OCTOBER 2015

CY 2016

Groundwater Monitoring Plan

Fire Training Pit (FTP) and Tracked Vehicle Repair/Old Mobilization and Training Equipment Site (TVR/Old MATES)

Joint Base Lewis-McChord and Yakima Training Center Yakima, Washington

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CY 2016
GROUNDWATER MONITORING PLAN

OCTOBER 2015

FIRE TRAINING PIT (FTP) AND TRACKED VEHICLE REPAIR/OLD MOBILIZATION AND TRAINING EQUIPMENT SITE (TVR/OLD MATES)

JOINT BASE LEWIS-MCCHORD YAKIMA TRAINING CENTER
YAKIMA, WASHINGTON

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Prepared for:
U.S. ARMY CORPS OF ENGINEERS, SEATTLE DISTRICT
AND
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ABBREVIATIONS AND ACRONYMS

ALS	ALS Environmental Laboratories
BETX	benzene, ethyl-benzene, toluene, and xylene
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
CFR	Code of Federal Regulations
Cis-DCE	Cis-1,2-dichloroethylene
cPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
DNAPL	Dense Non-Aqueous Phase Liquid
E&E	Ecology and Environment, Inc.
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERP	Environmental Restoration Program
FTP	Fire Training Pit
HRS	Hazard Ranking System
IRP	Installation Restoration Program
JBLM	Joint Base Lewis-McChord
LNAPL	Light Non-Aqueous Phase Liquid
MATES	Mobilization and Training Equipment Site
MMP	Main Motor Pool
MTCA	Model Toxics Control Act
MW	Monitoring Well
PAIC	Pomona Artesian Irrigation Company
PDB	Passive Diffusion Bag
PPE	Personal Protective Equipment
PQL	Practical Quantification Limit(s)
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
SAIC	Science Applications International Corporation

ABBREVIATIONS AND ACRONYMS (CONTINUED)

SAP	Sampling and Analysis Plan
SI	Site Investigation
SSI	Site Screening Inspection
SVOC	Semi-volatile Organic Compound(s)
SWMU	Solid Waste Management Unit
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TEC	Toxicity Equivalency Concentration
TEF	Toxicity Equivalency Factor
TPH	Total Petroleum Hydrocarbons
TPH-D	Total Petroleum Hydrocarbons – Diesel Range
TPH-G	Total Petroleum Hydrocarbons – Gasoline Range
TPH-O	Total Petroleum Hydrocarbons – Heavy Oil Range
TtEC	Tetra Tech EC, Inc.
TVR	Tracked Vehicle Repair
USACE	U.S. Army Corps of Engineers
UST	Underground Storage Tank
VOA	volatile organic analysis
VOC	Volatile Organic Compound
WAC	Washington Administrative Code
YTC	Yakima Training Center

1. INTRODUCTION

This Groundwater Sampling and Analysis Plan (SAP) was prepared for Joint Base Lewis-McChord (JBLM) Public Works, Joint Base Lewis-McChord, Washington by Tetra Tech EC., Inc. (TtEC). This plan presents the scope of work, sampling and analysis plan, and quality assurance plan for semi-annual groundwater sampling conducted at Yakima Training Center's (YTC) Former Fire Training Pit (FTP) and the Tracked Vehicle Repair/Old Mobilization and Training Equipment Site area (TVR/Old MATES). In addition, monitoring of Land Use Controls (LUCs) will be conducted annually and the results will be incorporated into the annual groundwater monitoring report. Groundwater sampling activities at the sites are completed in accordance with Washington Administrative Code (WAC) 173-350-500(4). Site-specific health and safety procedures are outlined in the Accident Prevention Plan/Site Safety and Health Plan (SES 2014).

1.1 YTC BACKGROUND

YTC is an active United States Army sub-installation of JBLM located approximately 5 miles northeast of the City of Yakima (Figure 1). YTC has been used for training military artillery, infantry, and engineering units since 1941. Expansion of YTC occurred in the early 1950s with the acquisition of additional land and permanent construction of the Cantonment area in the southwest portion of YTC. An expansion of YTC to the north occurred in the early 1990s. Currently the YTC is 327,231 acres.

In October 2010 as part of a Base Realignment and Closure (BRAC) action, Fort Lewis and neighboring McChord Air Force Base near Tacoma, Washington merged to create JBLM. All base services, including the former Fort Lewis Environmental Restoration Program (ERP) now the JBLM ERP, are provided by the Army-led Joint Base. The JBLM Installation Restoration Program (IRP) is conducting groundwater monitoring at YTC.

1.2 SITE GEOLOGY AND HYDROGEOLOGY

YTC is located within the Yakima Fold Belt, which is characterized by southeast-trending anticlines and synclines. Most of the YTC Cantonment area is located within the synclinal valley between the anticlinal Yakima Ridge and Umtanum Ridge.

In general, YTC is underlain by a thick sequence of basalt flows known as the Columbia River Basalt Group. From youngest to oldest, the four formations that comprise the Columbia River Basalt Group are the Saddle Mountain Basalt, Wanapum Basalt, Grande Ronde Basalt, and Imnaha Basalt (Schuster et al. 1997). Portions of the YTC Cantonment area have sedimentary rocks/deposits of the Ellensburg Formation and/or quaternary deposits on top of the basalt flows (Schuster et al. 1997).

1.3 SITE DESCRIPTIONS

Locations of the FTP and TVR/Old MATES sites are presented on Figure 2.

1.3.1 Former Fire Training Pit

The former FTP is located in the northeast portion of the Cantonment area (Figure 2). The FTP was used to practice extinguishing fires two or three times a year from an unknown start date until 1987 with a single training event in 1990 (Shapiro & Associates 1991). Practice events consisted of saturating an open, unlined earthen pit with water, adding and igniting 500 to 1,000 gallons of waste JP-4 aviation fuel, diesel fuel, or motor gasoline and then extinguishing the fire (Shapiro & Associates 1991). Although reports of the releases differ slightly (E&E 1993, SAIC 1995), petroleum products were released to site soils as a result of past fire training practices. During the 1990s, the site was used for storing stockpiles of waste sand filter material and sediments from the adjacent vehicle wash rack treatment system (E&E 1993) as well as storing fuel bladders (Shannon & Wilson 2001). Currently the site is vacant and not being used by YTC (Figure 3).

1.3.2 TVR/Old MATES

Trichloroethylene (TCE) was detected during a 1993 Site Investigation conducted by E&E in two monitoring wells (TVR-1 and TVR-2) installed near the TVR facility, two monitoring wells installed near the Old MATES (Building 951), and the Marie Well, a domestic drinking water well located southwest of both Buildings 845 and 951. TCE had been detected in the Marie Well before it was decommissioned in the late 1990s; however, TCE and other Volatile Organic Compounds (VOCs) have not been detected in the Main Motor Pool (MMP) monitoring wells (MMP-1 and MMP-2) located in the vicinity of the former Marie Well. TCE and other VOCs have not been detected in either of the currently active water supply wells (Pomona and PAIC wells) located in the vicinity of monitoring wells TVR-6 and TVR-7 (Figure 4).

Vehicle maintenance has been conducted and de-greasing solvents have been used at both facilities since about 1968 at Building 845 and 1975 at Building 951 (Shapiro & Associates 1991). Four 250-gallon underground storage tanks (USTs) used for waste oil were in use at Building 845 from 1975 until 1991 (Shapiro & Associates 1991, Pegasus 1993, SAIC 1995). A fifth waste oil UST (650 gallons) was used at Building 845 from 1980 until 1991 (Shapiro & Associates 1991, Pegasus 1993, SAIC 1995). One 2,000-gallon waste oil UST removed from Building 951 in 1995 was apparently in operation since 1968 (Shapiro & Associates 1991, SAIC 1995). All six of these former waste oil USTs have been removed. Three of the five waste oil tanks at Building 845 and the 2,000-gallon waste oil UST at Building 951 were “clean closed” with soil concentrations below cleanup levels promulgated under the Model Toxics Control Act (MTCA) (CEcon Corporation 1994, SAIC 1995). However, as discussed in the investigation chronology section below, soil contamination from waste oil USTs 845-3 and 845-4 remained under adjacent structures following tank removal activities. It should be noted that a down

gradient monitoring well (TVR-2) is located as close to the UST 845-3/4 excavation as possible. In addition, it should also be noted that a former floor drain from Building 845 discharged immediately adjacent to the current location of MW TVR-1 (Cory 2004).

1.4 INVESTIGATION CHRONOLOGY

1.4.1 Facility-wide Investigations

A facility-wide preliminary assessment of YTC was completed in the early 1990s by Shapiro & Associates, Inc. The preliminary assessment documented the aforementioned site uses, identified potential receptors, and concluded that sites such as the two sites covered by this report could potentially be releasing hazardous substances to groundwater as a result of historical activities.

A Site Screening Inspection and Hazard Ranking System (HRS) Score for YTC were completed in January 1993 by Resource Applications, Inc. A HRS score was calculated, however, was not high enough for YTC to be considered for inclusion on the Comprehensive Environmental Response, Compensation, and Liability Act National Priority List.

Yakima Health District collected groundwater samples from 12 private domestic wells located down gradient of YTC and analyzed those samples for VOCs in 1995. The Pomona Artesian Irrigation Company (PAIC) Well (located on YTC across the street from YTC's Pomona Well) was one of the 12 wells sampled. No contaminants were detected in any of the wells with the exception of styrene in a single well at a concentration equal to the detection limit of 0.1 µg/L.

The final Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) Report was completed in September 1995 by SAIC. The RFA for the entire installation was a result of a RCRA Part B Permit Application for the Range 14 open burning/open detonation area. The 1995 RFA indicated a high potential for releases to soil and possibly groundwater at the former FTP. As a result, remedial action to remediate contaminated soil and the petroleum product in well FTP 1 was recommended. Although the 1995 RFA did not explicitly address TCE in groundwater in the TVR/Old MATES area, the RFA recommended a corrective action for soil contamination that remained under a building adjacent to waste oil USTs 845-3 (Solid Waste Management Unit [SWMU] 43) and 845-4 (SWMU 44). RCRA corrective actions that were recommended or implied by the RFA need to satisfy MTCA regulations in accordance with Washington Administrative Code 173-303-646(3).

1.4.2 Fire Training Pit

The uppermost geologic unit at the former FTP site is the Pomona Flow of the Saddle Mountain Basalt Formation (E&E 1993, Schuster et al. 1997, Shannon & Wilson 2001). In general, this unit is present at a depth of approximately 5 to 10 feet below ground surface (bgs) at the site (E&E 1993, Shannon & Wilson 2001). Basalt apparently extends to an approximate depth of 150 feet bgs without significant interbeds at the site (E&E 1993, Shannon & Wilson 2001).

The former FTP site has impacted perched groundwater located in vesiculated, fractured basalt near the top of the Pomona Basalt flow (E&E 1993, Shannon & Wilson 2001). Depth to water at the site is approximately 10 to 25 feet bgs (Shannon & Wilson 2001). The direction of perched groundwater flow is towards the southwest and generally mirrors the surface topography. Seasonal fluctuation in groundwater elevation appears to be slight based on limited data (Shannon & Wilson 2001). The next deepest groundwater-bearing unit is at approximately 150 feet below the site (Shannon & Wilson 2001).

The former FTP was one of the YTC facilities/sites investigated in the September 1993 E&E Site Investigation (SI) Report. Monitoring Well (MW) FTP 1 was installed and four grab surface or near surface soil samples and two composite surface soil samples were collected during the E&E SI. Significant groundwater was not encountered during the drilling of the FTP 1 borehole to a depth of approximately 140 feet. However, when it came time to decommission the FTP 1 borehole, several gallons of petroleum product were discovered on top of a column of water. As a result, FTP 1 was completed to a depth of approximately 20 feet in the perched groundwater located at the fractured top of the uppermost basalt flow.

A RCRA Facility Investigation Report to further delineate the nature and extent of contamination at the former FTP site was completed in November 2001 by Shannon & Wilson. Monitoring wells FTP 13 through 16 were installed during 1999 in the perched groundwater located at the fractured top of the uppermost basalt flow. Groundwater monitoring events were conducted in July 1999, November 2000, and May 2001. The Shannon & Wilson report claimed that light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL) were present in FTP 1 during each groundwater monitoring event. However, the thicknesses of LNAPL and DNAPL were not accurately quantified. Review of the field notes and observations from the January 2004 Groundwater Monitoring event indicted the DNAPL claim was in error (the LNAPL claim might have been in error as well). Nine other soil borings were also advanced during the investigation.

An interim remedial action was completed in 2003 to remove soil contamination caused by the former FTP site that exceeded MTCA Method A/Standard Method B cleanup levels. Soil was excavated during three separate mobilizations – July 2003, September 2003, and October 2003. The total excavation area was approximately 5,000 square feet and extended to downward until the underlying basalt was encountered. 1351 tons of soil was disposed of off-site in November 2003. All contaminant concentrations in confirmation soil samples were below MTCA Method A/Standard Method B cleanup levels except for gasoline and diesel range total petroleum hydrocarbons (TPH-G and TPH-D, respectively) in samples 13 and 14 collected from the soil/basalt interface. The excavation was backfilled with clean soil. The cleanup action was documented in a January 2004 Bay West report.

The terrestrial ecological pathway was closed as described in the April 2006 terrestrial ecological evaluation by Pacific Northwest National Laboratory.

The Fort Lewis ERP conducted groundwater monitoring events in January 2004, March and August 2005, March and August 2006, March and September 2007, and March and September 2008. Between March 2005 and March 2007, four-inch diameter socks containing Oxygen Release Compound from Regensis were hung in the water column by Fort Lewis ERP in FTP-1 between 11 to 18 feet bgs. When the socks were hung in FTP-1, depth to water ranged from 11.54 feet bgs in August 2006 to 15.59 feet bgs in March 2007.

Groundwater monitoring events have been conducted during the first and third quarters each year since 2005. Typically the first quarter sampling event is conducted in March, designated the "wet" season sampling event. The third quarter sampling event ("dry" season) is conducted in September.

1.4.3 TVR/Old MATES

The uppermost bedrock unit underneath the overburden in the TVR/Old MATES area is the Pomona Flow of the Saddle Mountain Basalt Formation (E&E 1993, Shannon & Wilson 2001). In general, this unit was encountered at depths between 10 and 45 feet bgs in the six MWs at TVR, MTS, and MMP (E&E 1993). Saddle Mountain Basalt extends beneath the site without significant interbeds to a depth of greater than 100 feet bgs (E&E 1993).

The six E&E MWs "were completed within a fractured basalt zone confined aquifer, identified as the Selah Interbed [of the Ellensburg Formation] beneath the Pomona basalt flow" (E&E 1993). This was the first encountered groundwater during drilling. In general, depth to groundwater in these six MWs ranged from 60 to 100 feet bgs (E&E 1993). The direction of groundwater flow is to the west towards the Yakima River (E&E 1993).

In October 1991, Pegasus Environmental Management Services (Pegasus) evacuated, excavated, removed, cleaned, and disposed of five waste oil USTs at Building 845 (TVR). Pegasus noted visible surface contamination associated with three of the UST excavations. Soil samples from all excavations were analyzed for TPH, benzene, toluene, ethylbenzene, and xylenes (BETX), Toxicity Characteristic Leaching Procedure (TCLP) VOCs, and TCLP metals. TPH concentrations exceeding 10,000 mg/kg were detected in samples collected from all five UST excavations. TCLP TCE and TCLP tetrachloroethylene were detected at 20 mg/L and 17 mg/L, respectively, in samples collected from USTs 845-5 and 845-6 excavations respectively. No TCLP VOCs were detected in samples collected from USTs 845-3 (SWMU 43) and 845-4 (SWMU 44) excavations. No additional corrective action was taken by Pegasus due to contract limitations. CEcon Corporation was contracted to excavate and remove contaminated soil left in place following the tank removal activities by Pegasus. CEcon Corporation removed about 1,000 cubic yards of soil while excavating contaminated soil from the five Building 845 waste

oil tank sites in October 1993. Confirmation samples collected by CEcon Corporation verified that no further action was required for USTs 845-2 (SWMU 42), 845-5 (SWMU 45), and 845-6 (SWMU 46). However, some TPH contaminated soil was left in place on the north and east sidewalls of the UST 845-3/4 (SWMUs 43/44) excavation because existing structures (Building 845 lube rack and oil-water separator) prevented further excavation in those directions (over 400 cubic yards of soil had already been removed). Although all confirmation samples collected by CEcon Corporation were analyzed for all potential contaminants suspected at the time, no confirmation samples were analyzed for VOCs.

TVR, Old MATES, and MMP were among the facilities/site investigated in the September 1993 E&E SI. Groundwater samples were collected from the two TVR MWs, the two MATES MWs, and the two MMP MWs as well as drinking water wells including the Pomona Well, PAIC Well, and Marie Well. In addition, soil samples were collected from each MW borehole during drilling and analyzed for VOCs, Semi-Volatile Organic Compounds (SVOCs), pesticides/ polychlorinated biphenyls, metals, and TPH. Based on the presence of TCE in groundwater at TVR and Old MATES and the absence of any contamination in corresponding soil samples, the SI Report concluded that TCE contamination in groundwater "may indicate migration from an unidentified source at the YTC facility."

Fort Lewis ERP conducted a Groundwater Monitoring event in January 2004. Fort Lewis ERP installed MWs MTS-3, MTS-4, TVR-3, and TVR-4 between October and November 2004. Fort Lewis ERP installed MWs TVR-5, TVR-6, TVR-7, and 815-2 in October 2005. Groundwater monitoring events for the TVR Old MATES site have been scheduled to coincide with the FTP events during the first and third quarters each year since 2005.

Groundwater samples have been collected from monitoring wells using disposable passive diffusion bag (PDB) samplers since 2005. PDB samplers are sealed, low-density polyethylene bags filled with de-ionized water. A dedicated string and harness are used to position the PDB samplers approximately 2 to 4 feet above the bottom of the monitoring wells' screens. It is recommended that PDBs stay deployed in monitoring wells for a minimum of two weeks to allow VOC concentrations inside the bag and in the aquifer to reach equilibrium (Vroblesky 2001). From 2005 to 2010 PDBs were deployed during the previous Groundwater Monitoring event allowing the bags to stay in the monitoring wells for approximately 6 months. Beginning in 2010, PDBs were deployed during the second and fourth quarter sampling events for another YTC groundwater monitoring site, allowing the PDBs to stay in the wells for approximately 3 months.

1.5 POTENTIAL GROUNDWATER RECEPTORS

The nearest potential groundwater receptors to the FTP and TVR/Old MATES sites are the Pomona Well and PAIC Well. A third well, the Marie Well, was decommissioned in the late 1990s and is no longer a potential receptor (Figure 4). Before being decommissioned, the Marie

Well served as an emergency supply backup well to the Pomona Well for the YTC Cantonment Area Water System. The Pomona and PAIC wells are domestic water supply wells located approximately 1 mile southwest of the FTP site and approximately 250 feet southwest of MW TVR-1. The Pomona Well is an artesian well used by YTC as a primary production source for the Cantonment Area Water System. The Pomona Well is completed in the Wanapum and/or Grande Ronde Formation (Hong West 1996) with open borehole completion between depths of approximately 353 and 407 feet bgs (Fain 2000, Cory 2004). Sources of information provided incorrect information about the well construction details of the Pomona Well (including a typo in Table 2-1 of the current Water System Plan) (Cory 2004). A downhole video survey conducted by YTC in 1995 is considered to be the most accurate source of construction detail information for the Pomona Well to date. In addition to indicating the open interval referenced above, the video survey also indicated that water was entering the Pomona Well at approximately 401 feet bgs (Fain 2000).

The PAIC Well is an artesian well used by PAIC as the sole production well for the PAIC Water System serving approximately 60 homes and businesses located west of YTC (Wilson 2004). It appears that the PAIC Well was constructed in an identical fashion as the Pomona Well. Both wells were installed by the PAIC in 1913 by the same driller within 100 feet of each other (Fain 2000). Well logs from pump tests conducted in 1940 indicate identical (although very generic) well construction details for the Pomona Well and PAIC Well (Fain 2000). The construction details on the 1940 well logs were 10-inch diameter casings to a depth of 60 feet bgs and 6 and 5/8-inch diameter casings from 60 feet bgs to 430 bgs for both wells. Since the video survey of the Pomona Well showed the 1940 well log and other sources of post-drilling anecdotal information to be incorrect with respect to the actual well construction details of the Pomona Well, it is reasonable to assume that the video survey is also a more accurate representation of well construction details for the PAIC Well than the 1940 well log. Again, the basis for assuming nearly identical well construction details for the Pomona Well and PAIC Well are: both wells are artesian, both wells have similar production capacities, both wells were installed at the same time and location by the same well driller for the same water system, and both wells have identical 1940 well logs.

Given the distance of both the Pomona Well and PAIC Well from the FTP site and the hydraulic separation between the perched groundwater and the aquifer(s) the water supply wells are completed in, it is unlikely that these potential receptors are being impacted by the FTP site. It is also unlikely that either water supply well would be impacted by TCE contamination in the TVR/Old MATES area given the relatively low TCE concentrations in MWs and the hydraulic separation between the Selah Interbed and the aquifer(s) the water supply wells are completed in. Existing water quality data from the Pomona and PAIC Well supports this conclusion.

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2. FIELD SAMPLING PLAN

This SAP is designed to present all the required planning documentation to support groundwater monitoring in accordance with Washington State Department of Ecology (Ecology) regulations (Washington Administrative Code [WAC] 173-340-820 and applicable Ecology guidance [1995, 2001]).

2.1 PROJECT PERSONNEL AND RESPONSIBILITIES

The project team includes representatives from Ecology, JBLM Public Works' ERP, YTC Public Works, TtEC and ALS Environmental Laboratories (ALS) of Kelso, Washington (Table 1).

2.2 PRIOR COORDINATION

Before beginning each Groundwater Monitoring event, JBLM ERP personnel will ensure that a contract delivery order with ALS is established, will notify YTC and Ecology personnel about the planned activities, and will coordinate with YTC and PAIC regarding access to the Pomona Well and PAIC Well, respectively.

2.3 GROUNDWATER MEASUREMENT, SAMPLING, AND ANALYSIS

JBLM ERP personnel will conduct groundwater sampling events semi-annually typically during March and September. Monitoring well locations for the FTP are presented on Figure 3. Monitoring well and production well locations for the TVR/Old MATES are presented on Figure 4. Monitoring well construction details are presented in Table 2. A summary of the planned monitoring frequency and analytical methods for the FTP and TVR/Old MATES site is presented in Tables 3 and 4, respectively. Field Sampling Forms are contained in Appendix B. Standard Operating Procedures are included in Appendix C.

2.3.1 Fire Training Pit

During each Groundwater Monitoring event, an electronic water level indicator will be used to measure depth to water in each monitoring well except FTP 1. An electronic interface probe will be used to measure LNAPL thickness and depth to water in FTP 1. All measurements will be recorded to the nearest 0.01-foot from the top of the PVC casing (notch or mark on casing or north end).

For each MW scheduled to be sampled, water will be purged from the MW by hand bailing prior to sampling. Dedicated, disposable Teflon bailers will be used to purge and sample each MW. Each MW will be purged until three well volumes are removed or until the MW is bailed dry, whichever occurs first. After each MW has recharged, groundwater samples will be collected.

Groundwater samples collected from all MWs scheduled for sampling will be analyzed for TPH-G using Method NWTPH-G and diesel and heavy oil range TPH (TPH-D and TPH-O,

respectively) using Method NWTPH-Dx. In addition, samples collected from MW FTP 1 will be analyzed for VOCs using EPA Method 8260C and semi-volatile organic compounds (SVOCs) using EPA Method 8270C will be collected first before the other analytes. All 40-mL volatile organic analysis (VOAs) used for VOC and TPH-G analyses will be filled to a positive meniscus so that these containers do not contain any headspace. VOAs containing preservative will not be allowed to overflow during sampling.

Table 4 presents the appropriate sample containers, preservation, and holding times for scheduled analyses. Sample containers will be provided by the analytical laboratory prior to sampling.

2.3.2 TVR/Old MATES

During each Groundwater Monitoring event, an electronic water level indicator will be used to measure depth to water in each MW. All measurements will be recorded to the nearest 0.01-foot from the measuring point on the top of the PVC casing (notch or mark or north end).

For each MW scheduled to be sampled, groundwater samples will be collected using disposable PDB samplers. PDB samplers are sealed, low-density polyethylene bags filled with de-ionized water. A dedicated string/harness will be used to position the PDB sampler at approximately 2 to 5 feet above the bottom of the MW screen. PDB samplers will be installed during the previous quarter when IRP personnel are onsite conducting sampling activities for other groundwater monitoring sites.

PDB trip blanks will be collected when PDBs are received and deployed at the site and the results will be used with the sample data from the subsequent sampling round when the well PDBs are retrieved and sampled.

During each Groundwater Monitoring event, JBLM IRP will collect a sample from the Pomona Well and the PAIC Well.

All primary groundwater samples will be analyzed for VOCs using EPA Method 8260C. All 40-mL VOAs for VOC analyses will be filled to a positive meniscus so that these containers do not contain any headspace.

Table 4 presents the appropriate sample containers, preservation, and holding times for scheduled analyses. Sample containers will be provided by the analytical laboratory prior to sampling.

2.4 CHANGES TO THE 2007 GROUNDWATER MONITORING PLAN

A voluntary periodic review (5-year review) was conducted by the U.S. Army Corps of Engineers (USACE) during 2011 and the beginning of 2012. The review concentrated on six environmental cleanup sites at YTC. Two of the sites included in the review were the FTP and

TVR/Old MATES. The periodic review has more suggestions to change the SAP for the two sites than what is mentioned below, however; these changes will be written in an addendum to this SAP after Ecology has had a chance to review the voluntary periodic review.

No changes from the 2007 Groundwater Monitoring Plan are suggested at this time for the FTP sampling events.

Changes to the TVR Old/MATES sampling events in this plan compared to the 2007 plan include eliminating measuring depth to water in monitoring well MMP-2 and eliminating measuring depth to water and sampling monitoring well MRC-2.

Table 5 presents the difference in groundwater elevation measured in monitoring wells MMP-1 and MMP-2. Typically groundwater measured in MMP-2, located approximately 85 feet southwest of MMP-1 is less than six inches lower than groundwater measured in MMP-1 during the dry season. Groundwater is generally around 1.5 feet lower in MMP-2 compared to MMP-1 during the wet season. MMP-2's groundwater elevation value has not had much of an influence on adjusting groundwater iso-contours generated for the annual groundwater sampling reports for the TVR/Old MATES site.

Table 6 presents groundwater elevation measurements, TCE, and cis 1,2-dichloroethylene analytical results for samples collected from monitoring well MRC-2. Neither TCE nor cis-1,2-dichloroethylene (cis-DCE) have ever been detected in samples collected from monitoring well MRC-2. Due to its distance from buildings 845 and 951 and since no target VOCs have ever been detected in MRC-2 JBLM IRP proposes to eliminate MRC-2 from the sampling program.

2.5 FIELD RECORD-KEEPING

JBLM IRP will utilize the following forms to document each Groundwater Monitoring event: Field Checklist, Daily Field Report, and Groundwater Monitoring Form. The Field Checklist is designed to assist with planning and coordination prior to a field event. The Daily Field Report is used to document field activities on a daily basis. The Groundwater Monitoring Form is used to record and maintain monitoring, purging, sampling, and waste disposal data. Once completed, JBLM will maintain the original signed forms for at least 3 years after copies of the forms are included in an annual monitoring report.

2.6 EQUIPMENT DECONTAMINATION PROCEDURES

Monitoring wells at the FTP are sampled using dedicated, disposable Teflon bailers, groundwater level indicators and interface probes used to measure water levels will be decontaminated using Alconox and deionized water spray and will be wiped clean and dry prior to or after sampling a well. Monitoring wells at the TVR Old/MATES site are sampled using dedicated, disposable PDBs and do not have any sampling equipment that needs to be decontaminated prior to or after

sampling a well. Personal decontamination is discussed in the Accident Prevention Plan/Site Safety and Health Plan (SES 2014).

2.7 INVESTIGATION-DERIVED WASTE

Investigation-derived waste generated during each Groundwater Monitoring event will be handled and disposed of as follows:

- Purge water and decontamination water from FTP 1 through FTP 16 will be collected in 5-gallon buckets and disposed of on-site at a Main Vehicle Washrack catch basin for subsequent treatment with an oil/water separator.
- Personal protective equipment (PPE) and disposable equipment, including PDBs used at the TVR Old/MATES site, will be disposed of in a YTC dumpster or roll off box as part of the normal YTC solid waste stream.

2.8 SAMPLE LABELING, HANDLING AND SHIPMENT

Sample labels will clearly indicate the site location, sample name, date, time, sampler's initials, parameters to be analyzed, preservative added (if any), and any pertinent comments. Sample nomenclature will consist of the MW name (e.g., FTP-1).

Sample packaging and shipping procedures are based on EPA specifications and United States Department of Transportation regulations as specified in 49 Code of Federal Regulations (CFR) 173.6 and 49 CFR 173.24. All samples will be shipped as “Environmental Samples” and not as hazardous material. Samples will either be shipped via ground transportation to local (Washington State) laboratory or transported directly to the lab by the field technician as soon as reasonably possible after sample collection. The following are general packaging procedures:

- Sample labels will be securely attached to each sample container.
- Plastic bubble-wrap bags, sheets, or Styrofoam packing material will be used to protect sample containers.
- Insulated plastic or metal-clad plastic coolers will be used as shipping containers.
- All samples will be chilled with ice.
- The original chain-of-custody form (see also below) will be placed inside the cooler in a sealed plastic bag.
- Two signed custody seals will be placed over the lid of the cooler and covered with clear plastic tape.
- The cooler will be securely taped shut with strapping tape and drains will be taped shut
- The cooler will then shipped, sent by courier, or hand delivered to ALS for analysis. Chain-of-Custody Documentation

Chain-of-custody (COC) procedures are employed to maintain and document sample possession. A sample is considered under a person's custody if it is in that person's physical possession, within visual sight of that person after taking physical possession, secured by that person so that the sample cannot be tampered with, or secured by that person in an area that is restricted to authorized personnel only.

The originator (the sampler) will fill in all requested information on the custody record and will sign and date the record in the first "relinquished by" box. All remaining blank areas of the COC will be crossed off after completion. Original signed custody records listing the samples in the cooler will accompany all shipments of samples (note: it is possible that more than one custody form will be needed per cooler to list all the samples contained in the cooler). The originator of the custody record will keep the bottom copy (usually pink) in the project files.

