved in on BNSF property.

*PPE Compliance is strictly enforced*per the Section 21 of BNSF Safety Rules.

S-21.7 Safety Footwear

A. **Safety Boots**

Safety boots must meet the following criteria:

- Leather or leather-like upper.
- Sturdy no-leather sole that willresist puncture.
- 3/8 to 1-inch defined instep.
- Above ankel (5-inch height as measured from inside boot).
- Minimum ASTM F2412-05, ASTM F2413-5 - 75-pound (100 pounds in Canada) impact and compression class toe.
- Lace-up

B. **Anti-Slip Winter Footware**

Employees will wear anti-slip winter footwear when working in icy and or snowy conditions. Only BNSF approved winter footwar may be worn.

All employees must have appropriate PPE to perform the tasks that are contracted for; including:

- Eyewear and Face Protection
- Steel-toed boots/anti-slip footwear
- Hard Hat
- Hearing Protection
- Gloves/Hand protection
- High-Visibility, ANSI Class II or III vest (based on type of work performed)
- Other specialty PPE as identified/required by BNSF Safety Rules for task at hand

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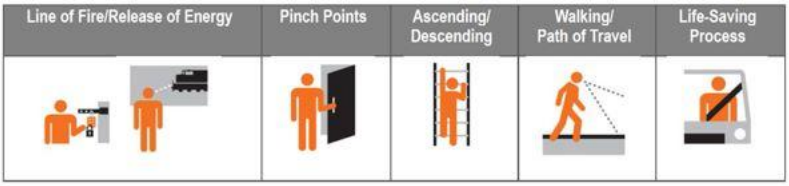
8. JOB SAFETY BRIEFINGS

The Contract employer must ensure their employees receive Job Safety Briefings at the start of each work shift and as needed during the course of the day; e.g. personnel changes, weather changes, and/or changes in assignments.

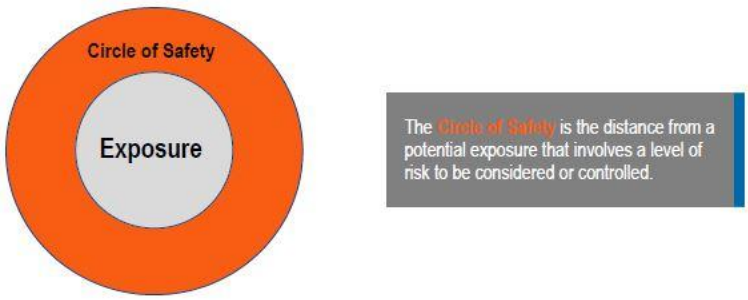
- Job Safety Briefings will include Emergency Preparedness Information and summarize the findings of Risk Assessment activities.
- In addition to critical safety and response preparation, BNSF Job Safety Briefings provide information on potential exposures in the work environment, discussion about the best ways to minimize risk to exposure, and potential cues to pause the work.

To hold an effective Job Safety Briefing, follow these steps:

Consider the exposures illustrated below and how you might protect yourself and your workers.



A measure of prevention to consider when protecting yourself from exposure is the Circle of Safety.



9. FIRE PREVENTION

HOT WORK

Hot work can be defined as cutting and welding operations for construction/demolition activities that involve the use of portable gas or arc welding equipment, or involve soldering, grinding, or any other similar activities producing a spark, flame, or heat.

Will “Hot Work” activities be performed on BNSF property?
No

FIRE PREVENTION AFFIRMATION

If “YES” then all of the following items must be implemented!

1. Risk Assessment activities and Job Safety Briefings will identify procedures/strategies, and equipment available for fire prevention and suppression, as well as, locations where suppression equipment will be staged
2. In right-of-way areas, the local fire agency is contacted to check for hot work bans or restrictions, and determine ability of local agency to provide emergency assistance.
3. In right-of-way areas, the BNSF Railway Right-of-Way Fire Prevention Risk Assessment form will be completed and maintained on the job-site.
4. All right-of-way fires are to be reported to the responsible BNSF Project Manager/EIC
5. List fire prevention and suppression equipment on-site.

10. SAFETY AUDITING

Briefly describe how safety audits will be conducted for work performed on BNSF

Person(s) responsible for audits (includename, title, and contact information)	John Jindra, CSP, ASP IEBU Health and Safety Manager
Frequency of audits	No safety audit will occur
Locations of audits	No safety audit will occur

11. SAFETY COMMUNICATIONS PLAN

Briefly describe how safety-related information is coordinated within your organization.

Communications audience	Alice Robinson, Diane Rauch, Joe Sawdey, John Jindra, Julia Schwarz, Katie Teague, Ryan Hultgren, Steve Misner, Tom Haskins, Ty Schreiner, Todd Miller, Jarod Fisher, Matt Biondolillo
Topics communicated	Injury and Illness Prevention and Railroad Safety
Frequency of communications	Employees are trained at least annually on railroad safety procedures and issues. Safety managers and site personnel meet (telephone conference) periodically to discuss safety related items.
Method of communications	Kennedy/Jenks Consultants has an Injury and Illness Prevention Plan and Industrial Services Corporate Health and Safety Operations Manual. Job site postings and email are also used to coordinate safety related issues.

12. ROADWAY WORKER PROTECTION / ON TRACK SAFETY

Will any contractors performing Roadway Worker duties be within 25’ of track centerline? Roadway Worker duties include inspection, construction, maintenance or repair of track, bridges, roadway, signal and communication systems, electric traction systems, roadway facilities or roadway maintenance machinery on or near track or with the potential of fouling a track, and other personnel directly involved with their protection.

RWP? Yes

If “YES” then all of the following items must be implemented.

1. The contract employer is responsible for training all of its employees.
2. Each contract employee must be able to provide training documentation upon request.
3. Each contract Roadway Worker In-Charge must maintain a current copy of your Roadway Worker Protection/On Track Safety manual and have it readily accessible.

Appendix A

Job Hazard Analysis:

GeoProbe

Groundwater Sampling and Monitoring

Hand Auger

Hand Tools

Soil Sampling, Logging, and Screening

Vehicle Operation

JOB HAZARD ANALYSIS	**Project No.:** 1896120*00
Job/Operation Title: GeoProbe	**Date:** January 2018
Business Unit: Environment/Industrial	**JHA Reviewed By:** John Jindra
Project Location: Wishram, WA	**JHA Revised By:** Tom Haskins
Person(s) Performing This Job/Task: Joe Sawdey, Tom Haskins, Julia Schwarz, Alice Robinson, Katie Teague	**Deputy Project Manager:** Ryan Hultgren
Job/Task Start Date: January 2018	**Job/Task Duration:** Annual

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Site/GeoProbe Set-up	Struck by/caught between	• Only qualified operator to unload the GeoProbe. • Use spotter. • Unload on level ground surface. • Secure transport vehicle or trailer (emergency break for vehicle, wheel chokes if trailer is disconnected or if the transport trailer is on a sloped surface). • Ensure all tools and rig equipment is secure prior to moving. • Establish site control or hazard warning devices around the unloading area if near the general public or other site workers. • Do not stand directly in front of the GeoProbe as it descends from the transport vehicle/trailer.
Utility Locate	Underground Equipment Utilities	• Investigate to ensure public and private underground utilities have been located by physical inspecting markings. • Ensure boring locations are at least 3 feet from marked underground utility lines
Utility Locate	Overhead Utilities	• Inspect routes to drilling locations for overhead utility lines. • Maintain 10 feet distance for overhead utility lines or minimum clearance distances described in the Utility Locate Acknowledge Form and SOP. • GeoProbe mast must be in the down

Task/Step	Potential Hazards	Recommended Safe Job Procedures
		position while mobilizing GeoProbe to boring locations.
Fueling for drill Rig	Fire Spills	• No smoking during refueling. • Fire extinguisher readily available. • Do not lock nozzle in the open position. • Remain with equipment at all times during refueling.
Mobilizing drill rig and equipment to boring locations	Overturning of drill rig. Struck by objects/Overhead hazard. Falling/Crushing injuries. Rotating / moving parts of drill rig. Struck by drill auger.	• Ensure stable ground and adequate footing for machinery. Adequate ground preparation to support loads. • Establish drill pad if necessary. • Ensure drill rig is level and stabilized. • Tools and equipment secured prior to rig movement. • Do not ride on the GeoProbe. • Do not utilize the GeoProbe to move objects it is not designed to haul. • Complete daily inspection of GeoProbe and equipment. • Ensure appropriate guards are installed or suitable barriers to protect personnel from moving parts.
Equipment Operation	Struck by vehicles and/or equipment. Dermal or inhalation exposure to contaminants. Slips, trips, and falls. Sprains and strains. Failure of drill rig components. Weather. Exposure to dust. Excessive noise.	• Ensure spill kit is readily available. • Properly clean up spills, if safe to do so. • Notify site supervisor if spills occurs. • Kill switch installed, clearly identified, and operational. • Test kill switch at the beginning of each shift. • Ensure all personnel know the location of and how to engage the kill switch. • Properly dispose of used materials. • Always make eye contact and get permission from the vehicle or equipment operator before approaching or crossing the path of any vehicle or piece of equipment. • Follow traffic control plans if developed. • Wear Class II safety vest. • Be aware of site traffic and pedestrians.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
		• Establish a work zone large enough to protect those outside the work area from the hazards inside the work area. • Loose clothing, long hair, and jewelry to be safely secured. • Do not approach an operating GeoProbe without making eye contact and getting permission from the operator. • Wear safety toe boots, Class II safety vest, hardhat, safety glasses. • Conduct air monitoring for potential hazardous atmospheres as described in the project's HASP. • Don PPE as prescribed in the project's written HASP. • Ensure good footing. Remove mud from work boots when possible. • Maintain good housekeeping in work area (i.e., remove excess materials, tools, and trash that create a slip or trip hazard. • Use proper lifting techniques and get help with heavy or awkward loads. • Use two people to lift object greater than 50 pounds. • Defective components repaired prior to return to service. • Lockout/tag out procedures used prior to maintenance • GeoProbe not to be operated in severe inclement weather, such as lightning storms, high winds, or severe rain. Mast to be lowered in these conditions. • Fugitive dust suppressed with water or by other approved means. • Fugitive dust suppressed with water or by other approved means. • Wear hearing protection while the GeoProbe is running.
Handling Probes and Augers	Cuts/abrasions. Struck by. Stains/sprains. Contact with contamination.	• Inspect equipment for sharp protrusions or debris. • Wear cut resistant gloves. • Make sure the path is clear before moving

Task/Step	Potential Hazards	Recommended Safe Job Procedures
		tools. • Maintain good housekeeping. • Wear protective safety toe boots. • Use proper lifting techniques. • Utilize the GeoProbe move tools. • Use two people to lift objects greater than 50 pounds. • Wear PPE as described in the Site-Specific HASP.
Hoisting operations	Overhead hazards	• Ensure all personnel stand clear during hoisting. • Ensure rigging is not damaged and is rated for what is being lifted.
Waste Disposal	Contact with contaminated debris and water	• Wear PPE as described in the site HASP.
Drum Moving	Strains and Sprains	• Fill drum a maximum of 85% full. • Use a drum dolly or similar mechanical device to move the drum.
Decontamination	Contact with contaminated debris and water	• Perform decontamination according to the site HASP. • Wear poly-coated tyvek with hood and booties, face shield, and nitrile gloves if pressure washing.

JOB HAZARD ANALYSIS	**Project No.:** 1896120*00
Job/Operation Title: Groundwater Sampling and Monitoring	**Date:** January 2018
Business Unit: Environment/Industrial	**JHA Reviewed By:** John Jindra
Project Location: Wishram, WA	**JHA Revised By:** Tom Haskins
Person(s) Performing This Job/Task: Joe Sawdey, Tom Haskins, Julia Schwarz, , Alice Robinson, Katie Teague	**Deputy Project Manager:** Ryan Hultgren
Job/Task Start Date: January 2018	**Job/Task Duration:** Annual

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Mobilizing / Demobilizing Equipment / Supplies at Each Location	Traffic	• Visually inspect vehicle before driving (tires, lights, etc). • Adjust mirrors (views for left, right and rear). • Fasten seatbelts before engaging vehicle. • Cell phone usage is prohibited while driving a vehicle. • Obey posted speed limits and traffic laws. • Place traffic cones behind vehicles as needed to alert vehicular traffic. • When possible, park sampling vehicle facing into traffic for protection. • Remove keys from ignition and engage parking brake when out of the vehicle
Perform Site Safety Inspection	Unidentified Site hazards, potential near-misses	• Assess potential Hazards. Analyze how to reduce risk. Act to ensure sampling is performed safely. • Site safety officer conducts tailgate safety meeting by reviewing Health and Safety Plan [HASP], Vehicle Safety, Job Hazard Analysis [JHA], Evacuation Plan. • Make site-specific changes to JSA, as necessary. • Sign compliance agreement to comply with HASP/JHA. • Identify nearest hospital, location of health and safety equipment (first aid kit/eye/fire extinguisher).
Personal Health & Safety	Heat stress and heat stroke	• Drink plenty of fluids and have plenty of fluids available (water and sports drinks are recommended; coffee and soda may actually cause further dehydration). • Wear loose, non-restrictive clothing and

Task/Step	Potential Hazards	Recommended Safe Job Procedures
		hat/cap. • Stay in shade as much as possible to keep cool (use vehicle and air-conditioning if necessary). • Use sunscreen to prevent sunburn and lip balm to prevent chapped lips. • Be aware of faintness, dizziness, unconsciousness, paleness, and profuse sweating in Site personnel (contact PM or if severe, contact emergency personnel). • Redness to the face, high body temperature, and lack of sweating may indicate heat stroke (contact emergency personnel immediately).
Access Monitoring Wells / Well Covers	Strain / sprains from opening well covers / heavy lifting / hand tools / puncture hazards from hidden boards with nails or hidden hails on the ground / biological	• Use proper lifting posture when opening/closing all well or vault covers. • Wear leather gloves and safety glasses when opening and closing well or vault covers and caps, tapping bolts. • Check for poisonous spiders, insects, etc. • Stand upwind of well when removing cover. • Ensure well is securely closed after sampling.
Calibrate and Check Over All Equipment	Equipment malfunction, inaccurate data recovery	• Calibrate water level/ water quality meter(s) and check over to ensure they are working properly.
Measuring Water Levels	Dermal contact and inhalation of potential constituents	• Perform careful triple-rinse decontamination of sounder or interface meter. • Wear Nitrile gloves when handling water. Be careful not to splash or spill large amounts of water on clothing or on the Site.
Well Purge & Sample	Pinch points / cross-contamination of wells / spills, leaks, slips, trips / Chemical exposure	• Keep hands clear of well opening when inserting bailer or pump tubing. • Replace peristaltic pump silicon and polyethylene tubing with new at each well location. • Inspect the integrity of liquid containers prior to and during use. • Carefully pour liquids when transferring between containers. • Avoid spills when filling sample bottles, and handle with care to avoid breakage. • Ensure bottles are labeled accurately. • Maintain good housekeeping. Have trash bag at Site and clean as work is conducted. • Sample preservative may consist of injurious chemicals, such as acids. Maintain adequate rinsing/flushing capabilities and baking soda to neutralize spills.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Place Samples in Cooler with Ice and Padding Materials	Bottle breakage, back strain	• Wear proper PPE and pack bottles carefully (bubble wrap bags are helpful). • Ensure cooler is thoroughly iced to maintain samples at proper temperature (4 degrees Celsius).
Load Equipment and Supplies into Vehicle	Back injury, equipment damage	• Use proper lifting techniques when loading/lifting coolers and equipment into vehicle. • Ensure equipment and supplies are loaded correctly and do not shift during driving.
Site Cleanup	Debris or equipment left on-Site or unsecure can cause tripping hazard	• Make careful visual sweep of Site. • Check for tools, debris or dirt left on-Site. • Remove free standing water by sweeping or with absorbent material.

POTENTIAL PHYSICAL HAZARDS OF THIS JOB

POTENTIAL PHYSICAL HAZARDS OF THIS JOB

Physical Hazards	Prob.	Sev.
Cold weather	2	3
Hot weather	2	3
Hand tools	3	2
Noise (Sound Pressure Level), dBA	1	2
Power tools (pump)	2	2
Rolling or pinching objects	3	3
Slippery surfaces (water, ice, snow)	3	3
Uneven surfaces (curbs, gutters, drains, etc.)	2	2
Vehicle Equipment Traffic	2	4

Consequences
Awkward or static position
Cuts and abrasions
Excessive lifting, twisting, pushing, pulling, reaching, or bending
Exposure (inhaling, swallowing, or absorbing) harmful levels of gases, vapors, aerosols, liquids, fumes, or dust.
Exposure to cold or heat (heat exhaustion or stroke / Hypothermia or frost bite).
Exposure to excessive noise (damage to hearing)
Exposure to excessive vibrations
Falling (< 6 feet), tripping, or slipping
Fatigue / Overexertion

POTENTIAL CHEMICAL HAZARDS OF THIS JOB

Chemical Hazards	Description/Health Hazards
Contaminates of concern (COC)	See SDS(s) attached to the HASP

POTENTIAL BIOLOGICAL HAZARDS OF THIS JOB

Biological Hazards	Prob.	Sev.
Animal excrement (bird droppings, bat guano, rodent, small mammals, large mammals)	3	3
Insect bites or stings (mosquitoes, bees, ticks)	1	2
Snake bite	2	5
Animal attack	2	5

Consequences
Allergic reactions
Reaction to venom

HAZARD CONTROL MEASURES USED FOR THIS JOB	
Administrative Controls: Audits (site or job) Emergency procedures Equipment maintenance and servicing manual Federal, state, and local regulations Inspections (ongoing) work areas, equipment, tools, etc. Monitoring (biohazards) Monitoring (hazardous atmospheres) Notification and communication procedures Operating instructions (equipment) Standard operating procedures (SOP) and/or guidelines (job or activity) Safety and health plan (site specific) Safety and health program Safety meetings - on-going (e.g., daily or weekly tailgate safety) Trained personnel Weather forecast (pre-job)	**Required Training:** Emergency plans First aid/CPR General Safety Hazard Communication (HAZCOM) Hazardous waste operations (HAZWOPER) Hearing protection Personal protective equipment (PPE) Tools
Engineering Controls: NA	**Required PPE:** Level D Clothing - long pants Gloves - work gloves Gloves inner - chemical-resistant Class II reflective safety vest Hard hat Hearing protection Safety glasses Safety-toe boots Other PPE:
Required Permit(s): NA	**Other Information:**

Severity	Probability
S-1 = 1	P-1 = Low
S-2 = 2	P-2 = Medium
S-3 = 3	P-3 = High
S-4 = 4	
S-5 = 5	

JOB HAZARD ANALYSIS	**Project No.:** 1896120*00
Job/Operation Title: Hand Auger	**Date:** January 2018
Business Unit: Environment/Industrial	**JHA Reviewed By:** John Jindra
Project Location: Wishram, WA	**JHA Revised By:** Tom Haskins
Person(s) Performing This Job/Task: Joe Sawdey, Tom Haskins, Julia Schwarz, Alice Robinson, Katie Teague	**Deputy Project Manager:** Ryan Hultgren
Job/Task Start Date: January 2018	**Job/Task Duration:** Annual

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Digging Using a Hand Auger	• Striking Underground Utilities • Struck By • Cuts / Laceration • Flying Debris • Strains / Sprains • Blistering	• Hand augering can only occur after a public and private utility locate has cleared the boring location. • Hand augering is not considered a soft digging technique. • Never use a hand auger to locate a utility. • Wear safety-toe boots and safety glasses. • Do not thrust the auger into the ground; the auger is intended to cut through the soil by twisting the handle. • Wear cut resistant gloves when handling the working end of the auger. • Adjust auger so handle is capable of being reached easily. • Wear gloves while auguring.

JOB HAZARD ANALYSIS	**Project No.:** 1896120*00
Job/Operation Title: Hand Tools	**Date:** January 2018
Business Unit: Environment/Industrial	**JHA Reviewed By:** John Jindra
Project Location: Wishram, WA	**JHA Revised By:** Tom Haskins
Person(s) Performing This Job/Task: Joe Sawdey, Tom Haskins, Julia Schwarz, Alice Robinson, Katie Teagy\ue	**Deputy Project Manager:** Ryan Hultgren
Job/Task Start Date: January 2018	**Job/Task Duration:** Annual

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Check condition of tool.	Lacerations	Avoid contact with blade or teeth of a tool.
Using hand tool.	Lacerations, pinching or impact and other injuries	Assess surrounding environment and be aware of others. Check to see that replaceable parts such as blades are secured. Be aware of what may happen if the tool slips or is misdirected. Use caution when using a hand tool. When possible, wear gloves.
Transporting hand tool.	Injuries to self and others	Ensure that the blade is not exposed when transporting. Do not throw the tool. Assess surrounding environment and be aware of others.

JOB HAZARD ANALYSIS	**Project No.:** 1896120*00
Job/Operation Title: Soil Sampling, Logging and Screening	**Date:** January 2018
Business Unit: Environment/Industrial	**JHA Reviewed By:** John Jindra
Project Location: Wishram, WA	**JHA Revised By:** Tom Haskins
Person(s) Performing This Job/Task: Joe Sawdey, Tom Haskins, Julia Schwarz, Alice Robinson, Katie Teague	**Deputy Project Manager:** Ryan Hultgren
Job/Task Start Date: January 2018	**Job/Task Duration:** Annual

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Prepare Work Area	Slips Trips and Falls Cuts / Abrasions Struck By Strains / Sprains	• Maintain good housekeeping practices. • Setup work area away from active operations and high traffic areas. • Remove trip hazards in workspace. • Setup work area on a level surface. • Use caution when climbing in and out of truck bed, avoid jumping out of truck bed. • Wear cut resistant gloves while using cutting devices. • Wear cut resistant gloves while unloading work supplies that may have pinch point or sharp edges, such as a sample table or work canopy. • Inspect work area for sharp edges prior to setup. • Wear safety toe boots. • Wear a hardhat. • Use proper lifting techniques. • Use two people to lift objects greater than 50 pounds.
Obtain Sample (Either from loose soil or sample tube)	Contamination with Hazardous Substances Cuts / Abrasions	• Conduct breathing space monitoring with a photoionization detector (PID) and follow site-specific Health and Safety Plan (HASP) requirements. • Wear chemical resistant gloves as defined in the site specific HASP. • Use caution when collecting sample from sample tube, as there may be rough or

Task/Step	Potential Hazards	Recommended Safe Job Procedures
		sharp edges
Clean work area in preparation for the next sample	Contamination w/ hazardous substances Cuts/abrasions	• Conduct breathing space monitoring with a PID and follow site-specific HASP requirements. • Wear chemical resistant gloves as defined in the site-specific HASP. • Pick up samples and place in appropriate disposal container. • Avoid brushing off work area with your hand, use a brush or broom.
Changing out PPE (Gloves)	Contamination w/ hazardous substances	• Remove gloves by removing one glove and turning the glove inside out as it is being removed. Use the inside out glove to remove the second glove also turning the second glove inside out as it is being removed. • Place the contaminated gloves in appropriate waste container.
Log sample description	Contamination w/ hazardous substances	• Remove contaminated PPE prior to handling the logbook. • Locate logbook away from contaminated areas.
Collect headspace analysis from soil sample	Contamination w/ hazardous substances	• Wear chemical resistant gloves as defined in the site-specific HASP. • Wear safety glasses. • Hold sample bag away from your body when puncturing bag.
Place soil sample in sample jar	Contamination w/ hazardous substances (including sample jar preservative)	• Wear chemical resistant gloves as defined in the site-specific HASP.
Cleanup/Decontaminate work area	Contamination w/ hazardous substances	• Wear chemical resistant gloves as defined in the site-specific HASP. • Wear safety glasses. • Place all waste in appropriate waste containers. • Decontaminate all surfaces and equipment that has contacted the contaminated soil according to the site-specific HASP.
Demobilize work area	Slips, trips, and falls Cuts/abrasions	• Maintain good housekeeping. • Use caution when climbing in and out of

Task/Step	Potential Hazards	Recommended Safe Job Procedures
	Struck by Strains/sprains	truck bed, avoid jumping out of truck bed. • Wear cut resistant gloves while loading work supplies that may have pinch point or sharp edges, such as a sample table or work canopy. • Wear steel toe boots. • Wear a hardhat. • Use proper lifting techniques. • Use two people to lift objects greater than 50 pounds.

JOB HAZARD ANALYSIS	**Project No.:** 1896120*00
Job/Operation Title: Vehicle Operation	**Date:** January 2018
Business Unit: Environment/Industrial	**JHA Reviewed By:** John Jindra
Project Location: Wishram, WA	**JHA Revised By:** Tom Haskins
Person(s) Performing This Job/Task: Joe Sawdey, Tom Haskins, Julia Schwarz, Alice Robinson, Katie Teague	**Deputy Project Manager:** Ryan Hultgren
Job/Task Start Date: January 2018	**Job/Task Duration:** Annual

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Entering vehicle	Injury from door	• Be careful when opening vehicle door.
Turn on engine	None foreseen	
Driving motorized vehicle	Injury to self from accidents Injury to others	• Fasten seat belt before driving. • Use defensive driving skills. • Obey all traffic regulations. • Never leave unattended car running. • Refer to the State Department of Motor Vehicles handbook for more information. • Survey surroundings before driving. • Use defensive driving skills. • Never leave unattended car running. • Refer to the Department of Motor Vehicles handbook for more information.
Parking	Property damage Injury to self from accidents Injury to others	• When or if available, back vehicle into position when parking to enable operator to pull forward when leaving the site.
Turn off engine	None foreseen	

Appendix B

Job Safety Briefing Record

BNSF - Job Safety Briefing Record

By:	Date:	Project:	Job No.:
Time:	Location/Milepost:		

Weather Conditions:	Forecasted Minimum Temperature (°F): _____ Forecasted Maximum Temperature (°F): _____
Railroad Flagger Name: _____	BNSF Project Representative Name: _____
K/J Site Safety Officer Name:_____	K/J Project Manager Name:_____

☐ BNSF/MRL EIC Name:_____ Contact Number:_____
Onsite Arrival/Notification Time: _____ Offsite Departure/Notification Time: _____

PERSONS ATTENDING (use additional sheets if necessary)

Name	Signature (* K/J Staff See Below)	Affiliation	Training Dates			
			BNSF Contractor Safety	E-RailSafe	Roadway Worker Protection	First Aid/ CPR

**KJ Staff Only- By signing above, K/J staff acknowledge they have received and read this project's HASP or HARP.*

Work Activities	Hazardous Materials	Heavy Equipment Ops	Work within 25' of Track	Environmental Assessment/Sampling

Work Description Summary: _____

_____

DOCUMENTATION

BNSF SAP		K/J H&S PLAN		TRACK PROTECTION			Utility Locate	
Yes	No	Yes	No	Yes	No	Type:	Yes	No

☐ End of Day / Task Safety Briefing — Topics:

Actions/Comments/Notes:_____

_____

Check the Topics/Information Reviewed:

- O site safety plan, review and location
- O directions to hospital
- O emergency procedures & evacuation route
- O daily scope of work
- O first aid / CPR
- O weather hazards
- O heat and cold stress
- O stop work authority
- O training/certification
- O personal protective equipment
- O noise hazards
- O fire prevention/safety/fire extinguishers
- O vehicle safety and driving/road conditions
- O cell phone usage / prohibitions
- O drinking water and restroom locations
- O eye wash station locations
- O Hazard Communication//SDS locations
- O confined spaces
- O fall protection
- O open pits and excavations
- O scaffolding
- O lockout/tagout
- O location of utilities and clearances
- O heavy equipment hazards
- O lifting techniques
- O equipment movement
- O traffic safety
- O public safety
- O backing-up hazards
- O ladder safety
- O parking and lay down areas
- O visitors / media / passers-by
- O smoking in designated areas only
- O drug and alcohol policy
- O pinch points
- O slips, trips, and falls
- O strains and sprains
- O sharp objects, rebar, and scrap metal
- O equipment and machinery familiarization
- O no horseplay
- O insects/snakes/biological hazards
- O dust and/or vapor control
- O site housekeeping
- O decontamination procedures
- O buddy system
- O tool safety
- O flying debris hazards
- O site control/security
- O other _____
- O other _____
- O other _____

BNSF JOB BRIEFING LOG

Date: _____

Work Location: _____

RWIC/EIC Name: _____

RWIC/EIC Phone No.: _____

Type of Track ☐ Controlled ☐ Non-Controlled

Track Speed: _____

Type of Track Protection _____

Working Limits

Inaccessible Track _____ To _____

Authority Number _____

Track Number(s) _____

Track Limits _____ To _____

Time Limits _____ To _____

Adjacent Track Protection ☐ Yes ☐ No

Track Limits _____ To _____

Time Limits _____ To _____

Training Approaching Warning

Clearing Time _____

Sight Distance _____

Individual Train Detection

Clearing Time _____

Sight Distance _____

Notes _____

Rule of Day _____

Appendix C

Heat Stress Fact Sheet

Heat Stress Prevention

HEAT EXHAUSTION

What happens to the body:

Headaches, dizziness, or light-headedness, weakness, mood changes, irritability or confusion, feeling sick to your stomach, vomiting, fainting, decreased and dark-colored urine, and pale, clammy skin.

