FINAL

Remedial Investigation/Feasibility Study Work Plan
Grain Handling Facility at Freeman, Freeman, Washington

Prepared for

Washington State Department of Ecology

On behalf of

Union Pacific Railroad and CHS Inc.

April 2016

Final Work Plan

Remedial Investigation/Feasibility Study Grain Handling Facility at Freeman Freeman, Washington

April 12, 2016

Prepared for:

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Acronyms and Abbreviations

°F	degrees Fahrenheit
ARAR	applicable or relevant and appropriate requirements
bgs	below ground surface
CHS	CHS Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	contaminant of potential concern
CSM	conceptual site model
E&E	Ecology and Environment, Inc.
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
FS	Feasibility Study
GHFF	Grain Handling Facility at Freeman
HSP	Health and Safety Plan
µg/kg	microgram per kilogram
µg/L	microgram per liter
MCL	maximum contaminant level
MTCA	Model Toxics Control Act
PA	Preliminary Assessment
RAO	remedial action objective
RI	Remedial Investigation
ROW	right-of-way
SAP	Sampling and Analysis Plan
TAT	turn-around time
USGS	United States Geological Survey
UPRR	Union Pacific Railroad
UST	underground storage tank
VOC	volatile organic compounds
WAC	Washington Administrative Code
WDOH	Washington State Department of Health

SECTION 1

Introduction

This Remedial Investigation/Feasibility Study (RI/FS) Work Plan was prepared pursuant to Task 1 of Exhibit B to Enforcement Order DE 12863 between the Washington State Department of Ecology (Ecology), and Union Pacific Railroad (UPRR) and CHS Inc. (CHS). The Order requires UPRR and CHS to conduct a RI/FS for contamination at the Grain Handling Facility at Freeman (GHFF). For the purposes of this work plan and per Model Toxics Control Act (MTCA), the Site refers to the GHFF and any parcels that may be impacted from contamination emanating from the GHFF. The GHFF is located at 14603 Highway 27 in Freeman, Washington.

SECTION 2

Background

2.1 Site Description

The GHFF is located on the east side of State Highway 27 in the town of Freeman, Washington, approximately 20 miles southeast of Spokane, Washington. The property is owned by UPRR, currently leased to CHS, and used as a seasonally active grain handling facility. The Facility consists of 11 steel grain silos, one steel grain elevator and a subterranean receiving pit. UPRR owns and operates a railway line that parallels Highway 27 and traverses the property from the southeast to the northwest (Figure 1).

Approximately 0.5 mile northeast of the GHFF is a former clay borrow pit and associated pond known as the Old Freeman Clay Pit (Figure 3). The abandoned clay pit may have been used for illegal dumping or disposal (Leinart, 2012). The property is currently owned by Mutual Materials Company. To the northwest of the GHFF is the Freeman Store. To the southeast of the GHFF, at approximately 0.25 mile is a former brick kiln. To the west and south of the GHFF is the Freeman School District Campus, several residences and sanitary wastewater treatment lagoons. A former residence with a house and multiple shops and outbuildings was located to the southwest of the GHFF (Marlow residence) and is now part of the Freeman School District Campus. West and south of the Freeman Campus and lagoons is land generally used for agricultural production.

The Freeman School District Campus is located immediately across Highway 27 from the GHFF. The Freeman Campus covers approximately 56 acres of land and includes an elementary school, middle school, and high school. There are three wells on the Freeman Campus. The current water well that supplies drinking water to the school (primary well labeled as WS5) was installed in 1980 and is the sole source of water for the Freeman Campus. It is located near the south perimeter on the Freeman Campus. The second well is a former residential well located in the northeast area of the Freeman Campus (labeled as the Former Marlow Well, W26). This well was not used as a drinking supply well to the Freeman Campus. The third well is a former residential well (labeled as W20) located in the southwest end of the Freeman Campus near the playfield. The three wells are shown in Figure 1.

The Freeman School District well is constructed with a 6-inch diameter steel casing to 52 feet below ground surface (bgs) with an open borehole extending from approximately 52 to 215 feet below site grade (see well log provided in Attachment 1). Information regarding the depth of the water-bearing zone(s) intersected by the primary Freeman School District well was not found in the available documents.

Water extracted from the primary Freeman School District well is pumped approximately 1,800 feet to the treatment system on the west side of the Freeman High School. The treatment system consists of an air stripper that was put into operation in late August 2013 to treat groundwater generated from the primary Freeman School District well (E&E 2014). After the air stripping process and prior to entering the water distributions system, the Freeman School District water is treated with chlorine for disinfection.

The second well, identified as the former Marlow residential well (W26) is connected to the water supply system by a 3-inch pipe. Although the piping infrastructure is present, this alternate well is not in service and is currently disconnected from the Freeman School District water storage/distribution system.

2.1.1 Summary of Well Sampling Results

Sampling of the primary Freeman School District well was initiated in 1992. The well was sampled twice that year, with carbon tetrachloride reported as non-detect in each case. The next sampling event when carbon tetrachloride was sampled was conducted nine years later in January 2001. Low levels of carbon tetrachloride below the carbon tetrachloride Maximum Contaminant Level (MCL) of 5 micrograms per liter (µg/L), were detected during the January 2001 sampling event. Subsequent sampling of this well was performed on a more routine basis; approximately yearly to 2007, increasing to quarterly thereafter. Currently the pre-treated water entering the treatment system is sampled every six months.

The available site documents report collection of 35 samples of untreated water from the primary Freeman School District well between 1992 and 2014 for analysis of carbon tetrachloride, see Table 2-1. Laboratory analytical reports were available for 4 of the sampling events presented in Table 2-1 (5/30/2012, 1/20/2013, 1/24/2014, and 4/22/2014). A review of these laboratory reports indicates that volatile organic compounds (VOCs), which include carbon tetrachloride and chloroform, were analyzed for in each of the 4 events via EPA Method 8260 or 524.2 (these analytical methods include reporting of over 50 VOCs). The only detected VOCs were carbon tetrachloride and chloroform, all other VOCs were below their respective laboratory reporting limits.

As detailed in Table 2-1, carbon tetrachloride concentrations reported for untreated water collected from the primary Freeman School District well range from non-detect to 22 µg/L. Chloroform concentrations in this well were typically an order of magnitude lower, ranging from non-detect to 2.38 µg/L. In general, carbon tetrachloride concentrations in untreated water from the primary Freeman School District well have been below the MCL of 5 µg/L, with a total of eight exceedances in the 35 sampling events conducted through April 2014. All eight carbon tetrachloride exceedances occurred from 2008 to 2014. There were no carbon tetrachloride exceedances in the primary Freeman School District well prior to 2008.

Additional domestic wells in the area of the GHFF have been sampled, including the former Marlow well (W26). Water quality results from these wells are listed in Table 2-1.

Table 2-1. Summary of Carbon Tetrachloride and Chloroform In Wells on and Near the Freeman School District Campus
Remedial Investigation/Feasibility Study Work Plan

Collection Date	Primary Freeman School District Well	Former Marlow Well (W26)	Former Residential Well (W20)
Results Below Reported As: Carbon Tetrachloride (µg/L) / Chloroform (µg/L)			
4/22/2014	**8.8** / 0.52	**23** / 1.7	-----
9/18/2013	3.8	-----	-----
7/2/2013	3.3	-----	-----
4/10/2013	**9.3**	-----	-----
1/25/2013	**22.0** / 1.28	< 1.0 / < 1.0	-----
1/24/2013	**7.6**	-----	-----
1/21/2013	-----	-----	**21.2** / 2.04
12/12/2012	**8.0**	-----	-----
9/5/2012	3.1	-----	-----
6/14/2012	2.1	-----	-----
5/30/2012	-----	**48.1** / 2.38	-----
4/19/2012	**7.2**	-----	-----
3/21/2012	**5.9**	-----	-----
12/7/2011	< 0.5	-----	-----
9/21/2011	< 0.5	-----	-----
6/22/2011	< 0.5	-----	-----
3/31/2011	3.9	-----	-----

Table 2-1. Summary of Carbon Tetrachloride and Chloroform In Wells on and Near the Freeman School District Campus

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Collection Date	Primary Freeman School District Well	Former Marlow Well (W26)	Former Residential Well (W20)
10/27/2010	3.1	-----	-----
8/18/2010	2.2	-----	-----
4/28/2010	4.3	-----	-----
11/4/2009	3.3	-----	-----
6/25/2009	1.8	-----	-----
2/26/2009	1.7	-----	-----
11/13/2008	3.7	-----	-----
9/12/2008	2.1	-----	-----
5/20/2008	2.3	-----	-----
4/3/2008	**7.8**	-----	-----
4/30/2007	2.3	-----	-----
5/31/2006	< 0.5	-----	-----
11/16/2004	1.6	-----	-----
8/12/2003	< 0.5	-----	-----
6/20/2002	1.4	-----	-----
7/11/2001	< 0.5	-----	-----
3/22/2001	0.7	-----	-----
1/30/2001	0.7	-----	-----
11/13/1992	< 0.5	-----	-----
5/27/1992	< 0.5	-----	-----

Notes: Bold font indicates concentration exceeds the carbon tetrachloride maximum contaminant level (MCL) of 5 µg/L

µg/L = micrograms per liter, "<" = not detected above the identified laboratory reporting limit, ----- = not sampled

Data Sources: 1992 – 2012 (GeoEngineers 2013 and Leinart 2012), 2013 – 2014 (E & E 2014)

In September 2015, the United States Environmental Protection Agency (EPA) added the GHFF to the National Priorities List; EPA identified the GHFF as a potential source of carbon tetrachloride and chloroform to the Freeman School water supply well. Ecology is the lead agency for cleanup activities at the GHFF.

2.2 Geologic and Hydrogeologic Setting

The town of Freeman is in the Columbia Plateau Physiographic Province, which is characterized by the extensive Miocene flood basalts of the Columbia River Basalt Group. The Columbia Plateau is underlain by nearly horizontal lava sheets of Columbia River Basalt of Tertiary age. Locally, the basalt flows are interbedded with sedimentary material of the Latah Formation. Both the basalt and the Latah Formation are overlain by the Palouse Formation of Quaternary age. Aeolian silts and clays of the Palouse Formation in the Freeman area range in thickness from 10 to 50 feet. The Latah Formation is sedimentary material interbedded with basalt flows, and primarily consists of clay, shale, and some beds of sand and gravel (United States Geological Survey [USGS], 1969).

The water well report log for the Freeman School District water supply well (WS5) shows overburden material from the ground surface to 5 feet bgs, underlain by clay to 51 feet bgs, with basalt underlying the clay to 195 feet bgs. Quartzsite gravel is described from 195 to 197 feet bgs, underlain by decomposed granite to the total depth of the well at 215 feet bgs. The water well log for the out-of-use well W-26 (the former Marlow well) describes topsoil from the ground surface to 2 feet bgs, underlain by clay to 30 feet bgs, with basalt underlying the clay to a total depth of the well at 140 feet bgs. The water well log for well W-20 describes topsoil from the ground surface to 4 feet bgs, underlain by clay to 64 feet bgs, with basalt underlying the clay to a total depth of the well at 100 feet bgs. Well logs are presented in Appendix A.

Soil encountered during previous investigations consisted of 0.5 to 4 feet of gravel at the surface, underlain by silt and clay to depths ranging from about 14 to 17 feet bgs. Interbedded sand, silt, and some gravel were encountered at depths below 14 to 17 feet bgs to the maximum depth explored during the investigation of 32 feet bgs in boring SB11.

2.2.1 Hydrogeology

Previous studies in the area of Freeman describe the Columbia Plateau aquifer system as follows:

> *The Columbia Plateau aquifer system includes, from youngest to oldest: (1) the overburden, a collective term used in this study for all materials overlying the Columbia River Basalt Group; (2) a minor amount of sediment interlayered with the basalt; and (3) a large thickness of basalt belonging to the Columbia River Basalt Group, which is the most extensive and hydrogeologically important geologic unit in the aquifer system* (USGS, 1999).

The overburden aquifer is further described as follows:

> *The overburden materials consist of fluvial consolidated to unconsolidated deposits of lacustrine, volcanic, and eolian origin whose lithology ranges from clay to gravels and shale to conglomerate. Most of these deposits generally have a much larger hydraulic conductivity than the basalts and, where saturated, make up a water table aquifer called the overburden aquifer* (USGS, 1999).

The water supply wells in the immediate vicinity of the Freeman School District Campus generally are completed in the basalts or upper portion of the underlying crystalline rock. Previous studies note that groundwater recharge to the Columbia River Basalt Group occurs through direct precipitation, vertical infiltration from overlying unconsolidated sediments, and lateral recharge from upgradient areas.

Previous evaluations and investigations completed near the site state that groundwater generally flows from northeast to southwest in the area of the Freeman School District Campus with an estimated hydraulic gradient of about 0.01 foot per foot. However, there is no supporting data provided in these studies to demonstrate flow direction and gradient.

2.3 Climate

The climate in the Freeman area of eastern Washington is characterized as continental, consisting of hot summers and cold winters. Over the course of a year, the average high temperature ranges from 35.3 degrees Fahrenheit in January to 84.1 degrees Fahrenheit in August. The average low temperature near the Freeman area ranges from 21.9 degrees Fahrenheit in January to 49.4 degrees Fahrenheit in July and August. During implementation of the RI in the spring of 2016, the average high temperature may range from 60 to 70 degrees Fahrenheit and the average low temperature may range from 35 to 45 degrees Fahrenheit.

Average annual precipitation near the Freeman area is approximately 18 inches. The highest average monthly precipitation occurs from November to January and ranges from about 2 to 2.4 inches. The average precipitation that may occur during implementation of the RI is estimated at 1.5 inches per month. The average total snowfall is approximately 27 inches.

SECTION 3

Summary of Previous Investigations

3.1 Technical Assessment

The Site Inspection provides the following information (Ecology and Environment, Inc. [E&E], 2014):

> *In May 2008, the Washington State Department of Health (WDOH) completed a Technical Assistance Consultation concerning the potential health hazards posed by the presence of carbon tetrachloride in the Freeman School District drinking water. The consultation was conducted in response to a notification by the Freeman School District to the WDOH that carbon tetrachloride had been detected in their well at a concentration that exceeded the MCL* [maximum contaminant level]. *For the consultation, the WDOH determined that the concentrations of carbon tetrachloride present in this water would not result in any non-cancer adverse health effects, and that the estimated cancer risk ranged from insignificant to very low. Based on these findings, the WDOH concluded that no apparent public health hazard existed for students, teachers, and other employees exposed to carbon tetrachloride present in Freeman School District drinking water* (O'Garro, 2008).

3.2 Contaminated Groundwater Status Report

In August 2012, Ecology completed a report summarizing the history of known carbon tetrachloride groundwater contamination in the city of Freeman (Leinart, 2012). This report also identified businesses and features that were considered potential sources for this contamination. The report categorized the likelihood of each feature being a source from high to low. These features, and their presumed likelihood of being a source of contamination, were as follows (Leinart, 2012):

- High Likelihood:
  - CHS, Freeman (formerly known as Rockford Grain Growers)
- Medium Likelihood:
  - UPRR main line and rail siding located approximately 300 feet east of the out-of-use Freeman School District well
  - The abandoned Old Freeman Clay Pit located approximately 0.15 mile northeast of the out-of-use Freeman School District well, which may have been used for illegal dumping or disposal (Leinart, 2012)
  - Freeman School District facilities that may have historically used carbon tetrachloride in welding/metal fabrication and automotive workshops, the school bus service/maintenance shop, and/or laboratory classrooms
- Low Likelihood:
  - Freeman School District underground storage tanks (USTs)
  - Freeman School District surface water outfall
  - Freeman Store automotive gasoline service station UST
  - Former brick kiln
  - State Route 27
  - Former shops and outbuildings associated with the residential property acquired by the Freeman School District

Features assigned a high or medium likelihood were those that are known to be associated with the use of carbon tetrachloride, those with a reasonable opportunity for improper waste disposal or storage practices, or those of sufficient scale to have possibly caused either a large release of carbon tetrachloride or ongoing small releases. Features assigned a low likelihood were those that were small in scale and that would not ordinarily use, store, or dispose carbon tetrachloride in a manner, or in quantities, that could result in regional aquifer contamination. At the time of this report, no specific data or information had been uncovered by Ecology documenting the use, storage, or disposal of carbon tetrachloride in the Freeman area (Leinart, 2012).

3.3 Feasibility Evaluation, Production Well Evaluation

In February 2013, GeoEngineers, Inc. completed a draft feasibility study for the Freeman School District that evaluated alternatives for addressing carbon tetrachloride contamination present in the district's primary drinking water well (termed a production well in the report). For the study, five wells were sampled. These included the school district's primary drinking water supply well (WS5), the former residential well (well W-26), a former domestic well located in the southeast portion of the Freeman School District campus (well W-20), a private well located southeast of the campus (well W-30), and the Freeman Store well. Two of these wells contained detectable concentrations of VOCs. These were the school district's primary drinking water supply well and well W20. Carbon tetrachloride was present in these wells at 22.0 µg/L (school district's primary drinking water supply well) and 21.2 µg/L (well W-20). Additionally, chloroform was present in these two wells at 1.28 and 2.04 µg/L, respectively. No other VOCs were detected. Neither carbon tetrachloride nor chloroform were present in the remaining three wells at concentrations above the method reporting limit of 1 µ g/L (including the former Marlow well [well W26], which previously had a detection of carbon tetrachloride above the MCL in May 2012 of 48.1 µg/L). GeoEngineers, Inc. speculated that the difference in carbon tetrachloride concentrations in the out-of-use Freeman School District well between the May 2012 sampling and the sampling in January 2013 may have been the result of differences in sampling techniques (such as purging the well before sampling), the depth of the water sampled within the well, the season sampling occurred, or plume migration (GeoEngineers, 2013).

The feasibility study explored three basic alternatives:

1. *Providing an alternative water supply source*
2. *Altering the design of the current water supply well to isolate the contaminated water zone from deeper uncontaminated water and draw water from that deeper zone*
3. *Treating water from the existing water supply well (GeoEngineers, 2013)*

Of these alternatives, installing a new water supply well was recommended because of lower costs as compared to the other alternatives (GeoEngineers, 2013).

3.4 Preliminary Assessment

In April 2013, E&E completed a Preliminary Assessment (PA) on behalf of the EPA for the Freeman groundwater contamination site to determine whether the GHFF is releasing, or has the potential to release, hazardous substances, pollutants, or contaminants into the environment, and whether it requires additional investigation or response action that is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; E&E, 2013).

The PA summarized the site setting, known contaminants, potential sources, and previous investigations that had been conducted in the area in relation to the carbon tetrachloride groundwater plume. The PA stated that a potential source of the carbon tetrachloride groundwater contamination was the GHFF, although the use of carbon tetrachloride at this location had not yet been confirmed. The PA also stated that other, less likely, potential sources of carbon tetrachloride in the area included private grain handling facilities (if present), the UPRR main line and rail siding, the Old Freeman Clay Pit, potential historic use of this chemical at Freeman School District facilities (e.g., welding/metal fabrication and automotive workshops, the school bus service/maintenance shop, or laboratory classrooms), a former brick kiln, State Route 27, and former shops and outbuildings associated with the former residence associated with the out-of-use Freeman School District well. USTs in the Freeman area were confirmed to be associated solely with petroleum products and for this reason were not considered a potential source of carbon tetrachloride contamination (E&E, 2013).

The PA recommended further investigation of the Freeman groundwater contamination site under CERCLA (E&E, 2013).

3.5 Site Inspection

In 2014, E&E conducted a Site Inspection at the Site under the direction of EPA, Region 10. The specific goals for the Site Inspection, identified by the EPA, were to determine the potential for the following:

- Threat to public health or the environment posed by the site
- Release of hazardous constituents into the environment
- Placement of the site on the National Priorities List

The historic use of carbon tetrachloride at the GHFF was not confirmed during Site Inspection document review or during interviews with operators of this facility. The presence of carbon tetrachloride, and its degradation product chloroform, was confirmed in subsurface soil samples collected at the GHFF. Samples from 6 of 14 soil borings were confirmed to contain soil concentrations of carbon tetrachloride and chloroform at depths ranging from 17.5 to 32 feet bgs. The concentrations of carbon tetrachloride detected in the soil samples ranged from 3.21 to 15 micrograms per kilogram (µg/kg). The highest concentration of carbon tetrachloride was detected from boing SB13 at 29.5 to 30 feet bgs. Chloroform was present in samples from two soil borings, SB13 and SB14. No soil samples were collected on the Freeman School District Campus property.

Carbon tetrachloride and chloroform were not detected in surface soil or near surface soil at the CHS facility. Based on analytical data collected during this investigation, the vertical and horizontal extent of carbon tetrachloride and chloroform in soil has not been defined at this facility. Groundwater was not encountered during the investigation.

Groundwater samples collected during the Site Inspection indicated the presence of carbon tetrachloride at concentrations in the out-of-use Freeman School District well (Former Marlow Well, Well W26) at 23 µg/L and in the primary Freeman School District water supply well (pre-treatment) at 8.8 µg/L. Chloroform was detected at concentrations in the out of-use Freeman School District well at 1.9 µg/L and in the primary Freeman School District well (pre-treatment) at 0.52 µg/L.

3.6 Treatment System Audit

An onsite audit of the groundwater treatment system was conducted by CH2M on July 20, 2015. In attendance were CH2M, Ecology, and Freeman School representatives. The treatment system, including the air stripper, associated piping, and infrastructure were in good working order. Freeman School representatives simulated sample collection methods; including sample handling and storage procedures, and documentation and chain-of-custody procedures. The site tour that took place in conjunction with the audit revealed the presence of multiple homes with private wells. These homes are located immediately northeast of the Freeman School Buildings on E. Prospect Avenue and E. 2nd Street. Based on CH2M's review of the available groundwater sampling data and discussion with Ecology during the audit, we believe the only testing conducted at these private wells are tests that may have been performed by the private owners. Given the proximity of the wells to the out-of-use Freeman School District well where the highest concentrations of carbon tetrachloride and chloroform have been reported, obtaining access to sample the well water is a priority.

SECTION 4

Data Gaps

The review of existing data and information led to the identification of primary data gaps in establishing nature and extent of contamination, identified source areas, localized groundwater flow direction, and groundwater transport mechanisms. Characterization of the nature and extent of carbon tetrachloride in soil and groundwater, identification and delineation of source areas, and evaluation of migration pathways will be required before a conceptual site model can be developed to assist in the decision-making process for cleanup of the site. The primary data gaps include:

- Whether soil contamination encountered of the GHFF property is linked to groundwater contamination in the immediate area.
- The soil investigation conducted for the 2014 Site Inspection did not fully characterize the nature and extent of carbon tetrachloride in soil near the Freeman School District Campus.
- Groundwater data (i.e., chemical characterization data) are not available for the GHFF.
- The interpreted groundwater flow direction and estimated hydraulic gradient for the basalt aquifer in the area of the Freeman School District Campus are not supported by data presented in the Feasibility Evaluation, Preliminary Assessment, or Site Inspection documents.
- A hydrogeologic conceptual site model has not been developed for the Site.

These data needs are described in the following subsections along with the rationale for subsequent data acquisition.

SECTION 5

Remedial Investigation

This section presents recommendations for a phased remedial investigation approach. The primary objectives of the Phase I investigation is to obtain the information required to characterize the nature and extent of carbon tetrachloride and chloroform contamination in soil and groundwater and develop the conceptual site model (CSM) for the GHFF and surrounding area. Phase I is addressed in this RI/FS Work Plan. The Phase II RI, if necessary, will be developed using data and information acquired during the Phase I RI. The RI will follow Federal requirements from the EPA on completing the RI/FS. It is assumed in this work plan that access to complete this work will be granted by the property owners, if access is not granted than the scope will need to be modified as appropriate.

5.1 Phase I Remedial Investigation

The objectives of Phase I RI activities include the following:

- Collect sufficient soil and groundwater data to characterize horizontal and vertical extent of carbon tetrachloride and chloroform at the GHFF and surrounding areas.
- Identify background conditions and potential source area(s).
- Characterize a possible shallow water-bearing zone, if present in the area of the GHFF and the Freeman School District Campus.
- Collect sufficient data in the area to evaluate groundwater flow direction and hydraulic gradient.
- Collect groundwater data from residences located on Highway 27 adjacent to the Freeman School District Campus. Based on Ecology's interpretation of site flow direction these wells could be in the vicinity of the contaminated plume.
- Review historical use of the GHFF, including possible target areas such as underground storage tanks, above ground storage (tanks or drums) locations, transfer areas, and possible chemical application areas. Ecology and CHS are planning on a site tour to review facility operations and conduct interviews with CHS facility personnel. Results of that site visit will be included in the final RI/FS work plan.
- Collect soil gas samples to evaluate if a vapor intrusion pathway is present on the Freeman School District campus.
- Obtain sufficient data and information to develop the CSM.

5.1.1 Soil Investigation

The proposed soil investigation activities under this RI/FS Work Plan consists of the following:

- Explore subsurface conditions using a total of 33 soil borings at the GHFF and surrounding areas. Of the 33 soil borings, 8 will be advanced on the Freeman School District Campus, 5 soil borings will be advanced at the 2013 soil boring locations near the GHFF where carbon tetrachloride was detected in soil, 8 soil borings advanced in the public right-of-way (ROW), and up to 12 soil borings will be advanced near the GHFF and UPRR ROW. The number and locations of soil borings are subject to change during implementation of the RI. The drilling program will be adaptively managed using a 24-hour turnaround time for soil sample analysis. The proposed locations presented in this RI/FS Work Plan are intended to provide a starting point for RI implementation. Soil borings will be advanced in unconsolidated material using sonic drilling to refusal at or near competent bedrock. Anticipated soil boring depth will be approximately 50 feet bgs. Proposed soil borings are presented in Figures 2 and 3.

- Soil samples will be collected during drilling activities from the retrieved continuous soil cores. Soil samples will be screened for the presence of VOCs using a photo-ionization detector (PID) with an 11.7 electron volt (eV) lamp for headspace analysis. Field screening procedures are provided in Appendix B (Sampling and Analysis Plan [SAP]). One soil sample will be collected for analytical testing at 5-foot intervals from each soil boring. Additional soil samples may be submitted for laboratory analysis based on field screening results.
- Submit soil samples to a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method 8260B. An onsite mobile laboratory will be utilized for analysis of all soil samples.
- Collection of groundwater grab samples at the unconsolidated/consolidated material contact in each soil boring, if present. Following refusal and extraction of the drill rod and sampler, the presence of groundwater will be monitored in each soil boring. The groundwater sampling method will be determined by the quantity and/or recharge measured. Groundwater samples will be analyzed by a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method 8260B. An onsite mobile laboratory will be utilized for analysis of all groundwater grab samples.
- A total of four soil vapor sampling locations are proposed in close proximity to existing school buildings on the Freeman School District Campus (Figure 2). Temporary soil vapor probes will be installed at the four locations in shallow soil (approximately 5 to 10 feet bgs) and Summa canisters will be used to collect the vapor samples. Samples will be submitted to a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method TO-15. Depending on the results of this initial soil vapor sampling in conjunction with the soil and groundwater investigation, additional evaluation of the vapor intrusion pathway may be completed during the Phase II remedial investigation.

Additional soil investigation detail is provided in Appendix B of this RI/FS Work Plan (SAP). Appendix C contains the Quality Assurance Project Plan. The site health and safety plan is presented in Appendix D.

5.1.2 Groundwater Investigation

The proposed groundwater investigation activities under this RI/FS Work Plan consists of the following:

- Installation of six basalt groundwater monitoring wells; one located at the GHFF, two located within the UPRR ROW, and three located on the Freeman School District Campus. It is anticipated that the wells will be installed to a depth of at least 140 feet bgs depending on site conditions during drilling. The monitoring well borings will be advanced using air rotary drilling. No soil samples will be collected during borehole advancement. The proposed monitoring well locations are co-located with the sonic soil borings. The depth to bedrock will be known at each location prior to the advancement of the monitoring well borings. The proposed monitoring well locations are shown in Figures 2 and 3. Well locations are subject to Ecology approval.
- Potential installation of groundwater monitoring wells targeting a shallow or perched water bearing zone at the GHFF or surrounding areas. The installation depth of these wells is uncertain and will be based on the presence of a shallow or perched water-bearing zone during soil boring advancement discussed in Section 5.1.1. The driller will be equipped to install shallow wells as field conditions dictate. Well locations will be subject to Ecology approval.
- All monitoring wells will be completed as 2-inch Schedule 40 polyvinyl chloride (PVC) with at least 10 feet of 0.020 inch slotted well screen.
- Complete quarterly groundwater sampling at the newly installed groundwater monitoring wells (MW-1 to MW-6), and at water wells available to sample listed in Table 5-1, provided access

agreements can be obtained. Known water well locations are shown on Figure 4. Quarterly sampling will be conducted until the Final RI/FS report is approved by Ecology. Laboratory reports will be provided to Ecology's Project Manager within 60 days of each sampling event. Parcels with structures and potential water wells directly south of the GHFF and adjacent to the Freeman School District Campus are shown in Figure 5. UPRR will draft access agreements and contact property owners to request permission to access wells for sampling. If additional residential wells are discovered in the vicinity of the contamination they may also be sampled.

- Submit groundwater samples to a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method 8260B. Groundwater samples collected from the basalt monitoring wells and residential wells will be analyzed using a fixed lab. Groundwater samples collected from potential shallow monitoring wells will be analyzed using the onsite mobile laboratory.
- All monitoring well and soil boring locations will be surveyed following drilling. Existing residential wells proposed for sampling as listed in Table 5-1 will also be surveyed.
- Water levels will be measured in all available wells to determine the potentiometric surface of groundwater.

Procedures for monitoring well installation, well development, water level monitoring, and groundwater sample collection are provided in Appendix B of this RI/FS Work Plan (SAP).

Table 5-1. Water Wells Near the Grain Handling Facility
Remedial Investigation/Feasibility Study Work Plan

Well Number	Well Owner Name	Well Opening Depth (feet bgs)	Current Use
WS5	Freeman School District #358	52 - 215	Primary Drinking Water Well for the School
W20	Larry Marlow	64 - 100	Not in Operation
W26	Freeman School District (formerly Virg/Elsie Marlow)	44 - 140	Not in Operation
W30	Joel Reed	59 - 180	Active, Domestic
N/A	Freeman Store	Well log not found	Active, Domestic
N/A	Bryant and Charlene Silva (formerly Mick Stark)	28-180	Unknown
N/A	Duane Lashaw (formerly Robert Brandt)	44-220	Unknown
N/A	Scott and Priscilla Marlow	Unknown	Unknown
N/A	Mary Rote	Unknown	Unknown
N/A	Raymond Davey	Unknown	Unknown
N/A	Arlo and Lois Randall	Unknown	Unknown

5.2 Soil Vapor Sampling

Review of available data were used to conduct a preliminary vapor intrusion evaluation of the Freeman School District campus to determine if concentrations of detected VOCs have the potential to pose an unacceptable human health risk. Vapor intrusion is the mechanism by which vapors from a subsurface chemical source (e.g., groundwater or soil), travel upward through the pore space of the soil and into an overlying building or structure. These vapors can enter buildings in several ways such as cracks in building foundations, as well as through conduits and other openings in a building.

In order for vapor intrusion to be a potential or actual human health risk, the chemical transport pathway between the source and receptor (individuals inside the building) must be complete. The mere presence of a volatile chemical in groundwater or soil beneath a building does not constitute a completed pathway. Federal and state guidance documents have been developed to help facilitate assessment of the vapor intrusion pathway. This evaluation is conducted in a stepwise process, which includes preliminary screening of site data against default screening values, followed by a phased collection of samples from the site, if necessary. The following section presents the results of the preliminary screening performed for the Freeman School District campus.

5.2.1 Tier I Assessment – Comparison against Default Screening Levels

Ecology's vapor intrusion guidance was used to conduct a preliminary vapor intrusion screening evaluation (Ecology 2009). Ecology's guidance document sets forth a tiered framework, with the first tier including comparison of site data to default screening levels. The default screening levels are based on a combination of multiple conservative assumptions and exposure parameters, designed to be protective under worst-case (i.e., ideal) vapor transport and exposure scenarios. A comparison of the screening levels against the maximum detected carbon tetrachloride and chloroform concentrations measured in wells in the vicinity of the Freeman School District campus is provided in Table 5-2.

Table 5-2. Comparison of Maximum Groundwater Concentrations to Ecology's Default Vapor Intrusion Screening Levels
Remedial Investigation/Feasibility Study Work Plan

Ecology's Default Groundwater Screening Levels **Carbon Tetrachloride: 0.54 μg/L** **Chloroform: 1.2 μg/L**	**Maximum Carbon Tetrachloride Concentration Detected in Groundwater (μg/L)**	**Maximum Chloroform Concentration Detected in Groundwater (μg/L)**
Primary Freeman School District Well	22.0 (Exceeds)	1.28 (Exceeds)
Former Marlow Well (W26)	48.1 (Exceeds)	2.38 (Exceeds)
Former Residential Well (W20)	21.2 (Exceeds)	2.04 (Exceeds)

Notes: μg/L = micrograms per liter

Ecology's groundwater screening levels were exceeded in all three wells with detected carbon tetrachloride and chloroform. Due to the level of conservativism in Ecology's screening levels, which assume the most favorable conditions for vapor transport (i.e., equivalent to vapor transport through a porous sand), it is currently not known if a complete exposure pathway exists for vapor intrusion. Based on Ecology's guidance, the first phase of sampling should be focused on soil gas rather than indoor air. The design of the soil gas sampling investigation is key to providing the site-specific lines of evidence required to technically justify ruling out the vapor intrusion pathway. A total of 4 soil vapor sampling locations are proposed in close proximity to existing school buildings on the Freeman School District Campus (Figure 3). Temporary soil vapor probes will be installed at the four locations in shallow soil (approximately 5-10 feet bgs) and Summa canisters will be used to collect the vapor samples. Depending on the results of this initial soil vapor sampling in conjunction with the soil and groundwater investigation, additional evaluation, including utility corridors as a preferential pathway, of the vapor intrusion pathway may be completed during the Phase II remedial investigation. Sampling methods and standard operating procedures are presented in Appendix B.

5.3 Phase II Remedial Investigation

New data and information obtained from the Phase I RI activities will be used to develop the CSM. The CSM will subsequently be used to help identify any remaining data gaps and uncertainty associated with potential or actual source(s) of carbon tetrachloride and chloroform on the GHFF and surrounding areas, and potential migration and exposure pathways between the GHFF and possible receptors.

During the soil investigation discussed in Section 5.1.1, CH2M will review actions that may reduce time in the field with the goal of collecting sufficient data to develop the CSM. These actions include:

- Using a local accredited laboratory or mobile laboratory approved by UPRR that could provide 24-hour turn-around time (TAT) on VOC analysis.
- Adaptively managing the proposed soil investigation using the 24-hour TAT to strategically locate and advance soil borings and characterize the extent of contamination more efficiently. If soil concentrations exceed Ecology screening for carbon tetrachloride and chloroform, this may allow ‘stepping-out’ from original boring locations and advancing additional soil borings to fully characterize nature and extent of site VOCs.

This work plan currently proposes six monitoring wells be completed at the GHFF, UPRR ROW, and the Freeman School District Campus. These wells will be sampled following well development and an equilibration period of at least 24 hours. Based on analytical results additional monitoring wells may need to be installed to fully characterize the extent of groundwater impacts from carbon tetrachloride and chloroform. Although the exact location of additional monitoring wells will not be known until analytical and gradient data are reviewed, proposed wells may include the following scenarios:

- If groundwater is impacted with site VOCs at MW-6, an additional well will be installed toward Little Cottonwood Creek, depending on the groundwater gradient and site access.
- If groundwater is impacted with site VOCs at MW-5, an additional monitoring well will be installed due west (depending on groundwater gradient) near the property boundary of the Freeman School District Campus and the Jeffery Emtman parcel.
- Depending on groundwater quality data collected from MW-1, MW-2, and MW-3 and the calculated groundwater gradient an additional well will be installed along the gravel road, north of the Mutual Materials site.

Following completion of the Phase I investigation, if additional field work is warranted, in lieu of submitting an new work plan, that a brief memorandum explaining rationale for additional field work and figure with proposed locations of additional monitoring wells and additional evaluation of the vapor intrusion pathway be submitted to Ecology for review and approval. This process will reduce administrative time and allow for additional data collection to fill possible data gaps and fully characterize nature and extent of VOCs in soil and groundwater in a timely manner.

SECTION 6

Feasibility Study

The RI/FS will develop preliminary cleanup standards for the Site and evaluate hazardous substances in soil and groundwater by comparing analytical results from soil and groundwater analyses to appropriate site-specific cleanup levels. Soil and groundwater cleanup criteria will be developed and used in accordance with Model Toxics Control Act (MTCA). If the RI analytical testing data do not exceed cleanup levels, the FS will be limited to establishment of cleanup levels and points of compliance. If the RI soil or groundwater data exceed cleanup levels, then the FS will develop and evaluate cleanup action alternatives for contaminated media so that cleanup actions may be selected. The following sections provide the details of the FS process that will be completed for the Site.

6.1 Developing Remedial Action Objectives

Remedial action objectives (RAOs) define the goals of the cleanup that must be achieved to adequately protect human health and the environment will be developed for each medium and area identified as requiring remedial action. These RAOs will be action-specific or media specific. Action-specific RAOs are based on actions required for environmental protection that are not intended to achieve a specific chemical criterion. Media-specific RAOs are based on developed cleanup levels. The RAOs will specify the contaminants of concern, the potential exposure pathways and receptors, and acceptable contaminant levels or range of levels for each exposure pathway, as appropriate.

6.2 Applicable or Relevant and Appropriate Requirements

Review of applicable or relevant and appropriate requirements (ARARs) will be conducted to meet Washington Administrative Code (WAC) 173-340-710, which requires that cleanup actions conducted under MTCA comply with applicable state and federal laws. Applicable state and federal laws are defined in WAC 173-340-710(1) as those requirements that are legally applicable and considered relevant and appropriate.

MTCA requires that the RI/FS for a site on the National Priorities List shall comply with federal regulations (WAC 173-340-700[6][a]). MTCA requires that the cleanup standards be “at least as stringent as all applicable state and federal laws.” Besides establishing minimum requirements for cleanup standards, applicable state and federal laws may also impose certain technical and procedural requirements for performing cleanup actions. These requirements are described in WAC 173-340-710. The FS will identify ARARs that are applicable to the Site.

6.3 Development of Cleanup Alternatives

Potential remediation technologies will be identified for meeting RAOs for each medium. Remediation technologies consist of specific remedial action technologies and process options. The technologies will be considered and evaluated based on the media type and the properties of any contaminant(s). These may include no action, institutional controls, containment or other engineering controls, removal, in situ treatment, and natural attenuation.

Specific remedial action technologies may be identified for each general remediation technology and multiple process options may exist within each specific technology. Specific remedial action technologies and representative process options will be selected for evaluation based on documented development or documented successful use for the particular medium and contaminant of potential concern (COPC). Cleanup alternatives will be developed from the general and specific remedial technologies and process options consistent with Ecology expectations identified in WAC 173-340-370 using best professional judgment and guidance documents as appropriate.

The purpose of this phase of the FS will be to combine identified remedial technologies into cleanup action alternatives that are specific to the site's contaminants, potential contaminant transport pathways, and receptors. Alternatives will be based on the general response actions developed during FS scoping and will incorporate the remedial technologies identified in the previous phase. Alternatives will be developed to comply with MTCA and ARARs, and to provide protection to human health and the environment. Other factors specified in WAC 173-340-360, such as permanence of the cleanup action, restoration timeframe, and public concerns will also be considered in developing cleanup alternatives for the Site.

6.4 Evaluation of Cleanup Alternatives

MTCA requires that cleanup alternatives be compared to a number of criteria as set forth in WAC 173-340-360 to evaluate the adequacy of each alternative in achieving the intent of the regulations, and as a basis for comparing the relative merits of the developed cleanup alternatives. Consistent with MTCA, the alternatives will be evaluated with respect to compliance with the following requirements: protectiveness, permanence, cost, effectiveness over the long term, management of short-term risks, technical and administrative implementability, and consideration of public concerns. The results of the evaluation will be documented in the RI/FS report.

SECTION 7

Schedule and Reporting

The Enforcement Order establishes the RI/FS schedule and reporting requirements. The schedule for specific project milestones is provided in Table 7-1. If at any time unanticipated conditions or changed circumstances are discovered that might result in a schedule delay during the RI/FS process, UPRR will bring such information to the attention of Ecology. Any requests for a schedule extension will be undertaken as required by the Enforcement Order.

Table 7-1. Remedial Investigation/Feasibility Study Schedule
Remedial Investigation/Feasibility Study Work Plan

Deliverable	**Date Due**
Draft RI/FS Work Plan, SAP, Health and Safety Plan (HSP), and Schedule	January 12, 2016*
Revised RI/FS Work Plan, SAP, HSP, and Schedule	30 days after receipt of Ecology's comments on the draft documents
Final RI/FS Work Plan, SAP, HSP, and Schedule	14 days after receipt of Ecology's written approval of the Revised RI/FS Work Plan
Begin implementation of RI	30 days after receipt of Ecology's written approval of the Revised RI/FS Work Plan
Agency review Draft RI/FS Report	12 months after receipt of Ecology's written approval of the Revised RI/FS Work Plan
Revised, public review Draft RI/FS Report	30 days after receipt of Ecology's comments on the Draft RI/FS Report
Final RI/FS Report	30 days after receipt of Ecology's written approval of the revised draft RI/FS Report
Progress Reports	Every 3 months

Note:

* The effective date of the Enforcement Order is November 12, 2015. UPRR was granted a 30-day extension for the RI/FS Work Plan deliverable, in accordance with the Enforcement Order.

References

Ecology and Environment, Inc. (E&E). 2013. *Freeman Groundwater Contamination, Freeman, Washington, Preliminary Assessment*. April.

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GeoEngineers, Inc. 2013. *Feasibility Evaluation, Production Well Evaluation – Carbon Tetrachloride Contamination, Freeman School District, Freeman, Washington*. March 14.

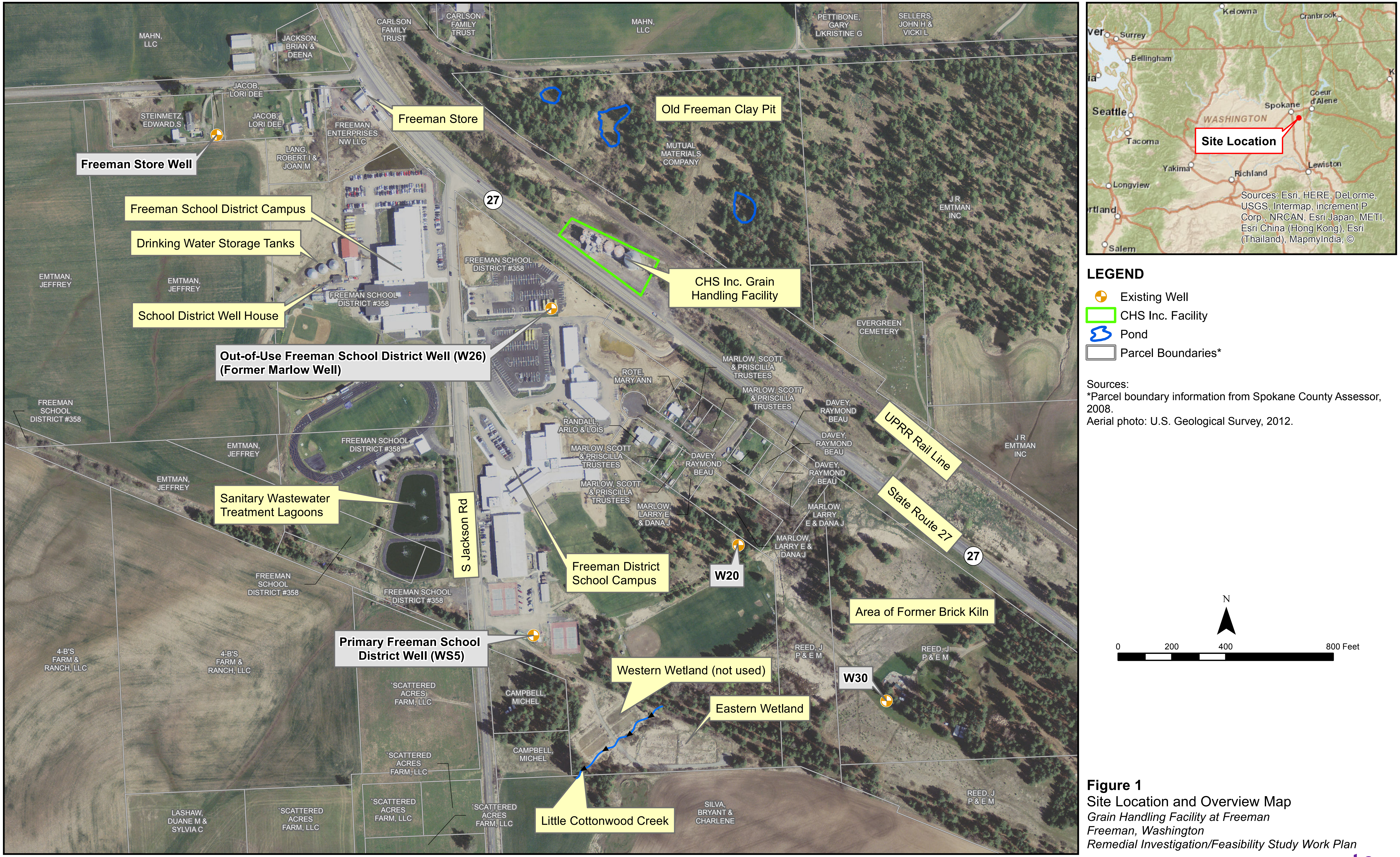
Leinart, P. 2012. *Freeman School Wells, Contaminated Groundwater Status Report Washington State Department of Ecology, Toxics Cleanup Program, Eastern Regional Office*. August 16.

O'Garro, Lendford, May 2008. Washington State Department of Health, Environmental Health Division, Office of Environmental Health Assessments, Site Assessment Section, *Technical Assistance Consultations, Freeman School District TA*.

United States Geological Survey (USGS). 1999. *Summary for the Columbia Plateau Regional Aquifer-System Analysis, Washington, Oregon, and Idaho*. U.S. Geological Survey Professional Paper 1413-A.

Washington State Department of Ecology (Ecology). 2015. Enforcement Order DE 12863. November 12, 2015.

Figures

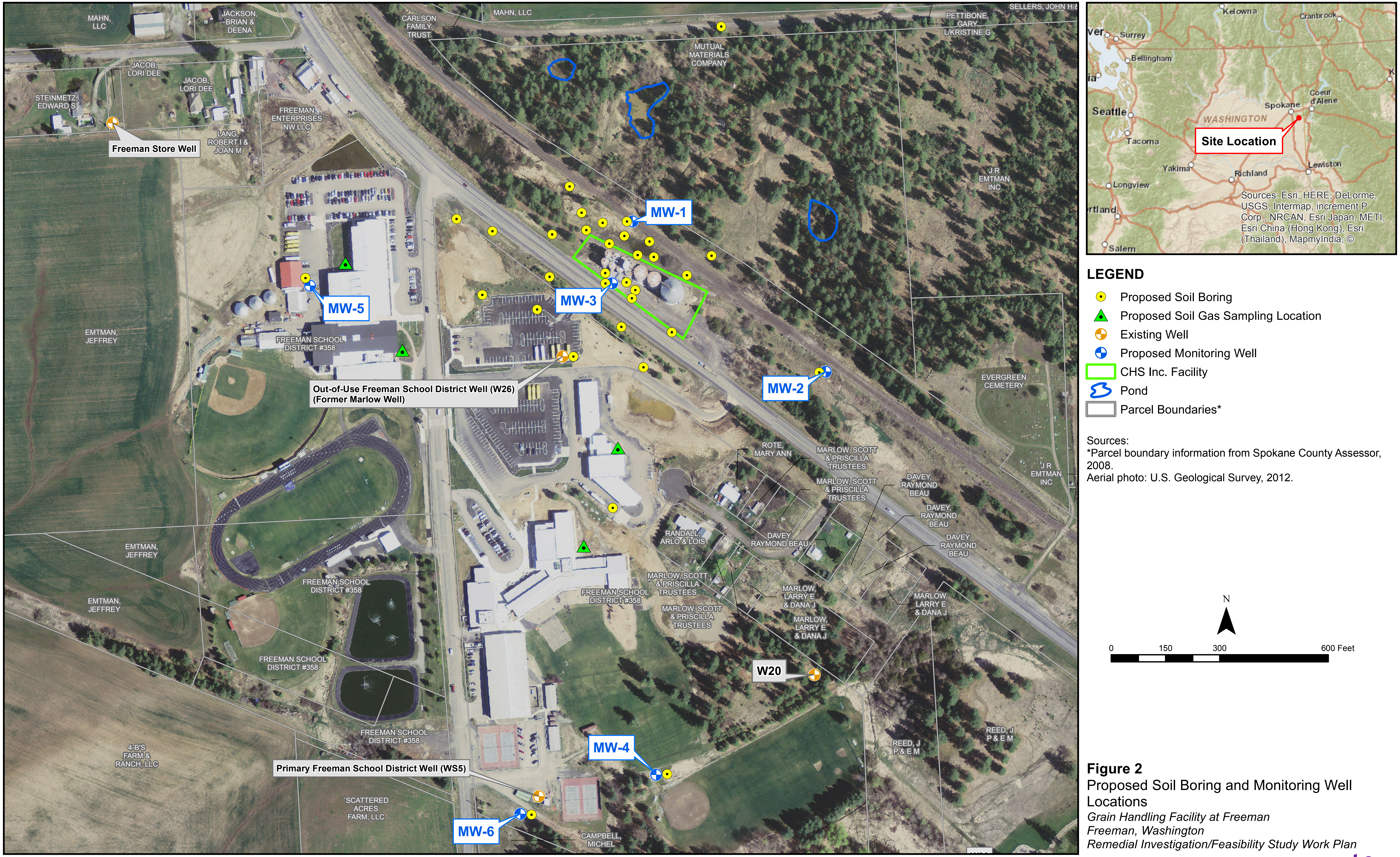


LEGEND

●	Existing Well
🟩	CHS Inc. Facility
○	Pond
▭	Parcel Boundaries*

Sources:
*Parcel boundary information from Spokane County Assessor, 2008.
Aerial photo: U.S. Geological Survey, 2012.

Figure 1
Site Location and Overview Map
Grain Handling Facility at Freeman
Freeman, Washington
Remedial Investigation/Feasibility Study Work Plan



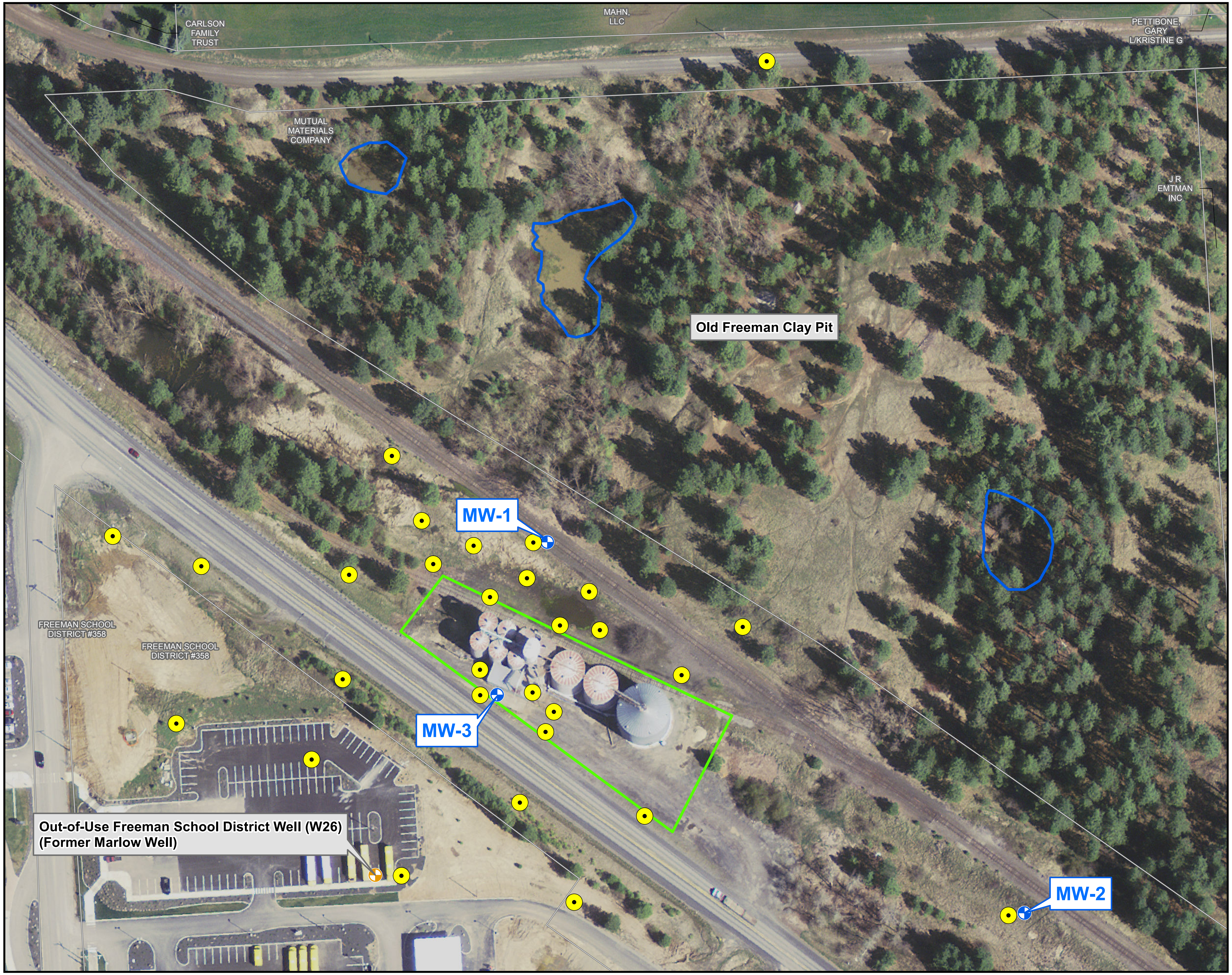
LEGEND

- ● Proposed Soil Boring
- ▲ Proposed Soil Gas Sampling Location
- ◐ Existing Well
- ◐ Proposed Monitoring Well
- 🟩 CHS Inc. Facility
- ○ Pond
- ☐ Parcel Boundaries*

Sources:
*Parcel boundary information from Spokane County Assessor, 2008.
Aerial photo: U.S. Geological Survey, 2012.

Figure 2
Proposed Soil Boring and Monitoring Well Locations
Grain Handling Facility at Freeman
Freeman, Washington
Remedial Investigation/Feasibility Study Work Plan

C:\USERS\GGEE\DOCUMENTS\GIS\UPRR FREEMAN\MAPFILES\FIGURE2_PROPOSEDSOILBORINGS.MXD GGEE 3/8/2016 3:14:45 PM



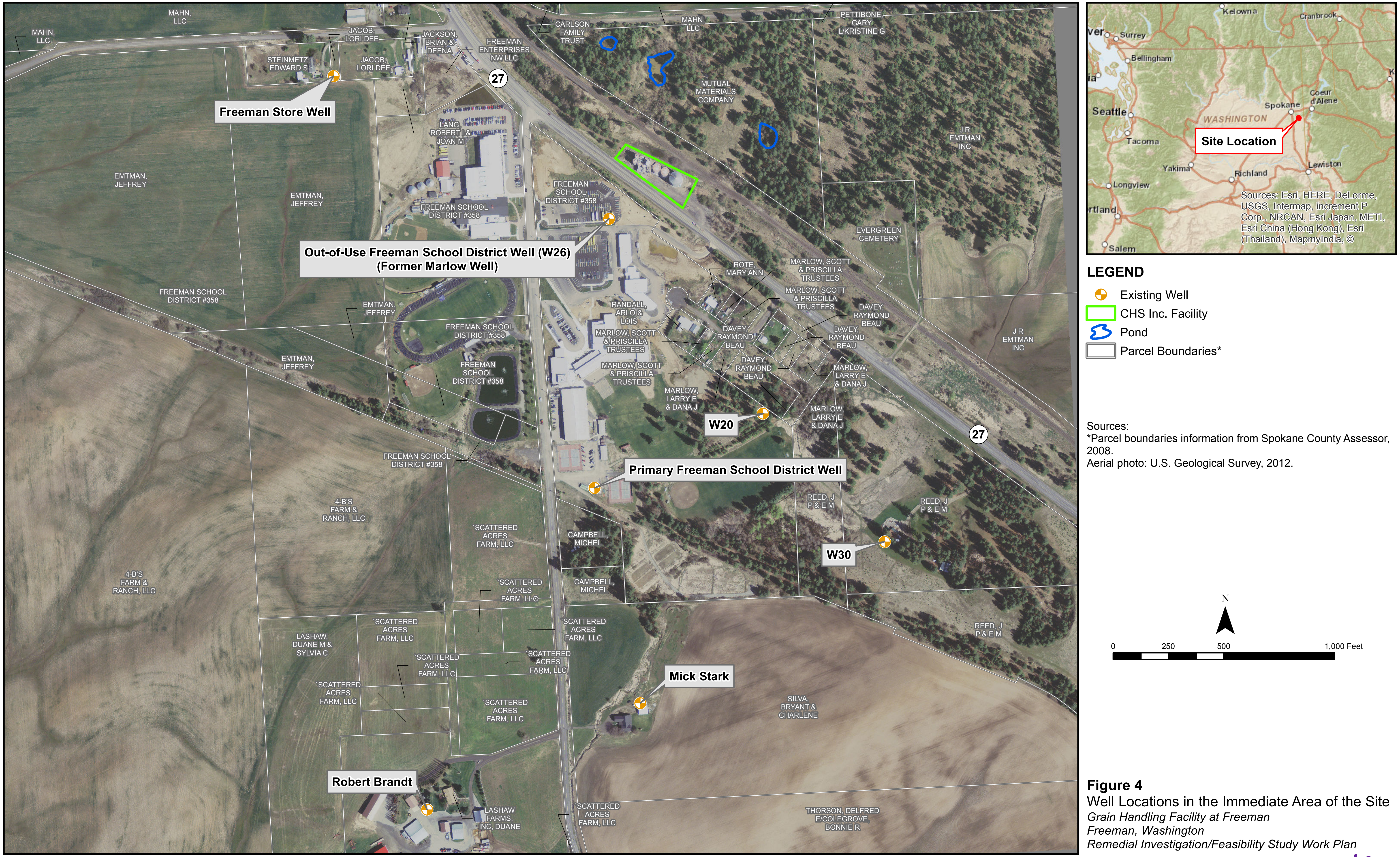
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, ©

LEGEND

●	Proposed Soil Boring
▲	Proposed Soil Gas Sampling Location
●	Existing Well
●	Proposed Location of Monitoring Wells
🟩	CHS Inc. Facility
○	Pond
▭	Parcel Boundaries*

Sources:
*Parcel boundary information from Spokane County Assessor, 2008.
Aerial photo: U.S. Geological Survey, 2012.

Figure 3
Proposed Soil Borings and Monitoring Well Locations Near the Grain Handling Facility
Grain Handling Facility at Freeman
Freeman, Washington
Remedial Investigation/Feasibility Study Work Plan



LEGEND

- ● Existing Well
- 🟩 CHS Inc. Facility
- ◯ Pond
- ☐ Parcel Boundaries*

Sources:
*Parcel boundaries information from Spokane County Assessor, 2008.
Aerial photo: U.S. Geological Survey, 2012.

Figure 4
Well Locations in the Immediate Area of the Site
Grain Handling Facility at Freeman
Freeman, Washington
Remedial Investigation/Feasibility Study Work Plan

C:\USERS\GGEE\DOCUMENTS\GIS\UPRR FREEMAN\MAPFILES\FIGURE4_PROPERTYOWNERSHIP.MXD GGEE 3/3/2016 12:24:26 PM

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, ©

LEGEND

▭ Parcel Boundaries*

Sources:
*Parcel boundaries information from Spokane County Assessor, 2008.
Aerial photo: U.S. Geological Survey, 2012.

Figure 5
Ownership and Parcel Identification
Grain Handling Facility at Freeman
Freeman, Washington
Remedial Investigation/Feasibility Study Work Plan

C:\USERS\GGEE\DOCUMENTS\GIS\UPRR FREEMAN\MAPFILES\FIGURE5_PARCELNUMBERS.MXD GGEE 3/3/2016 12:25:26 PM

Appendix A
Boring Logs from Domestic Wells

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

WS1

STATE OF WASHINGTON

Application No. ....

Permit No. ....

(1) OWNER: Name FREEMAN SCHOOL DISTRICT #358 Address Freeman, Washington 99015

(2) LOCATION OF WELL: County Spokane — SW ¼ NW ¼ Sec. 1 T. 23 N., R. 44E W.M.

earing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐
School District Irrigation ☐ Test Well ☐ Other ☒

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 375 ft. Depth of completed well 375 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1 ft. to 62 ft.
Threaded ☐ ...." Diam. from .... ft. to .... ft.
Welded ☒ ...." Diam. from .... ft. to .... ft.

Perforations: Yes ☐ No ☒
Type of perforator used..........
SIZE of perforations .... in. by .... in.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name..........
Type.......... Model No..........
Diam. .... Slot size .... from .... ft. to .... ft.
Diam. .... Slot size .... from .... ft. to .... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ....
Gravel placed from .... ft. to .... ft.

Surface seal: Yes ☒ No ☐ To what depth? 62 ft.
Material used in seal Bentinite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water?.......... Depth of strata..........
Method of sealing strata off..........

(7) PUMP: Manufacturer's Name..........
Type: .... H.P. ....