2.9 PROJECT REPORTING

After completion of each fall Groundwater Monitoring event, an annual Groundwater Monitoring Report will be prepared that includes:

- Brief site chronology
- Brief discussion of sampling methodology including any deviations from this SAP
- Two FTP and two TVR/Old MATES site maps (one for each Groundwater Monitoring event) showing relevant surface features, sampling locations, the estimated potentiometric surface contours based on measurements obtained during the Groundwater Monitoring event, and contaminant concentrations obtained during the Groundwater Monitoring event
- A summary table of historical and recent contaminant concentrations and comparison with MTCA Method A or Standard Method B cleanup levels for each site
- Statistical summary of key analytes detected in MW FTP 1 and multiple MWs for the TVR Old/MATES site
- Plot showing key contaminant concentrations in MW FTP 1 over time
- Copies of original field forms
- Laboratory certificates of analysis with chain-of-custody records
- Brief discussion of quality assurance/quality control (QA/QC) review and verification process including implications for project data as described in Quality Assurance Project Plan (QAPP)

A draft copy of the report will be submitted to Ecology's Project Manager. Comments provided by Ecology will be addressed and a final report will be produced. If no comments received are received from Ecology within 3 months following submittal of the draft report, the draft report will be considered "Final."

2.9.1 Analysis of Data

Gasoline range, diesel range and heavy oil range total petroleum hydrocarbons (TPH-G, TPH-D, and TPH-O, respectively) concentrations will be analyzed in samples collected from FTP monitoring wells. TCE concentration will be analyzed in samples collected from the TVR/Old MATES site. Summary statistics will be calculated using Microsoft Excel's Descriptive Statistics tool. Shapiro Wilkes test for normality and linear regression analysis will be performed on the data using a Microsoft Excel add in, Analyse-It®. The Mann - Kendall correlation test will be performed on non-parametric TCE data using Analyse-It.

All concentration measurements not known to be in error are considered valid; suspect "outliers" are not removed from the data set and will be included in the analyses. Non-detect data, which represent concentration measurements below the practical quantification limits (PQL) but above the minimum detection limit for each constituent, will be evaluated at the reporting limit value: e.g., if the reporting limit is 0.5 µg/L then the concentration value is set at 0.5 µg/L. PQLs for all of the contaminants of concern for both the TVR/ Old MATES and FTP sites are presented in Table 4. All of the PQLs are below or equal to MTCA A and B cleanup levels for the constituent.

2.9.2 Shapiro Wilk Test for Normality

Prior to analyzing data for trends, the data was tested for normal distribution. The null and alternate hypotheses are a summary of a test's objectives which, in this case, is to test for the data's distribution. The null hypothesis, or what is assumed to be true before given evidence that it may be false, for all tests for normality is that a dataset is normally distributed. The alternate hypothesis, then, is that a dataset is not normally distributed (Helsel and Hirsch 2002). A significance level, or alpha level, of 0.05 will be used when determining whether historical data from monitoring wells was normally distributed or not. P values, generated using the Shapiro Wilk Test for Normality, will then be compared to the alpha level. The alpha level is the "cutoff" point for the test statistic in making a decision whether the data was normally distributed or not. P values show the strength of the test in determining whether the data were normally distributed or not. P values range from 0 to 1. The closer a P value is to 1, the better the dataset is normally distributed. P values equal to or below 0.05 (alpha level) were not considered normally distributed.

Datasets that are not considered normally distributed will be transformed by taking the natural log of the original values. This is generally the most common transformation of water resources data. The Shapiro Wilk Test for Normality will be run on the transformed data with the same criteria as the datasets above.

2.9.3 Linear Regression and Mann - Kendall Correlation Analyses

Linear regression trend analyses will be conducted on all concentration data that are found to be normally or log normally distributed using the Shapiro Wilkes Test. In this instance, the null

hypothesis for the test is that there is no trend in the data (Helsel and Hirsch 2002). The alpha level for the linear regression analysis will be set at 0.05. P values generated by the analysis are then compared to the alpha level. P values less than the alpha value suggested a trend in the data.

The Mann-Kendall test for correlation will be performed on data that are not normally or log-normally distributed. No assumptions need to be made about the distribution of the data in order to perform the Mann-Kendall test (Helsel and Hirsch 2002). The null hypothesis is the same as the linear regression test above in that there is no trend in the data. The alpha level will be kept the same at 0.05, although the Mann-Kendall test computes a P value for a two-tailed prediction interval. As such, the alpha levels are actually 0.025 or 0.975. A P value that is smaller than 0.025 or larger than 0.975 suggest a correlation between the change in constituent concentration and time.

2.9.4 Total Toxic Equivalent Concentrations of cPAHs

During YTC's 5-year review conducted by the USACE in 2011, it was noted that the updated 2007 groundwater monitoring plan states that total carcinogenic polycyclic hydrocarbons (cPAHs) for the FTP would be evaluated using the total toxic equivalent concentration of benzo(a)pyrene method outlined in WAC 173-340-708(8)(e) Concentrations of cPAHs, which include benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluroanthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene are typically reported by the lab. The measured concentration of each cPAH is then multiplied by its corresponding toxicity equivalency factor (TEF) in Table 708-2 (WAC 173-340-900) to obtain the TEF of benzo(a)pyrene for each cPAH. The TEFs for each cPAH are then added together to obtain the toxic equivalent concentration (TEC) of benzo(a)pyrene for that sample. If the TEC for the six cPAHs listed above are equal to or greater than 0.1, then the cPAHs are above the MTCA Method A cleanup level of 0.1 µg/L for cPAHs. The cPAHs that are not detected at their laboratory PQL do not have a TEF calculated.

2.10 PROJECT SCHEDULE

The planned schedule for fieldwork and reporting is presented below:

- First quarter sampling event will be conducted in February or March of each year.
- Third quarter PDBs will be deployed in MWs in May or June.
- Third quarter sampling event will be conducted in August or September of each year.
- First quarter PDBs will be deployed in MWs in November or December.
- Draft Groundwater Monitoring Report will be submitted to JBLM by 01 December.
- Final Groundwater Monitoring Report will be submitted to Ecology 30 days after Ecology's comments on draft.
- Annual LUC inspections will be conducted in December.

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3. QUALITY ASSURANCE PROJECT PLAN

The following QAPP is designed to show plans for compliance with QA/QC portions of a SAP per WAC 173-340-820 as well as general agreement with Ecology guidance (2001). It should also be noted that some elements of a typical QAPP are not repeated if included elsewhere in this SAP.

The purpose of QA/QC procedures for this site is to provide assurance that field and analytical procedures produce data of acceptable quality to support site-specific decisions such as evaluation of site compliance with MTCA regulations.

3.1 FIELD QUALITY CONTROL SAMPLES

3.1.1 Fire Training Pit

A duplicate sample will be collected from one MW during either the first and third quarter sampling event and will be analyzed for TPH-G, TPH-D, and TPH-O. A trip blank provided by the project laboratory for each sampling event will be analyzed for total VOCs."

3.1.2 TVR/Old MATES

A duplicate sample will be collected from one MW during each sampling event and will be analyzed for total VOCs. A trip blank provided by the project laboratory for each sampling event will be analyzed for total VOCs.

3.2 LABORATORY QUALITY CONTROL

The project laboratory will be responsible for conducting laboratory QC procedures and reporting laboratory QC results in accordance with its standard operating procedures. It is expected at a minimum that the project laboratory will perform and report the following laboratory QC once per batch of VOC or SVOC samples for select analytes (the standard EPA Contract Laboratory Program analytes): method blank, blank spike, matrix spike, and matrix spike duplicate. Field QC samples will be labeled the same sample number as the parent sample and will be provided to the laboratory blind. It is expected at a minimum that the project laboratory will perform and report the following laboratory QC once per batch of TPH-G or NWTPH-Dx samples: blank and blank spike. Also, it is expected that the laboratory will perform and report results of surrogate recovery for every VOC, SVOC, TPH-G, and NWTPH-Dx sample.

3.3 PRACTICAL QUANTIFICATION LIMITS

Contaminants of potential concern at FTP are TPH-G, TPH-D, TPH-O, benzene, total cPAHs, total naphthalenes, and bis-(2-ethylhexyl) phthalate. Contaminants of potential concern at TVR/Old MATES are TCE and cis-1,2-DCE. Table 4 presents a comparison of MTCA Method A/B groundwater cleanup levels with PQL expectations for each contaminant of potential

concern. Although TPH-G, TPH-D, TPH-O, and total cPAHs do not satisfy the Ecology rule of thumb to ideally have PQLs at least 10 times lower than the regulatory limit (Ecology 2001), all PQLs are within an acceptable range (Ecology 1995). Although total cPAHs have an expected PQL above the MTCA Method A cleanup level, the expected PQLs for total cPAHs are appropriate and could be used as the cleanup standard in accordance with WAC 173-340-720(7)(c). Thus, it is expected that the current project laboratory will be able to achieve PQLs of appropriate sensitivity for comparisons between project data and MTCA cleanup levels.

It should also be noted that some samples (i.e., those collected from FTP 1) might need to be diluted prior to analysis, which will result in higher PQLs.

3.4 QA/QC REVIEW AND VERIFICATION

The overall data quality will be reviewed and verified by JBLM IRP to determine the appropriateness of project-related data. Project data as well as QA/QC data (i.e., field QC results, lab QC results, PQLs, and holding times) will be evaluated in terms of precision, accuracy, representativeness, comparability, completeness, and sensitivity. Results of this evaluation will be summarized in the project report. Corrective action for field or laboratory procedures will be taken as needed in consultation with Ecology.

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FIGURES

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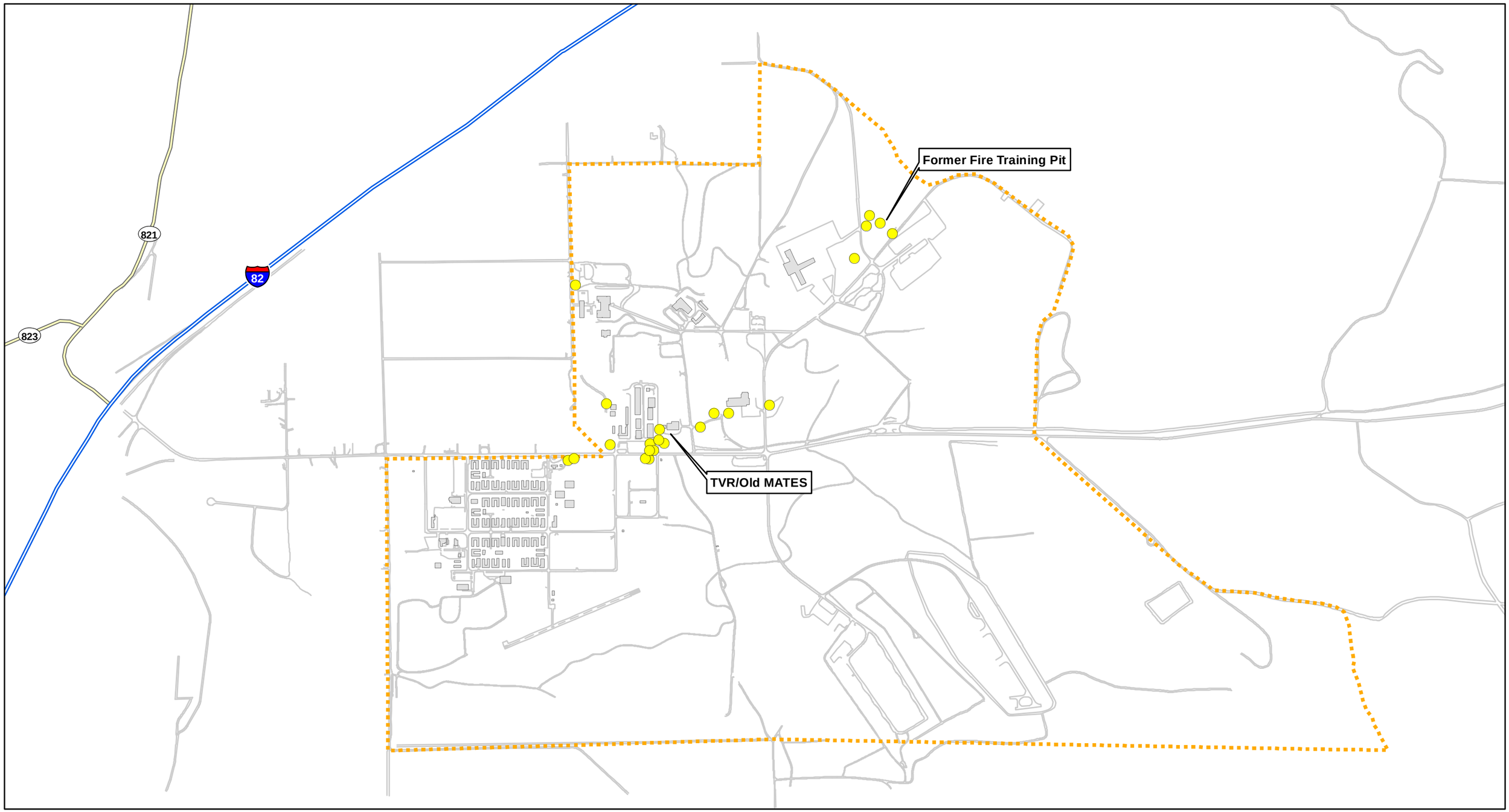
Yakima Training Center
YTC Cantonment Area
Caribou Cr.
Canal
Canal
Ginkgo State Park
Columbia R.
Lower Crab Cr.
Yakima R.
Squaw Cr.
Mattawa
Selah Cr.
Priest Rapids Lk.
Columbia R.
Wenas Cr.
Selah
Yakima
Union Gap
Wide Hollow Cr.
Ahtanum Cr.
Moxee
Canal
Canal
Canal
Canal
Canal
Wanity Sl.
Wapato
Zillah
Olympic NP
WA
Mount Rainier NP
North Cascades NP
0 20 40 60 80 100
Miles
JBLM Yakima Training Center Boundary
N
0 1 2 4 6 8
Miles
MAP DATA:
ELLIPSOID: GRS 80
COORDINATE SYSTEM: UTM, Zone 10
HORIZONTAL DATUM: WGS 84
JBLM Yakima Training Center Location Map
Figure
1



Monitoring Well

Cantonment Boundary

Building

N

0 1,550 3,100 6,200

Feet

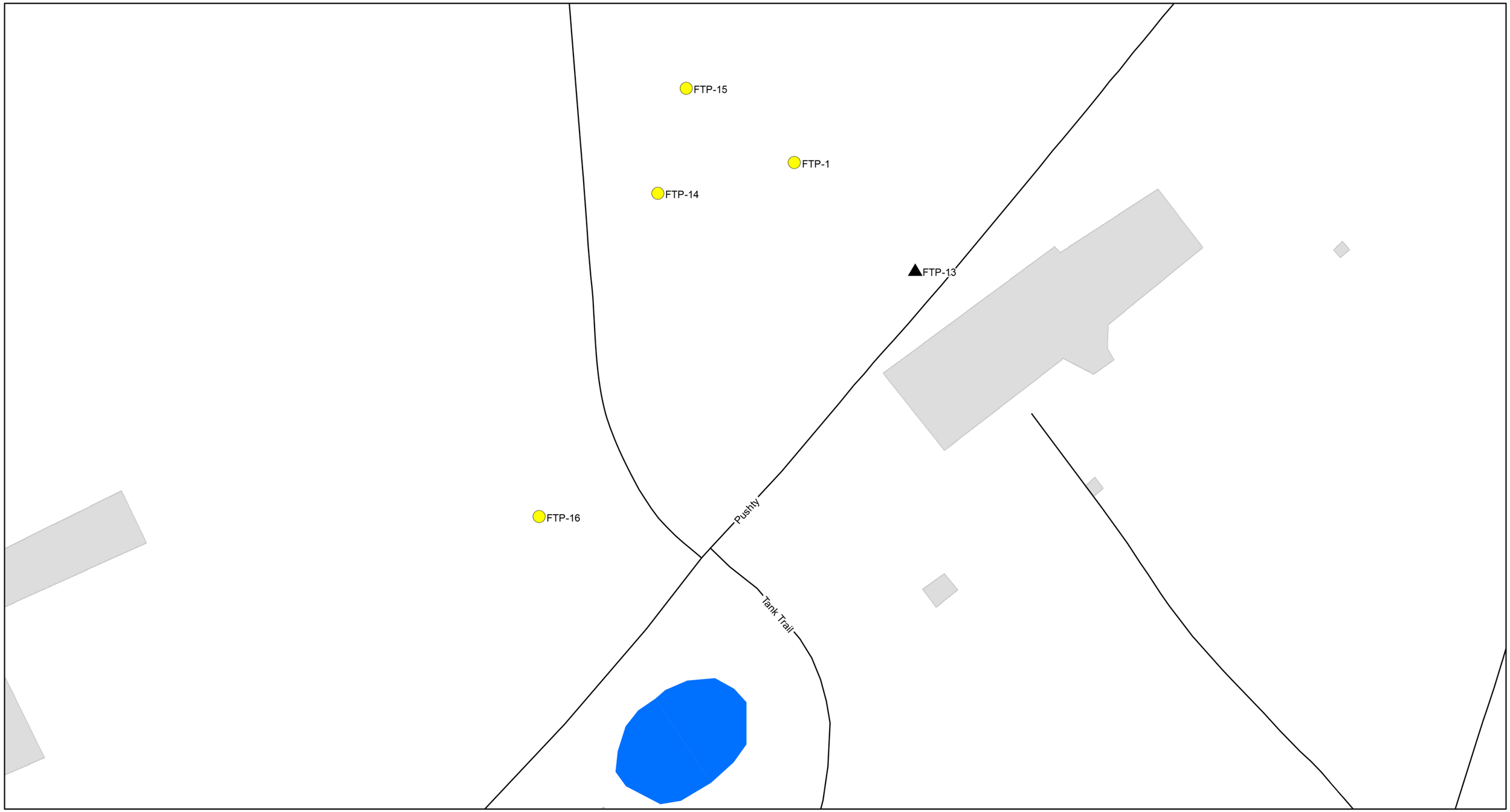
1 inch = 1,250 feet

MAP DATA:
COORDINATE SYSTEM: UTM, Zone 10
HORIZONTAL DATUM: WGS 84

PROJECT LOCATION MAP

Figure 2

R:\Projects_2014\JBLM\YTC\maps\Fig2_Project_Location.mxd



Sample Location / Identification

Monitoring Well
DTW and Sample

Monitoring Well
DTW Only

0 155 310 620

Feet

1 inch = 125 feet

MAP DATA:

ELLIPSOID: GRS 80

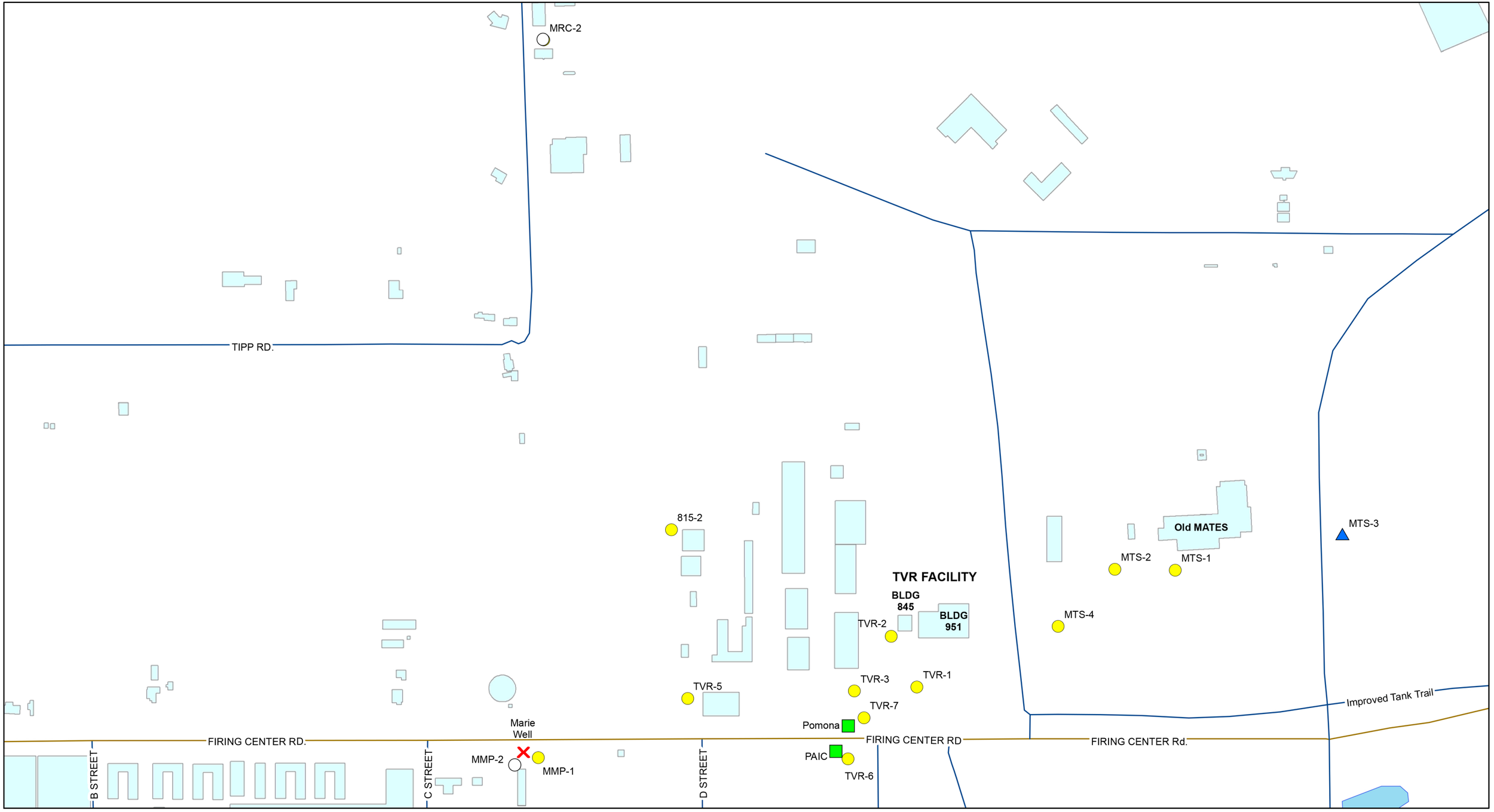
COORDINATE SYSTEM: UTM, Zone 10

HORIZONTAL DATUM: WGS 84

FORMER FIRE TRAINING PIT
SAMPLE LOCATIONS

Figure

3



Sample Location / Identification

- Monitoring Well DTW and Sample
- Monitoring Well DTW Only
- Production Well Sample Only
- Monitoring Well Removed from Program
- Decommissioned

0 375 750 1,500

Feet

1 inch = 300 feet

MAP DATA:

ELLIPSOID: GRS 80

COORDINATE SYSTEM: UTM, Zone 10

HORIZONTAL DATUM: WGS 84

TVR / Old MATES AREA SAMPLE LOCATIONS

Figure 4

TABLES

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Table 1 - Project Personnel Roles and Responsibilities

FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

Organization	Name	Title	Responsibilities
Joint Base Lewis-McChord Public Works	William Myers	Installation Restoration Program Manager	Final review, report signatory
Seattle District USACE	William Graney	Contracting Officer's Representative	Report review
U.S. Army Environmental Command	David Mays	USAEC Program Manager	Report review
Yakima Training Center Public Works	Margaret Taaffe	Chief, Environmental Division	Report review
Washington Department of Ecology	Greg Caron	Central Region Section Site Manager (hazardous waste and toxics reduction program)	Regulation overview
Sealaska Environmental Services, LLC	Scott Elkind	Project Manager	Project oversight
Tetra Tech EC, Inc.	Brent Jones	IRP Program Lead	Overall project performance, document review
	Mark Ingersoll	IRP Task Manager	Budget, schedule, quality, task performance, primary POC
	Dana Ramquist	Field Operations Lead/SSHO	Safety performance, technical task execution
	Keir Craigie	Data Quality Manager	Ensure data quality, data validation
ALS Environmental Laboratories	Gregory Salata	Project Point of Contact	Final analytical report signatory

Table 2 - Monitoring Well Construction Details

FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

Well ID	Elevation at TOC (ft AMSL)	Ground Surface Elevation (ft AMSL)	Easting UTM (m)	Northing UTM (m)	Total Depth (ft)	Screen Interval (ft bgs)	Date Installed
Fire Training Pit Monitoring Wells							
FTP 1	1467.72	1464.59	695828.3	5173198.0	21.0	8-18	28-Jun-99
FTP 13	1473.07	1470.96	695878.5	5173153.0	25.0	10-20	7-Sep-99
FTP 14	1457.48	1455.35	695771.4	5173185.2	22.0	12-22	8-Sep-99
FTP 15	1460.88	1458.72	695783.1	5173228.9	20.0	10-20	9-Sep-99
FTP 16	1444.81	1442.68	695722.0	5173050.7	30.0	20-30	22-Sep-99
TVR / Old Mates Monitoring Wells							
815-2	1304.28	1301.86	694687.7	5172445.5	132.0	115-130	12-Oct-05
MMP-1	1301.37	1298.39	694553.4	5172215.3	100.5	88-98	2-Mar-93
MMP-2	1301.31	1298.55	694529.6	5172207.9	75.5	64-74	3-Mar-93
MRC-2	1312.11	1309.64	694558.9	5172939.9	113.5	101-111	1-Mar-93
MTS-1	1361.02	1359.05	695196.9	5172404.6	127.0	115-125	24-Feb-93
MTS-2	1351.88	1348.79	695135.9	5172405.4	113.0	101-111	25-Feb-93
MTS-3	1362.36	1362.62	695366.1	5172439.6	72.0	62-72	27-Oct-04
MTS-4	1331.88	1332.14	695078.6	5172347.7	97.0	82-97	28-Oct-04
TVR-1	1320.17	1317.32	694936.0	5172286.6	105.0	93-103	25-Feb-93
TVR-2	1317.56	1314.18	694910.0	5172337.7	95.0	83-93	26-Feb-93
TVR-3	1310.60	1310.86	694872.9	5172282.5	158.0	143-158	29-Oct-04
TVR-5	1302.04	1299.42	694704.2	5172275.0	142.0	132-142	18-Oct-05
TVR-6	1310.06	1310.30	694866.4	5172214.0	139.0	139-149	20-Oct-05
TVR-7	1310.95	1311.63	694882.5	5172255.6	140.0	140-150	22-Oct-05

Notes:

TOC = Top of casing
ft AMSL = Feet above mean sea level
m = meters
ft bgs = Feet below ground surface

Table 3 - Groundwater Sampling Schedule

FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

Table 3a - Fire Training Pit (FTP) Sample Schedule

	1st Quarter Sampling Event					3rd Quarter Sampling Event				
Well ID	DTW Measured	TPH-G	TPH-D / TPH-O	VOCs	SVOCs	DTW Measured	TPH-G	TPH-D / TPH-O	VOCs	SVOCs
FTP 1	X	X	X	X	X	X	X	X	X	X
FTP 13	X					X				
FTP 14	X	X	X			X	X	X		
FTP 15	X	X	X			X	X	X		
FTP 16	X	X	X			X	X	X		
Duplicate		X	X				X	X		
Total	5	5	5	1	1	5	5	5	1	1

Table 3b - TVR / Old MATES

	1st Quarter Sampling Event		2nd Quarter	3rd Quarter Sampling Event		4th Quarter
Well ID	DTW Measured	VOCs	PDB Installed	DTW Measured	VOCs	PDB Installed
815-2	X	X	X	X	X	X
MMP-1	X	X	-	X	-	-
MMP-2	-	-	-	-	-	-
MRC-2	-	-	-	-	-	-
MTS-1	X	X	X	X	X	X
MTS-2	X	X	X	X	X	X
MTS-3	X	-	-	X	-	-
MTS-4	X	X	X	X	X	X
Pomona	-	X	-	-	X	-
PAIC	-	X	-	-	X	-
TVR-1	X	X	X	X	X	X
TVR-2	X	X	-	X	-	-
TVR-3	X	X	X	X	X	X
TVR-5	X	X	X	X	X	X
TVR-6	X	X	X	X	X	X
TVR-7	X	X	X	X	X	X
Duplicate	-	X	-	-	X	-
Trip Blank	-	X	-	-	X	-
Total	12	14	9	12	13	9

Notes:

DTW = Depth to Water

First quarter (January through March) sampling event is typically conducted in March.

Second quarter (April through June) PDB installation event is typically conducted in June.

Third quarter (July through September) sampling event is typically conducted in September.

Fourth quarter (October through December) PDB installation event is typically conducted in December.

TPH-G = Gasoline range total petroleum hydrocarbons analyzed using method NWTPH-Gx.

TPH-D / TPH-O = Diesel and heavy oil range total petroleum hydrocarbons are analyzed using method NWTPH-Dx.

VOCs = Volatile organic compounds are analyzed using EPA Method 8260B.

SVOCs = Semi-volatile organic compounds are analyzed using EPA Method 8270C.