What should be done:

- Move the person to a cool, shaded area. Don't leave the person alone. If the person is dizzy or light-headed, lay him on his back and raise his legs about 6-8 inches. If the person is sick to his stomach, lay him on his side.
- Loosen and remove heavy clothing.
- Have the person drink some cool water (a small cup every15 minutes) if he is not feeling sick to his stomach.
- Try to cool the person by fanning him. Cool the skin with acool spray mist of water or wet cloth.
- If the person does not feel better in a few minutes call for emergency help (ambulance or 911) .

If heat exhaustion is not treated, the illness may advance to heat stroke.

HEAT STROKE - A Medical Emergency

What happens to the body:

Dry, pale skin, sweating may still be present; hot, red skin (looks like a sunburn); mood changes; irritability, confusion, and not making any sense; seizures or fits, and collapse (will not respond).

What should be done:

- Call for emergency help (ambulance or 911.)
- Move the person to a cool, shaded area. Don't leave theperson alone. Lay him on his back and if the person is having seizures; remove objects close to him so he won't hit them. If the person is sick to his stomach, lay him on his side.
- Remove heavy and outer clothing.
- Have the person drink small amounts of cool water if he is alert enough to drink anything and not feeling sick to his stomach.
- Try to cool the person by fanning him or her. Cool the skin with a cool spray mist of water, wet cloth, or wet sheet.
- If ice is available, place ice packs in armpits and groin area.

PREVENTING HEAT RELATED ILLNESS

- Drink a lot of water, about 1 cup every 15 minutes.
- Know the signs/symptoms of heat-related illness; monitor yourself and co-workers.
- Block out direct sun or other heat sources.
- Use cooling fans/air-conditioning; rest regularly.
- Wear lightweight, light colored, loose-fitting clothes.
- Avoid alcohol, caffeinated drinks, or heavy meals.

Washington State Department of Labor & Industries

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Appendix D

Cold Stress Fact Sheet

COLD STRESS PREVENTION

OSHA® QUICK CARD™

Protecting Workers from Cold Stress

Cold temperatures and increased wind speed (wind chill) cause heat to leave the body more quickly, putting workers at risk of cold stress. Anyone working in the cold may be at risk, e.g., workers in freezers, outdoor agriculture and construction.

Common Types of Cold Stress

Hypothermia

- Normal body temperature (98.6°F) drops to 95°F or less.
- **Mild Symptoms**: alert but shivering.
- **Moderate to Severe Symptoms**: shivering stops; confusion; slurred speech; heart rate/breathing slow; loss of consciousness; death.

Frostbite

- Body tissues freeze, e.g., hands and feet. Can occur at temperatures above freezing, due to wind chill. May result in amputation.
- **Symptoms**: numbness, reddened skin develops gray/white patches, feels firm/hard, and may blister.

Trench Foot (also known as Immersion Foot)

- Non-freezing injury to the foot, caused by lengthy exposure to wet and cold environment. Can occur at air temperature as high as 60°F, if feet are constantly wet.
- **Symptoms**: redness, swelling, numbness, and blisters.

Risk Factors

- Dressing improperly, wet clothing/skin, and exhaustion.

For Prevention, Your Employer Should:

- Train you on cold stress hazards and prevention.
- Provide engineering controls, e.g., radiant heaters.
- Gradually introduce workers to the cold; monitor workers; schedule breaks in warm areas.

How to Protect Yourself and Others

- Know the symptoms; monitor yourself and co-workers.
- Drink warm, sweetened fluids (no alcohol).
- Dress properly:
  - Layers of loose-fitting, insulating clothes
  - Insulated jacket, gloves, and a hat (waterproof, if necessary)
  - Insulated and waterproof boots

What to Do When a Worker Suffers from Cold Stress

For Hypothermia:

- Call 911 immediately in an emergency.
- To prevent further heat loss:
  - Move the worker to a warm place.
  - Change to dry clothes.
  - Cover the body (including the head and neck) with blankets, and with something to block the cold (e.g., tarp, garbage bag). Do **not** cover the face.
- If medical help is more than 30 minutes away:
  - Give warm, sweetened drinks if alert (no alcohol).
  - Apply heat packs to the armpits, sides of chest, neck, and groin. Call 911 for additional rewarming instructions.

For Frostbite:

- Follow the recommendations **"For Hypothermia"**.
- Do not rub the frostbitten area.
- Avoid walking on frostbitten feet.
- Do not apply snow/water. Do not break blisters.
- Loosely cover and protect the area from contact.
- Do not try to rewarm the area unless directed by medical personnel.

For Trench (Immersion) Foot:

- Remove wet shoes/socks; air dry (in warm area); keep affected feet elevated and avoid walking. Get medical attention.

Appendix E

Utility Location Standard Operations Procedures

Utility Location and Acknowledgement Form

KENNEDY/JENKS CONSULTANTS

STANDARD OPERATING PROCEDURES

INVASIVE ACTIVITIES - UTILITY LOCATION PROCEDURES

Below is a summary of the minimum requirements for location of potential underground utilities where invasive activities are planned. Invasive activities include, but are not limited to, drilling soil borings, installing wells, hand-auger borings, excavating test pits, remedial injections, and other similar activities which penetrate the ground surface.

Minimum Procedures (Non-BNSF Sites or BNSF Off-property Sites)

1. Contact the client or property owner where invasive activities will be performed to inquire about possible underground utilities and request maps or drawings documenting the location of the utilities. Document your request for information (e.g., written email request for information).

2. Contact the local/regional underground utility location center to document planned activities and request all underground utilities be located. In most (if not all) US states, this can be initiated by dialing "811". Contacting the local underground utility center is also required by state law. Contacting the local utility location center is required for each episode (event) of invasive work. It is preferred to arrange a field meeting with utility representatives to confirm the absence of utilities at each drilling location. Maintain a written record for each boring/invasive location and get signatures from the locators documenting the locations are clear of utilities. This can be performed on a site map or KJ's *Utility Locate Form & Acknowledgment Form* (provided in the KJ Safety Zone). The goal is to have written acknowledgement that all final drilling locations are free of underground utilities.

3. At all locations where drilling, probing or well installation will be performed, an air-knife or similar form of suction pot-holing will be performed to assess possible underground utilities in the upper 6 to 8 feet of soils (depending on local conditions and expected depth of utilities). Potholing is required at **all drilling locations**, except in remote areas where the likelihood of encountering underground utilities is very low and only as approved by a Risk Manager, Resource Manager or Officer of the company familiar with underground utilities. (Note: Use of an air knife will be appropriate for most invasive drilling and probing work, but may not be appropriate for certain activities like very shallow borings (less than 1-foot deep), certain hand-auger borings, remedial injections using probe equipment and test pitting.) Case by case exceptions for activities may be provided.

Optional Step – While it is recommended under most conditions, an optional additional step includes coordinating (including establishing a written contract) with a private utility locator to perform an independent utility evaluation to locate "all underground utilities" at the proposed locations of invasive work. Maintain written record for each boring/invasive location and get signatures from the locators. *[Note: This step is typically not too expensive and can save costs incurred during suction pot-holing by focusing the areas of the borings (i.e., provides prior knowledge of possible utilities).]*

Minimum Procedures (BNSF Sites)

1. You must call **1-800-533-2891** to arrange for a BNSF underground cable locate. It is our responsibility to contact BNSF's one-call service and provide appropriate notification to other companies (public and private) who may have underground utilities in an area to be excavated. Get a Ticket Number and document your contact in the *BNSF Underground Cable Location & Acknowledgement Form* (provided in the KJ Safety Zone).

Also contact the local **Roadmaster, Yardmaster, Signal Supervisor or other local contact** for signal/telecommunications, electrical and water service shops (trades) to determine whether there are any underground communication lines, electrical lines, or utilities in an area of drilling/invasive work. Request any available maps, drawings or utility information and document your request for information in writing (see the *BNSF Railway Underground Cable Location & Acknowledge* form provided for on K/J Safety Zone).

2. Contact the local/regional underground utility location center to document planned activities and request all underground utilities be located. In most (if not all) US states, this can be initiated by dialing "811". Contacting the local underground utility center is also required by state law. Contacting the local utility location center is required for each episode (event) of invasive work. It is preferred to arrange a field meeting with utility representatives to confirm the absence of utilities at each drilling location. Maintain a written record for each boring/invasive location and get signatures from the locators documenting the locations are clear of utilities. This can be performed on a site map or KJ's *Utility Locate Form & Acknowledgment Form* (provided in the KJ Safety Zone). The goal is to have written acknowledgement that all final drilling locations are free of underground utilities.

3. At all locations where drilling, probing or well installation will be performed, an air-knife of similar form or suction pot-holing will be performed to assess possible underground utilities in the upper 6 to 8 feet of soils (depending on local conditions and expected depth of utilities). Potholing is required at **all drilling locations**, except in remote areas where the likelihood of encountering underground utilities is very low and only as approved by a Risk Manager, Resource Manager or Officer of the company familiar with underground utilities. (Note: Use of an air knife will be appropriate for most invasive drilling and probing work, but may not be appropriate for certain activities like very shallow borings (less than 1-foot deep), certain hand-auger borings, remedial injections using probe equipment and test pitting.) Case by case exceptions for activities may be provided.

Optional Step – While it is recommended under most conditions, an optional additional step includes coordinating (including establishing a written contract) with a private utility locator to perform an independent utility evaluation to locate "all underground utilities" at the proposed locations of invasive work. Maintain written record for each boring/invasive location and get signatures from the locators. *[Note: This step is typically not too expensive and can save costs incurred during suction pot-holing by focusing the areas of the borings (i.e., provides prior knowledge of possible utilities).]*

KENNEDY/JENKS CONSULTANTS
UTILITY LOCATION & ACKNOWLEDGEMENT FORM
Call 811 for Utility Locate at Least 48 Hours Prior to Work

Project Location: _____

Project Number: _____

Project Name: _____

Planned Start Date of Field Activities: _____

Kennedy/Jenks Personnel: _____

Private Utility Locator Name: _____

811 Contact Date and Time (48 hours before work begins): _____

KJ One-Call Contractor ID# (varies by state) _____

Ticket Number: _____

Utility Clearance Information

How Were Boring/Excavation Locations Cleared:

Utilities Contacted by 811	Utility Contact Number	Utility Contacted by Telephone	Marked in Field	Other (Describe)

Contact information verified by (K/J Staff):_____

Scheduled On-Site Meeting Location (if applicable):

Public Utility_____

Private Utility Locator_____

Use back of sheet to sketch of identified utilities and proposed boring/excavation locations **OR** attach figure. Include north arrow and structures if applicable.

Notes:

Mark all proposed borings and excavations with WHITE paint per APWA Utility Color Codes.

Request locator to mark utilities as required by their standard operating procedures or at least within 25 feet of boring/excavation, whichever is greater, with paint/flags.

Utility marks are valid for 14 calendar days and must be remarked if work continues beyond 14 days.

Appendix F

Field Chemical Use Policy and Procedures

Field Chemical Use Form

Field Chemical Use Policy & Procedures

Policy: Kennedy/Jenks will follow appropriate chemical handling protocol, implement proper health and safety measures, and follow appropriate waste regulations when using chemicals in the field. Examples of field chemical use include, but are not limited to:

- Test kits with chemical reagents;
- Chemical preservatives for samples;
- Chemicals for field investigations, bench tests, and pilot studies; and
- Special chemicals for cleaning equipment.

Procedures: Business Unit Health & Safety Managers must review and approve field chemical use before chemicals can be purchased or taken into the field. A site-specific project Health and Safety Plan (HASP) that addresses field chemical use must be prepared by the Deputy Project Manager, then reviewed and approved by the Business Unit Health & Safety Manager. The portion of a project HASP that addresses field use of chemicals should include the following information:

- Chemical use justification. Include evaluation of alternatives, such as, less hazardous chemicals, alternative means of measuring (direct measurements without chemical reagents), and testing by a commercial laboratory or mobile laboratory.
- List of chemicals to be used, including quantities on hand.
- Safety Data Sheets (SDS) for the chemicals.
- Names of staff members that will be using the chemicals.
- Personal protective equipment (PPE) required.
- Description of how the materials will be transported, where the materials will be received and how the materials will be stored (note that our office leases prohibit handling or storage of hazardous materials or non-hazardous materials in quantities considered hazardous).
- Description of how the waste residuals will be disposed. Hazardous wastes generated from field testing, pilot studies, or equipment decontamination must be disposed in accordance with state and federal hazardous waste regulations. Project Managers should include provisions and budget for assisting clients with residual waste disposal. As the generator, the client should sign the hazardous waste manifest. Consider:
    - Coordinating with a local analytical laboratory to accept the waste. Some laboratories will accept small quantities of reagent waste along with samples for disposal for a small fee. This typically involves collecting the wastes in an appropriate container, placing wastes into a sealed container inside of a cooler, and including safety data sheets for the materials with the shipment.

- Using client's existing hazardous waste generator process to dispose of waste. Provide client with information on the type of waste generated to assure compatibility with existing waste streams.

- Returning excess chemicals to the vendor for recycling or reuse. Wherever possible, purchase reagents from a vendor that will accept return of unused product. Have the vendor provide appropriate packaging materials for the return shipment.

- Disposing of non-hazardous residuals as solid waste or in a sanitary sewer. Some wastes, with review and approval by the Business Unit Health & Safety Manager, can be disposed of in the local municipal solid waste or wastewater systems.

This information on the field use of chemicals can be provided by incorporating the example form provided at the end of this document into the HASP. An SDS for each chemical or product must be attached to the HASP. The Business Unit Health & Safety Manager will review the HASP and conduct appropriate Hazard Communication update training for the staff that will be using the chemicals.

Project Task: _____

Name of Preparer: _____

Describe Evaluation of Alternatives to Chemical Use:

Chemicals to be Used for Project:

Chemical Name	Quantity (indicate units)

Names of Staff Using Chemicals During Project:

Describe Personal Protection to be Used When Using or Handling Chemicals:

- ☐ Safety Goggles
- ☐ Nitrile Gloves
- ☐ Respirator with _____ cartridges
- ☐ Other: _____
- ☐ Portable Eye Wash
- ☐ Splash Apron/Coveralls
- ☐ Face Shield

Describe how Chemicals will be Transported and Stored at Project Site:

Describe How Used or Leftover Chemicals will be Disposed:

_____ _____

Business Unit Health and Safety Manger Approval Signature **Date Approved**

Appendix G

Safety Data Sheets (SDSs)

SAFETY DATA SHEET

Hydrogen Chloride

Section 1. Identification

GHS product identifier : Hydrogen Chloride

Chemical name : Hydrogen chloride

Other means of identification :

Product use : Synthetic/Analytical chemistry.

Synonym :

SDS # : 001028

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : GASES UNDER PRESSURE - Compressed gas
ACUTE TOXICITY (inhalation) - Category 3
SKIN CORROSION/IRRITATION - Category 1
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Contains gas under pressure; may explode if heated.
Toxic if inhaled.
Causes severe skin burns and eye damage.
Causes serious eye damage.
May cause respiratory irritation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction.

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Use only outdoors or in a well-ventilated area. Avoid breathing gas. Wash hands thoroughly after handling.

Section 2. Hazards identification

Response : IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage : Store locked up. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Hydrogen chloride

Other means of identification :

CAS number/other identifiers

CAS number : 7647-01-0

Product code : 001028

Ingredient name	%	CAS number
hydrogen chloride	100	7647-01-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Section 4. First aid measures

Eye contact : Causes serious eye damage. Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : Toxic if inhaled. May cause respiratory irritation.

Skin contact : Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
halogenated compounds

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

Section 6. Accidental release measures

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Do not breathe gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
hydrogen chloride	**ACGIH TLV (United States, 3/2015).** C: 2 ppm **NIOSH REL (United States, 10/2013).** CEIL: 7 mg/m³ CEIL: 5 ppm **OSHA PEL (United States, 2/2013).** CEIL: 7 mg/m³ CEIL: 5 ppm **OSHA PEL 1989 (United States, 3/1989).** CEIL: 7 mg/m³ CEIL: 5 ppm

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Section 8. Exposure controls/personal protection

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Liquefied compressed gas.]

Color : Colorless. Yellowish.

Molecular weight : 36.46 g/mole

Molecular formula : Cl-H

Boiling/condensation point : -85°C (-121°F)

Melting/freezing point : -114°C (-173.2°F)

Critical temperature : 51.45°C (124.6°F)

Odor : Pungent.

Odor threshold : Not available.

pH : Not available.

Flash point : [Product does not sustain combustion.]

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Section 9. Physical and chemical properties

Vapor pressure : 613 (psig)

Vapor density : 1.3 (Air = 1)

Specific Volume (ft ^{3}/lb) : 10.5263

Gas Density (lb/ft ^{3}) : 0.095

Relative density : Not applicable.

Solubility : Soluble in the following materials: cold water.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : 0.25

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
hydrogen chloride	LC50 Inhalation Gas. LC50 Inhalation Gas.	Rat Rat	3124 ppm 1562 ppm	1 hours 4 hours

IDLH : 50 ppm

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
hydrogen chloride	Eyes - Mild irritant Skin - Mild irritant	Rabbit Human	- -	0.5 minutes 5 milligrams 24 hours 4 Percent	- -

Sensitization

Not available.

Mutagenicity

Not available.

Section 11. Toxicological information

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
hydrogen chloride	-	3	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
hydrogen chloride	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye damage. Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : Toxic if inhaled. May cause respiratory irritation.

Skin contact : Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Section 11. Toxicological information

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
hydrogen chloride	Acute LC50 240000 µg/l Marine water Acute LC50 282 ppm Fresh water	Crustaceans - Carcinus maenas - Adult Fish - Gambusia affinis - Adult	48 hours 96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
hydrogen chloride	0.25	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

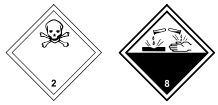
Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1050	UN1050	UN1050	UN1050	UN1050
UN proper shipping name	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS
Transport hazard class(es)	2.3 (8) 	2.3 (8) 	2.3 (8) 	2.3 (8) 	2.3 (8) 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	Inhalation hazard zone C **Reportable quantity** 5000 lbs / 2270 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements. **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: Forbidden. **Special provisions** 3	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2), 2.40-2.42 (Class 8). **Explosive Limit and Limited Quantity Index** 0 **ERAP Index** 25 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 38	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 0 Forbidden

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Water Act (CWA) 311: Hydrogen chloride

Clean Air Act (CAA) 112 regulated toxic substances: Hydrogen chloride

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Section 15. Regulatory information

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Listed

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
hydrogen chloride	100	Yes.	500	-	5000	-

SARA 304 RQ : 5000 lbs / 2270 kg

SARA 311/312

Classification : Sudden release of pressure
Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
hydrogen chloride	100	No.	Yes.	No.	Yes.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Hydrogen chloride	7647-01-0	100
Supplier notification	Hydrogen chloride	7647-01-0	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : This material is listed.

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : This material is listed or exempted.

Malaysia : This material is listed or exempted.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Section 15. Regulatory information

Canada

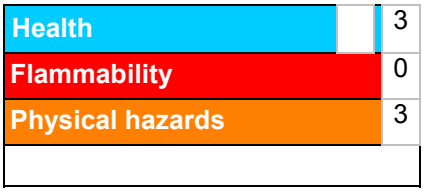
WHMIS (Canada) : Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Press. Gas Comp. Gas, H280	According to package
Acute Tox. 3, H331	On basis of test data
Skin Corr. 1, H314	Expert judgment
Eye Dam. 1, H318	Expert judgment
STOT SE 3, H335	Expert judgment

History

Date of printing : 6/24/2016

Date of issue/Date of revision : 6/24/2016

Section 16. Other information

Date of previous issue : No previous validation

Version : 0.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Sulfuric Acid, ACS

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 10/01/1998 Revision date: 11/01/2014 Supersedes: 06/27/2013 Version: 1.1

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form	:	Substance
Substance name	:	Sulfuric Acid, ACS
CAS No	:	7664-93-9
Product code	:	LC25550
Formula	:	H2SO4
Synonyms	:	battery acid / brown acid / brown oil of vitriol / dihydrogen sulfate / dipping acid / electrolyte acid / nordhausen acid / oil of vitriol / sulphuric acid
BIG no	:	14049

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	:	Industrial use Laboratory chemical Battery: component

1.3. Details of the supplier of the safety data sheet

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number	:	CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US classification

Skin Corr. 1A H314
Eye Dam. 1 H318

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labelling

Hazard pictograms (GHS-US) :

GHS05

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H314 - Causes severe skin burns and eye damage

Precautionary statements (GHS-US) : P260 - Do not breathe mist, vapours, spray
P264 - Wash exposed skin thoroughly after handling
P280 - Wear protective gloves, protective clothing, eye protection, face protection
P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - IF INHALED: remove victim to fresh air and keep at rest in a position comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P363 - Wash contaminated clothing before reuse
P405 - Store locked up
P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS-US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Sulfuric Acid, ACS (Main constituent)	(CAS No) 7664-93-9	96	Skin Corr. 1A, H314 Eye Dam. 1, H318

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

First-aid measures after inhalation : Remove the victim into fresh air. Immediately consult a doctor/medical service.

First-aid measures after skin contact : Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

First-aid measures after eye contact : Rinse immediately with plenty of water for 15 minutes. Take victim to an ophthalmologist. Do not apply neutralizing agents.

First-aid measures after ingestion : Rinse mouth with water. Do not induce vomiting. Do not give activated charcoal. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Take the container/vomit to the doctor/hospital. Ingestion of large quantities: immediately to hospital. Do not give chemical antidote.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Corrosion of the upper respiratory tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible laryngeal spasm/oedema. Risk of pneumonia. Risk of lung oedema. Respiratory difficulties.

Symptoms/injuries after skin contact : Caustic burns/corrosion of the skin.

Symptoms/injuries after eye contact : Corrosion of the eye tissue. Permanent eye damage.

Symptoms/injuries after ingestion : Nausea. Abdominal pain. Blood in stool. Blood in vomit. Burns to the gastric/intestinal mucosa. AFTER ABSORPTION OF HIGH QUANTITIES: Shock.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Itching. Skin rash/inflammation. Affection/discolouration of the teeth. Inflammation/damage of the eye tissue.

4.3. Indication of any immediate medical attention and special treatment needed

Obtain medical assistance.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Unsuitable extinguishing media : EXTINGUISHING MEDIA FOR SURROUNDING FIRES: Water. Water spray.

5.2. Special hazards arising from the substance or mixture

Fire hazard : DIRECT FIRE HAZARD. Non combustible. INDIRECT FIRE HAZARD. Reactions involving a fire hazard: see "Reactivity Hazard".

Explosion hazard : INDIRECT EXPLOSION HAZARD. Reactions with explosion hazards: see "Reactivity Hazard".

Reactivity : Violent exothermic reaction with water (moisture): release of corrosive gases/vapours. Reacts on exposure to water (moisture) with (some) metals: release of highly flammable gases/vapours (hydrogen). On heating/burning: release of toxic and corrosive gases/vapours (sulphur oxides). Reacts violently with (some) bases: heat release resulting in increased fire or explosion risk. Reacts with many compounds e.g.: with (strong) reducers, with organic material and with combustible materials: (increased) risk of fire/explosion.

5.3. Advice for firefighters

Precautionary measures fire	:	Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to fire/heat: seal off low-lying areas. Exposure to fire/heat: have neighbourhood close doors and windows.
Firefighting instructions	:	Cool tanks/drums with water spray/remove them into safety. When cooling/extinguishing: no water in the substance. Dilute toxic gases with water spray.
Protection during firefighting	:	Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	:	Gloves. Face-shield. Corrosion-proof suit. Large spills/in enclosed spaces: compressed air apparatus. Large spills/in enclosed spaces: gas-tight suit. See "Material-Handling" to select protective clothing.
Emergency procedures	:	Mark the danger area. No naked flames. Keep containers closed. Avoid ingress of water in the containers. Wash contaminated clothes. Large spills/in confined spaces: consider evacuation. In case of hazardous reactions: keep upwind. In case of reactivity hazard: consider evacuation.

6.1.2. For emergency responders

Protective equipment	:	Equip cleanup crew with proper protection.
Emergency procedures	:	Stop leak if safe to do so. Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment	:	Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Hazardous reaction: measure explosive gas-air mixture. Reaction: dilute combustible gas/vapour with water curtain. Take account of toxic/corrosive precipitation water. Heat exposure: dilute toxic gas/vapour with water spray.
Methods for cleaning up	:	Take up liquid spill into inert absorbent material, e.g.: dry sand/earth/vermiculite. Scoop absorbed substance into closing containers. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. See "Material-handling" for suitable container materials. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Keep the substance free from contamination. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Never add water to this product. Never dilute by pouring water to the acid. Always add the acid to the water. Keep away from naked flames/heat. Observe very strict hygiene - avoid contact. Keep container tightly closed. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection.
Hygiene measures	:	Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

Incompatible products	:	Strong bases. metals. combustible materials.
Heat and ignition sources	:	KEEP SUBSTANCE AWAY FROM: heat sources.
Prohibitions on mixed storage	:	KEEP SUBSTANCE AWAY FROM: combustible materials. reducing agents. (strong) bases. highly flammable materials. metals. cellulosic materials. organic materials. alcohols. amines. water/moisture.
Storage area	:	Store in a dry area. Ventilation at floor level. Keep locked up. Provide for a tub to collect spills. Unauthorized persons are not admitted. Meet the legal requirements.
Special rules on packaging	:	SPECIAL REQUIREMENTS: closing. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

Packaging materials : SUITABLE MATERIAL: stainless steel. carbon steel. polyethylene. polypropylene. glass. stoneware/porcelain. MATERIAL TO AVOID: monel steel. lead. copper. zinc.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Sulfuric Acid, ACS (7664-93-9)		
ACGIH	ACGIH TWA (mg/m³)	0.2 mg/m³
OSHA	OSHA PEL (TWA) (mg/m³)	1 mg/m³

8.2. Exposure controls

Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

Materials for protective clothing : GIVE EXCELLENT RESISTANCE: butyl rubber. polyethylene. tetrafluoroethylene. GIVE LESS RESISTANCE: neoprene. PVC. viton. GIVE POOR RESISTANCE: natural rubber. nitrile rubber. PVA.