(8) WATER LEVELS: Land-surface elevation above mean sea level... 2560 ft.
Static level 43 ft. below top of well Date 10/15/73
Artesian pressure .... lbs. per square inch Date..........
Artesian water is controlled by.......... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a ~~pump~~ air test made? Yes ☒ No ☐ If yes, by whom? Driller
Yield: 10 gal./min. with 132 ft. drawdown after 1 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
iler test.......... gal./min. with .... ft. drawdown after .... hrs.
Artesian flow.......... g.p.m. Date..........
Temperature of water.......... Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top soil, brown, silty	0'	2'
Clay, tan, hard	2'	14'
Clay, moist, tan	14'	23'
Quartz, heav fract	23'	27'
Basalt, decom, brown & green-black lay	27'	29'
Basalt, decom, mined w/gray clay, moist	29'	39'
Basalt, heav fract, brown, fairly hrd	39'	44'
Basalt, fract, brown-black, med hrd	44'	48'
Basalt, fract, blck, m hrd, water 2GPM	48'	55'
Basalt, heav fract, black, soft	55'	59'
Basalt, occas fract, gray-blck, hard	59'	98'
Basalt, fract, black, med hrd	98'	111'
Shale, tan & green, firm	111'	123'
Shale, olive green, firm	123'	125'
Basalt, brown, fairly hard	125'	137'
Clay, brown, firm	137'	168'
Basalt, fract, blck, m hrd, water 3GPM	168'	180
Basalt, occas fract, blck, hard	180'	188'
Basalt, heav fract, brn, m hrd, Wat. 5GPM	188'	194
Shale, brown, firm	194'	201'
Clay, moist, rusty brown	201'	212'
Clay, moist, white	211'	214'
Clay, moist, brown	214'	218'
Clay, moist, dark gray	218'	223'
Clay, moist, brown	223'	234'
Clay, moist, redish-orange	234'	241'
Clay, moist, tan	241'	259'
Quartz, purple & white, soft	259'	263'
Granite, heav fract, med hrd	263'	270'
Granite, occas fract, med hrd	270'	286'
Granite, heav fract, heavily white quartz content, med hard	286'	328'
Clay, moist, white, w/small layers of white quartz sand	328'	343'
Quartz, fract, white, w/mica flakes, med hard	343'	348
Quartz, purple & white, hard	348'	375'

Work started Oct 10, 1973 Completed Oct 15, 1973

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME ZINKGRAF WELL DRILLING COMPANY
(Person, firm, or corporation) (Type or print)

Address E. 1606 Sharp, Spokane, Wash. 99202

[Signed] James J. Zinkgraf
(Well Driller)

License No. 544 Date Oct. 17, 1973

10/23/73

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

WS4

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT No Record

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name FREEMAN SCHOOL Address FREEMAN WA.

(2) LOCATION OF WELL: County SPOKANE – – NE ¼ NE ¼ Sec. 3 T. [illegible] N., R. 44 W.M.

ing and distance from section or subdivision corner 4 Mi S. JACKSON + STOUGHTON RDS. 23

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☒ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 256 ft. Depth of completed well 256 ft.

(6) CONSTRUCTION DETAILS: 24" ADDED TO TOP
Casing installed: 6 " Diam. from ft. to ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☑
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☑
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☑ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☐ No ☐ ? To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level 2550 ft.
Static level 66 ft. below top of well Date 9-17-73
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test 12 gal./min. with 110 ft. drawdown after 3 hrs.
Artesian flow g.p.m. Date
Temperature of water 48 Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Cleaned granit sand that apeared to be decomposed granit that had fallen apart the yellow discoloration of water with large white cristals - Soft.	127	253

Work started , 19 Completed , 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME ACME DRILLING Co (Person, firm, or corporation) (Type or print)

Address Box 765 Rt3 Spokane Wa

[Signed] Anil A. Benander (Well Driller)

License No. 223-52-6400 Date 8-20, 1973

-033-

9/5/73

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

Production well
WS5

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. ....

(1) OWNER: Name Freeman School Dist. # 358 Address Freeman, Washington 99015

(2) LOCATION OF WELL: County Spokane — SW ¼ NW ¼ Sec. 1 T. ~~24~~ N., R. ~~44E~~ W.M.
Bearing and distance from section or subdivision corner ½ mile south of Hiway 27 on Jackson Rd 23 ~~45~~ 44

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☒

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 215 ft. Depth of completed well 215 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 52 ft.
Threaded ☐ ....." Diam. from ..... ft. to ..... ft.
Welded ☒ ....." Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☒
Type of perforator used ....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☒ No ☐ To what depth? 52 ft.
Material used in seal bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 2425 ft.
Static level ..... ft. below top of well Date 6-30-80
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? .....
Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
~~Bailer~~ AIR test 50 gal./min. with ..... ft. drawdown after 3 hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water 49 Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
overburden	0	5
clay brown, yellow white black	5	51
grey basalt med hard	51	105
blue basalt hard	105	175
grey basalt	175	180
basalt shattered pillow lava	180	195
quartzite gravel (water bearing)	195	197
decomposed granite	197	215

RECEIVED
JAN 15 1981
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started June 26, 19 80 Completed June 30, 19 80

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Acme Drilling Co. Inc. (Person, firm, or corporation) (Type or print)

Address Rt. 1 Box 185 Deer Park, Wn. 99006

[Signed] Ron S. Kennedy (Well Driller)

License No. 0712 Date June 30, 19 80

1/15/81

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

Well Tagging Form

Unique Well Tag No: AHC 757

RECORD VERIFICATION (check✓ one)

☐ Well Report available *(please attach this form to the well report and submit it to the Ecology Regional Office near you)*
☐ Verification inconclusive PWS ID 26460 SOURCE 05
☐ Well Report not available

WELL OWNERSHIP, IF DIFFERENT FROM WELL REPORT

First Name: FREEMAN SCHOOL Last Name:

Street Address: DIST 358

City: State:

LOCATION OF WELL, IF DIFFERENT FROM WELL REPORT

Well Address:

City: County: SPOKANE

T._____ N. R._____ _____ W.M. Sec._____ _____ 1/4 of the _____

FOR AGENCY USE ONLY

Latitude 47° 30 ' 57.486 "
Longitude 117° 11 ' 41.085 "

☒ GPS
☐ Topographic Map
☐ Survey
☐ Computer generated

Elevation at land surface _____ feet/meters *(circle one)*

☐ Digital Altimeter
☐ Topographic Map
☐ Other_____

Additional information, if available:

☐ Location marked on topographic map *(please attach)*

☐ Location marked on air photo *(please attach)*

FOR AGENCY USE ONLY

WELL CHARACTERISTICS

Physical Description of well (size of casing, type of well, housing, etc.)

SUBMERSIBLE OUTSIDE IN FENCED AREA

Location of Well identification Tag:

ON WELL CAP BOLT

Was supplemental tag needed for ease of identifying well? ☐ Yes ☐ No

If yes, where was tag placed? ____________________

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

Scale 1:24,000 (1"=2,000')

Indicate the location of the well within the Section by drawing a dot at that point.

SECTION ________________

COMMENTS:

FOR ECOLOGY WATER RESOURCES PROGRAM ONLY

Water Right # ________________ Date Issued ________________

Circle One: Application Permit Certificate Claim Exempt

W02

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....

Permit No. ....

(1) OWNER: Name John G. Welton Address Rt. # 1 Box 114 Valleyford, Washington

(2) LOCATION OF WELL: County Spokane — SW ¼ SW ¼ Sec 35 T. 24 N., R. 44E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....

New well ☒ Method: Dug ☐ Bored ☐

Deepened ☐ Cable ☐ Driven ☐

Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.

Drilled 103 ft. Depth of completed well 103 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1 ft. to 44 ft.

Threaded ☐ ......" Diam. from ...... ft. to ...... ft.

Welded ☒ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☒ No ☐ P.V.C. Pipe

Type of perforator used saw

SIZE of perforations 1/4 in. by 6 in.

80 perforations from 50 ft. to 103 ft.

...... perforations from ...... ft. to ...... ft.

...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☒

Manufacturer's Name ......

Type ...... Model No. ......

Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ......

Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.

Material used in seal bentonite

Did any strata contain unusable water? Yes ☐ No ☐

Type of water? ...... Depth of strata ......

Method of sealing strata off ......

(7) PUMP: Manufacturer's Name ......

Type: ...... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level... 2512 ft.

Static level 25' ft. below top of well Date ......

Artesian pressure ...... lbs. per square inch Date ......

Artesian water is controlled by ...... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☐ If yes, by whom? ......

Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.

" ...... " ...... " ...... "

" ...... " ...... " ...... "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ......

Bailer test 12 gal./min. with ...... ft. drawdown after ...... hrs.

Artesian flow ...... g.p.m. Date ......

Temperature of water cold Was a chemical analysis made? Yes ☐ No ☒

7/17/80

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
clay hard basalt	0	25
gray clay firm	25	30
broken basalt with layers of clay	30	42
porous basalt	42	50
Porous basalt water	50	66
firm basalt water	66	103
seep at 30 to 42		
water at 50 to 103		

RECEIVED
JUL 17 1980
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 6/10/ 1980 Completed 6/11/ 1980

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME American Drilling & Development Inc. (Person, firm, or corporation) (Type or print)

Address P.O. Box 14977 Spokane, Washington

[Signed] ...... (Well Driller)

License No. 0688 Date 7/15/ 1980

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

W03

82616

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W061763
UNIQUE WELL I.D. # ACT247
Water Right Permit No.

OWNER: Name DENNY MYERS Address E 13116 STOUGHTON RD, VALLEY FORD, WA 99036

(2) **LOCATION OF WELL:** County SPOKANE - NW 1/4 NW 1/4 Sec 02 T. 23N N., R 44E W.M.

(2a) **STREET ADDRESS OF WELL** (or nearest address)

(3) **PROPOSED USE:** ☒ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (If more than one)
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 180 feet. Depth of completed well 180 ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 6" Diam. from +2 ft. to 51 ft.
Welded ☒ 4" Diam. from -40 ft. to 180 ft.
Liner installed ☒
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name
Type PVC Model No.
Diam. 4 Slot size .20 from 140 ft. to 180 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? -40 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 40 ft. below top of well Date 12/7/00
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 30 gal./min. with stem set at 175 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
TOPSOIL	0	1
BROWN CLAY	1	35
BASALT WITH CLAY	35	40
BASALT - BROKEN - BLACK	40	45
BASALT - BLACK - MEDIUM	45	51
BASALT - BLACK - HARD	51	90
BASALT - BLACK - SOFT - BROKEN	90	125
CLAY - BLACK - HARD PAN	125	155
BASALT - BLACK - SOFT	155	175
CLAY - BROWN - SOFT	175	180

RECEIVED
DEC 11 2000
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 12-6-00, 19. Completed 12-7-00, 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME UNITED DRILLING INC (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address PO BOX 1690, HAYDEN ID 83835
(Signed) (WELL DRILLER) License No. 2364
Contractor's Registration No. UNITEDI137Q3 Date 12/7/00, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93) * * f

W06

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No.

Permit No

(1) OWNER: Name Mrs John O'Neill Address 34 Lynnbrook Dr. Eugene Ore.

LOCATION OF WELL: County Spokane NW ¼ NE ¼ Sec. 2 T. 23 N., R. 44 E W.M.

..ng and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)....

New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 260 ft. Depth of completed well 260 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from +1 ft. to 210 ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☐ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations ...... in. by ...... in.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type ...... Model No.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 18+ ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ...... Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: ...... H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level 2550 ft.
Static level 125 ft. below top of well Date 11-16-79
Artesian pressure ...... lbs. per square inch Date
Artesian water is controlled by ...... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
Air Test Approx 12 GPM "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test ...... gal./min. with ...... ft. drawdown after ...... hrs.
Artesian flow ...... g.p.m. Date
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top Soil	0	2
Brown Clay (Hard)	2	81
Yellow " (")	81	89
Pink Clay (")	89	111
Fractured Granite	111	260

RECEIVED
FEB 28 1980
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 11-13, 1979 Completed 11-16, 1979

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME J & J Drilling Inc. (Person, firm, or corporation) (Type or print)
Address 5613 S Linke Rd Greenacres Wa
[Signed] Gerald R Johnson (Well Driller)
License No. 0215 Date 11-18, 1979

2/29/80 (USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

W07

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No

Permit No.

(1) OWNER: Name Bill Hobbs Address S. 501 Howe Spokane

LOCATION OF WELL: County Spokane — SE ¼ NE ¼ Sec. 35 T. 24 N., R. 44 E W.M.

g and distance from section or subdivision corner Just W. of Fancher Rd on 37th

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)

New well ☒ Method: Dug ☐ Bored ☐

Deepened ☐ Cable ☐ Driven ☐

Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.

Drilled 155 ft. Depth of completed well 195 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from 0 ft. to 60 ft.

Threaded ☐ " Diam. from ft. to ft.

Welded ☒ 4 " Diam. from 5 ft. to 120 ft.

Perforations: Yes ☐ No ☒

Type of perforator used

SIZE of perforations in. by in.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

Screens: Yes ☐ No ☒

Manufacturer's Name

Type Model No.

Diam. Slot size from ft. to ft.

Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:

Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.

Material used in seal Bentonite

Did any strata contain unusable water? Yes ☐ No ☒

Type of water? Depth of strata

Method of sealing strata off

(7) PUMP: Manufacturer's Name

Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level... 2600 ft.

Static level 52 ft. below top of well Date 4-10-83

Artesian pressure lbs. per square inch Date

Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☐ If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.

" " " "

" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
Air Lift		50 gpm			

ate of test

Bailer test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m. Date

Temperature of water 49° Was a chemical analysis made? Yes ☐ No ☒

9/28/83

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Overburden	0	3
Sandy Clay	3	12
Sand + Gravel	12	17
Decomposed granite	17	59
Shattered Hard granite	59	195

RECEIVED
SEP 29 1983
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 4-5 , 1983. Completed 4-8 , 1983

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Acme Drilling Co. Inc
(Person, firm, or corporation) (Type or print)

Address Rt 1 Box 185 Deer Park

[Signed] Ron S Kennedy
(Well Driller)

License No. 0712 Date 4-15 , 1983

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

W10

File Original and First Copy with
Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No.

Water Right Permit No.

(1) **OWNER:** Name Robert BrandT Address S-6220 Ben Burr Rd Spok WA.

(2) **LOCATION OF WELL:** County Spokan - NE ¼ SE ¼ Sec 2 T 23 N., R 44 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) Elder Rd & Jackson Rd. Freeman WA.

(3) **PROPOSED USE:** ☑ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one)
Abandoned ☐ New well ☑ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☑ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 220 feet. Depth of completed well 220 ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 6" Diam. from +1 ft. to 44 ft.
Welded ☑ " Diam. from ft. to ft.
Liner installed ☑
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☑
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☑
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☑ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☑ No ☐ To what depth? 18+ ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name —
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 70 ft. below top of well Date 8-18-89
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.))

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☑ If yes, by whom? —
Yield: gal./min. with ft. drawdown after hrs.
" " " "
Air Test " 20 GPM "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Top Soil	0	2
Clay Brown - Hard	2	35
Basalt - Highly Fractured	35	40
" Hard	40	110
" Fractured w/Brn clay	110	160
" Med.	160	166
" Fractured	166	169
" Hard	169	170
" ~~Med.~~ Fractured	170	185
" Med.	185	187
" Fractured	187	196
" Hard	196	220

RECEIVED
SEP 15 1989

Work started 8-17 89. Completed 8-18-, 1989

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME J&J Drilling Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 5613 S Linke Rd Freeman WA. 82.
(Signed) Don Anderson (WELL DRILLER) License No. 1447
Contractor's Registration No. JJDRII-177K4 Date 8-23, 1989

(USE ADDITIONAL SHEETS IF NECESSARY)

W11

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. ....

(1) OWNER: Name DWAYNE LASHAW Address RT. 1 BOX 121 VALLEYFORD WA 99036

(2) LOCATION OF WELL: County SPOKANE — SE¼ SE¼ Sec 2 T 23 N., R 44 W.M.
Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 200 ft. Depth of completed well 200 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1 ft. to 59 ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☒ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☐ No ☒
Type of perforator used..........
SIZE of perforations ...... in. by ...... in.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name..........
Type.......... Model No..........
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ....
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 20+ ft.
Material used in seal BENTONITE
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ...... Depth of strata ......
Method of sealing strata off..........

(7) PUMP: Manufacturer's Name..........
Type: .... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level.... ft.
Static level 95 ft. below top of well Date ......
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by.......... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?..........
Yield: gal./min. with ft. drawdown after hrs.
APPROX. 120+ GPM BY AIR LIFT "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test...... gal./min. with...... ft. drawdown after...... hrs.
Artesian flow...... g.p.m. Date ......
Temperature of water...... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
TOPSOIL	0	1
LT. BRN. CLAY - HARD	1	12
SAND & GRAVEL	12	15
TAN CLAY - FIRM	15	22
GRAY CLAY - FIRM	22	38
BASALT - VERY HARD w/FRACTS WATER	38	135
BASALT - HARD w/FRACTS. - WATER	135	155
BASALT - FRACT - CLAY BINDER - WATER	155	168
BASALT - FRACT - CINDERS - CLAY BINDER - WATER	168	200
WELL IS LINED w/4" PVC		

RECEIVED
AUG 31 1987
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 8/27 1987 Completed 8/28 1987

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME J & J DRILLING, INC.
(Person, firm, or corporation) (Type or print)

Address S. 5613 LINKE RD. GREENACRES WA.

[Signed]
(Well Driller)

License No. 1278 Date 8/30 1987

8/31/87

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

3

W12

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name SCOTT GEIER Address E. 15602 SPRAGUE SPACE 19, SPOKANE WA.

(2) LOCATION OF WELL: County SPOKANE — NW ¼ SW ¼ Sec. 36 T. 24 N., R. 44 W.M.

g and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)

New well ☒ Deepened ☐ Reconditioned ☐

Method: Dug ☐ Bored ☐ Cable ☐ Driven ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.

Drilled 180 ft. Depth of completed well 180 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1 ft. to 39 ft.

Threaded ☐ " Diam. from ft. to ft.

Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒

Type of perforator used

SIZE of perforations in. by in.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

Screens: Yes ☐ No ☒

Manufacturer's Name

Type Model No.

Diam. Slot size from ft. to ft.

Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:

Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.

Material used in seal BENTONITE

Did any strata contain unusable water? Yes ☐ No ☒

Type of water? Depth of strata

Method of sealing strata off

(7) PUMP: Manufacturer's Name

Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.

Static level 15 ft. below top of well Date

Artesian pressure lbs. per square inch Date

Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☐ If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.

APPROX. 5 GPM BY AIRTEST "

" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

ate of test

Bailer test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? Yes ☐ No ☐

9/15/86

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
TOPSOIL	0	2
WHITE CLAY-FIRM	2	5
BRN. CLAY-FIRM TO HARD	5	18
BASALT-FRACT.	18	19
BASALT-MED. W/FRACTS.	19	55
BASALT-HARD W/FRACTS.-WATER	55	95
BRN. CLAY-HARD	95	150
DK. BRN. CLAY-HARD	150	170
LT. BRN. CLAY-GRITTY-FIRM	170	180

RECEIVED
SEP 15 1986
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 8/26 1986 Completed 8/29 1986

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME S & J DRILLING, INC. (Person, firm, or corporation) (Type or print)

Address S. 15613 LINKE RD., GREENACRES WA.

[Signed] (Well Driller)

License No. 1278 Date 9/8, 1986

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

W15

File Original with
Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W121466

UNIQUE WELL I.D. # ACY-030

Water Right Permit No. ______

(1) **OWNER:** Name Mick Stark Address 14909 S Valley Chapel Rd. Valleyford 99

(2) **LOCATION OF WELL:** County Spokane NW 1/4 SW 1/4 Sec 01 T 23N N.R. 44E WM

(2a) **STREET ADDRESS OF WELL:** (or nearest address) Corner of Jackson & Elder Rd.

TAX PARCEL NO.: ______

(3) **PROPOSED USE:** ☒ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) **TYPE OF WORK:** Owner's number of well (if more than one) 1

☒ New Well ☐ Deepened ☐ Reconditioned ☐ Decommission

Method: ☐ Dug ☐ Bored ☐ Cable ☐ Driven ☒ Rotary ☐ Jetted

(5) **DIMENSIONS:** Diameter of well 6" inches

Drilled 180 feet. Depth of completed well 180 ft.

(6) **CONSTRUCTION DETAILS**

Casing Installed:

☒ Welded 6" Diam. from +2 ft. to -28 ft.

☒ Liner installed 4" Diam. from -20 ft. to -180 ft.

☐ Threaded ______" Diam. from ______ ft. to ______ ft.

Perforations: ☒ Yes ☐ No

Type of perforator used Skillsaw

SIZE of perforations ______ in. by ______ in.

______ perforations from ______ ft. to ______ ft.

Screens: ☐ Yes ☐ No ☐ K-Pac Location ______

Manufacturer's Name ______

Type ______ Model No. ______

Diam. ______ Slot Size ______ from ______ ft. to ______ ft.

Diam. ______ Slot Size ______ from ______ ft. to ______ ft.

Gravel/Filter packed: ☐ Yes ☐ No ☐ Size of gravel/sand ______

Material placed from ______ ft. to ______ ft.

Surface seal: ☒ Yes ☐ No To what depth? 20 ft.

Material used in seal Bentonite

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? ______ Depth of strata ______

Method of sealing strata off ______

(7) **PUMP:** Manufacturer's Name ______

Type: ______ H.P. ______

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ______ ft.

Static level 50 ft. below top of well Date ______

Artesian pressure ______ lbs. per square inch Date ______

Artesian water is controlled by ______ (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes, by whom? ______

Yield: ______ gal./min. with ______ ft. drawdown after ______ hrs.

Yield: ______ gal./min. with ______ ft. drawdown after ______ hrs.

Yield: ______ gal./min. with ______ ft. drawdown after ______ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ______

Bailer test ______ gal./min. with ______ ft. drawdown after ______ hrs.

Airtest 20+ gal./min. with ______ ft. drawdown after ______ hrs.

Artesian flow ______ g.p.m. Date ______

Temperature of water ______ Was a chemical analysis made? ☐ Yes ☐ No

(10) **WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
Topsoil	0	3
Basalt Broken Soft	3	28
Basalt Black Medium	28	110
Basalt Fractured W/Some Clay	110	120
Basalt Black Medium	120	155
Basalt Fractured W/Water	155	180

RECEIVED
NOV 5 1999
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 10/18/99 Completed 10/18/99

WELL CONSTRUCTION CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and it compliance with all Washington well construction standards. Materials use and the information reported above are true to my best knowledge and belie

Type or Print Name Jim McLeslie License No. 2257 (Licensed Driller/Engineer)

Trainee Name ______ License No. ______

Drilling Company H2O Well Svc Inc. 1-800-772-4

(Signed) Jim McLeslie License No. 2257 (Licensed Driller/Engineer)

Address 582 W Hayden Ave Hayden Lake Id 8

Contractor's Registration No. H2OWESI101DW Date 10/18/99

(USE ADDITIONAL SHEETS IF NECESSARY)

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Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent ____
UNIQUE WELL I.D. # AEQ094
Water Right Permit No. W111948

(1) **OWNER:** Name Steve Ellersick Address 10015 E. 19th Spokane, WA 99206

(2) **LOCATION OF WELL:** County Spokane ____ 1/4 NW 1/4 Sec 36 T 24N N.R. 44E WM

(2a) **STREET ADDRESS OF WELL:** (or nearest address) Washington

TAX PARCEL NO.: unknown

(3) **PROPOSED USE:** ☒ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) **TYPE OF WORK:** Owner's number of well (if more than one) 1
☒ New Well ☐ Deepened ☐ Reconditioned ☐ Decommission
Method: ☐ Dug ☐ Bored ☐ Cable ☐ Driven ☒ Rotary ☐ Jetted

(5) **DIMENSIONS:** Diameter of well 6 inches
Drilled 480 feet. Depth of completed well 480 ft.

(6) **CONSTRUCTION DETAILS**
Casing Installed:
☒ Welded 6 " Diam. from +1 ft. to 39 ft.
☐ Liner installed ____ " Diam. from ____ ft. to ____ ft.
☐ Threaded ____ " Diam. from ____ ft. to ____ ft.

Perforations: ☐ Yes ☒ No
Type of perforator used ____
SIZE of perforations ____ in. by ____ in.
____ perforations from ____ ft. to ____ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location ____
Manufacturer's Name ____
Type ____ Model No. ____
Diam. ____ Slot Size ____ from ____ ft. to ____ ft.
Diam. ____ Slot Size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand ____
Material placed from ____ ft. to ____ ft.

Surface seal: ☒ Yes ☐ No To what depth? 18+ ft.
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

(7) **PUMP:** Manufacturer's Name ____
Type: ____ H.P. ____

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ____ ft.
Static level 100 ft. below top of well Date 8/11/99
Artesian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom? ____
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest 1/2 gal./min. with ____ ft. drawdown after ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water ____ Was a chemical analysis made? ☐ Yes ☒ No

(10) **WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION**
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
Topsoil	0	1
Clay, Brown	1	18
Granite, Hard	18	21
Granite, Fractured	21	26
Granite, Medium to Hard	26	71
Granite, Medium to Soft	71	77
Granite, Medium	77	107
Granite, Fractured - Water 1/2 gpm	107	108
Granite, Medium to Hard w/ slight fractures	108	197
Granite, Hard w/ slight fractures	197	206
Granite, Medium to Hard w/ slight fractures	206	347
Granite, Hard w/ slight fractures	347	480

RECEIVED
NOV 3 1999
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 8/10/99 Completed 8/11/99

WELL CONSTRUCTION CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and compliance with all Washington well construction standards. Materials us and the information reported above are true to my best knowledge and bel

Type or Print Name Don Anderson License No. 1447
(Licensed Driller/Engineer)

Trainee Name - License No. -
Drilling Company J & J Drilling, Inc.
(Signed) ____ License No. 0215
(Licensed Driller/Engineer)
Address S 5613 Linke Greenacres, WA99
Contractor's Registration No. JJDRII-177KU Date 8/20/99

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For spe

W19

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W101886
UNIQUE WELL I.D. # AEC465
Water Right Permit No. ____________

(1) **OWNER:** Name Tracy & Kim Johnson Address 16002 E. Washington Valleyford, WA 9

(2) **LOCATION OF WELL:** County Spokane ______ 1/4 SW 1/4 Sec 36 T24N N., R44E W

(2a) **STREET ADDRESS OF WELL** (or nearest address) 16002 E. Washington

(3) **PROPOSED USE:** ☒ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one) ____________
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 300 feet. Depth of completed well 300 ft.

(6) **CONSTRUCTION DETAILS:**

Casing Installed: 6" Diam. from +1 ft. to 50 ft.
Welded ☒ 4" Diam. from ______ ft. to 300 ft.
Liner installed ☐
Threaded ☐ ______" Diam. from ______ ft. to ______ ft.

Perforations: Yes ☐ No ☒
Type of perforator used ____________
SIZE of perforations ______ in. by ______ in.
______ perforations from ______ ft. to ______ ft.
______ perforations from ______ ft. to ______ ft.
______ perforations from ______ ft. to ______ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ____________
Type ____________ Model No. ______
Diam. ______ Slot size ______ from ______ ft. to ______ ft.
Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel ______
Gravel placed from ______ ft. to ______ ft.

Surface seal: Yes ☒ No ☐ To what depth? 18+ ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ______ Depth of strata ______
Method of sealing strata off ______

(7) **PUMP:** Manufacturer's Name ______
Type: ______ H.P. ______

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ______ ft.
Static level 20 ft. below top of well Date 6/31/98
Artesian pressure ______ lbs. per square inch Date ______
Artesian water is controlled by ______ (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? ______
Yield: ______ gal./min. with ______ ft. drawdown after ______ hrs.
"Air Test 3"gpm " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ______
Bailer test ______ gal./min. with ______ ft. drawdown after ______ hrs.
Airtest ______ gal./min. with stem set at ______ ft. for ______ hrs.
Artesian flow ______ g.p.m. Date ______
Temperature of water ______ Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aqui and the kind and nature of the material in each stratum penetrated, with at least one entry for ea change of information.

MATERIAL	FROM	TO
Top Soil	0	3
Granite, Decomposed	3	27
Granite, Med. to Soft	27	104
Granite, Medium	104	128
Granite, Fractured - Water 3gpm	128	131
Granite, Very Hard	131	210
Granite, Med. w/ Fractures	210	300

JUL 998
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 6/30/98, 19 Completed 6/31/98, 19 9

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME J & J Drilling, Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address S. 5613 Linke Greenacres, WA 99
(Signed) (WELL DRILLER) License No. 1447
Contractor's Registration No. JJDRII-177KU Date 7/2/98, 19 98

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93)

W20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. ....

) **OWNER:** Name Larry Marlow Address R-1 Box 91 Valleyford Wa 99036

) **LOCATION OF WELL:** County Spokane — ¼ NW ¼ Sec. 1 T. 23 N., R. 44E W.M.

ing and distance from section or subdivision corner Lot 1 Block 3 Freeman addition

(3) **PROPOSED USE:** Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 100 ft. Depth of completed well 100 ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 6 " Diam. from +2 ft. to 64 ft.
Threaded ☐ ...... " Diam. from ...... ft. to ...... ft.
Welded ☒ ...... " Diam. from ...... ft. to ...... ft.

Perforations: Yes ☐ No ☒
Type of perforator used ......
SIZE of perforations ...... in. by ...... in.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ......
Type ...... Model No. ......
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ......
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ...... Depth of strata ......
Method of sealing strata off ......

(7) **PUMP:** Manufacturer's Name ......
Type: ...... H.P. ......

(8) **WATER LEVELS:** Land-surface elevation above mean sea level 2600 ft.
Static level 29 ft. below top of well Date 2-22-84
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by ...... (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ......
Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.
" ...... " ...... " ...... "
" ...... " ...... " ...... "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ......
Bailer test 60 gal./min. with ...... ft. drawdown after ...... hrs.
Artesian flow ...... g.p.m. Date ......
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☒

(10) **WELL LOG:**

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Black top soil	0	4
Yellow clay	4	64
Black Basalt hard	64	100

RECEIVED
MAR 14 1984
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 2-5 1984 Completed 2-22 1984

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME BOYd L. WOOd (Person, firm, or corporation) (Type or print)
Address R-1 BOX 154A VALLEYFORd, Wa 9903
[Signed] Boyd L. Wood (Well Driller)
License No. 1283 Date 3-11 1984

3/14/84

(USE ADDITIONAL SHEETS IF NECESSARY)

W21

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)* 358294

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number ____________

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ____________

TYPE OF WORK: Owner's number of well (if more than one) 1

☒ New well ☐ Reconditioned *Method :* ☐ Dug ☐ Bored ☐ Driven

☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 580 ft.

Depth of completed well 580ft.

CONSTRUCTION DETAILS

Casing Installed:

☒ Welded 6" Diam. from +2 ft. to 18 ft.

☒ Liner installed 4" Diam. from -5 ft. to 580 ft.

☐ Threaded ____" Diam. From ____ ft. to ____ ft.

Perforations: ☒ Yes ☐ No

Type of perforator used SAW

SIZE of perfs 1/8 in. by 4 in. and no. of perfs 48 from -560ft. to -580ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location ____________

Manufacturer's Name ____________

Type ____________ Model No. ____________

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand ____

Materials placed from ____ ft. to ____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 18 ft.

Material used in seal BENTONITE

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? ____________ Depth of strata ____________

Method of sealing strata off ____________

PUMP: Manufacturer's Name ____________

Type: ____________ H.P. ____________

WATER LEVELS: Land-surface elevation above mean sea level ____ ft.

Static level 100 ft. below top of well Date 9/17/09

Artesian pressure ____ lbs. per square inch Date ____________

Artesian water is controlled by ____________ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? ____________

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____________

Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.

Airtest 10 gal./min. with stem set at ____ ft. for 1 hrs.

Artesian flow ____ g.p.m. Date ____________

Temperature of water COLD Was a chemical analysis made? ☐ Yes ☒ No

CURRENT

Notice of Intent No. WE10484

Unique Ecology Well ID Tag No. APC-148

Water Right Permit No. ____________

Property Owner Name MICHAEL POPPENS

Well Street Address 16305 E. WASHINGTON RD.

City VALLEYFORD County SPOKANE

Location SE1/4-1/4 NW1/4 Sec 36 Twn 34 R 44E EWM ☒ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long Lat Deg ____ Lat Min/Sec ____

Long Deg ____ Long Min/Sec ____

Tax Parcel No. (Required) 44362.9038

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Top Soil	0	3
Tan Clay	3	15
Soft Tan Clay	15	30
Gray Granite	30	60
Tan Granite	60	80
Grn & Gry Granite	80	160
Tan & Gry Granite	160	190
Gry & Wht Granite	190	240
Blk & Wht Granite	240	270
Gry & Wht Granite	270	440
Blk & Wht Granite	440	560
Gry & Wht Fract Granite	560	580

RECEIVED

OCT 6 2009

DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Start Date 9/16/2009 Completed Date 9/18/2009

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) JIM McLESLIE

Driller/Engineer/Trainee Signature Jim McLeslie

Driller or trainee License No. 2871

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company H2O WELL SERVICE INC.

Address 582 W. HAYDEN AVE.

City, State, Zip HAYDEN , ID, 83835

Contractor's Registration No. H2OWESI101DW. Date 9/18/2009

W22

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

S Card No. 060475 #1
UNIQUE WELL I.D. #
Water Right Permit No.

(1) **OWNER:** Name Gayle Cattaneo Address S 2821 Glenrose, Spokane, WA 99223

LOCATION OF WELL: County Spokane SE ¼ SW ¼ Sec 36 T. 24 N., R 44 W.M.

(2a) **STREET ADDDRESS OF WELL** (or nearest address) 16000 Stoughton, Freeman, WA

(3) **PROPOSED USE:** ☒ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one)
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 560 feet. Depth of completed well 560 ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 6 " Diam. from +1 ft. to 97 ft.
Welded ☒ " Diam. from ft. to ft.
Liner installed ☐
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18+ ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 60 ft. below top of well Date 5/24/93
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc))

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: 1 gal./min. with ft. drawdown after hrs.
Air test approx. 1-G.P.M.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Topsoil	0	1
Clay-brn.-hard	1	12
Granit-decomposed	12	78
Granit-med.	78	110
Granit-fract.-water-½-G.P.M.	110	115
Granit-soft to med.	115	185
Granit-fract.-water-½-G.P.M.	185	186
Granit-med. w/fracts.	186	340
Granit-hard	340	560

RECEIVED
JUN 15 1993

Work started 5/20/93, 19 Completed 5/24/, 1993

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME J & J DRILLING INC (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address S 5613 Linke Rd. Greenacres, WA 99016
(Signed) (WELL DRILLER) License No. 1962
Contractor's Registration No. JJDRII-177KU Date 5/27/, 1993

(USE ADDITIONAL SHEETS IF NECESSARY)

W23

File Original and First Copy with
Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 060480 #2
UNIQUE WELL I.D. #
Water Right Permit No.

(1) **OWNER:** Name Gayle Catteneo Address S 2821 Glenrose Spokane, WA 99223

(2) **LOCATION OF WELL:** County Spokane SE ¼ SW ¼ Sec 36 T. 24 N., R. 44 W.M.

(2a) **STREET ADDDRESS OF WELL** (or nearest address) 16000 Stoughton, Freeman, WA

(3) **PROPOSED USE:** ☒ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one)
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 300 feet. Depth of completed well 300 ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 6 " Diam. from +1 ft. to 119 ft.
Welded ☒
Liner installed ☒ 4 " Diam. from ft. to 300 ft.
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18+ ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 60 ft. below top of well Date 5/25/93
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: 20 gal./min. with ft. drawdown after hrs.
Air test approx. 20-G.P.M. "
" "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Topsoil	0	1
Clay-brn.-hard	1	8
Granit-decomposed	8	108
Gaanit-soft to med.	108	230
Granit-med. w/fracts.	230	270
Granit-fract.-water-20-G.P.M.	270	275
Granit-med.	275	300

JUN 15 [illegible]
DEPARTMENT OF ECOL
EASTERN REGIONAL O

Work started 5/24/93, 19 . Completed 5/25/, 19 93

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME J & J DRILLING INC (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address S 5613 Linke Rd. Greenacres, WA 99016
(Signed) (WELL DRILLER) License No. 1962
Contractor's Registration No. JJDRII-177KU Date 5/27/, 19 93

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

W24

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

31712

WATER WELL REPORT

STATE OF WASHINGTON

WELL

Application No. W27474
Permit No. AAL 153

(1) OWNER: Name DEL THORSON Address 15511 S. JACKSON VALLEYFord

(2) LOCATION OF WELL: County SPOKANE SE ¼ SW ¼ Sec. 1 T. 23 N., R. 44 W.M.

Bearing and distance from section or subdivision corner 15921 E. ELDER Rd

(3) PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....

New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☑ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 210 ft. Depth of completed well 210 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +2 0 ft. to 110 ft.
Threaded ☐ ...." Diam. from .... ft. to .... ft.
Welded ☑ ...." Diam. from .... ft. to .... ft.

Perforations: Yes ☐ No ☑
Type of perforator used ....
SIZE of perforations .... in. by .... in.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.

Screens: Yes ☐ No ☑
Manufacturer's Name ....
Type .... Model No. ....
Diam. .... Slot size .... from .... ft. to .... ft.
Diam. .... Slot size .... from .... ft. to .... ft.

Gravel packed: Yes ☐ No ☑ Size of gravel: ....
Gravel placed from .... ft. to .... ft.

Surface seal: Yes ☑ No ☐ To what depth? 18 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? .... Depth of strata ....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name ....
Type: .... H.P. ....

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 4 ft.
Static level 80 ft. below top of well Date 9-6-98
Artesian pressure .... lbs. per square inch Date ....
Artesian water is controlled by .... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ....
Yield: gal./min. with ft. drawdown after hrs.
AIR RRESSURE 40-50 GAL. "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test .... gal./min. with .... ft. drawdown after .... hrs.
Artesian flow .... g.p.m. Date ....
Temperature of water .... Was a chemical analysis made? Yes ☐ No ☑

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
BROWN CLAY	0	2
BROWN-YELLOW CLAY	2	192
GREY BASALT HARd	192	210

RECEIVED
OCT - 2 1998
OCT. 2 1998
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work started 9-1 1998 Completed 9-6- 1998

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME BOYd L. WOOD (Person, firm, or corporation) (Type or print)

Address 15910 S. CAMPBELL Rd
ROCKFord, WA 99030

[Signed] Boyd L. Wood (Well Driller)

License No. 1283 Date 9-6 1998

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

433985 W25

WASHINGTON STATE DEPARTMENT OF ECOLOGY

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number ____________

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ________

TYPE OF WORK: Owner's number of well (if more than one) 2

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven

☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 220 ft.

Depth of completed well 220 ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 6" Diam. from +1 ft. to 79 ft.

☒ Liner installed 4" Diam. from 10 ft. to 220 ft.

☐ Threaded _" Diam. From _ ft. to _ ft.

Perforations: ☒ Yes ☐ No

Type of perforator used bit

SIZE of perfs 3/8 in. by _____ in. and no. of perfs _____ from 170 ft. to 220 ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location ____________

Manufacturer's Name ____________

Type ____________ Model No. ____________

Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand ______

Materials placed from ______ ft. to ______ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 18+ ft.

Material used in seal Baroid Bentonite

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? ____________ Depth of strata ____________

Method of sealing strata off ____________

PUMP: Manufacturer's Name ____________

Type: ____________ H.P. ______

WATER LEVELS: Land-surface elevation above mean sea level ______ ft.

Static level 130 ft. below top of well Date 9/14/2011

Artesian pressure ______ lbs. per square inch Date ______

Artesian water is controlled by ____________ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? ____________

Yield: ______ gal./min. with _____ ft. drawdown after ______ hrs.

Yield: ______ gal./min. with _____ ft. drawdown after ______ hrs.

Yield: ______ gal./min. with _____ ft. drawdown after ______ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____________

Bailer test ______ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest 100+ gal./min. with stem set at ______ ft. for ______ hrs.

Artesian flow ______ g.p.m. Date ____________

Temperature of water ______ Was a chemical analysis made? ☐ Yes ☒ No

CURRENT

Notice of Intent No. WE13541

Unique Ecology Well ID Tag No. BCE817

Water Right Permit No. ____________

Property Owner Name Sandra and Joseph Atwood

Well Street Address 15709 E Elder Road

City Valleyford County Spokane

Location SW1/4-1/4 SE1/4 Sec 1 Twn 23N R 44E EWM ☐ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long Lat Deg _____ Lat Min/Sec _____

Long Deg _____ Long Min/Sec _____

Tax Parcel No. (Required) 43013.9038

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Topsoil	0	2
Clay, Brown & Medium	2	51
Clay, Brown w/ Sand	51	56
Clay, Brown & Medium	56	63
Basalt, Soft & Broken	63	69
Basalt, Medium	69	121
Basalt, Med. to Hard	121	183
Basalt, Fractured w/	183	194
Shale, Black		
Basalt, Highly Fractured	194	206
Water 100+gpm		
Basalt, Soft	206	217
Basalt, Fractured w/	217	220
Shale, Grey		
Recommended pump set		
depth is 210 feet.		

RECEIVED

OCT 27 2011

DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Start Date 9/13/2011 Completed Date 9/14/2011

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Brian Mosset

Driller/Engineer/Trainee Signature Brian T. Mosset

Driller or trainee License No. 2139

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company J & J Drilling, Inc.

Address 17313 East Linke Road

City, State, Zip Greenacres, WA, 99016

Contractor's Registration No. JJDRII-177KU Date 9/15/2011

W26 1286

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....
Permit No. ....

(1) OWNER: Name Virg & Elsie Marlow Address R-1 Box 116E Valleyford, Wa 99036

(2) LOCATION OF WELL: County SPOKANE ..... ¼ ..... ¼ Sec 1 T. 23 N., R. 44 E W.M.

Bearing and distance from section or subdivision corner Lot 2 Block 6 Freeman 1st addition

(3) PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☑ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☑ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 140 ft. Depth of completed well 140 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +2 ~~0~~ ft. to 44 ft.
Threaded ☐ ..... " Diam. from ..... ft. to ..... ft.
Welded ☑ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☑
Type of perforator used ....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☑
Manufacturer's Name ....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☑ Size of gravel: ....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☑ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? ..... Depth of strata .....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name ....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level..... ft.
Static level 78 ft. below top of well Date 3-4-88
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☑ If yes, by whom? .....
Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test 25 gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☑

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
0 - 2 Brown top soil	0	2
Yellow Clay	2	30
Broken basalt	30	44
Black hard basalt	44	140W

RECEIVED
MAY 4 - 1988
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 2-29, 1988 Completed 3-4, 1988

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Boyd L. Wood (Person, firm, or corporation) (Type or print)
Address R-1 Box 96 Rockford, Wa 99030
[Signed] Boyd L. Wood (Well Driller)
License No. 1283 Date 5-5, 1988

(USE ADDITIONAL SHEETS IF NECESSARY)

W30

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. ....

(1) OWNER: Name Joel Reed Address Rt-1 Box-88B Valley Ford WA.

LOCATION OF WELL: County Spokane - — SW ¼ SE ¼ Sec. 1 T 23 N., R. 44 W.M.

ring and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....

New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☑ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 180 ft. Depth of completed well 180 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from +1 ft. to 59 ft.
Threaded ☐ ....." Diam. from ..... ft. to ..... ft.
Welded ☑ ....." Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☑
Type of perforator used ....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☑
Manufacturer's Name ....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☑ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☑ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name ....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level 2600 ft.
Static level 100 ft. below top of well Date 9-23-81
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? .....
Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
Air Test Approx - 60 GPM "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top Soil	0	1
Lt-Brn. Clay - Hard	1	35
Lt-Brn Clay w/Basalt Layers	35	48
Basalt	48	60
Basalt - Very Hard	60	140
Cinders - w/ Water	140	180

RECEIVED
NOV - 5 1981
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 9-23, 1981. Completed 9-23-, 1981

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME J & J Drilling Inc. (Person, firm, or corporation) (Type or print)
Address 5613 S Linke Rd Greenacres
[Signed] Gerald R Johnson (Well Driller)
License No. 0215 Date 9-28, 1981

11/5/81

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

3

W34

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No
Permit No.

(1) OWNER: Name Lauren H. Brown Address Route 1, Box 92-B, Valleyford, WA 99036

LOCATION OF WELL: County SPOKANE W½ ¼ NE ¼ Sec. 36 T. 24 N., R. 44E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☒ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 50 ft. Depth of completed well 142 ft.

(6) CONSTRUCTION DETAILS: N/A

Casing installed: " Diam. from ft. to ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☐ No ☒ To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 33 ft. below top of well Date 9/21/87
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: 9 gal./min. with ft. drawdown after hrs.
" ESTIMATED AIRLIFT " "
" " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Granite, black, hard	92	96
Granite, white w/black, broken w/water	96	99
Granite, black, medium hard	99	142
NO PVC Liner Installed		
6" Drive shoe utilized		

OCT 1 3 1987

Work started 9/18, 19 87 Completed 9/21, 19 87

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME PONDEROSA DRILLING & DEVELOPMENT INC. (Person, firm, or corporation) (Type or print)

Address E. 6010 Broadway, Spokane, WA 99212

[Signed] Louie E. Hesner (Well Driller)

License No. 1472 Date 9/21, 19 87

10/13/87

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

W35

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W37743
UNIQUE WELL I.D. #
Water Right Permit No.

') OWNER: Name LAUREN BROWN Address E. 16305 WASHINGTON Rd., VALLEYFORD, WA.

LOCATION OF WELL: County SPOKANE S½ 1/4 NE 1/4 Sec. 36 T. 24 N., R. 44E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) WASHINGTON Rd.

(3) PROPOSED USE: ☒ Domestic ☐ Irrigation ☐ DeWater ☐ Industrial ☐ Test Well ☐ Municipal ☐ Other

(4) TYPE OF WORK: Owner's number of well (If more than one)

☐ Abandoned ☒ New well ☐ Deepened ☐ Reconditioned

Method: ☐ Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 325 feet. Depth of completed well 325 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1 ft. to 19 ft.
☒ Welded " Diam. from ft. to ft.
☐ Liner installed
☐ Threaded " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
lam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 19 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 40 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
APPROX. 1½ GPM BY AIRTEST "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information

MATERIAL	FROM	TO
TOPSOIL	0	1
BRN. CLAY - FIRM	1	7
GRANITE - MED. TO HARD, FRACTS. 1½ GPM @ 75'	7	125
GRANITE - HARD, FRACTS.	125	325

RECEIVED
NOV 14 1994
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 9/26 19 Completed 9/27 1994

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME CARPENTER DRILLING Co. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O. BOX 706 VERADALE, WA. 99037
(Signed) (WELL DRILLER) License No. 1278
Contractor's Registration No. CARPEDC091P2 Date 9/28 1994

(USE ADDITIONAL SHEETS IF NECESSARY)

W38

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No 009265

Water Right Permit No. ______

(1) **OWNER:** Name Paul Sublette Address 1214 E Broad Spok. WA.

LOCATION OF WELL: County Spokane W ½ NE ¼ Sec. 36 T. 24 N., R. 44 W.M.

(2a) **STREET ADDDRESS OF WELL** (or nearest address) Washington Rd. Thunder Mtd.

(3) **PROPOSED USE:** ☑ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one) ______

Abandoned ☐ New well ☑ Deepened ☐ Reconditioned ☐

Method: Dug ☐ Cable ☐ Rotary ☑ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.

Drilled 280 feet. Depth of completed well 280 ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 6" Diam. from +1 ft. to 25 ft.

Welded ☑ ______" Diam. from ______ ft. to ______ ft.

Liner installed ☑ ______" Diam. from ______ ft. to ______ ft.

Threaded ☐

Perforations: Yes ☐ No ☑

Type of perforator used ______

SIZE of perforations ______ in. by ______ in.

______ perforations from ______ ft. to ______ ft.

______ perforations from ______ ft. to ______ ft.

______ perforations from ______ ft. to ______ ft.

Screens: Yes ☐ No ☑

Manufacturer's Name ______

Type ______ Model No. ______

Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Gravel packed: Yes ☐ No ☑ Size of gravel ______

Gravel placed from ______ ft. to ______ ft.

Surface seal: Yes ☑ No ☐ To what depth? 18 ft.

Material used in seal Bentonite

Did any strata contain unusable water? Yes ☐ No ☑

Type of water? ______ Depth of strata ______

Method of sealing strata off ______

(7) **PUMP:** Manufacturer's Name ______

Type: ______ H.P. ______

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ______ ft.

Static level 50 ft. below top of well Date 9-23-88

Artesian pressure ______ lbs. per square inch Date ______

Artesian water is controlled by ______ (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☑ If yes, by whom? ______

Yield: ______ gal./min. with ______ ft. drawdown after ______ hrs.

" " " "

Air Test "5 GPM" "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ______

Bailer test ______ gal./min. with ______ ft. drawdown after ______ hrs.

Airtest ______ gal./min. with stem set at ______ ft. for ______ hrs.

Artesian flow ______ g.p.m. Date ______

Temperature of water ______ Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Top Soil Brn Clay	0	8
Decomposed Granit	8	12
Granit Soft	12	83
Granit Med.	83	160
Granit- Soft	160	181
Granit- Med.	181	264
Granit- Soft	264	270
Granit- Med.	270	280

Work started 9-21, 1988 Completed 9-23, 1988

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME J&J Drilling Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 5613 S Link Rd [illegible]

(Signed) Don Anderson 92 (WELL DRILLER) License No. 1447

Contractor's Registration No. JJDRII·177KH Date 9-27, 1988

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

W39

WATER WELL REPORT

ECOLOGY Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission *("x" in circle)* 188647

☒ Construction

○ Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number* ______

CURRENT Notice of Intent No. W208212

Unique Ecology Well ID Tag No. ALR592

Water Right Permit No. ______

Property Owner Name Travis Goldsmith

Well Street Address Thunder Mt. Rd.

City ______ County: Spokane

Location ____1/4-1/4 NE 1/4 Sec 36 Twn 24 R 44 [✓ EWM] *circle one* or WWM

Lat/Long: (s,t,r still REQUIRED) Lat Deg ______ Lat Min/Sec ______

Long Deg ______ Long Min/Sec ______

Tax Parcel No. 44361.9044

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ______

TYPE OF WORK: Owner's number of well (if more than one) ______

☒ New Well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven

☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 640 ft.

Depth of completed well 640 ft.

CONSTRUCTION DETAILS

Casing Installed:

☒ Welded 6" Diam. from +1 ft. to 39 ft.

☒ Liner installed 4" Diam. from 20 ft. to 640 ft.

☐ Threaded ____" Diam. from ____ ft. to ____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used ______

SIZE of perfs ____ in. by ____ in. and no. of perfs ____ from ____ ft. to ____ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location ______

Manufacturer's Name ______

Type ______ Model No. ______

Diam. ______ Slot Size ______ from ______ ft. to ______ ft.

Diam. ______ Slot Size ______ from ______ ft. to ______ ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand ______

Materials placed from ______ ft. to ______ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 20+ ft

Materials used in seal Bentonite

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? ______ Depth of strata ______

Method of sealing strata off ______

PUMP: Manufacturer's Name ______

Type: ______ H.P. ______

WATER LEVELS: Land-surface elevation above mean sea level ______ ft.

Static level 360 ft. below top of well Date ______

Artesian pressure ______ lbs. per square inch Date ______

Artesian water is controlled by ______ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level.

Was a pump test made? ☐ Yes ☐ No If yes, by whom? ______

Yield ______ gal./min. with ______ ft. drawdown after ______ hrs.

Yield ______ gal./min. with ______ ft. drawdown after ______ hrs.

Yield ______ gal./min. with ______ ft. drawdown after ______ hrs.

Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time Water Level Time Water Level Time Water Level

Approx. 5 GPM by Airtest

Date of test ______

Bailer test ______ gal./min. with ______ ft. drawdown after ______ hrs.

Airtest 5 gal./min. with stem set at 640 ft. for ______ hrs.

Artesian flow ______ g.p.m. Date ______

Temperature of water ______ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Topsoil	0	1
Brn. Clay	1	9
Very Decomp. Granite-S	9	28
Decomp. Granite-M,Fracts	28	190
1/2 GPM @ 50'		
Granite-H	190	590
Granite-H,Decomp.Fracts	590	630
water		
Granite-H	630	640

RECEIVED
JAN 25 2006
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Start Date 10/11/05 Completed Date 10/13/05

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Benson Carpenter

Driller/Engineer/Trainee Signature ______

Driller or Trainee License No. 1278

If trainee, licensed driller's Signature and License no. ______

Drilling Company Carpenter Drilling Co.Inc.

Address 8918 N. Forker Rd.

City, State, Zip Spokane, Wa. 99217

Contractor's Registration No. CARPEDCO22JT Date 10/14/05

Ecology is an Equal Opportunity Employer ECY 050-1-20 (Rev 4/01)

W40

Start Card No. W 090909

UNIQUE WELL I.D. # ______

Water Right Permit No. ______

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

(1) **OWNER:** Name Karl Lamon Address E 17015 Washington Rd Valleyford WA 99036

(2) **LOCATION OF WELL:** County Spokane ____ 1/4 SE 1/4 Sec 36 T. 24N N., R 44E W.M

(2a) **STREET ADDRESS OF WELL** (or nearest address) 16909 E Washington Rd Valleyford WA 99036

(3) **PROPOSED USE:** ☒ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (If more than one) ______

Abandoned ☐ New well ☐ Deepened ☒ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.

Drilled 300 feet. Depth of completed well 500 ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: ______" Diam. from ______ ft. to ______ ft.

Welded ☐ Liner installed ☒ 4" Diam. from ______ ft. to 500 ft.

Threaded ☐ ______" Diam. from ______ ft. to ______ ft.

Perforations: Yes ☐ No ☒

Type of perforator used ______

SIZE of perforations ______ in. by ______ in.

______ perforations from ______ ft. to ______ ft.

______ perforations from ______ ft. to ______ ft.

______ perforations from ______ ft. to ______ ft.

Screens: Yes ☐ No ☒

Manufacturer's Name ______

Type ______ Model No. ______

Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel ______

Gravel placed from ______ ft. to ______ ft.

Surface seal: Yes ☐ No ☐ To what depth? ______ ft.

Material used in seal ______

Did any strata contain unusable water? Yes ☐ No ☒

Type of water? ______ Depth of strata ______

Method of sealing strata off ______

(7) **PUMP:** Manufacturer's Name ______

Type: ______ H.P. ______

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ______ ft.

Static level 80 ft. below top of well Date 9/15/97

Artesian pressure ______ lbs. per square inch Date ______

Artesian water is controlled by ______ (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☒ If yes, by whom? ______

Yield: ______ gal./min. with ______ ft. drawdown after ______ hrs.

"Air Test 20 GPM " "

" " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ______

Bailer test ______ gal./min. with ______ ft. drawdown after ______ hrs.

Airtest ______ gal./min. with stem set at ______ ft. for ______ hrs.

Artesian flow ______ g.p.m. Date ______

Temperature of water ______ Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Granite, Very Hard	200	468
Granite, Hard & Fractured - Water	468	472
Granite, Very Hard	472	500

OCT 2

Work Started 9/11/97, 19. Completed 9/15/97, 19 9

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME J & J Drilling, Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address S. 5613 Linke Greenacres WA 9901

(Signed) Marty Rugo J+J (WELL DRILLER) License No. 2038

Contractor's Registration No. JJDRII-177KU Date 9/23, 19 97

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93)

W41

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. ____
UNIQUE WELL I.D. # ACF-982
Water Right Permit No. W21729

(1) **OWNER:** Name Karl Lamon Address 17015 E. Washington, Valleyford, Wa.

(2) **LOCATION OF WELL:** County Spokane ____ 1/4 S/E 1/4 Sec 36 T. 24 N., R 44 W.M.

(2a) **STREET ADDRESS OF WELL** (or nearest address) Same

(3) **PROPOSED USE:** ☒ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (If more than one) ____
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 200 feet. Depth of completed well 200 ft.

(6) **CONSTRUCTION DETAILS:**
Casing Installed: 6" Diam. from +1 ft. to 19 ft.
Welded ☐ ____" Diam. from ____ ft. to ____ ft.
Liner installed ☐ ____" Diam. from ____ ft. to ____ ft.
Threaded ☐

Perforations: Yes ☐ No ☒
Type of perforator used ____
SIZE of perforations ____ in. by ____ in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ____
Type ____ Model No. ____
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel ____
Gravel placed from ____ ft. to ____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 19 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

(7) **PUMP:** Manufacturer's Name Grundfos
Type: Submersiable H.P. 3/4

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ____ ft.
Static level 58 ft. below top of well Date 7/17/95
Artesian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? ____
Yield: 2 gal./min. with 110 ft. drawdown after 4 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water ____ Was a chemical analysis made? Yes ☒ No ☐

Choliform + Nitrate

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Top Soil	0	2
Decomposed granite, tan	2	5
Granite, med., slightly frac grey	5	50
Granite, grey, med; very frac.	50	55
Granite, white, med.	55	80
Granite, grey, med. frac.	80	90
Granite, salt+pepper, med. slightly frac.	90	140
VOID w/ water	140	145
Granite, tan, med., slightly frac.	145	180
Granite, grey, med.	180	200
6" Drive Shoe Installed		
200' PVC liner installed		

Work Started 7/15 19 ____ Completed 7/16 1996

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Vermillion Well Drilling, Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address W. 5309 Lynden Rd, Otis Orchards
(Signed) Keith D. Vermillion (WELL DRILLER) License No. 1079
Contractor's Registration No. VERMIWD126Q3 Date 7/21 1996

(USE ADDITIONAL SHEETS IF NECESSARY)

ECL 050-1-20 (2/93)

W43

Start Card No. W067564

UNIQUE WELL I.D. # acc-456

Water Right Permit No. ____

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

(1) OWNER: Name Brent & Janet Crosby Address 15611 E. Washington Rd.Spok.,Wa.

(2) LOCATION OF WELL: County Spokane ne 1/4 ne 1/4 Sec 36 T. 24 N., R 44 WM.

(2a) STREET ADDRESS OF WELL (or nearest address) same as above

(3) PROPOSED USE: XX Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ____

Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐

Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6" inches.

Drilled 140' feet. Depth of completed well 140' ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from +1½' ft. to 27½' ft.

Welded ☒ ____ Diam. from ____ ft. to ____ ft.

Liner installed ☐ ____ Diam. from ____ ft. to ____ ft.

Threaded ☐

Perforations: Yes ☐ No ☒

Type of perforator used ____

SIZE of perforations ____ in. by ____ in.

____ perforations from ____ ft. to ____ ft.

____ perforations from ____ ft. to ____ ft.

____ perforations from ____ ft. to ____ ft.

Screens: Yes ☐ No ☒

Manufacturer's Name ____

Type ____ Model No. ____

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel ____

Gravel placed from ____ ft. to ____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 20' ft.

Material used in seal bentonite

Did any strata contain unusable water? Yes ☐ No ☒

Type of water? ____ Depth of strata ____

Method of sealing strata off ____

(7) PUMP: Manufacturer's Name ____

Type: ____ H.P. ____

(8) WATER LEVELS: Land-surface elevation above mean sea level ____ ft.

Static level 20' ft. below top of well Date 10-10-95

Artesian pressure ____ lbs. per square inch Date ____

Artesian water is controlled by ____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☐ If yes, by whom? ____

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

" air test is approximate at time of
" drilling " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____

Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.

Airtest 6 gal./min. with stem set at 135' ft. for 1 hrs.

Artesian flow ____ g.p.m. Date ____

Temperature of water ____ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
clay-brown	0	6
granite-decomposed	6	25
granite-tan-soft	25	40
granite-grey-med.	40	95
granite w/clay-red	95	100
granite-tan-soft	100	140
6" drive shoe installed		
1 hour development		
recovery-fair		
135' 4" pvc liner installed		

RECEIVED
OCT 23 1995
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 10-10-95, 19 . Completed 10-10-95, 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Vermillion Well Drilling, Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 6403 N. Perry Spokane,Wa.99207

(Signed) Duane Lind (WELL DRILLER) License No. 2140

Contractor's Registration No. vermiwd126d3 Date 10-19-95, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

W44(Original)

File Original with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent
UNIQUE WELL I.D. # AEQ100
Water Right Permit No. W121307

(1) **OWNER:** Name Lauren & Grace Brown Address E. 16305 Washington Valleyford,WA 99036

(2) **LOCATION OF WELL:** County Spokane 1/4 NW 1/4 Sec 36 T24N N.R. 44E WM

(2a) **STREET ADDRESS OF WELL:** (or nearest address) Washington

TAX PARCEL NO.: unknown

(3) **PROPOSED USE:** ☒ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) **TYPE OF WORK:** Owner's number of well (if more than one) 2
☒ New Well ☐ Deepened ☐ Reconditioned ☐ Decommission
Method: ☐ Dug ☐ Bored ☐ Cable ☐ Driven ☒ Rotary ☐ Jetted

(5) **DIMENSIONS:** Diameter of well 6 inches
Drilled 400 feet. Depth of completed well 400 ft.

(6) **CONSTRUCTION DETAILS**

Casing Installed:
☒ Welded 6" Diam. from +1 ft. to 39 ft.
☐ Liner installed " Diam. from ft. to ft.
☐ Threaded " Diam. from ft. to ft.

Perforations: ☐ Yes ☒ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot Size from ft. to ft.
Diam. Slot Size from ft. to ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand
Material placed from ft. to ft.

Surface seal: ☒ Yes ☐ No To what depth? 18+ ft.
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 19 ft. below top of well Date 8/13/99
Artesian pressure lbs. per square inch Date
Artesian water is controlled by
(Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level

SEP 27 1999
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 2.0 gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

(10) **WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION**
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
Topsoil	0	1
Clay, Brown	1	13
Granite, Medium	13	17
Granite, Slightly Fractured	17	28
Granite, Medium w/ slight fractures	28	71
Granite, slightly fractured - Water 1/2 gpm	71	74
Granite, Medium w/ slight fractures	74	81
Granite, Medium to soft	81	97
Granite, Medium w/ slight fractures	97	240
Granite, Highly fractured w/ some granite sand - water	240	247
Granite, Medium w/ slight fractures	247	257
Granite, Fractured	257	261
Granite, Medium w/ fractures	261	301
Granite, Highly Fractured - Water 1& 1/4gpm	301	307
Granite, Medium w/ slight fractures	307	400

Work Started 8/12/99. Completed 8/13/99.