Table 4a - Sample Preparation and PQLs

FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

Analytical Method	Container Description	Preservation	Holding Time	Typical Lab PQLs µg/L	MTCA Method A Cleanup Level µg/L	Laboratory PQL (µg/L)	Labortory MDL (µg/L)	Laboratory QC limits 1/
EPA Method 8260B (VOCs)	Two 40ml glass VOA vials with Teflon septa lids	Cool to 4ºC, HCl preserved, no headspace	14 days	0.5 to 1.5	TCE = 5.0	0.5	0.1	77 - 123
					Benzene = 5.0	0.5	0.1	77 - 121
NWTPH-Gx (TPH-G)	Two 40ml glass VOA vials with Teflon septa lids	Cool to 4ºC, HCl preserved, no headspace	14 days	100	800	250	25	80 - 119
NWTPH-Dx (TPH-D, TPH-HO)	Two 1L amber glass jars	Cool to 4ºC, HCl preserved	1 month	250, 500	500	110	20	46 - 140
EPA Method 8270D (SVOCs)	Two 1L amber glass jars	Cool to 4ºC	1 month	0.5 - 2	Benzo(a)pyrene = 0.1	10	0.5 2/	46 - 159

Notes:

1/ Laboratory QC limits are the lower and upper control limits from the DoD QSM 5.0 (July 2013) except for the TPH methods which are the laboratory limits

2/ Benzo(a)pyrene has not been historically detected in groundwater and the laboratory MDL has been acceptable for project needs

PQL = Practical quantification limit
µg/L = Micrograms per liter
MTCA = Model Toxics Control Act - Chapter 173-340 WAC
VOCs = Volatile organic compounds
ml = milliliters
HCl = Hydrochloric acid
TCE = Trichloroethylene
TPH-G = Gasoline range total petroleum hydrocarbons
TPH-D / TPH-O = Diesel and oil range total petroleum hydrocarbons
SVOCs = Semi-volatile organic compounds

Table 4b. Organic Analysis by Gas Chromatography/Mass Spectrometry

(From Table 3 QSM 5.0 Appendix B)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Tune Check	Prior to ICAL and prior to each 12-hour period of sample analysis.	Specific ion abundance criteria of BFB or DFTPP from method.	Retune instrument and verify.	Flagging is not appropriate.	No samples shall be analyzed without a valid tune.
Performance Check (Method 8270 only)	At the beginning of each 12-hour period, prior to analysis of samples.	Degradation ≤ 20% for DDT. Benzidine and pentachlorophenol shall be present at their normal responses, and shall not exceed a tailing factor of 2.	Correct problem, then repeat performance checks.	Flagging is not appropriate.	No samples shall be analyzed until performance check is within criteria. The DDT breakdown and Benzidine/Pentachlorophenol tailing factors are considered overall system checks to evaluate injector port inertness and column performance and are required regardless of the reported analyte list.
Initial Calibration (ICAL) for all Analytes (including surrogates)	At instrument set-up, prior to sample analysis	Each analyte must meet one of the three options below: Option 1: RSD for each analyte ≤ 15%; Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$; Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$.	Correct problem then repeat ICAL.	Flagging is not appropriate.	Minimum 5 levels for linear and 6 levels for quadratic. No samples shall be analyzed until ICAL has passed. If the specific version of a method requires additional evaluation (e.g., RFs or low calibration standard analysis and recovery criteria) these additional requirements must also be met.
Retention Time Window Position Establishment	Once per ICAL and at the beginning of the analytical sequence.	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA.	NA.	Required for each analyte and surrogate.

Table 4b. Organic Analysis by Gas Chromatography/Mass Spectrometry

(From Table 3 QSM 5.0 Appendix B)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Evaluation of Relative Retention Times (RRT)	With each sample.	RRT of each reported analyte within ± 0.06 RRT units.	Correct problem, then rerun ICAL.	NA	RRTs may be updated based on the daily CCV. RRTs shall be compared with the most recently updated RRTs.
Initial Calibration Verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analytes within ± 20% of true value.	Correct problem. Rerun ICV. If that fails, repeat ICAL.	Flagging is not appropriate.	No samples shall be analyzed until calibration has been verified with a second source.
Continuing Calibration Verification (CCV)	Daily before sample analysis; after every 12 hours of analysis time; and at the end of the analytical batch run.	All reported analytes and surrogates within ± 20% of true value. All reported analytes and surrogates within ± 50% for end of analytical batch CCV.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for the specific analyte(s) in all samples since last acceptable calibration verification.	Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed. If the specific version of a method requires additional evaluation (e.g., average RFs) these additional requirements must also be met.
Internal Standards (IS)	Every field sample, standard and QC sample.	Retention time within ± 10 seconds from retention time of the midpoint standard in the ICAL; EICP area within - 50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions and correct problem. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	If corrective action fails in field samples, data must be qualified and explained in the case narrative. Apply Q-flag to analytes associated with the non-compliant IS. Flagging is not appropriate for failed standards.	

Table 4b. Organic Analysis by Gas Chromatography/Mass Spectrometry

(From Table 3 QSM 5.0 Appendix B)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Method Blank (MB)	One per preparatory batch.	No analytes detected > $^1/_2$ LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater. Common contaminants must not be detected > LOQ.	Correct problem. If required, reprep and reanalyze MB and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.	Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Laboratory Control Sample (LCS)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Must contain all surrogates and all analytes to be reported. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Matrix Spike (MS)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Examine the project-specific requirements. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.	Must contain all surrogates and all analytes to be reported. If MS results are outside the limits, the data shall be evaluated to determine the source(s) of difference, i.e., matrix effect or analytical error.
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. MSD or MD: RPD of all analytes ≤ 20% (between MS and MSD or sample and MD).	Examine the project-specific requirements. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.	MSD: Must contain all surrogates and all analytes to be reported. The data shall be evaluated to determine the source of difference.

Table 4b. Organic Analysis by Gas Chromatography/Mass Spectrometry

(From Table 3 QSM 5.0 Appendix B)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Surrogate Spike	All field and QC samples.	QC acceptance criteria specified by the project, if available; otherwise use QSM Appendix C limits or in-house LCS limits if analyte(s) are not listed.	Correct problem, then reprep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Apply Q-flag to all associated analytes if acceptance criteria are not met and explain in the case narrative.	Alternative surrogates are recommended when there is obvious chromatographic interference.

Table 4c - Sample PQLs and MDLs

FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

VOCs	CAS Number	PQL (µg/L)	MDL (µg/L)	Spike/Surrogate Recovery Limits 1/	Duplicate % RPD limits
Dichlorodifluoromethane	75-71-8	0.5	0.2	29 - 149	≤ 30
Chloromethane	74-87-3	0.5	0.2	50 - 136	≤ 30
Vinyl Chloride	75-01-4	0.5	0.1	56 - 135	≤ 30
Bromomethane	74-83-9	0.5	0.3	53 - 143	≤ 30
Chloroethane	75-00-3	0.5	0.2	59 - 139	≤ 30
Trichlorofluoromethane	75-69-4	0.5	0.2	62 - 140	≤ 30
1,1-Dichloroethene	75-35-4	0.5	0.2	70 - 131	≤ 30
Acetone	67-64-1	20	10	36 - 164	≤ 30
Carbon Disulfide	75-15-0	0.5	0.2	63 - 132	≤ 30
Methylene Chloride	75-09-2	2	0.2	70 - 128	≤ 30
Methyl t-butyl ether	1634-04-4	0.5	0.3	73 - 125	≤ 30
Trans-1,2-Dichloroethene	156-60-5	0.5	0.2	74 - 125	≤ 30
1,1-Dichloroethane	75-34-3	0.5	0.2	76 - 125	≤ 30
2,2-Dichloropropane	594-20-7	0.5	0.2	67 - 133	≤ 30
cis-1,2-Dichloroethene	156-59-2	0.5	0.2	77 - 123	≤ 30
2-Butanone	78-93-3	20	4	51 - 148	≤ 30
Bromochloromethane	74-97-5	0.5	0.2	78 - 125	≤ 30
Chloroform	67-66-3	0.5	0.2	78 - 123	≤ 30
1,1,1-Trichloroethane	71-55-6	0.5	0.2	73 - 130	≤ 30
Carbon Tetrachloride	56-23-5	0.5	0.2	70 - 135	≤ 30
1,1-Dichloropropene	563-58-6	0.5	0.2	76 - 125	≤ 30
Benzene	71-43-2	0.5	0.1	77 - 121	≤ 30
1,2-Dichloroethane	107-06-2	0.5	0.15	73 - 128	≤ 30
Trichloroethene	79-01-6	0.5	0.1	77 - 123	≤ 30
1,2-Dichloropropane	78-87-5	0.5	0.2	76 - 123	≤ 30
Chlorodibromomethane	74-95-3	0.5	0.5	74 - 126	≤ 30
Dichlorobromomethane	75-27-4	0.5	0.3	75 - 127	≤ 30
cis-1,3-Dichloropropene	10061-01-5	0.5	0.2	74 - 126	≤ 30
4-Methyl-2-Pentanone	108-10-1	20	10	65 - 135	≤ 30
Toluene	108-88-3	0.5	0.1	77 - 121	≤ 30
trans-1,3-Dichloropropene	10061-02-6	0.5	0.2	71 - 130	≤ 30
1,1,2-Trichloroethane	79-00-5	0.5	0.4	78 - 121	≤ 30
Tetrachloroethene	127-18-4	0.5	0.2	73 - 128	≤ 30
2-Hexanone	591-78-6	20	10	53 - 145	≤ 30
1,3-Dichloropropane	142-28-9	0.5	0.3	77 - 121	≤ 30
Dibromochloromethane	124-48-1	0.5	0.5	74 - 126	≤ 30
Ethylene dibromide	106-93-4	2	0.2	78 - 122	≤ 30
Chlorobenzene	108-90-7	0.5	0.2	79 - 120	≤ 30
Ethylbenzene	100-41-4	0.5	0.1	76 - 122	≤ 30
1,1,1,2-Tetrachloroethane	630-20-6	0.5	0.2	78 - 125	≤ 30
m, p-Xylene	179601-23-1	0.5	0.2	77 - 124	≤ 30
o-Xylene	95-47-6	0.5	0.2	77 - 123	≤ 30
Styrene	100-42-5	0.5	0.2	76 - 124	≤ 30
Bromoform	75-25-2	0.5	0.5	67 - 132	≤ 30
Isopropylbenzene	98-82-8	2	0.2	68 - 134	≤ 30
1,1,2,2-Tetrachloroethane	79-34-5	0.5	0.2	70 - 124	≤ 30
Bromobenzene	108-86-1	2	0.2	78 - 121	≤ 30

Table 4c - Sample PQLs and MDLs

FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

VOCs	CAS Number	PQL (µg/L)	MDL (µg/L)	Spike/Surrogate Recovery Limits 1/	Duplicate % RPD limits
n-Propylbenzene	103-65-1	2	0.2	73 - 125	≤ 30
1,2,3-Trichloropropane	96-18-4	0.5	0.5	73 - 125	≤ 30
2-Chlorotoluene	95-49-8	2	0.2	75 - 122	≤ 30
1,3,5-Trimethylbenzene	108-67-8	2	0.2	73 - 124	≤ 30
4-Chlorotoluene	106-43-4	2	0.2	72 - 124	≤ 30
Tert-Butylbenzene	98-06-6	2	0.2	73 - 125	≤ 30
1,2,4-Trimethylbenzene	95-63-6	2	0.2	75 - 123	≤ 30
Sec-Butylbenzene	135-98-8	2	0.1	73 - 126	≤ 30
p-Isopropyltoluene	99-87-6	2	0.2	73 - 127	≤ 30
1,3-Dichlorobenzene	541-73-1	0.5	0.2	77 - 121	≤ 30
1,4-Dichlorobenzene	106-46-7	0.5	0.2	75 - 120	≤ 30
n-Butylbenzene	104-51-8	2	0.1	70 - 128	≤ 30
1,2-Dichlorobenzene	95-50-1	0.5	0.2	78 - 121	≤ 30
1,2-Dibromo-3-Chloropropane	96-12-8	2	0.8	61 - 132	≤ 30
1,2,4-Trichlorobenzene	120-82-1	2	0.3	67 - 129	≤ 30
Hexachlorobutadiene	87-68-3	2	0.3	61 - 135	≤ 30
Naphthalene	91-20-3	2	0.3	62 - 129	≤ 30
1,2,3-Trichlorobenzene	87-61-6	2	0.4	66 - 130	≤ 30
Dibromofluoromethane (Surr)				78 - 119	
1,2-Dichloroethane-d4 (Surr)				71 - 136	
Toluene-d8 (Surr)				85 - 116	
4-Bromofluorobenzene (Surr)				79 - 119	
SVOCs					
N-Nitrosodimethylamine	62-75-9	25	5	23 - 120	≤ 30
Bis(2-Chloroethyl)Ether	111-44-4	10	0.5	31 - 120	≤ 30
Phenol	108-95-2	10	0.5	34 - 121	≤ 30
2-Chlorophenol	95-57-8	10	0.5	34 - 121	≤ 30
1,3-Dichlorobenzene	541-73-1	10	0.5	30 - 115	≤ 30
1,4-Dichlorobenzene	106-46-7	10	0.5	31 - 115	≤ 30
1,2-Dichlorobenzene	95-50-1	10	0.5	33 - 117	≤ 30
Benzyl Alcohol	100-51-6	10	0.5	29 - 122	≤ 30
Bis(2-chloroisopropyl) ether	39638-32-9	10	0.5	33 - 131	≤ 30
2-Methylphenol	95-48-7	10	0.5	32 - 122	≤ 30
Hexachloroethane	67-72-1	10	2	28 - 117	≤ 30
N-Nitrosodi-n-propylamine	621-64-7	10	2	36 - 120	≤ 30
4-Methylphenol	106-44-5	10	0.5	42 - 126	≤ 30
Nitrobenzene	98-95-3	10	0.57	34 - 122	≤ 30
Isophorone	78-59-1	10	1	30 - 122	≤ 30
2-Nitrophenol	88-75-5	10	0.5	36 - 123	≤ 30
2,4-Dimethylphenol	105-67-9	10	2	30 - 127	≤ 30
Bis(2-Chloroethoxy)Methane	111-91-1	10	0.5	36 - 121	≤ 30
2,4-Dichlorophenol	120-83-2	10	0.5	40 - 122	≤ 30
Benzoic Acid	65-85-0	25	25	0 - 125	≤ 30
1,2,4-Trichlorobenzene	120-82-1	10	0.5	34 - 118	≤ 30
Naphthalene	91-20-3	10	0.5	35 - 123	≤ 30
4-Chloroaniline	106-47-8	10	2	17 - 106	≤ 30
Hexachlorobutadiene	87-68-3	10	0.5	32 - 123	≤ 30

Table 4c - Sample PQLs and MDLs

FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

VOCs	CAS Number	PQL (µg/L)	MDL (µg/L)	Spike/Surrogate Recovery Limits 1/	Duplicate % RPD limits
4-Chloro-3-Methylphenol	59-50-7	10	0.5	45 - 122	≤ 30
2-Methylnaphthalene	91-57-6	10	0.5	38 - 122	≤ 30
2,4,6-Trichlorophenol	88-06-2	10	1	39 - 126	≤ 30
2,4,5-Trichlorophenol	95-95-4	10	0.5	41 - 124	≤ 30
2-Chloronaphthalene	91-58-7	10	0.5	41 - 114	≤ 30
Acenaphthene	83-32-9	10	0.5	40 - 123	≤ 30
2-Nitroaniline	88-74-4	25	0.5	44 - 127	≤ 30
Acenaphthylene	208-96-8	10	0.5	32 - 132	≤ 30
Dimethylphthalate	131-11-3	10	2	48 - 124	≤ 30
2,6-Dinitrotoluene	606-20-2	10	0.5	46 - 124	≤ 30
3-Nitroaniline	99-09-2	25	1	33 - 119	≤ 30
2,4-Dinitrophenol	51-28-5	25	25	23 - 143	≤ 30
Dibenzofuran	132-64-9	10	0.5	44 - 120	≤ 30
4-Nitrophenol	100-02-7	25	10	30 - 132	≤ 30
2,4-Dinitrotoluene	121-14-2	10	1	48 - 126	≤ 30
Fluorene	86-73-7	10	0.5	43 - 125	≤ 30
4-Chlorophenyl-Phenylether	7005-72-3	10	0.5	45 - 121	≤ 30
Diethylphthalate	84-66-2	10	0.5	50 - 124	≤ 30
4-Nitroaniline	100-01-6	25	4	30 - 120	≤ 30
4,6-Dinitro-2-Methylphenol	534-52-1	25	10	29 - 132	≤ 30
N-Nitrosodiphenylamine	86-30-6	10	0.5	38 - 127	≤ 30
1,2-Diphenylhydrazine	122-66-7	10	0.5	41 - 125	≤ 30
4-Bromophenyl phenyl ether	101-55-3	10	0.5	46 - 124	≤ 30
Hexachlorobenzene	118-74-1	10	0.53	45 - 122	≤ 30
Pentachlorophenol	87-86-5	25	5	25 - 133	≤ 30
Phenanthrene	85-01-8	10	0.5	50 - 121	≤ 30
Anthracene	120-12-7	10	0.61	47 - 123	≤ 30
Carbazole	86-74-8	10	0.5	50 - 123	≤ 30
Di-N-Butylphthalate	84-74-2	10	0.65	51 - 128	≤ 30
Fluoranthene	206-44-0	10	0.63	50 - 127	≤ 30
Pyrene	129-00-0	10	0.73	47 - 127	≤ 30
Butylbenzylphthalate	85-68-7	10	0.5	48 - 132	≤ 30
3,3'-Dichlorobenzidine	91-94-1	25	2	22 - 121	≤ 30
Benzo(a)anthracene	56-55-3	10	0.59	49 - 126	≤ 30
Chrysene	218-01-9	10	0.79	50 - 124	≤ 30
Bis(2-Ethylhexyl) Phthalate	117-81-7	10	1.9	41 - 133	≤ 30
Di-n-octyl phthalate	117-84-0	10	0.63	45 - 140	≤ 30
Benzo(b)fluoranthene	205-99-2	10	0.58	45 - 132	≤ 30
Benzo(k)fluoranthene	207-08-9	10	0.83	47 - 132	≤ 30
Benzo(a)pyrene	50-32-8	10	0.5	45 - 129	≤ 30
Indeno(1,2,3-cd)pyrene	193-39-5	10	0.68	45 - 133	≤ 30
Dibenzo(a,h)anthracene	53-70-3	10	0.75	45 - 134	≤ 30
Benzo(ghi)perylene	191-24-2	10	0.81	43 - 134	≤ 30
2-Fluorophenol (Surr)				35 - 115	
Phenol-d5 (Surr)				33 - 122	
Nitrobenzene-d5 (Surr)				37 - 122	
2-Fluorobiphenyl (Surr)				44 - 115	

Table 4c - Sample PQLs and MDLs

FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

VOCs	CAS Number	PQL (µg/L)	MDL (µg/L)	Spike/Surrogate Recovery Limits 1/	Duplicate % RPD limits
2,4,6-Tribromophenol (Surr)				39 - 132	
Terphenyl-d14 (Surr)				54 - 127	
Petroleum Hydrocarbons					
Diesel Range Organics		110	20	46 - 140	≤ 30
Residual Range Organics		110	50	45 - 159	≤ 30
o-Terphenyl (Surr)				50 - 150	
n-Triacontane (Surr)				50 - 150	
Gasoline Range Organics		250	25	80 - 119	≤ 30
1,4-Difluorobenzene (Surr)				50 - 150	

Notes:

1/ Laboratory QC limits are the lower and upper control limits from the DoD QSM 5.0 (July 2013) except for the TPH methods which are the laboratory limits

PQL = Practical quantification limit

µg/L = Micrograms per liter

VOCs = Volatile organic compounds

TPH-G = Gasoline range total petroleum hydrocarbons

TPH-D / TPH-O = Diesel and oil range total petroleum hydrocarbons

SVOCs = Semi-volatile organic compounds

Surr = Surrogate Compound

MDL = Method detection limit

Table 5 - Difference in Depth to Water Elevations Between MMP-1 and MMP-2

FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

	DTW (ft/bgs)		Difference (ft)	Groundwater Elevation (ft/AMSL)		Difference (ft)
Date	MMP-1	MMP-2	-	MMP-1	MMP-2	-
TOC	-		-	1301.37	1301.31	-
23-Mar-05	66.24	66.25	0.01	1235.13	1235.06	0.07
23-Aug-05	58.33	59.75	1.42	1243.04	1241.56	1.48
21-Mar-06	64.27	64.54	0.27	1237.1	1236.77	0.33
1-Aug-06	53.77	55.69	1.92	1247.6	1245.62	1.98
21-Mar-07	62.02	62.13	0.11	1239.35	1239.18	0.17
19-Sep-07	56.08	57.12	1.04	1245.29	1244.19	1.1
18-Mar-08	61.12	61.27	0.15	1240.25	1240.04	0.21
19-Sep-08	55.87	56.95	1.08	1245.5	1244.36	1.14
23-Mar-09	62.83	62.92	0.09	1238.54	1238.39	0.15
23-Sep-09	58.47	59.23	0.76	1242.9	1242.08	0.82
15-Mar-10	63.37	63.48	0.11	1238	1237.83	0.17
28-Sep-10	52.67	54.22	1.55	1248.7	1247.09	1.61
21-Mar-11	59.02	59.17	0.15	1242.35	1242.14	0.21
21-Sep-11	47.02	50.44	3.42	1254.35	1250.87	3.48
28-Mar-12	57.83	57.83	0	1243.54	1243.48	0.06

Notes:

ft/bgs = Feet below ground surface
ft = Feet
ft/AMSL = Feet above mean sea level
TOC = Top of casing elevation in ft/AMSL
- = Not applicable

Difference is the absolute value of the change in elevation between MMP-1 and MMP-2.

Table 6 - Depth to Water Measurements, TCE and cis-DCE Analytical Results MRC-2
FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

Well ID TOC	Date	DTW (ft/bgs)	Groundwater Elevation (ft / amsl)	TCE (µg/L)	cis-DCE (µg/L)
MRC-2	1-Mar-93		1236.27	5U	5U
1312.11	28-Feb-95	-	-	-	-
	1997	-	-	-	-
	1-Aug-99	-	-	-	-
	1-Jan-04	-	-	-	-
	23-Mar-05	81.82	1230.29	-	-
	23-Aug-05	76.09	1236.02	-	-
	21-Mar-06	-	-	-	-
	1-Aug-06	-	-	-	-
	21-Mar-07			0.5U [2]	0.5U [2]
	19-Sep-07	-	-	-	-
	18-Mar-08	74.59	1237.52	0.5U	0.5U
	19-Sep-08	67.90	1244.21	-	-
	23-Mar-09	75.90	1236.21	0.5U	0.5U
	23-Sep-09	-	-	-	-
	16-Mar-10	77.38	1234.73	1U	1U
	28-Sep-10	67.00	1245.11	-	-
	21-Mar-11	73.20	1238.91	0.5U	0.5U
	21-Sep-11	63.07	1249.04	-	-
	28-Mar-12	72.42	1239.69	0.5U	0.5U

Notes:

DTW = Depth to water
TCE = Trichloroethylene
cis-DCE = cis 1,2-dichloroetheylene
ft/bgs = Feet below ground surface
ft/AMSL = Feet above mean sea level
TOC = Top of casing elevation in ft/AMSL
µg/L = Micrograms per liter
- = Not applicable, no data

Table 7 - Groundwater Monitoring and Sampling Task Safety Analysis

FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

Task	Potential Hazard	Actions
Mobilize to work site	Traffic accident	Vehicle Operation - valid drivers license, seat belt use, routine vehicle inspections, no cell phone use while driving. Slow to 10 mph when passing troops on foot on road. Yield to pedestrians in crosswalks.
Groundwater monitoring and sampling	Struck by vehicles	Sampling vehicle(s) placed between workers and oncoming traffic. High visibility safety vests in traffic areas. No work will be done after twilight or before sun up. Gate will be closed upon entry and exit to the landfill limiting access to other motorists and pedestrians.
	Temperature stress	If temperature is above 80°F or below 40°F, administrative controls will be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, provisions for emergency heating or cooling).
	Lifting (musculoskeletal injuries)	If equipment is to be moved, an evaluation of potential pinch points and/or weight strain will be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help will be obtained by workers or mechanical assistance used on-site if equipment to be moved is unwieldy, has a weight >50 lbs or has to be moved by maneuvering through awkward positioning. Honda portable generator will not be moved out of the back of the sampling truck until all work has been completed for the day. Electric chord from Grundfos pump is long enough to reach from the truck to all wells if needed.
	Electric shock	Portable electrical tools and all portable electrical equipment that poses a shock hazard must be connected through ground fault circuit interrupters.
	Battery Fire/Explosion	Use only batteries that are not installed in vehicles and are not being charged during use for powering equipment.
	Fire	Fire extinguisher rated 2A and 5B (serviced annually and inspected monthly) located in back of cab of sampling vehicle. Fire extinguisher maintenance office is located in Bldg. 02014 on Pendleton Ave. and N. 3rd St. in back of the old fire station at JBLM.
	Chemical exposure	Medical clearance for hazardous waste work. 40hr HAZWOPER and current refresher for workers. 8hr additional supervisor for FM, SSHO, and all other on-site supervisors. Wash hands before eating or drinking. Nitrile gloves for chemical/contaminant contact. Chemical containers labeled with identity and hazard. MSDSs on site for all chemicals in use. Site-specific training must address chemicals, hazards, and proper handling.
	IDW Control	Purge water and decontamination water generated from bailing wells FTP 1 through FTP 16 will be collected in 5-gallon buckets and disposed of on-site at a Main Vehicle Wash Rack catch basin. The Wash Rack catch basin is self-contained and has an OWS in the system to manage fuel contaminated waters.

Table 8 - Groundwater Monitoring and Sampling PPE Requirements

FTP and TVR / Old MATES, Yakima Training Center, Washington 98901

Personal Protective Equipment (PPE)	Comments
Safety Shoes	
Hard Hat	If overhead hazards are present (not needed during routine sampling)
Safety Glasses With Side Shields	
Face Shields	As needed if handling free product or bulk corrosives (not needed during routine sampling)
Goggles	If splash potential, pouring corrosives or free product recovery (not needed during routine sampling)
Hearing Protection	As necessary (not needed during routine sampling)
Gloves	Nitrile, PVC or similar for potentially contaminated material; heavy duty work gloves for material handling
Other	
Safety Cones/Barricades	Sampling truck used as barricade
Safety Vest	
Knee Pads	Optional
Caution Tape	As needed, to exclude unauthorized personnel

APPENDIX A

BORING LOGS AND WELL COMPLETION DIAGRAMS

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ENVIRONMENTAL BOREHOLE LOG

Date Started 6/17/99	Location Fire Training Pit		Depth Water First Encountered (ft) 14.0
Date Completed 6/28/99	Drilling Company Andrews Drilling		Drilling Method HSA/Air Rotary
Total Depth (ft) 20.0	Sampling Method Split-spoon/Drill cuttings		Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 8	Ground Elev. (ft) 1475.8	Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
	FTP-FBI-02		33	0	0	0219 (6/17)		Medium dense, brown, medium to fine, silty SAND/sandy SILT; trace of basalt; dry; occasional gravels; SM.			
	FTP-FBI-03		21	67	0	0253 (6/17)	4.0	Very dense, light to medium brown, slightly silty, fine to medium sandy GRAVEL to gravelly SAND; dry to moist; GP-SP.			
5		G	50/4"	0	0	0300	5.5	BASALT: Grey to black, slightly vesicular, moderately weathered, slight petroleum odor at 8.0 feet, wet at 14 feet.			5
			50/6"	0	0	0310 (6/17)					
10		G									10
15		G								▽	15
20							20.0	BOTTOM OF BORING COMPLETED 6/28/1999			20
25								Note: Refusal at 5.5 feet bgs with HSA drill rig on 6/17/99; completed boring to 20 feet bgs with air rotary drill rig on 6/28/99.			25

Typ: EET Rev: AMJ Log: AMJ/JMH ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

I	2-inch O.D. Split Spoon Sample	▽	Ground Water Level ATD
III	3-inch O.D. Split Spoon Sample	▼	Ground Water Level in Well

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LOG OF BORING FTP-FB1

August 2001 21-1-14118-020

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FIG. D-2

ENVIRONMENTAL BOREHOLE LOG

Date Started: 6/18/99	Location: Fire Training Pit	Depth Water First Encountered (ft): 14.0
Date Completed: 6/28/99	Drilling Company: Andrews Drilling	Drilling Method: HSA/Air Rotary
Total Depth (ft): 20.0	Sampling Method: Split-spoon/Drill cuttings	Hammer: Weight (lbs): 300 Drop (in): 30
Borehole Diam. (in): 8	Ground Elev. (ft): 1474.1 Monument Elev. (ft): NA	PVC Elev. (ft): NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
								Very dense, dark brown, slightly silty, medium to fine SAND; trace of fine gravels; moist; scattered cobbles; strong hydrocarbon odors at 4.5 feet; SM.			
5	FTP-FB2-04/05/06		50	61	0	0720 (6/18)					5
	FTP-FB2-07		34	100	85.6	0748	5.0				
			25/2"	67	270	0813		Very dense, gray to black, slightly silty, sandy vesiculated BASALT; petroleum odor; GM.			
			50/5"	0	33.6	0840 (6/18)	6.5				
								BASALT: Slightly weathered, gray to black with iron-oxide staining. Water encountered at 14 feet.			
10					0						10
					0					▽	
15					0						15
20							20.0				20
								BOTTOM OF BORING COMPLETED 6/28/1999			
								Notes: (1) Small amount of water was seeping into the hole upon removal of drilling rods. (2) Refusal at 6.5 feet bgs with HSA drill rig on 6/18/99; completed boring to 20 feet feet bgs on 6/28/99 by air rotary drilling. (3) Duplicate (FTP-FB2-05) and split (FTP-FB2-06) collected with sample FTP-FB2-04.			
25											25

NOTES

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2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

2-inch O.D. Split Spoon Sample	Ground Water Level ATD
3-inch O.D. Split Spoon Sample	Ground Water Level in Well

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LOG OF BORING FTP-FB2

August 2001 21-1-14118-020

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FIG. D-3

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/JMH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/18/99	Location Fire Training Pit		Depth Water First Encountered (ft) N/A
Date Completed 6/28/99	Drilling Company Andrews Drilling		Drilling Method HSA/Air Rotary
Total Depth (ft) 20.0	Sampling Method Split-spoon/Drill cuttings		Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 8	Ground Elev. (ft) 1474.1	Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
								Dense, brown, slightly silty, medium to fine SAND; trace fine gravel; moist; SM.			
5	FTP-FB3-02		41	83	5.7	0935 (6/18)					5
	FTP-FB3-03		50/5"	83	0	0953 (6/18)	6.0	BASALT: Black, moderately weathered, slightly vesicular, occasional saprolites and quartz; moist at 14.5 feet.			
10											10
15											15
20							20.0	BOTTOM OF BORING COMPLETED 6/28/1999			20
25								Note: Refusal at 6.5 feet bgs with HSA drill rig; completed boring to 20 feet bgs with an air rotary drill rig on 6/28/99.			25

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Split Spoon Sample
- Ground Water Level ATD
- Ground Water Level in Well

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LOG OF BORING FTP-FB3

August 2001 21-1-14118-020

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FIG. D-4

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/JMH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/18/99	Location Fire Training Pit	Depth Water First Encountered (ft) 15.0
Date Completed 6/28/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary
Total Depth (ft) 20.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 8	Ground Elev. (ft) 1475.9 / Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
								Dense, brown, silty, medium to fine SAND; dry to moist; SM.			
	FTP-FB4-02/03/04		36	100	0	1050 (6/18)					
5	FTP-FB4-05	G	40 50/2"	94 0	0 0	1105 (6/18) 1114	5.4	BASALT: reddish-gray, slightly vesicular, moderately weathered, trace of silt; dry to moist.			5
10		G									10
15		G						--wet at 15 feet		▽	15
20							20.0	BOTTOM OF BORING COMPLETED 6/28/99			20
25								Note: Refusal at 5.5 feet below ground surface with HSA drill rig; completed boring to 20 feet bgs with an air rotary drill rig on 6/28/99.			25

Typ: EET Rev: AMJ Log: AMJ/JMH

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

I	2-inch O.D. Split Spoon Sample	▽	Ground Water Level ATD
III	3-inch O.D. Split Spoon Sample	▼	Ground Water Level in Well

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LOG OF BORING FTP-FB4

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FIG. D-5

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/21/99	Location Fire Training Pit	Depth Water First Encountered (ft) N/A
Date Completed 6/29/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary
Total Depth (ft) 20.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 8	Ground Elev. (ft) 1461.4 Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
	FTP-FB5-02		50/4"	50	0	0940		Very dense, yellow to brown, silty SAND; dry to moist; occasional gravels, weathered basalt encountered at 4.0 feet; SM.			
			50/6"	50	0	0945 (6/21)	4.0	BASALT: Tan to light gray, moderately weathered; dry.			
5											5
							9.5	BASALT: Gray to black, slightly to moderately vesicular, occasional quartz and clay, infilling of vesicles; moist.			
10											10
15											15
20							20.0	BOTTOM OF BORING COMPLETED 6/29/1999			20
25											25

Note: (1) MS/MSD sample collected from 2.5- to 4-foot sample interval.
(2) Refusal at 4.0 feet with HSA drill rig on 6/21/99; completed boring to 20 feet bgs on 6/29/99 with an air rotary drill rig.