Hand protection : Gloves.

Eye protection : Face shield.

Skin and body protection : Corrosion-proof clothing.

Respiratory protection : Gas mask with filter type E at conc. in air > exposure limit.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid

Appearance : Liquid.

Molecular mass : 98.08 g/mol

Colour : Pure substance: colourless;Unpurified: yellow to brown

Odour : Almost odourless

Odour threshold : > 1 mg/m³

pH : No data available

Relative evaporation rate (butylacetate=1) : No data available

Melting point : 10 °C

Freezing point : No data available

Boiling point : 288 °C

Flash point : Not applicable

Auto-ignition temperature : No data available

Decomposition temperature : > 340 °C

Flammability (solid, gas) : No data available

Vapour pressure : < 1.0 hPa

Relative vapour density at 20 °C : 3.4

Relative density : 1.8

Density : 1840 kg/m³

Solubility : Exothermically soluble in water. Soluble in ethanol.
Water: Complete

Log Pow : -2.20 (Estimated value)

Log Kow : No data available

Viscosity, kinematic : No data available

Viscosity, dynamic : No data available

Explosive properties : No data available.

Oxidising properties : No data available.

Explosive limits : No data available

9.2. Other information

VOC content : Not applicable

Other properties : Gas/vapour heavier than air at 20°C. Clear. Hygroscopic. Slightly volatile. Substance has acid reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

Violent exothermic reaction with water (moisture): release of corrosive gases/vapours. Reacts on exposure to water (moisture) with (some) metals: release of highly flammable gases/vapours (hydrogen). On heating/burning: release of toxic and corrosive gases/vapours (sulphur oxides). Reacts violently with (some) bases: heat release resulting in increased fire or explosion risk. Reacts with many compounds e.g.: with (strong) reducers, with organic material and with combustible materials: (increased) risk of fire/explosion.

10.2. Chemical stability

Unstable on exposure to moisture.

10.3. Possibility of hazardous reactions

Reacts violently with water. Reacts violently with (some) bases: release of heat.

10.4. Conditions to avoid

Incompatible materials. Moisture.

10.5. Incompatible materials

Water. Strong bases. Organic compounds. metals. Halogens. cyanides. combustible materials.

10.6. Hazardous decomposition products

Sulfur compounds.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Sulfuric Acid, ACS (\f)7664-93-9	
LD50 oral rat	2140 mg/kg bodyweight (Rat; Experimental value)

Skin corrosion/irritation : Causes severe skin burns and eye damage.

Serious eye damage/irritation : Causes serious eye damage.

Respiratory or skin sensitisation : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Sulfuric Acid, ACS (7664-93-9)	
Additional information	Strong inorganic acid mists containing sulfuric acid are carcinogenic to humans
IARC group	1 - Carcinogenic to humans
National Toxicology Program (NTP) Status	2 - Known Human Carcinogens

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

Symptoms/injuries after inhalation : Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Corrosion of the upper respiratory tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible laryngeal spasm/oedema. Risk of pneumonia. Risk of lung oedema. Respiratory difficulties.

Symptoms/injuries after skin contact : Caustic burns/corrosion of the skin.

Symptoms/injuries after eye contact : Corrosion of the eye tissue. Permanent eye damage.

Symptoms/injuries after ingestion : Nausea. Abdominal pain. Blood in stool. Blood in vomit. Burns to the gastric/intestinal mucosa. AFTER ABSORPTION OF HIGH QUANTITIES: Shock.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Itching. Skin rash/inflammation. Affection/discolouration of the teeth. Inflammation/damage of the eye tissue.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Classification concerning the environment: not applicable.

Ecology - air : Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009).

Ecology - water : Mild water pollutant (surface water). Ground water pollutant. Maximum concentration in drinking water: 250 mg/l (sulfate) (Directive 98/83/EC). Harmful to fishes. Harmful to invertebrates (Daphnia). Toxic to plankton. pH shift. Inhibition of activated sludge.

Sulfuric Acid, ACS (7664-93-9)	
LC50 fishes 1	42 mg/l (96 h; Gambusia affinis)
EC50 Daphnia 1	29 mg/l (24 h; Daphnia magna)
LC50 fish 2	49 mg/l (48 h; Lepomis macrochirus)
TLM fish 1	42 mg/l (96 h; Gambusia affinis)
Threshold limit other aquatic organisms 1	6900 mg/l (24 h; Pseudomonas fluorescens)

12.2. Persistence and degradability

Sulfuric Acid, ACS (7664-93-9)	
Persistence and degradability	Biodegradability: not applicable.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable

12.3. Bioaccumulative potential

Sulfuric Acid, ACS (7664-93-9)	
Log Pow	-2.20 (Estimated value)
Bioaccumulative potential	Bioaccumulation: not applicable.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Effect on ozone layer :

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle/reuse. Remove for physico-chemical/biological treatment. Remove to an authorized dump (Class I). Treat using the best available techniques before discharge into drains or the aquatic environment. Use appropriate containment to avoid environmental contamination.

Additional information : LWCA (the Netherlands): KGA category 01. Hazardous waste according to Directive 2008/98/EC.

Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN1830 Sulfuric acid with more than 51 percent acid, 8, II

UN-No.(DOT) : UN1830

DOT Proper Shipping Name : Sulfuric acid
with more than 51 percent acid

Department of Transportation (DOT) Hazard Classes : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive

Packing group (DOT)	:	II - Medium Danger
DOT Special Provisions (49 CFR 172.102)	:	A3 - For combination packagings, if glass inner packagings (including ampoules) are used, they must be packed with absorbent material in tightly closed metal receptacles before packing in outer packagings. A7 - Steel packagings must be corrosion-resistant or have protection against corrosion. B3 - MC 300, MC 301, MC 302, MC 303, MC 305, and MC 306 and DOT 406 cargo tanks and DOT 57 portable tanks are not authorized. B83 - Bottom outlets are prohibited on tank car tanks transporting sulfuric acid in concentrations over 65.25 percent. B84 - Packagings must be protected with non-metallic linings impervious to the lading or have a suitable corrosion allowance for sulfuric acid or spent sulfuric acid in concentration up to 65.25 percent. IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized. N34 - Aluminum construction materials are not authorized for any part of a packaging which is normally in contact with the hazardous material. T8 - 4 178.274(d)(2) Normal..... Prohibited TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and a is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: (image) Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively. TP12 - This material is considered highly corrosive to steel.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	154
DOT Packaging Non Bulk (49 CFR 173.xxx)	:	202
DOT Packaging Bulk (49 CFR 173.xxx)	:	242
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	1 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	30 L
DOT Vessel Stowage Location	:	C - The material must be stowed ‘‘on deck only’’ on a cargo vessel and on a passenger vessel.
DOT Vessel Stowage Other	:	14 - For metal drums, stowage permitted under deck on cargo vessels

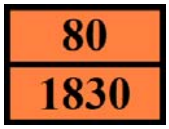
Additional information

Other information : No supplementary information available.

ADR

Transport document description	:	UN 1830 Sulphuric acid, 8, II, (E)
Packing group (ADR)	:	II
Class (ADR)	:	8 - Corrosive substances
Hazard identification number (Kemler No.)	:	80
Classification code (ADR)	:	C1
Danger labels (ADR)	:	8 - Corrosive substances

Orange plates :



Tunnel restriction code : E

Transport by sea

UN-No. (IMDG)	:	1830
Class (IMDG)	:	8 - Corrosive substances
EmS-No. (1)	:	F-A

EmS-No. (2) : S-B

Air transport

UN-No.(IATA) : 1830
Class (IATA) : 8 - Corrosives
Packing group (IATA) : II - Medium Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Sulfuric Acid, ACS (7664-93-9)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
RQ (Reportable quantity, section 304 of EPA's List of Lists) :	1000 lb
SARA Section 302 Threshold Planning Quantity (TPQ)	1000 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard

15.2. International regulations

CANADA

Sulfuric Acid, ACS (7664-93-9)	
WHMIS Classification	Class E - Corrosive Material

EU-Regulations

Classification according to Regulation (EC) No. 1272/2008 [CLP]
Skin Corr. 1A H314
Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC or 1999/45/EC

C; R35

Full text of R-phrases: see section 16

15.2.2. National regulations

Sulfuric Acid, ACS (7664-93-9)
Listed on IARC (International Agency for Research on Cancer) Listed as carcinogen on NTP (National Toxicology Program)

15.3. US State regulations

No additional information available

SECTION 16: Other information

Revision date : 11/01/2014

Full text of H-phrases: see section 16:

Eye Dam. 1	Serious eye damage/eye irritation, Category 1
Skin Corr. 1A	Skin corrosion/irritation, Category 1A
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage

NFPA health hazard : 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 2 - Normally unstable and readily undergo violent decomposition but do not detonate. Also: may react violently with water or may form potentially explosive mixtures with water.

NFPA specific hazard : W - Unusual reactivity with water. This indicates a potential hazard using water to fight a fire involving this material. When a compound is both water-reactive and an oxidizer, the W/bar symbol should go in this quadrant and the OX warning is placed immediately below the NFPA diamond.

HMIS III Rating	
Health	: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
Flammability	: 0 Minimal Hazard
Physical	: 2 Moderate Hazard
Personal Protection	: H

SDS US (GHS HazCom 2012)

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

Safety Data Sheet: **Simple Green® All-Purpose Cleaner** ★

Version No. 13000-14B Issue Date: September 13, 2014 Supersedes Date: January 7, 2014 *OSHA HCS-2012 / GHS*

Section 1: IDENTIFICATION

Product Name: Simple Green® All-Purpose Cleaner
Additional Names:

Manufacturer's Part Number: **Please refer to Section 16*

Recommended Use: Cleaner & Degreaser for water tolerant surfaces.
Restrictions on Use: Do not use on non-rinsable surfaces.

Company: Sunshine Makers, Inc.
15922 Pacific Coast Highway
Huntington Beach, CA 92649 USA

Telephone: 800-228-0709 ● 562-795-6000 *Mon – Fri, 8am – 5pm PST*
Fax: 562-592-3830
Email: info@simplegreen.com

Emergency Phone: Chem-Tel 24-Hour Emergency Service: 800-255-3924

Section 2: HAZARDS IDENTIFICATION

This product is not classified as hazardous under 2012 OSHA Hazard Communication Standards (29 CFR 1910.1200).

OSHA HCS 2012
Label Elements
Signal Word: None **Hazard Symbol(s)/Pictogram(s):** None required

Hazard Statements: None
Precautionary Statements: None
Hazards Not Otherwise Classified (HNOC): None
Other Information: None Known

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS Number	Percent Range
Water	7732-18-5	> 84.8%*
Ethoxylated Alcohol	68439-46-3	< 5%*
Sodium Citrate	68-04-2	< 5%*
Tetrasodium *N,N*-bis(carboxymethyl)-L-glutamate	51981-21-6	< 1%*
Sodium Carbonate	497-19-8	< 1%*
Citric Acid	77-92-9	< 1%*
Isothiazolinone mixture	55965-84-9	< 0.2%*
Fragrance	Proprietary Mixture	< 1%*
Colorant	Proprietary Mixture	< 1%*

**specific percentages of composition are being withheld as a trade secret*

Section 4: FIRST-AID MEASURES

Inhalation: Not expected to cause respiratory irritation. If adverse effect occurs, move to fresh air.
Skin Contact: Not expected to cause skin irritation. If adverse effect occurs, rinse skin with water.
Eye Contact: Not expected to cause eye irritation. If adverse effect occurs, flush eyes with water.
Ingestion: May cause upset stomach. Drink plenty of water to dilute. See section 11.

Most Important Symptoms/Effects, Acute and Delayed: None known.

Indication of Immediate Medical Attention and Special Treatment Needed, if necessary: Treat symptomatically

Section 5: FIRE-FIGHTING MEASURES

Suitable & Unsuitable Extinguishing Media: Use Dry chemical, CO2, water spray or "alcohol" foam. Avoid high volume jet water.
Specific Hazards Arising from Chemical: In event of fire, fire created carbon oxides may be formed.
Special Protective Actions for Fire-Fighters: Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

See section 16 for NFPA rating.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: *For non-emergency and emergency personnel:* See section 8 – personal protection. Avoid eye contact. Safety goggles suggested.

Environmental Precautions: Do not allow into open waterways and ground water systems.

Methods and Materials for Containment and Clean Up: Dike or soak up with inert absorbent material. See section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Precautions for Safe Handling: Ensure adequate ventilation. Keep out of reach of children. Keep away from heat, sparks, open flame and direct sunlight. Do not pierce any part of the container. Do not mix or contaminate with any other chemical. Do not eat, drink or smoke while using this product.

Conditions for Safe Storage including Incompatibilities: Keep container tightly closed. Keep in cool dry area. Avoid prolonged exposure to sunlight. Do not store at temperatures above 109°F (42.7°C). If separation occurs, mix the product for reconstitution.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limit Values: No components listed with TWA or STEL values under OSHA or ACGIH.

Appropriate Engineering Controls: Showers, eyewash stations, ventilation systems

Individual Protection Measures / Personal Protective Equipment (PPE)
Eye Contact: Use protective glasses or safety goggles if splashing or spray-back is likely.
Respiratory: Use in well ventilated areas or local exhaust ventilations when cleaning small spaces.
Skin Contact: Use protective gloves (any material) when used for prolonged periods or dermally sensitive.
General Hygiene Considerations: Wash thoroughly after handling and before eating or drinking.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Green Liquid
Odor: Added sassafras odor
Odor Threshold: Not determined
pH ASTM D-1293**:** 8.5 – 9.5
Freezing Point ASTM D-1177**:** 0-3.33°C (32-38°F)
Boiling Point & Range ASTM D-1120**:** 101°C (213.8°F)
Flash Point ASTM D-93**:** > 212°F
Evaporation Rate ASTM D-1901**:** ½ Butyl Acetate @ 25°C
Flammability (solid, gas): Not applicable
Upper/Lower Flammability or Explosive Limits: Not applicable
Vapor Pressure ASTM D-323**:** 0.60 PSI @77°F, 2.05 PSI @100°F
Vapor Density: Not determined

Partition Coefficient: n-octanol/water: Not determined
Autoignition Temperature: Non-flammable
Decomposition Temperature: 109°F
Viscosity: Like water
Specific Gravity ASTM D-891**:** 1.01 – 1.03
VOCs: ***Water & fragrance exemption in calculation*

SCAQMD 304-91 / EPA 24:	0 g/L	0 lb/gal	0%
CARB Method 310**:	2.5 g/L	0.021 lb/gal	0.25%
SCAQMD Method 313:	Not tested		

VOC Composite Partial Pressure: Not determined
Relative Density ASTM D-4017**:** 8.34 – 8.42 lb/gal
Solubility: 100% in water

Section 10: STABILITY AND REACTIVITY

Reactivity: Non-reactive.
Chemical Stability: Stable under normal conditions 70°F (21°C) and 14.7 psig (760 mmHg).
Possibility of Hazardous Reactions: None known.
Conditions to Avoid: Excessive heat or cold.
Incompatible Materials: Do not mix with oxidizers, acids, bathroom cleaners, or disinfecting agents.
Hazardous Decomposition Products: Normal products of combustion - CO, CO2.

Section 11: TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:
Inhalation - Overexposure may cause headache.
Skin Contact - Not expected to cause irritation, repeated contact may cause dry skin.
Eye Contact - Not expected to cause irritation.
Ingestion - May cause upset stomach.

Symptoms related to the physical, chemical and toxicological characteristics: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from short term exposure: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from long term exposure: headache, dry skin, or skin irritation may occur.
Interactive effects: Not known.

Numerical Measures of Toxicity

Acute Toxicity:
Oral LD_{50} (rat) > 5 g/kg body weight
Dermal LD_{50} (rabbit) > 5 g/kg body weight
Calculated via OSHA HCS 2012 / Globally Harmonized System of Classification and Labelling of Chemicals

Skin Corrosion/Irritation: Non-irritant per Dermal Irritection® assay modeling. No animal testing performed.
Eye Damage/Irritation: Minimal irritant per Ocular Irritection® assay modeling. No animal testing performed.
Germ Cell Mutagenicity: Mixture does not classify under this category.
Carcinogenicity: Mixture does not classify under this category.
Reproductive Toxicity: Mixture does not classify under this category.
STOT-Single Exposure: Mixture does not classify under this category.
STOT-Repeated Exposure: Mixture does not classify under this category.
Aspiration Hazard: Mixture does not classify under this category.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Aquatic: Aquatic Toxicity - Low, based on OECD 201, 202, 203 + Microtox: EC_{50} & IC_{50} ≥100 mg/L. Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Terrestrial: Not tested on finished formulation.

Persistence and Degradability: Readily Biodegradable per OCED 301D, Closed Bottle Test
Bioaccumulative Potential: No data available.
Mobility in Soil: No data available.
Other Adverse Effects: No data available.

Section 13: DISPOSAL CONSIDERATIONS

Unused or Used Liquid: May be considered hazardous in your area depending on usage and tonnage of disposal – check with local, regional, and or national regulations for appropriate methods of disposal.

Empty Containers: May be offered for recycling.

Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

Section 14: TRANSPORT INFORMATION

U.N. Number: Not applicable
U.N. Proper Shipping Name: Cleaning Compound, Liquid NOI
Transport Hazard Class(es): Not applicable
NMFC Number: 48580-3
Packing Group: Not applicable
Class: 55
Environmental Hazards: Marine Pollutant - NO
Transport in Bulk (according to Annex II of MARPOL 73/78 and IBC Code): Unknown.
Special precautions which user needs to be aware of/comply with, in connection with transport or conveyance either within or outside their premises: None known.

U.S. (DOT) / Canadian TDG: Not Regulated for shipping.
ICAO/ IATA: Not classified as Hazardous
IMO / IDMG: Not classified as Hazardous
ADR/RID: Not classified as Hazardous

Section 15: REGULATORY INFORMATION

All components are listed on: TSCA and DSL Inventory.

SARA Title III: Sections 311/312 Hazard Categories – Not applicable.
Sections 313 Superfunds Amendments and Reauthorizations Act of 1986 – Not applicable.
Sections 302 – Not applicable.

Clean Air Act (CAA): Not applicable
Clean Water Act (CWA): Not applicable

State Right To Know Lists: No ingredients listed
California Proposition 65: No ingredients listed
Texas ESL:

Ethoxylated Alcohol	68439-46-3	60 µg/m^3 long term	600 µg/m^3 short term
Sodium Citrate	68-04-2	5 µg/m^3 long term	50 µg/m^3 short term
Sodium Carbonate	497-19-8	5 µg/m^3 long term	50 µg/m^3 short term
Citric Acid	77-92-9	10 µg/m^3 long term	100 µg/m^3 short term

Section 16: OTHER INFORMATION

Size	UPC	Size	UPC
2 oz. Pump	043318130366	1 Gallon w/ Dilution Bottle	043318000669
2 oz. Pump	043318131035	1 Gallon	043318000799
4 oz. Pump	043318130014	1 Gallon w/ Dilution Bottle	043318001383
16 oz. Trigger	043318130021	1 Gallon w/ Dilution Bottle	043318002021
22 oz. Trigger	043318130229	1 Gallon	043318130052
24 oz. Trigger, 12 per case	043318000034	1 Gallon w/ Dilution Bottle, 112 per case	043318480140
24 oz. Trigger	043318000300	1 Gallon w/ Dilution Bottle, 4 per case	043318480416
24 oz. Trigger	043318130137	1 Gallon w/ Dilution Bottle, 24 per case	043318480492
32 oz. Trigger	043318000652	1 Gallon w/ laundry	043318002052
32 oz. Trigger	043318130335	1 Gallon w/ towel	043318001222
67.6 oz	043318000393	140 oz.	043318001390
67.6 oz.	043318130144	140 oz., 168 per case	043318561405
1 Gallon w/ Dilution Bottle	043318000539	140 oz. w/ Dilution Bottle	043318001468
1 Gallon w/ Dilution Bottle	043318000645		

USA items listed only. Not all items listed. USA items may not be valid for international sale.

Section 16: OTHER INFORMATION - continued

NFPA:

Health – None
Flammability – Non-flammable
Stability – Stable
Special - None

Acronyms

NTP	National Toxicology Program	IARC	International Agency for Research on Cancer
OSHA	Occupational Safety and Health Administration	CPSC	Consumer Product Safety Commission
TSCA	Toxic Substances Control Act	DSL	Domestic Substances List

Prepared / Revised By: Sunshine Makers, Inc., Regulatory Department.
This SDS has been revised in the following sections: Revised SDS layout

DISCLAIMER: The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Appendix H

Injury/Illness, Property Damage Incident, and Near Miss Reporting Forms

Injury/Illness Report Form

This form should only be used for reporting an incident resulting in employee injury/illness. Prior to completing this form, verify that the appropriate notifications have been made as identified below. Use the Property Damage Incident Report Form to document property damage. Use the Near-Miss Report Form to document Near-Misses.

Name and job title of injured/illness employee:

Employee's address and telephone number:

Time, Date, and Location where the injury/illness occurred:

Address of K/J site contact:

Check the appropriate nature of injury/illness(s):

Sprain ___ Strain ___ Fracture ___ Abrasion ___ Bruise ___ Laceration ___ Puncture ___

Avulsion (amputation) ___ Burn ___ Impact/Compression Injury ___ Allergic Reaction ___

Eye Injury ___ Hearing-Related Injury ___ Heat/Cold Exposure ___ Altered level of Consciousness ___

Respiratory/Cardiac-Related Event ___ Chemical/Substance Exposure ___ Nausea ___

Identify the body part affected:

What was the employee doing when the injury/illness occurred?

What action, mechanism, or piece of equipment directly contributed to the injury/illness?

What other processes or items may have indirectly contributed to the employee injury/illness?

Description of accident, accident scene and if accident scene has been instrumentally altered by employees, bystanders and/or emergency personnel and equipment:

How might have this injury/illness been avoided?

Was the injury/illness immediate or did it gradually evolve over time?

If this event occurred at a job site, was a site-specific safety plan prepared and approved? If so, please attach to this form.

If this event occurred at a job site, was a job hazard analysis completed for the task which the employee was performing at the time of injury/illness? If so, please attach.

What were weather conditions at the time of the injury/illness?

Was the employee's supervisor notified? When?

Did the employee contact WorkCare for medical direction? When?

List emergency medical services, fire, or law enforcement agencies summoned for the injured employee:

Provide names and phone numbers of witnesses:

Injured employee was transported to:

Name of person preparing this report: _____

Title: _____ Date: _____

Property Damage Incident Report Form

This form should be used only for an incident resulting in property damage without injury to employees involved. Use the Injury/Illness Report Form to document employee injuries. Use the Near-Miss Report Form to document Near-Misses.

Name(s) of employee(s) involved:

Time, Date, and Location where the incident occurred:

Description of the incident:

What was the employee doing when the incident occurred?

What action, mechanism, or piece of equipment may have directly contributed to the incident?

What other processes or items may have indirectly contributed to this incident?

If this incident occurred at a job site, was a site-specific safety plan prepared and approved? If so, please attach to this form.

Detail any corrective actions taken.

Provide names and phone numbers of witnesses:

Name of person preparing this report: _____

Title: _____ Date: _____

Signature of H&S Manager: _____ Date:_____

Signature of Deputy Project Manager: _ Date:
_____

Near-Miss Report Form

This form should only be used for Near-Miss events which did NOT result in injury or property damage. Use the Injury/Illness Report Form to record injuries or illness. Use the Property Damage Incident Report Form to record property damage.

Date: _____ Location: _____

Time: _____ ☐a.m. ☐p.m.

Weather Conditions: _____

Please check all that apply:

☐Unsafe Act ☐Unsafe Condition ☐Unsafe Equipment ☐Unsafe Use of Equipment

Description of Near-Miss in detail:

Employee Name _____ Date: _____

This section to be completed by Health & Safety Manager or Representative.

Cause of Near-Miss:

Corrective action(s) taken:

Business Unit H&S Manager _____ Date: _____

Appendix B

1950s Correspondence – Reference Documents

STATE OF WASHINGTON

Pollution Control Commission

ARTHUR B. LANGLIE
GOVERNOR

E. F. ELDRIDGE
DIRECTOR AND CHIEF ENGINEER

ADMINISTRATION BUILDING
OLYMPIA, WASHINGTON

September 15, 1950

Mr. Carl F. Thomas
Chief Engineer
General Offices
Spokane, Portland, and Seattle Railway
Portland, Oregon

Dear Mr. Thomas:

This letter is written to confirm our discussion on Tuesday, September 12, in your office.

During our conversation it was mentioned that the State Department of Fisheries had issued a complaint of oil pollution to this commission. A portion of the complaint is quoted for your information

> "..... the S P & S shops at Wishram are dumping this oil refuse into a small creek which empties into the Columbia River. The Indians are complaining of the oily water coming into their fishing grounds ½ mile below Wishram.
>
> This oil black gooie mess is about four feet wide in this creek and about 4 to 6 inches thick. ....."

This Commission has recently issued a series of minimum requirements for pollution abatement and those that apply to the oil using industries are enclosed for your information. Sections 3, 4, 7, 8, and 9 all apply to the shops at Wishram.

It is hereby requested that an analysis be made of the oil losses at the shops at Wishram and that suitable devices be installed so that these waste oils may be kept out of state waters.

It will be appreciated if a letter of acknowledgement will be sent to this commission after the problem has been investigated.

Very truly yours,

Alfred T. Neale

Alfred T. Neale,
Field Engineer

FBS
Cannon
Snow
Corratt
USN

ATN:ac
cc: Department of Fisheries
encl.

"Keep Washington Waters Clean"

Portland, Oregon
October 26, 1950
File 116 - 4
45753

C. F. T.
OCT 27 1950

Mr. C. F. Thomas,
Chief Engineer.

Your letter September 19, File 387, about complaint regarding oil in the Columbia River in the vicinity of Wishram.

You were to investigate and advise further, and would be glad to know what you have been able to develop.