WELL CONSTRUCTION CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Type or Print Name Don Anderson License No. 1447
(Licensed Driller/Engineer)
Trainee Name - License No. -
Drilling Company J & J Drilling, Inc.
(Signed) License No. 0215
(Licensed Driller/Engineer)
Address S. 5613 Linke Greenacres,WA9901
Contractor's Registration No. JJDRII-177KU Date 8/20/99

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-

ECY 050-1-20 (11/98)

W44 (Reconditioned)

File Original with
Department of Ecology
Second Copy Owners Copy
Third Copy Drillers Copy

130789

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W148285
UNIQUE WELL I D # AEQ 100
Water Right Permit No

(1) **OWNER** Name LAUREN BROWN Address E 16305 WASH, Rd, VALLEYFord, WA 9903

(2) **LOCATION OF WELL** County SPOKANE NE 1/4 SE 1/4 NW 1/4 Sec 36 T 24 N R 44 EWM

(2a) **STREET ADDRESS OF WELL** (or nearest address) E 16305 WASH Rd, VALLEYFord, WA 99036

TAX PARCEL NO 44362.9027

(3) **PROPOSED USE** ☑ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) **TYPE OF WORK** Owners number of well (if more than one)

☐ New Well
☐ Deepened
☑ Reconditioned
☐ Decommission

Method ☐ Dug ☐ Bored ☑ Cable ☐ Driven ☐ Rotary ☐ Jetted

(5) **DIMENSIONS** Diameter of well 6 inches

Drilled ____ feet Depth of completed well 320 ft

(6) **CONSTRUCTION DETAILS**

Casing Installed

☑ Welded 5 Diam from 278 ft to 320 ft
☑ Liner installed PVC 4 Diam from 20 ft to 320 ft
☐ Threaded ____ Diam from ____ ft to ____ ft

Perforations ☑ Yes ☐ No

Type of perforator used Torch

SIZE of perforations 1/8 in by 6 in

5" - 1/4 WALL STEEL perforations from 279 ft to 319 ft

4" PVC 20'-320' PERFORATION 280' 315'

Screens ☐ Yes ☑ No ☑ K Pac Location

Manufacturers Name

Type ____ Model No

Diam ____ Slot Size ____ from ____ ft to ____ ft

Diam ____ Slot Size ____ from ____ ft to ____ ft

Gravel/Filter packed ☐ Yes ☑ No ☐ Size of gravel/sand

Material placed from ____ ft to ____ ft

Surface seal ☐ Yes ☐ No To what depth? ____ ft

Material used in seal

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? ____ Depth of strata

Method of sealing strata off

(7) **PUMP** Manufacturers Name

Type ____ H P

(8) **WATER LEVELS** Land surface elevation above mean sea level ____ ft

Static level 19 ft below top of well Date 2-23-03

Artesian pressure ____ lbs per square inch Date

Artesian water is controlled by ____ (Cap valve etc)

(9) **WELL TESTS** Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes by whom?

Yield ____ gal /min with ____ ft drawdown after ____ hrs

Yield ____ gal /min with ____ ft drawdown after ____ hrs

Yield ____ gal /min with ____ ft drawdown after ____ hrs

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer test 3.5 gal /min with ____ ft drawdown after ____ hrs

Airtest ____ gal /min with ____ ft drawdown after ____ hrs

Artesian flow ____ g p m Date

Temperature of water ____ Was a chemical analysis made? ☐ Yes ☑ No

(10) **WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION**

Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
CLEANEd Mud + SANd	135'	320'
INSTALLEd 42' 5"-1/4 WALL		
STEEL CASING	278'	320'
4" 300' PVC	20'	320'

RECEIVED
MAY - 1 2003
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 9-1 99 Completed 9-21 99

WELL CONSTRUCTION CERTIFICATION

I constructed and/or accept responsibility for construction of this well and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

Type or Print Name Boyd L. Wood License No 1283
(Licensed Driller/Engineer)

Trainee Name ____ License No

Drilling Company Boyd L Wood WELL DRILLING

(Signed) Boyd L. Wood License No 1283
(Licensed Driller/Engineer)

Address 15910 S. CAMPbELL Rd, RockFord 9903

Contractors Registration No BOYdLWW024NS Date 2-23 03

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs contact the Water Resources Program at (360) 407 6600 The TDD number is (360) 407 6006

ECY 050 1 20 (11/98)

W46 433761

DEPARTMENT OF ECOLOGY
State of Washington

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number ____________

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ________

TYPE OF WORK: Owner's number of well (if more than one) ______

☐ New well ☒ Reconditioned *Method :* ☐ Dug ☐ Bored ☐ Driven
☐ Deepened ☐ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 0 ft.
Depth of completed well 200ft.

CONSTRUCTION DETAILS

Casing Installed:
☐ Welded ______" Diam. from ______ ft. to ______ ft.
☒ Liner installed 4" Diam. from +2 ft. to 190 ft.
☐ Threaded ______" Diam. From ______ ft. to ______ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used ____________

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☒ Yes ☐ No ☐ K-Pac Location ____________

Manufacturer's Name Johnsons

Type Prepack Model No. ____________

Diam. 5" Slot size 10 from 190 ft. to 200 ft.

Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand ______
Materials placed from ______ ft. to ______ ft.

Surface Seal: ☐ Yes ☒ No To what depth? ______ ft.

Material used in seal ____________

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? ____________ Depth of strata ____________

Method of sealing strata off ____________

PUMP: Manufacturer's Name ____________
Type: ____________ H.P. ____________

WATER LEVELS: Land-surface elevation above mean sea level ______ ft.

Static level N/A ft. below top of well Date ____________

Artesian pressure ______ lbs. per square inch Date ____________

Artesian water is controlled by ____________ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes, by whom? ____________

Yield: ______ gal./min. with _____ ft. drawdown after ______ hrs.
Yield: ______ gal./min. with _____ ft. drawdown after ______ hrs.
Yield: ______ gal./min. with _____ ft. drawdown after ______ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____________

Bailer test ______ gal./min. with ______ ft. drawdown after ______ hrs.

Airtest N/A gal./min. with stem set at ______ ft. for ______ hrs.

Artesian flow ______ g.p.m. Date ____________

Temperature of water ______ Was a chemical analysis made? ☐ Yes ☒ No

CURRENT

Notice of Intent No. WE13821

Unique Ecology Well ID Tag No. BCL-659

Water Right Permit No. ____________

Property Owner Name KEVIN DAVEY

Well Street Address 16724 E. El;der Rd.

City Rockford County Spokane

Location NE1/4-1/4 NE1/4 Sec 01 Twn 23N R 44 **EWM** ☒ **Or WWM** ☐
(s, t, r Still REQUIRED)

Lat/Long Lat Deg ____ Lat Min/Sec ____
Long Deg ____ Long Min/Sec ____

Tax Parcel No. (Required) 43121.9010

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Clean out silt with water	120	200

RECEIVED
DEC 21 2011
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Start Date 11/14/11 Completed Date 11/15/11

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Louie Hanner
Driller/Engineer/Trainee Signature
Driller or trainee License No. 1472
IF TRAINEE: Driller's License No:
Driller's Signature:

Drilling Company H2O Well Service Inc.
Address 582 W. Hayden Ave.
City, State, Zip Hayden , ID. 83835
Contractor's
Registration No. H2OWESI101DW Date 11/16/11

W04

WATER WELL REPORT

ECOLOGY

181903

Construction/Decommission (*"x" in circle*)
☒ Construction
○ Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number* W 215557

CURRENT
Notice of Intent No. W215557
Unique Ecology Well ID Tag No. AKW 032
Water Right Permit No.

Property Owner Name LLOYD L. LASZ
Well Street Address E 13910 Stoughton RD
City VALLEY FORD County: SPOKANE
Location ____1/4- 1/4 NW 1/4 Sec 2 Twn 23 R 44 [✓ EWM] or WWM *circle one*
Lat/Long: (s,t,r still REQUIRED) Lat Deg ____ Lat Min/Sec ____
Long Deg ____ Long Min/Sec ____
Tax Parcel No. 43022.9015

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ____

TYPE OF WORK: Owner's number of well (if more than one) 2
☒ New Well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven
☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 170 ft.
Depth of completed well 170 ft.

CONSTRUCTION DETAILS:
Casing Installed: ☒ Welded 6" Diam. from +3 ft. to 39 ft.
☒ Liner installed 4" Diam. from -6 ft. to 170 ft.
☐ Threaded ____" Diam. from ____ ft. to ____ ft.

Perforations: ☒ Yes ☐ No
Type of perforator used SKI 11 SAW
SIZE of perfs 6 in. by 1/4 in. and no. of perfs 65 from 130 ft. to 170 ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location ____
Manufacturer's Name ____
Type ____ Model No. ____
Diam.____ Slot Size ____ from____ ft. to ____ ft.
Diam.____ Slot Size ____ from____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☐ No ☐ Size of gravel/sand ____
Materials placed from____ ft. to ____ ft.

Surface Seal: ☒ Yes ☐ No ☐ To what depth? 0-21 ft.
Materials used in seal BENTNITE
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water?____ Depth of strata ____
Method of sealing strata off____

PUMP: Manufacturer's Name ____
Type: ____ H.P. ____

WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level 100 ft. below top of well Date 10-26-05
Artesian pressure____ lbs. per square inch Date ____
Artesian water is controlled by ____
(cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? ☐ Yes ☐ No If yes, by whom? ____
Yield:____ gal./min. with____ ft. drawdown after ____ hrs.
Yield:____ gal./min. with____ ft. drawdown after ____ hrs.
Yield:____ gal./min. with____ ft. drawdown after ____ hrs.
Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____
Bailer test____ gal./min. with ____ ft. drawdown after____ hrs.
Airtest 10 gal./min. with stem set at 166 ft. for 1 hrs.
Artesian flow____ g.p.m. Date____
Temperature of water____ Was a chemical analysis made? ☐ Yes ☒ No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
BROWN CLAY	0	35
MED FRAC BASALT	35	51
BROKEN BASALT (w) CLAY	51	60
MED / FRAC / BASALT	60	141
BROKEN BASALT (w) CLAY BROWN	141	170

RECEIVED
OCT 3 1 2005
OCT. 31, 2005
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Start Date 10-24-05 Completed Date 10-26-05

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to the best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) JEFF SHARP
Driller/Engineer/Trainee Signature Jeff Sharp
Driller or Trainee License No. 2586

If trainee, licensed driller's Signature and License no. ____

Drilling Company GREEN MT CONST & Drill INC
Address N 18918 GREEN MT LN
City, State, Zip NEWMAN - LK WA 99025
Contractor's Registration No. GREENMC002PJ Date ____

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 4/01)

W01

438253

ECOLOGY

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

CURRENT

Notice of Intent No. WE13519

Unique Ecology Well ID Tag No. BCE816

Water Right Permit No.

Property Owner Name Mahn LLC

Well Street Address Highway 27

City Mica County Spokane

Location SW1/4-1/4 NW1/4 Sec 35 Twn 24N R 44E EWM ☐ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long Lat Deg ____ Lat Min/Sec ____

Long Deg ____ Long Min/Sec ____

Tax Parcel No. (Required) 44352.9003

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number ____

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ____

TYPE OF WORK: Owner's number of well (if more than one) 2

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 80 ft.
Depth of completed well 80ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 6" Diam. from +1 ft. to 19 ft.
☒ Liner installed 4" Diam. from 10 ft. to 80 ft.
☐ Threaded _" Diam. From _ ft. to _ ft.

Perforations: ☒ Yes ☐ No

Type of perforator used bit

SIZE of perfs 3/8in. by ____ in. and no. of perfs ____ from 50ft. to 80ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location ____

Manufacturer's Name ____

Type ____ Model No. ____

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand ____

Materials placed from ____ ft. to ____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 18+ft.

Material used in seal Baroid Bentonite

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? ____ Depth of strata ____

Method of sealing strata off ____

PUMP: Manufacturer's Name ____

Type: ____ H.P. ____

WATER LEVELS: Land-surface elevation above mean sea level ____ ft.

Static level 13ft. below top of well Date 9/9/2011

Artesian pressure ____ lbs. per square inch Date ____

Artesian water is controlled by ____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? ____

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____

Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.

Airtest 100+ gal./min. with stem set at ____ ft. for ____ hrs.

Artesian flow ____ g.p.m. Date ____

Temperature of water ____ Was a chemical analysis made? ☐ Yes ☒ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Topsoil	0	2
Clay, Brown & Medium	2	9
Basalt, Fractured w/	9	12
Clay, Brown		
Basalt, Medium to Soft	12	25
Basalt, Medium	25	30
Basalt, Broken	30	33
Basalt, Medium	33	47
Basalt, Fractured w/	47	50
Shale, Brown		
Basalt, Highly Fractured	50	65
Water 100+gpm		
Basalt, Soft	65	79
Shale, Grey & Medium	79	80

RECEIVED
OCT 27 2011
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Start Date 9/8/2011 Completed Date 9/9/2011

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Brian Mosset

Driller/Engineer/Trainee Signature

Driller or trainee License No. 2139

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company J & J Drilling, Inc.

Address 17313 East Linke Road

City, State, Zip Greenacres , WA, 99016

Contractor's Registration No. JJDRII-177KU Date 9/16/2011

180682

W29

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)*

● Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ____

CURRENT

Notice of Intent No. WE03941

Unique Ecology Well ID Tag No. ALR979

Water Right Permit No. ____

Property Owner Name Mark Weber

Well Street Address Washington Road

City ____ County Spokane

Location SW1/4-1/4 NE 1/4 Sec 36 Twn 24 R 44 EWM ☑ or WWM ☐ circle one

Lat/Long (s, t, r Still **REQUIRED**) Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No. ____

PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ____

TYPE OF WORK: Owner's number of well (if more than one) ____

☑ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven

☐ Deepened ☐ Cable ☑ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 340 ft.

Depth of completed well 340 ft.

CONSTRUCTION DETAILS

Casing Installed: ☑ Welded 6 " Diam. from +1 ft. to 19 ft.

☑ Liner installed 4 " Diam. from 7 ft. to 340 ft.

☐ Threaded ____ " Diam. from ____ ft. to ____ ft.

Perforations: ☑ Yes ☐ No

Type of perforator used 3/8" Spade Bit - See perf note below right

SIZE of perfs ____ in. by ____ in. and no. of perfs ____ from ____ ft. to ____ ft.

Screens: ☐ Yes ☑ No ☐ K-Pac Location ____

Manufacturer's Name ____

Type ____ Model No. ____

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☑ No ☐ Size of gravel/sand ____

Materials placed from ____ ft. to ____ ft.

Surface Seal: ☑ Yes ☐ No To what depth? 18+ ft.

Material used in seal Baroid Bentonite

Did any strata contain unusable water? ☐ Yes ☑ No

Type of water? ____ Depth of strata ____

Method of sealing strata off ____

PUMP: Manufacturer's Name ____

Type: ____ H.P. ____

WATER LEVELS: Land-surface elevation above mean sea level ____ ft.

Static level 62 ft. below top of well Date 7/20/05

Artesian pressure ____ lbs. per square inch Date ____

Artesian water is controlled by ____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☑ No If yes, by whom? ____

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____

Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.

Airtest 5+ gal./min. with stem set at ____ ft. for ____ hrs.

Artesian flow ____ g.p.m. Date ____

Temperature of water ____ Was a chemical analysis made? ☐ Yes ☑ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Clay, Brown and Hard	0	3
Granite, Decomposed	3	9
Granite, Medium w/ Fractures	9	134
Granite, Fractured - Water 2gpm	134	137
Granite, Medium w/ Fractures	137	244
Granite, Slightly Fractured	244	271
Granite, Highly Fractured - Water 3+gpm	271	307
Granite, Soft to Medium	307	340
Set pump at 320 feet.		
PVC perforated from 80 to 100ft, 140 to 160ft,		
220 to 240ft, 300 to 340ft		

RECEIVED
OCT - 5 2005
DEPARTMENT OF ECOLOGY
EASTERN REGION

Start Date 7/18/05 Completed Date 7/20/05

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) Don Anderson

Driller/Engineer/Trainee Signature Don Anderson

Driller or trainee License No. 1447

If TRAINEE,
Driller's Licensed No. ____
Driller's Signature ____

Drilling Company J & J Drilling, Inc.

Address S. 5613 Linke Rd.

City, State, Zip Greenacres, WA 99016

Contractor's Registration No. JJDRII-177KU Date 7/22/05

Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 3/05)

The Department of Ecology does NOT warrant the Data and/or Information on this Well Report.

W37

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W37742
UNIQUE WELL I.D. #
Water Right Permit No.

(1) **OWNER:** Name PAUL LAZANIS Address P.O. BOX 163 MICA, WA.

(2) **LOCATION OF WELL:** County SPOKANE - 1/4 NE 1/4 Sec 36 T. 24 N., R. 44E W.M.

(2a) **STREET ADDRESS OF WELL** (or nearest address) WASHINGTON Rd.

(3) **PROPOSED USE:** ☒ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (If more than one)
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 300 feet. Depth of completed well 300 ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 6" Diam. from +1 ft. to 39 ft.
Welded ☒ 4" Diam. from 5 ft. to 300 ft.
Liner installed ☒
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 39 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 35 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
APPROX. 3 GPM BY AIRTEST "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
TOPSOIL	0	1
BRN. CLAY - FIRM	1	9
DECOMP. GRANITE - SOFT	9	25
DECOMP. GRANITE - MED.	25	34
GRANITE - MED. TO HARD,	34	300
FRACTS. 1GPM @ 150		
3 GPM @ 200		

RECEIVED
[illegible] 1 4 1994
DEPARTMENT
EASTERN

Work Started 9/22 19. Completed 9/23 1994

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME CARPENTER DRILLING CO. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address E. 14905 LONGFELLOW SPOKANE, WA.
(Signed) (WELL DRILLER) License No. 1278
Contractor's Registration No. CARPEDC817PE Date 9/27, 1994

(USE ADDITIONAL SHEETS IF NECESSARY)

Appendix B

Sampling and Analysis Plan

FINAL

Sampling and Analysis Plan Grain Handling Facility at Freeman, Freeman, Washington

Prepared for

Washington State Department of Ecology

On behalf of

Union Pacific Railroad and CHS, Inc.

April 2016

Contents

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Appendices

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Figures

Acronyms and Abbreviations

ºC	Celsius
ASTM	American Society for Testing and Materials
bgs	below ground surface
CH2M	CH2M HILL Engineers, Inc.
CSM	conceptual site model
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
eV	electron volt
FD	field duplicate
FS	Feasibility Study
GHFF	Grain Handling Facility at Freeman
HSP	Health and Safety Plan
ID	identification
IDW	investigation-derived waste
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act
PID	photo-ionization detector
PPE	personal protective equipment
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RI	Remedial Investigation
ROW	right-of-way
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
SOW	scope of work
TAT	turnaround time
UPRR	Union Pacific Railroad
VOC	volatile organic compound

SECTION 1

Introduction

This Sampling and Analysis Plan (SAP) has been prepared for the Remedial Investigation (RI) of the Grain Handling Facility at Freeman (GHFF) located in Freeman, Washington (Figure 1). For the purposes of this work plan and per the Model Toxics Control Act (MTCA), the Site refers to the GHFF and any parcels that may be impacted from contamination emanating from the GHFF. This SAP is the primary guide that describes the methods and procedures to be followed to achieve the field investigation objectives.

The objectives of the RI are to generate analytical data from groundwater, soil, and soil vapor sampling to address identified data gaps from previous site investigations, update the conceptual site model (CSM), and provide data that may be used for potential future remedial activities.

The SAP describes the design of the RI sampling effort, associated procedures and documentation, and has been organized into the following sections:

- **Sampling Overview –** Provides a summary of sampling procedures, locations, and analytical parameters.
- **Field Documentation –** Describes procedures for groundwater, soil, and soil vapor sample identification (ID), field notes, and completion of chain-of-custody paperwork.
- **Sample Collection Procedures –** Describes equipment and procedures related to the collection of samples.
- **Data Management and Reporting** – Describes the data management review and validation process and the RI Report.
- **Project Organization –** Describes the organizations and personnel that will be directly involved in this project.

Phase 1 field investigation activities related to the RI are anticipated to occur in early 2016 and will consist of a site reconnaissance, installation of soil borings, installation of monitoring wells, and collection of soil, groundwater, and soil vapor samples.

In the event that additional data are needed to answer key questions, the updated CSM will be used to develop an expanded site investigation (Phase 2). RI activities that would typically be considered for an expanded site investigation may include:

- Installation and sampling of additional monitoring wells
- Installation of additional soil borings and collection of soil and groundwater samples
- Sampling of additional water wells near the Site
- Soil vapor samples collected near the Freeman School District buildings

The SAP describes associated procedures and documentation for each of the anticipated investigation components.

SECTION 2

Sampling Overview

2.1 Objective

The objective of the RI is to generate analytical data from soil and groundwater sampling to address identified data gaps from previous site investigations, further expand the CSM, and provide data that may be used for potential future remedial activities. Field activities to be performed as part of the RI include the following:

Task 1 - Phase I Remedial Investigation

The proposed soil investigation activities under this RI/FS Work Plan consists of the following:

- Explore subsurface conditions using a total of 33 soil borings at the GHFF and surrounding areas. Of the 33 soil borings, 8 will be advanced on the Freeman School District Campus, 5 soil borings will be advanced at the 2013 soil boring locations near the GHFF where carbon tetrachloride was detected in soil, 8 soil borings advanced in the public right-of-way (ROW), and up to 12 soil borings will be advanced near the GHFF and UPRR ROW. The number and locations of soil borings are subject to change during implementation of the RI. The drilling program will be adaptively managed using a 24-hour turnaround time (TAT) for soil sample analysis. The proposed locations presented in this RI/FS Work Plan are intended to provide a starting point for RI implementation. Soil borings will be advanced in unconsolidated material using sonic drilling to refusal at or near competent bedrock. Anticipated soil boring depth will be approximately 50 feet bgs. Proposed soil borings are presented in Figure 2.
- Soil samples will be collected during drilling activities from the retrieved continuous soil cores. Soil samples will be screened for the presence of VOCs using a photo-ionization detector (PID) with an 11.7 electron volt (eV) lamp for head space analysis. Field screening procedures are provided in this SAP. One soil sample will be collected for analytical testing at 5-foot intervals from each soil boring. Additional soil samples may be submitted for laboratory analysis based on field screening results.
- Submit soil samples to a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method 8260B. An onsite mobile laboratory will be utilized for analysis of all soil samples.
- Collect groundwater grab samples at the unconsolidated/consolidated material contact in each soil boring, if present. Following refusal and extraction of the drill rod and sampler, the presence of groundwater will be monitored in each soil boring. The groundwater sampling method will be determined by the quantity and/or recharge measured. Groundwater samples will be analyzed by a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method 8260B. An onsite mobile laboratory will be utilized for analysis of the groundwater grab samples.

The proposed groundwater investigation activities under this RI/FS Work Plan consists of the following:

- Installation of six basalt groundwater monitoring wells; one located at the GHFF, two located within the UPRR ROW, and three located on the Freeman School District Campus. It is anticipated that the wells will be installed to a depth of at least 140 feet bgs depending on site conditions during drilling. The monitoring well borings will be advanced using air rotary drilling. No soil samples will be collected during borehole advancement. The proposed monitoring well locations are co-located with the sonic soil borings. The depth to bedrock will be known at each location prior to the advancement of the monitoring well borings. The proposed monitoring well locations are shown in Figure 2. Well locations are subject to Ecology approval.

- Potential installation of groundwater monitoring wells targeting a shallow or perched water bearing zone at the GHFF or surrounding areas. The installation depth of these wells is uncertain and will be based on the presence of a shallow or perched water-bearing zone during soil boring advancement discussed in Section 5.1.1. The driller will be equipped to install shallow wells as field conditions dictate. Well locations will be subject to Ecology approval.
- All monitoring wells will be completed as 2-inch Schedule 40 polyvinyl chloride (PVC) with at least 10 feet of 0.020 inch slotted well screen.
- Complete quarterly of groundwater sampling at the newly installed groundwater monitoring wells (MW-1 to MW-6), and at water wells available to sample listed in Table 1 provided access agreements can be obtained. Known water well locations are shown on Figure 4 of the Work Plan. Quarterly sampling will be conducted until the Final RI/FS report is approved by Ecology. Laboratory reports will be provided to Ecology's Project Manager within 60 days of each sampling event. Parcels with structures and potential water wells directly south of the GHFF and adjacent to the Freeman School District Campus are shown in Figure 5 of the Work Plan. UPRR will draft access agreements and contact property owners to request permission to access wells for sampling. If additional residential wells are discovered in the vicinity of the contamination they may also be sampled.
- Submit groundwater samples to a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method 8260B. Groundwater samples collected from the basalt monitoring wells and residential wells will be analyzed using a fixed lab. Groundwater samples collected from potential shallow monitoring wells will be analyzed using the onsite mobile laboratory.
- All monitoring well and soil boring locations will be surveyed following drilling. Existing residential wells proposed for sampling as listed in Table 1 will also be surveyed.

Water levels will be measured in all available wells to determine the potentiometric surface of groundwater. The proposed soil vapor sampling activities under this RI/FS Work Plan consists of the following:

- A total of 4 soil vapor sampling locations are proposed in close proximity to existing school buildings on the Freeman School District Campus (Figure 2). Temporary soil vapor probes will be installed at the four locations in shallow soil (approximately 5-10 feet bgs) and Summa canisters will be used to collect the vapor samples. Samples will be submitted to a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method TO-15. Depending on the results of this initial soil vapor sampling in conjunction with the soil and groundwater investigation, additional evaluation, including utility corridors as a preferential pathway, of the vapor intrusion pathway may be completed during the Phase II remedial investigation.

Task 2 - Phase 2 Remedial Investigation

1 - Phase 2 Remedial Investigation

Following completion of the Phase I investigation, if additional field work is warranted, CH2M proposes in lieu of submitting an new work plan, that a brief memorandum explaining rationale for additional field work and figure with proposed locations of additional monitoring wells and additional evaluation of the vapor intrusion pathway be submitted to Ecology for review and approval. This process will reduce administrative time and allow for additional data collection to fill possible data gaps and fully characterize nature and extent of VOCs in soil and groundwater in a timely manner. Additional detail is provided in Section 5.3 of the RI/FS Work Plan.

2.2 Sampling Methods

This section provides information regarding the design of the RI field efforts, including the general sampling approach, schedule, and proposed analytes for laboratory analyses. Field activities could consist of borehole drilling, monitoring well installation, soil sampling, soil vapor sampling and groundwater monitoring. All fieldwork will be performed in accordance with the approved project Health and Safety Plan (HSP). Details and requirements of the sampling methods are provided in the Standard Operating Procedures (SOPs) in Section 4.3 of this SAP and Appendix C.

2.2.1 Soil Investigation

Drilling activities will be conducted at the Site to characterize subsurface soils, identify potential carbon tetrachloride source areas, and measure and sample groundwater at the Site. Soil samples will be collected during drilling activities based on field observations and at specific depths, as described in Section 4.

It is anticipated that a total of 33 soil borings (includes 6 soil borings where deep monitoring wells are proposed) will be installed near the GHFF to investigate subsurface soil conditions and to screen for carbon tetrachloride and chloroform. Borings will be drilled using a truck-mounted sonic drill and will be advanced to refusal at the competent bedrock interface ranging from a few feet to approximately 50 feet bgs. Continuous sonic cores will be retrieved, logged, and screened for volatile organic compounds (VOCs) and sampled. In the event that shallow or perched groundwater is encountered during drilling with the sonic rig, the shallow monitoring wells will be installed utilizing the sonic drill rig.

It is anticipated that six basalt monitoring wells will be co-located with the sonic driven soil borings. Monitoring well boreholes will be advanced using a truck-mounted air rotary drill rig to complete advancement to the target water-bearing zone. The depth to bedrock will be known at each location prior to the advancement of the monitoring well borings.

The proposed soil boring and basalt monitoring well locations are shown in Figure 2. Well construction details, including well depth and screened interval will be provided subsequent to completed installation activities, which are tentatively scheduled for early spring 2016. Well construction as-built drawings will be included in Appendix A of this SAP, upon completion of well installation activities.

2.2.2 Groundwater Investigation

Groundwater samples will be collected no less than 48 hours after well development activities are completed on the newly installed monitoring wells. Groundwater samples will be collected using either peristaltic or submersible pumps, based on the measured depth to groundwater.

Where accessible, the field team will also sample local domestic water wells. Upon approval of site access, grab water samples of domestic and agricultural water wells will be collected using a spigot or valve as close to the well location as possible. Groundwater samples will be collected as described in Section 4.

A list of local water wells and owners that will be contacted for site access for sample collection are provided in Table 1. The six new monitoring well locations are shown in Figure 2.

Table 1. Water Wells Near the Grain Handling Facility
Sampling and Analysis Plan, Grain Handling Facility at Freeman

Well Number	Well Owner Name	Well Opening Depth (feet bgs)	Current Use
WS5	Freeman School District #358	52 - 215	Primary Drinking Water Well for the School

Table 1. Water Wells Near the Grain Handling Facility
Sampling and Analysis Plan, Grain Handling Facility at Freeman

Well Number	Well Owner Name	Well Opening Depth (feet bgs)	Current Use
W20	Larry Marlow	64 - 100	Not in Operation
W26	Freeman School District (formerly Virg/Elsie Marlow)	44 - 140	Not in Operation
W30	Joel Reed	59 - 180	Active, Domestic
N/A	Freeman Store	Well log not found	Active, Domestic
N/A	Bryant and Charlene Silva (formerly Mick Stark)	28-180	Unknown
N/A	Duane Lashaw (formerly Robert Brandt)	44-220	Unknown
N/A	Scott and Priscilla Marlow	Unknown	Unknown
N/A	Mary Rote	Unknown	Unknown
N/A	Raymond Davey	Unknown	Unknown
N/A	Arlo and Lois Randall	Unknown	Unknown

2.2.2.1 Groundwater Grab Sampling

Groundwater is anticipated to be present at the contact between unconsolidated and consolidated material. Refusal using the sonic drilling will likely occur at competent bedrock. Following refusal and removal of the drill rod and sampler, the presence of groundwater and recharge rate, if applicable, will be measured.

2.2.3 Soil Gas Investigation

A soil gas investigation will be performed as part of Phase I RI activities to investigate if VOCs are volatilizing and creating an inhalation hazard for facilities at the Freeman School. Four (4) temporary soil gas borings will be installed either by drill or hand-auger (determined by the depth of the borings) near three buildings on the Freeman School property. Soil gas probes will be temporarily installed to characterize subsurface soils and identify potential CT vapor areas. Soil gas probe locations are shown in Figure 2.

Soil gas probe installation depths have not been determined, but will be finalized prior to the Phase I investigation. Soil gas borings will be advanced either using a truck-mounted sonic or direct push technology (DPT) drill rig for deep installation, or performed manually using an approximate 3-inch diameter hand auger (for soil probes < 10 feet). Soil gas probes will be installed in accordance with the SOPs located in Appendix C.

Stainless steel soil gas probes and Teflon® tubing will be used. To install shallow probes (approximately 10 feet bgs), a boring will be advanced at each location using a hand auger, and each probe will be installed and checked for leaks. Deeper probes (greater than 10 feet bgs) will be installed using DPT or sonic drilling technology. Soil cuttings and cores created during probe installation will be screened for the presence of VOCs using a PID. The PID results will be used to help identify potential “hot spots.”

Soil gas probe construction details, including well depth and screened interval, will be provided subsequent to completion of Phase I investigation activities, which are tentatively scheduled for early spring 2016. Soil gas well construction as-built drawings will be included in Appendix A, upon completion of probe installation activities.

Soil gas samples will be collected in accordance with the Soil Gas Probe Sampling SOP (Appendix C). Soil gas samples will be collected using lab-provided Summa ® canisters and submitted for VOC analysis by EPA Method TO-15.

Based on the results of the Phase I soil gas probe results, additional soil gas probe testing may be performed as part of the Phase 2 RI investigation. The number and location of soil gas probes will be determined after analyzing the Phase I soil gas data. It will be determined at a later date if additional probes will be installed with permanent flush-mounted surface completions, allowing future sampling as necessary, or completed as temporary probes and abandoned shortly after use. SOPs for both permanent and temporary soil gas probe construction are provided in Appendix C.

2.3 Project Schedule

The project schedule provided in the Enforcement Order No. DE 12863 (Ecology, 2015) is summarized in Table 7-1 of the RI/Feasibility Study (FS) Work Plan.

Phase I monitoring well and soil boring installation activities are planned for the spring 2016. It is anticipated that all drilling and well installation activities will be completed in approximately 20 business days. Drilling will consist of both sonic (soil borings and potential shallow monitoring wells) and air rotary (basalt monitoring wells) methods and utilization of each drilling method will occur concurrently during the RI. After well installation has been completed, each of the newly installed wells will be developed by the driller.

Groundwater monitoring activities are expected to take up to 2 days for each event. The actual duration will be based on the number of offsite well locations (Table 1) where owners have granted access to sample.

2.4 Analytical Parameters

Soil and groundwater will be analyzed for VOCs by EPA Method 8260B. Soil samples will be collected using Ecology Method 5035A using Encore, or equivalent, sampling devices for collection of samples for volatile analysis. Air and groundwater (monitoring well and water well) samples will be submitted for analyses to Pace Analytical Laboratories, a Washington State accredited laboratory located in Tukwila, Washington. Soil and groundwater grab sample analysis will be performed onsite by their mobile laboratory. Analytical methods and typical bottle and preservation requirements for soil and groundwater samples are presented in the Quality Assurance Project Plan (QAPP).

Soil gas samples will be analyzed for VOCs by EPA Method TO-15. Air samples will be collected from the soil vapor wells using lab-supplied Summa ® canisters. Air samples will be submitted to Pace for analysis. Analytical methods and container requirements for soil vapor samples are presented in the QAPP.

SECTION 3

Field Documentation

This section presents sample numbering, documentation, and chain-of-custody procedures. The sampling lead will record field measurements and observations in a bound field notebook or dedicated field sampling forms and boring logs. Copies of the field forms and boring logs are provided in Appendix B. The sampling lead will maintain field documentation to provide a record of significant observations, measurements, personnel, and other noteworthy observations for each sampling effort. The recorded field documentation is intended to provide sufficient data and observations to enable participants to reconstruct the respective sampling events, if necessary. Additional documentation details and requirements are provided in the Field Logbook Standard Operating Procedure (SOP) in Appendix C.

Subsequent sections of the SAP provide additional detail of the field documentation (such as sampling methods, sample handling, and field quality control [QC]), sample ID, and sample documentation.

3.1 Sample Identification

Sample labels will be affixed to containers before sample collection and will be legibly written in indelible ink. In addition to the sample ID, spaces are also provided on the sample label to record the following information at the time of actual sample collection.

- Initials of personnel collecting samples
- Date and time of sample collection to the nearest 5 minutes
- Requested analyses

Soil Sampling Identification

Soil samples collected during drilling activities will be labeled as follows:

Boring/Monitoring well ID – SS – Sample Interval (in feet bgs)

For example, a soil sample collected from boring MW-2 from 6 to 8 feet bgs at 1 P.M. would be labeled as follows:

MW2-SS-6-8 with a sample time of **13:00**

Groundwater Sample Identification

Groundwater sampling labels will use the following system for designation:

Well ID – Year-Month

For example, a groundwater sample collected from MW-03 on March 21, 2016 at 3 P.M. would be labeled as follows:

MW03-1603 with a sample time of **15:00**

Soil Gas Sample Identification

Soil gas sampling labels will use the following system for designation:

Soil Gas Probe ID – Year-Month

For example, a soil gas sample collected from SG-02 on March 21, 2016 at 3 P.M. would be labeled as follows:

SG02-1603 with a sample time of **15:00**

Field Duplicates

Groundwater field duplicates will be collected at a frequency of 10 percent (1 in 10 samples collected). A minimum of two FDs will be collected for groundwater sampling with one duplicate collected from one of the six newly installed monitoring wells, and one duplicate collected from domestic water wells for each groundwater sampling event. Based on the total number of groundwater monitoring wells installed as part of Phase I and Phase 2 activities, additional field duplicates may be collected.

A fictitious sample ID number and sample time will be assigned to each FD sample. The sample ID for all groundwater FDs will be “FD” with a fictitious time. Soil sample FDs will be denoted with a “SS” prefix (SSFD), soil gas samples denoted with a “SG” prefix (SGFD) and will be numbered sequentially, in the order they are collected. The sampling lead will document in the field book and the field forms where the duplicate parent sample was collected; however, the chain-of-custody form will not indicate where the FD was collected.

3.2 Sample Documentation

Specific information and observations should be recorded during sampling on dedicated sampling field data sheets or in a bound field notebook. The most important information to document includes the following:

- General information, including sampling personnel, weather conditions, subcontractors onsite, short summaries of any tailgate or safety meetings, and description of the day’s scheduled tasks
- Observations and evidence regarding utility clearances before any ground disturbances
- Start and stop times for subcontractor work and other field activities
- Borehole logging data, soil observations, photo-ionization detector (PID) screening data, and well construction details during drilling activities
- Monitoring well purging data (including purge rate, total volume removed during purging, and water levels at the beginning and during the purging process)
- Field parameters (for example, temperature, pH, and specific conductance) collected during well purging and water well sampling
- Sampling data including sample ID, types of bottles filled, and analyses to be performed on each bottle, as well as method of collection (peristaltic or submersible pump, or grab), visual description of the water, and date and time samples were collected
- Any equipment problems and troubleshooting measures and any health and safety considerations or incidents
- Any other information, observations, or data that is related to investigation and sampling activities

3.3 Site Photographs

Photographs will be collected to document site conditions, subcontractor activities, field sampling, monitoring well and soil gas probe installation, and for any other pertinent observations or conditions. Photographs will be necessary to assist in soil logging of sonic core intervals during drilling activities, and at least one photo per core interval with scale should be taken. Photographs will also be taken when potential impacts are observed in soil cores. Additional photographs will be taken of newly installed monitoring wells, off-property water wells, and soil gas probes with a dry erase placard indicating the well or probe ID.

3.4 Chain-of-Custody for Samples

The contracted laboratory will supply a chain-of-custody form that the sampler fills in to record the sampling event and request analyses. Sample management for samples collected in the field will follow specific procedures outlined in the Sample Security and Packaging SOP (Appendix C) to make sure the samples are not tampered with and to protect sample integrity during storage and shipment. The possession of samples will be traceable from the time they are collected through the time they are analyzed by the contract laboratory to verify sample authenticity and data defensibility.

The following information is included in the chain-of-custody form:

- Project name
- Sample ID
- Signature of sampler
- Contact information of the sampler or project manager
- Date and time of samples collected
- Place of collection
- Type of sample (soil, surface water, or groundwater)
- Number of sample containers
- Date and time when sample possession was relinquished
- Signature of person relinquishing samples
- Signature of receiver at laboratory
- Any notes or instructions for the contract laboratory

SECTION 4

Sample Collection Procedures

The following information describes what is needed to collect samples and how to collect samples.

4.1 Sampling Equipment and Supplies

The following equipment should be available for collecting soil and groundwater samples at the Site:

General Field Supplies and Equipment

- Cooler and ice or chilled blue ice
- Ziploc bags
- Field camera
- Field notebook (containing SAP, HSP, QAPP, and other pertinent documents, tables, and figures)
- Permanent marking pens
- Sample labels
- Chain-of-custody seals
- Personal protective equipment (PPE)
- Nitrile gloves
- Decontamination supplies (discussed further in Section 4.5)

Soil Sampling

- Stainless steel sampling spoons
- Laboratory-provided sampling devices (Encore or equivalent), if required
- PID with 11.7 eV lamp
- Soil boring and sampling field forms
- Bucket and containers for decontamination water
- Tape measure
- Laboratory-supplied soil sample containers

Groundwater

- Socket set and well cap keys for accessing wells (flush mount)
- Well keys
- Peristaltic and/or submersible pump
- Tubing
- Water level probe
- Water quality probe with flow-through cell
- Buckets and containers for purge water
- Laboratory-supplied groundwater sample containers
- Groundwater and soil sampling field forms

Soil Gas Sampling

- Adjustable wrench and other hand tools
- Swagelok ® or equivalent fittings and barbs for tubing connections.
- Vacuum pump
- Electrical generator
- PID
- Teflon ® or equivalent tubing
- Laboratory-supplied air sample containers
- Soil Gas sampling field forms

4.2 Calibration of Field Equipment

The following field equipment will be used to support the groundwater water sampling activities:

- PID with 11.7 eV lamp – used to detect VOC concentrations in soil samples and during drilling activities
- Electronic groundwater level sounder (groundwater only—used for static level measurement and not used for collecting a water quality sample)
- Water quality meter (Horiba U-52 or equivalent) that provides readings for the following groundwater parameters: pH, specific conductance, dissolved oxygen, oxidation-reduction potential, turbidity and temperature

Further details regarding equipment parameter detection requirements are provided in the QAPP.

Calibration will be performed by the field team leader at the start of each day and in the afternoon according to the manufacturer's specifications. Recalibration will be performed during field activities, as needed, if inconsistent readings are obtained as determined by the field team leader. A post-calibration check will be performed at the end of each field day to determine if the equipment drifted out of calibration. Calibration information will be recorded in the field logbook.

4.3 Sample Collection

Brief descriptions of the methods that will be used to collect soil and groundwater samples are provided as follows.

4.3.1 Soil Sample Collection

Sonic core intervals will be retrieved, logged, screened for VOCs, and sampled as described in the following:

- Observe the core interval for any staining or evidence of contaminants.
- Collect representative photographs of the core interval using a dry erase board to indicate the following pertinent information and then positioned behind the core so it is visible in the photo:
  - Project site
  - Borehole ID
  - Depth interval of core
  - Time and date
  - Which end is top of the core
- Using the PID with an 11.7 eV lamp, carefully screen the core for VOCs following the procedures described in the PID Screening SOP (Appendix C). Take care not to contaminate the tip of the PID with soil. Record all readings (including non-detects) in the field log book/field forms.
- Log the core and visually classify soils according to the American Standard Testing Method (ASTM) visual-manual procedure, which is based on the Unified Soils Classification System (USCS).
- Soil samples will be collected using an Encore or equivalent soil-sampling device. Soil samples will be collected according to the procedures provided by the analytical laboratory for the provided sampling method and device.
- Using the methods required by the analytical laboratory, carefully collect a representative sample for the area of the core interval with highest detected VOC concentrations indicated by the PID. If multiple zones of contamination are observed, sample each of the discrete zones within the core that exhibit VOC readings. Multiple soil samples may be collected per boring.

- Carefully place collected soil in the appropriate sample containers supplied by the analytical laboratory.
- If elevated VOCs are not detected in the core interval, a representative soil sample will be collected at 20 feet bgs and from the termination depth of the boring to confirm impacts are not present. Soil samples will be submitted to the contracted laboratory for VOC analysis (8260B).
- Securely place sample containers into the laboratory-supplied sample cooler with ice to maintain 4 degrees Celsius (^{o}C).
- Record any deviations from the specified sampling procedures or any obstacles encountered.
- Complete a chain-of-custody form for all samples. Soil samples will be analyzed by EPA Method 8260B onsite by Pace Analytical using a mobile laboratory and a 24-hour TAT.

4.3.2 Monitoring Well Sample Collection

The sampling procedure used to monitoring groundwater in the newly installed wells for the Site are based on the low-flow method as described in *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers* (EPA, 2002). The following general procedures are recommended at the time of the sampling and are described in the Low-Flow Sampling SOP (Appendix C). Groundwater sampling will be conducted by sampling personnel who are experienced with sampling using the low-flow method. The following text provides a concise description of the low-flow sampling procedures.

- Upon arrival at each well, verify and record the ID of the monitoring well and inspect the wellhead to verify that the protective monument (flush-mount) and well cap are intact, secured, and in proper working order.
- Prior to purging and sampling activities, record the static water level to the nearest 0.01 foot using a decontaminated well sounder (water-level indicator) in accordance with the Water Level SOP (Appendix C)
- Well purging will be performed using a peristaltic pump or a portable submersible pump, based on the observed static water level in the well. The peristaltic pump tubing or the intake of the submersible pump will be slowly lowered into the well so as not to agitate or disturb the groundwater, and will be set to the approximate center of the screened interval. Well construction details will be provided at in Appendix A upon monitoring well installation.
- Begin purging and sampling following low-flow protocols (Appendix C). Record any observations regarding groundwater color, odor, presence of particulates, and other notable details during purging and sampling.
- Record field parameters and depth to groundwater at regular intervals during purging.
- Prior to sampling, each monitoring well is purged at a pump rate typically ranging from about 100 to 500 milliliters per minute. During the purging cycle, field parameters are measured and recorded at consistent 3, 4, or 5-minute intervals, following EPA guidelines. Groundwater samples are collected when each of the parameters shown in Table 2 have stabilized to their respective criteria for three consecutive readings:

Table 2. Stabilization Criteria for Groundwater Sample Parameters
Sampling and Analysis Plan, Grain Handling Facility at Freeman

Parameter	Stabilization Criteria [a]
pH	+/- 0.1 pH units
Specific Conductance	+/- 3%
Dissolved Oxygen (DO)	+/- 0.3 mg/L
Oxidation-Reduction Potential (ORP)	+/- 10 mV
Turbidity	+/- 10% [b]
Temperature c	no criterion

Notes:
a – Source: USEPA, 2002
b - When turbidity is greater than 10 nephelometric turbidity units (NTUs)
c - While temperature is recorded during well purging, it is not used as a water quality criterion.

- Once stabilization has been achieved, groundwater samples will be collected directly from the pump discharge tubing into the laboratory supplied sample containers.
- If stabilization has not occurred after 10 readings, or 45 minutes of purging, whichever is shorter, the groundwater sample will be collected. The FTL will record on the field form that stabilization did not occur prior to sampling.
- Securely place sample containers into the laboratory supplied sample cooler with ice to maintain 4^{o}C.
- Record any deviations from the specified sampling procedures or any obstacles encountered.
- Complete a chain-of-custody form for all samples. Water samples will be analyzed by EPA Method 8260B by Pace Analytical located in Davis, California.

4.3.3 Water Well Sample Collection

The presence of pumps in the local water wells will preclude the use submersible pumps for sampling. As such, grab groundwater samples will be collected from the water wells from an existing installed spigot or valve, as close to the well head as possible. The general procedures for sampling the water wells near the Site are as follows:

- Confirm the location and ID of the water well. Document the well ID and condition.
- Collect a water level measurement, if possible, in accordance with the Water Level SOP (Appendix C).
- Locate the spigot or valve closest to the well. Confirm there is no filtration or treatment in place at the sample location. Turn on the spigot and allow to flow for approximately 5 minutes to purge at a rate of approximately 5 gallons per minute. After purging, reduce the flow from the spigot to approximately 1 gallon per minute to reduce turbulence that may impact VOC concentrations.
- Collect one round of field parameters using the water quality probe.
- Reduce the flow from the spigot and carefully collect water samples by filling the laboratory-supplied containers directly from the spigot. Do not allow the sample container to touch the spigot.
- Secure the sample bottles and securely place sample containers into the laboratory-supplied sample cooler with ice to maintain 4^{o}C.

- Record any deviations from the specified sampling procedures or any obstacles encountered.
- Complete a chain-of-custody form for all samples. Water samples will be analyzed by EPA Method 8260B by Pace Analytical located in Davis, California.

4.3.4 Groundwater Grab Sample Collection

The presence of groundwater in soil borings at the unconsolidated/consolidated contact in each boring is uncertain. The sampling procedure used to monitor groundwater in the soil borings for the Site will be determined based on the amount of water present in the boring and the recharge rate measured following drill rod trip out. The following general procedures are recommended at the time of the sampling and are described in the Groundwater Grab Sample Collection SOP (Appendix C). The following text provides a concise description of the low-flow sampling procedures.

- Following sonic drilling refusal and drill rod trip out, the driller will confirm total depth using a decontaminated sounder. CH2M will then record the static water level to the nearest 0.01 foot using a decontaminated well sounder (water-level indicator) in accordance with the Water Level SOP (Appendix C). Monitor groundwater recharge, if any, until stabilization is achieved.
- The groundwater grab sample collection method will be determined by the thickness of groundwater measured in the soil boring. If limited water is present in the soil boring, a bailer will be employed to collect groundwater for sample collection. If an appreciable amount of water is present, then purging will be performed using a peristaltic pump or a portable submersible pump, based on the observed static water level in the boring. The peristaltic pump tubing or the intake of the submersible pump will be slowly lowered into the boring so as not to agitate or disturb the groundwater and placed near the bottom of the boring.
- Collect one round of field parameters prior to sample collection. Record any observations regarding groundwater color, odor, presence of particulates, and other notable details during purging and sampling.
- Secure the sample bottles and securely place sample containers into the laboratory-supplied sample cooler with ice to maintain 4^{o}C. Groundwater grab samples will be analyzed by EPA Method 8260B onsite by Pace Analytical using a mobile laboratory and a 24-hour TAT.

4.3.5 Soil Gas Sample Collection

Approximately 24 hours after soil gas probe installation, the probes will be purged using a vacuum pump and checked for leaks, and samples will be collected using Summa canisters. The samples will be shipped to Pace, where they will be analyzed for VOCs using EPA Method TO-15. Samples will be collected accordance with the Collection of Soil Gas Probe Samples from Temporary and Permanent Soil Gas Probes SOP, included in this document in Appendix C. Field duplicates will be collected at a 10 percent collection frequency, with a minimum of one (1) field duplicate collected per round of soil gas probe sampling. Proper chain of custody will be followed, and samples will be shipped for overnight delivery to Pace Analytical located in Minneapolis, Minnesota according to Chain of Custody, Packaging, and Shipping SOP (Appendix C).

4.3.6 Sample Packaging and Shipping

This section briefly describes the procedures for packaging and shipping samples to the contracted fixed analytical laboratory and consisting of groundwater samples collected from the basalt monitoring wells and residential wells, and soil gas samples. Packaging and shipping procedures do not apply for samples analyzed by the onsite mobile laboratory. Packaging and shipping procedures are described further in the Sample Security, Packaging, and Shipping SOP in Appendix C.

Before packaging samples, ensure the exteriors of the sample containers are clean and dry and verify that the sample labels are legible.

Samples to be shipped to the contract laboratory for analyses will be handled and packaged appropriately to maintain complete chain-of-custody records and prevent damage during shipment. Coolers, provided by the contract laboratory, will be used for shipping sample containers. Bubble wrap may be used to pack and cushion the sample containers in the cooler if glass bottles are used. Ice will be packed around samples. The chain-of-custody form will be placed in a plastic bag and attached to the inside of the cooler lid. Chain-of-custody seals will be attached to the front of the container. The name and address of the receiving laboratory will be placed in a position clearly visible on the outside of the cooler, and the lid will be secured with strapping tape.

The samples will be shipped via overnight courier to Pace Analytical in Seattle, Washington.

The laboratory will be notified by telephone or e-mail when the samples are shipped. Information provided to the laboratory will include how many coolers to expect and the air bill tracking numbers for each cooler. Air bill tracking numbers will be used to locate the samples in case they do not arrive at the laboratory when they are expected.

4.4 Quality Control

This section identifies the general QC procedures in support of the data needs and primary study questions. The QC procedures include pertinent information regarding field QC, laboratory QC, and potential corrective action (if needed). QC is evaluated against the measurement performance criteria established in the QAPP.

4.4.1 Field and Laboratory Quality Control Samples

QC samples will be collected to assist in determining data quality and reliability. QC samples will be collected using the same procedures and immediately following collection of the target or normal sample.

Field duplicates will be collected at a rate of 10 percent for soil samples (1 in 10 samples). An FD is an independent sample collected as close as possible to the original sample from the same source, and is used to assess sampling precision. FDs will be labeled as “FD” and packaged in the same manner as normal samples so the laboratory cannot distinguish between normal samples and duplicates. Each FD will be taken using the same sampling and preservation method as other samples.

Laboratory QC samples will be collected to perform MS and MSD analyses. MS/MSD samples will be collected at a frequency of 5 percent for soil samples (1 in 20 samples), and one MS/MSD per sampling event for groundwater only. A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). An MS analysis provides a measure of the method accuracy. A matrix spike duplicate is a laboratory split sample of the MS and is used to determine the precision of the method. Twice the normal sample volume will be collected for laboratory QC samples. Laboratory QC samples will be labeled as such on sample bottles and chain-of-custody forms.

One temperature blank and one trip blank will be included with each cooler shipment containing samples (regardless of targeted analysis) sent to the laboratory. Temperature blanks provide a means of verifying that samples have been maintained at the proper temperature (4^{o}C) following collection and during transport to the laboratory. Trip blanks provide verification that cross-contamination, or volatilization, of VOC contamination did not occur during sample management and during shipment. The laboratory will supply both the temperature and trip blanks as part of each bottle order request (to be returned with the batch of samples).

Additional details regarding QC samples are provided in the QAPP.

4.5 Decontamination

To the extent practicable and possible, the sampling equipment used for soil and groundwater sampling will either be dedicated (such as dedicated polyethylene tubing for the peristaltic pump) or new and consumed during each sampling event. Sample containers are provided by the contract laboratory for each sampling event and are discarded after use.

All drilling casing and tooling will be initially decontaminated by the driller prior to arriving onsite. All drilling casing, rods, drill bits, and samplers (if utilized) will be decontaminated between each boring location by steam cleaner at the site.

Non-disposable, non-dedicated groundwater sampling equipment and field probes will be decontaminated before initial use and between each monitoring well to minimize cross-contamination of samples and potential impacts to sample integrity. All non-dedicated field equipment used during sampling activities will be decontaminated with non-phosphate detergent (Liquinox or equivalent) using the procedures provided in the Decontamination SOP included in Appendix C.

Decontamination personnel will wear the appropriate PPE as required by the site-specific HSP. Applicable equipment will be decontaminated with potable water containing Liquinox (or equivalent non-phosphate detergent) and then thoroughly rinsed with potable water followed by rinsing with distilled or ASTM reagent-grade water. The equipment will then be wiped down with a clean paper towel or air-dried. Following decontamination, equipment will be handled and stored in a manner that will prevent contact with contaminated soil.

All excess decontamination water will be managed as described in Section 4.7.

4.6 Investigation-Derived Waste Management

Investigation-derived waste (IDW) generated from the drilling and sampling activities may consist of drill cuttings, decontamination water (as described in Section 4.6), excess purge water during groundwater sampling, and consumable sampling supplies. Protocol for handling these wastes is described in the following text.

Decontamination water may be generated from drilling activities, and soil and groundwater sampling activities. Excess decontamination water will be collected and placed in a drum, or equivalent container.

Excess purge water from groundwater sampling will be containerized onsite and temporarily stored in a drum or other equivalent container.

All IDW generated as part of the RI will be managed, transported, and properly disposed of by UPRR. Soil and water IDW generated during the RI will be characterized for the purpose of disposal.

Consumable sampling supplies (such as paper towels, nitrile gloves, sample tubing, and packaging supplies) will be contained in plastic trash bags and disposed of at the conclusion of each sampling event as municipal solid waste.

SECTION 5

Data Management and Reporting

5.1 Data Management, Quality Control, and Data Reporting

This section identifies the data management, data validation, and reporting in support of the groundwater monitoring activities as described in this SAP.

5.1.1 Field Documentation

Field observations and measurement data will be recorded on dedicated field forms (or field notebooks) to create a permanent record of field activities. All hand-entered data will be reviewed by a second person to minimize data entry errors. A check for completeness of field records (e.g., logbooks, field forms, databases, and electronic spreadsheets) will ensure that all requirements for field activities have been fulfilled, complete records exist for each activity, and the procedures specified in this SAP have been implemented. Field documentation will ensure sample integrity and provide sufficient technical information to re-create each field event using the guidelines in Section 2.

Data collected under the SAP will be reviewed by the respective field sampling leaders to determine whether the qualitative parameters of representativeness and comparability have been achieved. In general, the review will be accomplished by comparing the chain-of-custody and field notebook entries with the SAP sampling requirements herein. Any deficiencies will be communicated to the Project Manager immediately to determine what corrective action, if any, should be implemented.

5.1.2 Data Management

Upon receipt of the electronic data from the laboratory, the data will be reviewed and uploaded to the project and the Ecology Environmental Information Management (EIM) databases. The most recent sampling results will be compared against the initial (baseline) conditions. If the reported concentrations of a given sample from a specific location are grossly inconsistent with historical data, then efforts will be made to determine if the data reflect an actual change in environmental conditions at that sampling point, or if the integrity of the sample was compromised during collection, preservation, shipping, or analysis. Corrective actions will be taken to determine if the data meet project goals. If the data do not meet project goals, then the need for additional sampling and analysis will be determined by the respective sampling leaders. If needed and as determined by the project quality assurance (QA) specialist, data that do not meet project goals may be rejected.

Laboratory deliverables will include electronic data deliverables (EDDs) in Excel format and analytical reports in portable document format (PDF) files. The laboratory will send the deliverables for each sample delivery group by email to the project manager and data manager. EDDs will include sample ID information, analyte concentrations in field and QC samples, units, and other related information. An EDD template, along with valid values, will be provided to the laboratory.

Analytical reports will include a case narrative discussing any problems with the analyses, corrective actions taken, changes to the referenced method, and an explanation of data qualifiers. The laboratory data package will also include QC results associated with the data such as blanks, surrogate compounds, and check standards as well as results for analytical duplicates and MS.

When data are uploaded, the database manager will conduct manual data checks to make sure that the correct volume of data has been added to the database. These data checks will include verifying the number of records uploaded, verifying that all fields of information have been added, and spot-checking the data (not to exceed 5 percent of the uploaded data).

5.1.3 Data Review and Reporting

Data validation will be performed on an analytical batch basis by assessing QC samples and associated field sample results using method specific criteria and current industry standards for validation flagging. A QAPP describing criteria for evaluating laboratory QA/QC procedures is provided in the RI Work Plan. The following information will be reviewed as part of the summary data validation:

- Chain-of-custody documentation
- Holding time
- QC sample frequencies
- Method blanks
- Laboratory control sample
- Surrogate spikes
- MS/MSD, post spikes, and serial dilutions
- Internal standards data
- Field duplicate precision
- Case narrative review and other method-specific criteria

The primary objectives of the data review process provide documentation that the following are achieved:

- Data are consistent, correct, and complete in alignment with this SAP and the event-specific chain-of-custody, with no transcription errors or omissions.
- Results for QC samples were provided with the analytical laboratory report.
- Established criteria in the QAPP were met.
- Data qualifiers are properly assigned by the analytical testing laboratory in the data packages (as necessary).

A data validation summary will be provided in the RI Report containing information on the data usability for project objectives in terms of precision, accuracy, representativeness, completeness, and comparability.

5.2 Reporting

The reporting schedule is provided in Table 7-1 of the RI/FS Work Plan.

SECTION 6

Project Organization

CH2M is performing the groundwater characterization sampling for the GHFF located at Freeman, Washington. The following are the key project organizations and personnel that will be directly involved in this effort:

- **Mark Ochsner, Senior Project Manager.** Mark will serve as the day-to-day point of contact with UPRR and Ecology on technical issues and overall senior management of the project.
- **Carolyn Kossik, Environmental Manager.** Carolyn will serve as the compliance manager during implementation of the RI.
- **Steve Demus, Project Manager.** Steve will act as the project manager in the Spokane office and will coordinate field staff and development of the draft and final RI work plan.
- **Reuben Greer, Field Team Lead.** Reuben will support development of the draft and final RI/FS work plan, including development of GIS figures, tables and text for the work plan.
- **Bryan Jones, Chemist.** Bryan will perform data evaluations for all analytical results.
- **Jennifer Gross, Pace Analytical Project Manager.** Jennifer is the laboratory project manager for this investigation and will the main point of contact for analytical services.

SECTION 7

References

CH2M HILL Engineers, Inc. (CH2M). 2015. *Preliminary Conceptual Site Model, Evaluation of Data Gaps, and Recommended Pre-Remedial Investigation Activities, Freeman Grain Handling Facility, Freeman, Washington*. Technical Memorandum. 2015.

Washington State Department of Ecology (Ecology). 2015. Enforcement Order No. DE 12863. November 12, 2015.