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Split Spoon Sample
- Ground Water Level ATD
- Ground Water Level in Well

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LOG OF BORING FTP-FB5

August 2001 21-1-14118-020

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FIG. D-6

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/MH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started: 6/21/99	Location: Fire Training Pit	Depth Water First Encountered (ft): N/A
Date Completed: 6/29/99	Drilling Company: Andrews Drilling	Drilling Method: HSA/Air Rotary
Total Depth (ft): 20.0	Sampling Method: Split-spoon/Drill cuttings	Hammer: Weight (lbs): 300 Drop (in): 30
Borehole Diam. (in): 8	Ground Elev. (ft): 1463.5	Monument Elev. (ft): NA / PVC Elev. (ft): NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
								Very dense, gray-brown, slightly silty, fine to medium SAND; trace of fine gravels; dry to moist; SM.			
	FTP-FB6-02		50/4"	39	14.6	0805 (6/21)	4.0				
5								BASALT: Tan to dark gray, slightly vesicular, slightly to moderately weathered; moist from 12.5 to 15.0 feet.			5
					56.5						
10					0						10
15					0						15
20							20.0	BOTTOM OF BORING COMPLETED 6/29/1999			20
25								Note: Refusal at 4.0 feet with HSA drill rig; completed boring to 20 feet bgs on 6/29/99 with air rotary drill rig.			25

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Split Spoon Sample
- Ground Water Level ATD
- Ground Water Level in Well

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LOG OF BORING FTP-FB6

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FIG. D-7

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/MH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/21/99	Location Fire Training Pit		Depth Water First Encountered (ft) N/A
Date Completed 6/29/99	Drilling Company Andrews Drilling		Drilling Method HSA/Air Rotary
Total Depth (ft) 20.0	Sampling Method Split-spoon/Drill cuttings		Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 8	Ground Elev. (ft) 1467.4	Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
	FTP-FB7-02/03/04		50/2"	17	14	0706 (6/21)		Very dense, brown, slightly silty, medium to fine SAND; trace fine gravel; SM.			
5	FTP-FB7-02/03/04		47/6"	100	12	0720 (6/21)	5.0	Dense, brown, slightly silty, gravelly SAND; dry to moist; bedrock at 7.0 feet; SP.			5
					0		7.0	BASALT: Gray to dark gray, slightly vesicular, fresh to slightly weathered; moist; petroleum odor from 13 to 15 feet.			
10					0						10
					330						
15					950						15
20							20.0	BOTTOM OF BORING COMPLETED 6/29/1999			20
								Note: Duplicate (FTP-FB7-03) and split (FTP-FB7-04) samples collected with sample FTP-FB7-02.			
25											25

NOTES

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3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

2-inch O.D. Split Spoon Sample	Ground Water Level ATD
3-inch O.D. Split Spoon Sample	Ground Water Level in Well

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LOG OF BORING FTP-FB7

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FIG. D-8

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/MH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/21/99	Location Fire Training Pit	Depth Water First Encountered (ft) N/A
Date Completed 6/29/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary
Total Depth (ft) 20.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 8	Ground Elev. (ft) 1470.8 / Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
							0.5	Very dense, slightly sandy, well-graded GRAVEL; dry; little to no fines; GW.			
	FTP-FB8-02		49/6"	1001	0	1220 (6/21)		Very dense, yellow to light brown, slightly silty, gravelly, medium to fine SAND; occasional basalt > 2.0 inches; SW-SP.			
5							4.0	Very dense, medium brown, mottled, slightly silty, medium sandy, coarse GRAVELS; dry; GP-GM.			5
	FTP-FB8-03		44	61	0	1254 (6/21)	6.5	BASALT: Dark gray to black, slightly to moderately vesicular, slightly weathered; moist at 12.5 feet; petroleum odor between 15 to 17 feet.			
		G			0						
10											10
		G			0						
15		G			426						15
		G			65.6						
		G			76						
		G			0						
20							20.0	BOTTOM OF BORING COMPLETED 6/29/1999			20
								Note: Refusal at 6.5 feet with HSA drill rig; completed boring to 20 feet bgs on 6/29/99 with an air rotary drill rig.			
25											25

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

2-inch O.D. Split Spoon Sample	Ground Water Level ATD
3-inch O.D. Split Spoon Sample	Ground Water Level in Well

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LOG OF BORING FTP-FB8

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FIG. D-9

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/JMH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/8/99	Location Fire Training Pit	Depth Water First Encountered (ft) N/A
Date Completed 6/29/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary
Total Depth (ft) 180.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 8	Ground Elev. (ft) 1470.1 Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
5	1		50/5"			13:25		BASALT: Moderate strength, black, slightly weathered, slightly vesicular (Pomona Basalt member). --HSA refusal at 3.5 feet			5
10		G									10
15		G									15
20		G									20
25		G									25
30		G									30
35		G									35
40		G									40
45		G									45

CONTINUED NEXT PAGE

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Split Spoon Sample
- Ground Water Level ATD
- Ground Water Level in Well

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LOG OF BORING FTP-12

August 2001 21-1-14118-020

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FIG. D-9
Sheet 1 of 4

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/JMH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/8/99	Location Fire Training Pit		Depth Water First Encountered (ft) N/A
Date Completed 6/29/99	Drilling Company Andrews Drilling		Drilling Method HSA/Air Rotary
Total Depth (ft) 180.0	Sampling Method Split-spoon/Drill cuttings		Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 8	Ground Elev. (ft) 1470.1	Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
								BASALT: (cont.)			
55											55
60											60
65											65
70											70
75											75
80											80
85											85
90											90
95											95

CONTINUED NEXT PAGE

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Split Spoon Sample
- Ground Water Level ATD
- Ground Water Level in Well

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LOG OF BORING FTP-12

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FIG. D-9
Sheet 2 of 4

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/JMH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/8/99	Location Fire Training Pit		Depth Water First Encountered (ft) N/A
Date Completed 6/29/99	Drilling Company Andrews Drilling		Drilling Method HSA/Air Rotary
Total Depth (ft) 180.0	Sampling Method Split-spoon/Drill cuttings		Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 8	Ground Elev. (ft) 1470.1	Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
		G						BASALT: (cont.)			
105		G									105
110		G									110
115		G									115
120		G									120
125		G									125
130		G									130
135		G									135
140		G									140
145		G									145

CONTINUED NEXT PAGE

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

⊥	2-inch O.D. Split Spoon Sample	▽	Ground Water Level ATD
⊥⊥	3-inch O.D. Split Spoon Sample	▼	Ground Water Level in Well

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LOG OF BORING FTP-12

August 2001 21-1-14118-020

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FIG. D-9
Sheet 3 of 4

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/MH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/8/99	Location Fire Training Pit	Depth Water First Encountered (ft) N/A	
Date Completed 6/29/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary	
Total Depth (ft) 180.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300	Drop (in) 30
Borehole Diam. (in) 8	Ground Elev. (ft) 1470.1	Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
								BASALT: (cont.)			
155							155.0	Soft, brown, slightly gravelly, clayey SILT; moist; ML.			155
160											160
165							166.0	Dark brown to black, silty, sandy GRAVEL; moist to wet; GM.			165
170											170
175											175
180							180.0	BOTTOM OF BORING COMPLETED 6/29/1999			180
185											185
190											190
195											195

Log: AMJ/JMH Rev. AMJ Typ: EET

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Split Spoon Sample
- Ground Water Level ATD
- Ground Water Level in Well

RCRA Field Investigation
Yakima Training Center
Yakima, Washington

LOG OF BORING FTP-12

August 2001 21-1-14118-020

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. D-9
Sheet 4 of 4

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/21/99	Location Fire Training Pit	Depth Water First Encountered (ft) 15.0
Date Completed 7/9/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary
Total Depth (ft) 25.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 12	Ground Elev. (ft) 1470.9	Monument Elev. (ft) 1473.30 / PVC Elev. (ft) 1473.07

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
								Dense, medium brown, slightly silty, fine to medium SAND; dry to moist; occasional coarse gravels and fractured weathered basalt; SP-SM.			
	FTP13-02/ MS/MSD		74	100	0	0158 (6/21)					
5											5
	FTP13-03		52	100	0	0210 (6/21)					
							7.5	BASALT: Gray to reddish-brown, slightly to moderately vesiculated, slightly weathered, scattered silt and quartz infilling; moist at 20 feet.			
10		G									10
		G									
15										▽	15
		G									

CONTINUED NEXT PAGE

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Split Spoon Sample
- ▽ Ground Water Level ATD
- ▼ Ground Water Level in Well

RCRA Field Investigation
Yakima Training Center
Yakima, Washington

LOG OF BORING FTP-13

August 2001 21-1-14118-020

SHANNON & WILSON, INC.
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FIG. D-11
Sheet 1 of 2

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/JMH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/21/99	Location Fire Training Pit	Depth Water First Encountered (ft) 15.0
Date Completed 7/9/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary
Total Depth (ft) 25.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 12	Ground Elev. (ft) 1470.9 / Monument Elev. (ft) 1473.30	PVC Elev. (ft) 1473.07

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
								BASALT: (cont.)			
25							25.0	BOTTOM OF BORING COMPLETED 7/9/1999			25
								Note: Refusal at 7.5 feet with HSA drill rig; completed boring to 25.0 feet with an air rotary drill rig on 07/09/99. Well installation completed 7/21/99.			
30											30
35											35

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

I	2-inch O.D. Split Spoon Sample	▽	Ground Water Level ATD
III	3-inch O.D. Split Spoon Sample	▼	Ground Water Level in Well

RCRA Field Investigation
Yakima Training Center
Yakima, Washington

LOG OF BORING FTP-13

August 2001 21-1-14118-020

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. D-11
Sheet 2 of 2

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/JMH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/21/99	Location Fire Training Pit	Depth Water First Encountered (ft) 15.4
Date Completed 7/8/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary
Total Depth (ft) 30.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 10	Ground Elev. (ft) 1455.4	Monument Elev. (ft) 1457.65 PVC Elev. (ft) 1457.48

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
	FTP14-02		50/4"	17	0	1133		Very dense, light brown to medium brown, slightly silty, fine to medium SAND; trace gravels and weathered, vesiculated basalt; variations in color of sand in upper 3.0 feet; SM.			
5	FTP14-03		50/5"	67	0	1144	6.0	Loose, gray to brown, silty, sandy GRAVEL; dry; GM.			5
							7.5	BASALT: Gray to reddish-brown, slightly vesicular, occasional clay infilling in vesicles, moderately weathered; dry to moist.			
10											10
15											15
20											20

CONTINUED NEXT PAGE

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Split Spoon Sample
- Ground Water Level ATD
- Ground Water Level in Well

RCRA Field Investigation
Yakima Training Center
Yakima, Washington

LOG OF BORING FTP-14

August 2001 21-1-14118-020

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. D-12
Sheet 1 of 2

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/JMH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/21/99	Location Fire Training Pit	Depth Water First Encountered (ft) 15.4
Date Completed 7/8/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary
Total Depth (ft) 30.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 10	Ground Elev. (ft) 1455.4 / Monument Elev. (ft) 1457.65	PVC Elev. (ft) 1457.48

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
		G						BASALT: (cont.)			
30							30.0	BOTTOM OF BORING COMPLETED 6/21/1999			30
								Note: Refusal at 6.0 feet with HSA drill rig; completed boring to 30 feet with an air rotary drill rig on 7/8/99. Well installation completed 07/21/99.			
35											35
40											40
45											45

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

I	2-inch O.D. Split Spoon Sample	▽	Ground Water Level ATD
III	3-inch O.D. Split Spoon Sample	▼	Ground Water Level in Well

RCRA Field Investigation
Yakima Training Center
Yakima, Washington

LOG OF BORING FTP-14

August 2001 21-1-14118-020

SHANNON & WILSON, INC.
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FIG. D-12
Sheet 2 of 2

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/MH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/21/99	Location Fire Training Pit	Depth Water First Encountered (ft) N/A
Date Completed 7/9/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary
Total Depth (ft) 25.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 10	Ground Elev. (ft) 1458.7	Monument Elev. (ft) 1461.28 PVC Elev. (ft) 1460.88

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
								Dense, light brown to brown, slightly silty, fine to medium SAND; trace gravels; change in color and increase in cohesiveness at 3.5 feet; SM.			
	FTP15-02		44	100	0	1038	4.0	BASALT: Dark gray to brown, slightly vesicular, slightly weathered; moist at 16.0 feet.			
5											5
10											10
15											15

CONTINUED NEXT PAGE

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

2-inch O.D. Split Spoon Sample	Ground Water Level ATD
3-inch O.D. Split Spoon Sample	Ground Water Level in Well

RCRA Field Investigation
Yakima Training Center
Yakima, Washington

LOG OF BORING FTP-15

August 2001 21-1-14118-020

SHANNON & WILSON, INC.
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FIG. D-13
Sheet 1 of 2

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/JMH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 6/21/99	Location Fire Training Pit	Depth Water First Encountered (ft) N/A
Date Completed 7/9/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary
Total Depth (ft) 25.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 10	Ground Elev. (ft) 1458.7 Monument Elev. (ft) 1461.28	PVC Elev. (ft) 1460.88

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
		G						BASALT: (cont.)			
25							25.0	BOTTOM OF BORING COMPLETED 7/9/1999			25
								Note: Refusal at 4.0 feet with HSA drill rig; completed boring to 25 feet on 7/9/99 with an air rotary drill rig. Well installation completed 7/22/99.			
30											30
35											35

Log: AMJ/JMH Rev: AMJ Typ: EET

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Split Spoon Sample
- Ground Water Level ATD
- Ground Water Level in Well

RCRA Field Investigation
Yakima Training Center
Yakima, Washington

LOG OF BORING FTP-15

August 2001 21-1-14118-020

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. D-13
Sheet 2 of 2

ENVIRONMENTAL BOREHOLE LOG

Date Started 7/20/99	Location Fire Training Pit		Depth Water First Encountered (ft) 28.0
Date Completed 7/22/99	Drilling Company Andrews Drilling		Drilling Method HSA/Air Rotary
Total Depth (ft) 30.0	Sampling Method Split-spoon/Drill cuttings		Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 10	Ground Elev. (ft) 1442.7	Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
5	1							Loose, tan, slightly gravelly to gravelly, silty SAND; dry; moist at 11.0 feet; SM.			5
10	2										10
	3						12.5	BASALT: Moderate strength, dark gray, moderately vesicular, slightly weathered; moist; (Pomona Basalt member).			
15	4										15

CONTINUED NEXT PAGE

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Split Spoon Sample
- Ground Water Level ATD
- Ground Water Level in Well

RCRA Field Investigation
Yakima Training Center
Yakima, Washington

LOG OF BORING FTP-16

August 2001 21-1-14118-020

SHANNON & WILSON, INC.
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FIG. D-14
Sheet 1 of 2

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/JMH Rev: AMJ Typ: EET

ENVIRONMENTAL BOREHOLE LOG

Date Started 7/20/99	Location Fire Training Pit	Depth Water First Encountered (ft) 28.0
Date Completed 7/22/99	Drilling Company Andrews Drilling	Drilling Method HSA/Air Rotary
Total Depth (ft) 30.0	Sampling Method Split-spoon/Drill cuttings	Hammer: Weight (lbs) 300 Drop (in) 30
Borehole Diam. (in) 10	Ground Elev. (ft) 1442.7 / Monument Elev. (ft) NA	PVC Elev. (ft) NA

Depth (ft)	Sample Number	Interval	Blow Count Blows/Ft	Recovery(%)	PID (ppm)	Time	Depth (ft)	Lithologic Description	Soil Log	Well Log	Depth (ft)
								Ground Surface			
								BASALT: (cont.)			
25	5	G									25
30							30.0	BOTTOM OF BORING COMPLETED 7/22/1999			30
								Note: Monitoring well installation completed on 7/22/1999.			
35											35

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification unless otherwise noted.

LEGEND

2-inch O.D. Split Spoon Sample	Ground Water Level ATD
3-inch O.D. Split Spoon Sample	Ground Water Level in Well

RCRA Field Investigation
Yakima Training Center
Yakima, Washington

LOG OF BORING FTP-16

August 2001 21-1-14118-020

SHANNON & WILSON, INC.
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FIG. D-14
Sheet 2 of 2

ENV_MASTER 21-14118.GPJ SHAN_WIL.GDT 7/13/01 Log: AMJ/JMH Rev: AMJ Typ: EET

FIELD BOREHOLE LOG

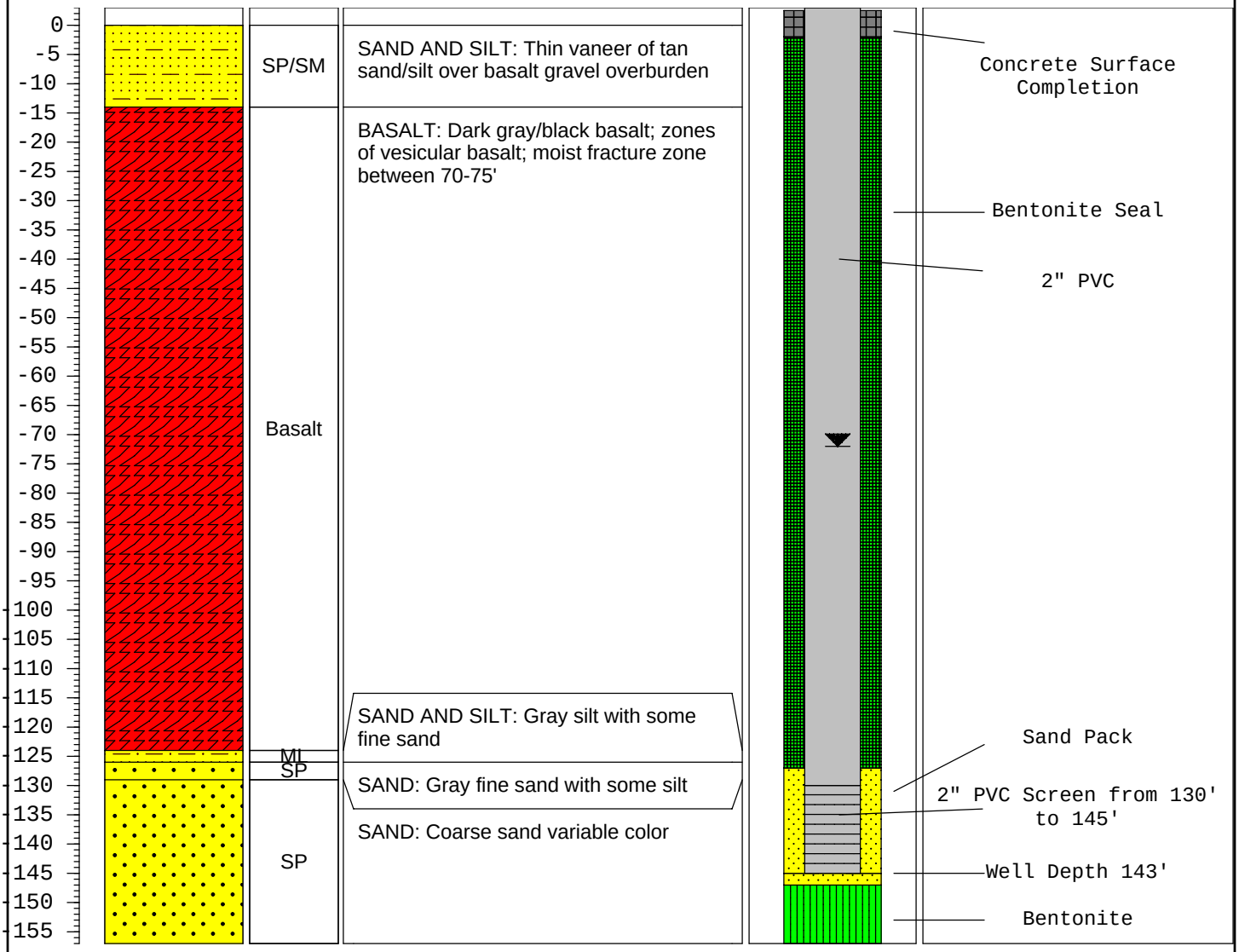
BOREHOLE/WELL ID: **815-1**

TOTAL DEPTH: **157'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**YTC SWMU 5**	DRILLING CO.:	**Environmental West**
SITE LOCATION:	**Yakima Training Center**	DRILLER:	**Ron Sink**
LOGGED BY:	**Joe Thompson**	RIG TYPE:	**Schramm T300E**
DATES DRILLED:	**10/12/05**	METHOD OF DRILLING:	**Air Rotary**
		LOGGING METHOD:	**Cuttings**
		DRILL BIT:	**6" downhole hammer**

▼ Water level in completed well

DEPTH	SOIL/ROCK SYMBOL	USCS	SOIL/ROCK DESCRIPTION	BORING COMPLETION	WELL DESCRIPTION



NOTES: 7" Tubex temporary casing to 15'

FIELD BOREHOLE LOG

BOREHOLE/WELL ID: **815-2**

TOTAL DEPTH: **132'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**YTC SWMU 5**	DRILLING CO.:	**Environmental West**
SITE LOCATION:	**Yakima Training Center**	DRILLER:	**Ron Sink**
LOGGED BY:	**Joe Thompson**	RIG TYPE:	**Schramm T300E**
DATES DRILLED:	**10-13-05 - 10-14-05**	METHOD OF DRILLING:	**Air Rotary**
		LOGGING METHOD:	**Cuttings**
		DRILL BIT:	**6" downhole hammer**

▼ Water level in completed well

DEPTH	SOIL/ROCK SYMBOL	USCS	SOIL/ROCK DESCRIPTION	BORING COMPLETION	WELL DESCRIPTION
0 to -130		SM	SAND AND SILT: Tan sand/silt soil and gravel fill overburden		Concrete Surface Completion
		Basalt	BASALT: Dark gray/black vesicular basalt; reddish-brown weathered basalt from 14-15'		Bentonite Seal
					2" PVC
					Sand Pack
		SP/SM	SAND AND SILT: Dark gray fine sand and silt		2" PVC Screen from 115' to 130'
		SW	SAND: Multi-colored coarse sand; poorly sorted; angular to sub-angular		Well Depth 127'

NOTES: 7" Tubex temporary casing to 10'

FIELD BOREHOLE LOG

BOREHOLE/WELL ID: **815-3**

TOTAL DEPTH: **117'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**YTC SWMU 5**	DRILLING CO.:	**Environmental West**
SITE LOCATION:	**Yakima Training Center**	DRILLER:	**Ron Sink**
LOGGED BY:	**Joe Thompson/Troy Bussey**	RIG TYPE:	**Schramm T300E**
DATES DRILLED:	**10/14/05, 10/17/05**	METHOD OF DRILLING:	**Air Rotary**
		LOGGING METHOD:	**Cuttings**
		DRILL BIT:	**6" downhole hammer**

▼ Water level in completed well

DEPTH	SOIL/ROCK SYMBOL	USCS	SOIL/ROCK DESCRIPTION	BORING COMPLETION	WELL DESCRIPTION
0 to -115		SM	SILTY SAND: Tan silty-sand; dry		Concrete Surface Completion
			BASALT: Dark gray to black basalt with vesicles on top of unit; dry		Bentonite Seal
		Basalt			2" PVC
					Sand Pack
					2" PVC Screen from 106' to 116'
		SP/SM	SAND AND SILT: Brown to black coarse sand with some sandy-silt; wet		Well Depth 116'
					Borehole Cave-in

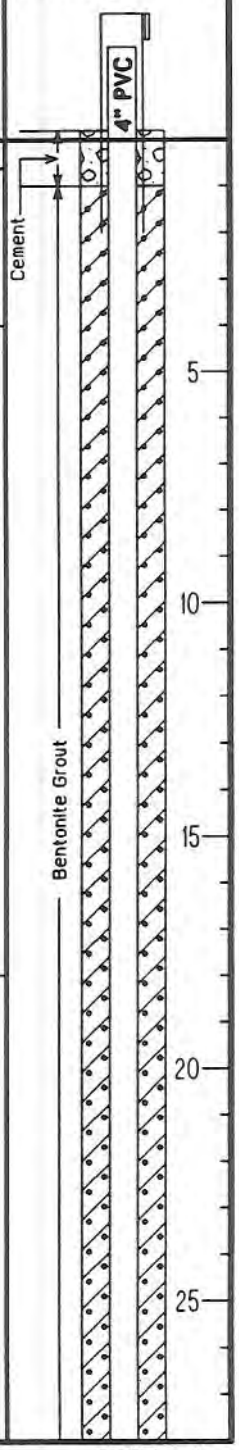
NOTES: 7" Tubex temporary casing to 10'

LOG OF MONITORING WELL MMP-1

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	Water Level: 59.15 ' (BGS)
Well Number: MMP-1 Start Date/Time: 3/2/93; Finish Date/Time: 3/2/93;	Logged By: D. Anderson
Top of Casing Elevation: 1301.42' Surface Elevation: 1298.5' Total Depth: 100.5'	Drilling Contractor: Cascade Drilling Driller: Steve Butler

Elevation Depth (feet)	Graphic Log	Sample ID # Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment
						GM	Asphalt.
						SM	Silty Sand. Medium to coarse sand, tan and very dense.
						SM	Grades to silt/clay (10%), orange.
						SM	Grades to orange-brown.
5						GM:SM	Sandy GRAVEL/gravelly Sand. Fine to medium sand. Gravel to 3", subrounded to rounded basalt. Dense. Moist.
10			50 - -	na	5"		Split-spoon sample - 6" recovery, collect sample #93MMP001SB
15						SM	Silty clayey Sand with gravel. Fine to coarse sand. Gravel (30%) to 2" in diameter. Clay balls when rolled. Tan. Moist to dry.
20			50 - -	na	0"	CL:ML	Silt and Clay tan, very dense, indurated, microfractures with iron staining. Split-spoon sample - no recovery, collect samples:.br .in8 #93MMP002GB Triplicate .in8 #93MMP003GB ASC .in8 #93MMP003GB NPD
25							

Monitoring Well Data



LOG OF MONITORING WELL MMP-1

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MMP-1

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
						CL:ML		
						SM	Sand Loess with some clay/silt. Fine sand. Light brown.	
						BA	Basalt brown, weathered.	
33							Grades to brown-black, vesicular.	
38								
43							Basalt black, crystalline/massive, very dense, little or no vesicules. Dry.	
48						BA		
53								
58								

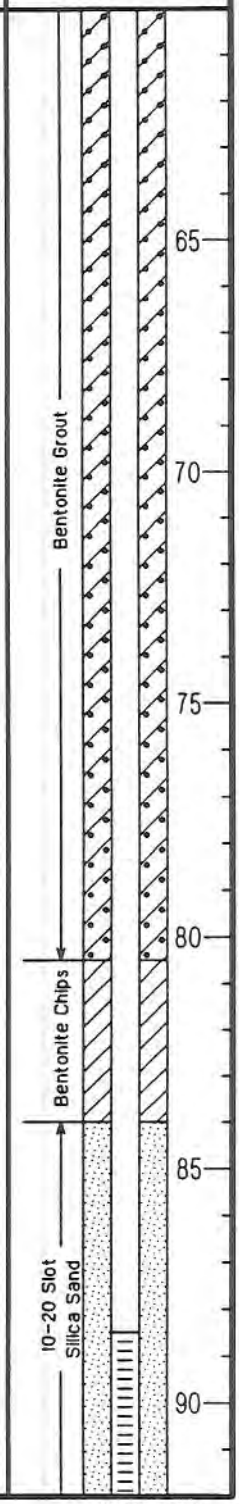
Bentonite Grout

3/9/93

LOG OF MONITORING WELL MMP-1

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MMP-1

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Hw (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
65								
70								
75						BA		
80								
85								
90								