E. B. Stanton

CC: Mr. J. A. Cannon
Mr. E. H. Showalter
Mr. W. P. Garrett
Mr. N. S. Westergard

Portland, Oregon
November 6th.,1950

Mr. C. F. Thomas
Chief Engineer
Portland Oregon

Dear Sir:-

I have made and on the ground inspection of the situation regarding alleged dumping of oil into the Columbia River ,on the part of our company in the vicinity of Wishram Washington which was the subject of correspondence with the Pollution Control Commission of the state of Washington,and after a careful investigation of the shore line of the river am unable to find any signs of escaping oil from our storage facilities into the river.

Some oil of course is lost in the process of loading and unloading which is being absorbed by the soil in the yards and conceivably some small portion might wash off into the river at hish water by rain drainage but it would be so small that its influence would be so inconsequential that it could not affect the fishing grounds referred to, and in this connection I learn that some complaint was made by youths using swimming facitilited improvised some distance up stream from our oil installations, that escaping oil from barges hauling on the river had contaminated the water of their pool and rendered it unusable for some time. This may be the source of the oil that forms the basis of the complaint on the part of the indians.

We have an old oil separator located in the vicinity of the epresent water tank equipped with baffles etc. The only trouble with the installation is that it has never been used in the past 35 years for such purposes and is now being used as a booster cistern for pumping water into the water tank.

There is an old overflow channel indicated by pencil outline on the map which accumulates the sewage from numerous small shacks being occupied by employes of the company which contains the usual filth and trash incident to such channels ,a part of which may find its way into the river at high water but aside from this and evidence of an old loss of considerable crude oil which has dried to the consistency of asphalt,there seems to be no evidence of any oil seepage from our installations into the river.

Yours very truly

Wm. W. Harcombe

November 20, 1950

Mr. Alfred T. Neale
Field Engineer
Pollution Control Commission
Olympia, Washington

Dear Sir:

This is to acknowledge receipt of your letter of September 15th in regard to complaint of oil pollution at Wishram, Wn.

The matter has been under investigation for some time and on several inspections there has been no evidence of oil entering the river from Railway facilities, however, at times in the past it may have done so.

Some years ago there was an accidental spill due to a broken valve while filling a locomotive. This oil was trenched across the track to side of fill where it accumulated in a swamp and has now dried to the consistency of asphalt, described in your letter as "oil black gooie mess".

The Railway Company will cooperate in observing all regulations or orders issued by a State agency. We have the matter of a sump or oil separator under investigation.

Very truly yours,

Chief Engineer

VE-c

Portland, Oregon
December 1, 1950

Mr. E. B. Stanton
Vice President and General Manager

Please refer to your letter of October 26th, file 116-4, and previous correspondence regarding complaint made by the Pollution Control Commission of the State of Washington with respect to oil in the Columbia River at Wishram.

We have made reply to the Pollution Control Commission, that we have made investigation several times since receipt of their letter and have found no additional oil in the river and that we will continue to observe the situation and report observations. However, since the last letter to the Pollution Control Commission on November 20th, there has been for the first time evidence of new oil just upstream from the power house.

The oil, I think, that was complained of originally was oil that was lost in considerable quantities a number of years ago when a valve broke on the service tank while a locomotive was fueling and this oil was trenched through to the river. However, regulations as far as Washington is concerned are that a terminal should have an oil separator and the railway company will have to do something in the way of installing such a facility in case the Wishram terminal remains in use permanently. At the time the terminal was constructed, there was a concrete oil separator, 30 ft. long, 8 feet wide and 11 ft. deep that was constructed. This separator was never used. It had a concrete top and just a manhole for access to the separator. If a separator is placed at Wishram, we would, of course, design one so that sludge could be removed with crane.

I think the best thing to do will be to make checks frequently during the next couple of months and in the meantime we may know a little more about the possibility of The Dalles Dam

project going through in the not too distant future and if it does appear that the Dalles project stands a good chance of being started, I believe we should state to the Pollution Control Commission that we believe additional costs would not be justified at Wishram inasmuch as for a period of 38 years there has been very little accumulation in the way of oil at that location.

CFT-p

Chief Engineer.

cc-Mr. J. A. Cannon
Mr. E. H. Showalter
Mr. W. P. Garrett
Mr. N. S. Westergard

COPY

STATE OF WASHINGTON
POLLUTION CONTROL COMMISSION
ADMINISTRATION BUILDING
OLYMPIA, WASHINGTON

ARTHUR B. LANGLIE
Governor

E.F. ELDRIDGE
Director and Chief
Engineer

February 26, 1951

General Offices of the
Spokane, Portland and Seattle Railway
Portland, Oregon

Gentlemen:

While on a trip along the Columbia River on Thursday, February 15, 1951, I had an opportunity to visit the railway yards and roundhouse at Wishram, Washington.

It was noted that three sewer outfalls in this vicinity discharge wastes to the banks of the Columbia River. It was apparent that liquid wastes from the roundhouse should pass through an oil separator. Waste oils could be seen on the banks of the Columbia in the vicinity of this outfall. It is understood from conversation with Mr. Raymond Olson, the yard Foreman, and from correspondence with Mr. Carl F. Thomas, Chief Engineer, that plans have been developed for such a devise and that it will be installed by the railway when favorable weather conditions prevail.

It was also noted that another sewer outfall a short distance downstream was used to carry septic tank effluent toward the Columbia. This outfall was terminated over 100 feet from the river and as a result these wastes flowed through an open ditch to the river. It is readily apparent that a nuisance condition and a public health hazard would prevail especially during warm summer months.

It is therefore the recommendation of this Commission that these two sewers should be extended in such a manner as to always empty directly to the waters of the Columbia River. It is expected that only waste waters from the oil separation unit and septic tank effluent are to be carried in these sewers.

Your interest and cooperation in extending these sewer outfalls as well as in coping with the oil separation problems at Wishram and at Vancouver are very much appreciated.

Very truly yours,
S/ Alfred T. Neale
Alfred T. Neale
Field Engineer

ATN: ac
cc: Dr. Lathrop
Klickitat County Health Officer
Court House, Goldendale, Washington

Not all S. PLS

Portland, Oregon
May 21, 1951
387

Mr. E. B. Stanton
Vice President and General Manager

Please refer to your letter of May 16th, file 116-4, regarding complaint made by the State of Washington Pollution Control Commission account oil in the river at Wishram and also sanitary sewage disposal to the river.

It appears now that it will be necessary to take care of this situation at Wishram in a temporary manner, although we have received no recent complaints. It is possible the terminal at Wishram will be moved in a matter of a couple of years and any work done should be done as cheaply as possible. I believe we should notify the Pollution Control Commission of the probable removal of the Wishram Yard and that, of course, when a new terminal is built there will be constructed a disposal system to take care of both oil and sanitary sewage.

We are running levels at this time to see if it would be possible to drain the pits to the old separator but the new pits were constructed a little bit differently from the old and I believe we will find that we will have to build a small temporary separator to take care of the oil. I will advise in the immediate future. In the meantime the river is so high and will be for quite some time that the problem of sewage disposal and oil in the water does not exist at the moment.

CFT-p

Chief Engineer.

cc-Mr. J. A. Cannon
Mr. W. P. Gibson

Portland, Oregon
June 4, 1951

Mr. E. B. Stanton
Vice President and General Manager

Your letter of May 24th, file 116-4, with respect to complaint made by the State of Washington Pollution Control Commission regarding oil in the Columbia River at Wishram.

I am enclosing a print that shows in red the location of a 12" pipe and a sump pump that would have to be placed to make usable the original oil separator. The separator would have to be cleaned, new hatch covers placed and two pipes plugged. The estimated cost for the work is as follows:

	Labor	Material	Total
Excavation 110 cu.yd. @ $5	$ 550	$ —	$ 550
Cutting invert and outfall in separator	100	—	100
Install 6 ft. dia. sump	200	400	600
Install 300 g.p.m. sewage pump	150	1500	1650
Piping and accessories	400	1300	1700
Electrical equipment	100	300	400
Backfill 90 cu. yds. @ $1	90	—	90
	1,590	3,500	5,090
Engineering and incidentals	160	350	510
Total	$ 1,750	$3,850	$5,600

The problem of sanitary sewerage should not be considered as the nuisance results only partly from the railroad. The only thing that could be done would be to extend the outfall 100 feet to low water.

As far as the control of oil is concerned, I believe decision should be deferred until next month to see if a definite construction appropriation is made for The Dalles Dam. If The Dalles

Dam is to be built, I think that the Washington Pollution Control Commission's attention should be called to the temporary use of an oil separator.

CFT-p

Chief Engineer.

cc-Mr. J.E.Cannon
Mr. W. P. Gibson

← To Portland

MAINLINE

To Spokane →

ENGINE HOUSE

WASH RACK

OIL SUMP

4×4 box

12" conc. sewer pipe x 78 ft.

OIL SEPARATOR

6" drain from oil sump.

oil drain from Engine house, 12" dia.

CAR REPAIR SHOP

REPAIR SHOP

WATER TANK

WATER TNK.

40'

PUMP HSE.

12" concrete sewer pipe x 270 ft., slope 0.0037.

PUMP SUMP, 500 g.p.m. sewage pump.

Scrap remainder of oil drain.

LOCATION PLAN

SCALE: 1" = 50'

Portland, Oregon
June 6, 1951
File 116 - 4
2532

C. F. T.

JUN 7 1951

Mr. C. F. Thomas,
Chief Engineer.

Your letter June 4th, file 387, about complaint by the State of Washington Pollution Control Commission regarding oil in the Columbia River at Wishram.

I do not think we should do anything whatsoever in connection with this matter for the time being. In the event we are pressed by the Commission at a future date, the uncertainty of the situation due to the possibility of the construction of The Dalles Dam, and the complete abandonment of the Wishram facilities should be pointed out to them, with the thought in mind that we will be spared going to the expense of making any changes at that point.

E. B. Stanton

CC: Mr. J. A. Cannon
Mr. W. P. Gibson

Appendix C

Former Water Supply Wells – Reference Documents

367-9

COPY.

Form A-80

SPOKANE PORT AND & SEATTLE RAILROAD Company

A. F. E. COMPLETION NOTICE

A. F. E. No. 2064 for Drill 12" well 180 ft deep just east of present power plant; extend power plant building to cover well. Wallbridge Wash.

Authorized Aug. 15, 1917; Completed July 31st, 1918

INVENTORY
O.T. BOOK 57 PAGE 28
Comp. Sketch. O.T. 57-P. 28

E. J. Keeley
Master Carpenter
A-6. Bryner
Superintendent
R. D. Halvorsham,
Res Eng
(SIGNED) ALEX. M. LUPFER
Chief Engineer

12/19/18

Vancouver Wash.
Sept. 14, 1918
INVENTORY-M.L. Book #62-Page-26

2/24-19.

(SIGNED) E. E. LILLIE
ASSISTANT GENERAL MANAGER

INFORMATION ENTERED			
MAP	FILE NO.	DRAFTSMAN	DATE
ROW SHEETS-PRINTS-TRACINGS			
ALIGN. MAPS-			
TRACK PROFILE			
Original to Federal Auditor.			
Duplicate to Asst. Gen. Mgr.			
March 13, 1919.			
BRIDGE & CULVERT SCHEDULE			
STOCKYARD DIAGRAM			
SHOW BLDG. PLAN ON INDEX CARD			

Log of Well made - See CC 556 -

Information Shown on Maps

1/11-19

SPOKANE PORTLAND & SEATTLE RAILROAD

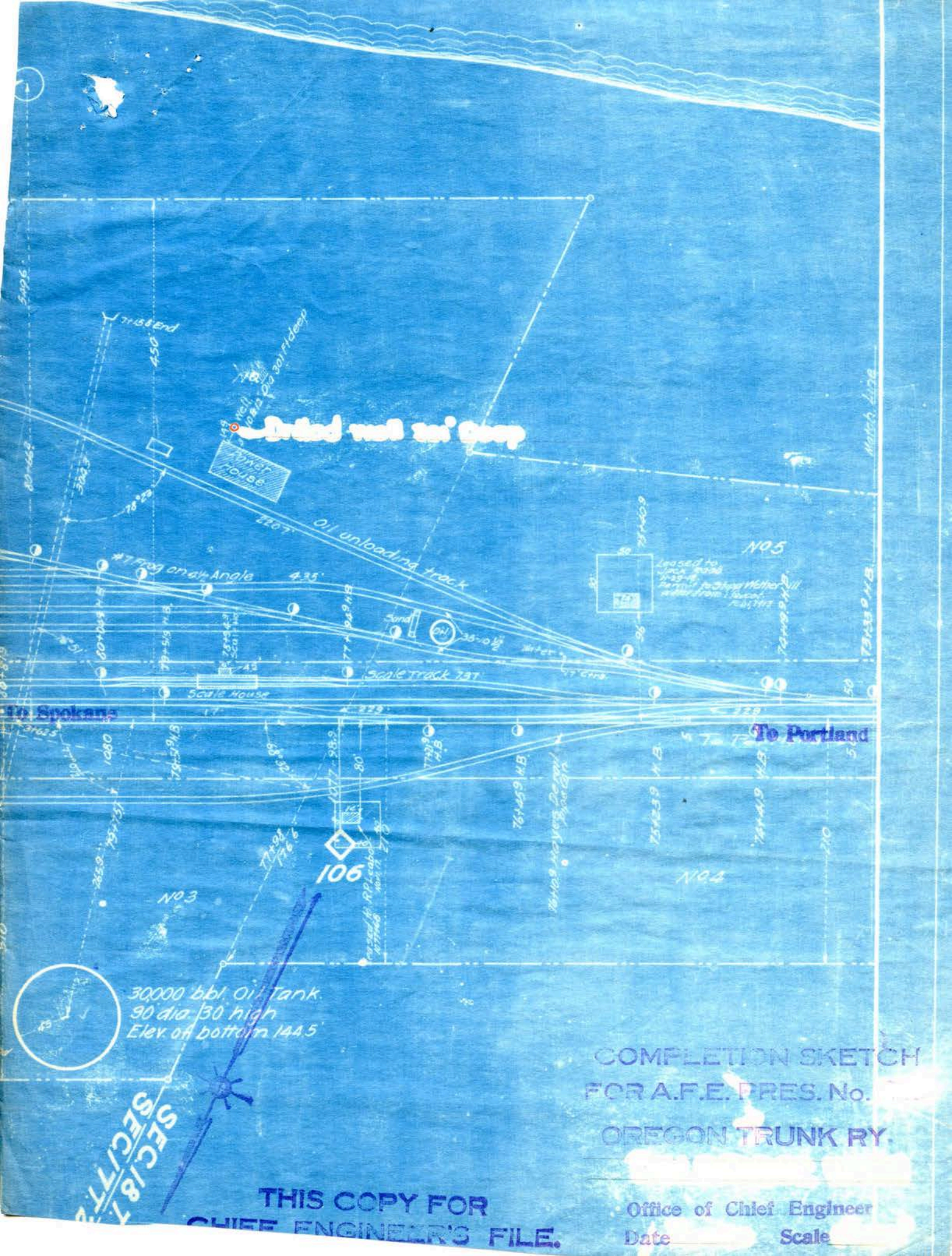
A.F.E. 2064 - Drill 12" well just east of present power plant and extend power plant building to cover well at Fallbridge, Washington.

INVENTORY

6½	Lbs Track spikes 5/8 x 6"
1½	" 6d nails
6	Ft 7" rubber belt
3	¼" elbows
10	Lbs 1 x 20 mach bolts
1	" 1" washers
2	5/8 x 12 mach bolts
2	5/8" hex nuts
8	3/4 x 1½ mach bolts
1	Hack saw blade
1	¼" elbow
1	¼" union
1	¼" x 3" nipple
12	½ x 1½ mach bolts
130	Rivets
12	½ x 1 mach bolts
6	1" square nuts
540	Lbs 5/16" sheep steel
405	Cu ft oxygen
282	" " acetylene
300	Lbs 60% dynamite
10	" 40% "
10	" 3" hex nuts S.H.
306	" 6 x 10 sheet steel
100	" ¼" sheet steel
3	" round iron
21	Lin ft 12" pipe S.H.
108	" " 10" W.I.P.
60	Pcs 2 x 12 - 16 Rgh
88	Elec exploders
1	Hand pump
17	Lin ft 10" pipe
6	10" couplings
278½	Lin ft 8" W.I.P.
4	8" couplers
108	Lin ft 1" W.I.P.
107	" " 10" std blk pipe
20	" " 12" " " "
82	" " 13" casing pipe

Office of Chief Engineer.
Portland, Oregon.
March 13, 1919.

AHL.



COMPLETION SKETCH
FOR A.F.E. PRES. No.
OREGON TRUNK RY.

THIS COPY FOR
CHIEF ENGINEER'S FILE.

Office of Chief Engineer
Date Scale

Form 1268

SUPPLEMENTARY

387-9

OREGON TRUNK RAILWAY

Division

Chief Engr's. Suppl'g No. 2058

Supp'l President's No. 2064

FALLBRIDGE, WASH.

Authority is asked for the expenditure of $ $ 3,919.82 for the following changes in Presidents A. F. E. No. 2064

which provides for drilling a 12 inch well 180 feet deep just east of present power plant; extend power plant building to cover well, Fallbridge, Washington.

CHANGES

Substitute the following estimate for one originally submitted, this authority is to cover the drilling of well only, separate authority will be prepared abandoning old well and equipment and the installation of new pump equipment and buildings.

ESTIMATE	Labor	Material
Drilling well & placing casing	$ 2500.00	$ 1000.00
Fuel		700.00
Miscellaneous supplies		300.00
Repairs to equipment	150.00	200.00
Freight		50.00
Engineering and contingencies	200.00	
	$ 2850.00	$ 2250.00
		2850.00
		$ 5100.00
Previously authorized		1180.18
Total this estimate.....		$ 3919.82

Copy to:
Mr. R. P. Habersham,
Mr. O. B. Riddle.
6-21-18

Reason why the above changes are recommended. Needed to supply water for engines and station use.

Chief Engineer's Supplementary AFE No. 2058.

Portland, Oregon, May 31st, 1918.

(SIGNED) ALEX. M. LUPFER
Chief Engineer or General Master Mechanic

Approved: A. J. Davidson
General Manager

Form 1868

SUPPLEMENTARY

OREGON TRUNK RAILROAD CO.

FALLBRIDGE, WN. ~~XXXXX~~

Suppl'g C. E. No. 2058

Supp'l President's No. 2064

Authority is asked for the expenditure

of $ $950.00 for the following changes in Presidents A. F. E. No. 2064

which provides for drilling 12" well, 180 feet deep just east of present power plant, Fallbridge, Washington.

Approved Feb. 28-1919.

CHANGES

Add to the amount previously authorized the following required to complete the work:

DETAILS

Increased cost of drilling well	$ 950.00
TOTAL.....	$ 950.00

Copy to
Mr. R. P. Habersham
Valuation Bureau

3-8-19

Reason why the above changes are recommended. Necessary to drill deeper than originally estimated, also got crook in hole, causing drilling to be difficult. This authority needed to comply with D. C. E. Circular #7.

Chief Engineer's Estimate No. 2058
Portland, Oregon, February 19, 1919

(SIGNED) ALEX. M. LUPFER

Chief Engineer or
General Master Mechanic

Approved: E. E. Lillie

General Manager

3879

Vancouver, Wn., Aug. 19, 1917

Mr. A. J. Davidson
Gen'l Superintendent

Oregon Trunk A. F. E. 2064, amount $1180.18, covering drilling of well at Fallbridge just east of present power plant. Note that on blue-print submitted that it proposes to drill the well at east end of power house and extend building to cover well. Please refer to sketch mailed you on July 6th with estimates showing the location of well to be on the river side of power house on east end .

It was not feaseable to locate the well as outlined on blue-print on account of oil sumps located within ten feet of the east end of power house.

If consistent, think the location should be changed to the original sketch.

cc to -
A. M. Lupfer

P. C. Wequier

3879

Portland, Oregon; August 21, 1917

Mr. A. M. Lupfer:-

Mr. Wegner's letter 19th inst., carbon of which was mailed you, AFE 2064, drilling well Fallbridge:

Agree with Mr. Wegner location of well should be changed to river side of power house as shown on original sketch. Please advise.

M J Dunniday

cc to:
Mr. R. C. Wegner

See special lines on plat-attached to AFE 2064

Portland, Oregon,
June 21, 1920.

Mr. A. J. Davidson,
General Manager. File 387-9

Dear Sir: STRAIGHTENING FALLBRIDGE WELL.

Referring to previous correspondence in the matter of straightening Fallbridge Well:

I am sending you herewith two prints showing conditions as they exist. Blue print shows plan of pump house indicating method of measuring dimensions in well. Print also shows the elevation of the well, one taken looking East and one looking North. The present 10" casing indicated by white lines, shows the amount that well is off plum in inches shown at every ten feet in depth. I have shown on these prints in red the way 8" drop pipe would hang if thetop of the well was straightened.

Pumping tests indicated that the normal water level is 35 beet below ground and that when pumping to capacity water is lowered 30 feet or to a distance of 65 feet below ground. This indicated clearly that there is no necessity of placing well cylinder deeper than about 75 feet. I would recommend therefore that we sink an open shaft around the present well casing to a depth of 35 or 40 feet making the shaft as small as can be done. After the well casing is exposed the 13-1/2 inch should be removed, the 10" casing examined to see that it is sound after which it should be straightened and blocked into true alighment so that the pump pipe will hang straight without binding. Shaft should then be backfilled and tamped, the drop pipe and pump rods shortened so that the bottom of the cylinder will hang at an elevation of approximately 80 feet, the pump and engine shifted on their foundations enough to

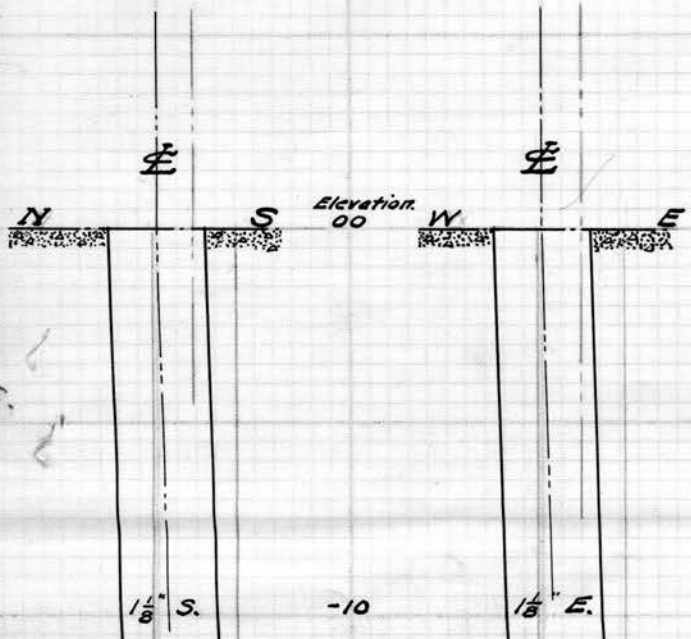
bring them into line with the straightened well and the equipment reconnected. I do not believe the 10 inch pipe should be cut off unless we find that it is badly damaged, after the 13-1/2 pipe is removed. I would estimate that it will cost in the neighborhood of $250.00 to straighten the well and $250.00 to move and reline, and reconnect the pumping equipment. Believe we should do this work with our own forces if it can be possibly arranged. Would suggest that after the well is straightened to what appears to be the correct location, that a final check should be made on the alignment of the well before the shaft is filled.

Yours truly,

WHM-D

Chief Engineer.

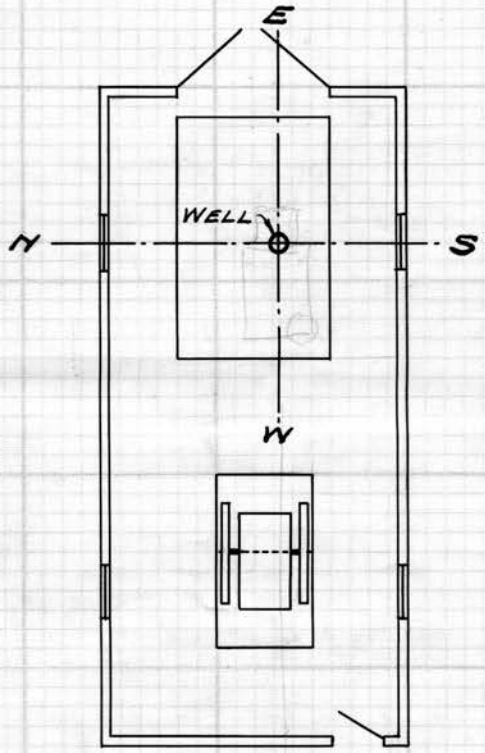
Encl.



ELEVATION

1" = 5'-0"

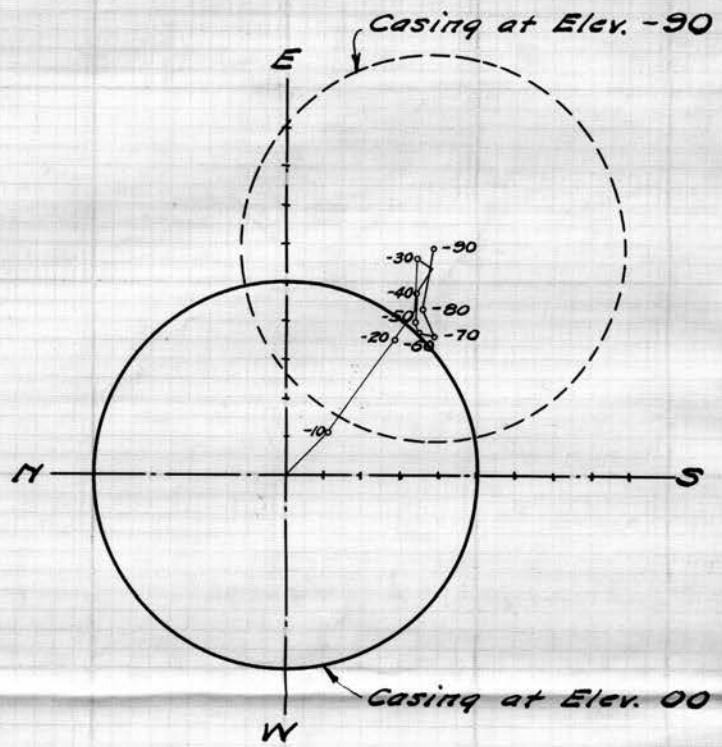
1" = 20'-0"



PLAN VIEW
OF
PUMP HOUSE.
1" = 10'-0"

ELEVATIONS.
1"=5'-0" H.
1"=20" H.

$3\frac{3}{4}$" S.	-50	$3\frac{15}{16}$" E.
4" S.	-60	$3\frac{1}{2}$" E.
$4\frac{1}{4}$" S.	-70	$3\frac{5}{8}$" E.
$4\frac{1}{16}$" S.	-80	$4\frac{3}{8}$" E.
$3\frac{3}{4}$" S.	-90	$5\frac{3}{4}$" E.



PLAN VIEW
OF
CENTER LINE OF 10" CASING.
1" = 5"

O.T. Ry.

FALLBRIDGE

PRESENT ALIGNMENT
OF
DEEP WELL.

Office of Chief Engineer June 18, 1920.
Scales as shown.

C O P Y

Tacoma, Wash., Jan. 16th, 1926.