U.S. Environmental Protection Agency (USEPA). 2002. *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers.*

Figures

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, ©

LEGEND

●	Existing Well
🟩	CHS Inc. Facility
○	Pond
☐	Parcel Boundaries*

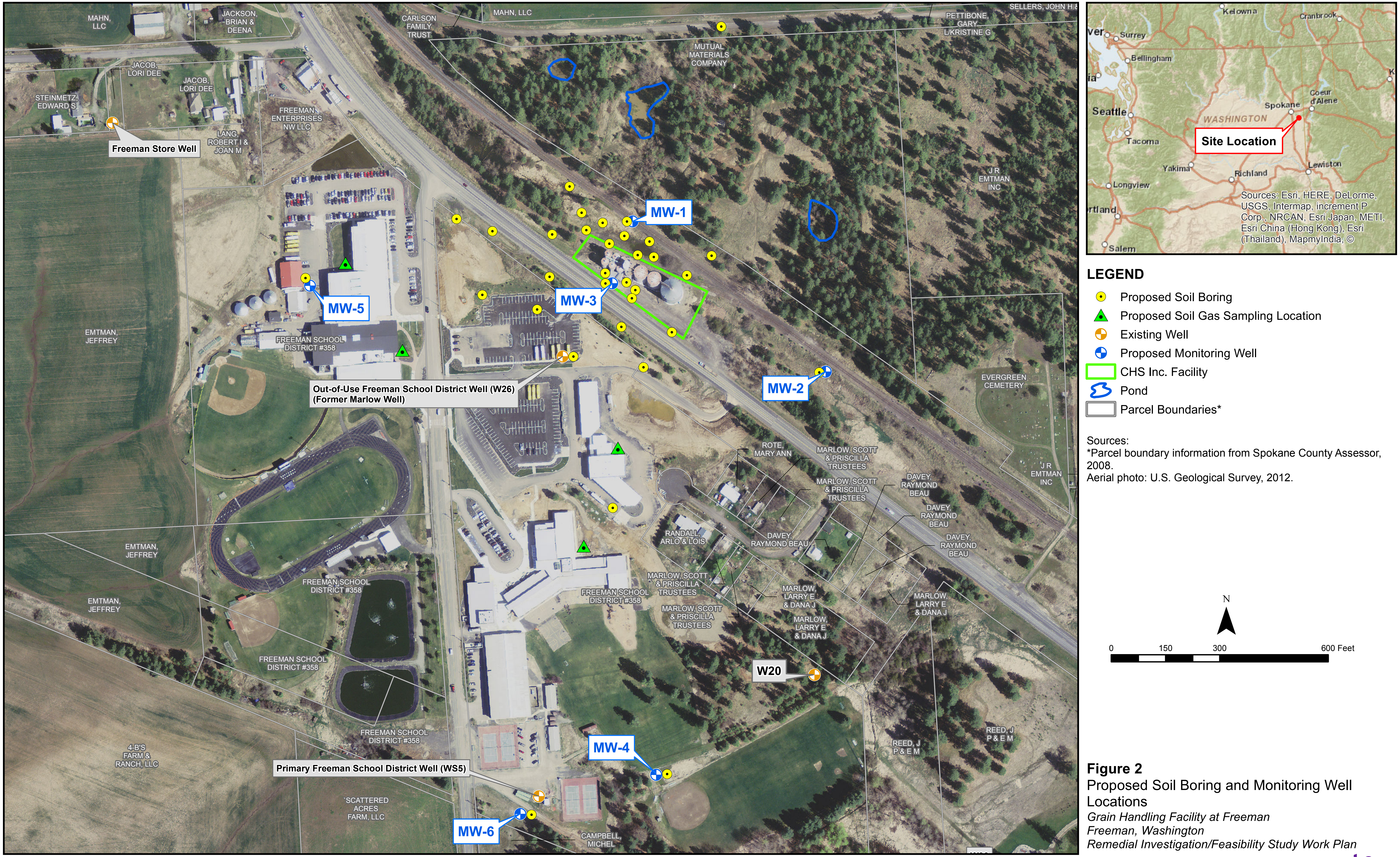
Sources:
*Parcel boundary information from Spokane County Assessor, 2008.
Aerial photo: U.S. Geological Survey, 2012.

N

0 200 400 800 Feet

Figure 1
Site Location and Overview Map
Grain Handling Facility at Freeman
Freeman, Washington
Remedial Investigation/Feasibility Study Work Plan

C:\USERS\GGEE\DOCUMENTS\GIS\UPRR FREEMAN\MAPFILES\FIGURE1_SITELOCATION.MXD GGEE 3/3/2016 12:01:33 PM



LEGEND

- ● Proposed Soil Boring
- ▲ Proposed Soil Gas Sampling Location
- ● Existing Well
- ● Proposed Monitoring Well
- 🟩 CHS Inc. Facility
- ○ Pond
- ☐ Parcel Boundaries*

Sources:
*Parcel boundary information from Spokane County Assessor, 2008.
Aerial photo: U.S. Geological Survey, 2012.

Figure 2
Proposed Soil Boring and Monitoring Well Locations
Grain Handling Facility at Freeman
Freeman, Washington
Remedial Investigation/Feasibility Study Work Plan

C:\USERS\GGEE\DOCUMENTS\GIS\UPRR FREEMAN\MAPFILES\FIGURE2_PROPOSEDSOILBORINGS.MXD GGEE 3/8/2016 3:14:45 PM

Appendix A

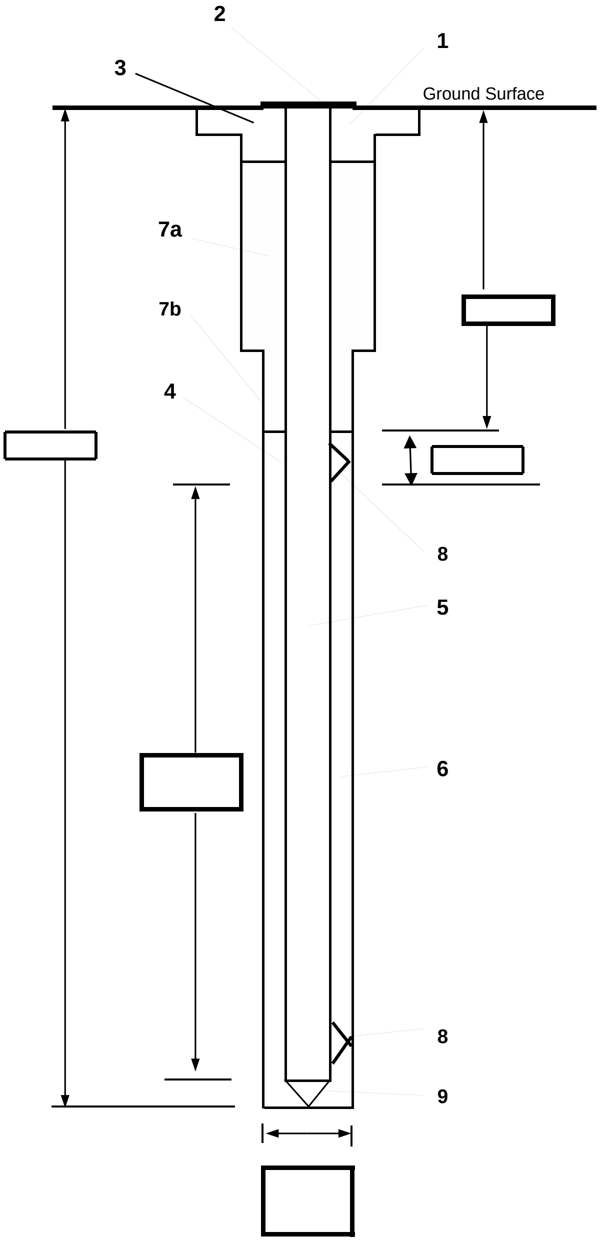
Monitoring Well Construction Diagrams

CH2MHILL

DATE: **WELL ID:**

MONITORING WELL COMPLETION DIAGRAM

PROJECT :
LOCATION :
Drilling Method:
Drlling Contractor:
Well Construction Start Time:
Completion Time:
Project Number :



Generalized Monitoring Well Completion Diagram

1- Surface completion

2- Casing Flushmount

3- Surface Completion/Pad

4- Dia./type of well casing

5- Type/slot/size of screen

6- Type screen filter

7a- Type of seal - Depth
7b- Type of seal - Depth

8- Centralizers (if applicable)

9- Sump below screen

Well Development:

Date: Pre Development WL:
Development Start Time: End Time:

Comments:

Appendix B
Field Forms

CH2MHILL

SOIL BORING / MONITORING WELL LOG

PAGE: OF

WELL NO:
PROJECT NUMBER:
PROJECT NAME:
LOCATION:
DRILLING CONTRACTOR:
TOC ELEVATION:
GROUND ELEVATION:
START DATE/TIME:
END DATE/TIME:
LOGGER:
DRILLING EQUIPMENT:
BORING DIAMETER:
TOTAL DEPTH:
SWL:

Depth (ft)	Sample ID/ TYPE	Sample Interval	SPT blows per 6"	Recovery (in/in)	**Soil Description** soil name, USCS group symbol, color, density or consistency, structure, mineralogy, grain size, grading, and moisture content	**Comments** drilling rate, drilling fluid loss, depth of casing, vapor tests, odor, other	**Graphic Log**	**Monitoring Well Construction** **Flush Mount**

Groundwater Purging and Sampling Form

CH2MHILL

SITE: ______________________ **Well ID:** ______________

Field Team: ______________________ Date: ______________

Weather/Temp: ______________________ Arrival Time: ______________

Well Condition: ______________________ **Initial DTW (ft btc):** ______________

Purge Method: ______________________ Purge Rate [5]: ______________

Field Parameters [1]									
Time	DTW [2]	Purge Vol. (gal)	Temp (°C)	pH	Sp. Cond.	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Note color, odor, sheen, etc.
	Begin Pumping								
Stabilization Criteria [3]	-	-	-	± 0.1 units	± 3%	± 10% [4]	± 0.3 mg/L	± 10 mV	-

[1] collect field parameters in 3-5 minute intervals

[2] DTW: depth to water measured from top of casing; total drawdown should not exceed 0.33 ft

[3] stabilization achieved once field parameters stabilize for 3 successive readings; minimum parameter subset: pH, sp. cond., and turbidity or DO

[4] for turbidity readings > 10 NTUs

[5] target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: ______________________ **Sample Time:** ______________

Analysis: ____

QC SAMPLE (CIRCLE): FD MS/MSD EQ Blank TOTAL PURGED (GAL): ______________

Field Duplicate ID : ______________________ Field Duplicate Time: ______________

Comments: ____

____

____

Appendix C

Standard Operating Procedures (SOPs)

STANDARD OPERATING PROCEDURE 1

Field Logbook Procedures

1.0 Scope and Application

The purpose of this Standard Operating Procedure (SOP) is to describe protocols for recording field information in a field logbook.

2.0 Materials

a. Field Logbook
b. Indelible ink pen (normal conditions)
c. Pencil (only for extreme weather conditions – cold/rain)

3.0 Procedure

All information will be recorded in a bound field logbook. The outside front cover of the logbook will contain the project name, location, and the logbook number. The inside front cover will include a mailing address and a point of contact. Each page will be consecutively numbered, dated, and initialed. All entries will be made in indelible ink and all corrections will consist of line-out deletions that are initialed and dated. Pencil will only be used under extreme weather conditions (e.g., freezing temperature, heavy rain) that preclude the use of ink. If only part of a page is used, the remainder of the page should have an "X" drawn across it.

At a minimum, entries in the logbook will include the following:

- Unique, sequential field sample number
- Time of arrival and departure at the sampling location
- Sampling rationale
- Location and description of each sampling point
- Details of the sample site (e.g., the elevation of the casing, casing diameter and depth, integrity of casing, etc.)
- Identification of sample crew members
- Type of sample (e.g., groundwater, soil)
- Number, depth, and volume of sample collected
- Sampling methodology, including distinction between grab and composite sample
- Analyses to be performed on the sample
- Sample preservation
- Date and time of sample collection
- QC samples associated with the sample
- Sample shipment (for example, name of the laboratory and cartage agent - FedEx, UPS, etc.)
- Maps of the sampling site
- Field observations (e.g., weather, description of samples, etc.)
- Field screening measurements (e.g., PID, pH, conductivity)
- Instrument calibration information
- Description of significant activities for the day

- Notes on visitors to the site
- Signature and date by the personnel responsible for observations

Sampling situations vary widely. No general rules can specify the extent of information that must be entered in a logbook. However, records should contain sufficient information so that someone can reconstruct the sampling activity without relying on the collector's memory.

Photographs will be taken to document field activities. A log of all photographs taken will be maintained in the field logbook. A log of the photographs taken will be documented on an arbitrary page of the filed logbook. The log will record the following information: camera identification number, exposure identification number, date and time of each photograph, name of person taking the photograph, and a brief description of the activity photographed. This log will continue until all space on the page is used at which time the log will be transferred to continue on the next available empty page in the logbook. A note will be made at the bottom of the completed page indicating the page number where the log continues. A subsequent note will be placed at the top of the page where the log continues indicating the page number from where it was transferred.

4.0 References

EPA. 2000. *Introduction to the CLP*. EPA540-R-99-004, OSWER 9240.0-34P. February.

EPA. 2001. *CLP Guidance for Field Samplers*. EPA 540-R-00-003, OSWER 9240.0-35. Draft Final. June.

5.0 Attachments

None

STANDARD OPERATING PROCEDURE 2

Water-Level Measurements Procedures

1.0 Scope and Application

The purpose of this procedure is to provide a guideline for the measurement of the depth to groundwater in piezometers and monitoring wells, even where a second phase of floating liquid (e.g., gasoline) is encountered, and on staff gages in surface-water bodies. This SOP includes guidelines for discrete measurements of static water levels and does not cover the use of continuously recording loggers.

2.0 Materials

a. Electronic water-level meter (Solinst® or equivalent) with a minimum 100-foot tape; the tape should have graduations in increments of 0.01 feet or less

b. Interface probe (Solinst® Model 122 Interface Meter or equivalent)

3.0 Procedure

Verify that the unit is turned on and functioning properly. Slowly lower the probe on its cable into the piezometer or well until the probe just contacts the water surface; the unit will respond with a tone or light signal. Note the depth from a reference point indicated on the piezometer or well riser. Typically this is the top of the PVC casing. If no reference is clearly visible, measure the depth to water from the northern edge of the PVC casing. If access to the top of the PVC casing is difficult, sight across the top of the locking casing adjacent to the measuring point, recording the position of the cable when the probe is at the water surface.

Measure the distance from this point to the closest interval marker on the tape, and record the water-level reading in the logbook. Water levels will be measured to the nearest 0.01-foot. Also, when specified in the project plans, measure and record the depth of the piezometer or well. The depth of the piezometer or well may be measured using the water-level probe with the instrument turned off.

Free product light or dense non-aqueous phase liquid may be present in the piezometer or well. If the presence of free product is suspected, the thickness of the product should be determined using appropriate equipment (e.g., Solinst® Model 122 Interface Meter). The depth to water also is determined with this equipment and the water-level meter should not be used in the piezometer or well as long as product is present. Typically, a constant sound is emitted from the device when free product is encountered and an alternating on/off beep sound is emitted when water is encountered.

The apparent elevation of the water level in the well or piezometer is determined by measuring both the apparent depth to water and the thickness of free product. The corrected water-level elevation is calculated by the following equation:

$$WL_c = Wl_a + (\text{Free-product thickness} \times 0.80)$$

Where WL_c = Corrected water-level elevation

Wl_a = Apparent water-level elevation

0.80 = Typical value for the density of petroleum hydrocarbon products

If free product is detected on the surface of the water in the piezometer or well, the value of sampling should be reconsidered because of the potential for contaminating the sampling equipment.

Staff gages may be installed in some surface-water bodies. These facilities typically are constructed by attaching a calibrated, marked staff gage to a wood or metal post, driving the post into the bottom of the surface-water body, and surveying the elevation of the top of the post to a resolution or 0.01-foot. The elevation of the water in the surface-water body then can be determined by reading off the distance the water level is from the top of the post. A shield or other protection may be needed to calm the fluctuations in water level if the gage is installed at a location exposed to wind or wave.

4.0 Precautions

Before each use, verify that the battery is charged by pressing the test button on the water-level meter.

Verify that the unit is operating correctly by testing the probe in distilled or deionized water. Leave the unit turned off when not in use.

5.0 Attachments

None

STANDARD OPERATING PROCEDURE 3

Low-Flow Groundwater Sampling from Monitoring Wells

1.0 Scope and Application

This SOP presents general guidelines for the collection of groundwater samples from monitoring wells using low-flow purging and sampling procedures. Operations manuals should be consulted for specific calibration and operating procedures.

2.0 Materials

a. Adjustable-rate positive-displacement pump, submersible pump, or peristaltic pump

b. Horiba® U-22 or equivalent water quality meters to monitor pH, specific conductance, turbidity, dissolved oxygen, oxidation-reduction potential (ORP), and temperature

c. Flow-through cell with inlet/outlet ports for purged groundwater and watertight ports for each probe

d. Generator or alternate power source depending on pump type

e. Water-level indicator

f. Disposable Teflon, Teflon-lined polyethylene tubing or polyethylene tubing for metals and other inorganics

g. Plastic sheeting

h. Well-construction information

i. Calibrated container and stopwatch to determine flow rate

j. Sample containers

h. In-line disposable 0.45 µm filters (QED® FF8100 or equivalent)

i. Shipping supplies (labels, coolers, and ice)

j. Field book

3.0 Procedure

3.1 Setup and Purging

1. Obtain information on well location, diameter(s), depth, and screen interval(s), and the method for disposal of purged water.
2. Calibrate instruments according to manufacturer's instructions.
3. The well number, site, date, and condition are recorded in the field logbook.
4. Plastic sheeting is placed on the ground, and the well is unlocked and opened. All decontaminated equipment to be used in sampling will be placed only on the plastic sheeting until after the sampling has been completed. To avoid cross-contamination, do not let any downhole equipment touch the ground.
5. All sampling equipment and any other equipment to be placed in the well is cleaned and decontaminated before sampling in accordance with SOP *Decontamination of Personnel and Equipment*.
6. Water level measurements are collected in accordance with the *Water-Level Measurements* SOP. **Do not measure the depth to the bottom of the well at this time;** this reduces the possibility that any accumulated sediment in the well will be disturbed. Obtain depth to bottom information from well construction log.

7. Attach and secure the tubing to the low-flow pump. Lower the pump slowly into the well and set it at approximately the middle of the screen. Place the pump intake in the middle of the saturated screen length and should be at least 2 feet above the bottom of the well to avoid mobilization of any sediment present in the bottom.
8. Insert the measurement probes into the flow-through cell. The purged groundwater is directed through the cell, allowing measurements to be collected before the water contacts the atmosphere.
9. If using a generator, locate it 30 feet downwind from the well to avoid exhaust fumes contaminating the samples.
10. Start purging the well at 0.1 to 0.5 liters per minute. Avoid surging. Purging rates for more transmissive formations could be started at 0.5 liter to 1 liter per minute. The initial field parameters of pH, specific conductance, dissolved oxygen, ORP, turbidity, and temperature of water are measured and recorded in the field logbook.
11. The water level should be monitored during purging, and, ideally, the purge rate should equal the well recharge rate so that there is little or no drawdown in the well (i.e., less than 0.3-foot). The water level should stabilize for the specific purge rate. There should be at least 1 foot of water over the pump intake so there is no risk of the pump suction being broken, or entrainment of air in the sample. Record adjustments in the purge rate and changes in depth to water in the logbook. Purge rates should, if needed, be decreased to the minimum capabilities of the pump (0.1- to 0.2-liter per minute) to avoid affecting well drawdown.
12. During purging, the field parameters are measured frequently (every 5 minutes) until the parameters have stabilized. Field parameters are considered stable when measurements meet the following criteria:

- pH: within 0.1 pH units
- Specific conductance: within 3 percent
- Dissolved oxygen: within 10 percent
- Turbidity: within 10 percent for values greater than 5 NTU; if 3 turbidity values are less than 5 NTU, consider the values as stabilized
- ORP: within 10 mV
- Temperature: within 3 percent

3.2 Sample Collection

Once purging is complete the well is ready to sample. The elapsed time between completion of purging and collection of the groundwater sample should be minimized. Typically, the sample is collected immediately after the well has been purged, but this is also dependent on well recovery.

Samples will be placed in sample containers that have been cleaned to laboratory standards and are preserved in accordance with the analytical method. The containers are typically pre-preserved, if required.

VOC samples are normally collected first and directly into pre-preserved sample containers.

During purging and sampling, the centrifugal/peristaltic pump tubing must remain filled with water to avoid aeration of the groundwater. It is recommended that 1/4- to 3/8-inch inside-diameter tubing be used to help ensure that the sample tubing remains water filled. If the pump tubing is not completely filled to the sampling point, collect non-VOC dissolved gases samples first, then increase flow rate slightly until water completely fills the tubing and collect the VOC/dissolved gases samples. Record new flow rate and drawdown depth.

The steps to be followed for sample collection are as follows:

1. The cap is removed from the sample bottle, and the bottle is tilted slightly.

2. The sample is slowly poured from the bailer or discharged from the pump so that it runs down the inside of the sample bottle with a minimum of splashing. The pumping rate should be reduced to approximately 100 ml per minute when sampling VOCs. Ensure that tubing does not contact the sample container during sample collection.
3. Inorganics, including metals, may be collected and preserved in the filtered form as well as the unfiltered form. Disposable in-line filters (0.45 micron filter), connected to the end of the sample tubing, and are typically used for field filtration. Samples are field filtered as the water is being placed into the sample container. If a bailer is used, filtration may be driven by a peristaltic pump.
4. Adequate space is left in the bottle to allow for expansion, except for VOC vials, which are filled to the top with a positive meniscus.
5. The bottle is capped and clearly labeled.
6. Samples are placed in appropriate containers and, if necessary, packed with ice in coolers as soon as practical.
7. Non-dedicated equipment is cleaned and decontaminated in accordance with the *Decontamination of Personnel and Equipment* SOP.

The following information, at a minimum, will be recorded in the log book:

1. Sample identification (site name, location, and project number; sample name/number and location; sample type and matrix; time and date; sampler's identity)
2. Sample source and source description
3. Field observations and measurements (appearance, volatile screening, field chemistry, sampling method), volume of water purged prior to sampling, number of well volumes purged, and field parameter measurements
4. Sample disposition (preservative; laboratory name, date and time sent; laboratory sample number, chain-of-custody number, sample bottle lot number)

3.3 Additional Remarks

1. If the well goes dry during purging, wait until it recovers sufficiently to remove the required volumes to sample all parameters. It may be necessary to return periodically to the well but a particular sample (e.g., large amber bottles for semivolatile analysis) should be filled at one time rather than over the course of two or more visits to the well.
2. Disposable tubing is disposed of with PPE and other site trash.

4.0 Precautions and Preventative Maintenance

- The drawdown in the well should be minimized as much as possible (preferably no more than 0.5-foot to 1 foot) so that natural groundwater-flow conditions are maintained as closely as possible.
- The highest purging rate should not exceed 1 liter per minute. This is to keep the drawdown minimized.
- Stirring up of sediment in the well should be avoided so that turbidity containing adsorbed chemicals is not suspended in the well and taken in by the pump.
- Overheating of the pump should be avoided to minimize the potential for losing VOCs through volatilization.
- Keep the working space clean with plastic sheeting and good housekeeping.
- Maintain field equipment in accordance with the manufacturer’s recommendations. This will include, but is not limited to:
  - Inspect sampling pump regularly and replace as warranted
  - Inspect quick-connects regularly and replace as warranted

  - Verify battery charge, calibration, and proper working order of field measurement equipment prior to initial mobilization and daily during field efforts

5.0 Attachments

A Low-Flow Groundwater Sampling White Paper

Attachment A
Low-Flow Groundwater Sampling White Paper

White Paper on Low-Flow Sampling

EPA recommends low-flow sampling as a means of collecting groundwater samples in a way that minimizes the disturbance to the natural groundwater flow system and minimizes the introduction of contamination into the samples from extraneous sources. The following are details about these issues.

When a pump removes groundwater from the well at the same rate that groundwater enters the well through the screen, the natural groundwater-flow system around the well experiences a minimum of disturbance. Some disturbance is bound to occur because you are causing groundwater to flow to the well in a radial fashion that otherwise would have flowed past it. However, the resulting low-flow sample provides the most-representative indication we can get of groundwater quality in the immediate vicinity of the well.

Normally, when a well is pumped at an excessive rate that drops the water level in the well below the water level in the aquifer, the water cascades down the inside of the well screen when it enters the well. The turbulence from this cascading causes gases such as oxygen and carbon dioxide to mix with the water in concentrations that are not representative of the native groundwater and are higher than expected. This causes geochemical changes in the nature of the water that can change the concentrations of some analytes, particularly metals, in the groundwater sample, not mention its effect on the dissolved oxygen levels that then will be measured in the flow-through cell. Such turbulence also may cause lower-than-expected concentrations of volatile organic compounds due to volatilization.

For wells in which the water level is above the top of the screen, the water up in the riser is out of the natural circulation of the groundwater and, therefore, can become stagnant. This stagnant water is no longer representative of natural groundwater quality because its pH, dissolved-oxygen content, and other geochemical characteristics change as it contacts the air in the riser. If we minimize the drawdown in the well when we pump, then we minimize the amount of this stagnant water that is brought down into the well screen and potentially into the pump. As a result, a more-representative sample is obtained.

Typically, wells contain some sediment in the bottom of the well, either as a residue from development that has settled out of the water column or that has sifted through the sand pack and screen since the well was installed. This sediment commonly has adsorbed on it such analytes as metals, SVOCs, and dioxins that normally would not be dissolved in the groundwater. If these sediments are picked up in the groundwater when the well is disturbed by excessive pumping, they can:

- Make filtering the samples for metals analysis more difficult
- Add unreasonably to the measured concentration of SVOCs and other organic compounds

The SOP for low-flow sampling has been modified recently and should be consulted for additional information about low-flow sampling and ways of dealing with wells in which the water level cannot be maintained at a constant level.

STANDARD OPERATING PROCEDURE 4

Sample Security (Chain-of-Custody), Packaging and Shipping Procedures

1.0 Scope and Application

This SOP describes the method for completing and use of a Chain-of-Custody (“COC”) form (Attachment A), COC Seals, sample labels, and packaging and shipping samples. A COC form documents the possession of samples from the time they are collected until they are received by the analytical laboratory or approved alternate receiving agency, or disposed. COC records that are initiated in the field are completed once the samples are received at the laboratory, whereupon the individual laboratory will institute appropriate internal management procedures. Proper packaging and shipping is essential to protect samples from breakage, as well as to protect mail carriers and laboratory personnel.

To prepare a COC form, the sampler completes the following information: company name, project location; project number, project name; sampler’s name; name, address, telephone number and facsimile number of person to whom results should be sent; courier, sample ID, date and time of collection, sample matrix type and number and type of containers for each sample; preservative type; analytical turnaround time; and any specific instructions to the laboratory. The completed COC is then placed into a Zip-Lock® or similar plastic bag and taped to the inside lid of the sample cooler.

The sampler signs, dates, and records the time that the samples were relinquished on the COC form, which then accompanies the samples. If appropriate, the COC form should state that the COC form was sealed in the cooler with the samples. It is not customary for the shipping company (e.g., FedEx) to sign the COC form.

The COC form is terminated when the samples are received by the laboratory or disposed. If one or more (but not all) samples entered on the COC are to be disposed prior to being sent to the laboratory, the individual disposing of the sample will strike the sample record from the COC with a single bold line, will indicate the date and time of disposal on the sample line of the COC and will sign the COC on the sample line. If all samples are disposed then the above procedure can be implemented for the entire COC, which should then be retained in the project file. Otherwise, when samples are received by the laboratory, the individual receiving the samples will inspect the samples, will indicate the date and time of sample receipt on the COC and sign the COC.

As an extra measure to ensure the integrity of samples during transportation, a COC Seal may be applied across the lid of each sample container and/or applied across the edge of the cooler in which the samples are packaged and shipped. To complete the COC Seal, the sampler dates and signs the COC Seal and then applies the COC Seal to the lid of the sample jar so that it will be conspicuously broken if and when the sample container is opened. Likewise, a signed and dated COC Seal will be placed across the edge of the cooler and covered with at least one layer of clear adhesive-backed tape to protect the COC Seal during transportation. This COC Seal will be so placed so that it will be conspicuously broken if and when the sample cooler is opened.

When samples are transported to a laboratory, they will be packaged in a cooler with ice and padding. (Sometimes samples analyzed for metals will not be packed in ice.) Padding must be sufficient to prevent sample container breakage. Ice must be sufficient to maintain cool temperatures within the cooler.

2.0 Materials

a. Coolers

b. Large plastic bags

c. Strapping and packaging tape

d. Chain of Custody

e. Chain of Custody seals

f. Ice

g. Bubble wrap or equivalent packing material

h. re-sealable plastic bags

i. Shipping air-bills

j. Sample labels

3.0 Procedure

3.1 COC Procedures

1. Obtain sufficient COC Forms, COC Seals, coolers, and packing materials from the approved receiving laboratory.
2. Collect and properly label samples. When collecting water samples, attach the completed label to the container before collecting sample. For wet solid samples, it may be helpful to cover the label with clear packing tape to maintain legibility. Labels should be completed with the following information at a minimum: sample ID, date, time, analysis required, preservative if pre-preserved, and project name.
3. If called for in the Work Plan, apply COC Seal to sample lid and bottle. (Note: COC Seals should not be placed over the Teflon seal on VOC vials but should be wrapped around the lid and jar. This is to preclude any sample contamination that might result if the syringe used by the laboratory to remove an aliquot of the sample from the vial should become contaminated by adhesives on the COC Seal.)
4. Complete COC form sections on “Report To,” “Bill To,” “Project Name,” and “Project Number.”
5. For each sample indicate unique customer sample I.D., date sampled, time sampled, matrix (gas, liquid, sludge, or solid), number of containers, and preservative. Include all QC samples specified in the Work Plan, such as laboratory-provided trip blanks or MS/MSD samples.
6. Provide the method name or number of the analysis requested for each sample. (Refer to the Work Plan or Sampling and Analysis Plan for the appropriate method name and number.)
7. Provide any additional instructions to the laboratory for an individual sample in the remarks column.
8. If delivering the samples to the laboratory in person, then sign, date and record the time on the COC form when you relinquish the samples to laboratory personnel. Retain one copy of the completed COC form in the project file. Record the COC number in the logbook.
9. If shipping the samples to a laboratory by courier, then sign, date and record the time plus the courier name and air bill number when the container (e.g., cooler) is ready for shipment. Retain one copy of the COC in the project file and place the remaining copies in a water proof bag (Zip-Lock® or equivalent bag) taped to the top inside lid of the cooler. When the cooler is sealed, place a custody seal over the edge of the lid. Record the COC number and FedEx airbill number in the logbook.
10. When disposing of a sample, the person who disposes of the sample signs, dates, and records the time on the COC when the sample is disposed. A copy of the COC is retained in the project file. Record the COC number and method of disposal in the logbook.
11. When the laboratory receives the samples a representative will complete a sample receipt and sign, date and enter the time the samples were received at the laboratory on the COC. This will complete the COC. A copy of the completed COC will be returned by the laboratory to the client with the analytical results.

The laboratory will then initiate internal laboratory sample COC and tracking procedures. Most laboratories use a Laboratory Information Management System (“LIMS”) to assist in managing and tracking samples at the laboratory.

3.2 Sample Packaging and Shipping Procedures

1. Wrap each glass sample container in a protective layer of bubble wrap or equivalent packing material and place each sample in a Zip-Lock bag. Foam forms may be used for VOA vials.
2. Pack ice in double Zip-Lock bags. Squeeze excess air out of bags before sealing.
3. Pad the bottom and sides of the sample cooler with bubble-wrap or equivalent packing material.
4. Place bagged samples and ice in a large plastic trash bag in the cooler. Add sufficient packing material between and above the sample containers to minimize movement during shipment. Add sufficient ice to keep samples chilled throughout transportation; this is of particular concern if the samples cannot be delivered immediately (overnight) to the laboratory. Securely close the large plastic bag by tying a knot in the top, or by using a large wire twist-tie or nylon zip-tie.

NOTE: Conservative sample packaging is advised due to the enormous costs associated with recollecting samples after breakage during shipment. In general, glass jars containing water necessitate the most careful packaging.

5. If transporting samples via FedEx or other vendor, place the completed Chain-of-Custody in a Zip-Lock bag and tape to the inside of the cooler. If personally delivering samples to the lab or using a courier, keep the completed COC outside the cooler to receive additional signatures.
6. Apply a Chain-of-Custody seal to the lid of the cooler and securely tape the cooler closed. Cover the Chain-of-Custody seal with at least one layer of clear packing tape to protect the seal from normal handling.
7. Securely tape the cooler lid closed by wrapping at least 3 layers of packing tape completely around the two ends of the cooler.
8. Deliver the sealed cooler to an express carrier for overnight delivery to the analytical laboratory. Review completed air bill with delivery service personnel and verify that the requested delivery service is available.
9. Contact the laboratory and inform them of the number of samples being shipped and the estimated day and time of delivery.

5.0 Attachments

A Pace Analytical Laboratories Chain of Custody

Attachment A
Pace Analytical Laboratories Chain of Custody

Pace Analytical®
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A
Required Client Information:

Company:
Address:
Email To:
Phone: Fax:
Requested Due Date/TAT:

Section B
Required Project Information:

Report To:
Copy To:
Purchase Order No.:
Project Name:
Project Number:

Section C
Invoice Information:

Attention:
Company Name:
Address:
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER ____________

Site Location
STATE: ____________

Section D
Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	↓Analysis Test↓ Y/N↓													Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1																																
2																																
3																																
4																																
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: **DATE Signed (MM/DD/YY):**

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

Instructions for completing Chain of Custody (COC)

1. **Section A and B:** Complete all Client information at top of sheet: company name, address, phone, fax, contact (the person to contact if there are questions, and who will receive the final report.), e-mail address (if available), PO#, Project Name and/or Project Number as you would like to see it appear on the report.
2. **Section C:** Invoice Information: Billing information is included in this section. This information should include the name and address of the person receiving the invoice.
3. Quote Reference should be completed if a quotation was provided by Pace Analytical. The Project Manager, and Profile No. will be completed by Pace Analytical Services.
4. **Site Location:** A separate COC must be filled out for each day of sample collection. Record the two letter postal code for the US state in which the samples were collected.
5. **Regulatory Agency:** List the program that is guiding the work to ensure proper regulations are followed.
6. **Section D:** Complete a Sample Description in the "SAMPLE ID' section as you would like it to appear on the laboratory report. The following information should also be included: the sample matrix, sample type (G (grab) or C (composite). When collecting a composite, the start time and end time should be documented in the respective boxes. The collection time for a grab (G) sample should be entered in the boxes marked 'Composite End/Grab'), Sample temp at collection (if required by state), the total number of containers, and preservative used.
7. Mark if the sample was filtered in the field by marking Y or N in 'Filtered' row by the Analysis requested.
8. Requested Analysis: List the required analysis and methods on the lines provided and place a check in the column for the samples requiring the analysis. Additional comments should be referenced in the bottom left hand corner or include attachments for extended lists of parameters.
9. The sampler should print their name in the space provided and sign their name followed by the date of the sampling event at the bottom of the COC in the spaces designated for 'SAMPLER NAME AND SIGNATURE'.
10. When relinquishing custody of the samples to a representative of the laboratory or other organization, indicate the Item Numbers of those samples being transferred; sign relinquished by, date and time, and include your affiliation.

***Important Note:**

Standard Turnaround Time is 2 Weeks/10 business days. Results will be delivered by end of business on the date due unless other arrangements have been made with your project manager.

Special Project Requirements such as Low Level Detection Limits or level of QC reported must be included on the chain of custody in the Additional Comments section.

STANDARD OPERATING PROCEDURE 5

Decontamination of Personnel and Equipment

1.0 Scope and Application

To provide general guidelines for the decontamination of personnel, sampling equipment, and monitoring equipment used in potentially contaminated environments. This SOP describes the general decontamination procedures.

2.0 Materials

a. Demonstrated analyte-free, deionized (“DI”) water (specifically, ASTM Type II water or lab-grade DI water)

b. Potable water; must be from a municipal water supplier, otherwise an analysis must be run for appropriate volatile and semivolatile organic compounds and inorganic chemicals (e.g., Target Compound List and Target Analyte List chemicals)

c. 2.5% (W/W) Liquinox® (or Alconox®) and water solution

d. Large plastic pails or tubs for Liquinox® and water, scrub brushes, squirt bottles for Liquinox® solution, methanol and water, plastic bags and sheets

e. Personal Protective Equipment as specified by the Health and Safety Plan

f. Decontamination pad and steam cleaner/high pressure cleaner for large equipment

3.0 Procedure

3.1 Personnel Decontamination

To be performed after completion of tasks whenever potential for contamination exists, and upon leaving the exclusion zone.

1. Wash boots in Liquinox® solution, then rinse with water. If disposable latex booties are worn over boots in the work area, rinse with Liquinox® solution, remove, and properly discard.
2. Wash outer gloves in Liquinox® solution, rinse, remove, and discard.
3. Remove disposable coveralls (“Tyveks”) and discard.
4. Remove respirator (if worn).
5. Remove inner gloves and discard.
6. At the end of the work day, shower entire body, including hair, either at the work site or at home.
7. Sanitize respirator if worn.

3.2 Sampling Equipment Decontamination—Groundwater Sampling Pumps

Sampling pumps are decontaminated after each use as follows.

1. Don phthalate-free gloves.
2. Spread plastic on the ground to keep equipment from touching the ground
3. Turn off pump after sampling. Remove pump from well and remove and dispose of tubing. Place pump in decontamination tube.
4. Turn pump back on and pump 1 gallon of Liquinox® solution through the sampling pump.
5. Rinse with 1 gallon of tap water.
6. Rinse with 1 gallon of deionized water.

7. Keep decontaminated pump in decontamination tube or remove and wrap in aluminum foil or clean plastic sheeting.
8. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of with solid waste in garbage bags, dependent on Facility/project requirements.

3.3 Sampling Equipment Decontamination—Other Equipment

Reusable sampling equipment is decontaminated after each use as follows.

1. Don phthalate-free gloves.
2. Rinse and scrub with potable water.
3. Wash all equipment surfaces that contacted the potentially contaminated soil/water with Liquinox® solution.
4. Rinse with potable water.
5. Rinse with distilled or potable water
6. Rinse with deionized water.
7. Completely air dry.
8. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed with solid waste in garbage bags, dependent on Facility/project requirements.

3.4 Health and Safety Monitoring Equipment Decontamination

1. Before use, wrap soil contact points in plastic to reduce need for subsequent cleaning.
2. Wipe all surfaces that had possible contact with contaminated materials with a paper towel wet with Liquinox® solution, and three times with a towel wet with distilled water. Dispose of all used paper towels with solid waste in garbage bags, dependent on Facility/project requirements.

3.5 Sample Container Decontamination

The outsides of sample bottles or containers filled in the field may need to be decontaminated before being packed for shipment or handled by personnel without hand protection. The procedure is:

1. Wipe container with a paper towel dampened with Liquinox® solution or immerse in the solution AFTER THE CONTAINERS HAVE BEEN SEALED. Repeat the above steps using potable water.
2. Dispose of all used paper towels with solid waste in garbage bags, dependent on Facility/project requirements.

3.6 Heavy Equipment and Tools

Heavy equipment such as drilling rigs, drilling rods/tools, and the backhoe will be decontaminated upon arrival at the site and between locations as follows:

1. Set up a decontamination pad in area designated by FS
2. Steam clean heavy equipment until no visible signs of dirt are observed. This may require wire or stiff brushes to dislodge dirt from some areas.

4.0 Key Checks and Items

- Clean with solutions of Liquinox®, methanol, and distilled water.
- Decontaminate filled sample bottles before relinquishing them to anyone.

STANDARD OPERATING PROCEDURE 6

Photoionization Detector (PID) Soil Screening

1.0 Scope and Application

This procedure describes the guidelines for field soil screening using a photoionization detector (PID), for VOCs.

2.0 Equipment and Materials

a. Photo-ionization Detector with an 11.7 eV (electron volt) lamp

b. Calibration gas

c. Ziplock® sandwich bags

3.0 Procedure

Soil samples are collected at established intervals in the soil profile, including at the surface. Sampling intervals are outlined in the investigation-specific work plan.

Soil headspace PID screening is performed as follows:

1. Calibrate the PID per the manufacturer's procedures.
2. Wear new protective gloves for each sample collected to reduce cross-contamination.
3. Fill two Ziplock® sandwich bags ¼ full of soil and immediately seal the bags.
4. Label the bags with the appropriate soil interval and boring ID.
5. Place the soil in direct sunlight (or other warm environment) and allow the soil to adequately warm up.
6. After the temperature has equilibrated (typically after 15 minutes), insert the probe through the wall of the first sealed bag while the PID is running.
7. Ensure the tip of the PID is not pushed into the soil to prevent blockage of the tip.
8. Record the highest reading on the field form or field notebook.

STANDARD OPERATING PROCEDURE 7

EnCore® Soil Sampling For VOCs

1.0 Scope and Application

This procedure describes the guidelines for field soil sampling using an EnCore sampler (SW5035) to collect VOCs for analysis by Method 8260B.

2.0 Equipment and Materials

a. Lab provided EnCore® sampler

b. Lab provided T-handler

b. Lab provided, certified clean sample containers

3.0 Procedure

Soil samples are collected at established intervals in the soil profile, including at the surface. Sampling intervals are outlined in the investigation-specific work plan. Additional EnCore® sampling instructions and procedures may be provided directly by the laboratory.

EnCore sampling is performed as follows:

1. Wear protective gloves to reduce cross-contamination and change gloves between samples.
2. Open the EnCore reusable package and remove the core device and cap.
3. Twist the piston on the EnCore sampler, so that the piston is unlocked and can move freely.
4. Place the core device into the T-handle.
5. Access the soil sample from the sampling device (e.g., split spoon, acetate liner, rotosonic core, etc.) containing the soil core.
6. Using a stainless steel spoon, scrape off the initial soil touching the soil-core sampler.
7. Push the EnCore core device into the soil core.
8. Twist the T-handle and pull the encore sample free of the soil. The sampler should now be full of soil. If not, repeat this step until the EnCore is full of soil. Confirm that the sampler is full by observing the o-ring through the viewer on the T-handle sampler.
9. Remove excess soil from the sides of the sampler and place the cap onto the sampler. Make sure both sides of the cap lock into place.
10. Twist the piston 90 degrees, so that it is locked.
11. Label and reseal in the original package.
12. Place into cooler with wet ice for shipment.

STANDARD OPERATING PROCEDURE 8

Installation of Permanent Soil Gas Sampling Probes

1.0 Scope and Application

This standard operating procedure (SOP) is recommended as a practical approach for the installation of permanent soil gas sampling probes where the intent is to collect soil gas samples on multiple occasions. A common use of this SOP is during vapor intrusion assessments associated with subsurface volatile organic compound (VOC) contamination. This SOP should be used when its application is consistent with the project's data quality objectives (DQOs) and in conjunction with the *SOP for the Collection of Soil Gas Samples from Temporary and Permanent Probes Using Canisters*. The project team is responsible for ensuring this procedure meets all applicable regulatory standards and receives approval/concurrence from the leading regulatory agency for the project. Only persons trained in the installation of soil gas probes should attempt this procedure.

2.0 Equipment and Materials

a. Geoprobe® Soil Gas Implant Method (the equipment below is typically supplied by the drilling subcontractor)
    - Drive rods – 1.25-inch outer-diameter (OD) drive rods
    - Expendable drive points – steel or aluminum 1.1-inch OD expendable drive points
    - Stainless steel probe screen, such as the Geoprobe Systems® implants. Several screen lengths are available (6-inch, 14-inch, 21-inch) but for discrete intervals required in Vapor Intrusion investigations, a 6-inch screen is typically recommended.
    - Materials to create a flush mount or stick up casing

b. AMS® Dedicated Gas Vapor Probe Method (the equipment may be rented or purchased from AMS®; they offer several different "Gas Vapor Probe Kits" which may be customized with additional pieces of equipment)
    - Slide hammer or hammer drill for driving the probe (will need power supply for the hammer drill)
    - Drive rods – 5/8-inch outer-diameter hollow drive rods
    - Removal jack
    - Dedicated gas vapor probe tip assembly
    - Materials to create a flush mount or stick up casing
    - Leather work gloves, vice grips, and a large adjustable wrench are necessary for the AMS method

c. Probe tubing – 1/4-inch OD Teflon® tubing (may be supplied by the drilling subcontractor)

d. Probe cap (to seal the tubing during equilibration) – Swagelok® part number SS-400-C

e. Glass beads (very small beads, similar to sand) to create a permeable layer around the probe screen.

f. Bentonite seal mixture (25 percent glass beads and 75 percent powdered bentonite clay [hi-yield type]) to grout the hole from above the screen to the ground surface.

g. Electrical tape

h. MultiRae five gas meter for health and safety monitoring during drilling. A MultiRae photoionization detector and Landtec GEM 2000 landfill gas meter (or equivalent) may be used instead of the five gas meter.

3.0 Project Specific Considerations

a. As with all intrusive site work, a utility clearance should be performed prior to mobilization. It may also be necessary to acquire permits and site access.

- Avoid installing soil gas probes within, or near, any utility corridors as trenches filled with higher permeability material may act as a preferential pathway for soil vapors.

b. Soil gas sampling should not be performed until 48 hours after a significant rain event (defined as >1 inch of rainfall).

c. It is common practice to install soil gas probes using a drill rig (e.g., Geoprobe® permanent soil gas implant method). Operation of such machinery shall be performed only by trained and licensed personnel. Soil gas probes can also be advanced with a hand tool method (e.g., the AMS® Retract-A-Tip system). The hand tool installation method is only applicable to relatively shallow sampling (e.g., up to 10 to 15 feet below ground surface [ft bgs] depending on the soil type).

d. The probe can be finished at the ground surface with a stick up or flush mount cover similar to groundwater monitoring wells.

e. Prior to attempting installing soil gas probes there should be an understanding of subsurface conditions at the site.

- Depth to Groundwater – soil gas samples must be collected in the vadose zone (and above the capillary fringe).
- Soil permeability – It may not be feasible to collect soil gas from finer-grained or tight soils with little pore volume, such as clays; if there are clay layers present in the subsurface, these intervals should be avoided. For sampling in these soils, using permanent soil gas implants with a wider borehole is recommended. Care should be taken during purging and sampling so that the vacuum in the sampling system never exceeds 7 inches mercury (inches Hg) or approximately 100 inches water.
- Gravel or dense clay layers may make the hand tool installation method impracticable.

f. Select the probe interval length – typically probe sample intervals are 6 inches or 1 foot; however, smaller or larger intervals may be selected depending on the project's DQOs.

g. Selecting the probe depth interval

- The top of the soil gas probe should be at least 5 ft bgs to avoid short circuiting with outdoor air. If there is impermeable ground cover (e.g., concrete, asphalt), shallower sampling depths may be considered.
- The bottom of the soil gas probe must be above the capillary fringe.
- As the depth of the sampling interval increases, the difficulty of installing the probe also increases, with the primary challenges being pushing the rods down with a hand tool.
- It is advisable to collect a soil core from the proposed sampling area prior to installing the soil gas probe to identify the exact depth of the capillary fringe and determine where the most permeable soil layers are located.
- Sampling at multiple depths at each sample location (or a subset of the locations) should be considered to obtain a vertical profile of soil gas conditions if the vadose zone height is long enough; typically the bottom of a probe should be at least 5 feet from the top of the probe beneath it. Multi-depth probes can be installed in one hole by starting with the deepest depth first and then continuing upward.

4.0 Permanent Soil Gas Probe System Set-Up

Obtain soil gas sampling probes in sufficient quantity to carry out the assessment. See **SOP 8 Figure 1**. These systems and their installation can be obtained from geotechnical firms that provide direct-push supplies and services or from AMS® for the hand tool method. Their basic installation procedures can be followed as long as the details below are included.

Manufactured soil gas probes (such as the Geoprobe® Soil Gas Implant, and AMS® dedicated gas vapor probe tip) are specifically manufactured for soil gas collection and facilitate installation, improve sampling, are easily decontaminated between each use, and offer consistency and ease of use.

It is necessary to coordinate the hardware (i.e., size of tubing, fittings, sampling interface assembly, etc.) that mates the soil gas probe sampling line to the sampling system (e.g., Tedlar® bags, SUMMA® canisters). Appropriate hardware is critical to achieving a leak-free system. All connections should be inert gas-tight compression fittings (i.e., Swagelok® or equivalent), and all sample transfer lines should be made of Teflon® or tubing. Typically, all tubing and fittings should be 1/4-inch OD. These fittings will match up with the sampling manifold specified in the soil gas sampling SOP.

The soil gas probes and equipment must be decontaminated prior to use. Steam cleaning is the preferred method of decontamination; however, a three-stage decontamination process consisting of a wash with a non-phosphate detergent, a rinse with tap water and a final rinse with distilled water may be used. The equipment should be allowed to dry before use. Once decontaminated, the probes must be shown to be free of contaminants. At a minimum, a suitably sensitive organic vapor meter should be used for this purpose. Any probe that does not pass decontamination should not be used.

Handle and store decontaminated soil gas probes in a manner that prevents contamination. Inspect each gas probe assembly for wear and faulty parts. Replace probe tips, o-rings, adapters, and probe rods as needed. New parts and parts in good working condition greatly reduce the chances of ambient air leaking into the soil gas sample and reduce the need for re-pushing probes.

5.0 Soil Gas Permanent Implant Installation

Assemble the drive point holder, implant anchor/drive point, and drive rod. Drive the rod to the desired bottom screen depth (e.g., for a probe screened from 5 feet 6 inches to 5 feet bgs, the rod should be driven to 5 feet 6 inches). Do not disengage the drive point at this time.

Attach the 1/4-inch Teflon tubing to the probe screen. Use enough tubing so that at least 2 feet will be left above ground. Make sure that the tubing does not spin on the probe screen; if it does, it will not be possible to screw the probe screen into the drive point/anchor. Electrical tape can be used to secure the tubing to the screen. Plug the exposed end of the tubing with the probe cap.

Remove the drive head and thread the probe screen (Geoprobe Systems® implant) and tubing down the inside of the drive rod. Once the implant reaches the drive point, turn the tubing counterclockwise with a gentle downward force to thread the screen into the drive point/anchor. Test that the screen is seated by gently pulling up on the tubing. It is very important to ensure that the screen is seated before moving on to the next step.

Retract the drive rod 12 inches while pushing down on the Teflon tubing. This is to ensure that as the rod is being removed while the anchor/drive point and implant stay at depth.

Thread the tubing through a funnel and place the funnel on top of the drive rod. Determine the volume of glass beads needed to fill the space around the screen plus an additional 6-inch space above the screen. Remove the cap placed over the end of the tubing. Pour the beads into the funnel and down the inside diameter of the drive rod. Use the Teflon tubing to stir the glass beads and ensure they make it all the way down to the bottom. Do not pull on the tubing. Note: Failure to remove the cap during this step can result in bridging of glass beads (due to air displacement issue) and therefore an insufficient filter pack around screen. See **SOP 8 Figure 1**.

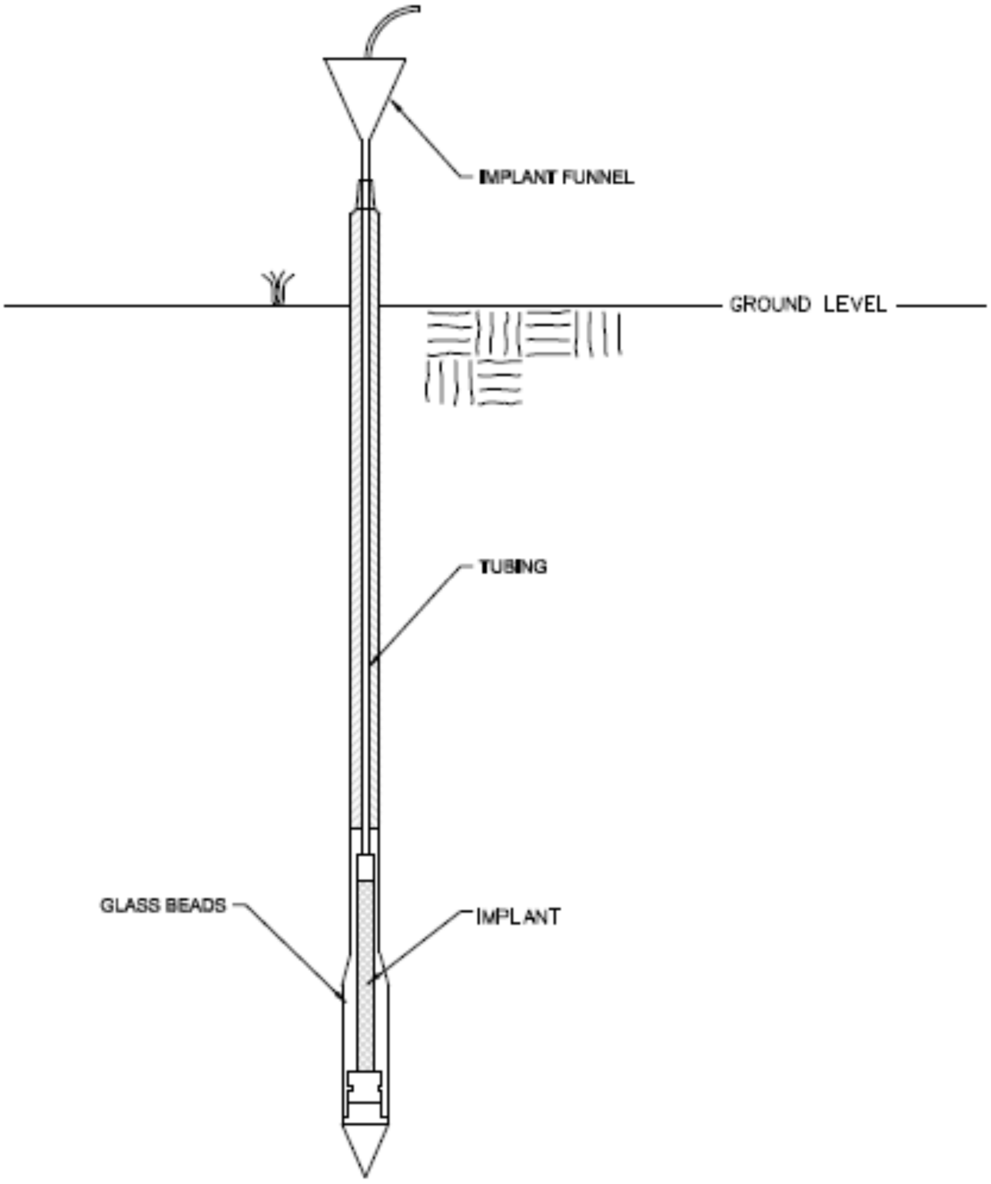
Lift the drive rod up an additional 18 to 24 inches and pour in the bentonite seal mixture. The mixture is 25 percent glass beads and 75 percent powdered bentonite clay (hi-yield type). It takes approximately 154 milliliters (ml) of this mixture per foot. At least 2 feet of the mixture are recommended to adequately seal the hole and prevent contribution from ambient air during sampling. Pour 50 ml of water down the drive rod to initiate the bentonite seal.

Replace cap over end of tubing. Pull the drive rod the rest of the way out of the ground and fill the remaining hole to about 1 foot from the ground surface with either bentonite or cement. Install either a stick up or flush mount cover to finish the probe. Coil the extra tubing inside the enclosure and cover. See **SOP 8 Figure 2.**

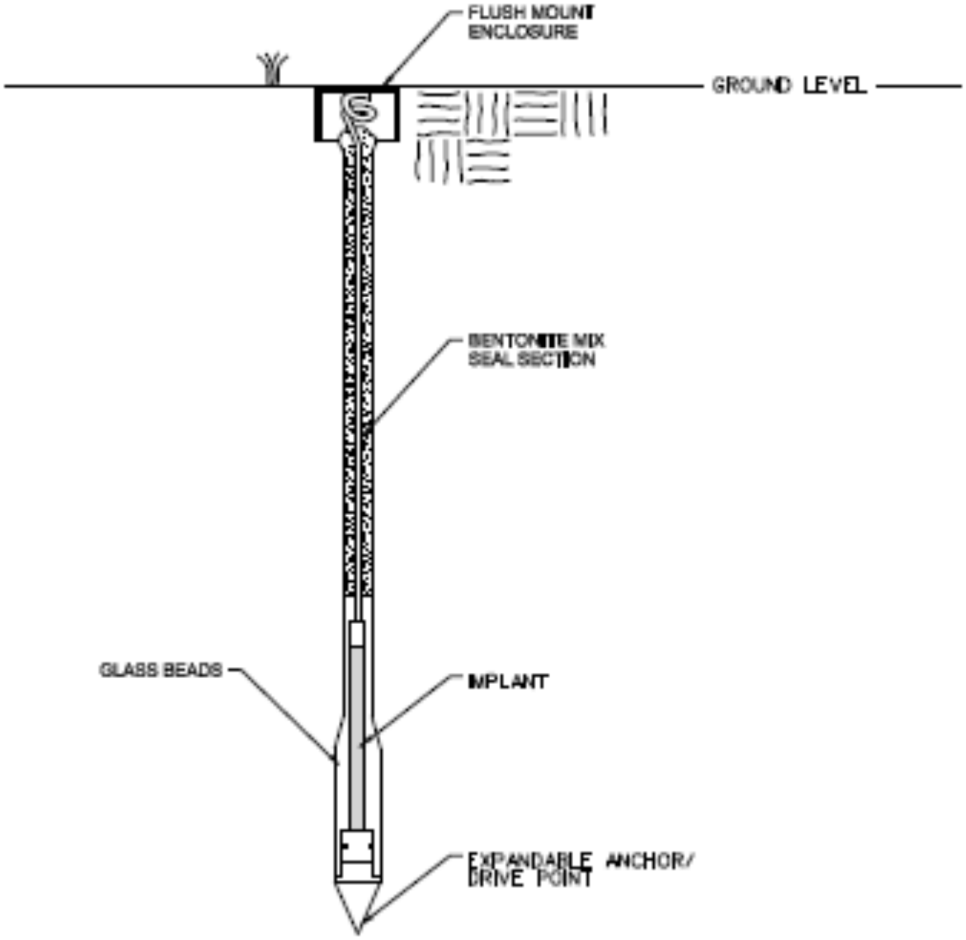
Wait at least 24 hours before sampling, so that the subsurface has time to equilibrate. Follow the proper procedures as presented in the *SOP for the Collection of Soil Gas Samples from Temporary and Permanent Probes Using Canisters*, and **be sure that leak-check procedures are employed**.

When calculating dead volume, use the internal volume of the Teflon tubing, the internal volume of the screen, and the volume of the glass bead pack (assume 30 percent porosity).

The surrounding ground surface shall be replaced and repaired to original condition.



SOP 8 Figure 1. Adding Glass Beads to the Geoprobe Implant



SOP 8 Figure 2. Installed Geoprobe Implant with Flush Mount Cover

6.0 Soil Gas Probe Installation & Removal for the AMS® Dedicated Gas Vapor Probe Method

Assemble the probe as shown in **SOP 8 Figure 3** and attach the tubing. Thread the tubing through the hollow rod and attach the drive end to the top of the rod. Electrical tape may be used to secure the tubing to the tip, and protect the tubing from the drive end.

Push the probe to the desired depth with either the slide hammer or hammer drill. Attach extra rods to achieve the desired depth. Ensure that the final depth of the drive point includes extra depth to include the length of the retracted tip. Retract the rod with the removal jack to expose the screen within the probe tip.

Install the probes in a manner that creates a leak-free seal between the above-ground atmosphere and the probe tip, while minimizing the impact on ground surface covers (e.g., asphalt, concrete, driveways, lawns) by following steps 6.5 to 6.7 below.

Determine the volume of glass beads needed to fill the space around the screen plus an additional 6-inch space above the screen. Remove the cap placed over the end of the tubing and thread the tubing through a funnel and place the funnel on top of the hole. Pour the glass beads into the funnel and down the inside of the hole. Use the Teflon tubing to stir the glass beads and ensure they make it all the way down to the bottom. Do not pull on the tubing. Note: Failure to remove the cap during this step can result in bridging of glass beads (due to air displacement issue) and therefore an insufficient filter pack around screen.

Pour in a bentonite seal mixture an additional 18 to 24 inches on top of the glass bead filter pack. The mixture is 25 percent glass beads and 75 percent powdered bentonite clay (hi-yield type). At least 2 feet of the mixture are recommended to adequately seal the hole and prevent contribution from ambient air during sampling. Pour enough water down the hole to initiate the bentonite seal.

Fill the remaining hole to about 1 foot from the ground surface with either bentonite or cement. Remove funnel and replace cap over end of tubing. In the event the installation technique does not work, and a pre-drilled pilot hole is needed, this procedure must be coordinated with the project engineer. Use of pre-drilled holes will require careful control as to not over-drill and may also create the need for back-grouting to overcome leakage from the aboveground ambient atmosphere.

Wait 30 minutes after the probe is installed and sealed properly to begin sampling, so that the subsurface has time to equilibrate. The probe cap should be tightened on the end of the tubing during the equilibration period. Follow the proper procedures as presented in the *SOP for the Collection of Soil Gas Samples from Temporary and Permanent Probes Using Canisters*, and **be sure that leak-check procedures are employed**.

SOP 8 Figure 3. AMS Gas Vapor Probe Assembly

STANDARD OPERATING PROCEDURE 9

Installation of Temporary Soil Gas Sampling Probes

1.0 Scope and Application

This standard operating procedure (SOP) is recommended as a practical approach for the installation of temporary soil gas sampling probes where the intent is to collect soil gas samples only on a single occasion. A common use of this SOP is during vapor intrusion assessments associated with subsurface volatile organic compound (VOC) contamination. This SOP should be used when its application is consistent with the project's data quality objectives (DQOs) and in conjunction with the *SOP for the Collection of Soil Gas Samples from Temporary Probes and Permanent Implants Using Canisters*. The project team is responsible for ensuring this procedure meets all applicable regulatory standards and receives approval/concurrence from the leading regulatory agency for the project. Only persons trained in the installation of soil gas probes should attempt this procedure.

2.0 Equipment and Materials

a. Geoprobe® PRT Method (the equipment below is typically supplied by the drilling subcontractor)

- Drive rods – 1.25-inch outer-diameter (OD) drive rods
- Expendable drive points – steel or aluminum 1.1-inch OD expendable drive points
- PRT expendable point holder.
- PRT adapters
- Post-run point popper

b. AMS® Retract-A-Tip Method (the equipment may be rented or purchased from AMS®; they offer several different "Gas Vapor Probe Kits" which may be customized with additional pieces of equipment)

- Slide hammer or hammer drill for driving the probe (will need power supply for the hammer drill)
- Drive rods – 5/8-inch outer-diameter hollow drive rods
- Removal jack
- Retract-A-Tip assembly

c. Probe tubing – 1/4-inch OD Teflon® tubing (may be supplied by the drilling subcontractor)

d. Probe cap (to seal the tubing during equilibration) – Swagelok® part number SS-400-C

e. Leather work gloves, vice grips, and a large adjustable wrench are necessary for the AMS method n.

f. Electrical tape

g. MultiRae five gas meter for health and safety monitoring during drilling. A MultiRae photoionization detector and Landtec GEM 2000 landfill gas meter (or equivalent) may be used instead of the five gas meter.