LOG OF MONITORING WELL MMP-1

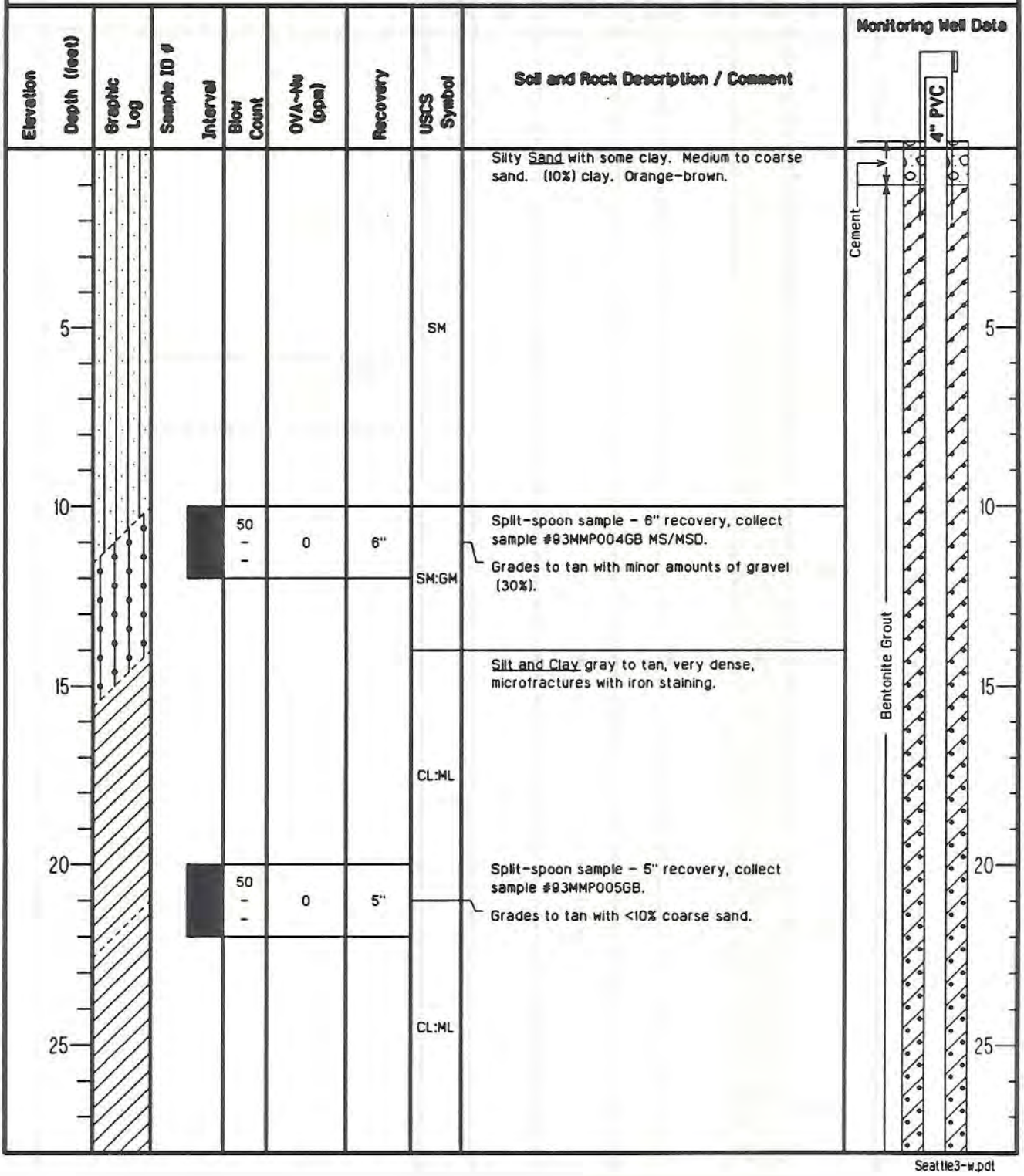
Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MMP-1

Elevation Depth (feet)	Graphic Log	Sample ID # Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
						BA		
97						BA:SM?	Fracture zone in Basalt, vesicules, with some iron staining. Interbeds of green volcanic ash and yellow coarser rhyolite/ash?.	10-20 Slot Silica Sand
							Total Depth of boring 100.5'.	
102								
107								
112								
117								
122								

Seattle3-w.pdt

LOG OF MONITORING WELL MMP-2

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	Water Level: 59.19' (BGS)
Well Number: MMP-2 Start Date/Time: 3/3/93; Finish Date/Time: 3/3/93;	Logged By: D. Anderson
Top of Casing Elevation: 1301.25' Surface Elevation: 1298.8' Total Depth: 75.5'	Drilling Contractor: Cascade Drilling Driller: Steve Butler



Seattle3-w.pdt

LOG OF MONITORING WELL MMP-2

Project Name: Yakima Training Center

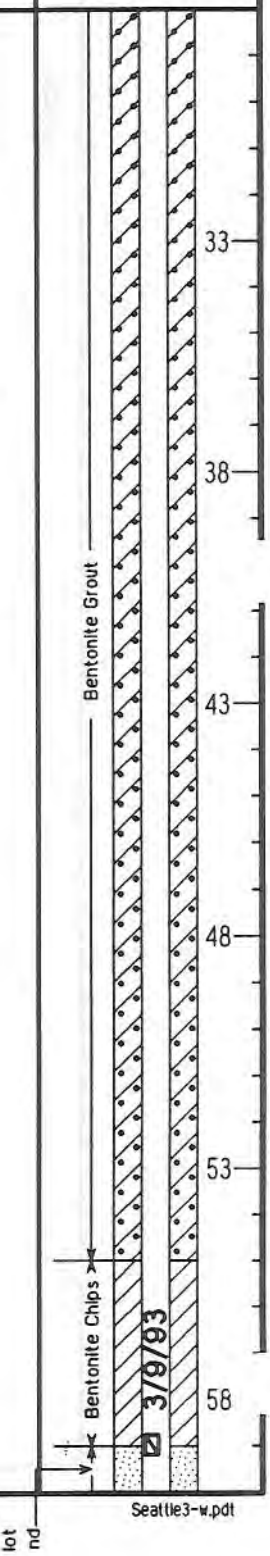
Job #: UF 3020

Location: Yakima, Wa.

WELL #: MMP-2

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment
33						CL:ML	
						ML:CL	Grades to gray.
38						BA	Basalt brown/black, some vesicules with iron staining. Dry.
							Grades to black, crystalline/massive.
43							
48						BA:ML	
53							
58							

Monitoring Well Data

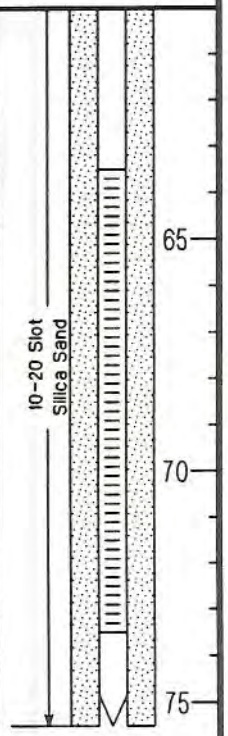


Seattle3-w.pdt

LOG OF MONITORING WELL MMP-2

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MMP-2

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
65						BA:ML		
70						BA:SM?	Fracture zone in Basalt, vesicules, with iron staining. Interbeds of green and yellow ash/volcanics.	
75								
80								
85								
90								

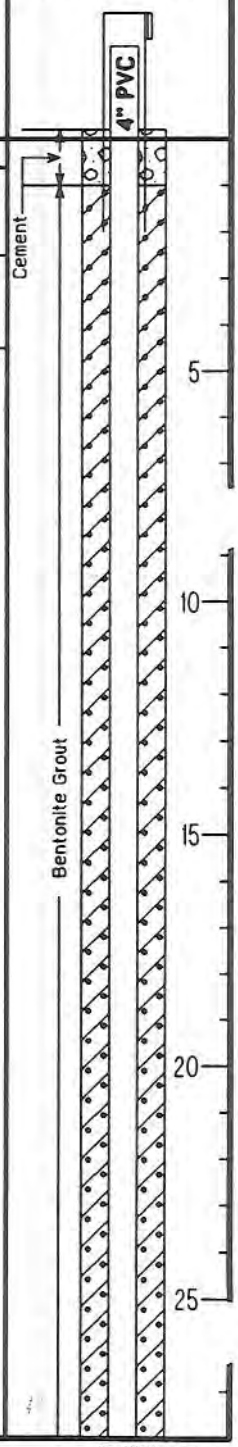


LOG OF MONITORING WELL MRC-2

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	Water Level: 75.43' (BGS)
Well Number: MRC-2 Start Date/Time: 3/1/93; Finish Date/Time: ;	Logged By: D. Anderson
Top of Casing Elevation: 1313.97' Surface Elevation: 1311.7' Total Depth: 113.5'	Drilling Contractor: Cascade Drilling Driller: Steve Butler

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Hw (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment
							Overburden silty, sandy GRAVEL.
						SM	Sand Loess, fine, little or no gravel, tan. Dry,
						SM:GM	Sandy GRAVEL, dark brown.
5							Basalt black to blue-gray, vesiculated, dense. Dry.
10							
15						BA	
20							
25							

Monitoring Well Data



LOG OF MONITORING WELL MRC-2

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MRC-2

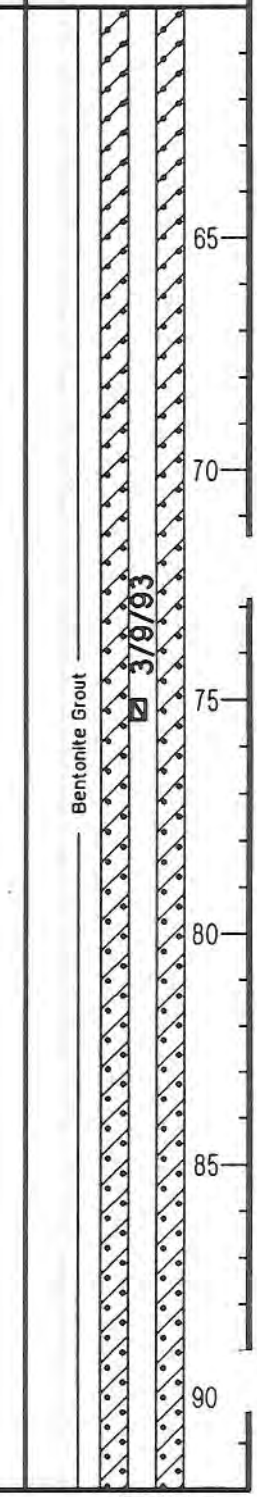
Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Ns (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
33								Bentonite Grout
38								
43						BA		
48								
53								
58								

LOG OF MONITORING WELL MRC-2

Project Name: Yakima Training Center | Job #: UF 3020

Location: Yakima, Wa. | WELL #: MRC-2

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
65								
70								
75						BA		
80								
85								
90								



LOG OF MONITORING WELL MRC-2

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MRC-2

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
97						BA		Bentonite Grout; Bentonite Chips
102								10-20 Slot Silica Sand
107								
112						BA:SM?	Fracture zone in Basalt, vesiculated, holes to 1/4". Iron staining – $FeCO_3$? Interbeds of coarse sand, with some ash/volcanics. Lots of water. A possible void was encountered during drilling below 111' BGS.	
							Total Depth of boring 113.5'.	
117								
122								

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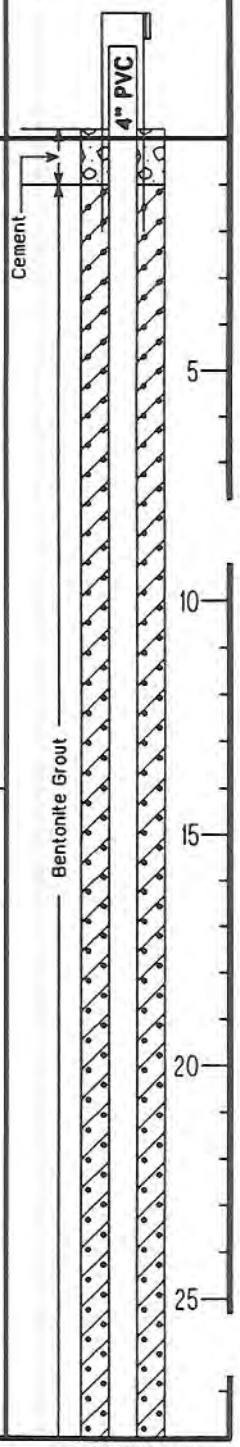
LOG OF MONITORING WELL MTS-1

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	Water Level: 100.22 (BGS)
Well Number: MTS-1 Start Date/Time: 2/24/93; 1430 Finish Date/Time: 2/25/93;	Logged By: D. Anderson
Top of Casing Elevation: 1361.69' Surface Elevation: 1358.1' Total Depth: 127'	Drilling Contractor: Cascade Drilling Driller: Mike Colbert

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment
0							Silty GRAVEL. Overburden/fill? Gravel to 3" in diameter. Dark brown to black. Damp. Basalt gravel.
				1.4		GM	
5							
							Large basalt boulder.
							Collect sample #93MTS001GB from cuttings.
10						GM	
							Sand with clay/silt. Fine to coarse sand, Lt. brown to tan. Clay/ silt (10%). Moist to dry.
15			19 22 24	na	8"	SM:SC	Split-spoon sample - 8" recovery, collect sample #93MTS002SB
							Grades to fine to medium sand, orange to tan. Moist to dry.
20						SM:SC	
25						SM:SC	Grades to lt. gray/brown with gravel (10%) to 1". Dry.

Monitoring Well Data



Seattle3-w.pdt

LOG OF MONITORING WELL MTS-1

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MTS-1

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
33						SM:SC		Bentonite Grout
38						SM:SC	Silty, clayey Sand with (10%) gravel. Fine to coarse sand. Gravel to 1" diameter. Dark black/brown. Moist to dry.	
43								
48						BA	Basalt black, no vesicules, massive with some crystalline structure.	
53								
58								

LOG OF MONITORING WELL MTS-1

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MTS-1

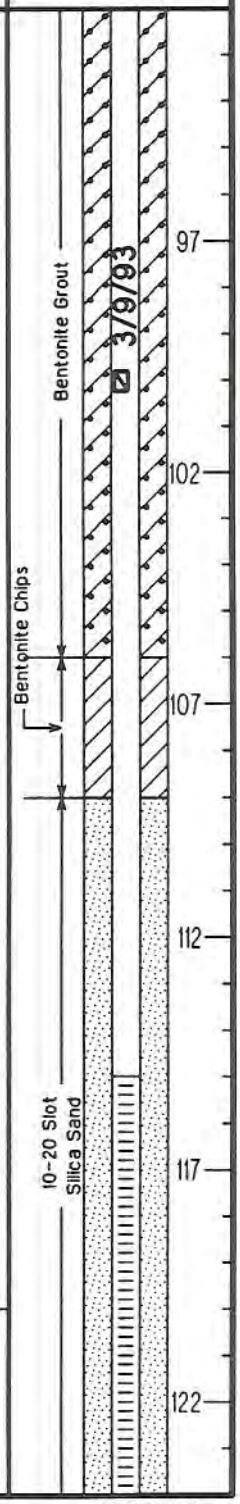
Elevation Depth (feet)	Graphic Log	Sample ID # Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
65								Bentonite Grout
70								
75						BA		
80								
85								
90								

LOG OF MONITORING WELL MTS-1

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MTS-1

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment
97							
102							
107						BA	
112							
117							
122						BA:SM?	Fracture zone in Basalt, wormhole or vesiculated, holes to 1/4", with some iron staining. Interbeds of white ash/volcanics.

Monitoring Well Data



LOG OF MONITORING WELL MTS-1

Project Name: Yakima Training Center

Job #: UF 3020

Location: Yakima, Wa.

WELL #: MTS-1

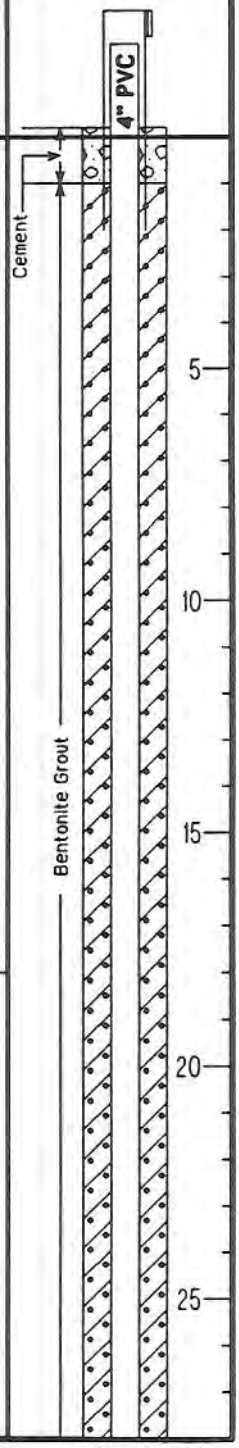
Elevation Depth (feet)	Graphic Log	Sample ID # Interval	Blow Count	OVA-Hs (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
						BA:SM?		10-20 Slot Silica Sand
							Total Depth of Boring 127'.	
129								129
134								134
139								139
144								144
149								149
154								154

LOG OF MONITORING WELL MTS-2

Project Name: Yakima Training Center	**Job #:** UF 3020
Location: Yakima, Wa.	**Water Level:** 92.0 ' (BGS)
Well Number: MTS-2 **Start Date/Time:** 2/25/93; **Finish Date/Time:** 2/25/93;	**Logged By:** D. Anderson
Top of Casing Elevation: 1351.84' **Surface Elevation:** 1348.8' **Total Depth:** 113'	**Drilling Contractor:** Cascade Drilling **Driller:** Mike Colbert

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Hw (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment
5						GM	Silty sandy GRAVEL. Overburden/fill? Gravel (60%) to 6". Medium to coarse sand. Dark brown to black. Moist/damp. Very dense.
							Silty clayey Sand with gravel. Fine to coarse sand. Gravel to 2"., silt/clay (20%). Tan and dense. Moist to dry.
10			50 – –	na	5"	SM:SC	Split-spoon sample – 5" recovery, collect sample #93MTS003GB
							Grades to more clay/silt (40%), drier.
15						SM:SC-ML:CL	
20			50 – –	na	6"	ML:CL	Silt and Clay with minor sand and gravel (<10%). Lt. tan, very dense, fractures in silt/clay filled with iron staining. semi-consolidated to consolidated.
							Split-spoon sample – 6" recovery, collect sample #93MTS004SB
							Silty clayey Sand with gravel. Fine to coarse sand. Gravel (10%) is subrounded to rounded. Silt/clay (10%). Dark brown.
25						SM:SC	

Monitoring Well Data



LOG OF MONITORING WELL MTS-2

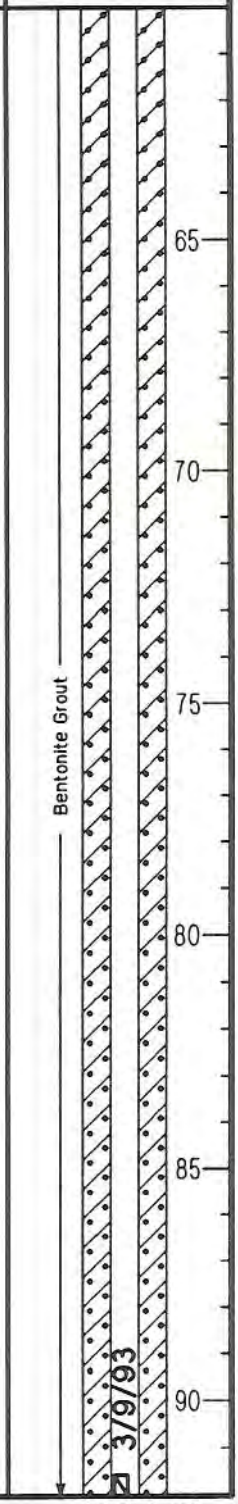
Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MTS-2

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
33						SM:SC		Bentonite Grout
38						BA	Basalt black, vesicular, holes to 1/4". iron staining. Interbeds?, little or no ash/volcanics.	
							Grades to blue-gray black, no holes. Dry.	
							Grades to brown-black, vesicular, small holes. Dry.	
43							Grades to blue-gray black, some vesicules but generally massive. Dry.	
48								
53								
58								

LOG OF MONITORING WELL MTS-2

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MTS-2

Elevation Depth (feet)	Graphic Log	Sample ID # Interval	Blow Count	OVA-Hu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
65								
70								
75						BA		
80								
85								
90								

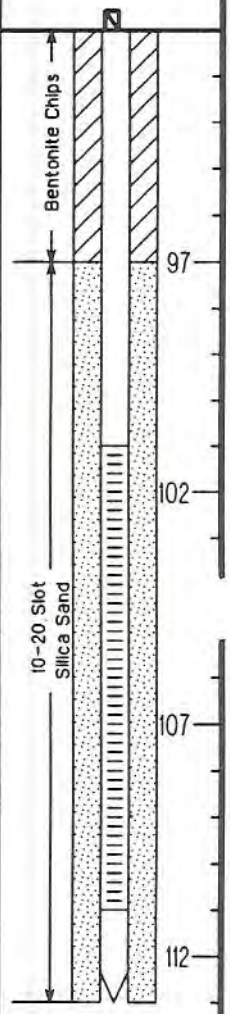


LOG OF MONITORING WELL MTS-2

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: MTS-2

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment
97						BA	
102							
107						BA	Fracture zone in Basalt, vesicular, with some iron staining. Interbeds little or no ash/volcanics.
112							Total Depth of Boring 113'.
117							
122							

Monitoring Well Data



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FIELD BOREHOLE LOG

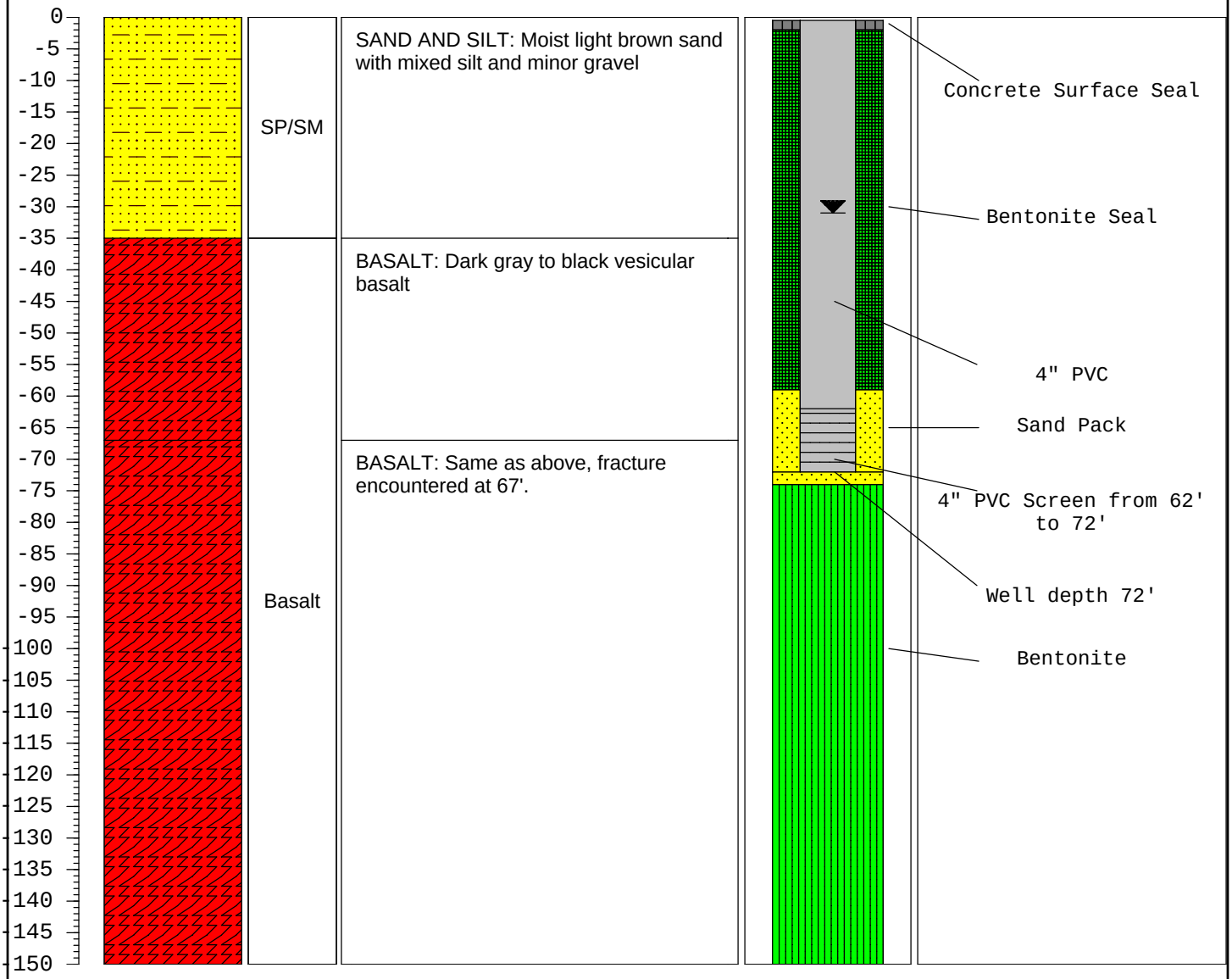
BOREHOLE/WELL ID: **MTS-3**

TOTAL DEPTH: **150'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**YTC GW SI**	DRILLING CO.:	**Environmental West**
SITE LOCATION:	**Yakima Training Center**	DRILLER:	**Ron Sink**
LOGGED BY:	**Joe Thompson/Troy Bussey**	RIG TYPE:	**Shramm T300E**
DATES DRILLED:	**10/27/04**	METHOD OF DRILLING:	**Air Rotary**
		LOGGING METHOD:	**Cuttings**
		DRILL BIT:	**8-inch downhole**

▼ Water level in completed well

DEPTH	SOIL/ROCK SYMBOL	USCS	SOIL/ROCK DESCRIPTION	BORING COMPLETION	WELL DESCRIPTION
0 to 35		SP/SM	SAND AND SILT: Moist light brown sand with mixed silt and minor gravel		
35 to 150		Basalt	BASALT: Dark gray to black vesicular basalt BASALT: Same as above, fracture encountered at 67'.		



NOTES: Tubex 8" temporary casing from 0' bgs to 42' bgs.

FIELD BOREHOLE LOG

BOREHOLE/WELL ID: **MTS-4**

TOTAL DEPTH: **103'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**YTC GW SI**	DRILLING CO.:	**Environmental West**
SITE LOCATION:	**Yakima Training Center**	DRILLER:	**Ron Sink**
LOGGED BY:	**Joe Thompson/Troy Bussey**	RIG TYPE:	**Shramm T300E**
DATES DRILLED:	**10/28/04**	METHOD OF DRILLING:	**Air Rotary**
		LOGGING METHOD:	**Cuttings**
		DRILL BIT:	**8" downhole**

▼ Water level in completed well

DEPTH	SOIL/ROCK SYMBOL	USCS	SOIL/ROCK DESCRIPTION	BORING COMPLETION	WELL DESCRIPTION
0 to -100		SM	SAND AND SILT: Tan to brown sand to silty-sand with some gravel		Concrete Surface Seal
		ML	CLAY AND SILT: Tan to green silt and clay; chlorite(?)		
		SW/SP	SAND AND SILT: Tan to brown sand with silt; some basalt near bottom of unit		Bentonite Seal
		Basalt	BASALT: Dark gray to black massive to vesicular basalt; multiple fractured zones; water encountered at 93' bgs		4" PVC Sand Pack 4" PVC Screen from 82' to 97' Well depth 97' Bentonite

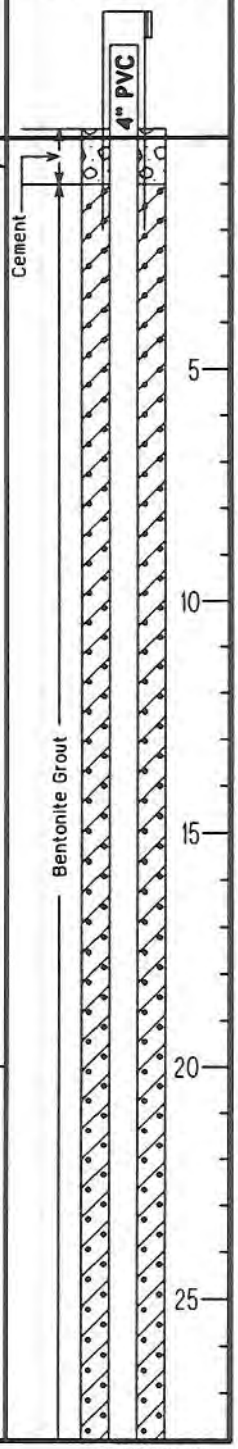
NOTES: Tubex 8" temporary casing from 0' bgs to 28' bgs.

LOG OF MONITORING WELL TVR-1

Project Name: Yakima Training Center	**Job #:** UF 3020
Location: Yakima, Wa.	**Water Level:** 70.39' (BGS)
Well Number: TVR-1 **Start Date/Time:** 2/25/93; **Finish Date/Time:** 2/26/93;	**Logged By:** D. Anderson
Top of Casing Elevation: 1320.11' **Surface Elevation:** 1317.2' **Total Depth:** 105.0'	**Drilling Contractor:** Cascade Drilling **Driller:** Mike Colbert

Elevation / Depth (feet)	Graphic Log	Sample ID #	Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment
								Asphalt
							GM	Sandy Gravel with silty clay, lt. brown, and saturated. Wet.
10				50 – –	0	0"	SM:SC	Clayey Sand with gravel, medium to coarse sand (70%). Gravel (20%) to 2" diameter. Clay (20%), moist and slightly plastic. Split-spoon refusal, collect sample #93TVR001GB from cuttings.
20				50 – –	0	8"	BA	Basalt dark brown, vesiculated. Some crystals in holes and iron staining. Dry. Split-spoon refusal ater 8", collect sample #93TVR002GB.
25							BA	Grades to blue-gray black, massive-crystalline, very dense. Dry.