Mr. H. E. Stevens,
Chief Engineer, N.P.Ry.
St. Paul, Minn.

Mr. J. R. W. Davis,
Chief Engineer, G.N. Ry.
St. Paul, Minn.

Gentlemen:

In accordance with your request of Jan. 5th a study has been made of the water situation on the S.P.& S. Ry. at Fallbridge, Wash. where an expenditure of $17,700 has been proposed for improvements.

Upon arrival at Fallbridge Jan. 13th we were met by the following officers of the S.P. & S. Ry:

W. A. Marsh - Asst. Chief Engineer
R. P. Habersham - Resident Engineer
E. F. Kelly - Master Carpenter
Steve Earles - Gen. Foreman of Water Service

Fallbridge is a terminal point where the water consumption runs to a maximum of 400,000 gallons per 24 hours during the summer months. The village is strictly a railroad enterprise with a population of about 300 and the Company furnishes all the water which is needed for fire protection, watering of lawns and gardens, for domestic and drinking purposes. This water is secured in part from a deep well, by means of Pomona Pumping equipment, actuated by a 35 H.P. type Y engine and in part from the Columbia River by means of a steam pumping plant. Drinking water is secured in tank cars from Tuscon, a station about 50 miles distant from Fallbridge on the Oregon Trunk Ry.

On account of difficulties encountered in driving the well, the casing was damaged at several places and a very crooked hole was secured. The evidence indicates conclusively that the casing was not properly seated in the first rock stratum at about 92 ft. below the surface as indicated on the log of the well, which is attached to this file.

These defects have permitted sand, as well as oil, sewage, etc. to enter the well. The crooked hole has prevented proper operation of the double line of pump rods causing rapid wear and other difficulties, which have made it almost impossible to keep the equipment in continuous service. The casing defects permitted sand to fill into the well to a depth of about 150 ft. in less than a 12 month period. Under these circumstances, maintenance is un-

necessarily very high and the operation uncertain as well as very unsatisfactory. Repairs to the present well are impossible at any justifiable expense.

The water source is apparently from the sand stratum at about 176 ft. below the surface and it seems evident that 300 ft, is an ample depth for wells in this location. When the well was completed in August of 1918 an analysis was made of the water, which showed a hardness of about 15 grains per gallon, in December 1918 a hardness of 12.36 grains and the analysis of March 31st, 1919 showed a hardness of 9.35 grains. Mr. Mills, the Engine House Foreman at Fallbridge, states that very little hard scale accumulates in the boilers, so it is evident that this hardness is largely due to carbonates and we may consider that water from this source is satisfactory for locomotive use, provided any surface contamination such as organic matter, oil, etc. is excluded.

Furthermore, if the well is constructed in a workmanlike manner and a water tight joint made between the casing and the rock stratum, there is little doubt but what water will be entirely suitable for human consumption. The present supply there, both from the well and the River is unsafe for drinking purposes and necessitates the hauling of drinking water from long distances, as previously mentioned.

From such tests of the flow of the existing well as are available, it is reasonable to assume that a good 12" well, drilled to 300 ft. depth can be depended on to furnish at least 250,000 gals. in 24 hours. This amount not being sufficient for all requirements, two wells will be necessary in case this plan is adopted.

There are three possible sources of water supply at Fallbridge and in the report which follows, they are designated as follows:

1. Pump water directly from the Columbia River, clarify by sedimentation and filtration and chlorinate, making this water fit for human consumption as well as suitable for boiler use.

2. Further develop certain nearby springs and secure a gravity supply.

3. Drill 2 deep wells, installing electric driven pumping machinery at one, and use the present deep well pumping equipment at the other.

PROPOSITION #1

The original Fallbridge Water Supply was obtained from the Columbia River, but difficulty in maintaining intake lines, rapid wearing of the pumps due to sand, and the boiler troubles incident to the use of muddy water during a portion of the year, made abandonment of this source advisable.

The Health Authorities condemned the use of this water for drinking purposes in 1916. Deep wells provided a satisfactory supply at other points along the Columbia River and it was therefore decided to seek a similar supply from a deep well at Fallbridge. The results obtained as previously described, have been very disappointing. A careful examination of the river bank at the site of the original intake lines, leads to the belief that a part of the trouble experienced, while operating the river plant, was due to the sandy character of the river bed and the agitation caused by eddies in the current above the rapids near this point. Some 1200 feet upstream a depression in the basalt rock of the river bottom forms an ideal location for a river intake. A fault in the rock follows about the line shown in dotted black on the enclosed station plat of Fallbridge where we have indicated location for a proposed 18" suction pipe leading to the pump house. This will permit of placing the suction line with the minimum of rock excavation and also afford suitable protection from floating ice. The location shown for pump house and filters is intended to be above the high water line. In this connection it may be noted that the rise and fall of the Columbia River at Fallbridge is between 25 and 30 feet and the water carries much higher turbidity throughout a longer period of the year than it does at points higher up, such as at Pasco. This is due to the entrance of the Snake and also the Deschutes River between Pasco and Fallbridge.

In order to obtain sufficient water of proper quality from the Columbia River, it is necessary to provide, in addition to adequate pumping facilities, a 300,000 gallon sedimentation basin, gravity sand filters in duplicate and chlorination apparatus. This work will cost approximately $25,000 and will probably afford the best water available for boiler purposes and certainly the most reliable supply.

PROPOSITION #2

At a point about 8000 ft. north of the depot and some 800 feet above the track, is a spring from which there is considerable flow and two rather small springs are located at a higher elevation, as shown on the enclosed print. The total flow from these springs as roughly estimated, amounts to about 60 gallons per minute at the present time. The water rises in a gravel stratum and it is very probable that a considerable increase could be secured by uncovering a more extensive area. It is our suggestion that the large spring be cleaned out in good shape and accurate measurement of the flow made by means of a weir. In case it is possible to develop a suitable flow from these springs, an expenditure of about $35,000 would be required to deliver the water to the Terminal. Of this total cost, the acquiring of the necessary land and water right, will amount to $16,500.

This water is of excellent quality for both boiler and domestic use and if obtainable in sufficient quantity will afford an excellent supply.

PROPOSITION #3

Two 12" wells drilled to a depth of approximately 300 feet should supply all the water required. It is proposed to thoroughly seal the present well to prevent further surface water contamination, drill one new well at a nearby location and a second well about 200 feet distant. The present Pomona pump and also type Y engine is in first class condition and can be used to advantage on one of the new wells. At the other well an electric driven double plunger, deep well pump is suggested. By thus leaving the oil engine unit at one well, they will be protected in case of failure of the electric power line circuit, which will supply the other deep well outfit. On account of proposing the more shallow wells and making use of the present pumping equipment, we estimate that the total cost of this proposition will not exceed $17,700, already requested for the installation of a single well.

SUMMARY

Proposition	Estimated first cost	Estimated annual cost including interest, depreciation and operation
1. River supply	$25,000	$8,800
2. Spring supply	35,000	3,100
3. Deep well supply	17,700	6,300

From the above summary it is evident that if sufficient water is obtained from the springs, this is the most economical source of supply.

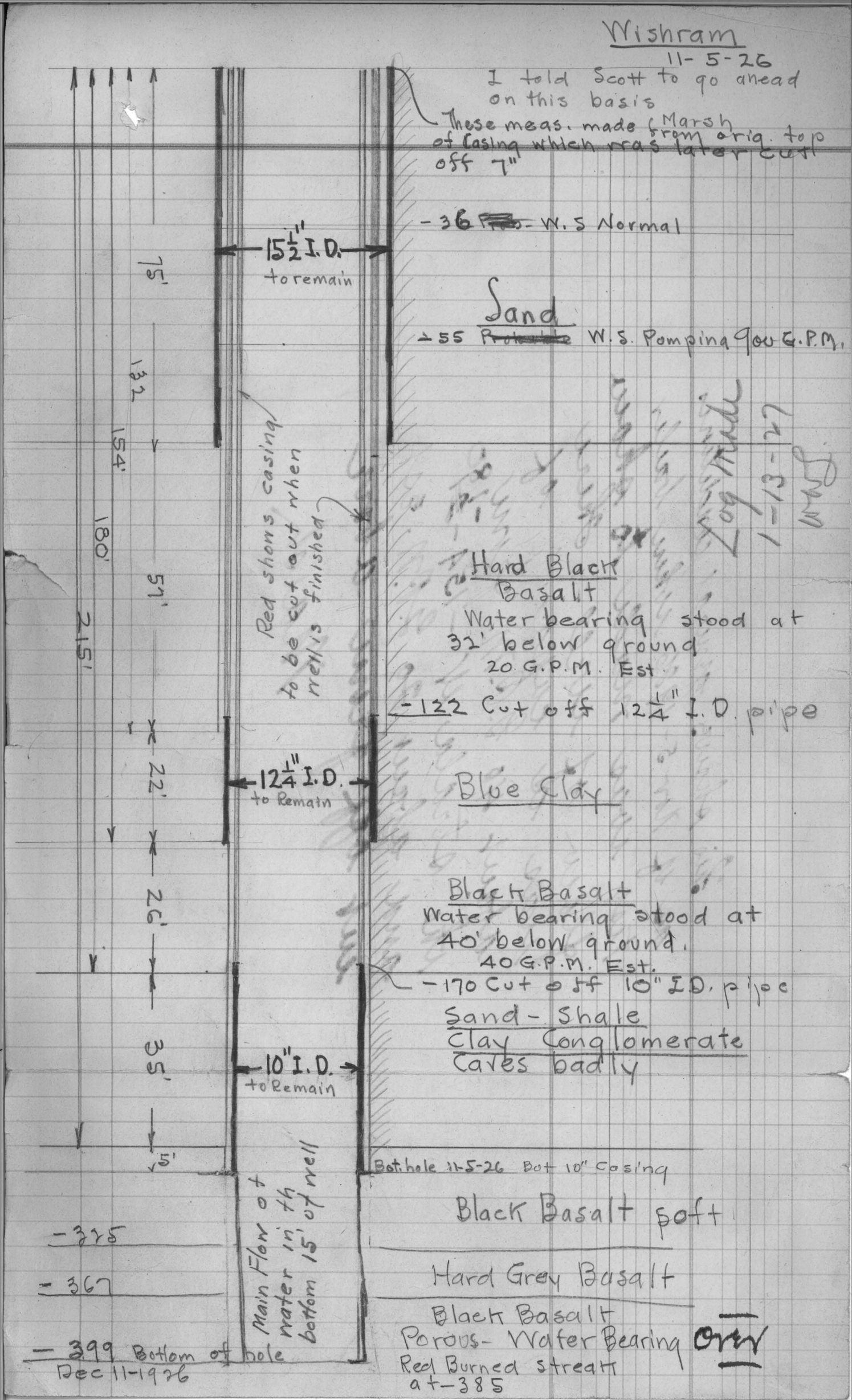
The next best source of supply is from the two wells but a decision as between the two, rests on the results of the measurement of the flow of the springs and the size of investment advisable at this water station.

(Signed) B. W. DeGeer

Engineer Water Service

(Signed) E. M. Grime

Engineer Water Service


Wishram
11-5-26
I told Scott to go ahead on this basis
These meas. made from Marsh of Casing which was later cut off 7"
-36 W.S Normal
15½" I.D. to remain
Sand
+55 W.S. Pumping 90 G.P.M.
Red shows casing to be cut out when well is finished
Hard Black Basalt
Water bearing stood at 32' below ground
20 G.P.M. Est.
-122 Cut off 12¼" I.D. pipe
12¼" I.D. to Remain
Blue Clay
Black Basalt
Water bearing stood at 40' below ground.
40 G.P.M. Est.
-170 Cut off 10" I.D. pipe
Sand - Shale
Clay Conglomerate
Caves badly
10" I.D. to Remain
Bot hole 11-5-26 Bot 10" Casing
Black Basalt soft
Hard Grey Basalt
Black Basalt
Porous - Water Bearing
Red Burned streak at -385
-325
-367
-399 Bottom of hole Dec 11-1926
Main flow of water in the bottom 15' of well
75'
132'
154'
180'
215'
51'
22'
26'
35'
15'

LANE-MILES STANDISH CO. FORM 80

S.P.&S.RY.
O.E.RY.
OCT
17
1927
CHIEF ENGINEER
PORTLAND, ORE.

387-9

OREGON TRUNK RAILWAY
(Insert name of Company)

A. F. E. No. 4454 for Drill, test and fully equip additional deep well.

Wishram, Wash.

Which was authorized on date of Oct.29,1925

has been { Completed / ~~Cancelled~~ on date of Oct.1,1927 / ~~Closed~~

The facility was ready to be placed in service on the date of Oct.1,1927

and was actually placed in service on the date of Oct.1,1927

ORIGINAL SIGNED BY
G. E. VOTAW
Superintendent.

R. D. Habersham
Res. Eng.

(SIGNED) A. J. WITCHEL
CHIEF ENGINEER

(SIGNED) A. J. DAVIDSON
GENERAL MANAGER

INVENTORY and SKETCH

Book 102 Page 72-73

INFORMATION ENTERED

MAP	FILE NO.	DRAFTSMAN	DATE
ROW SHEETS-PRINTS-TRACINGS			
ALIGN. MAPS-	R-7-153	Z.L.	12/19/27
TRACK PROFILE			
TRACK CHART			
STATION PLATS	D-1-1	✓	
SPUR & SIDING RECORD			
BRIDGE & CULVERT SCHEDULE			
STOCKYARD DIAGRAM			
SHOW BL. DG. PLAN ON INDEX CARD			

Information Shown on Maps 12-20-27

Oct.11,1927
Date Rendered

This report must be rendered for each project covered by an AFE or Work Order and must reach the Accounting Department not later than fifteen days after the date of completion. If however the facility was ready for service or was placed in service more than thirty days prior to the date of completion, a report on this form must be rendered at the time the facility was ready for service or placed in service. In such cases the date of completion should be shown as "Project Incompleted." When project is finally completed a second report should be made, showing all information called for by the form.

Original to Comptroller.
Duplicate to General Manager.
Triplicate to Valuation Bureau.
January 11th, 1928.

AJW.

COMPLETION NOTICE

Received By	Forwarded To
AAW. - 10/17/27	RPH. 10/17/27
	CMS. - 12/12/27
	CGO 12/22-27
Returned to	RPH. 12-23-27
	CGO. 1-9-28
	FAB. 1-10-28

Portland, Oregon,
February 29th, 1928.

File 387-9

Mr. Robt. Crosbie,
Comptroller.

ADDITIONS TO INVENTORY - A. F. E. 4454

Referring to your letter of February 10th, File DG 6-2.

The following items should be added to my inventory for A. F. E. 4454, under account 18.

5	Lbs. 3/16" oxweld iron
1	Bar iron ¼" x 2½" x 17"
660	Cu. ft. oxygen gas
576	" " acetylene gas
20	In. ¼" copper tubing
1	100 W light globe
4	¼" close nipples
2	¼" unions
4	¼" x 3" nipples
2	¼" tees
2	¼" st. elbows
1	Lamp filler
2	2" close nipples
1	2" x 5" nipple
1	2" tee
1	2" elbow
1	2" union
2	Lbs. bronze rods
2	3/8" x 4" bolts
2	5/8" x 16" "
1	Lb. tobin bronze
6	3/8" x 5" bolts
5	½" x 6" bolts
5	½" x 4" "
4	Lbs. solder
2	½" x 2" nipples

1 Roll friction tape
1 1" x ½" bushing
2 ¼" caps
8 3/8" x 2½" bolts
1 1½" x 6" nipple
2 Lbs. Arctic cup grease
3 Lbs. ¼" x 1" iron

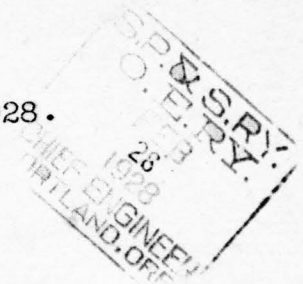
The balance of the material shown in your letter on Sale Orders 319 and 393 was used on this A. F. E., but it is included in the item "1 Pump house complete". All of the nails referred to in your letter, with the exception of 4 lbs. 8d nails, are also included in the pump house. The 4 lbs. were used in the concrete forms and are shown on sheet 1 of the inventory as submitted.

B

Chief Engineer.

Copy to G.E. Votaw
O.B. Riddle

Portland, Oregon,
Feburary, 28, 1928.



Mr. A.J. Witchel,
Chief Engineer, Office.

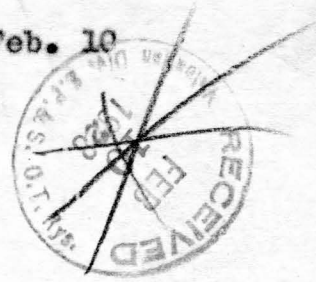
A.F. E. # 4454

Referring to attached letter to you from Mr.Crosbie under date of Feburary 10, 1928. On the first sheet items were furnished by Wishram store and we did not have them when inventory was made please find them in S.P.&S. Book #102,pages77 and 78. The nails which he refers to on second page were shown on page 73 in S.P.&S. Book # 102, they were there when inventory was made but I take it that they were not included when inventory was copied in your office. I checked this with the Supt. and they are showing this the same as in our book.

Yours truly,
P. P. Habersham
Res. Engr.

Portland, Oregon, Feb. 10

File DG 6-2.



[redacted]

Mr. A. J. Mitchel,
Chief Engineer.

A.F.E. 4454

The above authority provides for drilling and equipping additional deep well at Wishram, Washington. The following material was issued from Wishram Store and invoiced on Superintendent and charged by him to the A.F.E. but does not appear on inventory:

Sale Order 319

12 bolts 5/8 x 12
2 " 5/8 x 16
4 Washers
20 lbs. sheet steel
5 " oxweld iron
1 bar iron
220 Cu. ft. oxygen
276 " " acetylene
12 lag screws

Sale Order 393

20" Copper tubing
1 light globe
4 close nipples
2 unions
4 nipples
2 tees
2 st. elbows
30 bolts
30 hex nuts
24 bolts
24 hex nuts

Sale Order 393 Cont.

24 Washers
300 cu. ft. acetylene
1 lamp filler
440 cu. ft. oxygen
2 close nipples
1 nipple
1 tee
1 elbow
1 union
2 # bronze rods
4 bolts
1 # Tobin bronze
16 bolts
4 bars solder
2 nipples
1 roll friction tape
1 bushing
2 caps
8 bolts
1 nipple
2 # Artic cup grease
3 # iron

and in addition to the above, the following material was charged

in the Superintendent's material report of December:

8 lbs. 8d Nails
5 lbs. 20d "
3 lbs. 30d "
2 lbs. 6d "

Please furnish revised inventory.

Robt Crosbie
Comptroller.

ACD:HS
cc - G. E. Votaw

OREGON TRUNK RAILWAY

A. F. E. 4454 - Drill, test and fully equip additional deep well at Wishram. Washington.

Road & Equipment.
Acct. 18 - Water Stations.

	Well drilled 398.6'	(398.6')
1	Pump house complete, plan TV-349	
4	Cu. yds. sand)	
7	" " Gravel)	6.5 cu. yds. concrete
31	Sacks cement)	
(Salvage) 31	Empty cement sacks	
9	Pcs. 2 x 12 - 14' S4S	(forms)
6	" 2 x 4 - 16' "	"
4	Lbs. 8d nails	
2	2" close nipples New	
1	2" x 5" " "	
1	2" tee "	
1	2" elbow "	
1	2" union "	
300	Cu. ft. acetylene gas	
1	Oil can	
6	Lin. ft. 1/8" x 1-1/8" strap iron New	
1	Sterling deep well turbine pump complete, with 70' drop pipe, shaft, shaft bearing, housing, 30' of 8" suction pipe, and 60 H.P. motor.	
1	8" x 6" cast flanged reducer	
1	6" swing check valve	
5	6" - 6-hole companion flange unions	
43	Ft. 6" pipe	
1	6" double hub cast sleeve	
1	Float switch control complete with float & rod	
1	Ingersoll-Rand class VC air lift pump	
1	15½" well cap with packing ring	
1	6" supporting clamp	
1	Type VC 6" elbow head piece	
1	6" VC deflector with standards & flanges	
2½	Ft. 6" pipe	
1	35' pole New	
300	Ft. #9 insulated copper clad wire	
2	#504 strain insulators	
6	5/8" x 12" machine bolts	
10	#1341 pierce insulator clevices	

continued

3	30 amp. 250 volt, safety type fused entrance switches
1	30 amp. 125 volt, 2 pole safety switch
50	Lin. ft. ½" galv. iron conduit
2	½" type E condulets with 2 wire porcelain covers
10	½" T.& B. sockets
5	½" T.& B. bushings
200	Ft. RC solid copper wire
8	15 amp. Edison fuse plugs
5	6' 4-pin std. cross arms
10	½" x 4" machine bolts
4	5/8" double arming bolts
4	5/8" steel insulator pins
4	#4 lock porcelain insulators
2	3/8" key sockets
2	3/8" bushings
2	Rosettes
10	Ft. drop cord
½	Lb. friction tape
800	Ft. #1 soft drawn bare stranded copper wire
120	Ft. #1 DBRC stranded copper wire
1	1½" type F galv. iron condulet with 3-wire porc. cover
1	1½" type E " " " " " " "
1	1½" LL galv. condulet with blank cover
1	1½" LR " " " " "
1	Circuit opening voltage relay with 440 volt continuous service, voltage coil designed to open 440 volt A.C. control circuit
3	100 amp. 440 volt cartridge fuses
40	Lin. ft. 1½" conduit
4	1½" T.& B. bushings
8	1½" T.& B. lock nuts
10	1½" pipe straps
4	1" x 6" round iron dowels
10	¾" x 12" drift bolts
3	Prs. 4" x 4" L.P. butts with screws
1	Rim lock set complete
1	6" safety hinge hasp
1	Switch lock
5	Squares building paper

NOTE: Windlass moved from old plant to this one.

Inventory taken by
B.L.Mitts, 9-16-27.

Office of Chief Engineer.
Portland, Oregon.
January 11th, 1928.

AJW.


Engine House
Depot
Eating Ho.
Car body Occupied by P.G. Bramer
10000 Gal Tank on 60 Posts
Well drilled & equipped.
Pump House & 399' Well
Scale House
Oil unloading track
Scale track
A.F.E. PRES. No. 4454
WISHRAM
Office of Chief Engineer
Date 12-19-27
Scale 1" = 100'

LANE-MILES STANDISH CO. Form 1207

OREGON TRUNK RAILWAY
(Insert Name of Company)

Exhibit A

AUTHORITY FOR EXPENDITURE

Authority for an expenditure of $ 365.00 is requested for the purpose of Retirement (Character of Change) to the property of O. T. Ry. (Name of Owner) that is now operated by S. P. & S. Ry. Co. (Name of Operating Company)

Portland, Ore., Jan. 23, 1928 (Place and Date) Requested by A. J. Davidson, (Name) General Manager (Title)

Location of proposed project: State Washington Valuation Section V-Wash-1

Station or M. P. Wishram Division Vancouver

Description of Project: Remove equipment and pump house and abandon well near power house; also abandon discharge pipe line from well to location of new well.

Reasons and necessity for the extension, improvement, or other change: Well is crooked and never furnished sufficient water, and since completion of new large well, this old installation and well are not necessary. Equipment and house are to be used by S. P. & S. Ry. Co. at Lyle.

MAR 16 1928

SUMMARY OF ESTIMATE

Estimate gross cost of project		$ 365.00
Amount chargeable to O.C.& I. - S.P.& S.Ry.Co. for property retired	$ 9658.36	
Value of Salvage recovered	4257.89	
Cost of property retired	$ 13916.25	
Incidental costs chargeable to operating expenses		
To other accounts O. C. & I. - S. P. & S. Ry. Co.	365.00	14281.25
Net credit to property investment account		$ 13916.25

Total Cost to be borne by S. P. & S. Ry. Co. (Name of Company)

Or participated in by (Name all participants and amount borne by each)

Recommended (SIGNED) A. I. WITCHEL Chief Engineer — Recommended (SIGNED) A. J. DAVIDSON General Manager

Expenditure and change approved and authorized:

W. F. Turner
President

Recorded and Registered:

FEB 23 1928

Comptroller

REFERENCES

A. F. E.

Date	Number	State	Valuation Section
1-23-28	CE 4489	Wash.	V-Wash-1
	4924		

LANE-MILES STANDISH CO. Form 1207-A

OREGON TRUNK RAILWAY
(Insert Name of Company)

Exhibit A-1

Sheet No. 1 of 1 Sheets

DETAILED ESTIMATE

Reference CE File 387-9

Reference AFE's Pres. Nos. 2064 & 3109

Reference

Office of Chief Engineer, Portland, Oregon Date January 23rd, 1928 192

Location and description of project Wishram, Wash. Remove equipment and pump house, and abandon well near power house; also abandon discharge pipe line from well to location of new well.

DETAILED ESTIMATE OF LABOR AND MATERIAL

	Credit	Charges
O. C. & I. – S. P. & S. RY. CO.		
Engineering		15.00
Labor removing equipment & pump house		350.00
Salvage value of materials removed	4257.89	
	4257.89	
Estimate gross cost of project		365.00

PROPERTY ACCOUNT ADJUSTMENT

Ledger value (estimated) of property retired & not replaced.

Road & Equipment.		
Acct. 1 – Engineering.		
Engineering		87.14
Acct. 18 – Water Stations.		
Well – A.F.E. 2064		6039.24
Building, foundations, etc. – A.F.E. 3109		2077.00
Equipment in place (exclusive of windlass)		4279.94
Electric wiring, etc.		22.88
Pipe line in place		874.70
Store expense		39.05
Rental of equipment		329.31
Freight		166.99
Total credit		13916.25
O. C. & I. – S. P. & S. Ry. Co.		
Make corresponding debit	Dr	13916.25
Total debit		13916.25

Estimated by C. G. Davies, Assistant Engineer Approved (SIGNED) A. J. WITCHEL
Chief Engineer

Approved Approved

LANE-MILES STANDISH CO. FORM 80

387-9

Oregon Trunk Railway
(Insert name of Company)

A. F. E. No. 4924 for remove equipment andpump house and abondon well near power house, also abandon discharge pipe line from well to location of New well.

Wishram, Wash. Which was authorized on date of Feb. 23, 1928

has been { Completed / ~~Cancelled~~ / Closed X } on date of Dec. 20,1928

The facility was ready to be placed in service on the date of Dec. 20,1928

and was actually placed in service on the date of Dec. 20,1928

INVENTORY and SKETCH

Book 119 Page 75

ORIGINAL SIGNED BY
G. E. VOTAW
Superintendent.

R. P. Habersham
Res. Eng.

(SIGNED) A. J. WITCHEL
Chief Engineer.