3.0 Project Specific Considerations

a. As with all intrusive site work, a utility clearance should be performed prior to mobilization. It may also be necessary to acquire permits and site access.

- Avoid installing soil gas probes within, or near, any utility corridors as trenches filled with higher permeability material may act as a preferential pathway for soil vapors.

b. Soil gas sampling should not be performed until 48 hours after a significant rain event (defined as >1 inch of rainfall).

c. Temporary soil gas probes are typically installed with a drive point method, where the probe is pushed into the ground without creating a hole beforehand. The probe may either be advanced with a hand tool method (e.g., the AMS® Retract-A-Tip system), or a drill rig (e.g., Geoprobe® post-run tubing [PRT] method). Equipment specifically designed for temporary soil gas sampling is available for either method. Operation of direct-push machinery shall be performed only by trained and licensed personnel. The hand tool installation method is only applicable to relatively shallow sampling (e.g., up to 10 to 15 ft bgs depending on the soil type).

d. Prior to attempting installing soil gas probes there should be an understanding of subsurface conditions at the site.

- Depth to Groundwater – soil gas samples must be collected in the vadose zone (and above the capillary fringe).
- Soil permeability – It may not be feasible to collect soil gas from finer-grained or tight soils with little pore volume, such as clays; if there are clay layers present in the subsurface, these intervals should be avoided. For sampling in these soils, using permanent soil gas implants with a wider borehole is recommended. Care should be taken during purging and sampling so that the vacuum in the sampling system never exceeds 7 inches mercury (inches Hg) or approximately 100 inches water.
- Gravel or dense clay layers may make the hand tool installation method impracticable.

e. Select the probe interval length – typically probe sample intervals are 2 inches or 1 foot; however, smaller or larger intervals may be selected depending on the project's DQOs.

f. Selecting the probe depth interval

- The top of the soil gas probe should be at least 5 ft bgs to avoid short circuiting with outdoor air. If there is impermeable ground cover (e.g., concrete, asphalt), shallower sampling depths may be considered.
- The bottom of the soil gas probe must be above the capillary fringe.
- As the depth of the sampling interval increases, the difficulty of installing the probe also increases, with the primary challenges being pushing the rods down with a hand tool and threading the post-run tubing (PRT) adapter into the PRT point holder.
- It is advisable to collect a soil core from the proposed sampling area prior to installing the soil gas probe to identify the exact depth of the capillary fringe and determine where the most permeable soil layers are located.
- Sampling at multiple depths at each sample location (or a subset of the locations) should be considered to obtain a vertical profile of soil gas conditions if the vadose zone height is long enough; typically the bottom of a probe should be at least 5 feet from the top of the probe beneath it. Multi-depth probes can be installed in one hole by starting with the shallowest depth first and then continuing downward.

g. Temporary soil gas probes can be installed either with or without the sample tubing in place. The sample tubing is attached after the probe is pushed to depth in the PRT method. However, the probe can be pushed with the tubing attached by using a slotted drive cap and slotted pull cap. This method is better for deeper sampling intervals.

4.0 Temporary Soil Gas Probe System Set-Up

Obtain soil gas sampling probes in sufficient quantity to carry out the assessment. These systems and their installation can be obtained from geotechnical firms that provide direct-push supplies and services or from AMS® for the hand tool method. Their basic installation procedures can be followed as long as the details below are included.

Manufactured soil gas probes (such as the Geoprobe® PRT system, and AMS® Retract-A-Tip) are specifically manufactured for soil gas collection and facilitate installation, improve sampling, are easily decontaminated between each use, and offer consistency and ease of use.

It is necessary to coordinate the hardware (i.e., size of tubing, fittings, sampling interface assembly, etc.) that mates the soil gas probe sampling line to the sampling system (e.g., Tedlar® bags, SUMMA® canisters). Appropriate hardware is critical to achieving a leak-free system. All connections should be inert gas-tight compression fittings (i.e., Swagelok® or equivalent), and all sample transfer lines should be made of Teflon® or inert nylon tubing. Typically, all tubing and fittings should be 1/4-inch OD. These fittings will match up with the sampling manifold specified in the soil gas sampling SOP.

The soil gas probes and equipment must be decontaminated prior to use. Steam cleaning is the preferred method of decontamination; however, a three-stage decontamination process consisting of a wash with a non-phosphate detergent, a rinse with tap water and a final rinse with distilled water may be used. The equipment should be allowed to dry before use. Once decontaminated, the probes must be shown to be free of contaminants. At a minimum, a suitably sensitive organic vapor meter should be used for this purpose. Any probe that does not pass decontamination should not be used.

New tubing must be used for each soil gas probe; the tubing cannot be decontaminated. Handle and store decontaminated soil gas probes in a manner that prevents contamination. Inspect all probe parts for wear before each use. Replace probe tips, o-rings, adapters, and probe rods as needed. New parts and parts in good working condition greatly reduce the chances of ambient air leaking into the soil gas sample and reduce the need for re-pushing probes. Ideally, the expendable point holder will be a single piece (as opposed to two or more).

5.0 Soil Gas Probe Installation and Removal for the Geoprobe® PRT Method

Assemble the probe as shown in **SOP 9 Figure 1**. The PRT adaptor and tubing may be attached to the PRT point holder so that the tubing is pushed down instead of post-run if a slotted drive cap is used.

Push the probe to the desired depth. Ensure that the final depth of the drive point includes extra depth to include the length of the tip and the sampling interval when retracted (e.g., for a depth of 5 feet bgs with a 6-inch screen, push the probe to 5 feet 6 inches bgs).

Retract the probe to create an annular space. The retraction length is equal to the selected sampling interval length. It is advisable to check that the tip detached during retraction. This can be done by poking a small-diameter rod down the inside of the probe. Note: Sometimes an o-ring may be used between the tip and tip holder. If so, the tip is more likely to stay attached to the holder when the probe is retracted. Since a leak-check procedure will be utilized prior to collecting soil gas samples, it is not necessary to use an o-ring on the tip. The force of the direct push will hold the tip against the tip holder during the push. In other words, there is no need to create a leak-free seal at this connection, as the tip will be removed before sampling.

Attach the PRT adapter to the 1/4-inch OD Teflon® tubing and secure in place by wrapping the connection with about 2 inches of electrical tape. This prevents the tubing from slipping on the nipple while tightening. Double check that the o-ring on the PRT adapter is new and undamaged.

Feed the PRT adapter and tubing down the probe. When it reaches the point holder, cut the tubing so that an additional 2 to 3 feet of tubing remains above ground. While pushing down on the tubing, twist in a counter-clockwise direction until the probe adapter and tubing seat. Test the connection by lightly tugging on the tubing.

Install the probes in a manner that creates a leak-free seal between the above-ground atmosphere and the probe tip, while minimizing the impact on ground surface covers (e.g., asphalt, concrete, driveways, lawns). Achieving a leak-free seal may require placement of an inert sealing material (i.e., hydrated bentonite) at the point where the probe penetrates the ground surface. See **SOP 9 Figure 2**.

In the event the direct-push installation technique does not work, and a pre-drilled pilot hole is needed, this procedure must be coordinated with the project engineer. Use of pre-drilled holes will require careful control as to not over-drill and may also create the need for back-grouting to overcome leakage from the aboveground ambient atmosphere.

Wait 30 minutes after the probe is installed and sealed properly to begin sampling, so that the subsurface has time to equilibrate. The probe cap should be tightened on the end of the tubing during the equilibration period. Follow the proper procedures as presented in the *SOP for the Collection of Soil Gas Samples from Temporary Probes and Permanent Implants Using Canisters*, and **be sure that leak-check procedures are employed**.

Removal of the probes is to be carried out by trained personnel using the direct-push machinery. The probe will be removed in a manner that minimizes disruption of ground surface covers (e.g., asphalt, concrete, driveways, lawns). Abandon the borehole by filling with a hydrated bentonite slurry or concrete. Replace ground surface covers and repair to original condition.

6.0 Soil Gas Probe Installation and Removal for the AMS® Retract-A-Tip Method

Assemble the probe as shown in **SOP 9 Figure 2** and attach the tubing. Thread the tubing through the hollow rod and attach the drive end to the top of the rod. Electrical tape may be used to secure the tubing to the tip, and protect the tubing from the drive end.

Push the probe to the desired depth with either the slide hammer or hammer drill. Attach extra rods to achieve the desired depth. Ensure that the final depth of the drive point includes extra depth to include the length of the retracted tip. Retract the rod with the removal jack to expose the screen within the probe tip.

Install the probes in a manner that creates a leak-free seal between the above-ground atmosphere and the probe tip, while minimizing the impact on ground surface covers (e.g., asphalt, concrete, driveways, lawns). Achieving a leak-free seal may require placement of an inert sealing material (i.e., hydrated bentonite) at the point where the probe penetrates the ground surface.

In the event the installation technique does not work, and a pre-drilled pilot hole is needed, this procedure must be coordinated with the project engineer. Use of pre-drilled holes will require careful control as to not over-drill and may also create the need for back-grouting to overcome leakage from the aboveground ambient atmosphere.

Wait 30 minutes after the probe is installed and sealed properly to begin sampling, so that the subsurface has time to equilibrate. The probe cap should be tightened on the end of the tubing during the equilibration period. Follow the proper procedures as presented in the *SOP for the Collection of Soil Gas Samples from Temporary Probes and Permanent Implants Using Canisters*, and **be sure that leak-check procedures are employed**.

Remove the probe with the removal jack. The probe will be removed in a manner that minimizes disruption of ground surface covers (e.g., asphalt, concrete, driveways, lawns). Abandon the borehole by filling with a hydrated bentonite slurry or concrete. Replace ground surface covers and repair to original condition.

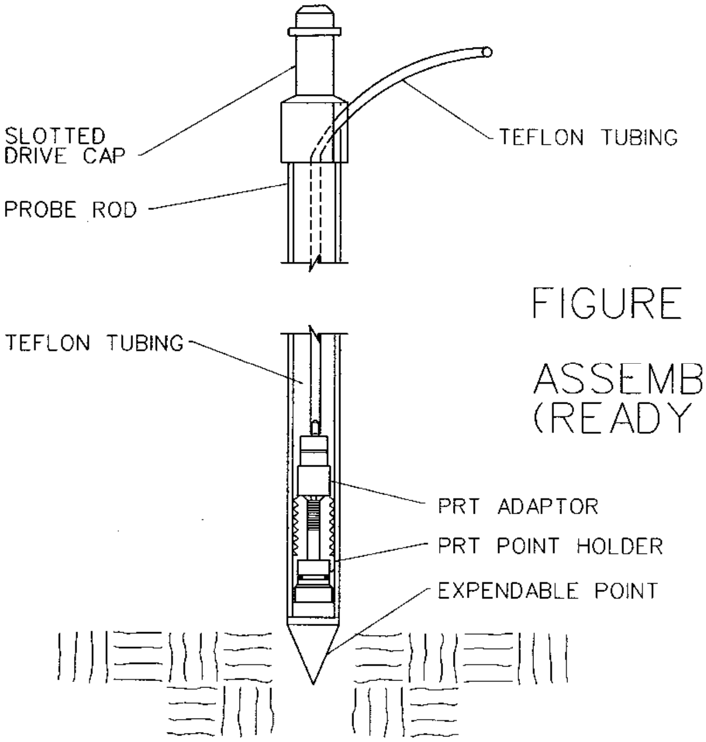
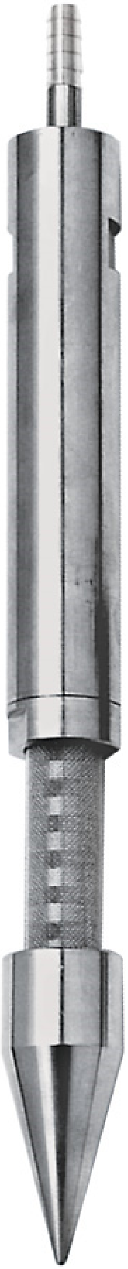


FIGURE 1

ASSEMBLED SOIL/GAS PROBE
(READY FOR INSTALLATION)

SOP 9 Figure 1. Assembled Soil/Gas Probe (Ready for Installation)



SOP 9 Figure 2. AMS Retract-A-Tip Probe Assembly

STANDARD OPERATING PROCEDURE 10

Collection of Soil Gas Samples from Temporary and Permanent Soil Gas Probes using SUMMA Canisters and a Helium Leak Check

1.0 Scope and Application

This procedure offers a practical approach for the collection of soil gas samples from GeoProbe Systems (or equal) direct push soil gas probes with post-run tubing (PRT) adapters or from permanently installed vapor points into SUMMA canisters. Soil gas sample integrity is verified by using a real time helium leak checking procedure before taking each sample. This must be done after probe installation and before sampling as well as before each subsequent sample for permanent probes. This standard operating procedure (SOP) should be used in conjunction with CH2M HILL's SOPs: "Soil Gas Probe Installation SOP" or "Soil Gas Implant Installation SOP," and when its application is consistent with the project's data quality objectives. It is the responsibility of the project team to make sure this procedure meets all applicable regulatory standards and receives approval/concurrence from the leading regulatory agency for the project. Only persons trained in the collection of soil gas samples should attempt this procedure.

2.0 Equipment and Materials

a. The soil gas probes should be installed by a licensed driller.

b. Teflon tubing, ¼-inch outer-diameter sample tubing.

c. Swagelok® ¼-inch nut and ferrule sets for connecting the probe tubing to the sampling manifold.

d. The helium leak check equipment, including the enclosure, helium cylinder (high purity helium), and helium detector (Dialectric MGD is preferred). The enclosure may be provided by the driller or can be constructed from polyvinyl chloride (PVC) pipe. The helium detector can be rented from an equipment rental company.

e. MultiRae five gas meter. (Optional if onsite atmospheric gas analysis is required)

f. Air pump for purging and electric supply for the pump (either generator or power inverter with adapter for car battery). Must be capable of a flow of 200 mls/min and a vacuum of 20 "Hg.

g. Sampling manifold consisting of Swagelok® gas tight fittings with three valves and one pressure gauge to attach the probe to the air pump and the sample canister. This manifold must be clean, free of oils, and flushed free of volatile organic compounds (VOCs) prior to use.

h. Canister, SUMMA polished, certified clean and evacuated. (Canisters are typically provided by the laboratory.)

i. Flow controller or critical orifice, certified clean and set at desired sampling rate. These are typically provided and set by the laboratory.

j. Negative pressure gauge, oil-free and clean, to check canister pressure. The pressure gauges are typically provided by the laboratory. The laboratory may either provide one pressure gauge to be used with all of the canisters, or a pressure gauge for each canister to be left on during sample collection. Sometimes the canisters are fitted with built-in pressure gauges that are not removable.

k. Shipping container, suitable for protection of canister during shipping. Typically, strong cardboard boxes are used for canister shipment. The canisters should be shipped back to the laboratory in the same shipping container in which they were received.

l. Wrenches and screw driver (clean and free of contaminants), various sizes as needed for connecting fittings and making adjustment to the flow controller. A 9/16-inch wrench fits the ¼-inch Swagelok® fittings, which most canisters and flow controllers have.

3.0 Site-Specific Considerations

Prior to attempting soil gas sampling there should be an understanding of subsurface conditions at the site:

- Depth to Groundwater – soil gas samples should be collected in the vadose zone (and above the capillary fringe). Generally, soil gas samples should not be collected at a depth above 5 feet below ground surface (bgs). Sampling at multiple depths should be considered.
- Soil permeability – It may not be feasible to collect soil gas from tighter grain soils with little pore volume, such as clays; if there are clay layers present in the subsurface, these intervals should be avoided. For sampling in these soils, it is recommended to uses soil gas implants with a wider bore hole. Care should be taken during purging and sampling so that the vacuum in the sampling system never exceeds 7 "Hg (100 "water).
- A utility clearance should be performed prior to mobilization, as with all intrusive site work.
- Soil gas sampling should not be performed until 48 hours after a significant rain event (>1 inch of rainfall).

4.0 System Setup

- Acquire all the necessary hardware and sampling equipment shown in **SOP 10 Figure 1**. Be sure to use ¼-inch outside diameter Teflon sample tubing. ***Do not connect the canister at this time***.
- Assemble or obtain the necessary fittings and vacuum gauge to create a soil gas probe and sampling manifold as shown in **SOP 10 Figure 1**. This manifold must be clean, free of oils, and flushed free of VOCs prior to use. Note: use only gas tight fittings such as Swagelok® or equivalent. Be sure to place the helium leak check enclosure over the probe, and push the sample tubing through the hole in the cap before attaching the sampling manifold.
- Adjust the purge system evacuation pump sampling rate to achieve the desired flow rate of 200 milliliters/min. This should be performed at the outlet of the vacuum pump prior to purging, either by using a suitable flow meter, or determining the amount of time required to fill a 1-liter Tedlar bag.
- Summa canisters are pre-evacuated by the laboratory. The vacuum will need to be verified in the field prior to use with a pressure gauge.
- Flow controllers (if used) should come pre-set by the laboratory to sample at a pre-determined rate based on specific project requirements (see **SOP 10 Table 1** for the most common options). In some cases [that is, project-specific quality assurance (QA)], the flow rate will need to be verified in the field prior to use. This is accomplished with a bubble meter, vacuum source, and instructions supplied by the laboratory.

5.0 System Leak Checking and Purging

Physical Leak Check – Perform a leak check of the sample manifold system by:

- Make sure the gas probe valve (valve #1) is closed and the sample valve (valve #2) is open.
- Open the purge valve (valve #3) and start the purge pump. Verify that the flow is set to 200 milliliters per minute (ml/min).
- Close the sample valve (valve #2) and achieve a vacuum gauge reading of approx. 15 inches of mercury ("Hg).
- A leak-free system will be evident by closing off the purge valve (valve #3), turning off the purge pump, and observing no loss of vacuum within the sampling manifold system for a period of 30 seconds. Repair any leaks prior to use.

- Record the leak check date and time on the field sampling log.

System Purge and Helium Leak Check – A purge of the soil gas probe and sampling manifold system is required before taking each sample. The helium leak check procedure is also performed during this step. This leak check will verify the integrity of the PRT adapter seal as well as the probe and ground interface. This is accomplished by:

- Where the ground surface is soft, the helium leak check enclosure is pressed down slightly into the ground surface. In situations where the ground surface is hard (for example, asphalt), apply a slight downward pressure to achieve a buildup of helium in the leak check enclosure.
- Start the flow of helium under the leak check enclosure at 200 ml/min. Try and position the tube so the helium is directed at the interface of the probe and the ground. Let the helium fill the enclosure for a couple of minutes.
- Turn the helium leak detector on and make sure that the detector is not reading any helium before proceeding. Verify that the helium concentration inside the leak check enclosure is >10% by placing the probe of the helium detector into the hole where the sample tubing comes out or under the enclosure wall. It is not necessary to verify that the helium concentration is 100% as this is bad for the detector. Safety factors will be incorporated into measured purge gas helium concentration to verify the probe seal integrity.
- Purging is carried out by pulling soil gas through the system at a rate of 200 ml /min for a time period sufficient to achieve a purge volume that equals at least 3-5 dead volumes (internal volume of the in-ground annular space, sample line, and sampling manifold system). When calculating the dead volume, be sure to take into account the inside diameter and length of the Teflon sample tubing, as well as the probe outside diameter and retract distance for the annular space for temporary probes. For permanent probes, calculate the volume of the annular space using a nominal 30% porosity for the sand or glass bead pack. If during the purge (or sampling) the vacuum exceeds 7 "Hg, then reduce the pump flow rate. The system vacuum must stay below this level at all times.
- Open the sample valve (valve #2) and the purge valve (valve #3) and start the purge pump. Verify that the flow rate is still 200 ml/min.
- To start the soil gas probe purge, open the gas probe valve (valve #1) and close the sample valve (valve #2) at the same time, and start timing.
- During the last 5 minutes of the purge (or the entire purge time if less than 5 minutes), attach a Tedlar bag to the purge pump exhaust on open the bag's valve.
- If the vacuum gauge reads >7 "Hg during the purge, then close the purge valve (valve #3) and monitor the vacuum in the manifold and probe. If there is no significant change after a minute, then there is an insignificant amount of soil gas and the vacuum is too great to take a soil gas sample. Several things can cause this. Consult with the project manager and take corrective action.
    - The soil formation is too 'tight' (that is, high clay or moisture content). Try using a lower flow rate. (temporary or permanent probe)
    - The soil formation is too 'tight'. Try a different depth or location. (temporary probe)
    - With a temporary probe system, the expendable tip may not have released when the probe was retracted. Try retracting the probe a little further, or use a long thin rod to poke the tip loose.
    - If water is visible in the flexible soil gas tubing, stop the purging immediately. It is not possible to take a soil gas sample at that depth or location.
- At the end of the pre-determined purge time and after the system is verified to be leak free, close the purge valve (valve #3), close the valve to the Tedlar bag, and turn off the pump. Do not open the purge valve again. Doing so will result in loss of the purge integrity and will require re-purging.

- Attach the Tedlar bag to the helium detector using a piece of flexible rubber tubing and open the valve. If a helium reading of >0.1%, or 1000 ppmv, is observed, then the probe leak check has failed and corrective action should be taken. This includes first checking the fittings and connections and trying another purge and leak check. It may also be necessary to remove the soil gas probe and re-install it in a nearby location. Using a limit of 0.1 % allows for a 10x safety margin to verify that the leak check was <1% (verify that this limit is consistent with appropriate project-specific agency guidance).
- Remove Tedlar bag and turn off the helium leak detector.
- Record the purge date, time, purge rate, leak check result, and purge volume on the field sampling log.
- Immediately move on to the sampling phase. Little to no delay should occur between purging and sampling.

6.0 Sample Collection

- 'Clean' sampling protocols must be followed when handling and collecting samples. This requires care in the shipping, storage, and use of sampling equipment. Cleanliness of personnel who come in contact with the sampling equipment is also important: no smoking, no eating, no drinking, no perfumes, no deodorants, no dry cleaned clothing, etc. Canisters should not be transported in vehicles with gas-powered equipment or gasoline cans. Sharpie markers should not be used for labeling or note-taking during sampling.
- The SUMMA canisters are certified clean and evacuated by the laboratory to near absolute zero pressure. Care should be used at all times to prevent inadvertent loss of canister vacuum. ***Never open the canister's valve unless the intent is to collect a sample or check the canister pressure.***
- Verify that the vacuum pressure of the canister is between 28 – 30 inches Hg. Do not use a canister that has an initial pressure less than 28 inches Hg because that canister likely leaked during shipment.
  - Remove the protective cap from the valve on the canister.
  - If using an external gauge, attach the gauge to the canister and open the valve. If the pressure gauge has two openings, make sure that the other opening is closed; the canister cap can be used for this. After taking the reading, close the canister and remove the gauge.
  - If using assigned pressure gauges, attach the pressure gauge to the canister, then attach the flow controller. When sample collection begins, record the initial pressure.
- Attach the canister to the flow controller and then connect the flow controller to the sample valve (valve #2) on the sampling manifold. Open the sample valve (valve #2)
- Before taking the sample, confirm that the sampling system valves are set as follows: 1) the purge valve (valve #3) is confirmed to be closed, gas probe valve (valve #1) is open, and 2) the sample valve (valve #2) is open.
- Slowly open the canister's valve approximately one full turn.
- After sampling for the appropriate amount of time (determined from project instructions, see **SOP 10 Table 1**), close the sample valve (valve #2) and the canister's valve. If the canister has a built-in or assigned pressure gauge, allow the canister to fill until the vacuum pressure reaches 0 – 10 inches Hg. Remove the canister from the sampling manifold.
- If using an external vacuum gauge, re-attach it, open the canister valve, and record the final pressure. Close the valve, remove the gauge, and replace and tighten the cap on the canister. Ideal pressure in the canister is between 0-10 inches Hg. More than 10 inches Hg can greatly increase reporting limits. Consult with the project team if this condition is encountered.
- Record the sampling date, time, canister identification (ID), flow controller ID, and any other observation pertinent to the sampling event on the field sampling log. The temperature and barometric pressure should be recorded.
- Fill out all appropriate documentation (sampling forms, sample labels, chain of custody, sample tags, etc.).

- Disassemble the sampling system.

7.0 Sample Handling and Shipping

- Fill out all appropriate documentation (chain of custody, sample tags) and return canisters and equipment to the laboratory
- The canisters should be shipped back to the laboratory in the same shipping container in which they were received. The samples do not need to be cooled during shipment. DO NOT put ice in the shipping container.
- When packing the canisters for shipment, verify that the valve (just past finger tight) and valve caps are snug (1/4 turn past finger tight), and use sufficient clean packing to prevent the valves from rubbing against any hard surfaces. Never pack the cans with other objects or materials that could cause them to be punctured or damaged.
- **Do not place sticky labels or tape on any surface of the canister!**
- Place a custody seal over the openings to the shipping container.
- Make sure to insure the package for the value of the sample containers and flow controllers.
- Ship canisters for overnight delivery.

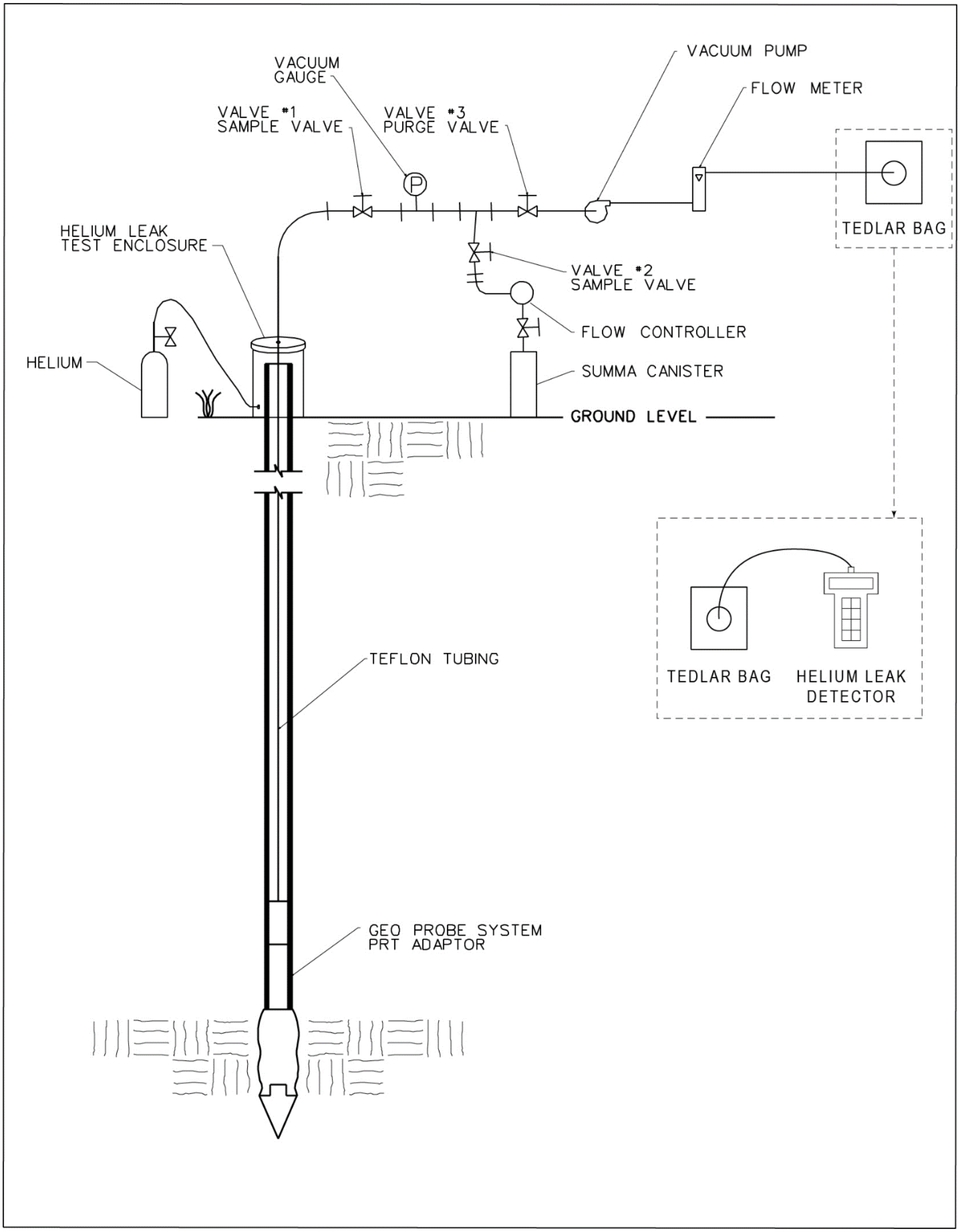
9.0 Quality Control

Canister supplied by the laboratory must follow the performance criteria and quality assurance prescribed in U.S. Environmental Protection Agency (EPA) Method TO-14/15 for canister cleaning, certification of cleanliness, and leak checking. SOPs are required.

Flow controllers supplied by the laboratory must follow the performance criteria and QA prescribed in EPA Method TO-14/15 for flow controller cleaning and adjustment. SOPs are required.

SOP 10 Table 1. Common Sampling Rates for Soil Gas Sampling

Can Size	Length of Sampling Time	Sampling Flow Rate (ml/min)
6 Liter	1 hour	90
6 Liter	8 hours	11.25
6 Liter	24 hours	3.75
1 Liter	5 minutes	180
1 Liter	1 hour	15
850 ml	5 minutes	150
850 ml	1 hour	12



SOP 10 Figure 1. Soil Gas Sampling System

Indoor Vapor Intrusion Assessment
Soil Gas Sampling Field Log

Sheet 1 of 2

Project Info

Project Name: **Project # :**
By: **Date:**

Structure

Identification:
Address:
Sample Location type:

☐ concrete slab on grade
☐ concrete footing w/crawl space
☐ basement
☐ Yard or Driveway
☐ other (describe)

Soil Gas Sampling System

Probe type (describe):

Probe to sample interface system (describe):

Sample collection type: ☐ Syringe ☐ Tedlar bag ☐ Summa canister

Other info (describe other aspects)

Soil Gas Probe Purging & Sampling Log

Sample location (show in diagram)	1	2	3	4
Sample Identification (field ID)				
Time Installed				
Depth of installed probe (feet bgs)				
Leak check, vacuum (probe/sampling interface)				
Calculated dead volume (1 purge volume), cc				
Calculated purge volume (3 purge volume), cc				
Purge rate, cc/min.				
Purge duration, min.				
Purge started (time of day)				
Purge vacuum, " Hg				
Max Helium Leak Check Reading				
Purge completed (time of day)				
Sampling period started (time of day)				
Sampling rate, cc/min				
Sampling vacuum, " Hg				
Sampling period ended (time of day)				

Observations and Comments:

STANDARD OPERATING PROCEDURE 11

Groundwater Grab Sample Collection

1.0 Scope and Application

This SOP presents general guidelines for the collection of groundwater samples from borings during drilling operations.

2.0 Materials

a. Portable adjustable-rate positive-displacement pump, submersible pump, peristaltic pump, or bailer

b. Horiba® U-52 or equivalent water quality meters to monitor pH, specific conductance, turbidity, dissolved oxygen, oxidation-reduction potential (ORP), and temperature

c. Flow-through cell with inlet/outlet ports for purged groundwater and watertight ports for each probe

d. Generator or alternate power source depending on pump type

e. Water-level indicator

f. Disposable Teflon, Teflon-lined polyethylene tubing or polyethylene tubing for metals and other inorganics

g. Plastic sheeting

h. Sample containers

i. In-line disposable 0.45 µm filters (QED® FF8100 or equivalent), if required

j. Shipping supplies (labels, coolers, and ice)

k. Field book/field forms

3.0 Procedure

3.1 Depth to Water Measurement

1. Drilling operations will stop at the target depth as directed by the Field Team Leader, based on the requirements described in the Work Plan. Driller will stop advancement, slightly pull up the outer drill casing to allow for the infiltration of groundwater into the boring. Driller will remove the inner drill rods and bit.
2. Obtain information on current depth of boring from the driller. Have driller confirm depth with a decontaminated sounding rod. Record the boring ID, confirmed boring depth, date, and time in the field logbook
3. Place plastic sheeting on the ground around the exposed drill casing. All decontaminated equipment to be used in sampling will be placed only on the plastic sheeting until after the sampling has been completed.
4. All sampling equipment and any other equipment to be placed in the well is cleaned and decontaminated before sampling in accordance with SOP *Decontamination of Personnel and Equipment*.
5. Water level measurements will be collected to measure current depth to water (DTW) and recharge rate and will be collected in general accordance with the *Water-Level Measurements* SOP with the following exceptions:
    - Measure the depth to water using the top of the exposed outer drill casing as the measuring point.
    - Allow water to equilibrate in the boring for a few minutes and collect another DTW measurement.
    - Measure the length of the outer well casing sticking up from the ground and subtract this value from the DTW measurements to get the estimated depth below ground surface for groundwater.

3.2 Groundwater Grab Sample Purging

1. Calibrate instruments according to manufacturer's instructions.
2. If limited water is present in the soil boring (< 1.0 feet), a bailer will be employed to collect groundwater for sample collection. If an appreciable amount of water is present, then purging will be performed using a portable submersible pump (or peristaltic pump, based on the observed static water level in the well).
3. The submersible pump or bailer will be slowly lowered into the well so as not to agitate or disturb the groundwater and near the bottom of the soil boring.
4. For well pumping, insert the measurement probes into the flow-through cell. The purged groundwater is directed through the cell, allowing measurements to be collected before the water contacts the atmosphere. If a bailer is used, the water will be gently poured into the flow-through cell.
5. If using a generator, locate it 30 feet downwind from the well to avoid exhaust fumes contaminating the samples.
6. Start purging the well at 0.1 to 0.5 liters per minute. Avoid surging.
7. The water level should be monitored during purging, and, if possible, the purge rate should equal the recharge rate of groundwater so that there is little or no drawdown in the boring.
8. The initial field parameters of pH, specific conductance, dissolved oxygen, ORP, turbidity, and temperature of water are measured and recorded in the field logbook. After collection one round of field parameters, begin sample collection.

3.3 Sample Collection

Groundwater sample collection will follow the procedures described in Section 3.2 of the Lo-Flow Sampling SOP.

4.0 Precautions and Preventative Maintenance

- Stirring up of sediment in the well should be avoided so that turbidity containing adsorbed chemicals is not suspended in the well and taken in by the pump.
- Overheating of the pump should be avoided to minimize the potential for losing VOCs through volatilization.
- Keep the working space clean with plastic sheeting and good housekeeping.
- In the event of minimal groundwater present in the boring, or significant drawdown of groundwater is observed during purging, groundwater sample collection will be prioritized over field parameter measurements. If sufficient groundwater remains within the boring subsequent collection of groundwater grab samples, field parameters will be collected.
- Maintain field equipment in accordance with the manufacturer’s recommendations. This will include, but is not limited to:
  - Inspect sampling pump regularly and replace as warranted
  - Inspect quick-connects regularly and replace as warranted
  - Verify battery charge, calibration, and proper working order of field measurement equipment prior to initial mobilization and daily during field efforts

Appendix C
Quality Assurance Project Plan

FINAL

Quality Assurance Project Plan
Grain Handling Facility at Freeman
Freeman, Washington

Prepared for

Washington State Department of Ecology

On behalf of

Union Pacific Railroad and CHS Inc.

April 2016

Title Page with Approvals

Quality Assurance Project Plan
Remedial Investigation/Feasibility Study,
Grain Handling Facility at Freeman, Freeman, Washington

The undersigned representatives concur that the Quality Assurance Project Plan (QAPP) is appropriate for the Remedial Investigation/Feasibility Study conducted at the Grain Handling Facility at Freeman, located in Freeman, Washington. This QAPP is effective from the date of signature approval below until amended or discontinued as determined by UPRR.

Site Owner: UPRR Environmental Site Manager Date

Project Manager: CH2M Date

Project Chemist: CH2M Date

Contents

Section Page

Tables

Figures

Acronyms and Abbreviations

bgs	below ground surface
CH2M	CH2M HILL Engineers, Inc.
CSM	conceptual site model
EDD	electronic data deliverable
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FD	field duplicate
GHFF	Grain Handling Facility at Freeman
HCL	hydrochloric acid
HSP	Health and Safety Plan
LOQ	Limit of quantitation
MDL	Method detection limit
MeOH	methanol
mL	milliliter
MS/MSD	matrix spike/matrix spike duplicate
MTCA	Model Toxics Control Act
NELAP	National Environmental Laboratory Accreditation Program
NTU	Nephelometric Turbidity Unit
ORP	Oxidation-Reduction Potential
PDF	portable document format
PPE	personal protective equipment
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
UPRR	Union Pacific Railroad
VOA	volatile organic analysis
VOC	volatile organic compound
WAC	Washington Administrative Code

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SECTION 1

Introduction

This Quality Assurance Project Plan (QAPP) has been prepared to document the policies, organization, functions, and specific quality assurance/quality control (QA/QC) activities with analytical data generation and assessment designed to achieve the data quality goals associated with the Remedial Investigation/Feasibility Study (RI/FS) activities at the Grain Handling Facility at Freeman (GHFF), located in Freeman, Washington. For the purposes of this QAPP and per Model Toxics Control Act (MTCA), the Site refers to the GHFF and any parcels that may be impacted from contamination emanating from the GHFF.

This QAPP is intended to be used while performing project-related RI activities at the Site. Its purpose is to establish general requirements to ensure that data are collected, reviewed, and analyzed in a consistent manner that will support obtaining analytical data of known quality. This QAPP is an attachment to the RI/FS Work Plan. A Sampling and Analysis Plan (SAP), which details the sampling protocols and associated field activities for the project is also included as an attachment to the Work Plan. This QAPP, along with the SAP, and health and safety plan (HSP) define the project field procedures to conduct the RI. Guidelines followed in the preparation of this plan are listed below.

- U.S. Environmental Protection Agency (EPA) *Guidance for Quality Assurance Project Plans* (EPA QA/G-5) (December 2002)
- Washington State Department of Ecology (Ecology) *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (July 2004)

1.1 Project Background

This QAPP has been prepared for the RI/FS for the GHFF, Washington (Figure 1). This QAPP is the primary guide that describes the methods and procedures to be followed to achieve the field investigation objectives.

A detailed description of the location, background, previous investigations, and purpose of the RI/FS is described in the Work Plan. The GHFF is located on the east side of State Highway 27 in the town of Freeman, Washington, approximately 20 miles southeast of Spokane, Washington. The GHFF is owned by UPRR, currently leased to CHS Inc., and used as a seasonally active grain handling facility. The Site consists of 11 steel grain silos, a steel grain elevator, and a subterranean receiving pit. UPRR owns and operates a railway line that parallels Highway 27 and traverses the property from the southeast to the northwest (Figure 1).

The Freeman School District Campus is located immediately across Highway 27 from the GHFF. The Freeman Campus covers approximately 56 acres of land and includes an elementary school, middle school, and high school. There are three wells on the Freeman Campus. The current water well that supplies drinking water to the school (primary well) was installed in 1980 to 215 feet below ground surface (bgs) and is the sole source of water for the Freeman Campus. It is located near the south perimeter on the Freeman Campus. The second well is a former residential well located in the northeast area of the Freeman Campus (labeled as the Former Marlow Well, W26). This well was not used as a drinking supply well to the Freeman Campus. The third well is a former residential well (labeled as W20) located in the southwest end of the Freeman Campus near the playfield.

Carbon tetrachloride has been detected in samples collected from the Freeman School District water supply well since January 2001. In 2013, an air stripper treatment system was installed at this supply well to remove volatile organic compounds (VOCs) such as carbon tetrachloride and chloroform from the extracted groundwater before use at the Freeman Campus.

In September 2015, the EPA added the Site to the National Priorities List. The EPA identified the Site as a potential source of carbon tetrachloride and chloroform to the Freeman School water supply well. Ecology is the lead agency for cleanup activities at the Site.

1.2 QAPP Objectives

The objectives of the RI is to characterize subsurface conditions at the Site and address identified data gaps for the site conceptual model (CSM) from previous investigations as described in the Work Plan. The SAP describes sample quantities, methods, and locations. This QAPP provides the minimum specifications for data quality and validation required for typical and expected project activities. These minimum standards are designed to provide a common baseline for creating defensible, comparable data.

The objective of the RI/FS is to generate analytical data from groundwater, soil, and soil vapor sampling to address identified data gaps from previous site investigations, update the CSM, and provide data that will be used for potential future remedial activities.

Groundwater, soil, and soil vapor samples will be collected and analyzed according to this QAPP. The contracted analytical laboratory is Pace Analytical Services. Groundwater and soil vapor samples will be shipped to the service center located in Tukwila, Washington. Pace is currently certified by Ecology for all determinative analytical methods. Water analysis will be performed at their Davis, CA laboratory and the air analysis to be performed at their Minneapolis, Minnesota laboratory. Soil analyses will be performed onsite by their mobile laboratory.

SECTION 2

Project Description

This section provides a description of the environmental needs and tasks conducted in support of the RI/FS. The key elements of the project description are information on the goal of the study, primary study questions, data needs, study boundaries, primary tasks, and alternative actions

2.1 Goal of Study

The goals of the RI/FS are to:

- Further understand the nature and extent of carbon tetrachloride contamination at the Site and surrounding areas in soil and groundwater.
- Identify baseline conditions and potential source area(s).
- Characterize a possible shallow water-bearing zone, if present in the area of the Site and the Freeman School District Campus.
- Collect sufficient data in the immediate area of the Site to evaluate groundwater flow direction and hydraulic gradient.
- Collect groundwater data from residences located on Highway 27 adjacent to the Freeman School District Campus.
- Obtain sufficient data and information to develop the CSM.

Based on previous site investigations and documentation, the source of carbon tetrachloride has not been identified, though the GHFF has been documented as the most likely source. The RI/FS will be performed to investigate the source of the carbon tetrachloride, provide a better understanding of site conditions, and update the Site CSM. Further details regarding the identified data gaps and previous site investigations are described in Section 4 of the Work Plan.

2.2 Primary Study Questions

In support of the goals, the following study questions (Q1, Q2, and Q3) formulate the basis of the primary data needs for the RI/FS effort:

- Q1 – What is the nature and extent of carbon tetrachloride contamination at the Site and surrounding areas in soil and groundwater?
- Q2 – Is a shallow water-bearing zone present at the Site?
- Q3 – What is the groundwater flow direction and hydraulic gradient at the Site and vicinity?

2.3 Data Needs

The data needs are based on types of information needed to answer the primary study questions listed above in support of the goals of the RI/FS. To address the study questions, soil borings and groundwater monitoring wells will be installed at the Site to investigate subsurface conditions and groundwater quality. The groundwater and soil sampling locations and analyses for the RI/FS were selected based on a review of previous documents and identified data needs for the CSM. Table 1 provides a summary of data needs for the RI/FS.

Table 1. Data Needs and Uses
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Target Medium	Matrix	Parameter	Data Type		Data Use/Data Need	Data User	Comments
			Field	Analytical			
Groundwater	Water Quality	Temperature (degrees Celsius)	X		Field parameter needed in support of "low-flow" procedures.	Field samplers	Parameter required for sampling (field) only
Groundwater	Water Quality	Hydrogen Ion Activity (pH)	X		Field parameter needed in support of "low-flow" procedures to assess stabilization criteria. Geochemical indicator parameter to assess for elevated pH and to compare against water quality criteria.	Field samplers, property manager/owner, regulator, and remedial technologists	Parameter required for sampling (field) only
Groundwater	Water Quality	Specific Conductance (Conductivity) (µmho/cm)	X		Field parameter needed in support of "low-flow" procedures to assess stabilization criteria. Geochemical indicator parameter to assess for elevated conductance.	Field samplers, property manager/owner, regulator, and remedial technologists	Parameter required for sampling (field) only
Groundwater	Water Quality	Oxidation-Reduction Potential (ORP)	X		Field parameter needed in support of "low-flow" procedures to assess stabilization criteria. Indicator parameter to assess if groundwater indicates a reducing or oxidation environment.	Field samplers, property manager/owner, regulator, and remedial technologists	Parameter required for sampling (field) only
Groundwater	Water Quality	Turbidity	X		Field parameter needed in support of "low-flow" procedures to assess stabilization criteria. Indicator parameter to assess the visual clarity of groundwater.	Field samplers, property manager/owner, regulator, and remedial technologists	Parameter required for sampling (field) only
Groundwater	Water Quality	Dissolved Oxygen	X		Field parameter needed in support of "low-flow" procedures to assess stabilization criteria. Indicator parameter to assess quantity of dissolved oxygen in groundwater to help determine whether aerobic or anaerobic conditions exist.	Field samplers, property manager/owner, regulator, and remedial technologists	Parameter required for sampling (field) only

Table 1. Data Needs and Uses
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Target Medium	Matrix	Parameter	Data Type		Data Use/Data Need	Data User	Comments
			Field	Analytical			
Groundwater	Water Quality	VOCs		X	VOCs are, typically related to fuels and solvents. Elevated concentrations of the chemical of concern, carbon tetrachloride and its associated degradation products, can be indicative of subsurface impacts or, if in high enough concentrations, potential source areas.	Property manager/owner, regulator, and remedial technologists	Included and selected for general perimeter monitoring because ammonia is included in the Part B and land application programs.
Soil	Soil	VOCs (field screen)	X	X	VOCs are typically related to fuels and solvents. Elevated concentrations of the chemical of concern, carbon tetrachloride and its associated degradation products, can be indicative of subsurface impacts or, if in high enough concentrations, potential source areas.	Property manager/owner, regulator, and remedial technologists	Included and selected for general perimeter monitoring because chloride is included in the Part B and land application programs.
Air	Air	VOCs	X	X	Organic volatile chemicals, typically related to fuels and solvents. Elevated concentrations of carbon tetrachloride and its associated degradation products can be indicative of subsurface impacts or, if in high enough concentrations, potential source areas, and a potential for vapor intrusion for indoor facilities.	Field samplers, site manager/owner, regulator, remedial technologists.	Carbon tetrachloride and chloroform are contaminants of concern at the site.

2.4 Study Boundaries

The GHFF address and legal description of the Site are summarized as follows:

- **Facility Address:** 14603 Highway 27, Freeman, Washington
- **Legal Description:** Township 23 North, Range 44 East, Section 1

Figure 1 shows the study area that defines the spatial boundaries applicable to the RI effort to be conducted at the GHFF and surrounding area. Figure 2 shows the location of proposed soil borings, monitoring wells, and water wells that will be part of the RI.

2.5 Primary Tasks

The primary tasks in support of the RI/FS are based on the data needed to answer the primary study questions (stated in Section 2.2). The primary tasks (T1 and T2) and subsequent monitoring activities are summarized as follows:

Task 1 - Phase I Remedial Investigation

The proposed soil investigation activities under this RI/FS Work Plan consists of the following:

- Explore subsurface conditions using a total of 33 soil borings at the GHFF and surrounding areas. Of the 33 soil borings, 8 will be advanced on the Freeman School District Campus, 5 soil borings will be advanced at the 2013 soil boring locations near the GHFF where carbon tetrachloride was detected in soil, 8 soil borings advanced in the public right-of-way (ROW), and up to 12 soil borings will be advanced near the GHFF and UPRR ROW. The number and locations of soil borings are subject to change during implementation of the RI. The drilling program will be adaptively managed using a 24-hour turnaround time for soil sample analysis. The proposed locations presented in this RI/FS Work Plan are intended to provide a starting point for RI implementation. Soil borings will be advanced in unconsolidated material using sonic drilling to refusal at or near competent bedrock. Anticipated soil boring depth will be approximately 50 feet bgs. Proposed soil borings are presented in Figure 2.
- Soil samples will be collected during drilling activities from the retrieved continuous soil cores. Soil samples will be screened for the presence of VOCs using a photo-ionization detector (PID) with an 11.7 electron volt (eV) lamp for head space analysis. Field screening procedures are provided in this SAP. One soil sample will be collected for analytical testing at 5-foot intervals from each soil boring. Additional soil samples may be submitted for laboratory analysis based on field screening results.
- Submit soil samples to a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method 8260B. An onsite mobile laboratory will be utilized for analysis of all soil samples.
- Collect groundwater grab samples at the unconsolidated/consolidated material contact in each soil boring, if present. Following refusal and extraction of the drill rod and sampler, the presence of groundwater will be monitored in each soil boring. The groundwater sampling method will be determined by the quantity and/or recharge measured. Groundwater samples will be analyzed by a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method 8260B. An onsite mobile laboratory will be utilized for analysis of the groundwater grab samples.

The proposed groundwater investigation activities under this RI/FS Work Plan consists of the following:

- Installation of six basalt groundwater monitoring wells; one located at the GHFF, two located within the UPRR ROW, and three located on the Freeman School District Campus. It is anticipated that the wells will be installed to a depth of at least 140 feet bgs depending on site conditions during drilling.

The monitoring well borings will be advanced using air rotary drilling. No soil samples will be collected during borehole advancement. The proposed monitoring well locations are co-located with the sonic soil borings. The depth to bedrock will be known at each location prior to the advancement of the monitoring well borings. The proposed monitoring well locations are shown in Figure 2. Well locations are subject to Ecology approval.

- Potential installation of groundwater monitoring wells targeting a shallow or perched water bearing zone at the GHFF or surrounding areas. The installation depth of these wells is uncertain and will be based on the presence of a shallow or perched water-bearing zone during soil boring advancement discussed in Section 5.1.1. The driller will be equipped to install shallow wells as field conditions dictate. Well locations will be subject to Ecology approval.
- All monitoring wells will be completed as 2-inch Schedule 40 polyvinyl chloride (PVC) with at least 10 feet of 0.020 inch slotted well screen.
- Complete quarterly of groundwater sampling at the newly installed groundwater monitoring wells (MW-1 to MW-6), and at water wells available to sample listed in Table 1 provided access agreements can be obtained. Known water well locations are shown on Figure 4 of the Work Plan. Quarterly sampling will be conducted until the Final RI/FS report is approved by Ecology. Laboratory reports will be provided to Ecology's Project Manager within 60 days of each sampling event. Parcels with structures and potential water wells directly south of the GHFF and adjacent to the Freeman School District Campus are shown in Figure 5 of the Work Plan. UPRR will draft access agreements and contact property owners to request permission to access wells for sampling. If additional residential wells are discovered in the vicinity of the contamination they may also be sampled.
- Submit groundwater samples to a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method 8260B. Groundwater samples collected from the basalt monitoring wells and residential wells will be analyzed using a fixed lab. Groundwater samples collected from potential shallow monitoring wells will be analyzed using the onsite mobile laboratory.
- All monitoring well and soil boring locations will be surveyed following drilling. Existing residential wells proposed for sampling as listed in Table 5-1 of the Work Plan will also be surveyed.

The proposed soil vapor sampling activities under this RI/FS Work Plan consists of the following:

- A total of 4 soil vapor sampling locations are proposed in close proximity to existing school buildings on the Freeman School District Campus (Figure 2). Temporary soil vapor probes will be installed at the four locations in shallow soil (approximately 5-10 feet bgs) and Summa canisters will be used to collect the vapor samples. Samples will be submitted to a qualified analytical laboratory accredited in Washington State for analysis of VOCs using EPA Method TO-15. Depending on the results of this initial soil vapor sampling in conjunction with the soil and groundwater investigation, additional evaluation, including utility corridors as a preferential pathway, of the vapor intrusion pathway may be completed during the Phase II remedial investigation.

Task 1 - Phase II Remedial Investigation (if performed)

Following completion of the Phase I investigation, if additional field work is warranted, CH2M proposes in lieu of submitting an new work plan, that a brief memorandum explaining rationale for additional field work and figure with proposed locations of additional monitoring wells and additional evaluation of the vapor intrusion pathway be submitted to Ecology for review and approval. This process will reduce administrative time and allow for additional data collection to fill possible data gaps and fully characterize nature and extent of VOCs in soil and groundwater in a timely manner. Additional detail is provided in Section 5.3 of the RI/FS Work Plan.

SECTION 3

Organization and Schedule

This section identifies the planning team, decision makers, supporting team members, project schedule, resources, constraints, and deadlines.

3.1 Planning Team

The planning team consists of the site owner (UPRR) and the environmental compliance regulator (Ecology). UPRR has contracted with an environmental consultant (CH2M HILL Engineers, Inc. [CH2M]) to assist with the systematic planning process, documentation of the QAPP, performing the site RI, and the data management.

The primary decision makers are UPRR and Ecology. Key management decisions influencing the monitoring program and potential corrective action are based on the monitoring results collected for the perimeter program.

3.2 Project Schedule

The project schedule is determined by UPRR and may be modified or adjusted based on direction and approval from Ecology. The schedule for specific project milestones is provided in Table 2.

Table 2. Remedial Investigation/Feasibility Study Schedule
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Deliverable	Date Due
Draft RI/FS Work Plan, SAP, HSP, and Schedule	January 12, 2016*
Revised RI/FS Work Plan, SAP, HSP, and Schedule	30 days after receipt of Ecology's comments on the draft documents
Final RI/FS Work Plan, SAP, HSP, and Schedule	14 days after receipt of Ecology's written approval of the Revised RI/FS Work Plan
Begin implementation of RI	30 days after receipt of Ecology's written approval of the Revised RI/FS Work Plan
Agency review Draft RI/FS Report	12 months after receipt of Ecology's written approval of the Revised RI/FS Work Plan
Revised, public review Draft RI/FS Report	30 days after receipt of Ecology's comments on the Draft RI/FS Report
Final RI/FS Report	30 days after receipt of Ecology's written approval of the revised draft RI/FS Report
Progress Reports	Every 3 months

Note:

* The effective date of the Enforcement Order is November 12, 2015. UPRR was granted a 30-day extension for the RI/FS Work Plan deliverable, in accordance with the Enforcement Order.

SECTION 4

Quality Objectives

This section identifies the project quality objectives as developed from the data needs and primary study questions. Project quality objectives are based on the measurement performance criteria.

Table 3 summarizes the measurement performance criteria for onsite field measurements performed during the RI and includes measurements collected from field equipment during soil and groundwater sampling.

Table 3. Measurement Performance Criteria for Onsite Field Measurements
Quality Assurance Project Plan Grain Handling Facility, Freeman, Washington

Medium	Matrix	Parameter	Method	Units	Stabilization Criteria*	Accuracy	Analysis Range
Groundwater	Water Quality	pH (hydrogen ion activity)	Hand-held multi-parameter probe (Horiba U-52 Model or equivalent)	Units	+/- 0.1	+/- 0.1	0 to 14
Groundwater	Water Quality	Turbidity	Hand-held multi-parameter probe (Horiba U-52 Model or equivalent)	Nephelometric Turbidity Units (NTU)	+/- 10% (> 10 NTUs)	+/- 0.1	0 to 800
Groundwater	Water Quality	Temperature	Hand-held multi-parameter probe (Horiba U-52 Model or equivalent)	Degrees Celsius	NA	+/- 1.0	0 to 55
Groundwater	Water Quality	Oxidation-Reduction Potential (ORP)	Hand-held multi-parameter probe (Horiba U-52 Model or equivalent)	millivolts (mV)	+/- 10	+/- 1.0	-2,000 to +2,000
Groundwater	Water Quality	Dissolved Oxygen	Hand-held multi-parameter probe (Horiba U-52 Model or equivalent)	milligrams per liter (mg/L)	+/- 0.3	+/- 0.01	0 to 50.0
Groundwater	Water Quality	Specific Conductance (Conductivity)	Hand-held multi-parameter probe (Horiba U-52 Model or equivalent)	µS/cm	+/- 3%	+/- 0.1	0 to 9,999 µS/cm

Note:

* Stabilization criteria only applicable to groundwater sampling via “low-flow” method as described in Section 4.3.2 of the SAP (details provided in Appendix C).