Monitoring Well Data



LOG OF MONITORING WELL TVR-1

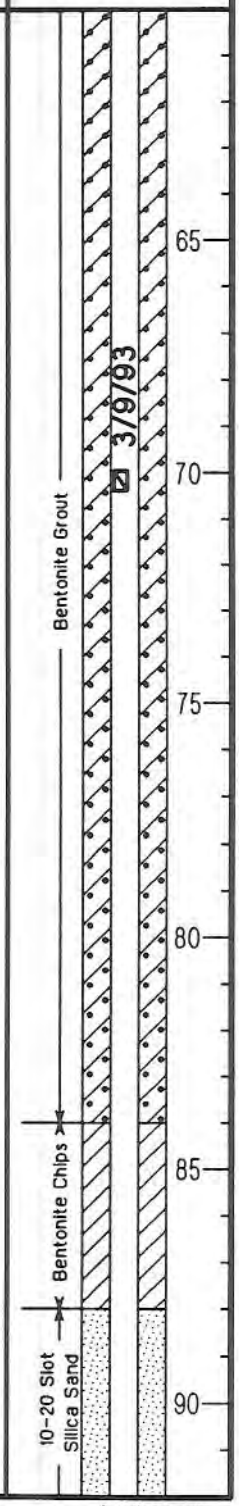
Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: TVR-1

Elevation Depth (feet)	Graphic Log	Sample ID # Interval	Blow Count	OVA-No (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
33								Bentonite Grout
38								
43						BA		
48								
53								
58								

LOG OF MONITORING WELL TVR-1

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: TVR-1

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
65								
70								
75						BA		
80								
85								
90								



LOG OF MONITORING WELL TVR-1

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: TVR-1

Elevation Depth (feet)	Graphic Log	Sample ID # Interval	Blow Count	OVA-Ne (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
97						BA		10-20 Slot Silica Sand
							Drilled to 100' on 2/25/93	
102						BA	Fracture zone in Basalt, vesicules, holes to 1/4". Interbeds of green/whitew ash/rhylolite?, and some quartz.	102
							Total Depth of Boring 105'.	
107								107
112								112
117								117
122								122

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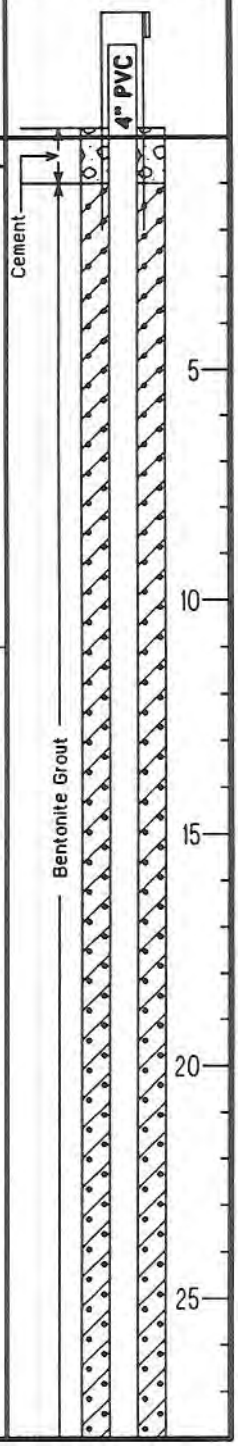
LOG OF MONITORING WELL TVR-2

Project Name: Yakima Training Center	**Job #:** UF 3020
Location: Yakima, Wa.	**Water Level:** 67.07' (BGS)
Well Number: TVR-2 **Start Date/Time:** 2/26/93; **Finish Date/Time:** 2/26/93;	**Logged By:** D. Anderson
Top of Casing Elevation: 1317.52' **Surface Elevation:** 1314.10' **Total Depth:** 95.0'	**Drilling Contractor:** Cascade Drilling **Driller:** Mike Colbert

Elevation / Depth (feet)	Graphic Log	Sample ID #	Interval	Blow Count	OVA-Hu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment
								Asphalt
							GM	Sandy Gravel with silty clay. Overburden. lt. brown. Wet- saturated. Fill?
5							SM:SC	Silty clayey Sand with gravel. fine to medium sand, 10% silt/clay. 10% gravel to 2" diameter. Tan to lt. brown. Dry to moist.
								Note: 1.0' caliche-cemented gravel layer approximately 10' above TVR2 in the bank cut.
10					0	6"		Split-spoon sample #93TVR003SB, 6" recovery.
							BA	Basalt black, massive-crystalline, no vesicules. Dry. No odor.
15							BA	Grades to brown-black. Vesicules encountered, very small. Some iron staining and yellow crystals in holes.
								Grades to blue-gray black, massive-crystalline, very hard.
20							BA	
25								

Monitoring Well Data



LOG OF MONITORING WELL TVR-2

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: TVR-2

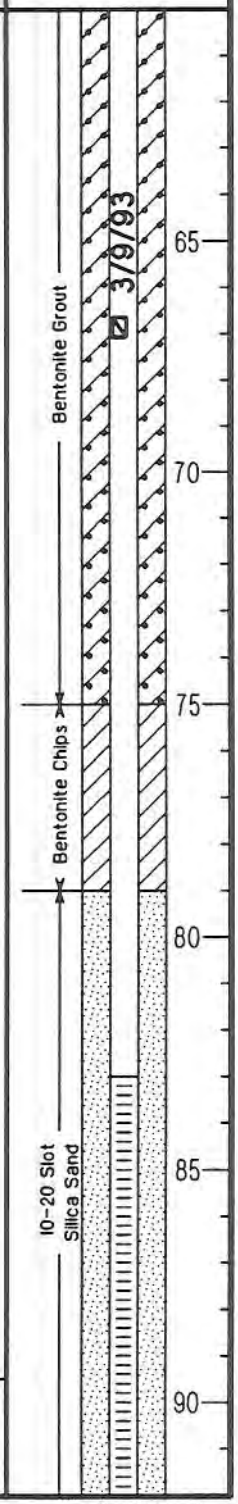
Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Nu (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
33								Bentonite Grout
38								
43						BA		
48								
53								
58								

LOG OF MONITORING WELL TVR-2

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: TVR-2

Elevation / Depth (feet)	Graphic Log	Sample ID # / Interval	Blow Count	OVA-Hs (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment
65							
70							
75						BA	
80							
85							
90						BA:SM?	Fracture zone in Basalt, vesicules, holes to 1/4". Some iron staining - $FeCO_3$. Interbeds of green-yellow ash/volcanics, with some white-yellow quartz.

Monitoring Well Data



LOG OF MONITORING WELL TVR-2

Project Name: Yakima Training Center	Job #: UF 3020
Location: Yakima, Wa.	WELL #: TVR-2

Elevation Depth (feet)	Graphic Log	Sample ID # Interval	Blow Count	OVA-Hw (ppm)	Recovery	USCS Symbol	Soil and Rock Description / Comment	Monitoring Well Data
						BA:SM?		10-20 Slot Silica Sand
							Total Depth of Boring 95'.	
97								97
102								102
107								107
112								112
117								117
122								122

FIELD BOREHOLE LOG

BOREHOLE/WELL ID: **TVR-3**

TOTAL DEPTH: **163'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**YTC GW SI**	DRILLING CO.:	**Environmental West**
SITE LOCATION:	**Yakima Training Center**	DRILLER:	**Ron Sink**
LOGGED BY:	**Joe Thompson**	RIG TYPE:	**Shramm T300E**
DATES DRILLED:	**10/29/04**	METHOD OF DRILLING:	**Air Rotary**
		LOGGING METHOD:	**Cuttings**
		DRILL BIT:	**8" Downhole Hammer**

▼ Water level in completed well

DEPTH	SOIL/ROCK SYMBOL	USCS	SOIL/ROCK DESCRIPTION	BORING COMPLETION	WELL DESCRIPTION
0 to -20		SW/SP	SAND AND SILT: Tan to brown sand/silt mixture with varying basalt gravels intermixed		Concrete Surface Seal
-20 to -145		Basalt	BASALT: Dark gray to black basalt; minor vesicles throughout		Bentonite Seal; 4" PVC
-145 to -160		SP/SC	SAND: Coarse sand varying in color; saturated (10-15 gpm) contains some small gravel and baked clay clasts		Sand Pack; 4" PVC Screen from 143' to 158'; Well depth 158'; Bentonite

NOTES: 8" Tubex temporary casing to 28'

FIELD BOREHOLE LOG

BOREHOLE/WELL ID: **TVR-4**

TOTAL DEPTH: **52'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**YTC GW SI**	DRILLING CO.:	**Environmental West**
SITE LOCATION:	**Yakima Training Center**	DRILLER:	**Ron Sink**
LOGGED BY:	**Joe Thompson**	RIG TYPE:	**Schramm T300E**
DATES DRILLED:	**11/8/04**	METHOD OF DRILLING:	**Air Rotary**
		LOGGING METHOD:	**Cuttings**
		DRILL BIT:	**8" downhole hammer**

▼ Water level in completed well

DEPTH	SOIL/ROCK SYMBOL	USCS	SOIL/ROCK DESCRIPTION	BORING COMPLETION	WELL DESCRIPTION
0 to -50		ML	SANDY SILT: Brown silt to sandy-silt soil overburden		Concrete Surface Seal
		Basalt	FILL: Basalt gravel fill		Bentonite Seal
		SM	SAND AND SILT: Tan to brown unconsolidated mixture of sands, silts, and minor clay		4" PVC
					Sand Pack
		Basalt	BASALT: Dark gray to black basalt; minor vesicles; reddish-brown basalt from 23-25' bgs; contains minor water (		4" PVC Screen from 16' to 26'
					Well depth 26'
					Bentonite

NOTES: 8" Tubex temporary casing from 0 to 27'

FIELD BOREHOLE LOG

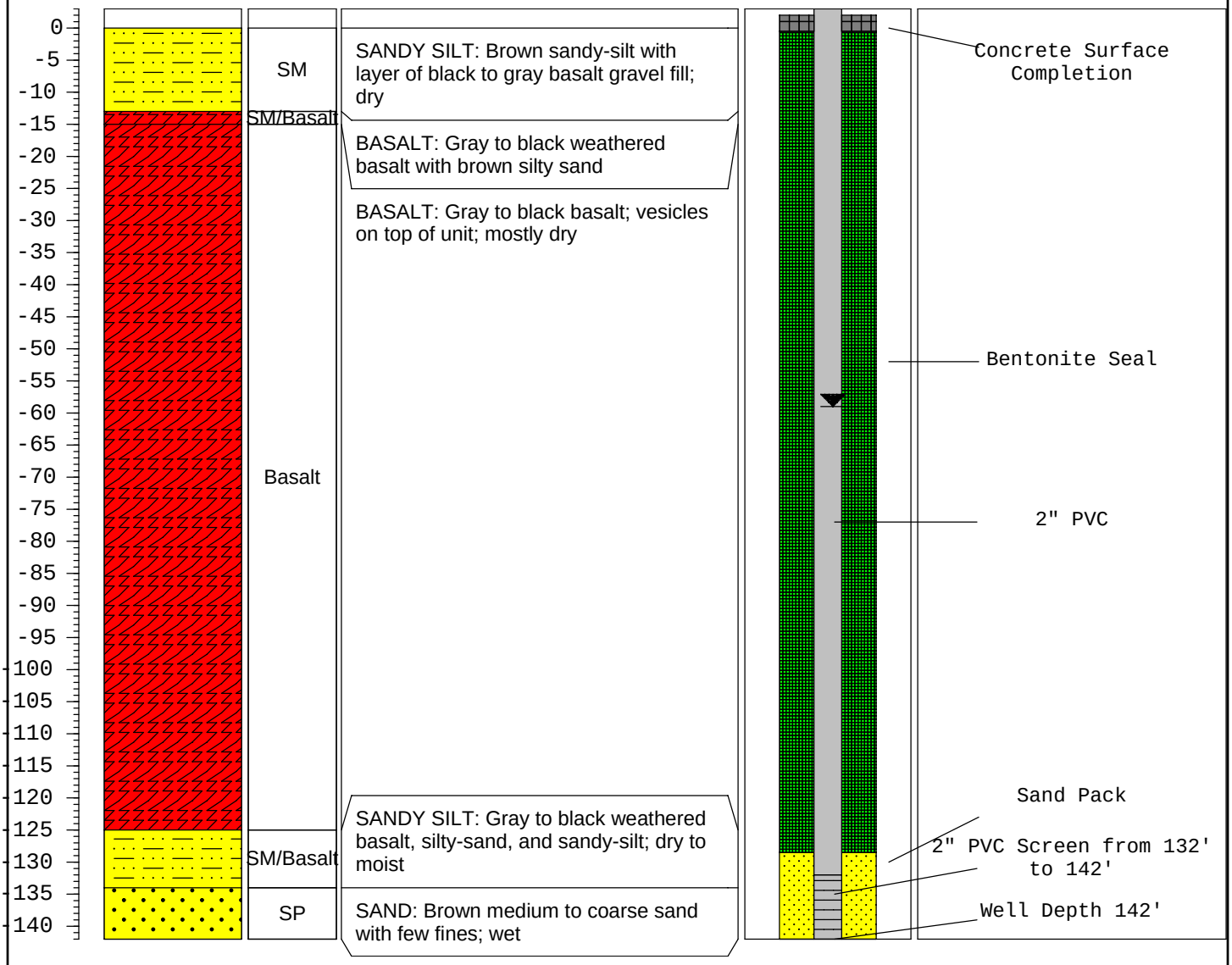
BOREHOLE/WELL ID: **TVR-5**

TOTAL DEPTH: **142'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**YTC Multi-Site SI**	DRILLING CO.:	**Environmental West**
SITE LOCATION:	**Yakima Training Center**	DRILLER:	**Ron Sink**
LOGGED BY:	**Troy Bussey**	RIG TYPE:	**Schramm T300E**
DATES DRILLED:	**10/18/05**	METHOD OF DRILLING:	**Air Rotary**
		LOGGING METHOD:	**Cuttings**
		DRILL BIT:	**6" downhole hammer**

▼ Water level in completed well

DEPTH	SOIL/ROCK SYMBOL	USCS	SOIL/ROCK DESCRIPTION	BORING COMPLETION	WELL DESCRIPTION



NOTES: 7" Tubex Temporary casing to 15'

FIELD BOREHOLE LOG

BOREHOLE/WELL ID: **TVR-6**

TOTAL DEPTH: **151'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**YTC Multi-Site SI**	DRILLING CO.:	**Environmental West**
SITE LOCATION:	**Yakima Training Center**	DRILLER:	**Ron Sink**
LOGGED BY:	**Troy Bussey**	RIG TYPE:	**Schramm T300E**
DATES DRILLED:	**10/20/05 - 10/21/05**	METHOD OF DRILLING:	**Air Rotary**
		LOGGING METHOD:	**Cuttings**
		DRILL BIT:	**6" downhole hammer**

▼ Water level in completed well

DEPTH	SOIL/ROCK SYMBOL	USCS	SOIL/ROCK DESCRIPTION	BORING COMPLETION	WELL DESCRIPTION
0 to -20		SM	SANDY SILT: Tan to reddish-brown sandy silt with layer of gray to black basalt gravel; dry		Concrete Surface Completion
-20 to -140		Basalt	BASALT: Dark gray to black basalt; weathered and vesicular on top of unit; dry		Bentonite Seal 2" PVC
-140 to -150		SP/GP	SAND PEBBLES: Light gray to brown to black medium sand to coarse gravel with few fines; wet		Sand Pack 2" PVC Screen from 139' to 149' Well Depth 149' Borehole Cave-in

NOTES: 7" Tubex temporary casing to 20'

FIELD BOREHOLE LOG

BOREHOLE/WELL ID: **TVR-7**

TOTAL DEPTH: **150'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**YTC Multi-Site SI**	DRILLING CO.:	**Environmental West**
SITE LOCATION:	**Yakima Training Center**	DRILLER:	**Ron Sink**
LOGGED BY:	**Troy Bussey**	RIG TYPE:	**Schramm T300E**
DATES DRILLED:	**10-21-05 - 10-22-05**	METHOD OF DRILLING:	**Air Rotary**
		LOGGING METHOD:	**Cuttings**
		DRILL BIT:	**6" downhole hammer**

▼ Water level in completed well

DEPTH	SOIL/ROCK SYMBOL	USCS	SOIL/ROCK DESCRIPTION	BORING COMPLETION	WELL DESCRIPTION
0 to 20		SM/SC	SILTY SAND: Tan to brown silty fine sand and silty clay with layer of basalt gravel fill; dry to moist		Concrete Surface Completion
20 to 145		Basalt	BASALT: Dark gray to black basalt; weathered and vesicular on top of unit; dry		Bentonite Seal; 2" PVC
145 to 150		GP/SP	GRAVEL AND SAND: Dark gray to brown to black fine gravel with few fines grading to medium sand with some fines; wet		Sand Pack; 2" PVC Screen from 140' to 150'; Well Depth 150'

NOTES: 7" Tubex temporary casing to 20'

APPENDIX B

FIELD FORMS

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WATER SAMPLING LOG

Project: JBLM – Yakima Training Center
Well No.: _____Date Well Purged:_____Date Well Sampled:_____

Well Data

Measuring Point (MP): Top of Casing
Depth to Water Below MP:_____Purge Method:_____

Water Sample Data

Sample Number:_____Time Sample Collected:_____
Sampling Method:_____
Sampling Personnel:_____
Remarks:_____

Checklist

☐ Well capped and locked (pre-sampling)

☐ Water level measured

☐ Appropriate sample containers filled and capped

☐ Samples placed in cooler with blue ice

☐ PDB deployed (if applicable)

☐ Well capped and locked (post-sampling)

Liters Out	Time	PH	Temp	DO	Spec. Cond.	ORP	Turb

DAILY EQUIPMENT INSPECTION

PROJECT_____

MANUFACTURER TYPE _____

UNIT #_____MODEL _____ DATE _____

ENGINE HRS/MILEAGE _____ /_____ SHIFT _____

Check appropriate column and describe correction needed.

	If Good (✔)	NA	Correction Needed
Steering Mechanisms[1] *	_____	_____	_____
Service Brakes [2]	_____	_____	_____
Emergency Brakes[1]			
Parking Brake[1]	_____	_____	_____
Transmission & Controls	_____	_____	_____
Suspension & Springs	_____	_____	_____
Hydraulic Leaks	_____	_____	_____
Exhaust System	_____	_____	_____
Warning Gauges	_____	_____	_____
Windshield[1] & Wipers	_____	_____	_____
Lights (Head & Tail)	_____	_____	_____
Brake Lights[1]	_____	_____	_____
Mirrors	_____	_____	_____
Seat and Seat Belts[1] (w/ ROPS)	_____	_____	_____
Tires/Tread[1]	_____	_____	_____
Regular Horn	_____	_____	_____
Audible Back-up Alarm[1]	_____	_____	_____
Steps, Hand-holds	_____	_____	_____
Fire Extinguisher	_____	_____	_____
Engine Coolant	_____	_____	_____
Engine Oil	_____	_____	_____
Hydraulics & Operating Controls	_____	_____	_____
Fenders/Mudflaps	_____	_____	_____
Heater/defroster	_____	_____	_____
All items in cab or bed secured	_____	_____	_____
Cleanliness inside and outside	_____	_____	_____

Remarks:

[1] Items required to be operational by OSHA 1926.602 before use.

[2] Service brake must be capable of stopping and holding equipment fully loaded. _____

_____ _____

Operator Name (Printed) Operator Signature

Review : Superintendent _____

Date Repairs or adjustments completed:_____

Equipment Supervisor/Mechanic:_____

DAILY BRIEFING SIGN-IN SHEET

Date: _____ Office/Project Name/Location: _____

Shift/Department: _____ Person Conducting Meeting/Briefing: _____

1. AWARENESS (e.g., special EHS concerns, pollution prevention, recent incidents, etc.):

2. OTHER ISSUES (ESQ Plan changes, action items, attendee comments, etc.):

3. ATTENDEES (Print Name):

1.	21.
2.	22.
3.	23.
4.	24.
5.	25.
6.	26.
7.	27.
8.	28.
9.	29.
10.	30.
11.	31.
12.	32.
13.	33.
14.	34.
15.	35.
16.	36.
17.	37.
18.	38.
19.	39.
20.	40.

Give completed documentation to SSHO.

OPERATOR/DRIVER TASK OBSERVATION CHECKLIST

Project Name _____ Project Number _____
Operator's Name _____ Observer's Name _____
Date of observation Type/make of equipment operated

Operating Safety Observations		S	U	N	Comments
A.	**Pre-use inspection prior to staring**				
1.	Conducts daily pre-use inspection.				
2.	Mounts & dismounts carefully-3 point contact.				
3.	Uses the seat belt all times while seated. Sounds horn before staring engine.				
4.	Checks equipment warning devices.				
5.	Checks hydraulic systems (if so equipped). Ensures system is filled and free from leakage.				
6.	Checks air system (if so equipped). Ensures all connections are tight.				
7.	Checks engine oil level. Ensures all plugs, filler caps, and other fittings are secure and not leaking.				
8.	Checks for broken, missing, excessively worn or damaged parts, and reports immediately.				
9.	Checks tires. Looks for serious cuts, bulges, irregularities and abnormal wear. Checks inflation pressures and keeps valve caps in place. Checks for tires rubbing.				
10.	For dump trucks, checks front wheel seal oil levels.				
11.	Checks fuel level and for fuel system leaks.				
12.	Coolant check—Should never open a hot system or pour cold coolant into radiator if the engine is very hot.				
13.	For safe visibility, cleans the windshield, mirrors and light lenses.				
14.	For articulating machines, checks to ensure that the steering frame lock or link have been removed and properly stored.				
15.	Checks for and maintains safe access to the cab (3 point contact). For safe mounting, clears the steps, grab rails, and floor and seat of mud and water.				
16.	Secures tools and keeps the floor free of debris.				
17.	For safe operation wipes steering wheel, foot pedals, hand levers and knobs clean of oil and grease.				
18.	Checks first aid kit and fire extinguisher. Reports missing items to the foreman or supervisor.				
19.	Checks equipment for warning tags.				
B.	**Starting**				
1.	Mounts & dismounts carefully-3 point contact.				
2.	Uses the seat belt at all times while seated. Sounds horn before starting engine.				
3.	Checks equipment warning devices.				
4.	Uses job specific PPE (e.g., hard hats, safety shoes, safety glasses, overalls, gloves, traffic vests, and ear protection).				
5.	Ensures the bowl, bucket, etc. is on the ground.				
6.	For starting, checks all controls to be sure they are in proper position.				
7.	Does not crank an electric starter for more than 30 seconds, Allows two minutes to cool prior to next attempt.				
8.	For steering safety, tests before moving. Turns the wheels to full left and full right.				
9.	Checks service and parking breaks for proper operation.				
10.	Checks the backup alarm.				
11.	Ensures head lamps and safety lighting are in working order.				

Operating Safety Observations		S	U	NA	Comments
C.	**Operation**				
1.	Before moving, places the bucket, bowl, blade, etc., into the transport position and secures all accessory equipment.				
2.	Obeys traffic & other posted/published site safety practices & rules.				
3.	Maintains control of equipment at all times.				
4.	Gives right-of-way to loaded machines or trucks.				
5.	Minimizes engine overspeed on downgrades & when shifting.				
6.	Does not transport passengers without proper provisions.				
7.	Does not engage in horseplay.				
8.	Crosses ditches at an angle, proceeding slowly.				
9.	Avoids large obstacles, deep holes & soft edges.				
10.	Slows down before turning.				
11.	Stays in gear on a downgrade.				
12.	When running across a hillside, proceeds slowly. Never turns sharply uphill or downhill.				
13.	Obeys flagmen & spotter signals.				
14.	Maintains safe stopping distance behind other equipment.				
15.	Shifting				
	a. Always stops the machine/truck and runs the engine at low idle speed to shift from forward into reverse.				
	b. Downshifts one speed range at a time.				
	c. Applies the retarder and/or service brakes to reduce speed before entering sharp turns, fill areas, and downgrades.				
	d. For machines, always leaves the shift lever in neutral position when stopped.				
16.	Braking				
	a. Avoids applying brake continuously on a downgrade unless system is so designed.				
	b. Uses the engine for additional brake force-or, if so equipped, the auxiliary retarder.				
	c. Anticipates grade and selects proper gear range accordingly.				
	d. Brakes firmly in one application. Avoids fanning the brake pedal.				
	e. Uses each brake system only for its intended purpose.				
17.	Turning				
	a. Does not cut corners too close when making sharp turns.				
	b. Maintains engine speed high enough for normal steering.				
	c. Downshifts when necessary or appropriate.				
	d. For machines, carries the load as low as conditions permit to maintain stability.				
18.	Hauling				
	a. Regulates speed to road conditions. Reduces speed before turning. Avoids over speeding the engine.				
	b. Downshifts when approaching a downgrade. Downshifts when necessary on an upgrade to avoid stalling the engine.				
	c. Obeys traffic rules and spotters.				
19.	Parking Precautions				
	a. Selects level ground whenever possible.				
	b. When parking on a grade, positions equipment at right angles to the slope; and sets parking brake if so equipped in addition to lowering bowl, bucket, etc.				
	c. Parks a reasonable distance from other equipment.				
	d. When parking on haul roads, picks the safest place, where the equipment is visible from both directions.				

Operating Safety Observations	S	U	NA	Comments
20. Demonstrates proficiency through smooth operation of controls (e.g., speed of operation appropriate for the conditions, not jerky or hesitant).				
21. Maintains eye contact with other operators, drivers, and ground personnel.				
22. Responds appropriately to signals from flaggers, spotters, operators directing equipment movements.				
23. Stops operation when ground personnel are out of line-of-sight.				
24. Positions and orients machine for safe operation (e.g., safe distance from edge of excavations, tracks perpendicular to excavation, clear distance maintained to fixed obstructions).				
25. Barricades, cones, tape set up to maintain clear zone within swing radius of counterweight.				
26. Maintains safe work area (e.g., windrow at edge of stockpiles, safe slopes).				
D. Shutdown				
1. Lowers the bowl, bucket, etc. to the ground. Lowers and secures the bed on dump trucks.				
2. Reduces engine speed. Sets parking brake.				
3. On machines, places transmission in neutral and locks shift lever if so equipped.				
4. Allows hot engine to cool gradually before stopping it.				
5. Secures equipment to prevent unauthorized starting and movement.				
6. Bleeds the air tanks, if so equipped.				
7. Dismounting—doesn't jump off, uses handrails and steps, and faces the machine/truck when getting off.				
8. Warning tags—attaches appropriate warning tags to steering wheel to prevent accidents.				
E. Overall Appraisal				
Overall appraisal of operator/driver				

S = Satisfactory
U = Unsatisfactory
NA = Non applicable
Note: For unsatisfactory observations also indicate the immediate corrective action taken (e.g., training, verbal or written warning, or reassignment).

EHS WEEKLY/MONTHLY CHECKLIST AND ACTION ITEM REPORT

Inspection Type: ☐ **Weekly** ☐ **Monthly**

Project/Location:	**Inspector/s:**	**Time/Date:**
TOPIC	**OBSERVATIONS**	**FINDING (Y/N)**
Work Conditions		
1. Housekeeping		
2. Walking/Working Surfaces		
3. Aisles and Passageways		
4. Platforms/Scaffolding		
5. Ladders		
6. Stairs, Guardrails, Toe-boards		
7. Exits/Egress		
8. Roadways		
9. Ventilation		
10. Lighting		
11. Noise Exposure		
12. Ergonomics		
13. Site Perimeter and Control Zones Identified		
Equipment		
14. Hand/Portable Tool Condition, Storage and Use		
15. Machine, Conditions/Guarding		
16. Mobile/Heavy Equipment a. Physical inspection of equipment b. Review of daily inspection reports c. Review of equipment deficiency corrections logs/records		
Material Handling Equipment		
17. Hoisting and Rigging		
18. Lifting Aids Used When Possible		
19. Proper Lifting Techniques Used		
Electrical Safety		
20. Power Cords		
21. GFCI		
22. Generators		
23. Breaker Box Access/Clearance		
Hazardous Materials		

24. Hazardous Chemical List Current		
25. MSDS		
26. Labeling		
27. Signs/Postings/Color Coding		
28. Proper Storage and Segregation of Hazardous Materials		
29. Compressed Gas Storage and Use		
Emergency Systems		
30. Emergency phone numbers posted		
31. Evacuation routes, rally points shown on site map		
32. Fire extinguishers inspected monthly		
33. Eyewashes and showers periodically inspected, units flushed, and fluids periodically changed		
34. First Aid Kits/Stations		
35. Emergency Rescue Equipment		
Protective Equipment		
36. PPE used, stored, and maintained in accordance with EHS plan		
37. Respirator use, storage, and maintenance		
Hazardous Waste Storage Area(s)/Satellite Accumulation Area		
38. Designated, secured area with "Hazardous Waste" signage. For SAA area is marked "SAA". (SAA)		
39. Containers:		
a. DOT-spec. containers (for wastes to go off-site only)		
b. Intact/in good condition		
c. Waste compatible with containers (e.g., no evidence of corrosion, softening, bulging) (SAA)		
d. Marked "Hazardous Waste"/ visible Accumulation Date. *For SAA, marked "Hazardous Waste"*		
e. Securely closed and stored to prevent rupture/leaking, except when add/remove waste. (SAA)		
f. For SAA only, Stored "at the point of generation" and meets		

quantity limits (Federal: 55 gal; check state requirements).		
40. Reactive/ignitable wastes stored at least fifty (50) feet from property.		
41. Liquid wastes within secondary containment (BMP, check Waste Management Plan to determine state requirements).		
42. Incompatible wastes separated by a dike, wall, berm or other device.		
43. Stored for less than 90 days. *(CERCLA projects may have storage variance).*[1]		
44. Container tracking log accurately reflects containers stored. (SAA)		
45. Area maintained in an orderly fashion and complies with state/EHS plan requirements. (e.g. good housekeeping, adequate aisle space)		
Hazardous Waste Tank Storage Area		
46. Daily written inspection is being conducted and is maintained on site. Inspections include: a. Overfill/spill control b. Aboveground points of tank; monitoring/leak detection c. Surrounding area Cathodic protection systems are inspected bimonthly (& 6 months after installation)		
Waste/Stockpiles		
47. Refer to: a. Attachment C – Hazardous Waste Less Than 90 Days For Hazardous Waste Stockpiles; b. Attachment C – Solid Waste For State Regulated/Non-Hazardous Stockpiles; and/or c. Attachment C – PCB for PCB Stockpiles, if applicable		
TSCA PCB Wastes		
48. Inspected every 30 days at a minimum. Refer to PESM PCB Checklist		
Point Source Discharges		

[1] If stored on-site 75 or more days, TSDF/transporter has been selected (EHS 1-4), pick-up date scheduled and PM/PESM are aware of 90-day limit.

49. Permit conditions are being met.		
50. Monitoring equipment is fully operational.		
51. Equipment calibrations and maintenance is up-to-date.		
52. Discharge sampling performed at required intervals.		
53. Review monitoring results *(Report permit exceedances)*		
54. DMR and Plant Logs properly completed, signed, and submitted (if required).		
55. Fugitive Dust – Appropriate BMPs are instituted for fugitive dust emissions.		
Stormwater and other NPDES Discharge Activities		
56. SWPPP reflects current activities and has been updated as necessary.		
57. BMPs in SWPPP/Soil Plan implemented.		
58. Visual observations indicate stormwater meets water quality criteria.		
59. Stormwater BMP inspections conducted and documented as required (weekly and before/after > 0.5" storm event).		
60. Monitoring/sampling performed at required intervals.		
61. Review monitoring results if required. (*Report permit exceedances)*		

Project/Location:	**Inspector/s:**		**Time/Date:**
ACTION ITEM	**RESPONSIBLE PARTY**	**SCHEDULE**	**DATE COMPLETED**
Other Conditions or Work Practices			
62.			
63.			
64.			
65.			