(SIGNED) A. J. DAVIDSON
GENERAL MANAGER

INFORMATION ENTERED			
MAP	FILE NO.	DRAFTSMAN	DATE
ROW SHEETS-PRINTS-TRACINGS			
ALIGN. MAPS	R-7-152	J.L.	2/13/29
TRACK PROFILE			
TRACK CHART			
STATION PLATS	D-1-1	—	
SPUR & SIDING RECORD			
BRIDGE & CULVERT SCHEDULE			
STOCKYARD DIAGRAM			
SHOWBUDG.BEAN ON INDEX CARD	✓	Information Shown on Maps 2-14-29	2-14-29

Jan. 2, 1929
Date Rendered

Pipe Line Map G-6-5

This report must be rendered for each project covered by an AFE or Work Order and must reach the Accounting Department not later than fifteen days after the date of completion. If however the facility was ready for service or was placed in service more than thirty days prior to the date of completion, a report on this form must be rendered at the time the facility was ready for service or placed in service. In such cases the date of completion should be shown as "Project Incompleted." When project is finally completed a second report should be made, showing all information called for by the form.

Original to Comptroller,
Duplicate to General Manager,
Triplicate to Valuation Bureau,
Portland, Oregon - 2-26-29.
AJW

COMPLETION NOTICE

Received By	Forwarded To
Acct. 2/4/29	RPH 2/4/29
" 2/9/29	RJD 2/9/29
	Gen. 2/11/29
	VE- 2/18-29
	FAB: 2/20/29

OREGON TRUNK RAILWAY

A.F.E. No. 4924 - remove equipment and pump house and abandon well near power house, also abandon discharge pipe line from well to location of new well. Wishram, Washington.

O. C. and I.
S. P. & S. Ry. Co.

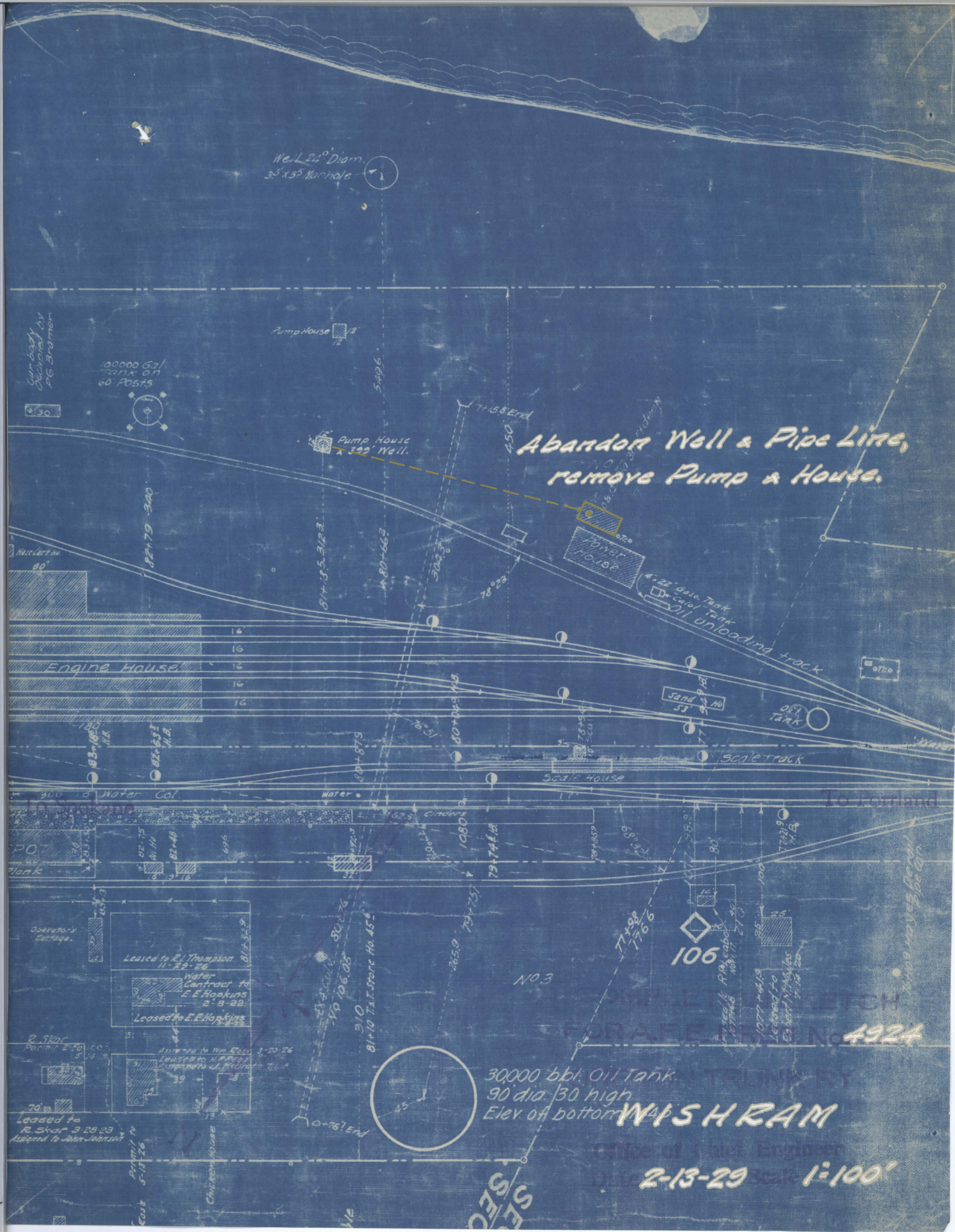
Material Salvaged.

1	25-H.P. "Y" oil engine	SH
1	7-3/4" Pomona cylinder complete with plungers	SH
100	ft. double coils for Pomona pump	SH
100	ft. 8" pipe	SH
1	#28 Pomona pump jack	"
1	Pomona pump head - complete	"
236	Lin. ft. 6" iron water pipe	"
1	Pump house 16' x 36' (Plan TV-332)	"
26	Cu. yds. common excavation	
26	" " " backfill	

Property Account Adjustment
Road & Equipment
Acct. 18 - Water Stations -
Material removed.
Same as shown in above O. C. & I. Account.

Inventory taken by
J.G.Smith - 2-9-29.

Office of Chief Engineer,
Portland, Oregon,
February 26th, 1929.
AJW


Well 24" Diam.
3.5' x 3.5' Manhole
Pump House
100000 Gal. Tank on 60' Posts
Car body occupied by P.G. Bramer
Pump House
x 399' Well.
Abandon Well & Pipe Line,
remove Pump & House.
Power House
Gaso. Tank
Oil unloading track
Engine House
Sand Ho.
Oil Tank
Scale Track
Scale House
Water Col.
Water
To Spokane
To Portland
Cinders
Plank
Operator's Cottage
Leased to R.I. Thompson 11-29-26
Water Contract to E.E. Hopkins 2-8-22
Leased to E.E. Hopkins
Leased to R. Skar 3-28-23
Assigned to John Johnson
Chicken House
106
NO.3
30,000 bbl. Oil Tank
90' dia. 30' high
Elev. of bottom
COMPLETION SKETCH
FOR A.F.E. REG. No. 4924
WISHRAM
Office of Chief Engineer
Date 2-13-29 Scale 1"=100'

LANE-HILES STANDISH CO. Form 80

387-9

OREGON TRUNK RAILWAY CO.

(Insert Name of Company)

A. F. E. No. 5312 for drill and test 10" well, install 6" belt driven turbine operated by 25 HP gas engine, and connect well to present tank: also build pump house. ----- Wishram, Wash. ----

Which was authorized on date of Aug. 6, 1929

has been { Completed / ~~Cancelled~~ / ~~Closed~~ } on date of Aug. 16, 1930

The facility was ready to be placed in service on the date of Aug. 16, 1930

and was actually placed in service on the date of Aug. 16, 1930

INVENTORY and SKETCH

Book 125 Page 38 to 41 & 46 to 47

ORIGINAL SIGNED BY
G. E. VOTAW
Superintendent.

R. T. Powell
RESIDENT ENGINEER

(SIGNED) A. J. WITCHEL
CHIEF ENGINEER

(SIGNED) A. J. DAVIDSON
GENERAL MANAGER

INFORMATION ENTERED

MAP	FILE NO.	DRAFTSMAN	DATE
ROW SHEETS-PRINTS-TRACINGS			
ALIGN. MAPS	C-7-154	E.L.	8/26/30
TRACK PROFILES	—		
TRACK CHART	—		
STATION PLATS	D-1-1	~	
SPUR & SIDING RECORD	F-6-5	~	
BRIDGE & CULVERT SCHEDULE			
STOCKYARD DIAGRAM			
SHOW BLDG. PLAN ON INDEX CARD			

August 16, 1930.
Date Rendered

Water Supply CC-341 ~
Log — H.A.

This report must be rendered for each project covered by an AFE or Work Order and must reach the Accounting Department not later than fifteen days after the date of completion. If however the facility was ready for service or was placed in service more than thirty days prior to the date of completion, a report on this form must be rendered at the time the facility was ready for service or placed in service. In such cases the date of completion should be shown as "Project Incompleted." When project is finally completed a second report should be made, showing all information called for by the form.

Original to Comptroller,
Duplicate to General Manager,
Triplicate to Valuation Bureau,
Portland, Oregon, October 3, 1930.
AJW.

COMPLETION NOTICE

Received By	Forwarded To
Aud. 8/18/30	H.P. - 8/18/30
	Mgr. - 8/25/30
	FAVB 8/27/30

OREGON TRUNK RAILWAY COMPANY

A.F.E. No. 5312 - Drill and test 10" well, install 6" belt driven turbine operated by 25 HP gas engine, and connect well to present tank: also build pump house, Wishram, Wash.

Well drilled and casing installed by contract dated Sept. 19, 1929, and completed March 12, 1930, A. A. Durand, contractor.

ROAD & EQUIPMENT — Acct. 18 - Water Stations

38	Lin. ft. 12" casing furnished & installed by contractor	
57	" " 8" " " " " " "	
5.1	cu. yds. com. dry. excavation building foundation	(Bldg. plan
3.5	" " " " " engine "	(T-V-332
5.5	" " " " " pump "	(Engineer's
9.3	" " " " " " pit	(file
2.6	" " " " " crab "	
5.5	" " concrete 1-3-5 mix 3/4" gravel building foundation	
6.6	" " " " " " " " floor	
3.2	" " " " " " " engine foundation	
7.6	" " " " " " " pump "	
2.3	" " " " " " " well pit	
3.0	" " " " " " " crab "	
~~22.2~~	" " gravel size 3/4") from Portland Terminal hauled	
13.4	" " sand) 106 miles	
116	Sacks cement	
300	FBM 1" x 12" No. 1 com. S1S1E form material	New
12	Pcs. 2" x 4" - 12 " " " " "	"
3	Lbs. 6 d nails	"
4	Pcs. 10" x 10" - 30' No. 1 com. S4S fir Tower	"
2	" " - 14' " " " " " " "	"
1	" 12" x 14" - 6' " " " " " " "	"
8	" 3" x 8" - 16' " " " " " "	"
4	" " - 18' " " " " "	"
2	" 4" x 6" - 16' " " " rgh. "	"
4	" " - 18' " " " " "	"
2	" 4" x 4" - 10' " " " S4S	"
55	" 2" x 4" - 10' " " " S1S1E	"
34	" " - 12' " " " "	"
25	" " - 16' " " " "	"
8	" " - 18' " " " "	"
6	" " - 20' " " " "	"
1	" 2" x 6" - 12' " " " "	"
1	" " - 16' " " " "	"
1600	FBM 1" x 12" " " " rgh.	"
18	Pcs. 1" x 6" - 16' " " " "	"
3	" 1" x 5" - 14' " " " "	"

3	Pcs. 1" x 4" - 14' No. 1 com. S1S1E	New
180	FBM 1" x 8" " 2 clear S4S.	"
10	Pcs. 1" x 6" - 12' " " " "	"
100	Lin. ft. 1-1/8" x 8" " " "	
4	Pcs. 1-1/8" x 4½" - 14' No. 1 com. #2 clear fir	"
4	" " x 5" - 14' " " " " " " "	"
3	" " x 5" - 12' " " " " " " "	"
2650	Lin. ft. 1" x 6" ceiling	"
1240	" " " car siding	"
1200	FBM " siding Pat. 115 #2 clear	"
100	" 1" x 8" shiplap	"
164	Lin. ft. 1" quarter round	"
1	2'8" x 6'8"x 1-3/4" 5 panel door with frame and outside trim	"
4	12 Lt. 10" x 16" check rail window with frame for 2 x 4 stud with sights & pulleys complete	"
6500	Star A star shingles	"
3	Pr. 14" T strap hinges	"
32	Lin. ft. bright ridge roll	"
1	Mortise door lock complete	"
1	Pr. 3½ x 3½ loose pin butts	"
45	Lbs. 20 d nails	"
50	" 10 " "	"
95	" 8 " "	"
22	" 6 " "	"
12	" 3 " shingle nails	"
8	" 8 " casing "	"
10	" 1" x 22" machine bolts with Hex. nuts	"
2	" 3/4" x 26 " " " " "	"
6	" 3/8" x 5" " " " " "	"
6	" 3/8" x 2" " " " " "	"
1	Dz. 1-1/4" x 2½" stove bolts	"
1	" 1½" F. H. Wood screws	"
8	5/8" x 5" lag screws	SH
18	3/4" x 14" machine bolts & nuts	"
64	1/2" x 10" boat spikes	"
8	3/4" x 20" drift bolts	"
66	3/4" standard mall. washers	New
5	Gals. yellow buff paint #157	"
7	" olive green " #189	"
5	" linseed oil	"
1/2	" turpentine	"
70	Lin. ft. #14 wire - wiring for lights	"
20	" " 1/4" loom " " "	"
18	Nail knobs " " "	"
2	Rosettes " " "	"

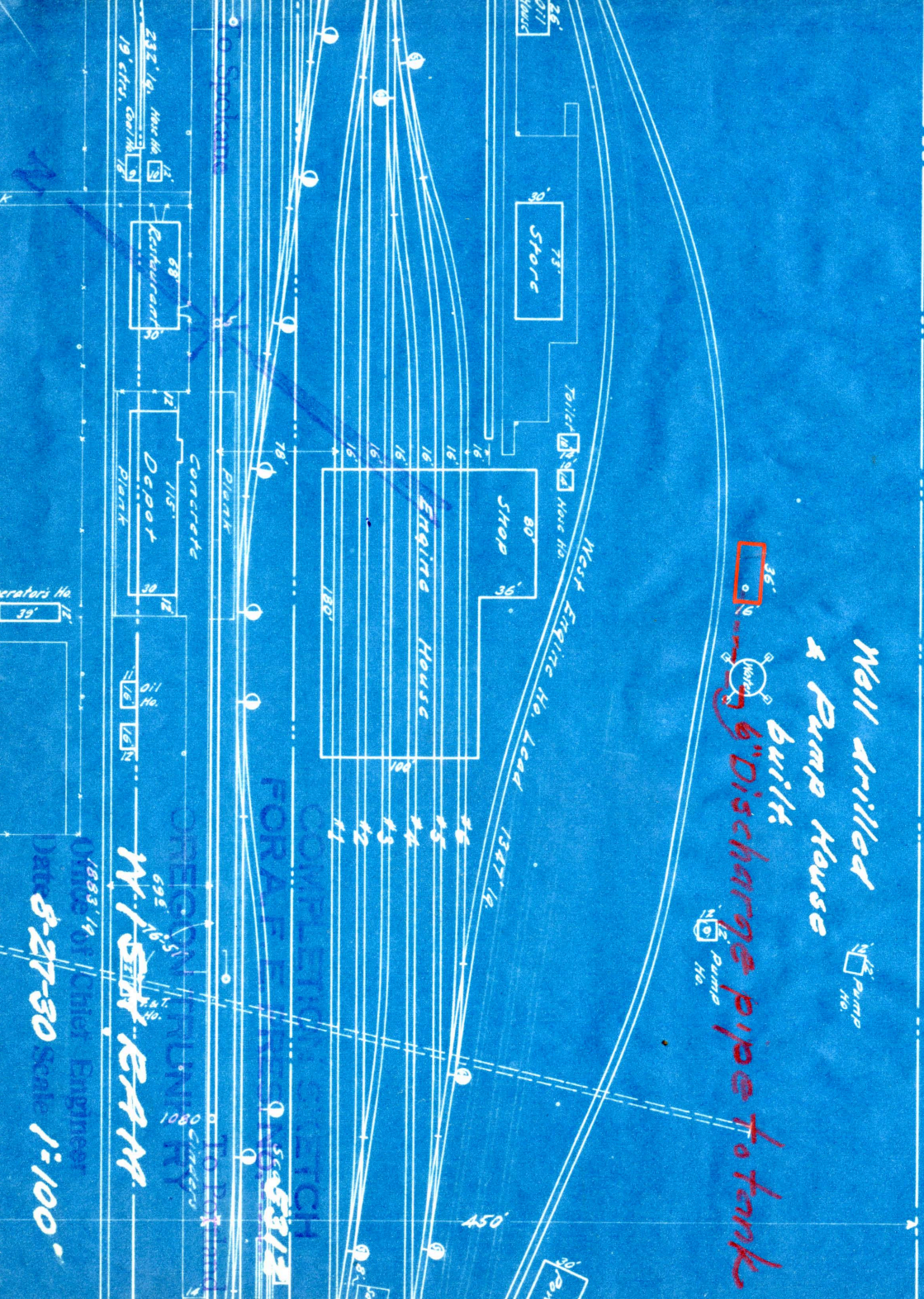
2	Keyless sockets - wiring for lights	New
1	Snap switch " " "	"
4	Lin. ft. drop cord " " "	"
1	Entrance switch " " "	"
1	Fairbank Morse Diesl Engine Type Y-style H 25 H.P. RPM 325 #407940	SH
15	Lin. ft. 8" iron exhaust pipe	"
1	Pomana duplex plunger pump, power head #28 - 250 gal. per minute capacity	"
1	Pump head	"
1	7-3/4" brass cylinder	"
80	Lin. ft. 8" drop pipe	"
99	" " Pomana pump rods	"
30	" " 6" iron pipe for suction & air chamber	"
40	" " 10" rubber belting	"
64	" " 1" iron pipe for belt guard	"
35	" " 4" " " pit drain	"
1	6" tee	"
1	6" check valve	"
1	6" x 17" nipple	New
2	6" x 6" nipples	SH
2	Pr. 6" flange unions	New
1	6" elbow	"
1	6" gate valve	SH
1	6" double hub cast iron tee	"
75	Lin. ft. 6" iron pipe	"
57	" " 1" " "	New
30	" " 3/4" galv. pipe	"
10	" " 1/2" " "	"
5	3/4" galv. elbows	"
1	" tee	"
4	1/2" elbows	"
1	3/4" union	"
1	1/2" "	"
1	" globe valve	SH
14	lin. ft. 1/2" iron pipe	"
6	" " 1/4" " "	"
1	3/8" union	"
2	1/2" "	"
2	" elbows	"
3	3/8" "	"
1	1/4" "	"
3	" check valves	"
1	" union	"
1	3/4" globe valve	New
1	1" " "	"

2	1/4" x 2" nipples	New
1	3/8" coupling	"
6	1/4" to 3/8" bushing	"
20	Lin. ft. 3/8" black pipe	
6	" " 5/8" iron rod	"
8	5/8" x 3" machine bolts	"
2	5/8" x12" " "	"
2	" x 6" " "	"
6	3/4" x 4" " "	"
4	1/2" x 5" " "	"
4	" x 4" " "	"
1	1-1/4" nuts	"
14	5/8" "	"
1	1-1/4" cut washer	"
1	1-1/2" " "	"
8	1/2" " "	"
10	5/8" " "	"
4	Lbs. 3/16" welding iron	"
100	ft. oxygen	"
100	acetylene	"
25	Lbs. asbestos cement	"
5	" waste	"
35.2	cu. yds. com. exc. & backfill -discharge pipe from pump to tank under 5' stages	
38.6	cu. yds. com. exc. for storage tanks	
1	Oil supply tank 1000 gal.	SH
1	" storage " 1200 "	"
120	Lin. ft. 1" black pipe -heating plant	New
2	1" x 6" nipples " "	"
2	1" x 5" " " "	"
2	3/8" x 2' " " "	"
4	1" elbows " "	"
2	3/8" elbows " "	"
2	1" tees " "	"
1	3/4" " " "	"
1	1" union " "	"
1	1" pipe plug " "	"
1	2" " " " "	"
4	3/8" strut ells " "	"
2	" globe valves " "	SH
2	5 section radiators " "	"
2	1" radiator valves " "	"
116	Empty cement sacks (salvage)	

Inventory taken by
H. Powell, 6-17-30.

Office of Chief Engineer,

Portland, Oregon, Oct. 3, 1930.



86+87½ Water Column 8½ R.
86+80 W. end Oil House 190' R.

85+01 W. end Store House 190' R.

83+36 - 10" Well 475' deep 336' R.
83+28½ W. end Pump House 329½' R.
83+18½ H.B. Open Tr. #9 Rigid Fr.

82+79 Ctr. 100,000 gal. Water Tank 340' R.
82+63½ H.B. Scale Tr. #9 Rigid Fr.

82+26½ W. end Engine House 68' R.

81+18½ 15" Well 399' deep 316' R.
80+96 W. end Auxiliary Pump House 405' R.
80+87½ Water Column 8½' R.
80+66½ Ctr. 24' Well 549½' R.

80+04½ H.B. Scale

78+94½ W. end Scale House

Appendix D

Former Proposed Sewers and Disposal System – Reference Documents

Private Sewer
Private Sewer
Private Sewer
Caffields water pipe
House
House
Bunk House
Bunk House
8" Sewer Pipe
MH #3 Invert Elev. 164 ±
4" Sewer Pipe
Lease Line
Sewer
MH #1 Invert Elev. 168 ±
8" pipe
6" pipe
8" Pipe
T BLOCKAD
MH #2 Invert Elev. 166 ±
House
Hse.
Hse.
Hse.
House
6" V.I. pipe
6" C.I. Pipe
Power House
Hse.
Stacking Unit
Stacking Unit
Railway Inns Incorporated
Recreation Bldg.
Stacking Unit
Lease Line
Lease Line
MH # 4 Invert Elev. 162 ±
Depot
Restaurant
105'
To Portland
℄ of Track
Main Line To Spokane
Existing 36" storm sewer
Existing 4" pipe & 36" corr. galv. pipe
New 4" transite pipe & 36" corr. galv. pipe
Switch Yard
Engine House
Store House
MH #5 Invert Elev. 160 ±
Five batteries of 'HYGI-SEPT' Precast Reinf. Concrete Septic Tanks
Cap. of each battery:
4500 gpd for single compartment tank
TOTAL CAP: 22500 GAL.
Existing water line
New 2" water line to pump ho.
Fence
Elev. 166 ±
Elev. 165 ±
400'
Top of ground is level Elev. 169
4" Pipe
4" Elev.
Distribution Boxes
3-6 Stone Tile lines Spaced @ 12" with 4' of filled width
Percolation Tests Dec. 28, 1959 SPLS Field BK 395-C 1" in 5" min
Water Tank
Shop
12" x 20" corr. culvert
20' clearance for roadway
Pump House #2
Top of dike
Top of dike
Exist. Inlet Elev. 157 ±
New Inlet Elev. 159 ±
Elev. outlet 168 ±
Pump House #1
200 gpm sewage pump
27' head

Notes:
This preliminary study of a sewage disposal system assumes the private parties are disposing their sewage through other facilities. Data for this study was gathered from existing data, maps and surveys

Design Criteria

1. Existing Population			
a. Single-family dwellings	60 persons	75 gpcd	6000 gpd
b. Hotel w/o private bath	60	50	3000
c. Restaurant	170	7	1200
d. Depot (office)	25	15	400
			10600 gpd
2. Automatic Washers - Add 50%			5000
3. Infiltration			6000
4. Total Design Capacity			20,000 gpd

COLUMBIA RIVER
Normal Pool Elevation - 160 ±
1894 Backwater 166 ±

KEY
Existing Sewers
Proposed Sewers
Treated Water Mains
Untreated Water Mains
Railroads Property line
Railroad Tracks
Man Holes

Rev. 2-10-61 D.D.B.
11-13-61
1-29-75 H. Moreno

SPOKANE PORTLAND & SEATTLE Rwy. Co.

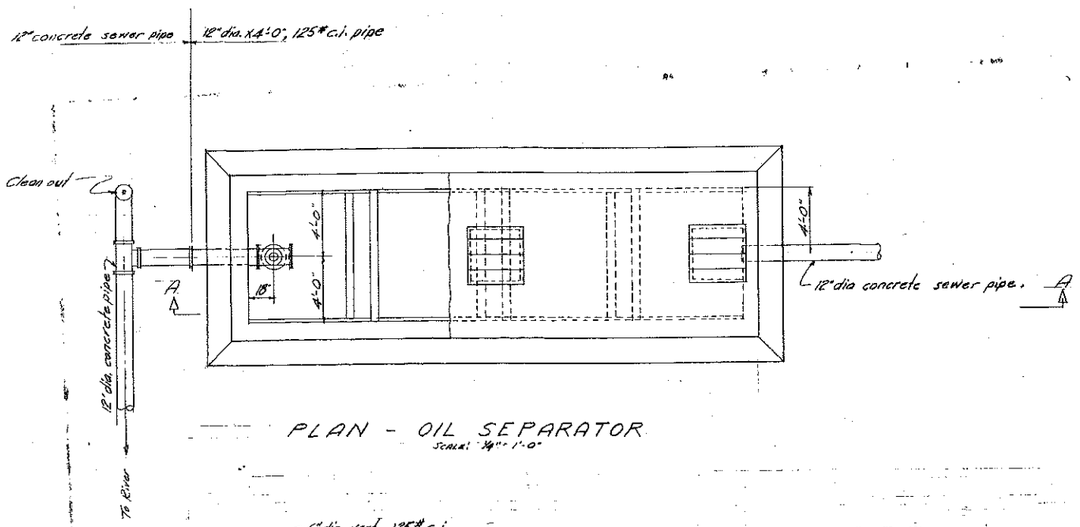
STATION LAYOUT OF EXISTING AND PROPOSED SEWERS AND DISPOSAL SYSTEM AT WISHRAM, WASHINGTON

Scale: 1" = 50'
Date: December 30, 1959
Designed by: H.F.M.
Checked by: R.K.H.
Drawn by: J.D.Wood
Sheet 1 of 1
File: F-6-5

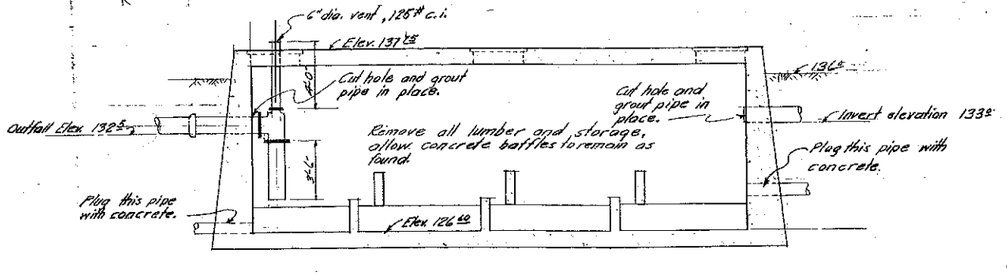
Approved by
R.C. LaDelle Jr.
Principal Asst. Engr.
K.F. Moy
Chief Engineer

F-6-5
F-6-5
F-6-5

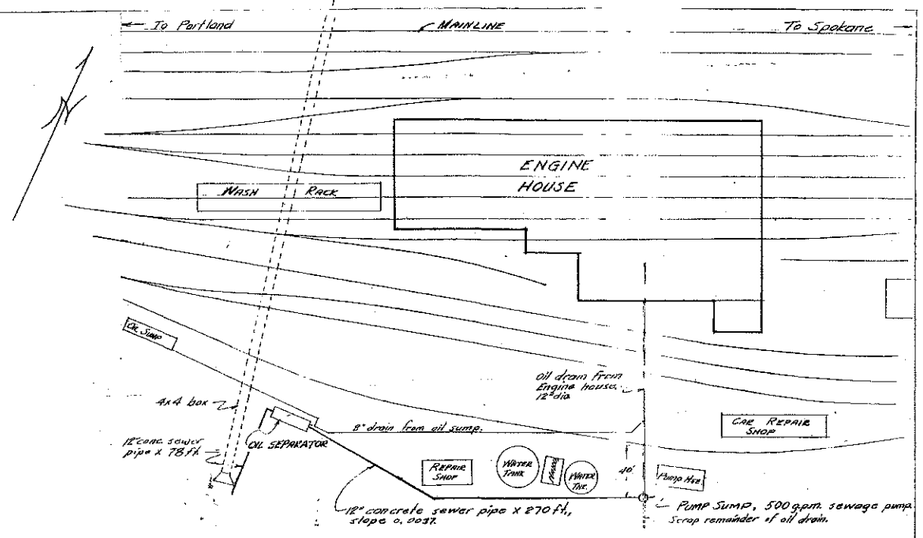
ELE-ON



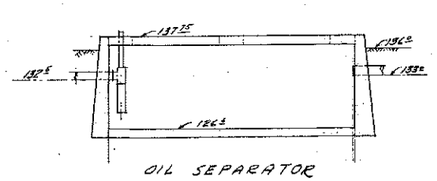
PLAN - OIL SEPARATOR
SCALE: ¼" - 1'-0"



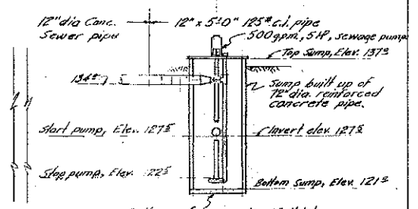
SECTION SCALE: ¼" - 1'-0" A - A



LOCATION PLAN
SCALE: 1" = 50'



OIL SEPARATOR



Bottom of Sump is 6" thick concrete slab, reinforced with 6 x 6, 10/10 wire cloth.