Tables 4A to 4E summarize the measurement performance criteria for analytical measurements performed in a testing laboratory under a controlled environment. The measurement performance criteria listed in Tables 4A to 4E consider typical analytical procedures and methods as set forth in the latest version of the following:

- *Guidelines Establishing Test Procedures for the Analysis of Pollutants* (40 Code of Federal Regulations Part 136).
- *Environmental Protection Agency SW-846 Third Edition Update IV.*

Table 4A. Measurement Performance Criteria for Offsite Measurements - Water
Volatile Organic Compounds by Method SW8260B
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Analyte	CAS#	MDL (µg/L)	LOQ (µg/L)	Lower	Upper	RPD
1,1,1,2-Tetrachloroethane	630-20-6	0.26	0.5	70	130	25
1,1,1-Trichloroethane	71-55-6	0.17	0.50	70	130	25
1,1,2,2-Tetrachloroethane	79-34-5	0.27	0.50	70	130	25
1,1,2-Trichloroethane	79-00-5	0.24	0.50	70	130	25
1,1,2-Trichlorotrifluoroethane	76-13-1	0.140	0.50	70	140	25
1,1-Dichloroethane	75-34-3	0.15	0.50	70	130	25
1,1-Dichloroethene	75-35-4	0.210	0.50	70	130	25
1,1-Dichloropropene	563-58-6	0.18	0.50	70	130	25
1,2,3-Trichlorobenzene	87-61-6	0.23	0.50	70	130	25
1,2,3-Trichloropropane	96-18-4	0.17	0.50	70	130	25
1,2,4-Trichlorobenzene	120-82-1	0.19	0.50	70	130	25
1,2,4-Trimethylbenzene	95-63-6	0.18	0.50	70	130	25
1,2-Dibromo-3-chloropropane	96-12-8	0.35	0.50	70	130	25
1,2-Dibromoethane (EDB)	106-93-4	0.18	0.50	70	130	25
1,2-Dichlorobenzene	95-50-1	0.17	0.50	70	130	25
1,2-Dichloroethane	107-06-2	0.16	0.50	70	130	25
1,2-Dichloroethene	540-59-0	0.18	0.50	70	130	25
1,2-Dichloropropane	78-87-5	0.19	0.50	70	130	25
1,3,5-Trimethylbenzene	108-67-8	0.16	0.50	70	130	25
1,3-Dichlorobenzene	541-73-1	0.19	0.50	70	130	25
1,3-Dichloropropane	142-28-9	0.23	0.50	70	130	25
1,4-Dichlorobenzene	106-46-7	0.2	0.50	70	130	25
1,4-Dioxane	123-91-1	1.9	10.0	70	130	25
2,2,4-Trimethylpentane	540-84-1	1.25	5.0	70	130	25
2,2-Dichloropropane	594-20-7	0.2	0.50	70	130	25
2-Butanone (MEK)	78-93-3	0.45	5.0	50	150	25
2-Chlorotoluene	95-49-8	0.48	1.0	70	130	25
2-Hexanone	591-78-6	0.34	5.0	50	150	25
4-Chlorotoluene	106-43-4	0.48	1.0	70	130	25
4-Methyl-2-pentanone (MIBK)	108-10-1	0.33	5.0	50	150	25
Acetone	67-64-1	1.10	5.0	70	130	25
Acrolein	107-02-8	3.50	5.0	70	130	25

Table 4A. Measurement Performance Criteria for Offsite Measurements - Water
Volatile Organic Compounds by Method SW8260B

Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Analyte	CAS#	MDL (µg/L)	LOQ (µg/L)	Lower	Upper	RPD
Acrylonitrile	107-13-1	0.85	5.0	70	130	25
Benzene	71-43-2	0.13	0.50	70	130	25
Bromobenzene	108-86-1	0.21	0.50	70	130	25
Bromochloromethane	74-97-5	0.15	0.50	70	130	25
Bromodichloromethane	75-27-4	0.13	0.50	70	130	25
Bromoform	75-25-2	0.18	0.50	70	135	25
Bromomethane	74-83-9	2.800	20.0	50	135	25
Carbon disulfide	75-15-0	0.130	0.50	70	135	25
Carbon tetrachloride	56-23-5	0.18	0.50	70	130	25
Chlorobenzene	108-90-7	0.19	0.50	70	130	25
Chlorodifluoromethane	75-45-6	0.18	5.0	70	130	25
Chloroethane	75-00-3	0.360	0.50	70	130	25
Chloroform	67-66-3	0.16	0.50	70	130	25
Chloromethane	74-87-3	0.380	0.50	70	130	25
cis-1,2-Dichloroethene	156-59-2	0.15	0.50	70	130	25
cis-1,3-Dichloropropene	10061-01-5	0.2	0.50	70	130	25
Dibromochloromethane	124-48-1	0.2	0.50	70	130	25
Dibromomethane	74-95-3	0.16	0.50	70	130	25
Dichlorodifluoromethane	75-71-8	0.28	0.50	65	140	25
Dichlorofluoromethane	75-43-4	0.28	0.50	70	130	25
Diisopropyl ether	108-20-3	0.14	0.50	70	130	25
Ethylbenzene	100-41-4	0.13	0.50	70	130	25
Ethyl-tert-butyl ether	637-92-3	0.14	0.50	70	130	25
Hexachloro-1,3-butadiene	87-68-3	0.25	0.50	70	130	25
Isopropylbenzene	98-82-8	0.14	0.50	70	130	25
m&p-Xylene	179601-23-1	0.25	0.50	70	130	25
Methylene Chloride	75-09-2	0.260	5.0	70	130	25
Methyl-tert-butyl ether	1634-04-4	0.150	0.50	70	130	25
Naphthalene	91-20-3	0.13	0.50	70	130	25
n-Butylbenzene	104-51-8	0.18	0.50	70	130	25
n-Propylbenzene	103-65-1	0.19	0.50	70	130	25
o-Xylene	95-47-6	0.18	0.50	70	130	25

Table 4A. Measurement Performance Criteria for Offsite Measurements - Water
Volatile Organic Compounds by Method SW8260B
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Analyte	CAS#	MDL (µg/L)	LOQ (µg/L)	Lower	Upper	RPD
p-Isopropyltoluene	99-87-6	0.13	0.50	70	130	25
Sec-Butylbenzene	135-98-8	0.17	0.50	70	130	25
Styrene	100-42-5	0.15	0.50	70	130	25
tert-Amyl methyl ether	994-05-8	0.16	0.50	70	130	25
Tert-Butyl alcohol	75-65-0	1.1	5.0	70	130	25
Tert-Butylbenzene	98-06-6	0.19	0.50	70	130	25
Tetrachloroethene	127-18-4	0.23	0.50	70	130	25
Tetrahydrofuran	109-99-9	0.9	5.0	50	150	25
Toluene	108-88-3	0.18	0.50	70	130	25
trans-1,2-Dichloroethene	156-60-5	0.180	0.50	70	130	25
trans-1,3-Dichloropropene	10061-02-6	0.17	0.50	70	130	25
Trans-1,4-Dichloro-2-butene	110-57-6	0.34	5.0	70	130	25
Trichloroethene	79-01-6	0.15	0.50	70	130	25
Trichlorofluoromethane	75-69-4	0.180	0.50	70	130	25
Vinyl acetate	108-05-4	0.26	5.0	50	150	25
Vinyl chloride	75-01-4	0.210	0.50	70	130	25
Xylenes (total)	1330-20-7	0.43	1.0	70	130	25
Surrogates						
1,2-Dichloroethane-d4 (S)	17060-07-0	--	--	70	130	--
2-Bromochlorobenzene (S)	694-80-4	--	--	50	150	--
4-Bromofluorobenzene (S)	460-00-4	--	--	70	130	--
Toluene-d8 (S)	2037-26-5	--	--	50	150	--

Table 4B. Measurement Performance Criteria for Onsite Measurements - Water
Volatile Organic Compounds by Method 8260
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Analyte	MDL µg/L	LOQ µg/L	Duplicate RPD	Matrix Spike		Lab Control Sample	
				% Recovery	**RPD**	**% Recovery**	**RPD**
1,1,1-Trichloroethane	0.1	0.5	20	70 - 140	20	70 - 140	20
1,1,2,2-Tetrachloroethane	0.099	0.5	20	70 - 130	20	70 - 130	20
1,1,2-Trichloroethane	0.1	0.5	20	75 - 135	20	75 - 135	20
1,1-Dichloroethane	0.12	0.5	20	75 - 135	20	75 - 135	20
1,1-Dichloroethene	0.14	0.5	20	55 - 150	20	55 - 150	20
1,2,3-Trichlorobenzene	0.045	2	20	70 - 130	20	70 - 130	20
1,2,4-Trichlorobenzene	0.077	2	20	70 - 130	20	70 - 130	20
1,2,4-Trimethylbenzene	0.06	0.5	20	70 - 130	20	70 - 130	20
1,2-Dichlorobenzene	0.076	0.5	20	80 - 120	20	80 - 120	20
1,2-Dichloroethane	0.078	0.5	20	70 - 130	20	70 - 130	20
1,3,5-Trimethylbenzene	0.075	0.5	20	70 - 130	20	70 - 130	20
1,3-Dichlorobenzene	0.096	0.5	20	80 - 120	20	80 - 120	20
1,4-Dichlorobenzene	0.07	0.5	20	80 - 120	20	80 - 120	20
2-Chlorotoluene	0.075	0.5	20	80 - 120	20	80 - 120	20
4-Chlorotoluene	0.073	0.5	20	80 - 120	20	80 - 120	20
Benzene	0.089	0.5	20	75 - 125	20	75 - 125	20
Carbon tetrachloride	0.038	0.5	20	60 - 140	20	60 - 140	20
Chlorobenzene	0.073	0.5	20	80 - 120	20	80 - 120	20
Chloroform	0.062	0.5	20	75 - 125	20	75 - 125	20
Chloromethane	0.16	2	20	25 - 150	20	25 - 150	20
cis-1,2-Dichloroethene	0.11	0.5	20	80 - 120	20	80 - 120	20
Ethylbenzene	0.054	0.5	20	80 - 120	20	80 - 120	20
Isopropylbenzene	0.081	0.5	20	80 - 120	20	80 - 120	20
m,p-Xylene	0.057	1	20	80 - 120	20	80 - 120	20
Methylene chloride	0.14	2	20	75 – 125	20	75 – 125	20
Naphthalene	0.088	5	20	45 - 150	20	45 - 150	20
n-Butyl Benzene	0.14	0.5	20	75 - 125	20	75 - 125	20
n-Propyl Benzene	0.1	0.5	20	80 – 120	20	80 – 120	20
o-Xylene	0.058	0.5	20	80 – 120	20	80 – 120	20
p-Isopropyltoluene	0.085	0.5	20	75 - 125	20	75 - 125	20
sec-Butyl Benzene	0.13	0.5	20	80 – 120	20	80 – 120	20

Table 4B. Measurement Performance Criteria for Onsite Measurements - Water

Volatile Organic Compounds by Method 8260

Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Analyte	MDL µg/L	LOQ µg/L	Duplicate RPD	Matrix Spike		Lab Control Sample	
				% Recovery	RPD	% Recovery	RPD
Styrene	0.065	0.5	20	75 - 125	20	75 - 125	20
tert-Butylbenzene	0.12	0.5	20	75 - 125	20	75 - 125	20
Tetrachloroethene	0.081	0.5	20	80 – 120	20	80 – 120	20
Toluene	0.053	0.5	20	75 - 125	20	75 - 125	20
trans-1,2-Dichloroethene	0.11	0.5	20	80 – 120	20	80 – 120	20
Trichloroethene	0.062	0.5	20	75 - 125	20	75 - 125	20
Vinyl chloride	0.16	0.5	20	40 - 150	20	40 - 150	20
Xylenes, total	0.115	1.5	20	80 - 120	20	80 - 120	20
Surr: 1-Bromo-2-chloroethane						60 - 140	
Surr: Toluene-d8						60 - 140	
Surr: 4-Bromofluorobenzene						60 - 140	

Table 4C. Measurement Performance Criteria for Offsite Measurements - Soil

Volatile Organic Compounds by Method SW8260B

Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Analyte	CAS#	MDL (mg/kg)	LOQ (mg/kg)	Lower	Upper	RPD
1,1,1-Trichloroethane	71-55-6	0.017	0.25	70	130	25
1,1,2,2-Tetrachloroethane	79-34-5	0.013	0.25	70	130	25
1,1,2-Trichloroethane	79-00-5	0.016	0.25	70	130	25
1,1,2-Trichlorotrifluoroethane	76-13-1	0.01	0.25	50	150	25
1,1-Dichloroethane	75-34-3	0.0105	0.25	70	130	25
1,1-Dichloroethene	75-35-4	0.012	0.25	70	130	25
1,2,4-Trichlorobenzene	120-82-1	0.024	0.25	70	130	25
1,2,4-Trimethylbenzene	95-63-6	0.019	0.25	70	130	25
1,2-Dibromoethane (EDB)	106-93-4	0.0165	0.25	70	130	25
1,2-Dichlorobenzene	95-50-1	0.0095	0.25	70	130	25
1,2-Dichloroethane	107-06-2	0.0145	0.25	70	130	25
1,3,5-Trimethylbenzene	108-67-8	0.0095	0.25	70	130	25
1,3-Dichlorobenzene	541-73-1	0.0075	0.25	70	130	25
1,4-Dichlorobenzene	106-46-7	0.01	0.25	70	130	25
2-Butanone (MEK)	78-93-3	0.105	2.5	50	150	25
2-Hexanone	591-78-6	0.085	2.5	50	150	25
4-Methyl-2-pentanone (MIBK)	108-10-1	0.065	2.5	50	150	25
Acetone	67-64-1	0.125	2.5	50	150	25
Benzene	71-43-2	0.0145	0.25	70	130	25
Bromodichloromethane	75-27-4	0.0165	0.25	70	130	25
Bromoform	75-25-2	0.023	0.25	70	140	25
Bromomethane	74-83-9	0.25	1	55	130	25
Carbon tetrachloride	56-23-5	0.0165	0.25	70	130	25
Chlorobenzene	108-90-7	0.0255	0.25	70	130	25
Chloroethane	75-00-3	0.0155	0.25	70	130	25
Chloroform	67-66-3	0.019	0.25	60	130	25
Chloromethane	74-87-3	0.15	0.25	70	130	25
cis-1,2-Dichloroethene	156-59-2	0.0135	0.25	70	130	25
cis-1,3-Dichloropropene	10061-01-5	0.0175	0.25	70	130	25
Dibromochloromethane	124-48-1	0.013	0.25	70	130	25
Dichlorodifluoromethane	75-71-8	0.01	0.25	40	135	25
Ethylbenzene	100-41-4	0.007	0.25	70	130	25

Table 4C. Measurement Performance Criteria for Offsite Measurements - Soil
Volatile Organic Compounds by Method SW8260B
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Analyte	CAS#	MDL (mg/kg)	LOQ (mg/kg)	Lower	Upper	RPD
Hexachloro-1,3-butadiene	87-68-3	0.0195	0.25	70	130	25
m&p-Xylene	179601-23-1	0.021	0.25	70	130	25
Methylene Chloride	75-09-2	0.0125	0.25	70	130	25
Methyl-tert-butyl ether	1634-04-4	0.0125	0.25	60	130	25
Naphthalene	91-20-3	0.0205	0.25	70	130	25
o-Xylene	95-47-6	0.016	0.25	70	130	25
Styrene	100-42-5	0.0075	0.25	70	130	25
Tetrachloroethene	127-18-4	0.0105	0.25	70	130	25
Tetrahydrofuran	109-99-9	0.135	5	50	150	25
Toluene	108-88-3	0.024	0.25	70	130	25
trans-1,2-Dichloroethene	156-60-5	0.0165	0.25	70	130	25
trans-1,3-Dichloropropene	10061-02-6	0.0165	0.25	70	130	25
Trichloroethene	79-01-6	0.016	0.25	70	130	25
Trichlorofluoromethane	75-69-4	0.0125	0.25	70	130	25
Vinyl acetate	108-05-4	0.0225	1	50	150	25
Vinyl chloride	75-01-4	0.0235	0.25	70	130	25
Surrogates					**Recoveries**	
1,2-Dichloroethane-d4 (S)	17060-07-0	--	--	50	150	--
2-Bromochlorobenzene (S)	694-80-4	--	--	50	150	--
4-Bromofluorobenzene (S)	460-00-4	--	--	50	150	--
Toluene-d8 (S)	2037-26-5	--	--	50	150	--

Table 4D. Measurement Performance Criteria for Onsite Measurements - Soil
Volatile Organic Compounds by Method 8260
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

				Matrix Spike		Lab Control Sample	
Analyte	**MDL µg/kg**	**LOQ µg/kg**	**Duplicate RPD**	**% Recovery**	**RPD**	**% Recovery**	**RPD**
1,1,1-Trichloroethane	12	25	20	55 - 131	20	59 - 143	20
1,1,2,2-Tetrachloroethane	4.8	25	20	29 - 139	20	61 - 133	20
1,1,2-Trichloroethane	8.3	25	20	56 - 134	20	72 - 128	20
1,1-Dichloroethane	4.9	25	20	53 - 134	20	65 - 136	20
1,1-Dichloroethene	4.1	25	20	20 - 183	20	51 - 160	20
1,2,3-Trichlorobenzene	3.6	25	20	52 - 117	20	73 - 122	20
1,2,4-Trichlorobenzene	5.2	25	20	58 - 116	20	80 - 118	20
1,2,4-Trimethylbenzene	4.3	25	20	66 - 129	20	57 - 139	20
1,2-Dichlorobenzene	8.5	25	20	71 - 113	20	87 - 118	20
1,2-Dichloroethane	4.5	25	20	56 - 128	20	66 - 133	20
1,3,5-Trimethylbenzene	2.6	25	20	65 - 133	20	32 - 159	20
1,3-Dichlorobenzene	4.2	25	20	62 - 125	20	88 - 116	20
1,4-Dichlorobenzene	3.9	25	20	61 - 122	20	83 - 116	20
2-Chlorotoluene	9.5	25	20	67 - 133	20	87 - 130	20
4-Chlorotoluene	6.5	25	20	63 - 132	20	92 - 126	20
Benzene	6.6	25	20	55 - 126	20	67 - 128	20
Carbon tetrachloride	5.4	25	20	44 - 136	20	70 - 126	20
Chlorobenzene	3.4	25	20	69 - 113	20	83 - 114	20
Chloroform	5.1	25	20	60 - 127	20	73 - 127	20
Chloromethane	15	50	20	13 - 199	20	24 - 199	20
cis-1,2-Dichloroethene	6.8	25	20	27 - 176	20	67 - 129	20
Ethylbenzene	7.1	25	20	71 - 116	20	80 - 126	20
Isopropylbenzene	4	25	20	74 - 123	20	91 - 121	20
m,p-Xylene	1.8	50	20	71 - 111	20	79 - 124	20
Methylene chloride	2.3	100	20	67 - 127	20	20 - 162	20
Naphthalene	8.6	25	20	51 - 119	20	64 - 125	20
n-Butyl Benzene	9.3	25	20	70 - 124	20	90 - 122	20
n-Propyl Benzene	2.8	25	20	64 - 140	20	84 - 139	20
o-Xylene	3.2	25	20	68 - 113	20	80 - 122	20
p-Isopropyltoluene	4.9	25	20	69 - 128	20	89 - 129	20
sec-Butyl Benzene	4.1	25	20	68 - 129	20	87 - 126	20

Table 4D. Measurement Performance Criteria for Onsite Measurements - Soil

Volatile Organic Compounds by Method 8260

Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Analyte	MDL µg/kg	LOQ µg/kg	Duplicate RPD	Matrix Spike		Lab Control Sample	
				% Recovery	**RPD**	**% Recovery**	**RPD**
Styrene	4.8	25	20	70 - 119	20	82 - 116	20
tert-Butylbenzene	7.1	25	20	68 - 131	20	83 - 139	20
Tetrachloroethene	7.4	25	20	35 - 165	20	61 - 133	20
Toluene	2.6	25	20	59 - 117	20	65 - 134	20
trans-1,2-Dichloroethene	4.1	25	20	34 - 160	20	47 - 151	20
Trichloroethene	4.4	25	20	27 - 173	20	67 - 132	20
Vinyl chloride	14	25	20	17 - 199	20	25 - 199	20
Xylenes, total	5	75	20	65 - 120	20	75 – 125	20
Surrogates						% Recovery	
Surr: 1-Bromo-2-chloroethane						44 - 130	
Surr: Toluene-d8						42 - 136	
Surr: 4-Bromofluorobenzene						54 - 145	

Table 4E. Measurement Performance Criteria for Offsite Measurements Air
Volatile Organic Compounds by Method TO15
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Analyte	CAS#	MDL (ppbv)	PRL (ppbv)	Lower	Upper	RPD
1,1,1-Trichloroethane	71-55-6	0.0446	0.2	72	140	25
1,1,2,2-Tetrachloroethane	79-34-5	0.0471	0.1	68	137	25
1,1,2-Trichloroethane	79-00-5	0.0444	0.1	66	138	25
1,1,2-Trichlorotrifluoroethane	76-13-1	0.0386	0.2	70	132	25
1,1-Dichloroethane	75-34-3	0.0382	0.2	68	137	25
1,1-Dichloroethene	75-35-4	0.0591	0.2	73	138	25
1,2,4-Trichlorobenzene	120-82-1	0.120	0.5	48	150	25
1,2,4-Trimethylbenzene	95-63-6	0.0251	0.2	75	134	25
1,2-Dibromoethane (EDB)	106-93-4	0.0991	0.2	75	132	25
1,2-Dichlorobenzene	95-50-1	0.0837	0.2	71	129	25
1,2-Dichloroethane	107-06-2	0.0500	0.1	73	139	25
1,2-Dichloropropane	78-87-5	0.0574	0.2	70	130	25
1,3,5-Trimethylbenzene	108-67-8	0.0365	0.2	75	133	25
1,3-Butadiene	106-99-0	0.0784	0.2	65	135	25
1,3-Dichlorobenzene	541-73-1	0.0868	0.2	75	131	25
1,4-Dichlorobenzene	106-46-7	0.0816	0.2	69	135	25
2-Butanone (MEK)	78-93-3	0.0759	1	67	131	25
2-Hexanone	591-78-6	0.0984	1	72	130	25
2-Propanol	67-63-0	0.0960	1	65	135	25
4-Ethyltoluene	622-96-8	0.0377	0.2	75	130	25
4-Methyl-2-pentanone (MIBK)	108-10-1	0.0522	1	68	134	25
Acetone	67-64-1	0.3450	1	63	144	25
Benzene	71-43-2	0.0375	0.1	64	139	25
Benzyl chloride	100-44-7	0.0315	0.2	75	125	25
Bromodichloromethane	75-27-4	0.0285	0.2	75	134	25
Bromoform	75-25-2	0.0857	0.2	72	130	25
Bromomethane	74-83-9	0.0784	0.2	71	132	25
Carbon disulfide	75-15-0	0.0320	0.2	55	140	25
Carbon tetrachloride	56-23-5	0.0301	0.1	75	150	25
Chlorobenzene	108-90-7	0.0286	0.2	71	132	25
Chloroethane	75-00-3	0.0722	0.2	71	129	25
Chloroform	67-66-3	0.0383	0.1	73	136	25

Table 4E. Measurement Performance Criteria for Offsite Measurements Air

Volatile Organic Compounds by Method TO15

Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Analyte	CAS#	MDL (ppbv)	PRL (ppbv)	Lower	Upper	RPD
Chloromethane	74-87-3	0.0514	0.2	52	143	25
cis-1,2-Dichloroethene	156-59-2	0.0609	0.2	64	137	25
cis-1,3-Dichloropropene	10061-01-5	0.0801	0.2	75	128	25
Cyclohexane	110-82-7	0.0902	0.2	60	140	25
Dibromochloromethane	124-48-1	0.0989	0.2	75	136	25
Dichlorodifluoromethane	75-71-8	0.0954	0.2	70	141	25
Dichlorotetrafluoroethane	76-14-2	0.0436	0.2	70	140	25
Ethanol	64-17-5	0.139	0.5	60	145	25
Ethyl Acetate	141-78-6	0.0950	0.2	65	140	25
Hexachloro-1,3-butadiene	87-68-3	0.0599	0.2	51	150	25
m&p-Xylene	179601-23-1	0.178	0.4	71	134	25
Methylene Chloride	75-09-2	0.154	1	64	130	25
Methyl-tert-butyl ether	1634-04-4	0.0827	1	73	134	25
Naphthalene	91-20-3	0.0573	0.5	43	150	25
n-Heptane	142-82-5	0.0669	0.2	65	135	25
n-Hexane	110-54-3	0.0996	0.2	65	135	25
o-Xylene	95-47-6	0.0796	0.2	75	134	25
Propylene	115-07-1	0.0774	0.2	60	135	25
Styrene	100-42-5	0.0445	0.2	75	133	25
Tetrachloroethene	127-18-4	0.0403	0.1	66	137	25
Tetrahydrofuran	109-99-9	0.0396	0.2	50	150	25
Toluene	108-88-3	0.0402	0.2	70	130	25
trans-1,2-Dichloroethene	156-60-5	0.0952	0.2	70	130	25
trans-1,3-Dichloropropene	10061-02-6	0.0563	0.2	70	130	25
Trichloroethene	79-01-6	0.0504	0.1	70	130	25
Trichlorofluoromethane	75-69-4	0.0231	0.2	70	130	25
Vinyl acetate	108-05-4	0.0922	0.2	50	150	25
Vinyl chloride	75-01-4	0.0752	0.1	70	130	25

Surrogates					Lower	Upper
1,4-Dichlorobenzene-d4 (S)	3855-82-1				30	150
Hexane-d14 (S)	21666-38-6				30	150
Toluene-d8 (S)	2037-26-5				30	150

Table 5 summarizes the analytes, methods, and soil and groundwater quality screening criteria.

Table 5. Analytical Suite, Methods, and Soil and Water Quality Criteria
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Method	**Analyte**	**Groundwater Reporting Limit**	**Groundwater Criteria** [a]	**Soil Reporting Limit**	**Soil Criteria**[b]
SW8260B	Carbon Tetrachloride	0.5	5.0 µg/L	0.25	14.3 mg/kg/1880 mg/kg
SW8260B	Chloroform	0.5	80 µg/L	0.25	32.3 mg/kg/4230 mg/kg

Notes:

a Groundwater Quality Standards are per Chapter 173-200 of Washington Administrative Code (WAC).

b Soil Screening Level is per Chapter WAC 173-340 MTCA Method B/Method C

Section 8 provides guidance on how the data will be evaluated to ensure that the measurement performance criteria or project quality objectives are met.

SECTION 5

Sampling Process Design

This section describes the sampling design, which includes details on the data types, parameters, frequency, field measurements, and laboratory measurements. Subsequent sections of this QAAP provide pertinent details regarding field and analytical sampling methods (that is, standard operating procedures [SOPs]).

5.1 Data Types, Samples, and Frequency

Table 1 summarizes the data types and parameters (based on the data needs and users). Table 3 summarizes the onsite (field) measurements. Tables 4A to 4E summarizes the offsite measurements (laboratory-analyzed parameters). Table 5 summarizes the analytes, methods, and the soil and groundwater criteria. Table 6 summarizes the sample containers, preservation, and holding times. Figure 2 illustrates the RI/FS boring and groundwater sampling locations.

Table 6. Sample Containers, Preservatives, and Hold Times
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Matrix	Parameter	Method	Container	Preservation	Analytical Holding Time
Water	VOCs	SW8260B	40 mL VOA Vial	HCL	14 days
Soil	VOCs	SW8260B	Encore or equivalent	4ºC	14 days
Air	VOCs	TO15	1-Liter Summa Canister	None	30 days

Notes:
HCL = hydrochloric acid
mL = milliliter
VOA = volatile organic analysis

5.2 Field Documentation and Measurements

Table 3 summarizes the field measurements and measurement performance criteria. The sampling lead will record field measurements and observations on a bound field notebook or dedicated field sampling forms (copies of field forms are provided in the SAP, Appendix A of the RI/FS Work Plan). Field documentation will be maintained by each sampling lead to provide a daily record of significant observations, measurements, personnel, and other noteworthy observations for each sampling effort. The recorded field documentation is intended to provide sufficient data and observations to enable participants to reconstruct the respective sampling events if necessary.

The SAP provides additional detail of the field documentation (such as sampling methods, sample handling, and field QC).

5.3 Laboratory Documentation and Measurements

Tables 4A to 4E summarize the laboratory measurements and measurement performance criteria. Samples submitted to the analytical laboratory will be accompanied by a chain-of-custody record. The sample custodian receiving the samples will sign, date, and note the time of receipt of samples on the chain-of-custody record. The sample custodian will verify that the sample numbers match those on the chain-of-custody record. Pertinent information as to the shipment, pickup, and courier will be entered in the sample receiving logbook. The sample custodian will then enter the unique sample numbers into a sample tracking system, and is responsible for making sure that all samples are transferred to the proper analyst or stored in the appropriate secure area.

The sample custodian is responsible for the care and custody of samples from the time they are received, until the sample is exhausted or disposed. All identifying sample tie tags, data sheets, and laboratory records are retained as part of the documentation. Sample containers and remaining samples are disposed of by the laboratory in compliance with all federal, state, and local regulatory requirements.

Laboratory calibration procedures will follow the methods referenced in Tables 7A and 7B. All calibrations (unless otherwise specified), at a minimum, will be at the following level of effort:

Table 7A. SW8260B Calibration and Quality Control Criteria
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS tuning check Use BFB	Prior to initial calibration and calibration verification	Refer to criteria listed in the method	Retune instrument and verify.	Not appropriate
Initial multipoint calibration for all analytes (minimum five standards) (ICAL)	Initial calibration prior to sample analysis	**SPCCs**: Average RF ≥ 0.30 [c] (SW8260B),**CCCs:**% RSD for RFs ≤ 30%**and** one of the options below: *Option 1*: linear – RSD for each analyte < 15% *Option 2 linear* – linear least squares regression r ≥ 0.995 for each analyte	Correct problem then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
Second-source calibration verification	Once per ICAL	All analytes within ± 20% of expected value	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Retention time window position establishment for each analyte and surrogate	Once per ICAL	Position shall be set using the midpoint standard of the initial calibration curve.	N/A	N/A
Retention time window verified for each analyte	Each sample.	Relative retention time (RRT) of the analyte within ± 0.06 RRT units of ICAL	Correct problem then reanalyze all samples analyzed since the last retention time check.	Apply J-flag to all results for the specific analyte(s) in the sample which are outside the established window.

Table 7A. SW8260B Calibration and Quality Control Criteria

Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
CCV	Daily, before sample analysis unless ICAL performed on same day and after every 12 hours of analysis time	**SPCCs:** average RF ≥ 0.30[c] **CCCs:** ≤ 20% D All analytes within ± 20% D of expected value from ICAL	Correct problem then rerun CCV. If that fails, repeat initial calibration.	Apply J-flag to all results for the specific analyte(s) > 20% D for all samples associated with the calibration verification.
Internal Standards	Each sample	Retention time ± 30 seconds from retention time of the IS in the ICAL mid-point std. EICP area within -50% to +100% of area from IS in ICAL mid-point standard	Inspect mass spectrometer and GC for malfunctions and corrections made as appropriate. Reanalysis of samples analyzed while the system was malfunctioning is mandatory.	Apply J-flag to all results for analytes associated with a failed IS unless a matrix effect can be verified, then apply M-flag.
Method blank	One per analytical batch	No analytes detected > ½ RL For common lab contaminants no analytes detected > RL	If necessary,-reprep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate.
LCS for all analytes	One LCS per analytical batch	Acceptance criteria in Tables 4A and 4B.	Correct problem then reanalyze. If still out, reprep and reanalyze the LCS and all samples in the affected batch.	If corrective action fails, apply J-flag to the specific analyte(s) in all samples in the associated preparatory batch.
MS/MSD	One MS/MSD per every 20 project samples per matrix	Acceptance criteria in Tables 4A and 4B.	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes.	For the specific analyte(s) in parent sample
Surrogate spike	Every sample, spiked sample, standard, and method blank	Acceptance criteria in Tables 4A and 4B.	Correct problem then reprep and reanalyze the affected samples. If matrix effect is verified, discuss in case narrative.	If the %R > UCL apply J-flag to all positive results for associated analytes. If the %R < LCL apply J-flag to all positive results for associated analytes and UJ -flag to all associated non-detects.

Table 7A. SW8260B Calibration and Quality Control Criteria

Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ ½ the RLs in Tables 4A & 4B See 40 CFR, Part 136 Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid.	Run MDL verification check at higher level and set higher MDL or reconduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply J-flag to all results between MDL and RL.

Table 7B. TO15 Calibration and Quality Control Criteria

Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS tuning check (Use BFB)	Prior to initial calibration and calibration verification	Refer to criteria listed in method	Retune instrument and verify.	Not appropriate
Initial multipoint calibration for all analytes (minimum five standards) (ICAL)	Initial calibration prior to sample analysis	One of the options below: *Option 1*: linear – RSD for each analyte ≤ 30%. *Option 2*: linear – least squares regression r $\geq$ 0.995 for each analyte.	Correct problem then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
Second-source calibration verification	Once per ICAL	All analytes within ± 30% of expected value	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
CCV	Daily, before sample analysis unless ICAL performed on same day and every 24 hours of analysis time	All analytes within ± 30% of expected value	Correct problem, rerun CCV. If that fails, repeat initial calibration.	Apply J-flag to all results for the specific analyte(s) > 30 %D for all samples associated with the calibration verification.
Internal Standards	Each sample	Retention time ± 0.33 minutes from retention time of the IS in the most recent valid calibration. (ICAL mid-point standard or CCV) EICP area within ± 40% of area of the IS in most recent valid calibration	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while the system was malfunctioning is mandatory.	Apply Q-flag to all results for analytes associated with a failed IS unless a matrix effect can be verified, then apply M-flag.
Method blank (humid zero air)	Immediately after ICAL or daily CCV	No analytes detected ≥ RL	Assess data. Correct problem. If necessary, reprep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate. Section 8.2.1.4.
LCS for all analytes	One LCS per analytical batch	Acceptance criteria in Table 4E.	Correct problem then reanalyze. If still out, reprep and reanalyze the LCS and all samples in the affected associated preparatory batch..	If corrective action fails, apply J-flag to the specific analyte(s) in all samples in the associated preparatory batch.

Table 7B. TO15 Calibration and Quality Control Criteria
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Sample duplicate	One sample duplicate per analytical batch	Acceptance criteria in Table 4E.	Correct problem and reanalyze sample and duplicate.	If corrective action fails, apply J-flag to the specific analyte(s) in the sample.
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ ½ the RLs in Table 4e. See 40 CFR, Part 136 Appendix B. Verification checks must produce a response at least 3X instrument noise level and must produce a response greater than the blanks associated with the MDL study.	Run MDL verification check at higher level and set higher MDL or reconduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply J-flag to all results between MDL and RL.

5.4 Laboratory Data Management

Data reduction will be done manually or by using appropriate application software. Quantitation procedures specified for each method must be followed. If data reduction is done manually, the documentation must include the formulas used. Any application software used for data reduction must have been previously verified by the laboratory for accuracy. Documentation of the software's verification must be maintained on file in the laboratory. All documentation of data reduction must allow re-creation of the calculations.

All data will undergo a minimum of three levels of review at the laboratory prior to release. The analyst performing the tests shall initially review 100 percent of the data. After the analyst's review has been completed, 100 percent of the data shall be reviewed independently by a senior analyst or by the section supervisor for accuracy, compliance with calibration, and QC requirements, holding time compliance, and for completeness. Analyte identification and quantitation must be verified. Calibration and QC results will be compared with the applicable control limits. Reporting limits should be reviewed to make sure they meet the project objectives. Results of multiple dilutions should be reviewed for consistency. Any discrepancies must be resolved and corrected. Laboratory qualifiers will be applied when there are nonconformances that could potentially affect data usability. These qualifiers must be properly defined as part of the deliverables. All issues that are relevant to the quality of the data must be addressed in a case narrative. The laboratory QC manager will review a minimum of 10 percent of data or deliverables generated for this program against the project specific requirements. A final data review will be conducted by the Laboratory Manager or Client Services Representative to ensure that all required analyses were performed on all samples and that all documentation is complete.

The pdf-copy and electronic laboratory reports for all samples and analyses will contain the information necessary to perform data evaluation.

PDF copy deliverables, in summary format, equivalent to those specified in the latest versions of USEPA Contract Laboratory Program Statements of Work for Organics Analyses or CLP-like are preferred. Other delivery formats are also acceptable as long as the format provides summarized, form oriented reporting. Alternate reporting formats require approval from the Project Chemist. The laboratory data report should be organized in format that facilitates identification and retrieval of data. A Level 1 will include, at a minimum, the following information (when applicable):

- Cover Letter complete with the following information:
  - Title of report and laboratory unique report identification (Sample Delivery Group Number)
  - Project name, site location
  - Name and location of laboratory and second-site or subcontracted laboratory
  - Client name and address
  - Statement of authenticity and official signature and title of person authorizing report release
- Table of contents
- Summary of samples received that correlates field sample ids with the laboratory ids
- Laboratory qualifier flags and definitions
- Field identification number
- Date received
- Date prepared
- Date analyzed (and time of analysis if the holding time is less than or equal to 48 hours)
- Preparation and analytical methods
- Result for each analyte (dry weight basis for soils)
- Percent solids results for soil samples
- Dilution factor (provide both diluted and undiluted results when available)
- Sample-specific reporting limit adjusted for sample size, dilution/concentration
- Sample-specific MDL adjusted for sample size, dilution/concentration (when project objectives require reporting less than the RL)
- Units

A Level 2 report will consist of all the elements included in a Level 1 deliverable plus those outlined below:

- Case Narrative that addresses the following information at a minimum;
  - Sample receipt discrepancies, such as bubbles in VOA samples, and temperature exceedances.
  - Descriptions of all non-conformances in the sample receipt, handling, preparation, analytical and reporting processes and the corrective action taken in each occurrence.
  - Identification and justification for sample dilution
- Surrogate percent recoveries
- MS/MSD and LCS spike concentrations, native sample results, spiked sample results, percent recoveries, and RPDs between the MS and MSD results. Associated QC limits must also be provided.
- Method blank results

- Analytical batch reference number that cross references samples to QC sample analyses
- Executed chain of custody and sample receipt checklist

A Level 3 report will consist of all the elements included in Level 1 and 2 reports plus those outlined below:

- Analytical sequence or laboratory run log that contains sufficient information to correlate samples reported in the summary results to the associated method QC information, such as initial and continuing calibration analyses.
- Calibration blank results for inorganic analyses (required in PDF copy format only)
- Internal standard recovery and retention time information, as applicable
- Initial calibration summary, including standard concentrations, RFs, average RFs, RSDs or correlation coefficients, and calibration plots or equations, if applicable (required in PDF copy format only)
- Continuing calibration verification summary, including expected and recovered concentrations and percent differences (required in PDF copy format only)
- Instrument Tuning and mass calibration information for gas chromatography /mass spectrometry analyses
- Any other method-specific QC sample results

Level 3 deliverables are required.

5.5 PDF copy and Electronic Deliverables

Within the timeframe specified in the laboratory statement of work, contract, or purchase order from sample receipt, the laboratory shall deliver PDF copy documentation as specified in this document. In addition the laboratory shall deliver one electronic copy of the data within the same timeframe.

All electronic data files shall match the final pdf copy results. CH2M HILL requires receipt of final pdf copy results in conjunction with submittal of electronic files.

All raw data will be maintained on file in the laboratory and will be available upon request by project management. Complete documentation of sample preparation and analysis and associated QC information will be maintained in a manner that allows easy retrieval in the event that additional validation or information is required. All data generated using gas chromatography /mass spectrometry must be maintained on magnetic tapes and will be made available to CH2M HILL upon request. All documentation must be retained for a minimum of 10 years after data acquisition.

The primary responsibility for the implementation of these procedures within the laboratory will reside with the laboratory manager or equivalent. The laboratory manager will approve laboratory reports before transferring the information to the client.

SECTION 6

Sampling Procedures

This section identifies the sampling procedures in support of the data needs and primary study questions. Section 6.1 describes the general requirements and sampling procedures, including training, health and safety, and sample management; whereas Section 6.2 provides SOPs for routine groundwater and surface water sampling.

The general sampling procedures include details on specialized training, health and safety requirements, sample identification, sample documentation, sample handling, calibration of field equipment, decontamination of sampling equipment, and the management of investigation-derived waste.

6.1 Specialized Training

Sampling will be conducted by personnel who have the required training and experience with environmental sampling and are familiar with site conditions and potential hazards. The site-specific health and safety requirements identify required training (refer to Section 6.2). In addition, UPRR requires additional site training and security background checks for work conducted at their facilities.

6.2 Health and Safety Requirements

All CH2M personnel and subcontractors will abide by the approved health and safety requirements provided in the site-specific CH2M HSP. All fieldwork performed by CH2M will be conducted by personnel who have participated in a pre-job health and safety meeting to review the site hazards and document the job hazard analysis for each investigation activity. In addition to the HSP, all CH2M field team members will abide by UPRR safety and training requirements for performing fieldwork on UPRR property and near railroad ROWs.

All field activities (as described in the SAP) will be performed using the required personal protective equipment (PPE) that will include at a minimum nitrile gloves, eye protection, steel toed boots, hearing protection, and hard hats (when necessary). Additional PPE may be required and will be determined by the Health and Safety Manager. All PPE requirements will be provided in the HSP.

6.3 Sample Procedures

Sampling procedures and SOPs are described in detail in the SAP that is included as part of the Work Plan. The SAP also provides details on field equipment calibration and operation, sample labeling, sampling methods, chain-of-custody requirements, and other procedures required for sample collection.

SECTION 7

Measurement Procedures

This section identifies the measurement procedures (equivalent to analytical procedures) in support of the data needs to answer the primary study questions.

Tables 4A to 4E list the measurement performance criteria for analytical measurements.

Table 5 summarizes the analytical parameters, test methods, and the water quality and soil cleanup criteria.

Table 6 summarizes the sample containers, preservatives, hold times, and measurement methods.

The contracted analytical laboratory is Pace Analytical Services, samples will be shipped to the service center located in Tukwila, Washington. Pace is currently certified by Washington Department of Ecology for all determinative analytical methods. Analysis of groundwater samples collected from the basalt monitoring wells and residential wells will be performed at their Davis, California laboratory and the air analysis to be performed at their Minneapolis, Minnesota laboratory. Groundwater grab samples, groundwater samples collected from potential shallow monitoring wells, and soil analyses will be performed onsite by their mobile laboratory.

SECTION 8

Quality Control

This section identifies the QC procedures in support of the data needs and primary study questions. The QC procedures include pertinent information regarding field QC, laboratory QC, and potential corrective action (if needed). QC is evaluated against the measurement performance criteria established in Section 4 (Quality Objectives).

8.1 Field and Laboratory Quality Control Samples

Quality control samples will be collected to assist in determining data quality and reliability. QC samples collected in the field include field duplicates (FDs) and laboratory QC samples (MS and MSD analyses). In addition equipment blanks, temperature blanks and trip blanks are submitted to support QC objectives. QC samples will be collected using the same procedures and immediately following collection of the target or “normal” sample. Further details on field and laboratory QC sample labeling is provided in the SAP.

FDs will be collected at a rate of 10 percent for air, soil and water samples (1 in 10 samples). An FD is an independent sample collected as close as possible to the original sample from the same source, and is used to assess sampling precision. FDs will be labeled as “FD” and packaged in the same manner as normal samples so the laboratory cannot distinguish between normal samples and duplicates. Each FD will be taken using the same sampling and preservation method as other samples.

Laboratory QC samples will be collected to perform MS and MSD analyses. MS/MSD samples will be collected at a frequency of 5 percent for soil and water samples (1 in 20 samples). A MS is an aliquot of a sample that is spiked with a known concentration of target analyte(s) in the laboratory. An MS analysis provides a measure of the method accuracy. A MSD is an additional sample same as the MS and is used to determine the precision of the method. Three times the normal sample volume will be collected for MS/MSD laboratory QC samples. Laboratory QC samples will be labeled as such on sample bottles and chain-of-custody forms.

For each sampling event that includes decontamination of sampling equipment for soil and water an equipment blank should be taken for each matrix and be analyzed for the analytes reported in that matrix. One equipment blank should be taken per matrix for each event, week or 20 normal samples, whichever is more frequent.

One temperature blank will be included with each cooler shipment containing soil and water samples (regardless of targeted analysis) sent to the laboratory. Temperature blanks provide a means of verifying that samples have been maintained at the proper temperature (0-6 degrees Celsius) following collection and during transport to the laboratory. The laboratory will supply the temperature blank as part of each bottle order request (to be returned with the batch of samples).

Two - three trip blank vials will be included with each cooler shipment containing soil and water samples for VOC analysis sent to the laboratory. Trip blanks are provided to identify contaminants artificially introduced to the normal samples during transport to and from the laboratory. The laboratory will supply the trip blanks as part of each bottle order request that includes VOCs (to be returned as one of the samples in the batch for analysis).

8.2 Corrective Action

During the course of the project, analytical results may indicate a QC problem. The accredited laboratory chemist will follow proscribed procedures to resolve those problems. The project chemist will determine whether corrective action is necessary, which may include the following:

- Recalibrating analytical measurement devices or laboratory testing meters
- Reanalyzing samples if enough residual sample is available, and if possible, within hold-time requirements
- Collecting additional samples
- Modifying analytical procedures
- Qualifying analytical results, if needed

If potential corrective action is needed, the chemist will contact the site owner (UPRR) and the sampling lead to determine which of the options listed above is necessary. Ecology will also be notified of any potential corrective action. Details regarding the corrective action and outcome will be supplied by the contracted laboratory (Pace Analytical Services) for each occurrence as part of the QC data package.

SECTION 9

Data Management and Reporting

This section identifies the data management and reporting in support of the goals and primary study questions.

9.1 Field Documentation

Field observations and measurement data will be recorded on dedicated field forms (or bound field notebooks) to create a permanent record of field activities. All hand-entered data will be reviewed by a second person to minimize data entry errors. A check for completeness of field records (e.g., logbooks, field forms, databases, and electronic spreadsheets) will ensure that all requirements for field activities have been fulfilled, complete records exist for each activity, and the procedures specified in this QAPP have been implemented. Field documentation will ensure sample integrity and provide sufficient technical information to re-create each field event using the guidelines in Section 6.

Data collected under the SAP will be reviewed by the respective field sampling leaders to determine whether the qualitative parameters of representativeness and comparability have been achieved. In general, the review will be accomplished by comparing the chain-of-custody and field notebook entries with the QAPP sampling requirements herein.

9.2 Data Management

Upon receipt of the electronic data from the laboratory, the data will be reviewed and uploaded to the UPRR and project databases. Data are uploaded by the site owner (UPRR), or designated data management specialist, into the UPRR Project Electronic Data Deliverable system and the Ecology Environmental Information Management (EIM)

Laboratory deliverables will include electronic data deliverables (EDDs in Excel format) and analytical reports in portable document format (PDF) files. The laboratory will send the deliverables for each sample delivery group by email to the project manager and data manager. EDDs will include sample identifying information, analyte concentrations in field and QC samples, units, and other related information. An EDD template, along with valid values, will be provided to the laboratory.

Analytical reports will include a case narrative discussing any problems with the analyses, corrective actions taken, changes to the referenced method, and an explanation of data qualifiers. The laboratory data package will also include QC results associated with the data such as blanks, surrogate compounds, and check standards as well as results for analytical duplicates and MS/MSDs.

When data are uploaded, the database manager will conduct manual data checks to make sure that the correct volume of data has been added to the database. These data checks will include verifying the number of records uploaded, verifying that all fields of information have been added, and spot-checking the data (not to exceed 5 percent of the uploaded data). In addition, the system will send an error message during the uploading process if a problem is encountered, and the upload will be halted until the problem is resolved.

Electronic copies of the original data will be retained by the site owner.

9.3 Data Review and Reporting

The contracted laboratory will supply the site owner (URPP) with the EDDs for each sampling event, which include all the documentation as summarized in Section 9.2. Data collected under this QAPP will undergo the following three stages of review:

- In the field, by the sampling lead for each task during and immediately after sample collection with the methods and procedures described in Sections 5 and 7.
- At the testing laboratory, by the accredited laboratory testing chemist in accordance with the SOPs for analyte-specific methods.
- Outside the laboratory, by the site owner (UPRR, or its designated data review specialist) using the objectives listed in the following text.

The primary objectives of the data review process make sure of the following:

- Data are consistent, correct, and complete in alignment with this QAPP and the event-specific chain-of-custody, with no transcription errors or omissions.
- Results for QC samples (described in Section 8) accompany the sample results.
- Established criteria for QC results were met.
- Data qualifiers are properly assigned by the testing laboratory in the data packages (as necessary).
- Methods and protocols specified in the QAPP and SAP were followed.

Table 8. Flagging Conventions
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Quality Control Check	Evaluation	Flag	Samples Affected
Holding Time	Holding time exceeded for extraction or analysis	J = positive results; UJ = nondetects	Sample
	Holding time exceeded by a factor of two	J = positive results; R = nondetects	
Sample Preservation SW8260B	Sample not preserved	J = positive results; UJ = nondetects	Sample
Sample Integrity SW8260B	Bubbles in VOA vial used for analysis	J = positive hits; UJ = nondetects	Sample
Temperature SW8260B	>6°C	J = positive results; UJ = nondetects	All samples in same cooler
ICAL	RRF <0.050, <0.010 for poor responders	J = positive results, R = nondetects	All associated samples in analysis batch
	%RSD >20.0% SW8260B %RSD >30.0% TO15 **OR** calibration curve used, but with coefficient of correlation or determination <0.99	J = positive results, UJ = nondetects	
Calibration Verification (second-source and continuing calibration verification)	RRF <0.050, <0.010 for poor responders	J = positive results, UJ = nondetects	All associated samples in analysis batch
	%D >25.0%	J = positive results, UJ = nondetects	

Table 8. Flagging Conventions
Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Quality Control Check	Evaluation	Flag	Samples Affected
Laboratory Control Sample	%R >UT	J = positive results	All samples in preparation batch
	%R LT	J = positive results, UJ = nondetects	
	%R <10%	J = positive results; R = nondetects	
Calibration Blank Method Blank	Multiply the highest blank concentration by five	U = positive sample results <5x highest blank concentration	All samples in preparation batch or analytical batch, whichever one applies, associated with method blank or calibration blank
Equipment Blank			All samples, same site, matrix and date (water) or all samples, same site, matrix (soil) associated with equipment blank
Trip Blank			All samples shipped in the same cooler as the trip blank
MS/MSD			
%R	%R >UT	J = positive results	MS analytes in parent sample and FD if any.
	%R <LT	J = positive results; UJ = nondetects	
	%R <10%	J = positive results; R = nondetects	
RPDs	RPD >UT	J = positive results	MS analytes in parent sample and FD, if any.
Surrogates			
	%R >UT	J = positive results	All analytes in sample
	%R <LT and none <10%	J = positive results; UJ = nondetects	
	%R <10%	J = positive results; R = nondetects	
Internal Standards	Area >UT	J = positive results; UJ = nondetects	Associated analytes in sample
	Area <LT but not <10%	J = positive results;	
	Area <10%	J = positive results; R = nondetects	
FDs	Concentration of reported analytes are >5 times the RL in either sample and RPD >UT (30% for water samples; 50% for soil vapor samples)	J = positive results	FD pair

Table 8. Flagging Conventions

Quality Assurance Project Plan, Grain Handling Facility, Freeman, Washington

Quality Control Check	Evaluation	Flag	Samples Affected
	One or both sample results <5 times the RL and a difference of ±2 times the RL for water (±4 times for soil vapor).	J = positive; UJ = nondetect	

Notes:

QA/QC criteria not provided in this document will be provided by the lab performing the analysis and will be used for validation criteria.

Spike recovery limits do not apply when sample concentration exceeds the spike concentration by a factor of four or more.

Where one MS recovery meets acceptance criteria and the other MS of the pair does not, professional judgment may be used to determine if the parent sample should be qualified for matrix effects by comparing the MS recoveries to other QC results within the batch or sample site.

Qualifier may not apply in cases where a surrogate coelutes with a nontarget analyte.

Qualifier may not apply in cases where low surrogate recoveries are due to sample dilution.

< = less than

> = greater than

%R = percent recovery

LT = lower tolerance

UT = upper tolerance

SECTION 10

References

U.S. Environmental Protection Agency (EPA). 2002. *EPA Guidance for Quality Assurance Project Plans.* EPA QA/G-5. December.

U.S. Environmental Protection Agency (EPA). 2008. *EPA SW-846 Third Edition Update IV.* January.

Washington State Department of Ecology (Ecology). 2004. *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*. July.

Figures

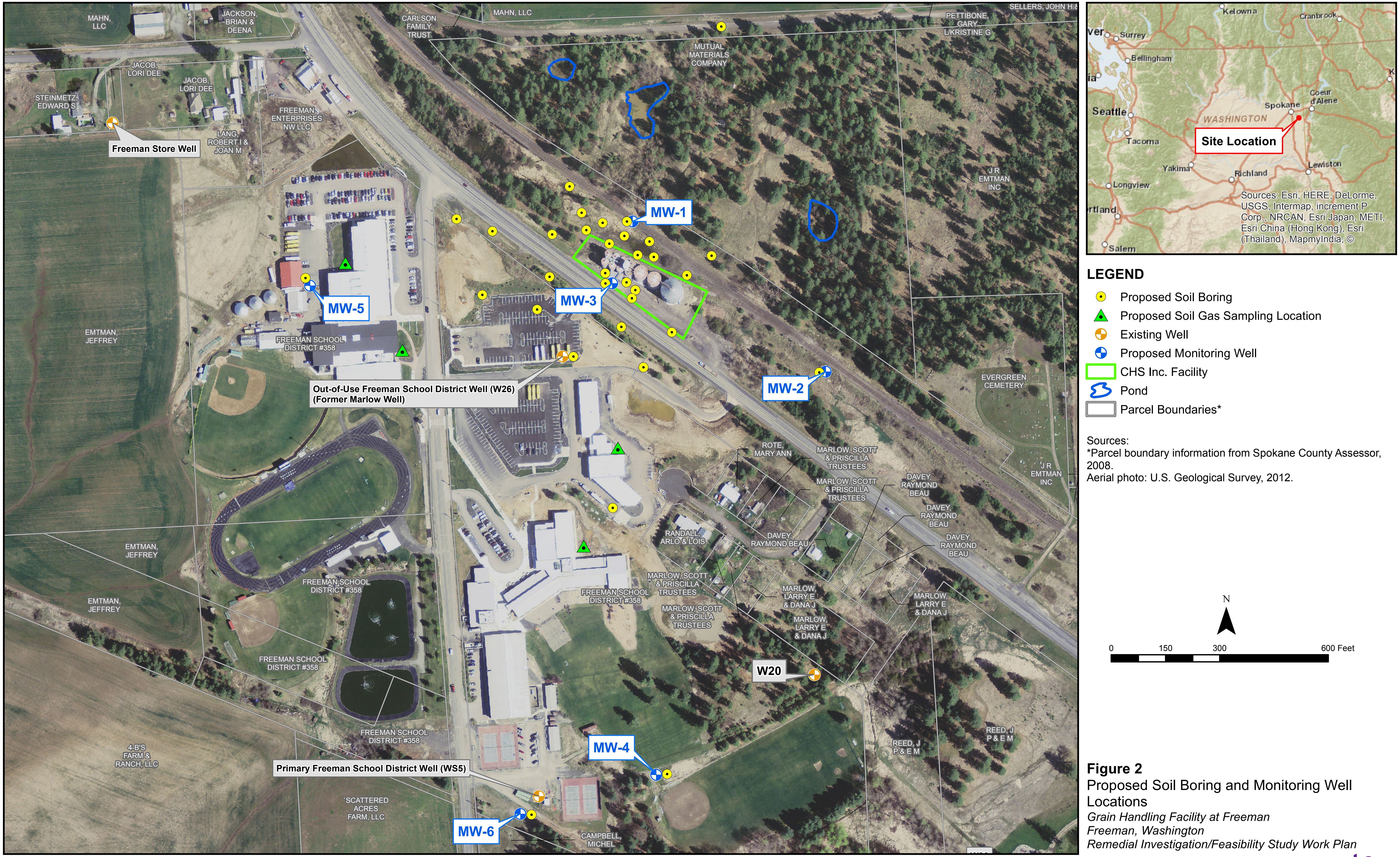
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, ©

LEGEND

- ● Existing Well
- 🟩 CHS Inc. Facility
- ○ Pond
- ☐ Parcel Boundaries*

Sources:
*Parcel boundary information from Spokane County Assessor, 2008.
Aerial photo: U.S. Geological Survey, 2012.

Figure 1
Site Location and Overview Map
Grain Handling Facility at Freeman
Freeman, Washington
Remedial Investigation/Feasibility Study Work Plan



Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, ©

LEGEND

- ● Proposed Soil Boring
- ▲ Proposed Soil Gas Sampling Location
- ◍ Existing Well
- ◍ Proposed Monitoring Well
- 🟩 CHS Inc. Facility
- ◯ Pond
- ☐ Parcel Boundaries*

Sources:
*Parcel boundary information from Spokane County Assessor, 2008.
Aerial photo: U.S. Geological Survey, 2012.

Figure 2
Proposed Soil Boring and Monitoring Well Locations
Grain Handling Facility at Freeman
Freeman, Washington
Remedial Investigation/Feasibility Study Work Plan

C:\USERS\GGEE\DOCUMENTS\GIS\UPRR FREEMAN\MAPFILES\FIGURE2_PROPOSEDSOILBORINGS.MXD GGEE 3/8/2016 3:14:45 PM

Appendix D
Health and Safety Plan

FINAL

Health and Safety Plan
Grain Handling Facility at Freeman, Freeman, Washington

Prepared for

Washington State Department of Ecology

On behalf of

Union Pacific Railroad and CHS Inc.

April 2016

Emergency Contacts

24-hour CH2M Injury Reporting– 1-866-893-2514
24-hour CH2M Serious Incident Reporting Contact – 720-286-4911

Medical Emergency – 911	**CH2M- Medical Consultant** WorkCare Dr. Peter Greaney M.D. 300 S. Harbor Blvd, Suite 600 Anaheim, CA 92805 800-455-6155/866-893-2514 714-978-7488
Fire/Spill Emergency – 911 Facility Fire Response #: 911 Local Fire Dept. #: 911	**CH2M Director – Health, Safety, Security & Environment** Andy Strickland/DEN 720-480-0685 (cell) or 720-286-2393 (office)
Security & Police – 911 Local Police #:911	**CH2M Responsible Health and Safety Manager (RHSM):** John Culley/SPK Cellular Number: 206/660-3367
Utilities Emergency Phone Numbers Water: 911 Gas: 911 Electric: 911	**CH2M Human Resources Department** Phone: Employee Connect toll-free number 1-877-586-4411 (U.S. and Canada)
Safety Coordinator (SC-HW) Name: Rueben Greer/SPK Phone: 509/847-8819	**CH2M Worker's Compensation:** Contact Market HR dept. to have form completed or contact Jennifer Rindahl after hours: 720-891-5382
Project Manager (PM) Name: Steve Demus/SPK Phone: 509/944-1785	**Media Inquiries Corporate Strategic Communications** Name: John Corsi Phone: (720) 286-2087
CH2M Project Environmental Manager Name: Carolyn Kossik/SEA Cellular Number: 425/530-1143	**Automobile Accidents** Contact Mary Ellegood-Oberts/DEN (720-286-2291)
Federal Express Dangerous Goods Shipping Phone: 800/238-5355	**CHEMTEL (hazardous material spills)** **Phone: 800/255-3924**
Facility Alarms:	Evacuation Assembly Area(s): Main facility parking area

Facility/Site Evacuation Route(s): To be determined

Directions and MAP to Local Hospital

Hospital Name/Address: Deaconess (Valley) Medical Center
12606 E Mission Ave, Spokane, WA

Hospital Phone #: (509) 473-5706

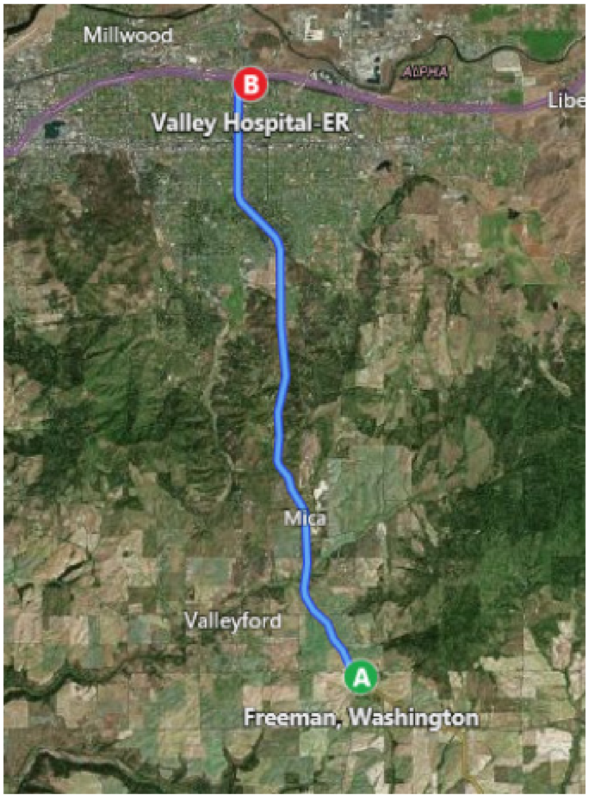
Directions to Hospital

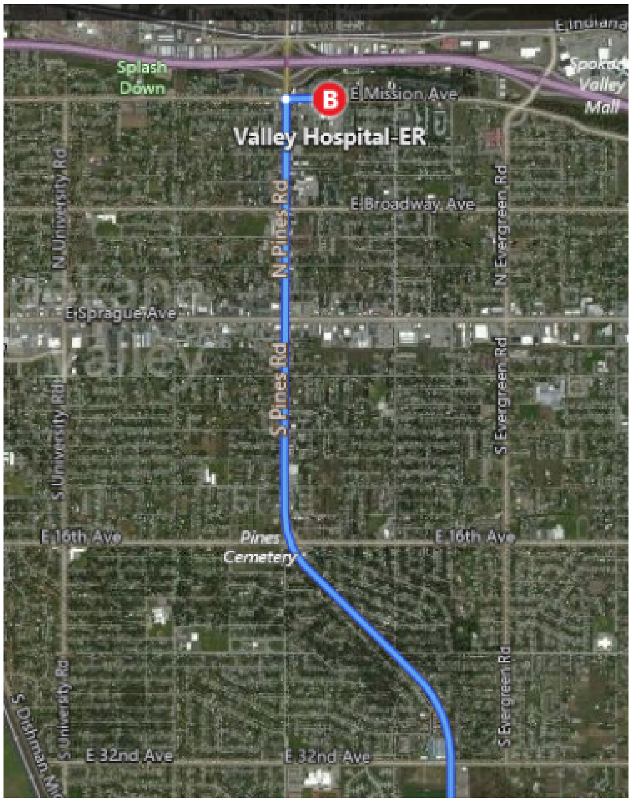
Directions:

Take Hwy WA-27 N, toward Spokane Valley, WA (Hwy 27 will turn into Pines Road) – 12 miles
Turn right onto E Mission Ave; Destination will be on the right
(If you hit I-90, you've gone too far)

SC-HW will develop hand-written map once onsite

Hospital Route Map





Incident Notification and Reporting

- Notify and submit reports to client as required in contract.
- Serious Incidents must be reported in accordance with CH2M Standard of Practice, *Serious Incident Reporting Process,* immediately. Serious incidents are those that involve any of the following:
  - Work related death, or life threatening injury or illness of a CH2M employee, subcontractor, or public
  - Kidnap/missing person
  - Acts or threats of terrorism
  - Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than $ 500,000 in damage
  - Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community, or the environment

In the event of an emergency, immediately call… **911.**

- ➢ Severe Bleeding
- ➢ Loss of consciousness
- ➢ Chest Pain
- ➢ Broken bones

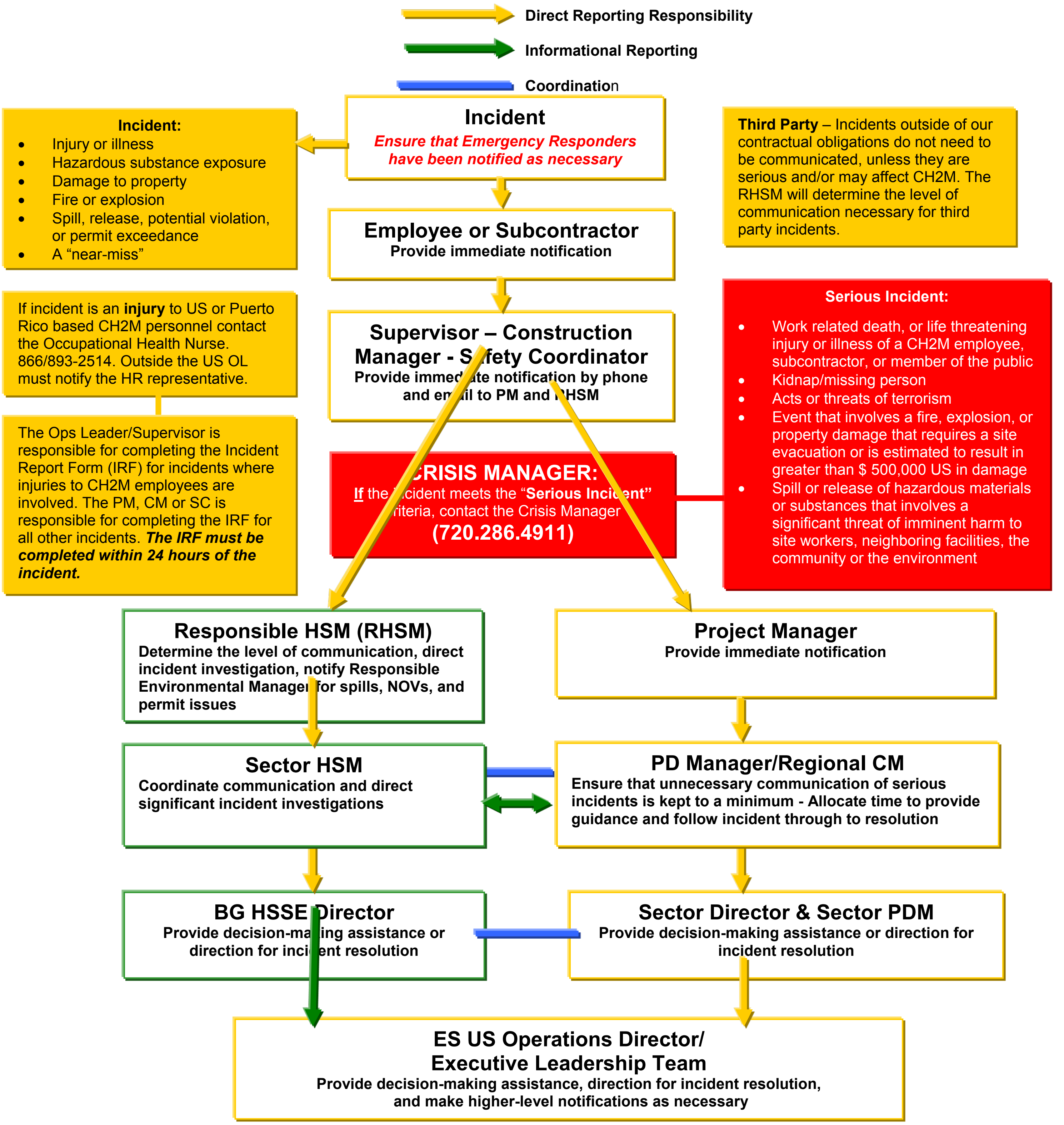
- All other injuries or illness' (even those that are minor and may only require First Aid) which occur at work, while on business travel or commute must be reported to your supervisor immediately.
- **After informing their supervisor, the injured employee calls CH2M's contracted Occupational Nurse**.

24-hour CH2M Emergency Nurse Assistance
1-866-893-2514

- The Occupational Injury Nurse listens to the injured employee to understand the injury/illness.
- Employee is provided guidance on appropriate treatment options (triage).
- Appropriate treatment details are handled by the Occupational Injury Nurse, and HR Groups.
- Nurse communicates and troubleshoots with and for employee through full recovery.
- Complete a HITS report and notify the HSM.