66.			
67.			
68.			
69.			
70.			
71.			
72.			
73.			
74.			
75.			

Reviewed by: _____ _____

SS / Site Manager Date

cc: Project Manager (monthly only)
PESM (monthly only)

APPENDIX C

STANDARD OPERATING PROCEDURES

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Standard Operating Procedure 1
Low-Flow Groundwater Sampling

Required Equipment

1. Final project plans
2. Field logbook
3. Indelible black-ink pens and markers
4. Sample tags/labels and appropriate documentation
5. pH/conductivity/temperature meter, water level meter, turbidity meter, and dissolved oxygen meter
6. Flow-through box
7. Insulated cooler(s), chain-of-custody seals, Ziploc™ bags
8. Sample containers, coolers, blue ice or equivalent
9. Sampling equipment: Grundfos Redi-Flow submersible pump; Reel E-Z™ system, including control box; 3600 MultiQuip™ or equivalent portable generator
10. Decontamination equipment: two 15-gallon jugs of potable water (Lakewood Water District); Liquinox; and deionized water
11. Sample log forms (see Attachment 1)

Typical Procedures

Preparation

1. Record necessary data in field logbook.
2. Prepare sampling equipment including calibration of field meters prior to use.
3. Move equipment and supplies to sampling location.

Purging

1. Remove well cap and measure static water level. Also measure the total depth of the well if unknown.
2. Remove the pump from the pump holder and rinse the pump off with distilled water. Slowly lower the pump into the well to the required depth.

3. Connect the discharge hose and cable for the control box to the Reel E-Z™ system. Start the generator and set control box to 120 volts. Make sure the generator is kept downwind from the sampling system.

4. Place the discharge hose in the flow-through box. Place the probes for the calibrated field meters into the flow-through box. Place the bucket beneath flow-through box to catch purged water if applicable.

5. Turn on the pump and adjust the flow rate to about 1 to 2 liters per minute.

6. After about 4 liters of water has been purged from the well, reduce the flow rate to 1 liter per minute.

7. Start recording field parameters every 3 liters of water purged. Purging should continue at a constant rate until the dissolved oxygen and specific conductance stabilize. Stabilization is considered achieved when three sequential measurements are within 10 percent.

Sampling

1. After specified parameters have stabilized, reduce flow rate on control box to create a trickle of water.

2. Disconnect discharge hose from Reel E-Z™ system.

3. Connect Teflon® sampling tube to Reel E-Z™ system. Place the bucket beneath sampling tube to catch unsampled water if applicable.

4. Change sampling gloves.

5. Fill necessary sample bottles. Collect volatile organic compounds; benzene, toluene, ethylbenzene, and xylene; and total petroleum hydrocarbon-gasoline samples first if scheduled. When sampling for volatile organic compounds, keep the flow rate at a trickle of water. When sampling for other analytes, increase flow rate to approximately 1 liter per minute.

6. Ensure sample are properly labeled, and recorded on the Chain-of-custody.

7. Place samples in cooler on ice.

Decontamination

1. Place the pump in one of the 15-gallon drums containing potable water and a small amount of Liquinox or Alconox. Place discharge hose into same bucket.

2. Stand by with additional potable water.

3. Turn on system and pump water through the sampling system. Add more water as needed and pump for about 3 minutes.

4. Place the pump into a second 15-gallon drum of potable water and turn on system. Pump until the soapy water has filled the first bucket. Place the discharge hose into the second 15-gallon bucket of potable water and pump for approximately 1 minute.

5. Remove the pump from the decontamination bucket and place the pump in its holder on the Reel E-Z™ system.

6. Pour unsampled water, purge water, and decontamination water into a 55-gallon drum marked “development water,” if applicable, for transport to the onsite water storage tank.

Documentation

1. Fill out one sample log form for each sample collected. Record all necessary information in the field logbook.

SOP 1, Attachment 1 – Typical Water Sampling Log

WATER SAMPLING LOG

Project: McChord AFB RA-O Area D/ALGT
Well No.:_____ Job Number: 106-8672.06050
Date Well Purged:_____ Date Well Sampled:_____

Well Data

Diameter of Well Casing: 2"
Measuring Point (MP): Top of Casing
Total Depth of Well Below MP:_____
Depth to Water Below MP:_____
Length of Water Column in Well: N/A
Gallons per Foot: N/A Gallons in Well: N/A
Three Times Casing Volume: N/A Gallons Purged from Well:_____
Purge Method: LOW FLOW

Water Sample Data

Sample Number: AD-10-_____ Time Sample Collected:_____
Sampling Method: LOW FLOW
Sampling Personnel:_____
Remarks:_____

Liters Out	Time	PH	Temp	DO	Spec. Cond.	Redox	Turb

Well Casing Volumes

GAL/FOOT 1-1/4" = 0.077 2" = 0.16 3" = 0.37 4" = 0.65
1-1/2" = 0.10 2-1/2" = 0.24 3-1/2" = 0.50 6" = 1.46

Standard Operating Procedure 2
Groundwater Sampling - Bailer

Required Equipment

1. Final project plans
2. Field logbook
3. Indelible black-ink pens and markers
4. Sample tags/labels and appropriate documentation
5. Insulated cooler(s), chain-of-custody seals, Ziploc™ bags
6. Sample containers, coolers, blue ice or equivalent
7. Sampling equipment: 2-inch disposable Tephalon bailers, string
8. Sample log forms (see Attachment 1)

Typical Procedures

Preparation

1. Record necessary data in field logbook.
2. Prepare sampling equipment including calibration of field meters prior to use.
3. Move equipment and supplies to sampling location.

Purging

1. Remove well cap and measure static water level. Also measure the total depth of the well if unknown.
2. Tie string securely to Tephalon bailer and lower into well, allowing it to fill with water.
3. Retrieve bailer from well and pour purge water from bailer into 5-gallon bucket.
4. Deploy bailer back into well and allow to fill.
5. Repeat steps 1 through 4 until 3 casing volumes of water have been purged from the well.

Sampling

1. Once 3 casing volumes of water has been purged from well, deploy bailer, allow to fill and retrieve to collect sample.
2. Change sampling gloves.

3. Fill necessary sample bottles. Collect volatile organic compounds; benzene, toluene, ethylbenzene, and xylene; and total petroleum hydrocarbon-gasoline samples first if scheduled. When sampling for volatile organic compounds, keep the flow rate at a trickle of water. When sampling for other analytes, increase flow rate to approximately 1 liter per minute.

4. Ensure sample are properly labeled, and recorded on the Chain-of-custody.

5. Place samples in cooler on ice.

Decontamination

1. Place the disposable Tephalon bailer in trash, as they are one time use.

2. Pour unsampled water, purge water, and decontamination water into a 55-gallon drum marked “development water,” if applicable, for transport to the onsite water storage tank.

Documentation

1. Fill out one sample log form for each sample collected. Record all necessary information in the field logbook.

SOP 1, Attachment 1 – Typical Water Sampling Log

WATER SAMPLING LOG

Project: McChord AFB RA-O Area D/ALGT
Well No.:_____ Job Number: 106-8672.06050
Date Well Purged:_____ Date Well Sampled:_____

Well Data

Diameter of Well Casing: 2"
Measuring Point (MP): Top of Casing
Total Depth of Well Below MP:_____
Depth to Water Below MP:_____
Length of Water Column in Well: N/A
Gallons per Foot: N/A Gallons in Well: N/A
Three Times Casing Volume: N/A Gallons Purged from Well:_____
Purge Method: LOW FLOW

Water Sample Data

Sample Number: AD-10-_____ Time Sample Collected:_____
Sampling Method: LOW FLOW
Sampling Personnel:_____
Remarks:_____

Liters Out	Time	PH	Temp	DO	Spec. Cond.	Redox	Turb

Well Casing Volumes

GAL/FOOT 1-1/4" = 0.077 2" = 0.16 3" = 0.37 4" = 0.65
1-1/2" = 0.10 2-1/2" = 0.24 3-1/2" = 0.50 6" = 1.46

Standard Operating Procedure 3
Groundwater Sampling - PDB

Required Equipment

1. Final project plans
2. Field logbook
3. Indelible black-ink pens and markers
4. Sample tags/labels and appropriate documentation
5. Insulated cooler(s), chain-of-custody seals, Ziploc™ bags
6. Sample containers, coolers, blue ice or equivalent
7. Sampling equipment: PDBs and wiring harness
8. Sample log forms (see Attachment 1)

Typical Procedures

Preparation

1. Record necessary data in field logbook.
2. Prepare sampling equipment including calibration of field meters prior to use.
3. Move equipment and supplies to sampling location.

Purging

1. Remove well cap and measure static water level. Also measure the total depth of the well if unknown.
2. Remove PDB from well.

Sampling

1. Change sampling gloves.
2. Carefully cut corner of PDB, and immediately fill necessary sample bottles. Collect volatile organic compounds; benzene, toluene, ethylbenzene, and xylene; and total petroleum hydrocarbon-gasoline samples first if scheduled.
3. Ensure sample are properly labeled, and recorded on the Chain-of-custody.
4. Place samples in cooler on ice.
5. Deploy new PDB down well if applicable.

Decontamination

1. Place the PDB in trash, as they are one time use.

Documentation

1. Fill out one sample log form for each sample collected. Record all necessary information in the field logbook.

SOP 1, Attachment 1 – Typical Water Sampling Log

WATER SAMPLING LOG

Project: McChord AFB RA-O Area D/ALGT
Well No.:_____ Job Number: 106-8672.06050
Date Well Purged:_____ Date Well Sampled:_____

Well Data

Diameter of Well Casing: 2"
Measuring Point (MP): Top of Casing
Total Depth of Well Below MP:_____
Depth to Water Below MP:_____
Length of Water Column in Well: N/A
Gallons per Foot: N/A Gallons in Well: N/A
Three Times Casing Volume: N/A Gallons Purged from Well:_____
Purge Method: LOW FLOW

Water Sample Data

Sample Number: AD-10-_____ Time Sample Collected:_____
Sampling Method: LOW FLOW
Sampling Personnel:_____
Remarks:_____

Liters Out	Time	PH	Temp	DO	Spec. Cond.	Redox	Turb

Well Casing Volumes

GAL/FOOT 1-1/4" = 0.077 2" = 0.16 3" = 0.37 4" = 0.65
1-1/2" = 0.10 2-1/2" = 0.24 3-1/2" = 0.50 6" = 1.46

APPENDIX D

JBLM ACCIDENT PREVENTION PLAN

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Environmental Remediation Program Services Joint Base Lewis McChord and Yakima Training Center, Washington

Accident Prevention Plan

Prepared for

U.S. Department of the Army
Seattle District, Corps of Engineers

PO Box 3755
Seattle, Washington 98124-2255

Prepared by:

Tetra Tech EC, Inc.

19803 North Creek Parkway
Bothell, WA 98011
(425) 482-7600

Contract # W912DW-11-D-1031; Task Order 0001

September 3, 2013

INTRODUCTION

This Accident Prevention Plan (APP) addresses the safety and health practices and controls that will be implemented by all Sealaska and SES-Tt SES-Tt Team, Inc. Team (SES-Tt) employees and subcontractors involved treatment system operation and maintenance and groundwater sampling. Activities addressed by this plan include remediation system operation and maintenance and monitoring, land use control and other site management, waste management and disposal.

Contract No. W912DW-11-D-1031, Task Order 0001 with all safety and health evaluations and controls being addressed in this APP and the Site Safety and Health Plan (SSHP) included as Attachment 1.

Activities performed under this APP will comply with applicable sections of 29 Code of Federal Regulations (CFR) 1910.120, the United States Army Corps of Engineers (USACE) Safety and Health Requirements Manual (EM 385-1-1), and the SES-Tt SES-Tt Team, Inc. Environmental Health and Safety Program.

Modifications to the APP/SSHP will be reviewed and approved by the SES-Tt Director of Environmental, Health and Safety, and the SHM for this project and the USACE prior to implementation via the Design Change Notice (DCN) process.

Tetra Tech, subcontractors, and the client do not guarantee the health or safety of any person entering this site. Because of the nature of this site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Strict adherence to the safety and health guidelines set forth herein will reduce, but not eliminate, the potential for injury at this site. The safety and health guidelines in this plan were prepared specifically for this site and should not be used on any other site without prior research and evaluation by trained safety and health specialists. A copy of this plan will be kept at the site in the Site Safety and Health Officer (SSHO) field vehicle during fieldwork.

TABLE OF CONTENTS

ATTACHMENTS

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
APP	Accident Prevention Plan
bpm	beats per minute
CEO	Chief Executive Officer
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CP/QC	Contractor Production / Quality Control
CPR	cardiopulmonary resuscitation
dBA	decibel, A-weighted scale
DCN	Design Change Notice
EHS	Environmental Health and Safety
FOL	Field Operations Lead
EZ	Exclusion Zone
GFCI	ground fault circuit interrupter
HAZCOM	hazard communication
HAZWOPER	Hazardous Waste Operations and Emergency Response
MCC	motor control center
MSDS	material safety data sheet
N/A	Not Applicable
NRR	noise reduction rating
OSHA	Occupational Safety and Health Administration
PM	Project Manager
PPE	personal protective equipment
PQCM	Project Quality Control Manager
PVC	polyvinyl chloride
QA	Quality Assurance
QAR	Quality Assurance Representative
QC	Quality Control
QCPM	Quality Control Program Manager
RAC	Risk Assessment Code
SES-Tt	Sealaska -SES-Tt Team

SHM	Safety and Health Manager
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
TO	Task Order
USACE	U.S. Army Corps of Engineers

1.0 SIGNATURE PAGE

CONTRACT W912DW-11-D-1031
TASK ORDER 0001

DRAFT
ACCIDENT PREVENTION PLAN INCLUDING SITE SAFETY AND HEALTH PLAN

SEPTEMBER 3, 2014

ENVIRONMENTAL REMEDIATION PROGRAM SERVICES JOINT BASE LEWIS McCHORD & YAKIMA TRAINING CENTER, WASHINGTON
SES-TT SES-TT TEAM, INC.
BOTHELL, WASHINGTON

Prepared by: _____

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Concurrence by: _____

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2.0 BACKGROUND INFORMATION

2a CONTRACTOR NAME

Sealaska - Tetra Tech EC Team, Inc. (SES-Tt)

2b CONTRACT NUMBER

W912DW-11-D-1031

2c PROJECT NAME

Task Order (TO) 0001, Remediation Program Services Joint Base Lewis McChord and Yakima Training Center, Washington.

2d DESCRIPTION OF WORK TO BE PERFORMED

This TO has a 12-month period of performance starting at the date of notice to proceed on July 15, 2014 through August 31, 2015. The work to be performed includes:

- Remediation systems operation, maintenance, monitoring, and reporting.
- Contaminant fate, transport, nature and extent investigations and monitoring.
- Technical, regulatory, and programmatic analysis, advice, and reporting
- Land use control and other site management.
- Managing and disposing of all waste generated.

3.0 SAFETY AND HEALTH POLICY

The Sealaska-Tetra Tech EC Team (SES-Tt Team) management, staff, and subcontractors are committed to ensuring the health, safety, and well-being of our employees and the communities in which we work. Our commitment includes the following:

- Demonstrating commitment to improving health and safety performance.
- Participating in programs that support the environmental, social, and financial strength of our clients, shareholders, and community.
- Meeting or exceeding all applicable local, state, and federal compliance requirements and applicable occupational health and safety legislation.
- Identifying and mitigating hazards through proactive elimination or control.
- Providing exceptional training to all employees to meet or exceed compliance with all applicable health, safety, and environmental legislation.
- Striving to achieve zero workplace injuries through appropriate training measures and identification of workplace hazards.

The SHM establishes policies and procedures to meet these commitments. Each employee of SES-Tt SES-Tt Team has the responsibility to help create and work in a safe and environmentally protective manner, to strive for the elimination of all workplace accidents, and to promote the continual improvement of our organization. A copy of the HSM table of contents and policy statement are provided in Attachment 2.

4.0 RESPONSIBILITIES AND LINES OF AUTHORITY

4a DECLARATION OF HEALTH & SAFETY PROGRAM RESPONSIBILITY

SES-Tt management, including Project Managers (PMs), take ultimate responsibility for implementing the health and safety on this project. Controlling job site hazards and preventing accidents and injuries, however, requires the participation of all project personnel, including site workers and subcontractors. To this extent, everyone associated with the work has a role to play in ensuring that a safe and healthful work environment is maintained throughout the project. These specific roles and responsibilities are described below.

4b IDENTIFICATION AND ACCOUNTABLILITY OF PROJECT PERSONNEL

SES-Tt project staff will include personnel from various departments within the SES-Tt organization. Designated staff positions for this APP include: PM, Project Quality Control Manager (PQCM), SS, SSHO, and Alternate SSHO. Resumes for the SSHO and all alternates are listed in Attachment 3. The project health and safety staff are supported by a Certified Industrial Hygienist (CIH), who is the SES-Tt SHM and serves as the Safety and Health and Safety Manager.

The lines-of-authority of these individuals are described in Section 4e and Figure 4-1. Their specific roles and responsibilities are as follows:

Project Manager

The PM shall be responsible for the management of all aspects of the project for Tetra Tech, including safety and health. The PM shall provide management of and direction to the project personnel assigned to the project.

Project Quality Control Manager

The PQCM is responsible for all matters relating to project quality and ensures the implementation and maintenance of the on-site quality control (QC) program. The PQCM will also evaluate and report any situations that appear to compromise worker health and safety at the site.

Field Operations Lead

The FOL or alternate shall be responsible for the management of SES-Tt and subcontractor site personnel. The FOL will provide direction for the activities of the field personnel and shall keep the PM informed as to personnel requirements and scheduled release dates. The FOL will be responsible for the following:

- Supervising the site personnel.

- Coordinating with home office staff.
- Managing and coordinating all SES-Tt subcontractors on site.
- Ensuring completion of the field activities in accordance with the contract documents and applicable codes and standards.
- Ensuring completion of the project on schedule and within budget, in accordance with the permits and project plans.
- Ensuring that appropriate change management procedures are in place.
- Ensuring compliance with applicable environmental, health, and safety regulations, including the Occupational Safety and Health Administration (OSHA), the Hazardous Waste Operations and Emergency Response Standard (HAZWOPER), the USACE Safety and Health Requirements Manual (EM385-1-1), plus client- specific requirements.
- Ensuring the maintenance of adequate site security, appropriate for the activities being performed.
- Ensuring that permanent equipment is properly stored and maintained, consistent with manufacturer instructions and good warehousing practices.

Site Safety and Health Officer

The SSHO and alternate are qualified to fulfill the duties and responsibilities for maintaining regulatory compliance and conformance with the HSM. For this TO, the FOL will serve in a dual role as the SSHO. The FOL will have direct stop work authority during the drilling program, as granted by both SES-Tt PM, Project QC Officer, and DHSE/PHSM. Training requirements for this position are detailed in Section 6. Work will not be performed unless the SSHO or alternate is present at the job site. The SSHO resume and training certifications as well as those of the alternate SSHOs are found in Attachment 3. The SSHO shall be responsible for the following:

- Reporting to the PM and collaterally to the SHM.
- Assisting with the implementation of the SHM, and ensuring that SES-Tt employees and subcontractors understand the requirements of the SES-Tt Health and Safety Manual procedures through training and communication.
- Helping to ensure that operations are performed in compliance with applicable client and site-specific requirements and government regulations.
- Implementing the health and safety portion of these plans.
- Conducting and documenting daily health and safety briefings.
- Conducting informal inspections of the project site.

- Conducting health and safety inspections for both SES-Tt and subcontractor operations.
- Exercising stop work authority when warranted by conditions, per the project plans.
- Performing specific tasks per the project plans.
- Ensuring that SES-Tt site personnel have received required health and safety regulatory and program training, per the EHS 3-1, Health and Safety Training.
- Conducting accident and incident investigations in collaboration with the DHSE.
- Functioning as an on-site resource for all environmental, safety, loss control, and industrial hygiene issues.
- Ensuring that the specific responsibilities for health and safety personnel identified in the HSM and the SSHP are fulfilled.
- Performing on-site monitoring to determine appropriate levels and use of personal protective equipment (PPE), with assistance from the DHSE/PHSM as needed.
- Performing site surveillance, hazard identification, and health risk analysis, as directed by the SHM.
- Implementing procedures and programs to eliminate risk to site personnel, including initiating changes to the plan.
- Fulfilling the role of Site Emergency Coordinator as described in Section 9.
- Implementing site control measures.
- Maintaining the field health and safety logbook.
- Providing summaries of field operations and progress to the SHM.

Safety and Health Manager

The SHM has the responsibility and authority to oversee the development, revision, and approval of the APP and to:

- Audit the equipment and training of involved company and subcontractor employees to implement the APP.
- Review health and safety issues that may arise during the project.
- Approve SSHO assignments and project responsibilities and coordinate changes in PPE requirements with the SSHO.
- Conduct major accident investigations.

- Perform periodic site audits and inspections.
- Use discretionary authority to shut down the project to correct observed deficiencies.

The project may not start until the SHM and the USACE have approved all plans, including the APP/SSHP.

Project Quality Control Officer

The Project Quality Control Officer (PQSO) reports directly to the Program Manager on all matters affecting QC. The QCPM has:

- Authority to act on behalf of the Program Manager on site-related issues affecting the quality of the work performed.
- Responsibility to report any observations or information on unsafe field activities or conditions to the SSHO or the DHSE/PHSM.

Site Workers

- All site workers, including subcontractors, have the responsibility to report any unsafe or potentially hazardous situations to the SSHO or the SS.
- All site workers will maintain knowledge of the information, instructions, and emergency response actions contained in the APP.
- All site workers will comply with the rules, regulations, and procedures as set forth in the APP, and Tt Project Rules Handbook
- All site workers are expected to stop work and contact their supervisor whenever they believe their work, or that of their coworkers, poses an uncontrolled hazard or unreasonable risk of injury or illness.
- Each project participant is expected and encouraged to participate in the implementation of the environmental safety and health process through participation in meetings, incident reporting and investigations, inspections, hazard identifications, and hazard analyses.

4c COMPETENT PERSON QUALIFICATIONS FOR OVERSIGHT OF SPECIFIC OSHA-REGULATED TASKS

The SSHO is competent to provide project health and safety oversight on the project but may not be qualified to act as a competent person for other specialized tasks specifically regulated by OSHA (such as confined space entry, excavation, scaffolding, crane operations, working at heights, and handling certain regulated substances). These activities require oversight from designated persons who have training and/or experience and are authorized to implement corrective measures as needed. Currently, these tasks are not a part of this project. Should

these or other such tasks become necessary to this project, this APP/SSHP will be amended to include the names and qualifications of individuals who, by virtue of their training and experience, and authorization to stop work are competent to provide health and safety oversight of these activities.

For this project a designated competent person is not required.

4d PRE-TASK SAFETY AND HEALTH ANALYSIS

Before work begins on the project, all major field activities were evaluated for safety and health hazards and are presented in Table 10-1, and Appendix A, Activity Hazard Analysis (AHA). This analysis involved a variety of work site examinations to identify not only existing hazards but also conditions and operations in which changes might occur to create new hazards. Any corrective measures were then incorporated into the scope of work and the APP/SSHP. In addition, the project will include a hazard identification program in which all site workers may record identified workplace hazards on a tally sheet so they can be systematically evaluated and addressed. These hazard findings are also discussed during the daily tailgate safety meetings.

Health and safety analysis is also achieved through regular inspections of the job site as described in Section 7 of this APP.

4e LINES OF AUTHORITY

The PM reports directly to SES-Tt Program Manager. The SS/SSHO reports to the PM but is directly supported by Tetra Tech's SHM. The SHM reports directly to Tetra Tech' EC President Project quality control functions will be managed by the PM who is supported by the SES-Tt QCPM. The QCPM reports to the Program Manager. For all field work associated with this pumping test, the SES-Tt FOL will have direct stop work authority during the drilling program, as granted by both SES-Tt PM, Project QC Officer, and SHM. These individuals and the lines-of-authority are shown in the organization chart in Figure 4-1.

4f NON-COMPLIANCE WITH SAFETY REQUIREMENTS

Compliance with the safety and health requirements described in this APP is expected of all personnel working on the projects. When lapses in a worker's compliance occur, the SSHO will attempt to resolve the issue by discussing the problem directly with the individual, stating clearly the nature of the deficiency and the steps that need to be taken to correct it. These corrective actions will be written into the field logbook with completion dates specified as appropriate. The SSHO will then monitor the worker's performance to ensure the problem has been corrected. If compliance problems continue to exist, a graded disciplinary approach will be taken, which may involve a letter of reprimand issued to the worker or removal from the project. The SSHO and

all site personnel will have direct stop work authority during the drilling program for any safety violations are an immediate danger.

If the noncompliance issue involves failure to correct an unsafe condition or implement a required safety and health control, the problem will immediately be brought to the attention of the SSHO and the Project Manager for resolution. The Project Manager will then immediately notify USACE Project Manager by phone. All personnel working on site are expected to participate in this hazard notification process. Once the issue has been disclosed, an investigation will be conducted by the SSHO or DHSE to evaluate the deficiency and correct it. Their findings and corrective actions will be reported on the SES-Tt Incident Reporting system, and the system will automatically notify the Project Manager and the DHSE. An electronic copy of the deficiency and corrective action will be provided to the USACE Project Engineer and QAR. The unsafe condition or control will be immediately corrected if possible. Otherwise, the problem will be isolated, site personnel informed, and a corrective action schedule with assigned completion dates will be recorded t and implemented until the matter is resolved.

4g MANAGEMENT ACCOUNTABILITY

To ensure project management is held accountable for the safety and health performance on this project, the Program Manager will conduct reviews of project performance regularly. In conjunction with the PHSM, he will evaluate the nature of all incidents occurring on each project and provide direct feedback to the Project Manager on the adequacy of their approach to managing safety and health risks.

SES-Tt executive management conducts quarterly program reviews with the Program Manager. If applicable, the review will include a discussion on the quantity and types of incidents that occurred and the actions taken to improve safety performance.

Project management directly participates in scheduled site inspections, reviews all accident/incident reports and investigations, reviews all quality incident reports, ensures action items from incident reports are completed, and approves all changes to this APP.

Safety and health performance is also a specific category in each SES-Tt associate’s performance evaluation.

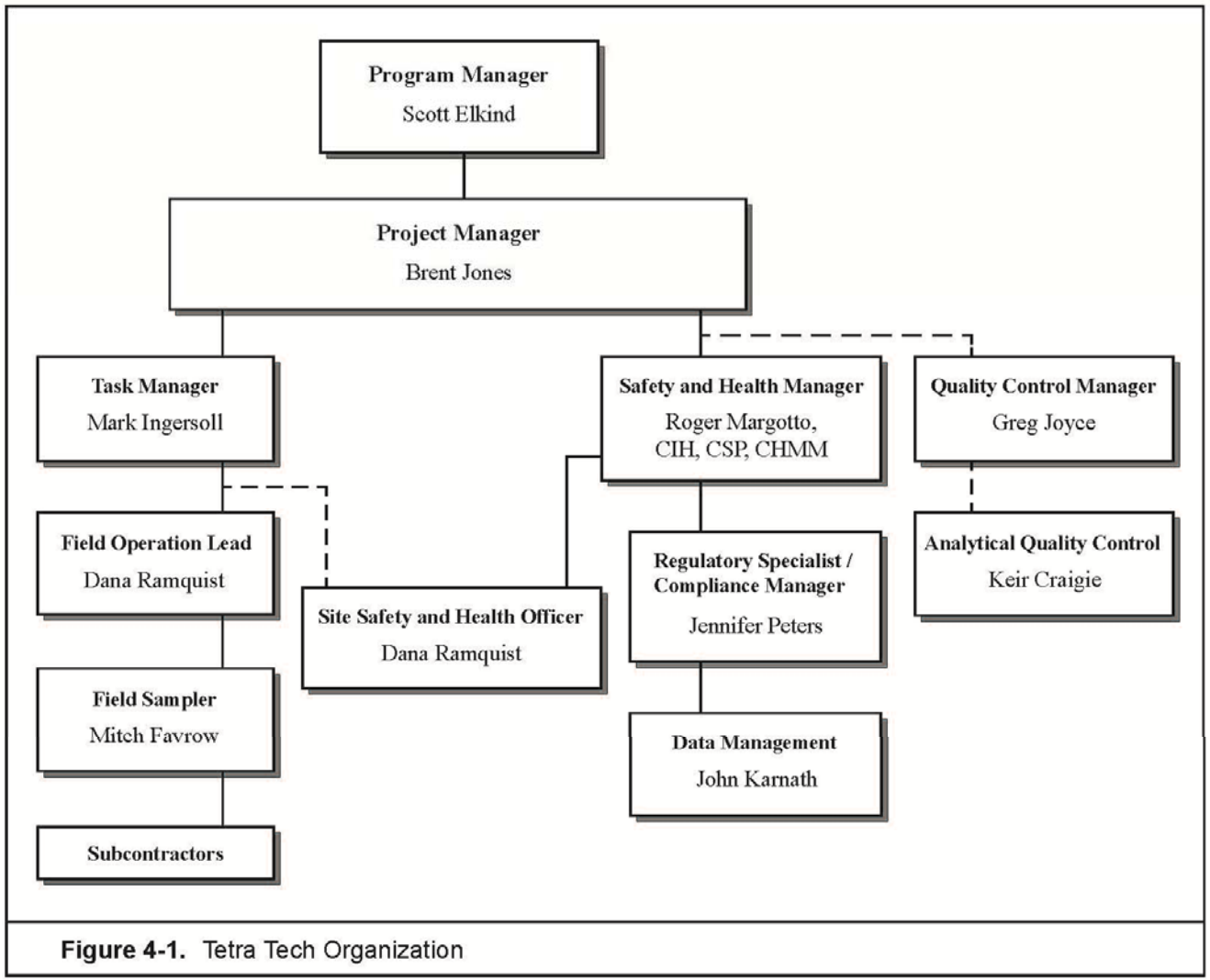

Figure 4-1. Tetra Tech Organization

5.0 SUBCONTRACTORS AND SUPPLIERS

5a IDENTIFICATION OF SUBCONTRACTORS

Subcontractors that are currently scheduled to assist on this project include:

- David Johnson Engineering – Operation and maintenance and inspections of JBLM Area D/ALGT groundwater treatment system.
- Cascade Drilling- Monitoring well decommissioning groundwater injections (JBLM).
- Helen's Pumps – Monitoring well rehabilitation and pump replacement.
- Vironex, Inc – ISCO Injection.
- SES-Tt – field support.