PUMP SUMP

PROFILE & SECTIONAL ELEVATION
SCALE: ⅛" - 1'-0"

GENERAL NOTES

1. Elevations shown are with reference to B.M. on rivet head on N.E. pedestal, E. water tower. B.M. Elev. 138.21.

OREGON TRUNK RY.

ALTERATION, OIL SEPARATOR, WISHRAM.

SCALES: As shown.

BY DIRECTION OF CHIEF ENGINEER

APPROVED

CHIEF ENGINEER

DATE 1 June 1951

DRAWN BY F.H.M.

TRACED BY

CHECKED BY

NO-373

Appendix E

Responses to Ecology Comments

RESPONSE TO COMMENTS ON
DRAFT WISHRAM BNSF TRACK SWITCHING FACILITY REMEDIAL INVESTIGATION WORK PLAN ADDENDUM

Comments from:
John Mefford, Cleanup Project Manager, CRO Toxics Cleanup Program, State of Washington Department of Ecology, November 27, 2017, and additional comments received February 5, 2018.

Comment Number	Section/ Page		
Below is a brief summary for discussion purposes of the expanded scope of the RI addendum based on Ecology comments.			
NONE	**NONE**	Summary of Proposed Additional Sampling Locations and Groundwater Monitoring Wells based on responses to comments listed herein. Locations are presented on Figures 9A, 9B, and 9C.	List of Applicable Ecology Comments to the RI Work Plan Addendum
		Additional Soil Boring Locations, some with Reconnaissance Groundwater Sample Collection (Boring location IDs): 1. Add 2 boring locations on northwest and southeast corners of the former oil/water (o/w) separator. Collect soil samples from both borings and one reconnaissance groundwater sample. (B-17-19 and B-17-20) 2. Add 6 boring locations for a total of 7 locations along former 8" Oil Drain between Former Engine House and former o/w separator. 2 of these locations positioned near former water supply Wells #2 and #3 to address Comment #3d. (B-17-12 to B-17-18) 3. Add 3 boring locations to Former Engine House footprint for a total of 11 within footprint. (B-17-01 to B-17-11) 4. Add 1 boring location near former pump house #2 / sewage outfall. (B-17-21) 5. Add 2 borings for dissolved phase diesel near maintenance building / former boiler house (north of main line). (B-17-24, B-17-25) 6. Shift location of WMW-21 to the west to be closer downgradient from former water supply Well #2. 7. Shift location of WMW-22 to the east to be closer downgradient from former water supply Well #3. 8. Add 5 boring locations near the former septic system to east of former engine house. Assume 1 boring near former pump house #1, 1 boring on river side of concrete septic tanks, and 3 borings within approximate extent of the septic drainage field. (B-17-26 to B-17-30)	Applicable Ecology Comments: 1. Comments 3a 2. Comments 3a, 3d 3. Comment 8f 4. Comment 3b 5. Comment 8j 6. Comment 3d 7. Comment 3d 8. Comments 3b, 3e
		Additional Monitoring Wells 1. Install 13 shallow monitoring wells (WMW-19 through WMW-32) and two deep monitoring wells (RMD-5 and RMD-6). 2. Wells will be installed in accordance with WAC 173-160. Shallow wells will be installed with direct push drilling techniques in accordance with WAC 173-160-451 and using either prepacked or sand packed well screens 10 feet in length. Depths at which groundwater was observed in 2016 soil borings and pressure transducer data recorded Between December 2016 and 2017 will be evaluated for typical seasonal ranges in groundwater table elevations across the site. To the extent possible based on this data, well screens will be placed such that the groundwater table occurs within the open screen portion of each new shallow well. Deep monitoring wells (RMD-5 and RMD-6) will be installed with either rotosonic or hollow stem auger (HSA) drilling and will use sand packed well screens. Wells will be set in flush mounted well completions.	Applicable Ecology Comments: 1. Comment 8a 2. Comment 8a
		Groundwater Sampling Program for New Shallow Wells – Applicable to wells WMW-19 through WMW-32 and replacement WMW-2R 1. Assume quarterly groundwater sampling (4 events) for one year, and semiannual sampling for subsequent years. Field and laboratory analytical parameters identified in Table 2 will be analyzed during the first year of quarterly monitoring events. After first year of quarterly monitoring, BNSF may request in writing for Ecology's approval to modify the laboratory analytical program based on quarterly sampling results.	Applicable Ecology Comments: Multiple parts of Comments 7 and 8
		Groundwater Sampling Program for New Deep Wells – Applicable to RMD-5 and RMD-6 1. Assume semiannual groundwater sampling (2 events) for first and all subsequent years, similar to deep wells installed in 2016. Field and laboratory analytical parameters identified in Table 2 will be analyzed during the first year of semiannual monitoring events. After first year of semiannual monitoring, BNSF may request in writing for Ecology's approval to modify the laboratory analytical program based on sampling results.	Applicable Ecology Comments: Multiple parts of Comments 7 and 8

RESPONSE TO COMMENTS ON
DRAFT WISHRAM BNSF TRACK SWITCHING FACILITY REMEDIAL INVESTIGATION WORK PLAN ADDENDUM

Comments from:
John Mefford, Cleanup Project Manager, CRO Toxics Cleanup Program, State of Washington Department of Ecology, November 27, 2017, and additional comments received February 5, 2018.

Comment Number	Section/ Page	Comment	Response
Report Title Page			
1	**Title Page**	This site is known as the BNSF Track Switching Facility. The title page can include the alias but must list Ecology's official name so that this Site can be properly referenced.	Text will be updated as requested. Revised Title: "BNSF Track Switching Facility (aka Wishram Railyard) Remedial Investigation Work Plan Addendum Wishram, Washington"
Section 1: Introduction and Background			
2	**Section 1.1: Status of Completed RI Field Tasks**	a. Please state in the text whether any of the slug testing has been completed and if additional slug testing is expected.	a. Sections 1.1 and 3.4 identify wells in which slug tests were performed in December 2016 in accordance with the RI Work Plan (revised March 2017). Section 3.4 of the Addendum identified seven proposed wells for slug testing: six shallow wells and one deep well. Section 1.1 has also been updated to reflect additional sampling events performed since July 2017.
		b. Please revise the wording of the text below to accurately reflect the situation. "Several" refers to more than two but not many. Forty-two samples out of ninety-five is far more than several. Descriptions such as "nearly half of more closely characterize the number of samples that were erroneously analyzed with silica gel cleanup as a preparation method. The text states: *"In January 2017, it was discovered that several samples submitted in August, October, and November 2016, to ESC Lab Sciences of Mt. Juliet, Tennessee (ESC), were inadvertently prepared using the Silica Gel Cleanup (SGC) method prior to analysis of the samples for Northwest Total Petroleum Hydrocarbons as Diesel and Oil Extended (NWTPH-Dx)."*	b. Comment is noted, text will be revised as requested: *"In January 2017, it was discovered that nearly half of the samples submitted in August, October, and November 2016 to ESC Lab Sciences of Mt. Juliet, Tennessee (ESC), were inadvertently prepared using the Silica Gel Cleanup (SGC) method prior to analysis for Northwest Total Petroleum Hydrocarbons as Diesel and Oil Extended (NWTPH-Dx)."*
		c. *"Rather than resampling previous locations, a limited number of soil and groundwater samples near the previous locations will be analyzed by NWTPH-Dx with and without SGC preparation to further evaluate previously collected data."* The Addendum Work Plan should acknowledge that Ecology has not formally approved the deviation (shown above as underlined) in the Remedial Investigation Work Plan. Please refer to Ecology's letter dated March 3, 2017, as the last written communication regarding this issue. We do, however, support the collection of a data set of comparison results with and without SGC.	c. Comment is noted. Text will be revised to reference the 3 March 2017 letter from Ecology as follows: *"Rather than resampling previous locations, a limited number of soil and groundwater samples near the previous locations will be analyzed by NWTPH-Dx with and without SGC preparation to further evaluate previously collected data. Ecology has not formally approved the deviation from the RI Work Plan of analyzing samples for NWTPH-Dx with SGC preparation only, however, does support the collection of a data set of comparison results with and without SGC. Ecology's 3 March 2017 letter was the last written communication regarding this issue".*
		d. Additionally, the Remedial Investigation (RI) Work Plan called for the analysis of soil samples without silica gel cleanup (SGC) due to the potential presence of Bunker C source mass. The rationale is that the use of SGC may low bias the analytical results for Bunker C since this product type contains significant amounts of polar compounds that contain sulfur and nitrogen. The RI Work Plan also provided for the collection of analytical comparison results (with and without SGC preparation) for such purposes as evaluation of the ratio of the concentration of petroleum hydrocarbons to the concentration of non-petroleum hydrocarbon (polar metabolites). To Ecology's knowledge, comparison results by well have not been obtained yet, or if so, have not been reported to us. Collect comparison data at specific wells both with and without silica gel cleanup when analyzing groundwater by NWTPH-Dx and report these results to Ecology.	d. Comment is noted. Eight soil samples collected in October 2016 were analyzed with and without SGC. The samples were collected from soil borings within and outside (west) the inferred Bunker C / oil LNAPL extent. Groundwater samples collected in November 2017 from the five shallow transect wells were also analyzed with and without SGC. Revised text: *"Groundwater monitoring well samples collected in January 2017, April 2017, September 2017, and November 2017 were analyzed by NWTPH-Dx without SGC, in accordance with the RI Work Plan. Groundwater samples collected in November 2017 were also analyzed by NWTPH-Dx with SGC for comparison of results. Oil nodule/NAPL samples collected from the river in October 2016 (two samples) and in August 2017 (two samples) were correctly analyzed by NWTPH-Dx without SGC."* In 2018, soil and groundwater samples from selected borings/wells will be prepared with and without SGC for comparative analysis. Section 3.3 includes a list of five borings (soil and recon GW), 10 shallow wells, and three deep wells for this comparison of results.

RESPONSE TO COMMENTS ON
DRAFT WISHRAM BNSF TRACK SWITCHING FACILITY REMEDIAL INVESTIGATION WORK PLAN ADDENDUM

Comments from:
John Mefford, Cleanup Project Manager, CRO Toxics Cleanup Program, State of Washington Department of Ecology, November 27, 2017, and additional comments received February 5, 2018.

Comment Number	Section/ Page	Comment	Response
Report Title Page			
3	**Section 1.2: Additional Identified Data Gaps**	a. The text states: *"Based on review of laboratory analytical results from groundwater monitoring well sampling events conducted in November 2016, January 2017, and April 2017, further delineation of the nature and extent of dissolved phase petroleum hydrocarbon impacts in shoreline areas to the southwest and southeast of the former fueling distribution line system is also warranted."* Please add in language to reflect that the investigation of the nature of the contamination is not limited to the dissolved phase component but includes sorbed phase and separate phase product as well. Ecology's letter dated May 22, 2017, calls attention to the investigation of contaminants in both the soil and the groundwater media. We specifically call attention to the area between the shoreline and the particular features in that area which include the former oil/water separator, the engine house, and the roundhouse. Additional step-out borings from known areas of contamination may be required to provide better definition of impacted areas.	a. Comment noted. Will revise text to reference soil (sorbed phase) and separate phase product as well. For clarification, the feature identified by Ecology as the "roundhouse" was a turntable. A "roundhouse" was never constructed at the Wishram railyard. Additional proposed boring locations are summarized on the first page of this RTC matrix and on Figures 9 and 10. Revisions to text include: *"Based on reconnaissance groundwater sampling results from August 2016, additional data gaps include areas east of the Bunker C and diesel fueling distribution line system including areas in the vicinity of the Former Engine House, Former Wash Rack, rail area north of the Former Wash Rack, Former Repair Shop, Former Turntable, areas near two Former Oil Houses, and Former Oil/Water Separator. Based on review of laboratory analytical results from groundwater monitoring well sampling events conducted in November 2016, January 2017, and April 2017, further delineation of the nature and extent of dissolved phase petroleum hydrocarbon impacts in shoreline areas to the southwest and southeast of the former fueling distribution line system is also warranted. Investigations in these areas will address potential contamination impacts to soil (sorbed phase) and groundwater (dissolved and separate-phase product)."* *"Ecology's 22 May 2017 letter referred to a roundhouse as a potential data gap area. According to The Northwest's Own Railway (NWOR) Fall 2014 publication describing the Wishram railyard (NWOR 2014), the original design for the railyard had included a roundhouse for servicing locomotive engines; however, it was never constructed. Instead, a rectangular run through type engine house was built. The Former Turntable, present between 1911 and 1922, had been located south of the engine house."*
		b. Also, make reference to the additional information provided in the attachment (ca 1950 correspondence). This is a series of correspondences from 1950, and 1951, by the Washington State Pollution Control Commission, which refers to a complaint filed by the indigenous people of Celilo Falls to the Commission. The complaint forwarded by the Commission refers to "a small creek which empties into the Columbia River." Furthermore, the BNSF's predecessor, SP & S Railway, admitted that oil from a release caused by a broken valve was drained to a "swamp". SP & S Railway also acknowledged that the sole oil/water separator at the railway facility was never used in the 35 years prior to emergence of the complaint. The Commission also reports an additional spill that occurred between November 20, and December 1, 1950, coinciding with the time of this correspondence exchange, and which was recorded as having released "just upstream from the power house." Also, the Pollution Control Commission visited the facility and in a letter dated February 26, 1951, noted three sewer outfalls that discharged wastes to the Columbia River. The documents record that Field Engineer, Alfred Neale inspected the facility and observed waste oils on the banks of the Columbia in the vicinity of the outfall nearest to the oil/water separator. He also observed an open ditch a short distance downstream which had an outfall that terminated over 100 feet from the river for conveyance of sewage wastes to the river. The information in these letters will have to be evaluated and additional sampling locations may be warranted based on the results of the evaluation.	b. Comment noted. Text has been added to Section 1.2 as requested. Without drawings/sketches, the locations of the features described in the circa 1950 correspondence can only be approximated. The "small creek" could be the visible feature in the 1951 aerial photographs aligned with the concrete culvert sewer line which runs under railyard to former pump house #2. This feature no longer exists due to The Dalles Dam. The 1951 aerial photograph is included as Figure B-1 in Appendix B. Aerial photograph from 1951 includes an area to southeast of the former power house that appears to be disturbed; whether this is the location of the "swamp" or the spill area upstream of power house is unknown. Regarding 1951 observations by field engineer, waste oils on banks of the Columbia River and the open ditch are likely no longer present/accessible for sampling due to The Dalles Dam. One soil boring / reconnaissance groundwater sample location has been added adjacent to the concrete platform for former pump house #2.

RESPONSE TO COMMENTS ON
DRAFT WISHRAM BNSF TRACK SWITCHING FACILITY REMEDIAL INVESTIGATION WORK PLAN ADDENDUM

Comments from:
John Mefford, Cleanup Project Manager, CRO Toxics Cleanup Program, State of Washington Department of Ecology, November 27, 2017, and additional comments received February 5, 2018.

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3 (continued)	**Section 1.2: Additional Identified Data Gaps (continued)**	c. The text states: *"Other associated COCs include polycyclic aromatic hydrocarbons (PAHs), including carcinogenic PAHs (cPAHs) at low concentrations. In addition, benzene, toluene, ethylbenzene, and xylenes (BTEX) and some metals (primarily arsenic and lead) have been detected at low concentrations in site soil and groundwater."* Please add in language to reflect that groundwater contaminant concentrations have not been compared to surface water standards. These surface water standards are based on water quality criteria in Chapter 173-201A WAC, Section 304 of the Clean Water Act, and in the National Toxics Rule (40 CFR part 131). What is stated in this draft work plan as low contaminant concentrations may actually represent contaminant levels that exceed surface water quality criteria for protection of human health and aquatic life.	c. Comment noted. Text will be added to reflect that groundwater COC concentrations have not previously been compared to surface water standards and/or will be compared to appropriate cleanup levels in the RI Report. *"The RI/FS report will summarize RI field tasks and data collected and include comparison of groundwater contaminant concentrations to applicable regulatory standards, including surface water standards based on water quality criteria in Chapter 173-201A WAC, Section 304 of the Clean Water Act and in the National Toxics Rule (40 CFR part 131)."*
		d. Remove or revise the following language: *"Records currently available do not report any water contamination issues associated with former water supply wells Well 2 (constructed in 1926) and Well 3 (constructed in 1930)."* This statement does not present the full characterization of the situation, in terms of assessing the current status of the water quality in the unconfined aquifer and in the basalt aquifer. Both former water supply wells, #2 and #3, were positioned near waste drain lines that extended south from the engine house and west to the oil/water separator as shown in the attached line diagram (Alteration, Oil Separator, Wishram, dated June 1951). Additionally, these abandoned wells may contribute to short-circuiting and act as preferential pathways, depending on several factors such as whether these wells were properly decommissioned, the existing state of the well casing material, and whether other hydrologic conditions exist. If this current wording is retained, additional wording should be added to state that the current status of the water quality in the unconfined aquifer and possibly into the basalt aquifer is unknown pending further investigation. Ecology is interested in how BNSF proposes to specifically address the issue of whether one or more of these former water wells may currently present or may have historically presented a preferential pathway that could have adversely impacted the chemistry of the potable water in the aquifer. Although the well is decommissioned, that is insufficient to demonstrate effective formation sealing that prevents intercommunication of different water-bearing zones.	d. Comment noted. The text will be removed. As indicated under the Response to Comment #3a, two soil borings will be advanced in the vicinity of former water supply Wells #2 and #3 to evaluate shallow groundwater quality.
		e. Another line diagram in the attachment (Station Layout of Existing and Proposed Sewers and Disposal System at Wishram, Washington, dated December 1959) shows proposed sewer lines that extend from the engine house east to five septic tanks and to an associated septic drain field. Determine if any of the drain lines from the engine house directed sewage or other waste streams to the sewage outfall designated in the diagram near pump house # 1. If this is the case, add sampling locations to assess soil and groundwater in the vicinity of any sewage outfall, the sewage distribution lines and at the septic system. Consult with Ecology on the appropriate analyses. The Agreed Order provides for additional data gaps investigation to determine the nature and extent of contamination at this facility which as a history of releases and threatened releases to the environment.	e. Text has been added to Section 3.2.1 to describe the septic tanks and leach field. Five soil boring and reconnaissance groundwater sampling locations are proposed (see Figures 11 and 12) to investigate this feature.
Section 2: Remedial Investigation (RI) Objectives and Approach			
4	**Section 2.1: Soil Investigation**	a. The text states: *"Evaluating areas of the site where petroleum hydrocarbons compounds or other COCs may have been used, stored, or distributed to assess potential impacts to site media. See Section 3.2 for a detailed discussion of the sufficiency of previous site assessments and proposed additional investigation."* Please make sure to reference that the previous site assessments were performed as independent remedial actions. As such, the sufficiency of portions of the previous work has not been fully vetted by Ecology. Also, it is important to submit the data collected to the Environmental Information Management (EIM) database. Note that the sufficiency of all of the RI work will be evaluated during the review of the RI Report.	a. Text will be revised to include: *"Following review of the results from the previous independent remedial investigations and actions conducted between 2002 and 2016,"* *The following text will be added to the last paragraph of Section 5.2 Schedule:* *"Additionally, historical site investigation and remedial action data will be uploaded to EIM prior to submitting the RI/FS Report to Ecology*."

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5	**Section 2.2: Groundwater Investigation**	a. Per subsections (3), (4), or (5) of WAC 173-340-720, the groundwater cleanup standards shall be stringent enough to protect surface water beneficial uses and meet all applicable state and federal laws. Explicitly acknowledge in the Work Plan the requirement for the assessment of the groundwater to surface water pathway and of surface water compliance. b. The text states: *"Wells installed to the east of WMW-18 will be positioned to address potential impacts toward the shoreline south-southeast of the Former Oil/ Water Separator, Former Engine House, and Former Repair Shops."* Figure 10 shows these wells as WMW-20, WMW-21, WMW-22, and WMW-23. Please indicate that other monitoring wells to the east in that general vicinity are further upland (WMW-24, WMW-25, WMW-26, WMW-27, and WMW-28) and will be situated in or around the Engine House area.	a. Text will be revised to state: "Per subsections (3), (4), or (5) of WAC 173-340-720, the groundwater cleanup standards shall be evaluated as part of the Feasibility Study and selected in cooperation with Ecology to meet applicable state and federal laws. Establishing conditional points of compliance will be discussed with Ecology during the Feasibility Study phase and will adhere to WAC 173-340-720(8). Evaluation of applicable cleanup standards will take into consideration the groundwater to surface water pathway and compliance with surface water regulations." b. The intent of this section is to provide a general overview of Addendum investigation areas (without listing each proposed boring/well by name). This particular bullet is referring to extending the shallow transect to the east along the shoreline. Text will be revised as follows: *"Wells installed to the east of WMW-18 along the shoreline (WMW-20 to WMW-23) will be positioned to address potential impacts toward the shoreline south-southeast of the Former Oil/ Water Separator, Former Engine House, and Former Repair Shops. Additional wells installed further upland to the east of WMW-18 include six wells in the vicinity of the Former Engine House/Machine Shop (WMW-24 to WMW-29)."*
Section 3: Additional RI Field Activities			
6	**Section 3.1: Pre-Field Activities**	a. The text states: *"Prior to implementing the investigation described in this Addendum, BNSF will consult with Washington Department of Archaeology and Historic Preservation (DAHP) to identify; sensitive sites in the Wishram Railyard area and obtain necessary permits. In consultation with DAHP, the Yakama Nation, and other potentially interested parties (Confederated Tribes of Umatila Indian Reservation, Confederated Tribes of Warm Springs, and Nez Perce Tribe), BNSF will develop an appropriate plan for conducting the work described in this Addendum."* Please revise language to show how Ecology will be kept fully informed in a timely manner through email or by telephone about archaeological issues that may affect the performance and/or the schedule of any remedial work under the Agreed Order. The initial discovery of cultural materials in August 2016, was not promptly communicated by BNSF to Ecology. We were informed of a sheen on that field day but not of the discovery of cultural materials unearthed on that same day. The first indication of the encountering of archaeological materials was provided by a third party, the State Archaeologist, who called Ecology for more information regarding the find.	a. Comment noted. Add following text: *"Ecology will be notified in a timely manner through email or by telephone about archaeological issues that may affect the performance and/or the schedule of any remedial work under the Agreed Order."*
7	**Section 3.2: Additional Site Assessment Data Gaps**	a. The text states: "Proposed soil borings and monitoring well locations to address Ecology's identified data gaps and to further assess potential dissolved-phase DRO and ORO impacts along the shoreline are summarized below and in Table 2." Revise the wording in the remainder of the text in the appropriate portions of Section 3, and in other corresponding Sections of this supplemental Work Plan and in Table 2 to be consistent with the following: i. Revise note "h" on Table 2 to state that wells, WMW-24 and WMW-29 through WMW-32 will be installed as permanent monitoring wells consistent with WAC 173-160. Change the text in Table 2 and in appropriate portions of Section 3 and other corresponding Sections of the supplemental Work Plan to reflect this change.	a. Comment noted. i. Text will be revised to indicate that installation of wells WMW-24 and WMW-29 through WMW-32 will be consistent with WAC 173-160: The text will be revised as follows: *"Proposed shallow monitoring wells will be installed using direct push drilling and pre-packed well screens (10 feet in length)……Well installation will be in accordance with the requirements of WAC 173-160 including setting in a flush mounted well completion monument."*

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7 (continued)	**Section 3.2: Additional Site Assessment Data Gaps (continued)**	ii. The text of note "d' on Table 2 states: "Dissolved lead (WMW-19 and RMD-5) or RCRA 8 metals (all other proposed wells), NWTPH-Gx (WMW-32), and PAHs (WMW-20 through WMW-32) analyses will be discontinued after one monitoring event if not detected at concentrations above the Model Toxics Control Act (MTCA) Method A groundwater cleanup level." Revise note "d" of Table 2 to clarify that if analysis shows detection of any of these contaminants then further groundwater sampling is required to evaluate the fluctuation in groundwater concentrations of these COCs and to show whether these groundwater concentrations can be demonstrated to be compliant with the MTCA cleanup standards. Revise the text to reflect this change in the appropriate portions of Section 3 and other corresponding Sections of this supplemental Work Plan, if applicable.	ii. Comment 7b requires that metals listed in Table 2 include analyses for total and dissolved components. And based on comment 9, samples are to be analyzed for dissolved and total metals (or lead) until approved otherwise by Ecology. Note "d" on Table 2 will be revised: *"(d) Total and dissolved lead (WMW-19 and RMD-5) or total and dissolved RCRA 8 metals (all other proposed wells), NWTPH-Gx (WMW-32), and PAHs (WMW-20 through WMW-32) analyses will be discontinued in applicable wells after two monitoring events (during typical high and low groundwater levels) if not detected at concentrations above the Model Toxics Control Act (MTCA) Method A groundwater cleanup level. If laboratory results show detections of one or more of these constituents, then further groundwater sampling will be performed to evaluate whether concentrations are compliant with the MTCA cleanup standards. Historical data collected for the site indicates dissolved and total metals analyses result in similar concentrations in groundwater samples collected from site wells. Elimination of the requirement for dissolved metals analysis will be considered if the initial two sampling events indicate the two concentrations are within 20 percent. Any changes to the laboratory analytical program will be proposed by BNSF in writing to Ecology for approval prior to implementing."*
		iii. The text of note "e" states: "Semi-annual sampling will be conducted on each of the four (4) shallow wells (WMW-25 through WMW-28) and two (2) deep wells (RMD-5 and RMD-6) that does not contain LNAPL." Revise note "e" of Table 2 to state that quarterly monitoring is required in the shallow wells, WMW-25 through WMW-28, for initial characterization purposes. Revise the text to reflect this change in the appropriate portion of Section 3 and other corresponding Sections of this supplemental Work Plan, if applicable.	iii. Note "e" will be revised: *"(e) For initial characterization, four quarterly sampling events will be conducted on each of the fourteen (14) new shallow wells (WMW-19 through WMW-32). The sampling frequency and status of new shallow wells (WMW-19 through WMW-32) to be retained or decommissioned will be evaluated following completion of the initial four quarterly sampling events. Semi-annual sampling will be conducted on each of the two (2) new deep wells (RMD-5 and RMD-6). Wells containing LNAPL (measurable thickness, sheen, or sheen in purge water) will not be sampled. Any changes to the monitoring well sampling program will be proposed by BNSF in writing to Ecology for approval prior to implementing."*
		b. Ecology requires that all of the assessments for metals listed in Table 2 will include analyses for total metals and dissolved metals. Revise the text to reflect this change in the appropriate portion of Section 3, in Table 2 and other corresponding Sections of this supplemental Work Plan, if applicable.	b. Comment noted. Incorporated into the response to comment 7a.ii, above for note (d) in Table 2. Total metals will not be analyzed in reconnaissance groundwater samples identified in Table 2 as the results would not be representative of formation conditions.
		c. On all proposed monitoring wells (WMW-19 through WMW-32), decrease the screened interval from a length of 15 feet to 5 feet in each monitoring well at all investigation locations. The rationale is to minimize the effects of flow-averaging of contaminant concentrations. Revise the text to reflect this change in the appropriate portion of Section 3, in Table 2 and other corresponding Sections of the supplemental Work Plan, if applicable.	c. Propose alternate screen length of 10 feet to allow for fluctuating groundwater table (average groundwater fluctuation near river is 2 to 3 feet and near tracks is 1 to 1.5 feet). A screen length of 5 feet may result in future sampling issues for shallow groundwater wells where the screened interval crosses the groundwater table. Low-flow sampling procedures are employed at the site to minimize the effect of flow-averaging COC concentrations. Text modified to indicate 2016 soil borings data and December 2016 to December 2017 pressure transducer water level data will be reviewed for well screen placement.