ESBG Incident Reporting Flow Diagram

Individual Programs may have additional or alternate reporting procedures



Direct Reporting Responsibility

Informational Reporting

Coordination

Incident:

- Injury or illness
- Hazardous substance exposure
- Damage to property
- Fire or explosion
- Spill, release, potential violation, or permit exceedance
- A "near-miss"

If incident is an **injury** to US or Puerto Rico based CH2M personnel contact the Occupational Health Nurse. 866/893-2514. Outside the US OL must notify the HR representative.

The Ops Leader/Supervisor is responsible for completing the Incident Report Form (IRF) for incidents where injuries to CH2M employees are involved. The PM, CM or SC is responsible for completing the IRF for all other incidents. ***The IRF must be completed within 24 hours of the incident.***

Incident

Ensure that Emergency Responders have been notified as necessary

Employee or Subcontractor

Provide immediate notification

Supervisor – Construction Manager - Safety Coordinator

Provide immediate notification by phone and email to PM and RHSM

CRISIS MANAGER:

If the incident meets the "**Serious Incident**" criteria, contact the Crisis Manager

(720.286.4911)

Third Party – Incidents outside of our contractual obligations do not need to be communicated, unless they are serious and/or may affect CH2M. The RHSM will determine the level of communication necessary for third party incidents.

Serious Incident:

- Work related death, or life threatening injury or illness of a CH2M employee, subcontractor, or member of the public
- Kidnap/missing person
- Acts or threats of terrorism
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than $ 500,000 US in damage
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment

Responsible HSM (RHSM)

Determine the level of communication, direct incident investigation, notify Responsible Environmental Manager for spills, NOVs, and permit issues

Project Manager

Provide immediate notification

Sector HSM

Coordinate communication and direct significant incident investigations

PD Manager/Regional CM

Ensure that unnecessary communication of serious incidents is kept to a minimum - Allocate time to provide guidance and follow incident through to resolution

BG HSSE Director

Provide decision-making assistance or direction for incident resolution

Sector Director & Sector PDM

Provide decision-making assistance or direction for incident resolution

ES US Operations Director/ Executive Leadership Team

Provide decision-making assistance, direction for incident resolution, and make higher-level notifications as necessary

Post-emergency incident communications regarding serious incidents at a CH2M office or project (regardless of the party involved) shall be considered sensitive in nature and must be controlled in a confidential manner.

Contents

Section Page

Approval

This Health and Safety Plan (HSP) has been written for use by CH2M only. CH2M claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific project, site conditions, and identified scope(s) of work. The plan must be amended if those conditions or scope(s) of work change.

By approving this HSP, the Responsible Health and Safety Manager (RHSM) certifies that the personal protective equipment has been selected based on the project-specific hazard assessment.

ORIGINAL PLAN

Original Plan Written by: John Culley/SPK **Date**: December 2015

RHSM Approval: **John Culley/SPK, CIH** **Date**: **December 5, 2015**

Project Manager Approval: **Date:**

REVISIONS:

Revisions Made By: **Steve Demus/SPK** **Date: April 2016**

Description of Revisions to Plan: Updated plan based on WA DOE comments; added tasks; updated hazards/controls; updated 3rd-party contractors; revised tables.

Revisions Approved By: **John Culley/SPK** **Date: April 19, 2016**

SECTION 1

Applicability

This HSP applies to the following:

- All CH2M staff, including subcontractors and tiered subcontractors of CH2M working on the site
- All visitors to CH2M construction or remediation sites in the custody of CH2M (including visitors from the Client, the Government, the public, and other staff of any CH2M company)

In addition, Subcontractors and tiered subcontractors shall also follow any of their company HSE programs, and site-specific HSPs and AHAs.

This HSP does not apply to the third-party contractors, their workers, their subcontractors, their visitors, or any other persons not under the direct control or custody of CH2M.

This HSP defines the procedures and requirements for the health and safety of CH2M staff and visitors when they are physically on the work site. The work site includes the project area (as defined by the contract documents) and the project offices, trailers, and facilities thereon.

This HSP will be kept onsite during field activities and will be reviewed as necessary. The HSP will be revised as project activities or conditions change or when supplemental information becomes available. The HSP adopts, by reference, the CH2M Enterprise-wide Core Standards and Standard Operating Procedures (SOPs), as appropriate. In addition, applicable requirements contained in the Environment and Nuclear (E&N) Market (E&NM) Health, Safety, Security, and Environment (HSSE) Handbook (Handbook) will be implemented. The Handbook is available as a stand-alone Handbook at the project site. The HSP may adopt procedures from the project Work Plan and any governing regulations. If a contradiction exists between this HSP and any governing regulation, the more stringent and protective requirement shall apply.

All CH2M staff and subcontractors must sign the employee sign-off form (Attached to this HSP) to acknowledge review of this document. Copies of the signature page will be maintained onsite by the Safety Coordinator (SC).

SECTION 2

General Project Information

2.1 Project Information and Background

Project Number: 661508.10.02.01	Project/Site Name: UPRR Freeman
Client: UPRR	Site Address: 14603 State Highway 27, Freeman, WA
CH2M Project Manager: Steve Demus	CH2M Office: SPK
DATE HSP Prepared: April 2015	Date(s) of Site Work: April 19, 2016 through April 30, 2017

2.2 Site Background, Setting, and Map

The facility is a seasonally active grain handling facility consisting of 11 steel grain silos and a steel grain elevator and receiving pit. The facility was constructed by Rockford Grain Growers (RGG) in 1955 with active use starting shortly thereafter. CHS Inc. purchased the facility from RGG in 1993, and CHS Inc. is the current owner/operator. UPRR owns the land where the facility is located, and owns and operates a railway that traversed the property, parallel to Highway (Hwy) 27. The Freeman School District has three schools located across Hwy 27 from the facility. In 2008 carbon tetrachloride (CT) was detected in the well that is the sole source water supply to the school. The U.S. Environmental Protection Agency (EPA) conducted a Preliminary Assessment in 2013 that concluded that the facility as the likely source of CT. In 2014, EPA conducted a Site Inspection at the Grain Handling Facility.

This is a remedial investigation to address data gaps. The Scope of Work (SOW) will include installation of six groundwater monitoring wells by drilling subcontractor and collection of soil samples during drilling and subsequent groundwater samples by CH2M field staff. There will be a utility locating subcontractor to clear drilling sites, and a third-party drilling contractor to drill and install monitoring wells.

2.3 Description of Tasks

Below is a description of the tasks covered by this plan. Any additions or changes in scope will require a revision to this HSP; see Change Management below.

2.3.1 HAZWOPER-Regulated Tasks

- Observation of third-party drilling/direct-push
- Observation of third-party well installation
- Observation of third-party mobile lab operations
- Surface and sub-surface soil sampling
- Groundwater sampling
- Hand augering
- IDW management

2.3.2 Non-HAZWOPER-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state HAZWOPER regulations are not applicable. The following tasks do not involve exposure to safety or health hazards associated with the hazardous waste operations. HAZWOPER training or medical requirements do not apply for the tasks listed below.

TASKS	CONTROLS
• Site walks • Surveying (with no exposure to site contaminants) • Utility location	• Brief on hazards, limits of access, and emergency procedures. • Post areas of contamination as appropriate. • Perform air sampling/monitoring as specified in this HSP in Section 9. • Wear PPE as specified in this HSP in Section 10.

2.4 Change Management

Changes to this HSP shall be documented and approved by the CH2M Responsible Health and Safety Manager for the project. The following are examples of changes that may require a revision to the plan:

- Change in CH2M staff;
- New subcontractor to perform work;
- New chemicals brought to site for use;
- Change in scope or addition of new tasks;
- Change in contaminants of concern (COCs) or change in concentrations of COCs; and
- New hazards or hazards not previously identified that are not addressed in this HSP.

2.5 Changes to Health and Safety Plans

Changes to the HSP shall be documented and accepted by using the Health and Safety Field Change Request (FCR) form (included in Attachments) or by resubmitting a revised HSP for acceptance. A revised HSP should be produced when a large number of changes (e.g., 15 or more not including AHAs) using FCRs has been employed. The CH2M Project Manager (PM) and RHSM shall be responsible for the review and acceptance of the FCR, and the RHSM will maintain an FCR log of approved changes. Field Change Requests are not required for safety-related changes that a Safety Coordinator (SC) or RHSM would normally make in the field, such as upgrade or downgrade to PPE within pre-established action levels, expansion or reduction of work control zones based on air monitoring results, and similar changes made within the operating parameters of the HSP. The field copy of the HSP shall be kept up to date by annotating the appropriate section (i.e., update to AHA) to indicate that an FCR is in effect; copies of FCRs should be kept with the HSP. The FCR number must be referenced in the HSP and available for review.

2.6 Daily Safety Meetings and Pre-Task Safety Plans

Safety meetings are to be held with all project personnel in attendance to review the hazards, controls, and required procedures or AHAs that apply for each day’s activities, as well as any environmental issues, requirements and/or best management practices:

- Everyone involved in the day’s work needs to sign a sign-in form to show they have had a briefing or attended a meeting.
- Pre-Task Safety Plans (PTSPs) serve the same purpose as general safety meetings, but the PTSPs are completed by individual crews to focus on those hazards posed by their specific work.
- For smaller crews, or if there is just one activity, the PTSP is often used as a means to document the overall Safety Meeting.

A copy of the PTSP and Daily Safety Meeting sign-in sheet is included as an Attachment.

2.7 Subcontractor HSSE Chartering Meeting

A subcontractor HSSE chartering meeting shall be held with subcontractors performing fieldwork on the project. The purpose of the meeting is to discuss and agree on key HSSE requirements on a project, and to emphasize and reinforce CH2M expectations for subcontractor HSSE performance. The target audience includes key CH2M project staff with HSSE responsibilities (e.g., PM, RHSM, SC, Field Team Leader (FTL)) and key Subcontractor staff (e.g., project manager, supervisors, designated field HSSE contact, drill team leads, foreman). For small scale projects (e.g., small drill crew and limited CH2M staff), all the subcontractor crew members should attend if available. The meeting should be held prior to mobilization with enough time to ensure that HSSE issues identified can be addressed prior to the start of work. The meeting can be held over the phone or in person depending on project needs. An example agenda can be found in the E&NM homepage.

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, ©

LEGEND

- ◐ Existing Well
- 🟩 CHS Inc. Facility
- ◯ Pond
- ▭ Parcel Boundaries*

Sources:
*Parcel boundary information from Spokane County Assessor, 2008.
Aerial photo: U.S. Geological Survey, 2012.

N

0 200 400 800 Feet

Figure 1
Site Location and Overview Map
Grain Handling Facility at Freeman
Freeman, Washington
Remedial Investigation/Feasibility Study Work Plan

SECTION 3

Project Organization and Responsibilities

A full description of responsibilities, including Employee Responsibilities and Authority, can be found in the Handbook, Section 3, "Roles and Responsibilities."

3.1 Client

Contact Name:	Gary Honeyman, UPRR
Phone:	307/745-6532

3.2 CH2M

Project Manager:			**Environmental Manager:**	
PM Name:	Steve Demus		**EM Name:**	Carolyn Kossik
Office:	SPK		**Office:**	SEA
Telephone number:			**Telephone number:**	
Cellular Number:	509/944-1785		**Cellular Number:**	425/530-1143

Responsible Health and Safety Manager:			**Safety Coordinator:**	
RHSM Name:	John Culley		**SC Name:**	Name: Rueben Greer/SPK Phone: 509/847-8819
Office:	SPK		**Office:**	
Telephone number:			**Telephone**	
Cellular Number:	206/660-3367		**Cellular Number:**	

3.3 CH2M Subcontractors

Subcontractor: American Leak Detection			**Subcontractor:**	
Contact Name:	Patti Godwin		**Contact Name:**	
Telephone number:	509/536-5166		**Telephone**	
Cellular Number:			**Cellular Number:**	
Tasks:	Underground utility locating			
Safety Procedures Required:	Subcontractor must submit an AHA prior to commencing fieldwork onsite.			

Subcontractors must comply with the following activities, and are responsible to:

- Comply with all local, state, and federal safety standards;
- Comply with project and owner safety requirements;
- Actively participate in the project safety program and either hold or attend and participate in all required safety meeting s;
- Provide a qualified safety representative to interface with CH2M;
- Maintain safety equipment and PPE for their employees;

- Maintain and replace safety protection systems damaged or removed by the subcontractor's operations;
- Notify the SC of any accident, injury, or incident (including spills or releases) immediately and submit reports to CH2M within 24 hours;
- Install contractually required general conditions for safety (for example, handrail, fencing, fall protection systems, floor opening covers);
- Conduct and document weekly safety inspections of project-specific tasks and associated work areas;
- Conduct site-specific and job-specific training for all subcontractor employees, including review of the CH2M HSP, subcontractor HSPs, and subcontractor AHAs and sign appropriate sign-off forms; and
- Determine and implement necessary controls and corrective actions to correct unsafe conditions.

The subcontractors listed above may be required to submit their own site-specific HSP and other plans such as lead or asbestos abatement compliance plans. Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit their plans to CH2M for review and acceptance before the start of fieldwork.

Subcontractors are also required to prepare AHAs before beginning each activity posing hazards to their personnel. The AHA shall identify the principal steps of the activity and the potential health and safety hazards for each step and recommended control measures for each identified hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements, and training requirements for the safe operation of the equipment listed must be identified.

3.4 Client Contractors

Client Contractor: Environmental West Drilling		**Client Contractor: TBD by Env West Drilling**	
Contact Name:	Josh Burrows	**Contact Name:**	
Telephone number:	509/534-2740	**Telephone number:**	
Cellular Number:		**Cellular Number:**	
Contractor Tasks:	Drilling/Direct-push/Well Installation	**Contractor Tasks:**	Traffic Control
Safety Plan Requirements:	Contractor is responsible for developing and following their own site-specific HSP	**Safety Plan Requirements:**	Contractor is responsible for developing the site Traffic Control Plan. A courtesy copy will be place in Attachment 5

Client Contractor: Pace Analytical Services, Inc.	
Contact Name:	Nick Nigro
Telephone number:	
Cellular Number:	608/692-7645
Contractor Tasks:	Operation of onsite mobile lab
Safety Plan Requirements:	Contractor is responsible for onsite development of, and following their own lab Chemical Hygiene Plan

This HSP does not cover contractors that are contracted directly to the client or the owner. CH2M is not responsible for the health and safety or means and methods of the client contractor's work, and we must never assume such responsibility through our actions (such as advising on health and safety issues).

SECTION 4

Standards of Conduct

All individuals associated with this project must work injury-free and drug-free and must comply with the standards of conduct stated in the Handbook (Section 4, “Standards of Conduct”), comply with all requirements of this HSP, and Subcontractors must comply with the safety requirements of the Subcontractor HSP. Forms related to Subcontractor Safety (i.e., Observation Hazard Form and Stop Work Order Form) are attached to this HSP.

SECTION 5

Project Hazard Analysis

A health and safety risk analysis (Table 1) has been completed for this project. Specific project activities are listed in Table 1 with a designation of who performs the task, CH2M (C) or Subcontractor (S). An Activity Hazard Analysis has been developed for each project activity. AHAs will be prepared by the Safety Coordinator for CH2M activities and are included as an attachment to this HSP.

CH2M subcontractors are required to provide AHAs specific to their scope of work on the project for acceptance by CH2M prior to the start of work. Each subcontractor shall submit AHAs for their field activities, as defined in their scope of work, along with their project-specific safety plan and procedures. Additions or changes in field activities, equipment, tools, or material used to perform work or hazards not addressed in existing AHAs requires either a new AHA to be prepared or an existing AHA to be revised.

Table 1. Health and Safety Risk Analysis Table

Associated Hazard Section	**Project Activity**	**Observation of Third-party Drilling/Direct-push; Well Installation**	**Groundwater and Soil Sampling; Hand Augering; Observation of 3rd-party Mobile Lab Operations**	**IDW Management**	**Site walks; Surveying; Utility location**
General Hazards – Refer to General Hazards and Controls in HSSE Handbook, Section 7.					
Bloodborne Pathogens		C	C	C	C, S
Driving Safety		C	C	C	C, S
Electrical Safety		C	C	C	C, S
Field Trailer/Office Setup		C	C	C	C, S
Field Vehicles		C	C	C	C, S
Fire Prevention		C	C	C	C, S
General Practices and Housekeeping		C	C	C	C, S
Hazard Communication/GHS		C	C	C	C, S
Knife Use (if approved)		C	C	C	C, S
Lighting		C	C	C	C, S
Manual Lifting		C	C	C	C, S
Personal Hygiene		C	C	C	C, S
Substance Abuse		C	C	C	C, S
Project-Specific Hazards – Refer to HSSE Handbook, Section 8, and the additional project-specific controls in this plan when specified.					
Observation of Drilling/Well Installation		C	C	C	
Hand and Power Tools		C	C	C	C, S
Portable Generators		C	C		

Table 1. Health and Safety Risk Analysis Table

Associated Hazard Section Project Activity	Observation of Third-party Drilling/Direct-push; Well Installation	Groundwater and Soil Sampling; Hand Augering; Observation of 3rd-party Mobile Lab Operations	IDW Management	Site walks; Surveying; Utility location
Groundwater Sampling	C	C	C	
Steep Slopes and Uneven Walking Surfaces	C	C	C	C, S
Railroad Safety	C	C	C	C, S
Personal Security/Encountering Illegal Activity and/or Homeless People	C	C	C	C, S
Traffic Hazards	C	C	C	C, S
Utilities (underground)	C	C		C, S
Utilities (overhead)	C			
Working Alone	C	C	C	C, S
Physical Hazards – Refer to Physical Hazards in HSSE Handbook, Section 9, and the additional project-specific controls in this plan when specified.				
Ultraviolet Light exposure (sunburn)	C	C	C	C, S
Temperature Extremes	C	C	C	C, S
Biological Hazards – Refer to Biological Hazards in HSSE Handbook, Section 10, and the additional project-specific controls in this plan when specified.				
Bees and Other Stinging Insects	C	C	C	C, S
Bird Droppings	C	C	C	C, S
Cougars/Mountain Lions	C	C	C	C, S
Coyotes	C	C	C	C, S
Feral Dogs	C	C	C	C, S
Hantavirus	C	C	C	C, S
Mosquito Bites	C	C	C	C, S
Poison Ivy, Oak and Sumac	C	C	C	C, S
Snakes	C	C	C	C, S
Spiders – Brown Recluse and Black Widow	C	C	C	C, S
Ticks	C	C	C	C, S

C – Hazard section applicable to CH2M personnel
S – Hazard section applicable to Subcontractor personnel

SECTION 6

Hazards and Controls

Safe work practices and hazard control measures to reduce or eliminate potential hazards as identified in Table 1 are stated in the Handbook, Sections 7-10, the associated CH2M SOP, and are addressed in project AHAs. Any additional project-specific control measures, or those hazards requiring additional emphasis, are identified in the following sections. Always consult the appropriate CH2M Enterprise SOP to ensure all requirements are implemented. CH2M employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M employees and subcontractors who do not understand any of these provisions should contact the RHSM for clarification.

6.1 Physical Hazards and Controls

In conjunction with the handbook provisions, special emphasis is placed on these hazards and controls because they are not fully addressed in the handbook:

6.1.1 Drilling/Direct-push

(Reference CH2M SOP, *Drilling*)

- Only authorized personnel are permitted to operate drill rigs.
- Stay clear of areas surrounding drill rigs during every startup.
- Stay clear of the rotating augers and other rotating components of drill rigs.
- Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.
- Do not wear loose-fitting clothing or other items such as rings or watches that could be caught in moving parts. Long hair must be restrained.
- If equipment becomes electrically energized, personnel shall be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party shall be contacted to have line de-energized prior to approaching the equipment.
- Smoking around drilling operations is prohibited.
- Wear the appropriate PPE when sampling (refer to Section 10) especially when splash hazards exist.
- Use the appropriate lifting procedures when unloading equipment and sampling.
- Utilize proper lifting techniques (refer to employee HSSE Handbook for specific guidance)
- Allow ample space for personnel to lift/store drilling rods.
- Avoid movement near rig. Do not place hands near hammer.
- If dermal contact with the groundwater and acid used in sample preservation, wash exposed skin thoroughly with soap and water.
- Avoid eating and drinking on site and during sampling.
- Use ear plugs during sampling if sampling involves a generator.
- The drill rig must be equipped with a kill wire or switch, and personnel are to be informed of its location.

- Be aware and stand clear of heavy objects that are hoisted overhead.
- The driller to verify the rig is properly maintained in accordance with the drilling company's maintenance program.
- The driller is to verify that all machine guards are in place while the rig is in operation.
- The driller is responsible for housekeeping (maintaining a clean work area).
- The drill rig should be equipped with at least one fire extinguisher.
- If the drill rig comes into contact with electrical wires and becomes electrically energized, do not touch any part of the rig or any person in contact with the rig, and stay as far away as possible. Notify emergency personnel immediately.
- The drill rig should be leveled and stabilized with jacks and adequate cribbing before raising the mast and during drilling operations. Cribbing materials should be made from materials that are capable of supporting the weight of the rig. Care should be taken in muddy, soggy soils, or partially frozen areas. In addition to cribbing, guy wires should be used to improve stability if the rig is located on wet, partially frozen ground, or in areas with loose, caving soil, or in an area subject to frequent gusty winds.

6.1.2 Railroad Safety

The following precautions must be taken when working around trains and rail-yards.

- Attend client’s safety training courses as required.
- All staff working adjacent to traveled way or within work area must wear reflective/high-visibility safety vests.
- Eye protection should be worn to protect from flying debris.
- Always pay attention to moving trains – never assume they are looking out for you
- Work as far from traveled way as possible to avoid creating confusion for trains.
- Use the “buddy system” when work does not face the direction in which trains are coming from.

Careful observation of railroad safety requirements is essential. These requirements include attending a railroad safety orientation class, coordinating with the railroad for permission to be on their property, and wearing the required personal protective equipment. Proof of the safety orientation, which must be renewed yearly, is given in a wallet-size safety card and hardhat sticker, both of which must be “on-person” when on railroad property. Permission to enter railroad property must be obtained from the local roadmaster. Under some circumstances, work parties must include at least two people while on railroad property. Health and Safety Manager shall determine whether “lone workers” will be allowed to perform certain tasks based on risk of site activities, other environmental factors, and location of work.

“Lone workers” are permitted, depending on the work tasks scheduled, isolation, environmental factors, etc. Reference the *“Lone Worker Protocol”* included in this HSP, **Figure 6.1.2**, for additional guidance on the protocol. Lone workers are permitted under many circumstances. Field personnel will provide written daily confirmation to the project manager (or designee) of the anticipated tasks scheduled for the day documenting the tasks on the Pre-Task Safety Plan. Field technicians shall strive to adhere to the work schedule. If you will be within 25 feet of the track, you must be accompanied by a UPRR EIC, or have specific approval from the EIC to conduct the work. Required personal protective equipment includes the following:

- ANSI-241.1 lace-up, steel-toed ankle-high boots,
- green/yellow safety vest,

- ANSI-Z89.1 hardhat, and
- Safety glasses with side shields (sun glasses or eye glass are not sufficient).

EIC:
Phone:

On-Track Safety

- Employees must maintain a distance of at least 25 feet to any track unless the railroad's EIC is present to authorize movements.
- Wear an green/yellow, reflectorized vest
- Participate in a job briefing for On-Track Safety requirements.

Minimum Required Clothing

- Waist length shirts with sleeves
- Trousers that cover the entire leg (no shorts or bell-bottom pants)
- Footwear that covers their ankle and has a defined heal (if working in areas where steel-toed boots are not required)
- Sandals, canvas-type shoes, or other thin sole shoe is NOT allowed
- Loose or ragged clothing, neckties, finger rings, or other loose jewelry is NOT allowed.

Minimum Required Personal Protective Equipment (PPE)

- Hardhats with Company Logo
- Safety glasses
- Green/yellow traffic safety vest
- Hearing Protection required when employees are:
  - Within 100 feet of locomotive or roadway/work equipment; 15 feet of power operated tools 150 feet of jet blowers or pile drivers 150 feet of retarders in use (when within 10 feet, employees must wear dual ear protection – plugs and muffs)
- Other equipment as required (i.e., fall protection, face shields, respirators)

Equipment

- All equipment must be in safe operating condition
- The operator's manual, which includes instruction for safe operation, must be kept with each machine
- All self-propelled equipment must be equipped with a first aid kit, fire extinguisher, and audible back-up alarm.
- All unattended equipment must be parked at least 25 feet away from any track, and a minimum of 250 feet from any railroad crossing, unless otherwise authorized by the railroad's EIC.
- All equipment must be secured from movement before leaving.
- Cranes must be equipped with three orange cones that will be used to mark the work area and minimum clearances to overhead power lines.
- All overhead power lines will be considered high voltage.
- All moves are well communicated and coordinated with other employees. Emergency signals to stop movement will be designated before the start of work.
- All equipment operators must be:

- Trained and competent in the safe operation of the equipment
- Familiar with and comply with UPRR's rules on lockout/tagout of equipment.

General Safety Requirements

- The railroad must be promptly notified of any reportable injury
- The railroad must be promptly notified of any damage to railroad property
- Employees shall not use, be under the influence or, or have in their possession any alcoholic beverage or illegally obtained drug, narcotic, or other substance.
- All waste must be properly disposed of. No fires are permitted.
- All contractor's vehicles stop at all railroad crossings to ascertain the way is clear
- All employees must participate in and comply with any job briefings conducted by the railroad's EIC. During these briefings, the railroad's EIC will specify safe work procedures, the potential hazards of the job, and Emergency Response Procedures.
- All excavations, holes, and trenches are protected to prevent injuries to other workers, railroad employees or the public.
- Always be on alert for moving equipment in either direction on the tracks. Do not stop or walk on the top of rail, frog, switches, guardrails, or other track components.
- When walking around a standing rail car, stay at least 20 feet behind it. Do not walk between rail cars unless there is a 50 feet clearance between cars. Do not sit on, lie under, or cross between cars.
- No tools or materials are to be left close to the track when trains are passing

All employees comply with all federal and state regulations concerning workplace safety. Federal Railroad Administration (FRA) personnel, who operate independently of the railroads, can issue citations for violations of these safety requirements. The civil penalty, for which individuals are personally responsible, is $1,500 per infraction; therefore, failure to have steel-toed boots, vest, and safety glasses could cost $4,500.

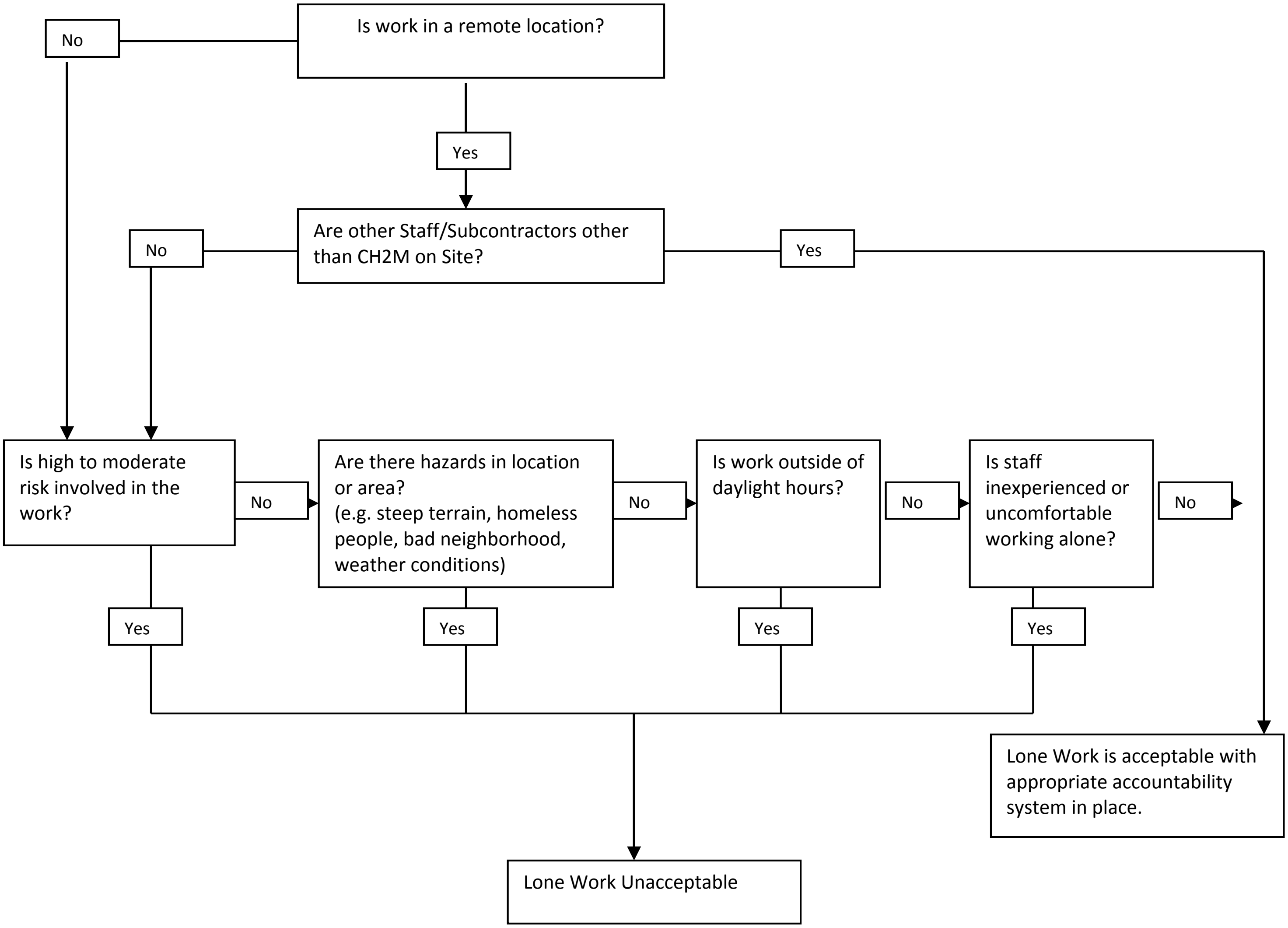


Figure 6.1.2: Lone Worker Protocol

6.1.3 Noise Hazards

Previous surveys indicate that heavy equipment such as drilling or excavation equipment may produce continuous and impact noise at or above the action level of 85 decibels (dBA). All CH2M personnel within 25 feet of operating equipment, or near an operation that creates noise levels high enough to impair conversation, shall wear hearing protective devices (either muffs or plugs). Personnel will wash their hands with soap and water prior to inserting earplugs to avoid initiating ear infections. Additional information regarding CH2M's Hearing Conservation Program is located in of the CH2M Corporate Health and Safety Program, Program and Training Manual. Access to this document can be easily obtained on the CH2M H&S Intranet Site. All CH2M field staff should complete the training module on Noise Hazards located on the virtual office before fieldwork begins.

6.1.4 Encountering Illegal Activity or Homeless in the Field

- Always have a buddy
- Keep in mind you may encounter illegal activity or homeless persons within your work areas.
- If you encounter an illegal activity, immediately leave the area. Do not wait around to use your phone, mark on maps, mark locations on GPS units, etc. when near the illegal activities. Contact the authorities and mark maps once you are safely miles away.
- If you are confronted by a suspected criminal or homeless person, do not escalate the situation. Explain to them that you are not anyone of authority. If you are told to surrender something to a criminal, do so and leave the area. If you are asked for money by a homeless person, use your best judgment, but it is best not to give them any so they do not continue to return. It is better for your safety and theirs

6.1.5 Hand and Power Tools

(Reference CH2M, SOP HSE-210, *Hand and Power Tools*)

- Below are the hazard controls and safe work practices to follow when personnel or subcontractors are using hand and power tools. Ensure the requirements in the referenced SOP are followed.
- Tools shall be inspected prior to use and damaged tools will be tagged and removed from service.
- Hand tools will be used for their intended use and operated in accordance with manufacturer’s instructions and design limitations;
- Maintain all hand and power tools in a safe condition.
- Use PPE (such as gloves, safety glasses, earplugs, and face shields) when exposed to a hazard from a tool.
- Do not carry or lower a power tool by its cord or hose.
- Portable power tools will be plugged into GFCI protected outlets; and
- Portable power tools will be Underwriters Laboratories (UL) listed and have a three-wire grounded plug or be double insulated.
- Disconnect tools from energy sources when they are not in use, before servicing and cleaning them, and when changing accessories (such as blades, bits, and cutters).
- Safety guards on tools must remain installed while the tool is in use and must be promptly replaced after repair or maintenance has been performed.

- Store tools properly in a place where they will not be damaged or come in contact with hazardous materials.
- If a cordless tool is connected to its recharge unit, both pieces of equipment must conform strictly with electrical standards and manufacturer's specifications.
- Tools used in an explosive environment must be rated for work in that environment (that is, intrinsically safe, spark-proof, etc.).
- Working with manual and pistol-grip hand tools may involve highly repetitive movement, extended elevation, constrained postures, and/or awkward positioning of body members (for example, hand, wrist, arm, shoulder, neck, etc.). Consider alternative tool designs, improved posture, the selection of appropriate materials, changing work organization, and sequencing to prevent muscular, skeletal, repetitive motion, and cumulative trauma stressors.

Machine Guarding

- Ensure that all machine guards are in place to prevent contact with drive lines, belts, chains, pinch points or any other sources of mechanical injury.
- Unplugging jammed equipment will only be performed when equipment has been shut down, all sources of energy have been isolated, and equipment has been locked/tagged and tested.
- Maintenance and repair of equipment that results in the removal of guards or would otherwise put anyone at risk requires lockout of that equipment prior to work.

6.1.6 Knife Use

Open-bladed knives (e.g., box cutters, utility knives, pocketknives, machetes, and multi-purpose tools with fixed blades such as a Leatherman™) are prohibited at worksites except where the following three conditions are met:

- The open-bladed knife is determined to be the best tool for the job.
- An approved Activity Hazard Analysis (AHA) or written procedure is in place that covers the necessary safety precautions (work practices, PPE, and training).
- Knife users have been trained and follow the AHA.

6.1.7 Utilities (underground)

Local Utility Mark-Out Services
Name: UPRR Fiber Optic Locators
Phone: 800/336-9193

Name: One Call
Phone: 811

Name: American Leak Detection
Phone: 509/536-5166

An assessment for underground utilities must be conducted where there is a potential to contact underground utilities or similar subsurface obstructions during intrusive activities. Intrusive activities include excavation, trenching, drilling, hand augering, soil sampling, or similar activities.

The assessment must be conducted <u>before any intrusive subsurface activity</u> and must include at least the following:

1. A background and records assessment of known utilities or other subsurface obstructions.

2. Contacting and using the designated local utility locating service.
3. Conducting an independent field survey to identify, locate, and mark potential underground utilities or subsurface obstructions. *Note: This is independent of, and in addition to, any utility survey conducted by the designated local utility locating service above.*
4. A visual survey of the area to validate the chosen location.

When any of these steps identifies an underground utility within 5 feet (1.5 meters) of intrusive work, then non-aggressive means must be used to physically locate the utility before a drill rig, backhoe, excavator or other aggressive method is used.

Aggressive methods are never allowed within 2 feet of an identified high-risk utility (see paragraph below).

Any deviation from these requirements must be approved by the Responsible HS Manager and the Project Manager.

Background and Records Assessment of Known Utilities

Identify any client- or location-specific permit and/or procedural requirements (e.g., dig permit or intrusive work permit) for subsurface activities. For military installations, contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.

Obtain available utility diagrams and/or as-built drawings for the facility.

Review locations of possible subsurface utilities including sanitary and storm sewers, electrical lines, water supply lines, natural gas lines, fuel tanks and lines, communication lines, lighting protection systems, etc. Note: Use caution in relying on as-built drawings as they are rarely 100 percent accurate.

Request a facility contact with knowledge of utility locations review and approve proposed locations of intrusive work.

Designated Local Utility Locating Service

Contact your designated local utility locating service (e.g., Dig-Safe, Blue Stake, One Call) to identify and mark the location of utilities. Call 811 in the US or go to www.call811.com to identify the appropriate local service group. Contacting the local utility locating service is a legal requirement in most jurisdictions.

Independent Field Survey (Utility Locate)

The organization conducting the intrusive work (CH2M or subcontractor) shall arrange for an independent field survey to identify, locate, and mark any potential subsurface utilities in the work area. This survey is in addition to any utility survey conducted by the designated local utility locating service.

The independent field survey provider shall determine the most appropriate instrumentation/technique or combinations of instrumentation/techniques to identify subsurface utilities based on their experience and expertise, types of utilities anticipated to be present, and specific site conditions.

A CH2M or subcontractor representative must be present during the independent field survey to observe the utility locate and verify that the work area and utilities have been properly identified and marked. If there is any question that the survey was not performed adequately or the individual was not qualified, then arrangements must be made to obtain a qualified utility locate service to re-survey the area. Obtain documentation of the survey and clearances in writing and signed by the party conducting the clearance. Maintain all documentation in the project file.

If the site owner (military installation or client) can provide the independent field survey, CH2M or the subcontractor shall ensure that the survey includes:

- Physically walking the area to verify the work location and identify, locate, and mark underground utility locations;
- Having qualified staff available and instrumentation to conduct the locate; and
- Agreeing to document the survey and clearances in writing.

Should any of the above criteria not be met, CH2M or subcontractor must arrange for an alternate independent utility locate service to perform the survey.

The markings from utility surveys must be protected and preserved until the markings are no longer required. If the utility location markings are destroyed or removed before intrusive work commences or is completed, the PM, SC, or designee must notify the independent utility locate service or the designated local utility locating service to resurvey and remark the area.

Visual Assessment before and during Intrusive Activities

Perform a “360 degree” assessment. Walk the area and inspect for utility-related items such as valve caps, previous linear cuts, patchwork in pavement, hydrants, manholes, utility vaults, drains, and vent risers in and around the dig area. The visual survey shall include all surface landmarks, including manholes, previous liner cuts, patchwork in pavement, pad-mounted transformers, utility poles with risers, storm sewer drains, utility vaults, and fire hydrants.

If any unanticipated items are found, conduct further research before initiating intrusive activities and implement any actions needed to avoid striking the utility or obstruction.

Subsurface Activities within 5 feet of an Underground Utility or if there is Uncertainty

When aggressive intrusive activities will be conducted within 5 feet (1.5 meters) of an underground utility or when there is uncertainty about utility locations, locations must be physically verified by non-aggressive means such as air or water knifing, hand digging, or human powered hand augering. Non-conductive tools must be used if electrical hazards may be present. If intrusive activities are within 5 feet (1.5 meters) and parallel to a marked existing utility, the utility location must be exposed and verified by non-aggressive methods every 100 feet (30.5 meters). Check to see if the utility can be isolated during intrusive work.

Intrusive Activities within 2 feet of an Underground Utility

Use non-aggressive methods (hand digging, vacuum excavation, etc.) to perform intrusive activities within 2 feet of a high-risk utility (i.e., a utility that cannot be de-energized or would cause significant impacts to repair/replace). Hazardous utilities shall be de-energized whenever possible.

Spotter

A spotter shall be used to monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon, presence of pea gravel or sand in soils, presence of concrete or other debris in soils, or refusal of auger or excavating equipment). If any suspicious conditions are encountered, stop work immediately and contact the PM or RHSM to evaluate the situation. The spotter must have a method to alert an operator to stop the intrusive activity (e.g., air horn, hand signals).

6.1.8 Utilities (overhead)

Proximity to Power Lines

It must be determined whether equipment operations including, positioning, and traveling will occur in proximity to power lines within 20 feet (6.1 meters) for line voltage up to 350 kilo volts (kV), and within 50 feet (15.2 meters) for line voltage between 350 kV to 1000 kV. For power lines over 1000 kV, the distance must be determined by the utility/operator or qualified registered professional engineer in electrical power transmission and distribution.

Operations adjacent to overhead power lines are PROHIBITED unless one of the following conditions is satisfied:

Power has been shut off, positive means (such as lockout) have been taken to prevent the lines from being energized, lines have been tested to confirm the outage, and the utility company has provided a signed certification of the outage.

The minimum clearance from energized overhead lines shown in the table below, or the equipment will be repositioned and blocked to ensure that no part, including cables, can come within the minimum clearances shown in the table.

Minimum Distances from Powerlines

Powerlines Nominal System Kv	Minimum Required Distance, Feet (Meters)
0-50	10 (3.0)
50-200	15 (4.6)
201-350	20 (6.1)
351-500	25 (7.6)
501-750	35 (10.7)
751-1000	45 (13.7)

(These distances have been determined to eliminate the potential for arcing based on the line voltage.)

The power line(s) has been isolated with insulating blankets that have been properly placed by the utility. If insulating blankets are used, the utility will determine the minimum safe operating distance; get this determination in writing with the utility representative's signature.

All inquiries regarding electric utilities must be made in writing and a written confirmation of the outage/isolation must be received by the PM prior to the start of work.

6.1.9 Traffic Hazards

The following precautions must be taken when working around traffic, and in or near an area where traffic controls have been established by a contractor.

- Exercise caution when exiting traveled way or parking along street – avoid sudden stops, use flashers, etc.
- Park in a manner that will allow for safe exit from vehicle, and where practicable, park vehicle so that it can serve as a barrier.
- All staff working adjacent to traveled way or within work area must wear reflective/high-visibility safety vests.
- Eye protection should be worn to protect from flying debris.

- Remain aware of factors that influence traffic related hazards and required controls – sun glare, rain, wind, flash flooding, limited sight-distance, hills, curves, guardrails, width of shoulder (i.e., breakdown lane), etc.
- Always remain aware of an escape route -- behind an established barrier, parked vehicle, guardrail, etc.
- Always pay attention to moving traffic – never assume drivers are looking out for you
- Work as far from traveled way as possible to avoid creating confusion for drivers.
- When workers must face away from traffic, a “buddy system” should be used, where one worker is looking towards traffic.
- Work area should be protected by a physical barrier – such as a K-rail or Jersey barrier.
- Review traffic control devices to ensure that they are adequate to protect your work area. Traffic control devices should: 1) convey a clear meaning, 2) command respect of road users, and 3) give adequate time for proper traffic response. The adequacy of these devices are dependent on limited sight distance, proximity to ramps or intersections, restrictive width, duration of job, and traffic volume, speed, and proximity.
- Lookouts should be used when physical barriers are not available or practical. The lookout continually watches approaching traffic for signs of erratic driver behavior and warns workers. Vehicles should be parked at least 40 feet away from the work zone and traffic. Minimize the amount of time that you will have your back to oncoming traffic.
- Either a barrier or shadow vehicle should be positioned a considerable distance ahead of the work area. The vehicle should be equipped with a flashing arrow sign and truck-mounted crash cushion (TMCC). All vehicles within 40 feet of traffic should have an orange flashing hazard light atop the vehicle.
- Lookouts should be used when physical barriers are not available or practical. The lookout continually watches approaching traffic for signs of erratic driver behavior and warns workers. Vehicles should be parked at least 40 feet away from the work zone and traffic. Minimize the amount of time that you will have your back to oncoming traffic.
- See Traffic Control Plan in Attachment 5

SECTION 7

Hazard Communication/GHS

As indicated in Section 7 of the Handbook, under “Hazard Communication,” the hazard communication (HazCom) coordinator (the SC or qualified designee) must perform the following (additional HazCom duties are outlined in the Handbook):

- Complete an inventory of chemicals brought on site by CH2M using the chemical inventory form included as an attachment to this HSP;
- Confirm that an inventory of chemicals brought on site by CH2M subcontractors is available;
- Before or as the chemicals arrive on site, obtain a Safety Data Sheet (SDS) for each hazardous chemical and include on the chemical inventory sheet (attached to this HSP) and add the SDS to the SDS attachment section of this HSP;
- Give employees required chemical-specific HazCom training using the chemical-specific training form included as an attachment to this HSP.

Contaminants of Concern

The table below summarizes the potential contaminants of concern (COC) and their occupational exposure limit and signs and symptoms of exposure. The table also includes the maximum concentration of each COC and the associated location and media that was sampled (groundwater, soil boring, surface soil). These concentrations were used to determine engineering and administrative controls described in the "Project-Specific Hazard Controls" section of this HSP, as well as PPE and site monitoring requirements.

Contaminants of Concern

Contaminant	Location and Maximum[a] Concentration	Exposure Limits[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
Carbon Tetrachloride	GW: 23 µg/L SB: 0.015 mg/kg	2 ppm (WISHA)	200 Ca	Central nervous system (CNS) depression, nausea, vomiting, eye and skin irritation, liver and kidney injury, drowsiness, dizziness	11.47
Chloroform	GW: 1.9 µg/L	2 ppm (WISHA)	500 ppm	Skin and eye irritation; dizziness; nausea; confusion; drowsiness; headache; fatigue	11.42

Footnotes:

[a] Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), SS (Surface Soil), SL (Sludge), SW (Surface Water).

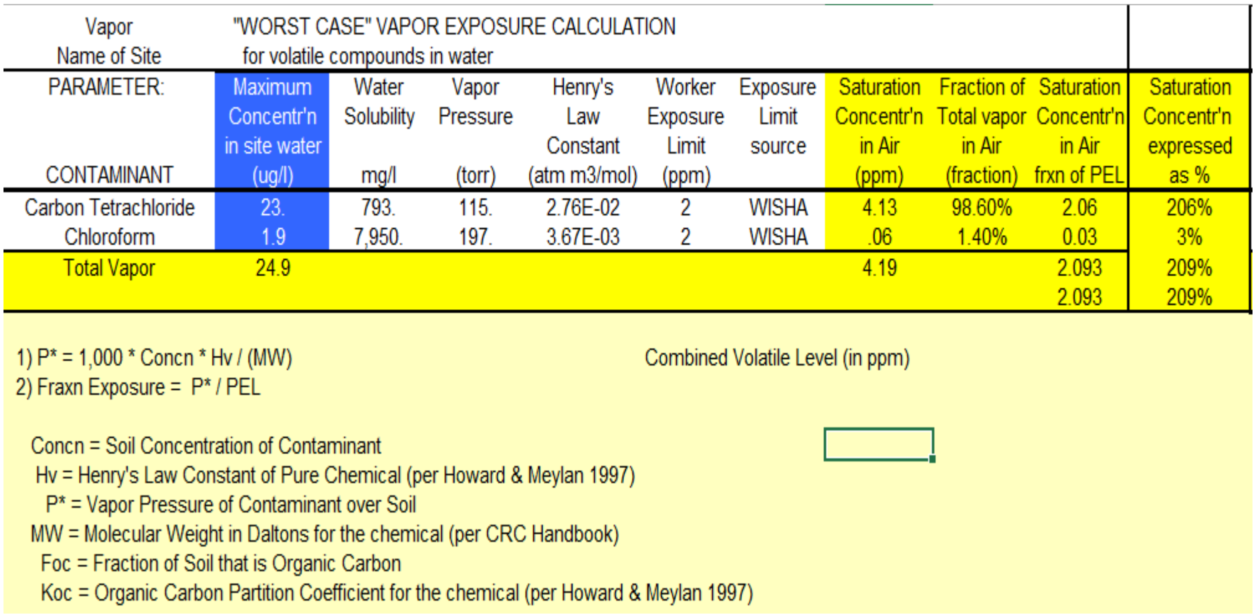
[b] Appropriate value of permissible exposure limit (PEL), recommended exposure limit (REL), or threshold limit value (TLV) listed.

[c] IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; Ca = Potential occupational carcinogen.

[d] PIP = photoionization potential; NA = Not applicable; UK = Unknown.

eV = electron volt

Potential Routes of Exposure		
Dermal: Contact with contaminated media. This route of exposure is minimized through use of engineering controls, administrative controls and proper use of PPE.	**Inhalation:** Vapors and contaminated particulates. This route of exposure is minimized through use of engineering controls, administrative controls and proper use of respiratory protection when other forms of control do not reduce the potential for exposure.	**Other:** Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).



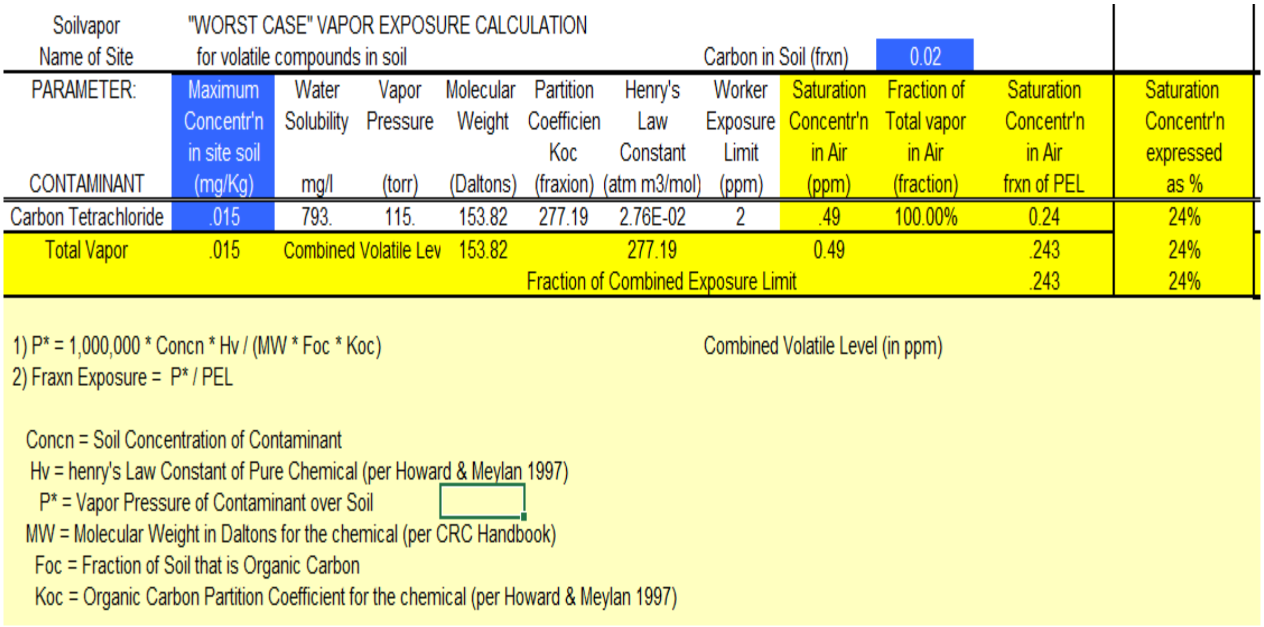
Vapor "WORST CASE" VAPOR EXPOSURE CALCULATION
Name of Site for volatile compounds in water

PARAMETER: CONTAMINANT	Maximum Concentr'n in site water (ug/l)	Water Solubility mg/l	Vapor Pressure (torr)	Henry's Law Constant (atm m3/mol)	Worker Exposure Limit (ppm)	Exposure Limit source	Saturation Concentr'n in Air (ppm)	Fraction of Total vapor in Air (fraction)	Saturation Concentr'n in Air frxn of PEL	Saturation Concentr'n expressed as %
Carbon Tetrachloride	23.	793.	115.	2.76E-02	2	WISHA	4.13	98.60%	2.06	206%
Chloroform	1.9	7,950.	197.	3.67E-03	2	WISHA	.06	1.40%	0.03	3%
Total Vapor	24.9						4.19		2.093	209%
									2.093	209%

1) P* = 1,000 * Concn * Hv / (MW)
2) Fraxn Exposure = P* / PEL

Combined Volatile Level (in ppm)

Concn = Soil Concentration of Contaminant
Hv = Henry's Law Constant of Pure Chemical (per Howard & Meylan 1997)
P* = Vapor Pressure of Contaminant over Soil
MW = Molecular Weight in Daltons for the chemical (per CRC Handbook)
Foc = Fraction of Soil that is Organic Carbon
Koc = Organic Carbon Partition Coefficient for the chemical (per Howard & Meylan 1997)



Soilvapor "WORST CASE" VAPOR EXPOSURE CALCULATION
Name of Site for volatile compounds in soil Carbon in Soil (frxn) 0.02

PARAMETER: CONTAMINANT	Maximum Concentr'n in site soil (mg/Kg)	Water Solubility mg/l	Vapor Pressure (torr)	Molecular Weight (Daltons)	Partition Coefficien Koc (fraxion)	Henry's Law Constant (atm m3/mol)	Worker Exposure Limit (ppm)	Saturation Concentr'n in Air (ppm)	Fraction of Total vapor in Air (fraction)	Saturation Concentr'n in Air frxn of PEL	Saturation Concentr'n expressed as %
Carbon Tetrachloride	.015	793.	115.	153.82	277.19	2.76E-02	2	.49	100.00%	0.24	24%
Total Vapor	.015	Combined Volatile Lev		153.82		277.19		0.49		.243	24%
					Fraction of Combined Exposure Limit					.243	24%

1) P* = 1,000,000 * Concn * Hv / (MW * Foc * Koc)
2) Fraxn Exposure = P* / PEL

Combined Volatile Level (in ppm)

Concn = Soil Concentration of Contaminant
Hv = henry's Law Constant of Pure Chemical (per Howard & Meylan 1997)
P* = Vapor Pressure of Contaminant over Soil
MW = Molecular Weight in Daltons for the chemical (per CRC Handbook)
Foc = Fraction of Soil that is Organic Carbon
Koc = Organic Carbon Partition Coefficient for the chemical (per Howard & Meylan 1997)

** Based on modeling, carbon tetrachloride appears to be the main driver for potential occupational exposures; therefore, air monitoring and PPE protocols will be constructed around this assessment. If future analysis suggests otherwise, notify the Health and Safety Manager so those provisions can be reevaluated.

SECTION 9

Site Monitoring

(Reference CH2M SOP HSE-207, Exposure Monitoring for Airborne Chemical Hazards)

For each task listed in the table below, perform the associated monitoring ensuring the equipment is calibrated daily according to the manufacturer's recommendations. Use the Daily Site Monitoring Form (or equivalent) to document the calibration and the readings taken. Retain area monitoring readings with project records.

Exposure records (breathing zone and personal air sampling) must be preserved for the duration of employment plus thirty years. Copies of all project exposure records (e.g., copies of Daily Site Monitoring form or field logbook pages where breathing zone readings are recorded along with associated calibration) shall be sent to the Sector Safety Program Assistant (SPA) for retention and maintained in the project files. Subcontractors are responsible for monitoring and performing integrated personal sampling for their employees as documented in their HSP or, if permitted, according to the table below.

9.1 Direct Reading Monitoring Specifications

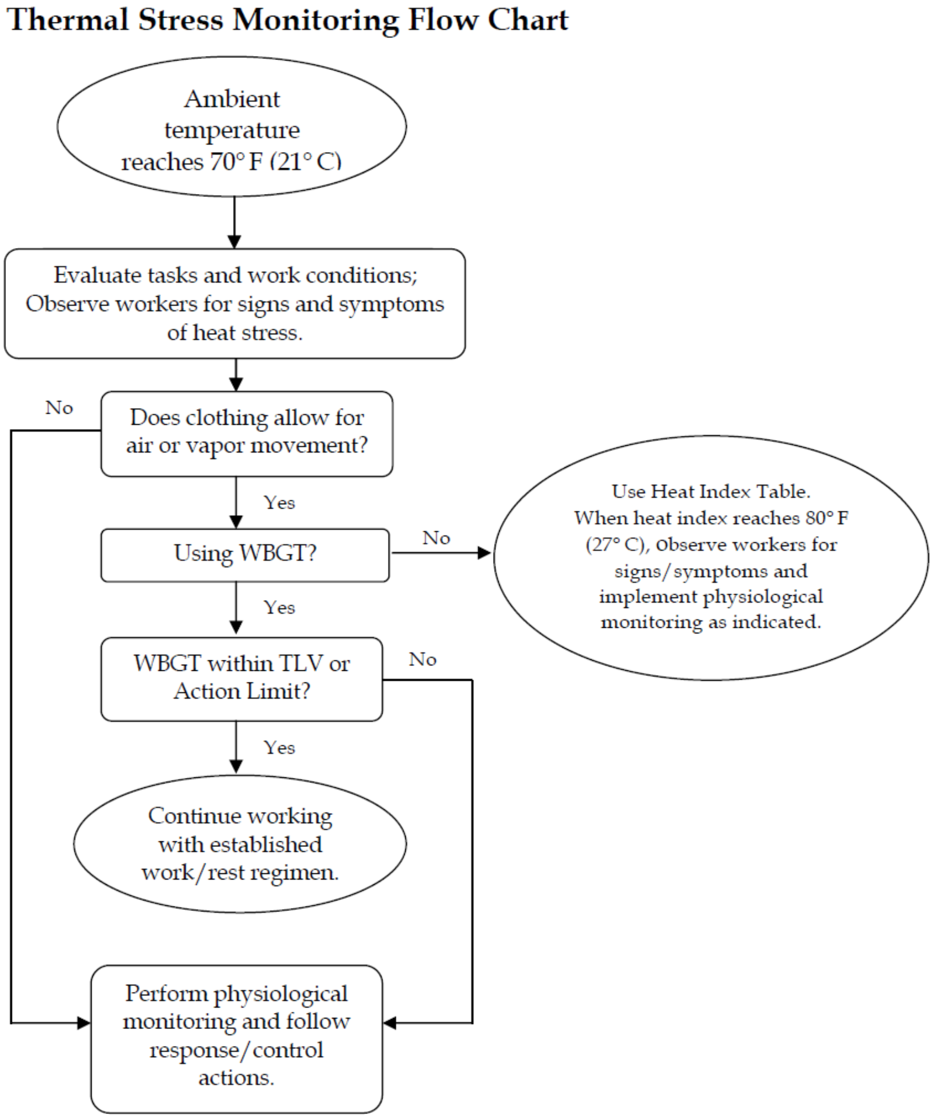
Instrument	Tasks	Action Levels[a]		Frequency [b]	Calibration
PID: MiniRAE or MultiRAE with 11.7eV lamp	• Observation of 3rd-party Drilling/Direct-push • Observation of 3rd-party Well installation • Observation of 3rd-party mobile lab operations • Surface and sub-surface soil sampling • Groundwater sampling • Hand augering • IDW management	**Action Levels based on the 1.7 relative response of the 11.7 eV lamp to Carbon Tetrachloride** <0.6 ppm → Level D ≥0.6 ppm → Collect colormetric tubes, if Carbon Tetrachloride **<u>IS NOT</u>** detected, then: 0.6-5 ppm → Level D >5 ppm → Contact HSM If Carbon Tetrachloride **<u>IS</u>** detected, then: 0.6-25 ppm → Level C >25 ppm → Stop work; Notify HSM		Initially and periodically during task	Daily
Detector Tube or CMS: Carbon Tet specific; 0.2 – 10 ppm range	• All activities when PID Action Levels are exceeded	No Color Change → Color Change →	See PID See PID	Initially and periodically when PID ≥0.6 ppm	Not applicable
O_2: MultiRae or equivalent[c]	• Drilling/Direct-push	20.9% → >23.5% →	Normal O_2 Fire Hazard; notify HSM	Initially and periodically during task	Daily
LEL/ CGI: MultiRae or equivalent[c]	• Drilling/Direct-push	<10% LEL: → >10% LEL: →	No explosion hazard Explosion hazard; evacuate or vent	Initially and periodically during task	Daily
Dust Monitor: Visual Assessment	• All invasive tasks	Visual Dust→ Initiate dust control methods (e.g. apply water or mist immediately)		Initially and periodically during tasks	NA
Heat Stress Monitor Refer to Flow Chart Below	All tasks	Refer to the Handbook for the type of monitoring conducted. ☒ Ambient Temperature ☒ Physiological ☒ Pulse		When Heat Index reaches criteria	

[a] Action levels apply to sustained breathing-zone measurements above background for more than 5 minutes.

[b] The exact frequency of monitoring depends on field conditions and is to be determined by the SC; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate.

9.2 Heat Stress Monitoring Flow Chart

Use the flow chart below and refer to the applicable protocol in Section 9 of the Handbook for heat stress monitoring.



9.3 Integrated Personal Air Sampling

Personal air sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Based on site contaminants and concentrations, the following integrated personal air sampling will be conducted:

Method/Analyte	Tasks	Frequency
Based on COC concentrations, use of direct-reading instruments, modeling, current site conditions, and planned tasks, personal air sampling is not required at this time. However, employees should pay close attention to personal hygiene and wear PPE as instructed.		

SECTION 10

Personal Protective Equipment

(Reference CH2M- SOP HSE-117, Personal Protective Equipment, and Section 11 of the Handbook)

10.1 Required Personal Protective Equipment

PPE must be worn by employees when actual or potential hazards exist and engineering controls or administrative practices cannot adequately control those hazards. A PPE assessment has been conducted by the RHSM based on project tasks (see PPE specifications below). Verification and certification of assigned PPE by task is completed by the RHSM that approved this plan. Refer to the Handbook, Section 11, "Personal Protective Equipment," for requirements on the use, care, and maintenance of PPE. The table below outlines PPE to be used according to task based on project-specific hazard assessment. If a task other than the tasks described in this table needs to be performed, contact the RHSM so this table can be updated.

Project-Specific Personal Protective Equipment Requirements[a]

Task	Level	Body	Head	Respirator [b]
• Site walks • Surveying (with no contact to site contaminants) • Utility location	Non-HW	☒ Work clothes (sleeved shirt, long pants) ☐ Cotton Coveralls ☒ Safety-toed Boots ☒ Gloves (leather) ☒ ANSI high visibility vest	☒ANSI Z89.1 Hardhat [c] ☒ANSI Z87.1 Safety glasses ☐Hearing protection [d]	None required
• Observation of 3rd-party Drilling/Direct-push • Observation of 3rd-party Well installation • Observation of 3rd-party mobile lab operations • Surface and sub-surface soil sampling • Groundwater sampling • Hand augering • IDW management	Modified D	**Coveralls:** Cotton coveralls or uncoated Tyvek aprons **Boots:** Steel-toe, chemical-resistant boots OR steel-toe leather work boots **Gloves:** Inner surgical-style nitrile and outer chemical-resistant nitrile gloves	☒ANSI Z89.1 Hardhat [c] ☒ANSI Z87.1 Safety glasses ☒Hearing protection [d]	None required
When Action Levels in Section 9.1 (Air Monitoring) are exceeded	C	**Body:** Polycoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Side-impact Hardhat [c] Splash shield [c] Ear protection [d]	APR, full face, MSA Advantage 1000 with GME/P100 cartridges[e] or equivalent;

Reasons for Upgrading or Downgrading Level of Protection (with approval of the RHSM)

Upgrade[f]	Downgrade
• Request from individual performing tasks. • Change in work tasks that will increase contact or potential contact with hazardous materials. • Occurrence or likely occurrence of gas or vapor emission. • Known or suspected presence of dermal hazards. • Instrument action levels in the "Site Monitoring" section exceeded.	• New information indicating that situation is less hazardous than originally thought. • Change in site conditions that decrease the hazard. • Change in work task that will reduce contact with hazardous materials.

[a] Modifications are as indicated. CH2M will provide PPE only to CH2M employees.

[b] No facial hair that would interfere with respirator fit is permitted.

[c] Hardhat and splash-shield areas are to be determined by the SC.

[d] Ear protection should be worn when conversations cannot be held at distances of 3 feet (1 meter) or less without shouting.

[f] Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the RHSM, and an SC qualified at that level is present.

10.2 Respiratory Protection

(Reference CH2M SOP HSE-121, *Respiratory Protection*)

Implement the following when using respiratory protection:

Respirator users must have completed appropriate respirator training within the past 12 months. Level C training is required for air-purifying respirators (APR) use and Level B training is required for supplied-air respirators (SAR) and self-contained breathing apparatus (SCBA) use. Specific training is required for the use of powered air-purifying respirators (PAPR).

Respirator users must complete the respirator medical monitoring protocol and been approved for the specific type of respirator to be used.

Tight-fitting face piece respirator (negative or positive pressure) users must have passed an appropriate fit test within past 12 months.

Respirator use shall be limited to those activities identified in this plan. If site conditions change that alters the effectiveness of the specified respiratory protection, the RHSM shall be notified to amend the written plan.

Tight-fitting face piece respirator users shall be clean-shaven and shall perform a user seal check before each use.

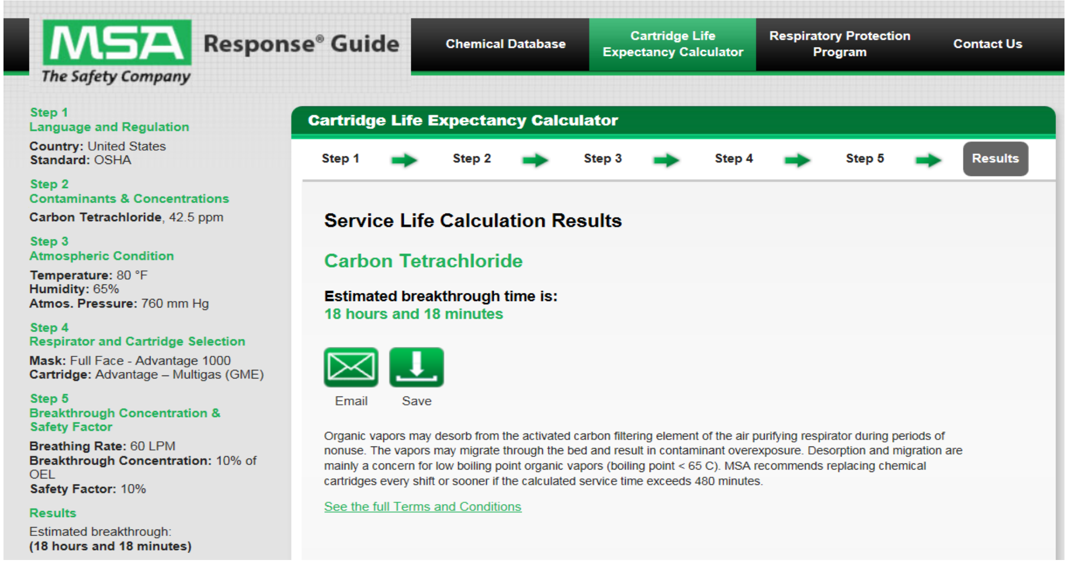
Canisters/cartridges shall be replaced according to the change-out schedule specified in this plan. Respirator users shall notify the SC or RHSM of any detection of vapor or gas breakthrough. The SC shall report any breakthrough events to the RHSM for schedule upgrade.

Respirators in regular use shall be inspected before each use and during cleaning

Respirators in regular use shall be cleaned and disinfected as often as necessary to ensure they are maintained in a clean and sanitary condition.

Respirators shall be properly stored to protect against contamination and deformation.

Field repair of respirators shall be limited to routine maintenance. Defective respirators shall be removed from service.



Step 1
Language and Regulation
Country: United States
Standard: OSHA

Step 2
Contaminants & Concentrations
Carbon Tetrachloride, 42.5 ppm

Step 3
Atmospheric Condition
Temperature: 80 °F
Humidity: 65%
Atmos. Pressure: 760 mm Hg

Step 4
Respirator and Cartridge Selection
Mask: Full Face - Advantage 1000
Cartridge: Advantage – Multigas (GME)

Step 5
Breakthrough Concentration & Safety Factor
Breathing Rate: 60 LPM
Breakthrough Concentration: 10% of OEL
Safety Factor: 10%

Results
Estimated breakthrough:
(18 hours and 18 minutes)

Cartridge Life Expectancy Calculator

Service Life Calculation Results

Carbon Tetrachloride

Estimated breakthrough time is:
18 hours and 18 minutes

Organic vapors may desorb from the activated carbon filtering element of the air purifying respirator during periods of nonuse. The vapors may migrate through the bed and result in contaminant overexposure. Desorption and migration are mainly a concern for low boiling point organic vapors (boiling point < 65 C). MSA recommends replacing chemical cartridges every shift or sooner if the calculated service time exceeds 480 minutes.

See the full Terms and Conditions

10.2.1 Respirator Change-Out Schedule

Contaminant	Change-Out Schedule
Carbon Tetrachloride	End-of-service life or end of 8hr shift (whichever occurs first)

SECTION 11

Worker Training and Qualification

11.1 CH2M Worker Training

(Reference CH2M SOP HSE-110, Training, and Section 12 of the Handbook)

The following training is required for CH2M personnel working onsite. Copies of training either will be available onsite, or readily available from the CH2M HandS training database system. Refer to Section 12 of the Handbook for a description of HAZWOPER-related and Safety Coordinator training.

Required CH2M Worker Training	**CH2M Task or Equipment-Specific Training (if performing task)**
☒ 40-hour HAZWOPER Training	☐ Aerial Lift Operator Training
☒ 8-hour HAZWOPER Refresher	☐ Confined Space Entry Training
☒ 3-day HAZWOPER OJT	☐ Excavation Safety Training
☒ CH2M HSP Training	☐ Fall Protection (site-specific)
☒ CH2M E&NM HSSE Handbook	☐ Forklift Operator
☒ CH2M AHAs	☒ Hazard Communication
☐ Subcontractor HSP	☒ On-Track Railroad Safety Training
☐ 10-hour OSHA Construction Safety Training	☐ NFPA 70E Training (energized electrical safety training)
☒ At least one SC-HW (refer to worker category for all applicable training needed)	☐ Qualified Earthmoving Equipment Operator
☒ HWW (refer to worker category for all applicable training needed)	☐ Scaffold Training
☐ At least one SC-C (refer to worker category for all applicable training needed)	☒ Other (specify): UPRR Contractor Orientation
☐ Other (specify)	☒ Other (specify): E-Railsafe

Project-Specific Required (VO) Training

- ☐ 3R Munitions Safety Awareness Training
- ☐ Arsenic Training
- ☐ Asbestos Awareness Training
- ☐ Bear Awareness Training
- ☐ Benzene Training
- ☐ Cadmium Training
- ☐ Chromium Training
- ☐ Confined Space Awareness Training
- ☐ Drum Handling Training
- ☐ Electrical Safety Training
- ☐ Excavation Safety Training
- ☐ Fall Protection Training
- ☐ Formaldehyde Training
- ☐ Drum Handling Training
- ☐ Hand Safety Training
- ☐ Hydrogen Sulfide Hazard Recognition Training
- ☐ Ionizing Radiation Training
- ☐ Lead Exposure Training
- ☐ Lockout/Tagout Training
- ☐ Manual Lifting Training
- ☐ Methylene Chloride Training
- ☐ Noise Training
- ☐ Radio Frequency Safety Awareness
- ☐ Railroad Safety On-line Training
- ☒ Respirators Level C Training
- ☐ Stairways and Ladders
- ☐ Traffic Safety Training
- ☐ Vinyl Chloride Training

11.2 Subcontractor Worker Training

The following training is required for Subcontractor personnel working onsite. Copies of training shall be available onsite.

Required Subcontractor Worker Training

- ☐ 40-hour HAZWOPER Training
- ☐ 8-hour HAZWOPER Refresher
- ☐ 8-hour HAZWOPER Supervisor
- ☐ 3-day HAZWOPER OJT
- ☐ CH2M HSP Training
- ☒ Subcontractor AHAs
- ☐ Subcontractor HSP
- ☐ 10-hour OSHA Construction Safety Training
- ☐ 30-hour OSHA Construction Safety Training
- ☐ Respiratory Protection Training
- ☐ CH2M E&NM HSSE Handbook
- ☐ First Aid/CPR/BBP – at least 2 people
- ☐ Other (specify)

Subcontractor Task or Equipment-Specific Training (required if performing this work)

- ☐ Aerial Lift Operator Training
- ☐ Asbestos Competent Person
- ☐ Asbestos Training (Supervisor, Worker)
- ☐ Confined Space Entry Training
- ☐ Certified Crane Operator
- ☐ Crane Assembly/Disassembly Competent Person
- ☐ Demolition Competent Person
- ☐ Excavation Competent Person
- ☐ Fall Protection (site-specific)
- ☐ Flagger Training
- ☐ Forklift Operator
- ☐ Hazard Communication
- ☐ Ladder Safety Training
- ☐ Lead Training
- ☐ Lockout/Tagout Training
- ☒ On-Track Railroad Safety Training (if within 25’ of active tracks)
- ☐ NFPA 70E Training (energized electrical safety training)
- ☐ Qualified Drill Rig Operator
- ☐ Qualified Earthmoving Equipment Operator
- ☐ Qualified Rigger
- ☐ Scaffold Training
- ☒ Other (specify): UPRR Contractor Orientation

The designation of **competent person** is a specific position of authority for a particular activity with defined roles and responsibilities and, in some cases, requisite qualifications. The Subcontractor must designate a qualified competent person for the following tasks, and supporting documentation (e.g. training documentation, resume of experience, activity competent person designation is granted for, etc.) must be available for CH2M review upon request**.**

Subcontractor Tasks Requiring a Competent Person	
☐ Excavation Competent Person	☐ Lead Competent Person
☐ Asbestos Competent Person	☐ Other:
☐ Scaffolding Competent Person	☐ Other:
☐ Crane Competent Person	☐ Other:

11.3 HAZWOPER-Exempted Tasks

The following tasks are not within the scope of the HAZWOPER standard so HAZWOPER training is not required for workers performing these tasks:

Task	**Task**
• Site walks • Surveying (with no exposure to site contaminants) • Utility location	

SECTION 12

Medical Surveillance and Qualification

(Reference CH2M SOP HSE-113, Medical Surveillance, and Section 13 of the Handbook)

The following medical surveillance is required for CH2M and subcontractor personnel working onsite. Copies of physician's medical opinion either will be available onsite, or for CH2M staff, readily available from the CH2M HandS training database system. Refer to Section 13 of the Handbook for a description of HAZWOPER, respirator user, and hearing conservation medical surveillance.

General Required Medical Surveillance	Job or Activity-Specific Medical Surveillance (required if performing this work)
☒ HAZWOPER Medical Clearance	☐ Noise
☒ Respirator Medical Clearance	☐ Baseline Blood Lead
	☐ Asbestos Medical Clearance
	☐ Other (specify):

Personnel or Tasks Not Requiring Medical Surveillance

SECTION 13

Site-Control Plan

(Reference CH2M SOP HSE-218, Hazardous Waste Operations, and Section 14 of the Handbook)

Site control is established to prevent the spread of contamination throughout the site and to ensure that only authorized individuals are permitted into potentially hazardous areas. Task-specific control measures are listed below. **Use of the Buddy System will be implemented unless a Working Alone protocol has been established and approved as indicated in Sections 5 and 6 above.**

Site Control for General Work Area(s)

☐ Perimeter fencing	Location:	☐ Barricades	Location:
☐ Signage	Location:	☒ Other: __Caution Tape___	Location: As needed
☐ Traffic control devices	Location:	☐ Other: _________________	Location:

Location	**Site Control Procedure (discuss important elements such as signs, barricades, briefings, qualifications, required supplies and equipment, sign-in/out logs, etc.)**
Support Zone:	Watch for public and non-HAZWOPER trained persons, and stop before they enter the site.
Contamination Reduction Zone:	Caution tape between CRZ and Support Zone; watch for public and non-HAZWOPER trained persons, and stop before they cross this line. Only HAZWOPER trained and medically monitored personnel inside this zone
Exclusion Zone:	Only HAZWOPER trained and medically monitored personnel inside this zone

SECTION 14

Decontamination

(Reference CH2M SOP HSE-218, Hazardous Waste Operations, and Section 15 of the Handbook)

Refer to the Handbook, Section 15, “Decontamination,” for a complete description of decontamination activities and diagrams of typical decontamination areas. Decontamination areas will be established for work in potentially contaminated areas to prevent the spread of contamination. Decontamination areas should be located upwind of the exclusion zone where possible and should consider any adjacent or nearby projects and personnel. No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones.

All contaminated material generated through the personnel and equipment decontamination processes (e.g., contaminated disposable items, gross debris, liquids, and sludges) will be properly containerized and labeled, stored at a secure location, and disposed in accordance with project plans.

The SC-HW must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SC-HW. The SC-HW must ensure that procedures are established for disposing of materials generated on the site.

14.1 Decontamination Specifications

Personnel

- Boot wash/rinse
- Glove wash/rinse
- Outer-glove removal
- Body-suit removal
- Inner-glove removal
- Respirator removal
- Hand wash/rinse
- Face wash/rinse
- Shower ASAP
- Dispose of PPE in municipal trash, or contain for disposal
- Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal

Sample Equipment

- Wash/rinse equipment
- Solvent-rinse equipment
- Contain solvent waste for offsite disposal

Heavy Equipment

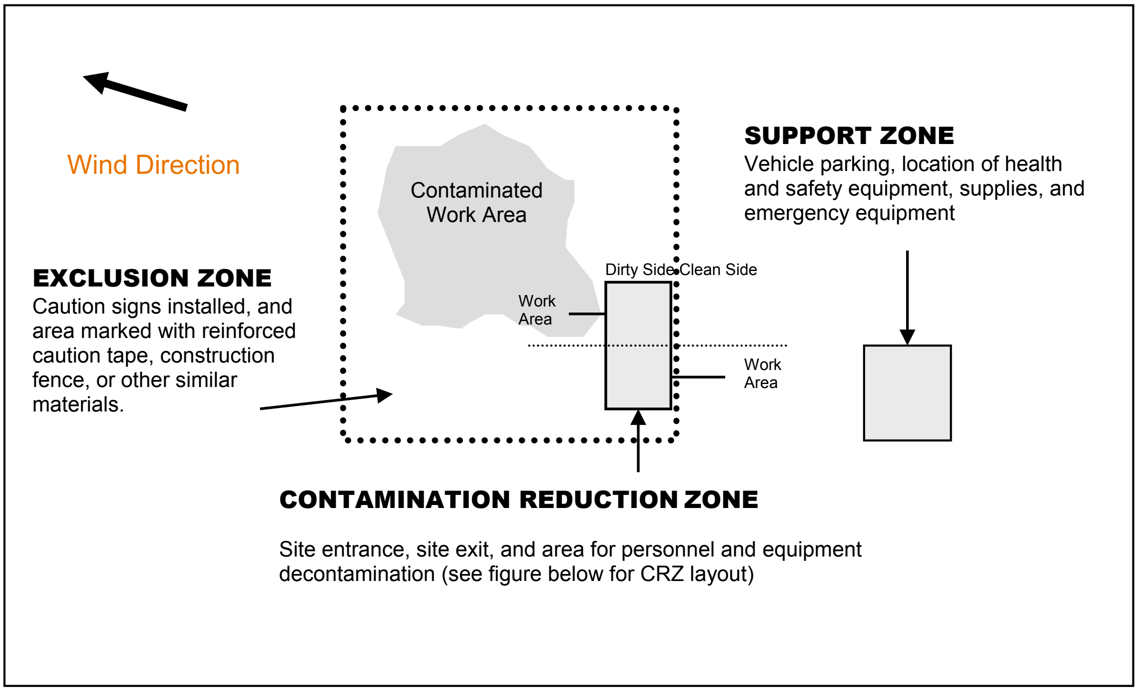
- Power wash
- Steam clean
- Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal

14.2 Diagram of Personnel-Decontamination Line

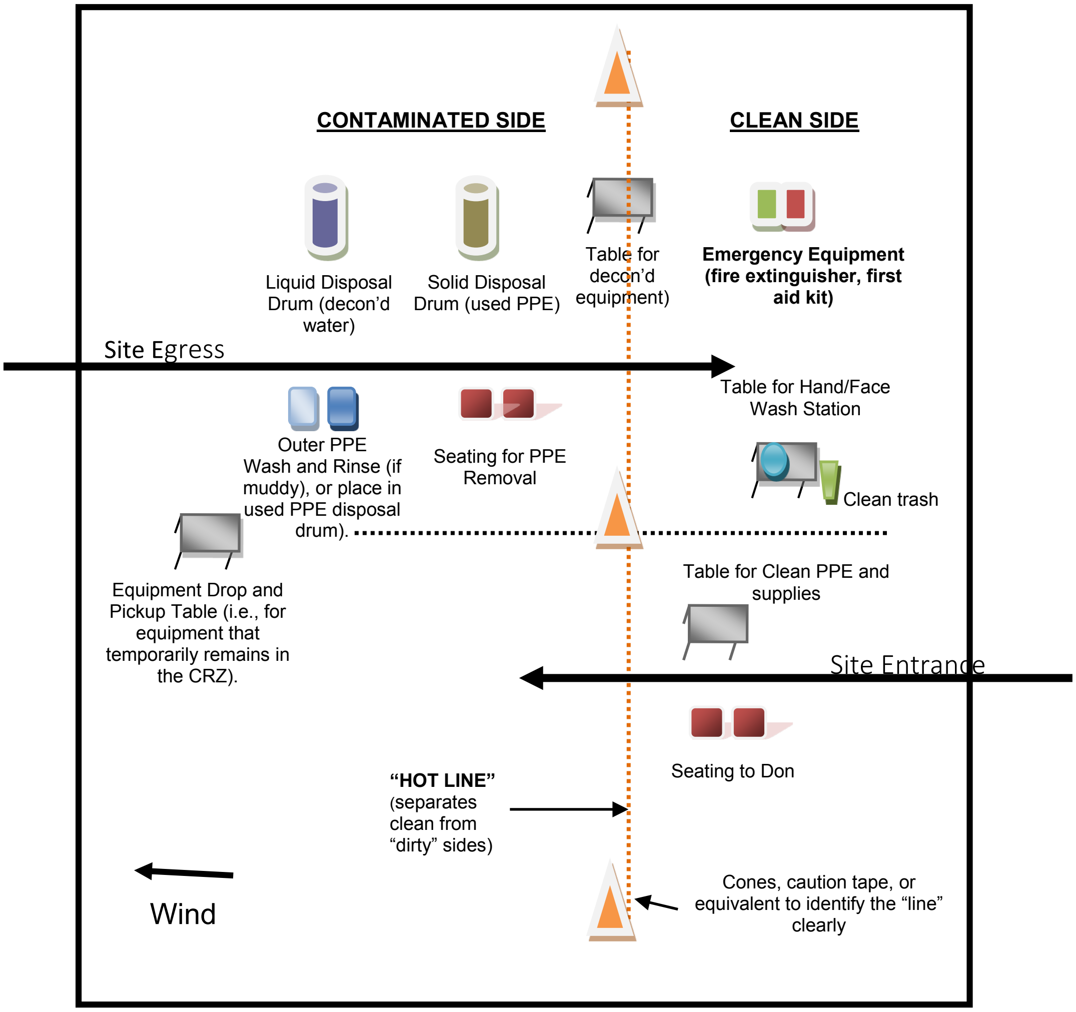
No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SC should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

The following figure illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SC to accommodate task-specific requirements.

Work Area - Set up appropriately based on wind direction



Typical Contamination Reduction Zone



14.3 Decontamination during Medical Emergencies

Standard personnel decontamination practices will be followed whenever possible. For emergency lifesaving first aid and/or medical treatment, normal decontamination procedures may need to be abbreviated or omitted. In this situation, site personnel shall accompany contaminated victims to advise emergency response personnel on potential contamination present and proper decontamination procedures.

Outer garments may be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Protective clothing can be cut away. If the outer garments cannot be safely removed, a plastic barrier between the individual and clean surfaces should be used to help prevent contaminating the inside of ambulances or medical personnel. Outer garments can then be removed at the medical facility.

SECTION 15

Communications

A primary and backup means of communication for field crews have been established as described below:

Type of Communication	Primary Means	Backup Means
Communication between field crew	☒ Voice ☐ Radio ☒ Phone	☐ Voice ☐ Radio ☐ Phone
Communication with Office crew	☐ Radio ☒ Phone	☐ Radio ☐ Phone
Communication with Fire and Emergency Services	☐ Radio ☒ Phone	☐ Radio ☐ Phone

SECTION 16

Required Facilities and Equipment

The following facilities and equipment are required and used for safe completion of work:

Facility	Type	Location
☐ Worker Showers/lockers		
☒ Restrooms		Port-a-let
☐ Supplementary Illumination		
☒ Emergency Eyewash		Field Vehicle
☐ Emergency Shower		
☒ First aid kit/supplies		Field Vehicle
☒ Fire extinguishers		Field Vehicle/Drill Rig
☐ Spill Kit(s)		
☒ Potable Water		Field Vehicle
☒ Shade/rest area	Nature	
☐ Heated rest area		
☐ Other______________________		

Emergency Response Plan

(Reference CH2M SOP HSE-106, Emergency Planning, and Section 16 of the Handbook)

Personnel responsible for coordinating emergencies during site activity are identified below. The Emergency Contacts Page is at the front of this Plan. A map showing directions to the authorized medical facility is included at the beginning of this document. Documented rehearsal and critique of this plan is required at least once during the task, or more often as necessary.

Responsibility	**Name**	**Phone Number(s)**
Emergency Response Coordinator (ERC)	Name: Rueben Greer/SPK Phone: 509/847-8819	
Alternate ERC		
Type (desk or field) and frequency of rehearsal		

If an emergency develops which requires evacuation of the work area, the following steps shall be implemented.

Evacuation Step	**Methods and comments:**
Notify affected workers	
Evacuate to safe location	
Assemble and account for workers	
Notify Supervisor/Manager	
Complete incident report	

Potential emergencies and response actions are identified below.

In case of:	**Response actions:**
Injury or illness	See Section 18.5
Chemical exposure	Follow MSDS/SDS and see Section 18.5
Fire or explosion	See Section 18.6
Adverse weather	Seek shelter
Heat Stroke	Call 911, have a designee give location and directions to ambulance service if needed. If CH2M employee, call occupational physician at 1-866-893-2514.
Material spill or release	Appropriate spill response materials for all chemicals must be present at the job site. Only qualified (by training and previous experience) who have proper PPE and equipment available shall provide spill response operations, when safe to do so.

Evacuation Signals:	**Meaning:**
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy’s wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

SECTION 18

Incident Notification, Reporting, and Investigation

(Reference Section 16 of the Handbook for complete definitions and protocol)

18.1 Incident Notification

All employees and subcontractors' employees shall immediately report any incident (including "near misses,") in which they are involved or witness to their supervisor.

The CH2M or Subcontractor supervisor, upon receiving an incident report, shall inform his immediate superior and the CH2M SC.

The SC shall immediately report the following information to the RHSM and PM by phone and e-mail:

- Project Name and Site Manager;
- Date and time of incident;
- Description of incident;
- Extent of known injuries or damage;
- Level of medical attention; and
- Preliminary root cause/corrective actions

If the incident was an environmental permit issue (potential permit non-compliance, other situation that result in a notice of violation) or a spill or release, contact the Project EM immediately so evaluation of reportable quantity requirements and whether agency reporting is required.

18.2 Drug and Alcohol Testing for CH2M Employees

As required by CH2M Policy 810, U.S. Employees are subject to post-incident and reasonable suspicion drug and alcohol testing. The Employee must submit to drug and alcohol testing if the supervisor has a reasonable suspicion, and when any of the following occur:

- Work-related injury in which the Company reasonably believes (under the Reasonable Suspicion provisions in the Policy) that drug and/or alcohol use is a contributing factor;
- Incident resulting in property damage over USD$500 as determined by the Company;
- Injury on or in Company Property/Workplace (to Employee or third parties) involving the Employee's use of heavy machinery as determined by the Company;
- Incident considered to be a serious near-miss injury that occurs in the field or in the office as determined by the Company and where the Company reasonably believes (under the Reasonable Suspicion provisions in the Policy) that drug and/or alcohol use is a contributing factor to the serious near miss injury;
- Other circumstances as dictated by Employee Relations; or
- An Employee contributes to any of the above.

Refer to the E&NM HSSE Handbook and CH2M Policy 810 for additional information and specific requirements.

18.3 Drug and Alcohol Testing for Subcontractors

The drug and alcohol testing requirements stated above apply to subcontractors when required by the subcontract.

18.4 HITS System and Incident Report Form

The SC shall complete an entry into the Hours and Incident Tracking System (HITS) database system located on CH2M's Virtual Office (or if VO not available, use the hard copy Incident Report Form and Root Cause Analysis Form and forward it to the RHSM) within 24 hours and finalize those forms within 3 calendar days.

18.5 Injury Management/Return-to-Work (for US/Puerto Rico based CH2M Staff Only)

In the event of an injury, or potential injury (i.e., involvement in motor vehicle collision with no apparent injury; a puncture wound with no bleeding or apparent infection, etc.), the following actions shall be taken:

- Employee informs their supervisor.
- Employee calls the Injury Management Program toll free number 1-866-893-2514 immediately and speaks with the Occupational Injury Nurse. This number is operable 24 hours per day, 7 days a week. **Employees are encouraged to enter this phone number into their cell phones prior to starting fieldwork.**
- Supervisor ensures employee immediately calls the Injury Management Program number. Supervisor makes the call with the injured worker or for the injured worker, if needed.
- Nurse assists employee with obtaining appropriate medical treatment, as necessary schedules clinic visit for employee (calls ahead, and assists with any necessary follow up treatment). The supervisor or SC accompanies the employee if a clinic visit is necessary to ensure that employees receive appropriate and timely care.
- Supervisor or SC completes the HITS entry or Incident Report Form immediately (within 24 hours) and forwards it to the Project Manager and RHSM.
- Nurse notifies appropriate CH2M staff by e-mail (supervisor, Health & Safety, Human Resources, Workers' Compensation).
- Nurse communicates and coordinates with and for employee on treatment through recovery.
- Supervisor ensures suitable duties are identified and available for injured or ill workers who are determined to be medically fit to return to work on transitional duty (temporary and progressive).
- Supervisor ensures medical limitations prescribed (if any) by physician are followed until the worker is released to full duty.

1-866-893-2514

24/7 physician access

Injured on the job—who do you call?

For more information please visit us on the VO at:

Company Resources | Corporate Groups | Health, Safety, Security, and Environment

HSSE

18.6 Serious Incident Reporting Requirements

Serious incidents include the following:

- Work related death, or life threatening injury or illness of a CH2M employee, subcontractor, or member of the public;
- Kidnap or missing person;
- Acts or threats of terrorism;
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than $ 500,000 in damage; or
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community, or the environment.

If an incident meets the "Serious Incident" criteria, the Project Manager is to immediately contact the Crisis Manager at 720-286-4911, then follow the standard incident reporting procedure.

SECTION 19

Inspections

19.1 Project Activity Self-Assessment Checklists

The following self-assessment checklists are required when the task or exposure is initiated and weekly thereafter. The checklists shall be completed by the SC or other CH2M representative and maintained in project files.

Drilling

19.2 Safe Behavior Observations

The SC or designee shall perform at least one SBO each week for any fieldwork performed by subcontractors or when there are at least two CH2M personnel performing field work.

E-mail completed forms to the following:

- Federal Sector: CH2M ES FED Safe Behavior Observation
- Commercial Sector: CH2M ES COM Safe Behavior Observation
- Canada: cnressafe@ch2m.com
- International: ESINTLSafeBehaviorObservation@ch2m.com

19.3 Agency Inspections

If a Federal or local agency (e.g., OSHA, local water board, EPA) announces it will be performing inspection, either announced or unannounced, refer to Attachment 2, Target Zero Bulletin on Agency Inspections. Contact the PM, RHSM and EM as soon as you receive notice.

SECTION 20

Records and Reports

Refer to the Handbook, Section 19, “Records and Reports,” for a complete description of HSE recordkeeping requirements. Below are examples of records that must be maintained as the project progresses:

- Exposure records includes air monitoring data (including calibration records), SDSs, exposure modeling results
- Training records
- Respiratory fit test records
- Incident reports, investigations and associated back-up information
- Federal or state agency inspection records
- HSE audits and assessments
- Confined space entry permits
- Waste profiles
- Agency submittals
- Equipment inspections
- Equipment maintenance
- Emergency equipment inspection records
- SBOs
- Self-assessment checklists
- Daily Safety Meeting Sign-In forms/PTSPs
- Waste analytical data
- Manifests
- Reports and certifications

SECTION 21

Employee Signoff Form

EMPLOYEE SIGNOFF FORM
Health and Safety Plan

The CH2M project employees and subcontractors listed below have been provided with a copy of this HSP, have read and understood it, and agree to abide by its provisions.

Project Name:

Project Number:

EMPLOYEE NAME (Please print)	**EMPLOYEE SIGNATURE**	**COMPANY**	**DATE**

Attachment 1
CH2M Health and Safety Plan – Vehicle Accident Guidance

2011 Vehicle Accident Guidance—ESBG

Remember that if you a **renting** a non-CH2M owned vehicle (short-term rental) in the U.S., you should carry the insurance card from the state where your driver's license is issued.

If you operate a **fleet vehicle**, carry the insurance card where the vehicle is registered.

For ALL Vehicles if you are in an accident:

1. If you are injured, call 911 for emergency medical treatment or 1-866-893-2514 to contact the CH2M Occupational Nurse/Physician for minor injuries. If you feel you have not been injured, contact the RHSM for guidance on whether calling the CH2M Occupation Nurse/Physician is applicable.

2. **Call the Police--**For any vehicle accident/damage, it is recommended that the local police (or site security/emergency services if working on a client site that provides such services) be called to determine if a report needs to be filed. In some instances, a report may not be required (during accident alerts, or in public parking lots). Document that the authorities were called and follow up with any guidance they give you. State requirements vary. If a report is filed, obtain a copy.

3. Notify Supervisor, (and PM/RHSM if working on a project site)

4. Complete a HITS report on the VO.

Additional Steps

To report an auto accident, and before a claim can be taken by telephonic reporting, have available your name (the company name alone is no longer accepted, a driver's name must be provided even for fender benders), location of accident and your office address if different than the accident location, business group and project number. A claim cannot be taken without your name, address, business group and your project number. By location the state where the accident occurred, and which office you are aligned to, i.e., accident occurs in Idaho, but you are out of the Denver office. Advise the claim recorder the accident occurred in ID, but that your office location is Denver. This will assist the claim intake person in identifying location coding for the claims.

Auto accidents involve two different sections of an Auto policy:

1) Liability to others due to Bodily Injury and Property Damage

2) Physical Damage - Comprehensive and Collision - damage to the vehicle CH2M employee is driving

CH2M has Liability coverage for any auto - our policy will respond on either a primary or excess basis.

Refer to the table below for additional notifications to make based on the type of accident experienced and type of vehicle being used.

Liability - Bodily Injury or Property Damage to Others

Scenario	Which Coverage Responds	What to do if in an accident
CH2Mfleet, pool or project vehicle - long term lease - lower 48	CH2M - Primary	Contact Broadspire (1-800-753-6737); Mary Ellegood-Oberts/DEN (720-286-2291); Linda George/DEN (720-286-2057)
CH2M fleet, pool or project vehicle - long term lease - Alaska (North Slope)	CH2M - Primary	Mary Ellegood-Oberts/DEN (720-286-2291)
Client vehicle driven by CH2M employee	Client's auto policy unless client has made CH2M responsible for vehicle	Contact Broadspire (1-800-753-6737); Mary Ellegood-Oberts/DEN (720-286-2291); contact client
Short term lease (30 days or less)	Rental car company if rented through Enterprise, Budget or Hertz; CH2M excess	Contact Broadspire (1-800-753-6737); Contact local branch of rental car company where vehicle leased (ERAC includes 24 hour roadside assistance) and Mary Ellegood-Oberts/DEN (720-286-2291)
Short term lease (30 days or less)	CH2M - Primary if rented through company other than our national agreements; $100,000 deductible	Contact Broadspire (1-800-753-6737); Contact rental car company and Mary Ellegood-Oberts/DEN (720-286-2291)
Personal vehicle used on business	Employee's personal auto policy; CH2M on an excess basis	Contact personal auto insurance company; contact Mary Ellegood-Oberts/DEN (720-286-2291)

Physical Damage - damage to vehicle CH employee was driving

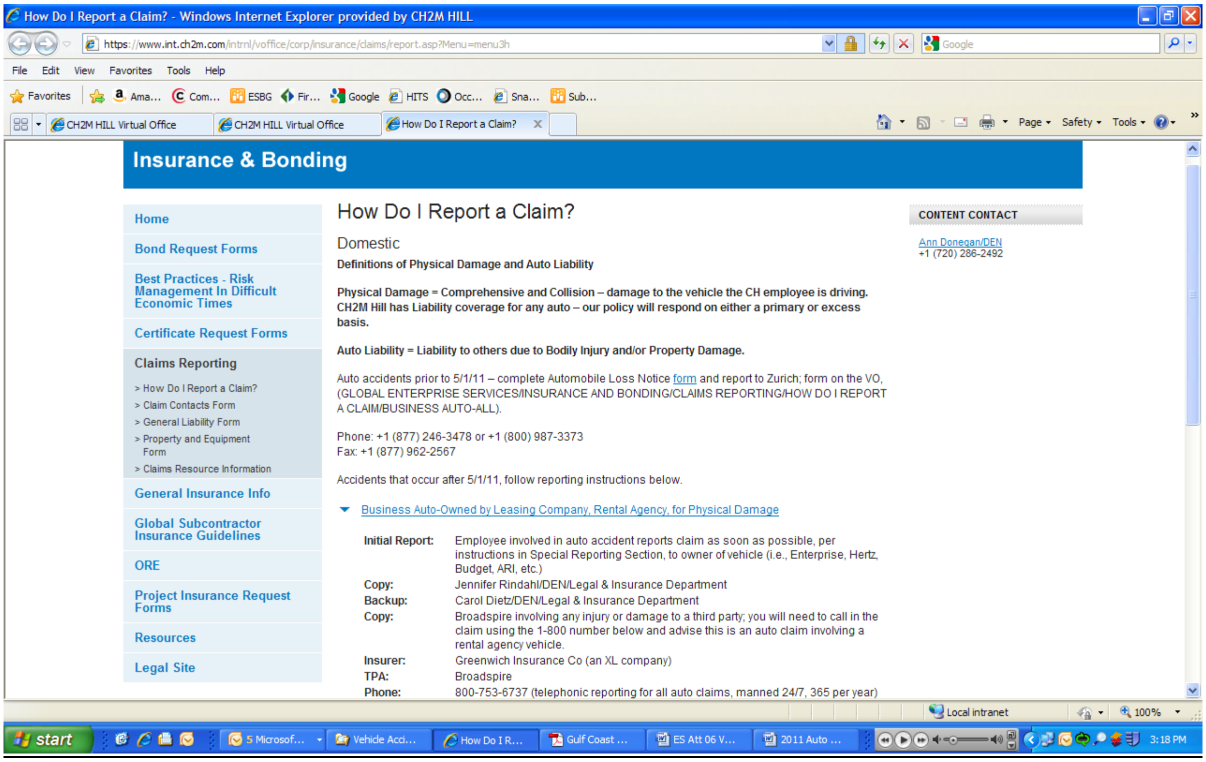
Scenario	Which Coverage Responds	What to do if in an accident
CH2M fleet, pool or project vehicle - long term lease - lower 48	CH2M ONLY if vehicle is scheduled on policy - $5,000 deductible	Contact Broadspire (1-800-753-6737); Mary Ellegood-Oberts/DEN (720-286-2291); Linda George/DEN (720-286-2057)
CH2M fleet, pool or project vehicle - long term lease - Alaska (North Slope)	CH2M Equipment Schedule if scheduled on policy	Contact Mary Ellegood-Oberts/DEN (720-286-2291)
CH2M fleet, pool or project vehicle - long term lease	ARI if physical damage coverage purchased - $500 deductible	Contact Mary Ellegood-Oberts/DEN (720-286-2291); call ARI at 1-800-221-1645 give them Client Code and ARI fleet vehicle number; and notify Linda George/DEN - Fleet Coordinator - 720-286-2057
Client vehicle CH2M Employee is driving	Client's auto policy unless client has made CH2M contractually responsible for vehicle	Contact Mary Ellegood-Oberts/DEN (720-286-2291); contact client; contact Broadspire (1-800-753-6737)
Short term lease (30 days or less) using corporate VISA	VISA if corporate credit card used and vehicle is not a pickup, truck, cargo van or used off-road	Contact VISA - 1-800-847-2911 or http://www.visa.com/eclaim
Short term lease (30 days or less) through Enterprise (ERAC) and vehicle is used off-road and physical damage coverage included when vehicle leased	ERAC up to $3,000 in damage; CH2M's coverage is excess	Notify Rental Car Company; contact Mary Ellegood-Oberts/DEN (720-286-2291) if damage over $5,000
Short term lease (30 days or less) did **not** use corporate VISA	CH2M - $5,000 deductible (project responsibility)	Contact Broadspire (1-800-753-6737); Contact Mary Ellegood-Oberts/DEN (720-286-2291); contact VISA - 1-800-847-2911 or http://www.visa.com/eclaim
Personal vehicle used on business	CH will reimburse the amount of the deductible carried on the employee's policy up to $500 whichever is less	Contact Mary Ellegood-Oberts/DEN (720-286-2291); contact client; contact Broadspire (1-800-753-6737)

Details for reporting a claim on the CH2M VO are accessed by going to the VO home page and clicking:

GLOBAL ENTERPRISE SERVICES/INSURANCE & BONDING/CLAIMS REPORTING

HOW DO I REPORT A CLAIM TAB or access the following URL:

https://www.int.ch2m.com/intrnl/voffice/corp/insurance/claims/report.asp?Menu=menu3h



How Do I Report a Claim?

Domestic

Definitions of Physical Damage and Auto Liability

Physical Damage = Comprehensive and Collision – damage to the vehicle the CH employee is driving. CH2M Hill has Liability coverage for any auto – our policy will respond on either a primary or excess basis.

Auto Liability = Liability to others due to Bodily Injury and/or Property Damage.

Auto accidents prior to 5/1/11 – complete Automobile Loss Notice form and report to Zurich; form on the VO, (GLOBAL ENTERPRISE SERVICES/INSURANCE AND BONDING/CLAIMS REPORTING/HOW DO I REPORT A CLAIM/BUSINESS AUTO-ALL).

Phone: +1 (877) 246-3478 or +1 (800) 987-3373
Fax: +1 (877) 962-2567

Accidents that occur after 5/1/11, follow reporting instructions below.

Business Auto-Owned by Leasing Company, Rental Agency, for Physical Damage

Initial Report:	Employee involved in auto accident reports claim as soon as possible, per instructions in Special Reporting Section, to owner of vehicle (i.e., Enterprise, Hertz, Budget, ARI, etc.)
Copy:	Jennifer Rindahl/DEN/Legal & Insurance Department
Backup:	Carol Dietz/DEN/Legal & Insurance Department
Copy:	Broadspire involving any injury or damage to a third party; you will need to call in the claim using the 1-800 number below and advise this is an auto claim involving a rental agency vehicle.
Insurer:	Greenwich Insurance Co (an XL company)
TPA:	Broadspire
Phone:	800-753-6737 (telephonic reporting for all auto claims, manned 24/7, 365 per year)

CONTENT CONTACT

Ann Donegan/DEN
+1 (720) 286-2492

For Personally Owned Vehicles (POVs):

CH2M does not provide auto insurance for POVs; it is responsibility of the owner. If you are in a vehicle accident conducting company business, contact the police as above, supervisor, and 911 or CH2M's occupational nurse/physician as stated above. Complete a HITS report. Contact Julie Zimmerman/DEN for assistance for meeting personal insurance deductibles (up to $500) with proof of insurance and deductible.

If using your POV for extended project use, notify the PM to make sure a rental car is not needed. Check your insurance policy for guidance on using the POV for business use.

Additional Resources:

Claims Resource Manual

Attachment 2
CH2M Health and Safety Plan – Agency Inspection Target Zero Bulletin

Environmental Services Business Group

TARGET ZERO BULLETIN

Subject: HSSE Agency Inspections (OSHA, EPA, DOT, State Health Department)

Do you know what YOU would do if an agency inspector arrived at your site unannounced?

Recently, a State Occupational Safety and Health Administration (OSHA) inspector made an unannounced visit to one of our Federal project sites. OSHA, EPA, and authorized state or local agencies have authority to inspect any facility that is subject to health, safety, and environmental legislation. Inspections may be announced or unannounced. This particular inspector indicated that the project was targeted for an inspection because the work was funded by the American Recovery and Reinvestment Act (ARRA).

Enterprise Standard Operating Procedure (SOP) HSE-201, *Agency Inspections and Communications,* describes the responsibilities, procedures, and requirements associated with inspections conducted by external regulatory agencies, as well as the methods for communicating information to key individuals. This Target Zero Bulletin is a brief summary of what to do in the event of an agency inspection at your site. Refer to the SOP for more specific guidance.

Notification of Inspections

- If the inspection is an announced regulatory agency inspection, the Project Manager (PM) should notify the Responsible Health and Safety Manager (RHSM) and Responsible Environmental Manager (REM) well in advance of the inspection.
- If an unannounced agency inspector visits one of our projects, Field personnel must immediately notify the project Emergency Response Coordinator (ERC). Typically, the ERC is the Safety Coordinator (SC).
- The ERC must immediately notify the RHSM/REM, as appropriate, of unannounced inspections, or designate someone to call the RHSM/REM. The RHSM/REMs can provide guidance to the field staff and PM.

Inspector Credential Verification

- Upon arrival, the ERC must request the inspector to provide official credentials. Record the inspector’s name and office phone number or obtain the inspector’s business card.
- The inspector shall sign the visitors log and be given a site-specific health, safety, and environmental protection briefing.
- The inspector shall meet any site access requirements associated with security clearances, specialized training, and medical monitoring. The CH2M representative shall verify that the inspector possesses these requirements; access will only be granted to those areas where appropriate access requirements are met. Some inspectors have the authority to gain access to any work area at any time, such as an inspector with a search warrant. In these cases, we can stop work operations as necessary to protect the safety of the inspector(s).

Opening Conference

- The CH2M Project Manager, ERC, RHSM, or REM, and the inspector shall determine attendees for the opening conference. The RHSM (for OSHA and other worker health and safety inspections) or REM (for environmental inspections) shall join the opening conference via conference call.

- The inspector shall inform CH2M of the purpose of the inspection and provide a copy of the complaint, if applicable.
- The inspector shall outline the scope of the inspection, including employee interviews conducted in private, physical inspection of the workplace and records, possible referrals, discrimination complaints, and the closing conference(s).

Requests for OSHA Logs

- An OSHA inspector may request to review the project OSHA Injury/Illness log, better known as the OSHA 300 Log. Contact your RHSM for assistance in obtaining the OSHA 300 Log.
- Field projects with a continuous duration of one year or longer are considered separate establishments and are required to maintain an OSHA 300 log specific to the project. The project OSHA 300 log should be maintained onsite and kept current.
- Recordable injuries and illnesses sustained on field projects less than one year in duration are maintained on the CH2M office log where the injured employee is based.

The Inspection

- The scope of the inspection shall be limited to that indicated by the inspector in the opening conference. The inspector shall be escorted to relevant areas only. The ERC or other designated by the RHSM or REM must accompany the inspector during the inspection.
- Ensure that the inspection is limited to the scope that the inspector disclosed during the opening conference. The ERC should always take notes that identify: areas inspected, machinery or equipment and materials examined, employees or other persons interviewed, and photographs taken by the inspector.
- The inspector will observe safety, health, and environmental conditions and practices and document the inspection process. The inspector may also take photos and instrument readings, examine records, collect air samples, measure noise levels, survey existing engineering controls, and monitor employee exposure to toxic vapors, gases, and dusts.
- CH2M should gather duplicate information (photographs, readings, samples) in the same manner and condition as the inspector. If the equipment needed to take duplicate samples is not onsite, ask the inspector if the sampling can wait until the equipment is available. If samples are taken, request a description of the tests that the agency intends to perform on the samples and request results as soon as they are available.
- Employees may be questioned during the inspection tour. The employee can refuse to speak to an inspector, can speak to the inspector with a company representative (including management) present, or can speak to the inspector privately. It is CH2M policy that employees who wish to speak to the inspector are not discriminated against, intimidated, or otherwise mistreated for exercising their rights during compliance inspections.
- Copies of documents should not be provided to the inspector without the approval of the RHSM or REM or Legal Insurance Department (LID). **DO NOT** voluntarily release documents. Respond only to inspection team requests.
- During the course of the inspection, the inspector may point out violations. For each violation, the CH2M representative should ask the inspector to discuss possible corrective action. Where possible, violations detected by the inspector should be corrected immediately and noted by the inspector as corrected.

- For those items that cannot be corrected immediately, an action plan shall be formulated for timely correction. In any instance, employees exposed to hazards shall be removed from the area.

Closing Conference

After the inspection, a closing conference is normally held as follows:

- The CH2M PM, ERC, RHSM or REM shall be involved via conference call in the closing conference, at a minimum;
- The inspector shall describe the apparent violations found during the inspection and other pertinent issues as deemed necessary by the inspector. CH2M shall be advised of their rights to participate in any subsequent conferences, meetings, or discussions. Any unusual circumstances noted during the closing conference shall be documented by the ERC;
- The inspector shall discuss violations observed during the inspection and indicate for which violations a citation and a proposed penalty may be issued or recommended;
- The ERC shall request receipts for all samples and approved documents photocopied by the inspector, request a photocopy of the inspector's photograph log, and request a copy of the final inspection report; and
- Any documentation from an agency inspection must be transmitted immediately to the RHSM or REM, and LID.

Unannounced regulatory agency inspections may happen at any time on our projects -

Get your RHSM/REM and PM involved immediately if an Inspector arrives.

Attachment 3
CH2M Health and Safety Plan – CH2M AHAs/HAZ Com Forms/SDS(s)

CHEMICAL INVENTORY/REGISTER FORM

Refer to SOP HSE-107, Attachment 1, for instructions on completing this form.

Location:

HCC:

☐ Office ☐ Warehouse ☐ Laboratory ☐ Project:

Project No.:

Regulated Product	Location	Container labeled (✓if yes)	MSDS available (✓if yes)

MSDS for the listed products will be maintained at:

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CHEMICAL-SPECIFIC TRAINING FORM

Refer to SOP HSE-107 Attachment 1 for instructions on completing this form.

Location: Project # :

HCC: Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

☐ Physical and health hazards

☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)

☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance, or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

Attachment 4

CH2M Health and Safety Plan – Minimum Safety Requirements for UPRR Contractors

CH2MHILL

Minimum Safety Requirements for UPRR Contractors

Sections 1-5 Apply to All Contractors

ENGINEERING DEPARTMENT CONTRACTORS

1.0 General Safety Requirements

The safety of personnel, property, rail operations, and the public is of paramount importance in execution of the work pursuant to this agreement. The terms Contractor, Contractor-in-Charge, and Contractor Employees as used in this document refer to all Employees of the contractor as well as all Employees of any subcontractor.

The Contractor shall be responsible for the safety of his workers and subcontractors in compliance with Federal, State, and Local Regulatory Agencies including but not limited to the Occupational Safety Health Administration and the Federal Railroad Administration. As reinforcement and in furtherance of overall safety measures to be observed by the Contractor (and not by way of limitation), the following special safety rules shall be followed:

The Contractor shall keep the job site free from safety and health hazards and ensure that its Contractor Employees are competent and properly trained in all safety and health aspects of the job. Specifically, the Contractor must ensure that:

- The Contractor shall have proper first aid supplies available on the job site and someone trained as a first responder so that prompt first aid services can be provided to any person that may be injured on the job site.
- The railroad is promptly notified of any reportable injury (as defined by the U. S. Occupational Safety and Health Administration) to an employee that occurs during the performance of work at the job site.
- The railroad is promptly notified of any damage to railroad property.
- Contractor Employees do not use, be under the influence of, or have in their possession any alcoholic beverage or illegally obtained drug, narcotic, or other substance while on railroad property.

- All waste is properly disposed of in accordance with applicable federal and state regulations. No open fires are permitted on railroad property.
- All contractors vehicles stop at all railroad crossings to ascertain the way is clear.
- Seat belts must be worn on vehicles and equipment so equipped.
- Contractor-In-Charge or Contractor Employees will notify UP representative of any hazardous material spill observed in their work area. Any spill from a locomotive or car is to be reported immediately.
- Contractor Employees will participate in and comply with any job briefings conducted by the Railroad Representative. During these briefings, the Contractor and the Railroad Representative will specify safe work procedures, the potential hazards of the job, and Emergency Response Procedures. If any participant has any questions or concerns about the work, he/she must voice them during the job briefing. Additional job briefings will be conducted during the work as conditions, work procedures, or personnel change.
- Contractor and Contractor Employees must take every precaution to prevent injury to themselves, other employees, and the public.
- All track work performed by the Contractor meets the minimum safety requirements established by the Federal Railroad Administration's Track Safety Standards 49CFR213.
- All excavations, holes, and trenches are protected to prevent injuries to other workers, railroad employees or the public.
- Ensure that the Union Pacific policy of NO SMOKING on company property is enforced.

All Contractor and Contractor Employees must comply with the following safety procedures when working around any railroad track:

- Always be on the alert for moving equipment. Contractor Employees must always expect movement on any track, at any time, in either direction.
- Do not step or walk on the top of the rail, frog, switches, guardrails, or other track components.
- In passing around the ends of standing cars, engines, roadway machines or work equipment, leave a minimum of 20 feet between yourself and the end of the equipment. Do not go between pieces of equipment if the opening is less than 50 feet as a minimum.
- Avoid walking or standing on a track unless authorized by the Railroad Representative.
- Before stepping over or crossing tracks, look in both directions first.
- Do not sit on, lie under, or cross between cars except as required in the performance of your duties and only when equipment has been protected against movement and authorized by the Railroad Representative.
- No tools or materials are left close to the track when trains are passing.
- All Contractor Employees comply with all Federal, State, and local regulations concerning Workplace Safety.
- All Contractor Employees must have and be wearing a badge or readily shown identification showing employment with the Contractor.

Regulatory Training Requirements

The railroads insist on 100% training compliance that is required by all Federal, State, and Local Safety Regulations depending on the scope of the work. Contractors must be aware of, understand, and comply with ALL Federal, State, and Local Workplace Safety Regulations, including, but not limited to, the following:

Fall Protection

The contractor must ensure that its employees comply with fall protection requirements contained in:

- FRA's Bridge Worker Safety regulations 49 CFR 214, Subpart B when working on railroad bridges, and
- OSHA's Fall Protection regulations 29 CFR 1926, Subpart M when working on all other elevated structures.

The contractor must review the fall protection plan with the railroad's employee in charge before commencing work.

Confined Spaces

The contractor must ensure that its employees comply with OSHA's Confined Space regulations 29 CFR 1910.146. If it will be necessary to enter or work in a confined space (permit-required or non-permit required), the contractor must review the confined space entry plan with the railroad's employee in charge. Examples of confined spaces on Railroads are:

- Sanitary and storm sewer systems
- Sand towers
- Underground utility vaults
- Boilers
- Pipe/utility tunnels
- Enclosed railroad cars (covered hoppers, tank cars, etc.)
- Pits

In addition, the contractor must:

- Obtain any available information regarding permit-required confined space hazards and entry operations from the railroads entry supervisor.
- Coordinate entry operations with the railroads Employee In Charge, when both railroads employees and contractor personnel will be working in or near the permit-required confined spaces, so employees of both the railroad and the contractor do not endanger each other.

Tunnel Safety

Prior to working in any railroad tunnel, the contractor must review the specific tunnel safety plan with the railroad's employee in charge. The contractor must anticipate that employees may be required to wear respirators while working in the tunnel. Therefore, the contractor's employees should be medically cleared and fit-tested for the appropriate respirators prior to commencing work.

The contractor's employees must participate in all job briefings pertaining to their work in the tunnel and comply with instructions given in the job briefings.

Excavation Work

The contractor must ensure that all employees comply with OSHA's Excavations regulations 29 CFR 1926, Subpart P. If it will be necessary to work in or around an excavation, the contractor must review the excavation safety plan with the railroad's employee in charge prior to commencing work.

Hazardous Chemicals

The contractor must ensure compliance with OSHA's Hazard Communication regulations 29 CFR 1910.1200. This regulation requires employers to establish hazard communication programs to transmit information on the hazards of chemicals to their employees by means of labels on containers, material safety data sheets, and training programs. Implementation of these hazard communication programs will ensure all employees have the "right-to-know" the hazards and identities of the chemicals they work with, and will reduce the incidence of chemically - related occupational illnesses and injuries.

Contractors will learn the identity of any potentially hazardous chemicals to which their employees may be exposed while working at a Railroads facility and precautions necessary to protect employees from these hazards. Contractors will also be able to request a Material Safety Data Sheet (MSDS) from the railroad facility supervisor/manager.

Contractors shall provide the railroad with copies of MSDS's for any hazardous chemicals that will be used prior to bringing them into a Railroads facility or using them on the Railroads property.

In the event of a spill involving hazardous chemicals, the contractor must immediately contact the railroads Employee In Charge.

Asbestos

The contractor must ensure that all employees comply with OSHA's Asbestos regulations 29 CFR 1926.1101 when working with any materials known to contain asbestos. The contractor must review with the railroad's employee in charge their plan to protect all personnel from the hazards of airborne asbestos.

Lead

The contractor must ensure that all employees who are exposed to lead comply with OSHA's Lead regulations 29 CFR 1926.62. Each contractor must have a program that protects its employees and others who are in or near the work site from the hazards of airborne lead. Work processes covered in this program include but are not limited to routine and emergency maintenance of bridges, buildings, overhead cranes, sand towers, tanks, scales, and other steel structures with lead-based coatings.

The contractor must review with the railroad's employee in charge their plan for protecting all personnel from exposure to lead before commencing work.

Roadway Worker Protection

The contractor must ensure that all employees comply with the FRA's Roadway Worker Protection regulations as required by 49 CFR 214.343 when they are working within 25 feet of any track.

2.0 Clothing

The Contractor-In-Charge is responsible to insure that all Contractor Employees will be suitably dressed to perform their duties safely and in a manner that will not interfere with their vision, hearing, or free use of their hands or feet. Specifically, the Contractor Employees must wear:

- Waist length shirts with sleeves.
- Trousers that cover the entire leg. If flare-legged trousers are worn, the trouser bottoms must be tied to prevent catching.
- Contractor Employees must not wear loose or ragged clothing, neckties, finger rings, or other loose jewelry while operating or working on machinery.

3.0 Personal Protective Equipment

The Contractor-In-Charge shall require its Employees to wear personal protective equipment as specified by OSHA and Railroad rules and regulations. In particular, the protective equipment to be worn shall be:

- Hardhat that meets the American National Standards Institute (ANSI) Z89.1 latest revision. Eye protection that meets the ANSI standard for occupational eye and face protection, Z87.1 latest revision. Additional eye protection must be provided to meet specific job situations such as welding, grinding, burning, etc.
- Hearing protection that affords enough attenuation to give protection from noise levels that will be occurring on the job site. Hearing protection, in the form of plugs or muffs, must be worn when Contractor Employees are within:
  - 100 feet of a locomotive/Refrigeration Car or roadway/work equipment
  - 15 feet of power operated tools
  - 150 feet of jet blowers or pile drivers
  - 150 feet of retarders in use (when within 10 feet, Contractor Employees must wear dual ear protection plugs and muffs)

Safety-toed footwear that conforms to the American National Standards Institute (ANSI) must be worn while on the job. Shoes must have a defined heel and no thin soled or canvas style shoes shall be worn.

Other types of personal protective equipment, such as respirators, fall protection equipment, green/yellow or orange reflectorized vests, and face shields, must be worn as directed by the working conditions or area the Contractor Employees are in.

4.0 Equipment

It is the responsibility of the Contractor-In-Charge to ensure that all equipment is in a safe condition to operate. If, in the opinion of the Railroad Representative, any of the Contractors equipment is unsafe for use, the Contractor shall remove such equipment from the railroads property. In addition, the Contractor-In-Charge must ensure that:

- The operators of all equipment are properly trained and competent in the safe operation of the equipment. In addition, operators must be:
  - Familiar and comply with OSHA regulations on lockout/tagout of equipment.
  - Familiar and comply with FRA Regulation Title 49CFR214 Subpart D dealing with Roadway Maintenance Machine Safety
  - Trained in and comply with the applicable operating rules if operating of any high yield-rail equipment on-track.
  - Trained in and comply with the applicable air brake rules if operating any equipment that moves rail cars or any other rail-bound equipment.
- The operator’s manual, which includes instructions for safe operation, must be kept with each machine.
- All self-propelled equipment is equipped with fire extinguisher and audible back-up warning device.
- Unless otherwise authorized by the Railroad Representative, all unattended equipment is parked a minimum of 25 feet from any track and minimum of 250 feet from any road crossing. Before leaving

any equipment unattended, the operator must stop the engine and properly secure the equipment against movement.

- Cranes are equipped with three orange cones that will be used to mark the working area of the boom and load and the minimum clearances to overhead power lines. All overhead lines are considered high voltage.
- All moves are well communicated by the Contractor-In-Charge and coordinated with other Contractor Employees and the Railroad Representative at the job site. Emergency signals to stop movements may be given by anyone.
- No equipment is moved or coupled into while under the blue signal protection of workers.
- No handbrakes are released on rolling equipment unless authorized by Railroad Representative.
- No derails are applied or removed without Railroad Representative permission.
- The Contractor shall provide its own Hazardous Energy Control (Lock-out/tag-out) procedures and devices to prevent injury to Railroad and Contractor Employees from unexpected energization, start-up, or release of stored power in machines with which they are working.
- The Contractor shall comply with all requirements of the U.S. Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.147 on controlling hazardous energy

5.0 Working around Live Tracks (Red Zones)

Prior to beginning work on live track, the Contractor-In-Charge must notify a Railroad representative and a job briefing must be conducted with the Railroad representative. Engineering Department Contractors are governed by FRA Roadway Worker Protection regulations, referenced in 49CFR214, Subpart C, which requires some form of On-Track Safety prior to fouling any track.

Red Zones are defined as that area within an arm's length of the track, or any physical position, which places the employee in a life-threatening situation. The following two rules are key to Red Zone compliance.

Alert to Train Movement

Contractor Employees must expect the movement of trains, engines, cars, or other moveable equipment at any time, on any track and in either direction.

Sufficient Distance

Maintain a safe distance from equipment and DO NOT:

- Cross or step foul of tracks closely in front of or behind moving equipment or close to the end of equipment.
- Go between standing equipment if the opening is less than 50 feet.
- Cross tracks in front of or behind standing equipment unless there is at least 20 feet between the employee and the equipment.
- Use three-point contact when getting on and off locomotives and cars.

In locomotive and car repair facilities where equipment has been spotted for repair, and the distance between that equipment or around the end of equipment is less than specified, Contractor Employees may go between or around the equipment, provided that the equipment is under Blue Signal Protection of Workmen, in accordance with Rule 5.13, and the employee knows that no movement will be made by the equipment.

These are two of many Red Zone rules that deal with moving equipment. Any questions that arise related to working in the Red Zone should be directed to the Railroad Representative.

6.0 On-Track Safety - Engineering Department Contractors Only

The Contractor is responsible for compliance with the Federal Railroad Administrations Roadway Worker Protection regulations (49CFR214, Subpart C) and UPRRs On-Track Safety rules. Under 49CFR214, Subpart C, railroad contractors are responsible for the training and qualifications of their employees on these regulations. Contractor employees must have documentation of their training and qualifications while on the work site. At a minimum, each contractor employee must be trained as a Roadway Worker. Additional training and qualification requirements for the positions of Machine Operator, Lookout, or Lone Worker must be met for those contractor employees performing those functions.

In addition to the instructions contained in FRAs Roadway Worker Protection regulations, all contractor employees must:

- Maintain a distance of at least 25 feet to any track unless the railroads EIC is present to authorize movements.
- Wear a green/yellow, reflectorized vest or similar orange, reflectorized workwear approved by the railroads EIC.

Participate in a job briefing that will specify the type of On-Track Safety for the type of work being performed. Contractors must take special note of limits of track authority, which tracks may or may not be fouled, and clearing the track. They will also receive special instructions relating to the work zone around machines and minimum distances between machines while working and traveling.

Attachment 5
CH2M Health and Safety Plan – Site Traffic Control Plan