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8	**Section 3.2.1: Additional Data Gaps**	a. The text states: *"Eleven additional soil borings (B-17-01 to B-17-11), eight shallow monitoring wells (WMW-20 through WMW-23 and WMW-25 through WMW-28), five temporary shallow monitoring wells (WMW-24, and WMW-29 through MWW-32), and one deep monitoring well (RMD-6) are proposed to address the data gaps identified by Ecology in the eastern portion of the site (Section 1.2). The locations of proposed wells WMW-20 and RMD-6 will also further evaluate extents of potential impacts from the former fueling areas (Section 3.2.2)."* Ecology will not allow the use of temporary wells in lieu of permanent monitoring wells in this portion of the investigation. The five temporary wells (WMW-24, and WMW-29 through WMW-32) shall be installed as permanent monitoring wells, consistent with the regulations pertaining to resource protection wells under WAC 173-160. The monitoring frequency shall initially be performed on a quarterly basis if there are detections of contaminants.	a. Comment is noted. Text will be revised: *"Eleven additional soil borings (B-17-01 to B-17-11), 13 shallow monitoring wells (WMW-20 through MWW-32), and one deep monitoring well (RMD-6) are proposed to address the data gaps identified by Ecology in the eastern portion of the site (Section 1.2)."* New shallow monitoring wells (WMW-19 through WMW-32) will be sampled on a quarterly basis for one year for laboratory analyses identified in Table 2, if identified during the first monitoring event. After four quarterly monitoring events, the frequency will be reduced to semi-annual monitoring. Analytes reported to be below their respective method reporting limits during the first monitoring event will not be included in subsequent events. The two new deep monitoring wells (RMD-5 and RMD-6) will be sampled on a semi-annual basis, consistent with deep monitoring wells installed under the RI Work Plan (March 2016, Revised March 2017). Any changes to the laboratory analytical monitoring program will be proposed in writing to Ecology for review prior to implementing.
		<u>Former Oil/Water Separator</u> b. The text states: *"One soil boring (WSB-04-34) was advanced to the north of this area in 2004. DRO and ORO were not detected in a soil sample collected at 5 feet bgs nor in a RGW sample collected from 11 to 12 feet bgs (Figure 8). Paired shallow (WMW-20) and deep (RMD-6) monitoring wells will be installed to the south of the Former Oil/Water Separator along the shoreline, and soil and groundwater samples collected to evaluate the potential for impacts from the Former Oil/Water Separator and from former fueling distribution system areas to the northwest (Figure 10)."* The evaluation of the single location at WSB-04-34, even with the inclusion of additional sampling locations at WMW-20 and RMD-6, is insufficient to assess the area that includes the oil/water separator and the waste steam conveyance system. Further assessment with sampling is required to evaluate soil and groundwater media in the area that includes the oil/water separator and the waste steam conveyance system. Additionally, confirm whether the oil/water separator was removed from the ground or whether it was abandoned in place. We also note that the soil at WSB-04-34 was not assessed for PAHs and metals. Groundwater at WSB-04-34 was assessed for various analytes and arsenic was shown to exceed slightly above the MTCA Method A cleanup levels. Further analysis is required to evaluate arsenic concentrations in this vicinity in addition to the exceedances of arsenic found near WMW-2 and WMW-3. Add language in the work plan to provide for this further analysis. The samples from the oil/water separator area and the waste stream conveyance system will be evaluated for the presence of metals, volatile organic compounds including chlorinated solvents, and PAHs either in both, the soil and groundwater media, or in the applicable media, if not previously assessed. Add these analyses to the work plan.	Discuss locations for additional borings with Ecology. Oil/Water separator: Propose two soil borings, one on either side of the former o/w separator (north and south). Collect soil samples from each boring and one reconnaissance groundwater sample (from impacted boring or downgradient boring location if no impact observed in the field). Reconnaissance groundwater samples will be collected from each boring if impacts are observed in both borings. Documentation is not available as to how the oil/water separator was removed or abandoned. A concrete footing is partially visible beneath soil and vegetation in the general area of the former oil/water separator. Waste stream conveyance (see <u>Oil Drain Lines</u>): Propose seven soil borings, one approximately every 50 feet, along the oil drain length (Figure 9). Analyze samples for metals, VOCs, PAHs, and NWTPH-Dx (constituents consistent with the former structures / activities).
		<u>Former Repair Shop (West)</u> b. The text states: "One shallow monitoring well (WMW-21) will be installed along the shoreline to the south of the Former Repair Shop (Figure 10), and soil and groundwater samples collected (including samples for NWTPH-Dx analysis with and without SGC during the first sampling event) to further confirm the results from the RGW sample." Ecology objects to limiting the comparison of analytical results with and without SGC from a particular sampling location to only a single sampling event. The type and quantity of the petroleum metabolites consequent of the degradation of the petroleum source mass may impact human health or the environment. As such, additional comparison analyses should be performed over a period of time sufficient to assess temporal fluctuations and/or trends in the ratio of the concentration of petroleum hydrocarbons to the concentration of petroleum metabolites.	c. Comment noted. In 2018, soil and groundwater samples from selected borings/wells will be prepared with and without SGC for comparative analysis. Section 3.3 includes a list of 5 borings (soil and recon GW), 10 shallow wells, and three deep wells for this comparison of results. The list of wells includes proposed and existing wells.

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8 (continued)	**Section 3.2.1: Additional Data Gaps (continued)**	<u>Former Repair Shop (East) and Former Turntable</u> d. The text states: "One soil boring (B-17-01) and one temporary shallow monitoring well (WMW-24) will be installed in the eastern portion of the Former Wash Rack as shown on Figure 10, and soil and groundwater samples collected to further evaluate the presence of DRO and ORO at this location." Verify whether the reference to B-17-01 is a typographic error and correct as needed. Also, we note that the groundwater samples from WSB-04-12 and WSB-04-29, both collected in 2004, were not assessed for gasoline. Sample for gasoline in groundwater at B-17-11. <u>Former Wash rack and Rail Area North of Wash Rack</u> e. Install WMW-24 as a permanent monitoring well with collection and analysis of soil samples during installation. Monitor initially on a quarterly basis if contaminants are detected. <u>Former Engine House/Machine Shop</u> f. The text states: "Five soil samples and one RGW sample had previously been collected in and around the vicinity of the Former Engine House/Machine Shop in 2004." We note that the groundwater at WSB-04-27 was not assessed for diesel, heavy oil or metals. Collect soil and groundwater samples and analyze for those potential contaminants in the cell in which WSB-04-27 is located. Also, add at least two more boring locations in the engine house area at the two cells between B-17-07 and B-17-03 and between B-17-01 and B-16-21. Analyze soil and groundwater for the contaminants listed in Table 2 for the engine house process area. For metals, analyze for both, dissolved and total metals. g. Install WMW-29 as a permanent monitoring well including collection and analysis of soil samples during installation. Monitor initially on a quarterly basis if contaminants are detected. <u>Former Oil House (East of Store House)/Former 5,000-gallon Oil UST/Former Oil House and 1,000-gallon Gasoline UST</u> h. Install wells, WMW-30 through WMW-32, as permanent monitoring wells rather than temporary wells. Monitor initially on a quarterly basis. <u>Oil Drain Lines</u> i. The text states: "Potential impacts to groundwater from portions of the oil drain between the Former Engine House and Former Oil/Water Separator will be addressed by three of the new shallow monitoring wells (WMW-20, WMW-21, and WMW-22) along the shoreline. Additionally, two of the proposed soil borings in the Former Engine House/Machine Shop area (B-17-07 and B-17-09) will be advanced along the oil drain to the south as shown in Figure 10." Standard points of compliance are appropriate for this Site with the exception of possibly setting conditional points of compliance for groundwater as provided for under MTCA based on further information. Conditional points of compliance (CPOCs) have not been formally established yet. Establishment of CPOCs requires adherence to WAC 173-340-720(8). Refer to comment # 12 below for the investigation near the areas where the former water supply wells were located, two of which were located within the vicinity of the oil drain lines. j. Also, the dissolved phase petroleum hydrocarbon plume has not been defined at the northern bound near WMW-7 and WMW-8 nor has the plume been defined at the eastern extent from the former boiler house to the former wash rack. The LIF investigation screened for NAPL but it cannot be used to assess the dissolved phase concentrations of groundwater contaminants. Determination of the nature and extent of contamination is a key element of the Agreed Order objectives.	d. Yes, this is a typographical error. The revised location number is B-17-23. Change in numbers resulting from additional soil borings based on Ecology's comments. Add NWTPH-Gx (gasoline range organics) to analyte list for groundwater samples from B-17-23. NWTPH-Gx will also be added to the soil samples from B-17-23. e. Well WMW-24 will be installed in accordance with WAC 173-160. Soil samples will be collected during installation and groundwater samples will be collected on a quarterly basis (four events) during the first year of monitoring for analyses proposed in Table 2. f. Add three soil borings and reconnaissance groundwater sample locations such that one boring exists within each grid cell, as indicated in the comment. A total of eleven new soil borings/recon GW samples are proposed (B-17-01 to B-17-11). As stated in the response to comment 7b, total metals will not be analyzed in reconnaissance groundwater samples identified in Table 2 as the results would not be representative of formation conditions. g. Well WMW-29 will be installed in accordance with WAC 173-160. h. Text will be modified under each subheading to remove the word "temporary". i. Comment is noted. Seven soil borings/reconnaissance groundwater sample locations (B-17-12 to B-17-18) are proposed along the oil drain (shoreline side) as presented on Figure 9. j. Comment is noted. Propose two soil borings/reconnaissance groundwater sample locations: one north of WMW-7 and WMW-8, one between former boiler house and Maintenance Shop, as indicated on Figure 9.

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9	**Section 3.3: Laboratory Analyses and Sampling Schedule**	a. Collect groundwater samples for total metals analysis in addition to dissolved metals analysis for new monitoring wells in the process areas like the Engine House and other maintenance areas such as the Repair Shops, until Ecology states otherwise in writing. b. Report the turbidity values measured in the field along with other field parameters collected during sample collection as part of the data submittal.	a. Comment noted. See previous response to comment 7 regarding dissolved versus total metals analyses. b. Field parameters are included in the groundwater analytical tables. The tables will also be updated to include depth to water and LNAPL presence/thickness if present.
10	**Section 3.4: Well Surveying and Hydrogeologic Characterization**	a. Are the measurements collected using the GPS unit referenced to the World Geodetic System 84 (WGS-84)? If so, please indicate that the GPS measurements are referenced to WGS-84 rather than to the NAVD88 datum.	a. No, the horizontal datum for the GPS unit is referenced to North American Datum (NAD) 1983 State Plane Washington South (feet), consistent with survey data for site features. Changing the vertical and horizontal datum will introduce error into the groundwater conceptual site model. NAVD88/NAD83 are the appropriate vertical and horizontal datums to use. No changes made to text.
11	**Section 3.5: Former Water Supply Wells**	a. Add additional borings adjacent to each of the three former water wells. Collect soil and grab groundwater samples from each of these boring locations. Assess the soil and groundwater for the following: - Total metals (RCRA 8) + zinc, vanadium and nickel at all former water well locations; - Diesel and heavy oil at all former water well locations; and - Chlorinated solvents at all former water well locations. b. Install additional monitoring wells if contamination is detected in the vicinity of any of the former water supply wells and monitor initially on a quarterly basis if there are detections of contaminants.	a. Nature and extent of potential impacts to soil and groundwater near former water Well #1 have been investigated previously through advancement of soil borings (B-12-10 and MWD-3) and TarGOST borings (G5, CR5 and CR-5.5) in its close vicinity. Additional investigation in this area has also included collecting soil and groundwater samples at wells WMW-17 and RMD-3. No additional borings are planned at Well #1 to define nature or extent of COCs. As shown on Figure 9, soil boring/reconnaissance groundwater sample locations are proposed in close proximity to Well #2 (B-17-18) and Well #3 (B-17-14). Soil and groundwater samples will be collected for metals, diesel and heavy oil, and VOCs (including chlorinated solvents). On 19 December 2017, Ecology removed the requirement to analyze the soil and grab groundwater samples for zinc, vanadium, and nickel at the former water well locations. b. Proposed wells along the shoreline will be in the vicinity of Well #2 (shallow wells WMW-20 and WMW-21, deep well RMD-6) and Well #3 (shallow well WMW-22) (see Figure 9A).
12	**Section 3.5.1: Status of Former Water Supply Wells**	a. The text states: *"If no metallic objects are located in the electromagnetic survey areas, then it will be assumed the well casings are no longer present in the area."* What is the penetration depth of the EM61 metal detector? What alternate steps will BNSF take if Well # 1 is not found using the EM61? b. The text states: *"If visual evidence of cement/grout is visible within the well casing, it will be assumed the well was properly abandoned."* The well decommission log states that Well # 1 was compromised by oil contamination. Other documentation states that sewage also contaminated the groundwater through the damaged casing on Well # 1. Ecology requires verification that the decommissioning seal is extensive on all of the former water wells, rather than just the verification of the presence of a cement and/or concrete plug near or at the ground surface.	a. Based on the September 2017 site inspections, location of Well #1 may have been found. Next step will be to remove the concrete well seal (or what appears to be) and inspect what is underneath. The option for using electromagnetic survey to locate the well has been removed based on the visual inspection and amount of metallic debris (concrete rebar, scrap metal, etc.) which would likely interfere with the electromagnetic survey. b. The historical documentation (e.g., 1/16/1926 letter) does not specify how the oil or sewage entered the well. Documentation does state that casing was damaged or crooked in several places; however, those portions of the casing had been installed within larger diameter casing (e.g., 10-inch diameter casing within 13.5-inch diameter outer casing). BNSF presumes that because the records indicate the well was also impacted by sewage, surface water, rather than groundwater impacts, is the plausible route for the impact. 1926 letter proposes “thoroughly sealing” the well to prevent further surface water contamination.

RESPONSE TO COMMENTS ON
DRAFT WISHRAM BNSF TRACK SWITCHING FACILITY REMEDIAL INVESTIGATION WORK PLAN ADDENDUM

Comments from:
John Mefford, Cleanup Project Manager, CRO Toxics Cleanup Program, State of Washington Department of Ecology, November 27, 2017, and additional comments received February 5, 2018.

Comment Number	Section/ Page	Comment	Response
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13	**Section 3.5.2: Potential Impacts to Potable Water Sources**	a. The text states: "The presence or absence of potable water supply sources in the vicinity of Wishram will be evaluated as a desktop review, including review of Ecology well records and the DOH drinking water database." A simple review of well log records and the DOH drinking water database is insufficient to determine the potability of groundwater. Refer to WAC 173-340- 720 and 173-340-730 for criteria for determining if groundwater or surface water is a current or potential source of drinking water.	a. NOTE: This section has been renumbered to be Section 3.5.3. The intent of this statement in the Work Plan is to determine whether or not there are one or more potable water supply wells in Wishram, not whether the water itself is potable. Revise text to: *"The presence or absence of potable water supply wells in the vicinity of Wishram will be evaluated as a desktop review, including review of Ecology well records and the DOH drinking water database."*
		b. Regarding potential impacts to potable water source, Piper (1932) states: "Well abandoned in 1927, because water was contaminated by oil from near-by waste pit, contamination suggests defective casing." The well referenced is former water supply well # 1.	b. Piper (1932) report does not provide a reference for the information regarding why the well was abandoned. Note that according to SP&S documentation, the well was abandoned in 1928. The SP&S documentation does not mention a 'near-by waste pit' though it does mention that the well had been contaminated by oil and sewage and that sand had entered the casing due to defective well installation. The recommendation to thoroughly seal and abandon the well to prevent surface water contamination implies that surface water is the source of contamination to the well.
		c. The draft work plan references the City of Wishram water well that was installed in 1993 (well tag #AFL-874). Indicate that the City of Wishram commissioned the drilling of a new city well (well tag #AAR-991) and that well #AFL-874 is still being maintained, i.e., it has not been decommissioned. Note that the new well (#AAR-991) is fully cased throughout the entire length of the well whereas well #AFL-874 is cased intermittently over the length of that well.	c. Noted. Appropriate text will be added.
		d. A previous investigation report (Kennedy Jenks, 2007) stated that oil timbers were encountered during the installation of (now decommissioned) well, WMW-2, which was situated near the southwest end of the oil sump/concrete vault, in the vicinity of former water supply well #1. The same report states, "a localized mass of stained soil was left in place around the base of the sub-grade concrete vault at a depth of approximately 18 feet bgs." We note that the investigation report in 2004, documented that the contaminants found near WMW-2 with concentrations that exceeded or were at concentrations near the MTCA Method A groundwater cleanup levels included gasoline-range and diesel-range organics, benzene and arsenic. Ethylbenzene, toluene, and xylenes were also detected but at low concentrations. For compliance purposes, a permanent monitoring well shall be installed to assess the area near the decommissioned WMW-2 and the former water supply well #1. Consult with Ecology to confirm the analytical suite. Ecology also notes that groundwater concentrations of arsenic in that general area exceeded the MTCA Method A cleanup levels at MW-3 (8.54 ug/L) and MW-2 (18.4 µg/L).	d. Comment noted. Nature and extent of potential impacts to soil and groundwater in the vicinity of former well WMW-2 have been evaluated through previous sampling of well WMW-2, advancement of multiple TarGOST soil borings, soil sample collection from multiple soil borings, and through current groundwater monitoring of wells WMW-17 and RMD-3. No additional borings or wells are proposed for this area to further delineate nature or extent of COCs. No changes made to the Addendum text.
Table and Figures			
14	**Table 1: Former Water Supply Wells Construction Data**	a. Wells #2 and #3 which were installed in 1926, and 1930, were observed to have steel casing. However, it is unknown if the casing in either well has been compromised by corrosion. Also unknown is the extent of decommissioning, e.g., if the obstruction encountered in well #2 is actually an attempt at decommissioning or if there is another reason for the obstruction of the casing. Describe how well #2·was assessed, e.g. whether it was videologged or simply sounded with a water level meter. Indicate that the decommissioning for well #2 has to be verified.	a. Comment noted. Text will be added to describe Well #2 assessment. The proposed soil borings (Figure 9) in vicinity of water supply Wells #2 and #3 will be advanced prior to any additional water well decommissioning activities.
15	**Tables/Figures (general)**	a. Update portions of any tables and figures including the associated notes to reflect the changes discussed above. b. Include the well tag numbers on at least one table to show a cross-reference to the well name listed in the reports, e.g., BJX-232 corresponds to OHM-1.	a. Updates will be made as applicable. b. A table will be prepared to summarize well tag numbers along with well construction data for existing wells.

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16	**Section 3.2.1: Additional Data Gaps**	a. Please add …in accordance with the requirements…"for monitoring wells under"… WAC 173-160. b. <u>Former Engine House/Machine Shop</u> Clarify that the RGW samples are mandatory for all new boring locations under this proposal. The rationale is that there is a greater chance of detection of contaminants in groundwater as opposed to soil sampling alone. c. <u>Former Septic Tanks and Drainage Field</u> Clarify that the collection and analysis of the RGW sample is mandatory at the septic field area. The rationale is that there is a greater chance of detection of contaminants in groundwater as opposed to soil sampling alone.	a. Text revised. b. Additional text added to Section 3.2: *"As presented in Section 3.2.1, with the possible exception of one soil boring, a RGW sample will be collected from each soil boring not converted into a monitoring well. The one exception is related to the two soil borings proposed upgradient and downgradient of the Former Oil/Water Separator. If field observations (visual, olfactory, PID, and sheen tests) do not indicate impacts in either of the two proposed soil borings, then a RGW sample will only be collected from the downgradient (closer to Columbia River) soil boring."* c. See above response.
17	**Section 3.3** **Laboratory Analyses and Sampling Schedule**	a. Please add additional wording: ...for review..."and approval"…prior to…. The procedure would be similar to how changes in the analytical suite were handled in the previous instance. A formal request in writing with submittal of data, preferably four quarters, for Ecology to review for approval, then followed by a written approval provided by Ecology. b. Clarify in the text that groundwater samples will also be collected from the monitoring wells and analyzed for total metals analysis. I would like to ensure consistency in the work plan to reduce chances of misunderstanding when implementing in the field.	a. Text revised. Also note that the following subsections have been added to break up this section: 3.3.1 Soil Samples 3.3.2 Reconnaissance Groundwater Samples 3.3.3 Monitoring Well Groundwater Samples b. Total and dissolved metals are addressed for groundwater samples from monitoring wells under Section 3.3.3.
18	**Section 3.3.2 Reconnaissance Groundwater Samples**	Mandatory RGW sample collection and analysis at all locations. The rationale is that there is a greater chance of detection of contaminants in groundwater as opposed to soil sampling alone.	Additional text added to Section 3.2.
19	**Section 3.3.3 Monitoring Well Groundwater Samples**	a. At RMD-5 and RMD-6, we'd like to see addition of comparison analysis by NWTPH-Dx with SGC and without SGC sample prep. The rationale is that the comparison analyses will give another line of evidence to evaluate natural attenuation. Update Table 2 (text and footnotes) to match the revised text of this redline version of the Work Plan. b. Retain all analyses for additional sampling event then re-evaluate. Provide written request for reduction of analytes for approval by Ecology. Can we determine when high and low groundwater levels will occur during a typical year based on the historical data and on an understanding of the Corps of Engineers constraints for managing the lake level? Ideally, we would like to see analyses of samples collected during the high and low groundwater periods. Update Table 2 (text and footnotes) to match the revised text of this redline version of the Work Plan.	a. Applicable text added to Section 3.3.3 and Table 2 revised. b. Revised text and Table 2 to indicate samples for PAHs, metals, and NWTPH-Gx analyses will be collected during first high and low groundwater level monitoring events. Similar text also added to discussion of NWTPH-Dx with and without SGC. High groundwater levels are typically observed during April and May and lows during September and October. Also added: *"Any changes to the laboratory analytical monitoring program will be proposed by BNSF in writing to Ecology for review and approval prior to implementing."*

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20	**Section 3.4** **Well Surveying and Hydrogeologic Characterization**	Before this can be approved, please explain why the well specs were changed from the original specs.	Comment was made with respect to changing the planned well screen interval for shallow transect wells and shallow upland wells. Response to Comment 7c. above had proposed a well screen length of 10 feet (instead of 5 or 15 feet), which required changing the planned screen interval. Screen intervals were selected to provide a minimum of approximately 5 feet of water column in the well, depending on typical groundwater level seasonal fluctuations. See additional text at start of Section 3.2.1.
21	**Section 3.5.1** **Status of Former Water Wells**	a. Add clarifying language that "the surface casing is no longer present in the area". b. The issue of whether the well is regarded as having been adequately addressed and a determination of no further assessment will have to be put to Avery Richardson, CRO's well coordinator for Water Resources. c. Please add: "After consultation with Ecology,…additional decommissioning activities are warranted, work will be completed…"	a. Text revised. b. Text revised. c. Text revised.
22	**Section 3.5.2** **Field Investigation**	a. What about results from former monitoring well WMW-2? Even though the well was decommissioned because it was supposedly installed in a mass of oily timbers, the arsenic levels were greater than GW CUL of 5ug/L (values were 18.4 to 21.7 ug/L). Benzene and gasoline were also elevated. Add information about WMW-2, what was found, what was done to remediate (e.g. excavation and ORC?). Do we know if the arsenic is related to some aspect of that area? b. Please verify the fit of the Targost transects that is overlain on the site map. Look at CR-02 and CR-03. Check the light petroleum hydrocarbon LIF response at about 10-13 feet bgs. This depth is consistent with what is seen at G-01 and G-02 which suggests that the land elevation is similar (at grade with land elevation below the berm). LIF borings on the raised berm should show a greater difference from land surface to the groundwater table. Revise any associated figures that depict the Targost transects, if appropriate. c. The RGW sample collection and analysis is mandatory.	a. Text revised. Evaluation of potential sources of contaminants (e.g., petroleum hydrocarbons, arsenic) will be included in the RI Report. b. Note – no transects are included in the Addendum. For reference, the spatial locations of Targost borings CR-02, CR-03, G-01 and G-02 as shown on Figures 4, 9 and 10 of this Addendum are based on handheld GPS unit measurements. Ground surface elevations were not surveyed. c. Additional text added to Section 3.2.