This APP will be amended with the identity of additional subcontractors, as needed.

5b SAFETY RESPONSIBILITIES OF SUBCONTRACTORS

All subcontractors working on this project will be required to comply with site-specific work rules, APP requirements, applicable HSM policies and procedures, vendor contract requirements, state and federal worker safety and health regulations, and client-specified project requirements. Subcontractors performing high-incident potential work will be approved by the DHSE prior to starting work. All subcontractors will be responsible for ensuring their work activities are conducted in a safe and healthful manner in accordance with the above-mentioned standards and directives. They will be expected to participate in all scheduled safety and health meetings and training sessions and to be available for routine safety and health audits and inspections. They must also report to the SS all unsafe conditions and behaviors, loss, damage, and injury events.

The SS will direct the activities of all subcontractors working on site and will monitor their compliance with this APP. Problems with compliance will be communicated directly to subcontractor management for resolution. Subcontractor personnel must comply with the training and medical requirements specified in the APP and provide documentation of same for the project files. No subcontractor will be allowed to work on site until the medical and training documentation file is complete.

6.0 TRAINING REQUIREMENTS

6a MANDATORY TRAINING AND CERTIFICATIONS

Depending on their roles in the project, all personnel entering the exclusion zone (EZ) shall have the following safety training:

Personnel	Requirements
All site staff	• Site-specific orientation training
General site workers (working within the exclusion zone)	• 40-hour HAZWOPER training • 3 Days of supervised field experience training • Current 8-hour HAZWOPER Refresher training • Site-specific orientation training
FOL	• General site worker training • 8-hour HAZWOPER Supervisor training • First aid/cardiopulmonary resuscitation (CPR)/ bloodborne pathogen training
SSHO	• General site worker training • 8-hour HAZWOPER Supervisor training • First aid/CPR/bloodborne pathogen training • OSHA 30-hour Construction Safety course • 5 Years of task-related safety experience
One worker, in addition to the SSHO (if multiple workers at site)	• First Aid/CPR/bloodborne pathogen training
Users of portable fire extinguishers	• OSHA compliant fire extinguisher education • 29 Code of Federal Regulations (CFR) 191.157(g)

The 24 hours of field experience for all general site workers must be under the direct supervision of a trained, experienced supervisor. The initial 40-hour HAZWOPER training must be supplemented by annual 8-hour HAZWOPER Refresher training. For individuals directly responsible for, or who supervise, employees engaged in hazardous waste operations, a one-time 8-hour HAZWOPER Supervisor Training course is required. First aid training and CPR training will be updated as needed to maintain current certification. Finally, to remain current with respect to the 30-Hour Construction Safety training, the SSHO will receive 24 hours (cumulative) of formal health and safety training every 5 years.

A copy of the training completion certificates for each employee working in the EZ will be maintained in the SSHO field vehicle, at the SES-Tt Bothell, Washington office, and available online.

6b SITE-SPECIFIC SAFETY AND HEALTH ORIENTATION TRAINING

All project personnel, SES-Tt and subcontractor employees will receive site-specific orientation training before they will be allowed to work at the site. The orientation training will cover the following topics:

- The content of this APP.

- Potential site hazards (chemical, physical, and biological) and the means to control or eliminate them, including applicable AHAs.
- Hazard communication (HAZCOM) for chemicals brought onto the site per EM-385-1-1 Section 06.B.01 thru 06.B.04. (Although current plans call for very few materials to be brought onto the site for use during fieldwork, Material Safety Data Sheets [MSDS] and Safety Data Sheets (SDS) will be kept on file in the SSHO site vehicle for each chemical product used on the project. These MSDS/SDS will be made available to each employee on request. Workers who may be exposed to hazardous chemicals in groundwater will be trained to recognize chemical contact hazards in the workplace, the physical properties and health hazards of hazardous chemicals, and the personal protective measures that will be taken to control exposures.) All site personnel will have received training on the Global Harmonization System (GHS) as require by OSHA.
- Selection, use, and limitations of required PPE.
- Emergency response procedures, including emergency medical protocols.
- Bloodborne pathogen briefing (site-specific briefings will include information about bloodborne pathogen hazards and how to react to possible bloodborne pathogen exposures. Questions on post-exposure follow-up should be directed to the DHSE, as procedures will differ between SES-Tt personnel, visitors, and subcontractors.)
- Employee and supervisor responsibilities for reporting all accidents.
- Requirements and responsibilities for accident prevention and the maintenance of a safe and healthful work environment.
- Procedures for reporting and correcting unsafe conditions and practices.
- General safety and health policies and procedures.

This site-specific training will be documented in writing in the field logbook by date, name, content, and trainer and kept on file at the job site. Site-specific training will be repeated as necessary whenever work activities and site conditions change or new personnel arrive to work at the site.

6c EMERGENCY RESPONSE TRAINING

SES-Tt personnel on this project have been trained as “awareness level” responders. They will not respond to off-site releases of hazardous materials, structural or major fires, or other catastrophic incidents beyond their training and competency. Training during initial orientation, as well as periodic drills and reviews, will include the following:

- Employee alarm system.

- Evacuation procedures, routes, meeting places, and accountability.
- Control of fuel sources.
- Regional Fire Watch training for any person standing fire watch prior to issuance of any Hot Work Permit.
- Fire extinguisher education (no employee is permitted to attempt to fight a fire beyond incipient stage).
- First aid, CPR, and bloodborne pathogen training for sufficient numbers of personnel.
- Minor spill control/cleanup on site in accordance with the plan (this may include source control [e.g., shutoffs, container repositioning], containment [e.g., drum overpacks, sorbent booms, earthen dikes], and non-emergency cleanup [e.g., sweeping, digging, pumping and containerization of spills and residues]).
- Rescue operations, in cooperation with other trained personnel.
- Review how to contact Emergency Response personnel at the facility, brief the Response Team Commander and turn over control of the site upon acceptance by Response Team Commander, and offer assistance to the Response Team Commander if requested.

7.0 HEALTH AND SAFETY INSPECTIONS

7a INSPECTION RESPONSIBILITIES

The SSHO will conduct an informal daily inspection of the job site for any hazards prior to starting work.

Health and safety inspections of the job site will also be conducted each week by the SSHO for active work sites. Monthly inspections by the PM and/or DHSE will be conducted. Copies of completed inspection checklists will be kept on file at the job site and will be available to the DHSE for review.

Inspection results, including deficiencies, will be reported in the field logbook. Each deficiency will be corrected at the time of its discovery, immediately before work begins, or by a designated authority according to a completion date determined by the SSHO or DHSE (assuming the deficiency is not serious and will not impede the work). Deficiencies will be recorded and the results of corrections will be entered into the Incident Tracking database.

These inspections will evaluate the overall effectiveness of the APP and assess compliance with applicable OSHA regulations and the HSM. The results of these audits will be submitted and available for review. Copies of the inspection findings will be sent to the PM for evaluation and correction of any deficiencies.

7b EXTERNAL INSPECTIONS

Inspections of the job site by regulatory officials or other agencies external to the USACE are not required or anticipated. Should SES-Tt receive a request for an external inspection, personnel will follow procedure EHS 3-03 Inspections.

8.0 ACCIDENT REPORTING

8a EXPOSURE REPORTING

Exposure hours will be recorded and reported quarterly to the USACE.

8b ACCIDENT INVESTIGATIONS, REPORTS, AND LOGS

Minor injuries and near misses will be reported to the PM and DHSE by phone and email within 24 hours.

A serious mishap or incident which triggers immediate reporting to the PM, DHSE, USACE Project Manager, and QAR includes:

- An injury or illness that:
  - Involves an exposure to a hazardous substance above the permissible exposure limit
  - Meets the OSHA recordable criteria
  - Results in permanent, total, or partial disability
  - Results in one or more worker hospitalizations
  - Results in a worker fatality
- An injury or unexpected chemical exposure to a client or a member of the public
- Any material or weight-handling incident or near miss including overturned crane, collapsed boom, dropped load, or damage to crane or adjacent property
- Any government property damage greater than $2,000
- A fire, explosion, or flash
- Safety-related events reported by an enforcing authority or client
- External regulatory inspections that result in findings or citations
- A spill or release resulting from SES-Tt activities
- A permit exceedance
- Any event that could result in adverse public media interest

Appropriate federal or state OSHA agencies will be notified by Tetra Tech's HSM within 8 hours of any fatality or hospitalization.

A USACE decision tree that will be used to determine the appropriate accident/injury reporting requirements is provided in Attachment 4.

Incident Investigation

If necessary, the SS or SSHO will suspend operations and secure and/or evacuate the area. The scene of any fatality, injury involving hospitalization, weight-handling incident, fire/explosion/flash or government property damage exceeding $2,000 will be secured from disturbance pending investigation and further instructions from the USACE and contractor's HSM.

All information pertaining to the incident will be recorded (e.g., time, date, location, name and company of person(s) involved, witnesses, description of event, and actions taken). The SSHO will perform an initial accident investigation and document findings in a report. The SSHO is assisted as necessary in the investigation, causal analysis, and action plan development by the DHSE. Based on a causal analysis of the event, corrective actions will be specified and implemented to prevent similar incidents from occurring in the future. A USACE Engineering Form 3394 will be completed for each incident and will be submitted to USACE Project Manager.

9.0 PLANS AND PROCEDURES REQUIRED BY THE USACE SAFETY AND HEALTH REQUIREMENTS MANUAL

The following is a listing of plans required by the USACE that may or may not apply to the project as required by Section 9.0 of Appendix A in EM 385-1-1. Those that do not apply are designated as Not Applicable (N/A).

	Applicable Plans	**Location**
a.	Site layout plans:	See 9a
b.	Emergency response procedures and tests:	
	(1) Procedures and tests:	See 9b
	(2) Spill plans:	See 9b
	(3) Firefighting plan:	See 9b
	(4) Posting of emergency telephone numbers:	See 9b
	(5) Man overboard/abandon ship:	N/A
	(6) Medical support:	See 9b
c.	Plan for prevention of alcohol and drug abuse:	See 9c
d.	Site sanitation plan:	See 9d
e.	Access and haul road plan:	See 9e
f.	Respiratory protection plan:	N/A
g.	Health hazard control plan:	See 6b
h.	Hazard communication program:	See 9h
i.	Process safety management plan:	N/A
j.	Lead abatement plan:	N/A
k.	Asbestos abatement plan:	N/A
l.	Radiation safety program:	N/A
m.	Abrasive blasting:	N/A
n.	Thermal stress monitoring plan:	See 9n
o.	Crystalline silica monitoring plan:	N/A
p.	Night operations lighting plan:	N/A
q.	Fire prevention plan:	See 9q
r.	Wild land fire management plan:	See 9r
s.	Hazardous energy control plan:	See 9s
t.	Critical lift plan:	N/A
u.	Contingency plan for severe weather:	See 9u
v.	Float plan:	N/A
w.	Site-specific fall protection & prevention plan:	N/A
x.	Demolition plan:	N/A
y.	Emergency rescue:	N/A
z.	Underground construction fire prevention and protection plan:	N/A
aa.	Compressed air plan:	N/A
bb.	Formwork and shoring erection and removal plans:	N/A
cc.	Precast concrete plan:	N/A
dd.	Lift slab plans:	N/A
ee.	Steel erection plan:	N/A
ff.	Site safety and health plan:	See Attachment 1
gg.	Blasting safety plan:	N/A
hh.	Diving plan:	N/A
ii.	Confined space plan:	N/A

Listed below are the site-specific plans that have been developed for this project.

9b EMERGENCY RESPONSE PROCEDURES AND TESTS

Fuels and lubricants will be used on site to service or maintain equipment such as site vehicles and generators. As a result, the possibility of a fuel spill or medical emergency (personnel injury, fire, or explosion) does exist. A copy of the Emergency Response Plan (this section) and the map to the emergency medical facility (see Figure 9-1) shall be posted at the work site by the SSHO and kept in all SES-Tt and subcontractor vehicles at all times. Direction to the medical facility and directions to the site are provided below.

Figure 9-1. Joint Base Lewis-McChord Site Route to St. Clare Hospital

Figure 9-1. JBLM Site to St. Clare Hospital

Driving directions from Fort Lewis Gate to St. Clare Hospital, 11315 Bridgeport Way SW, Lakewood, WA.

- Start out going northwest on 41st Division Drive S. for 0.01 mile
- Merge onto I-5 North toward Tacoma / Seattle and travel for 4.8 miles
- Take Exit 125 Lakewood/Joint Base Lewis-McCord, turn left at the end of the off-ramp at the light onto Bridgeport Way SW.

- Go about 3/10 of a mile. St. Clare Hospital is on the right.

Hospital Phone Numbers:

Main: 253-588-1711

Emergency 253-985-6700

Figure 9-2. Yakima Training Center Route to Hospital

Figure 9-2. YTC Site to Yakima Memorial Hospital

Driving directions from YTC Gate to Yakima Memorial Hospital, 2811 Tieton Drive, Yakima, WA

.

- Start out going west out of YTC to Interstate 82
- Go South on I-82 to Highway 12 West (Exit 31)
- Go West on Highway 12 approximately 1 mile to 16th Avenue Exit
- Go South on 16th Avenue to Tieton Drive
- Go West on Tieton Drive to 2811 Tieton Drive

The Emergency Response Plan shall be rehearsed at the start of the project. The rehearsal shall include a staged personnel injury, spill of fuel, or fire. At the completion of the exercise, the PM and SSHO will evaluate the effectiveness of the emergency response procedures and make corrections to this APP. The briefing will be documented and suggestions and comments will be annotated in the field logbook. The briefing will also be documented on the daily/weekly CP/QC Report. The Emergency Response Plan will be modified to include any changes necessary. Any changes will be coordinated with the PM and the PHSM.

Table 9-1 provides a listing of emergency response contacts. Note that satellite phones or hand-held radios will be available should cell phone reception at the site not be sufficient for communication.

Table 9-1. Emergency Response Contacts

All Emergencies	911
Hospital – Saint Claire Hospital 11315 Bridgeport Way SW Lakewood, Washington 98499	(253) 985-1711
Hospital – Yakima Memorial Hospital 2811 Tieton Dr, Yakima, WA 98902	(509) 575-8000
National Poison Control Hotline	1-800-222-1222
Agency for Toxic Substances and Disease Registry	1-888-422-8737
USACE Project Engineer, Matthew Kitterman	(253) 967-3608 (office) (253) 677-1750 (cell)
USACE Project Manager, Rodney Taie	(206) 764-33498(office) (206) 617-0341 (cell)
SES-Tt Team Program Manager, Brent Jones	(425) 482-7864 (office) (425) 785-6890 (cell)
SES-Tt Team Project Manager, Scott Elkind	(360) 930-3187 (office) (360) 626-3991 (cell)
SES-Tt Team Task Manager, Mark Ingersoll	(406) 270-6339 (cell)
SES-Tt Team Project FOL/SSHO, Dana Ramquist	(425) 482-7864 (office) (425) 877-3883 (cell)
SES-Tt Project QC Officer, Greg Joyce	(360) 598-8117 (office) (360) 780-0371 (cell)
SES-Tt DHSE/PHSM, Roger Margotto, CIH, CSP, CHMM	(619) 471-3505 (office) (619) 988-0520 (cell)
SES-Tt Team DHSE/PHSM, Dale Berndt, CIH	(360) 392-5308 (office) (360) 420-6944 (cellular)
WorkCare	(800) 45-6155

Site Emergency Coordinator

SES-Tt has assigned responsibility for implementation of this Emergency Response Plan to a Site Emergency Coordinator who is the SSHO. The SSHO, therefore, is responsible for ensuring the evacuation, emergency treatment, emergency transport of site personnel, as

necessary, and notifying emergency response units, the USACE, and the appropriate SES-Tt management staff.

The SSHO shall conduct an inspection of emergency response equipment prior to site mobilization. As part of the daily site walk-through, the SSHO shall pay close attention to potential fire hazards, spill potential, and individual work practices.

In the event of an emergency situation, such as a fire, explosion, etc., the Site Emergency Coordinator shall immediately do the following:

- Establish the safety of all personnel while having someone calling 911 (see Table 9-1) with the nature of the emergency, location, and the exact location of any injured personnel. Direct the administration of first aid as appropriate.
- Shut down all combustion equipment.
- Prohibit outside personnel from entering the evacuated area until the Emergency Response Team arrives.
- Provide emergency equipment as appropriate.
- Notify the USACE Project Manager, SES-Tt PM, and PHSM, if not already notified.

Communication of evacuation routes and assembly points shall occur initially and daily during the tailgate safety briefing. Hospital routes and emergency telephone numbers will be kept inside each site vehicle.

Environmental Incident (Spill)

A spill is any un-permitted or uncontrolled release of oil or hazardous substance to the water or ground. This includes spilling, leaking, pumping, emitting, discharging, injecting, escaping, leaching, disposing, or dumping of liquid or solid material that is not authorized. Immediately notify the facility if a spill cannot be contained by on-site personnel, it may enter an adjacent body of water, or it may enter any storm drain.

Emergency Spill Event

- Is an immediate threat to human health, property, or the environment.
- Is a material either known/not known to the person discovering the spill ie: fuel.
- Has the immediate potential to enter or has entered a drain or waterway, or migrate off property.
- Requires assistance from the JBLM for cleanup.

- Is more than 10 gallons of fuel or the reportable quantity of material, if on land or any amount to any waterway.

Non-Emergency Spill Event

- Is not an immediate threat to human health or the environment.
- Is a material known to the person discovering the fuel spill.
- Has not entered and does not have immediate potential of entering a waterway or waterway inlet (storm drain, sanitary sewer manhole, etc.) and remains on USACE property.
- Can be cleaned up safely by SES-Tt personnel without assistance from the USACE.
- Is 10 gallons of fuel, or less than the reportable quantity of material..

Only non-emergency spills will be responded to by SES-Tt or subcontractors. Only small containers of fuel (less than 5 gallons) will be brought on site to operate small equipment. SES-Tt will follow the "Contractor's Guide to Environmental Compliance" for any non- emergency spills. To summarize the response in the event of a non-emergency spill, SES-Tt will do the following:

- Stop the source of the fuel spill.
- Contain the spilled material by keeping the spill away from drains or waterways and by blocking off drains located near the spill if the spill may reach them.
- The SSHO may conduct air monitoring to further characterize the nature and extent of the incident, consulting the DHSE as needed.
- Notify the PM, then the USACE Project Manager to report the event.
- Cleanup the spilled material wearing the proper personal protective equipment.
- Dispose of the fuel spill debris per waste designation.
- On-site spill control equipment will consist of: plastic sheeting (storm drain protection), petroleum absorbent boom and pads, nitrile gloves, paper towels, Tyvek clothing, garbage bags, zipties (for linking boom pieces), and a petroleum absorbent kit for placing under equipment leaks (includes a plastic tub and absorbent pouches). The spill kit will be stored in the SSHO's vehicle, and left on site if the vehicle leaves the area for a non-emergency.

Fire and Explosion

In the event of any fire or explosion, the SSHO, or his designee, will do the following:

- Start immediate response actions appropriate for the emergency.
- Determine the extent of the fire.
- Remove or isolate flammable or other hazardous materials, which may contribute to the fire. (if possible, avoid taking risks)
- Coordinate and manage fire suppression efforts until a determination is made to evacuate or the fire is put out (SES-Tt will only attempt fire suppression if the fire is in incipient stage and only if safe to do so [i.e., means of egress is immediately available]).
- Coordinate the evacuation of injured or non-essential personnel from the site following the evacuation procedure and notify the local fire and medical services, as appropriate.
- Provide emergency first aid as required.
- Assist emergency response personnel when requested.
- Advise emergency response personnel of the location, nature, and identification of the hazardous materials on site.
- Immediately notify the USACE Project Manager, SES-Tt PM, and PHSM.

In the event of an explosion, all non-essential personnel shall evacuate and help secure the site. It is essential that the site be evacuated and no one be allowed to re-enter until emergency responders have arrived on site and entry is cleared by the Emergency Response Team Commander. The control of the site will pass to the Emergency Response Team Commander as Incident Commander as soon as he is briefed by the SSHO. The Response Team will determine what actions, if any, are appropriate. Rescue services will be provided by the host facility sponsoring the work. Emergency rescue is available by calling the facility's Emergency Response Team at the telephone numbers listed on Table 9-1.

Personal Injury

In the event of serious personal injury (fatality, unconsciousness, possibility of broken bones, severe bleeding, burns, blood loss, shock, trauma, chest pain, difficulty breathing, seizure, electrocution, disorientation, or suspected poisoning), the employee/witness shall immediately do the following:

- Call 911 and provide the nature of the emergency and location of injured person. Administer first aid if qualified; if not qualified, immediately seek out a person qualified to administer first aid.
- Notify the SSHO of the name of the individual involved, the location, and the nature of injury.

- Upon notification of an injury, the SSHO shall immediately do the following:
  - Assist the injured party as deemed appropriate.
  - Provide a copy of the injured party's medical data sheet to responding medical personnel, if available.
  - Designate someone to accompany the injured party to the hospital and to provide MSDS/SDS to the emergency medical team.
  - Notify the USACE Project Manager, SES-Tt PM, and PHSM, if not already notified.
  - Complete an Incident Report on SharePoint.

First aid/CPR providers are authorized to stabilize an injured person until emergency medical services can be brought to the accident scene to treat and transport the victim. They have the skills to perform an initial assessment of the victim's injuries, open an airway and provide rescue breathing, control bleeding, manually stabilize skeletal and spinal injuries, treat shock, perform an emergency move of the victim, and administer CPR. The SSHO and emergency service providers will determine the seriousness of the injury and decide if the victim should be transported to the hospital for treatment.

Serious injuries occurring at the JBLM jobsite will be treated at Saint Claire Hospital, 11315 Bridgeport Way SW., Lakewood, Washington (see Table 9-1). A route map with directions to the hospital is provided in Figure 9-1. Serious injuries occurring at the YTC jobsite will be treated at Yakima Valley Memorial Hospital, 2811 Tieton Drive, Yakima, WA 98092. Local ambulance service will be used to transport the injured worker to the hospital by calling 911. Non-serious injuries, such as minor cuts, abrasions, strains, and sprains, will be treated on site by first aid/CPR trained personnel, and, if needed, transported to an appropriate medical facility.

Bloodborne Pathogens

The EHS includes a Bloodborne Pathogen procedure (EHS 4-01) that defines the requirements for working with potential bloodborne pathogens and provides a written Exposure Control Plan to minimize or eliminate an employee's potential exposure to bloodborne pathogens. Any SES-Tt employee involved in an exposure incident will be offered a post-exposure evaluation consisting of prophylaxis treatment within 24 hours of exposure, and follow-ups as necessary. The process for this evaluation and treatment will follow the procedures in HSM 2.3. Reporting of the incident will follow procedures set forth in Section 8, Accident Reporting.

Emergency Equipment

SES-Tt will supply and maintain all protective clothing and emergency equipment required by its crews. Basic emergency and first aid equipment is as follows with specific equipment for each activity determined by the SSHO:

- First aid kits for 10 people, meeting requirements of EM 385-1-1, Table 3-1
- 10-pound at a minimum ABC fire extinguishers
- Eyewash meeting ANSI Z358.1 (capable of providing 0.4 gallons per minute for 15 minutes)
- On-site spill control equipment as listed in the Emergency Spill section of this APP
- Tyvek/polyvinyl chloride (PVC) clothing, nitrile gloves, hard hats, and safety glasses
- Cellular telephones and/or radios

A copy of this APP will be in the SSHO's site vehicle. The following information from the APP shall be provided in each site vehicle:

- Emergency telephone numbers for fire, ambulance, hospitals, and police
- Name and telephone number of the DHSE/PHSM, PM, and SSHO
- Location of fire extinguishers and emergency equipment
- Map to the hospital (Figure 9-1)

9c DRUG AND ALCOHOL ABUSE PREVENTION PLAN

SES-Tt is committed to maintaining a workplace free of substance abuse and illegal drugs and maintains a substance abuse program. The complete policy is not repeated here; however, the following brief synopsis of the policy is intended to provide direction to personnel for situations that may arise during the course of fieldwork.

Referring to the Project Work Rules attached to this APP/SSHP as Attachment 5, Rule 2 states that any individual that adds or changes the type of prescribed drugs taken must inform the SSHO or the PHSM of this change. The Corporate Medical Consultant must review the type of medication taken, and inform the PHSM and the SSHO if the employee can safely work on site while taking the medication. Additionally, Rule 20 states that possession or use of alcohol or controlled substances is forbidden. Zero tolerance with respect to this rule will be strictly enforced.

Should the SSHO have reasonable suspicion (i.e., observation of use or possession, or physical symptoms of being under the influence of drugs or alcohol) that SES-Tt personnel (including subcontractors and/or vendors) are in possession, or under the influence, of alcohol or controlled substances, the following procedures should be taken:

- Immediately stop work being conducted by the suspected personnel.

- Question the suspected personnel in private as to whether they are in possession of and/or under the influence of alcohol, controlled substances, or other medications.
- Immediately notify the PM (or if not available, notify the Program Manager and/or the SHM) of details of the situation (i.e., suspected personnel, observations, etc.), the USACE Project Engineer and QAR.
- The suspected personnel are not to resume work until directed by the PM or the Program Manager/HSM.
- If in the judgment of the SSHO the situation poses a significant and/or imminent risk of property damage and/or injury, the SSHO will dial emergency 911 and request assistance.

Follow-up actions after the situation is under control (i.e., the suspected personnel is off of the work site) will include interfacing with the PM and/or Program Manager to provide written details of the situation to the USACE Project Manager, DHSE, Tetra Tech's President.

9d SITE SANITATION PLAN

The site sanitation plan will have the following three components:

- A portable construction toilet with hand washing station will be available at the job site.
- Bottled drinking water will be provided at the job site.
- An emergency eye wash/shower station will be provided to the job site.

9e ACCESS AND HAUL ROAD PLAN

N/A

9h HAZARD COMMUNICATION PROGRAM

Tetra Tech's HAZCOM Program is described in EHS 4-02 and is available on request. The procedure requires that on-site personnel are informed of the potential hazards of chemicals used in the workplace in accordance with HAZCOM 29 CFR 1910.1200. The program applies to all SES-Tt operations where employees have potential exposure to hazardous chemicals as a result of their normal job duties or a foreseeable emergency, but does not apply to hazardous wastes.

The program includes proper labeling of materials brought onto the site for use, MSDS, personal responsibilities of SES-Tt personnel, and training requirements. SES-Tt will ensure that these materials are properly labeled. MSDS are kept on file in the site vehicle. Discussion

of MSDS/SDS will be included during the daily safety and health briefing prior to commencement of work.

Table 4-2 of the SSHP (Attachment 1) lists the hazardous materials that may be used by site personnel. The MSDSs will be updated based on manufacturer's changes. Site personnel will consult the product label instructions and the product's MSDS for information on proper PPE to be worn when using the product.

9n THERMAL STRESS MONITORING PLAN

Because planned work activities will be conducted outside where temperature conditions are typically warm during summer months, there is a risk that site workers could develop heat stress. The likelihood of this occurring is dependent on environmental conditions, the level of work activity, and the personal control measures that are used to manage heat loads (work/rest cycles, use of clothing and/or cooling devices, hydration, etc.). Additionally, work during winter months include temperature conditions cold enough that cold stress is also a concern. Monitoring for hypothermia and frostbite is included below.

Appropriate control measures will be taken to manage these thermal stress concerns. For example, the SSHO will ensure that site personnel are trained to recognize both cold and heat stress symptoms, monitor ambient temperatures in the work area to establish work/rest schedules, conduct physiological monitoring on representative workers as appropriate, and treat incipient cold stress/heat stress illness if it develops. Personnel who have experienced previous thermal stress events that resulted in medical treatment must communicate this information to medical personnel during the physical and the DHSE.

Cold Stress/Hypothermia

A. SIGNS AND SYMPTOMS

Mild hypothermia (Body temperature of 98 - 90°F)

- Shivering
- Lack of coordination, stumbling, fumbling hands
- Slurred speech
- Memory loss
- Pale, cold skin

Moderate hypothermia (Body temperature of 90 - 86°F)

- Shivering stops
- Unable to walk or stand

- Confused and irrational

Severe hypothermia (Body temperature of 86 - 78°F)

- Severe muscle stiffness
- Very sleepy or unconscious
- Ice cold skin
- Death

B. STABILIZATION AND BASIC LIFE SUPPORT

Mild hypothermia

- Move to warm area.
- Stay active.
- Remove wet clothes and replace with dry clothes or blankets, cover the head.
- Drink warm (not hot) sugary drink.

Moderate hypothermia

All of the above, plus the following:

- Call 911 and transport to the clinic.
- Cover all extremities completely.
- Place very warm objects, such as hot packs or water bottles on the victim's head, neck, chest and groin.

Severe hypothermia

- Call 911 and transport to the clinic.
- Treat the victim very gently.
- Do not attempt to re-warm (the victim should receive treatment in a hospital).

C. SPECIAL CONSIDERATIONS

1. Early recognition is imperative.
2. Shivering does not occur when core body temperature is below 90°F; at 90°F the patient may not even feel cold.
3. For moderate to severe cases, warming should be done under controlled conditions in the hospital with careful monitoring.
4. Below 86°F body temperature, the heart may fibrillate. CPR may be necessary for extended periods.

5. CPR is unnecessary if the patient has even a faint pulse and occasional respirations. Metabolic demands are greatly reduced with hypothermia. CPR is needed for no heart beat or ventricular fibrillation.
6. Airway manipulation should be avoided, if possible, because it may induce ventricular fibrillation in the hypothermic patient.
7. Do not assume the patient is dead; full recovery has occurred even after periods of cardiac arrest.

Frostbite

Frostbite occurs when the skin actually freezes and loses water. In severe cases, amputation of the frostbitten area may be required. While frostbite usually occurs when the temperatures are 30°F or lower, wind chill factors can allow frostbite to occur in above freezing temperatures. Frostbite typically affects the extremities, particularly the feet and hands.

A. SIGNS AND SYMPTOMS

1. Cold, tingling, stinging or aching feeling in the frostbitten area, followed by numbness
2. Skin color turns red, then purple, then white or very pale skin, cold to the touch
3. Blisters in severe cases

B. STABILIZATION AND BASIC LIFE SUPPORT

1. Place patient in comfortable position.
2. Remove wet or constricting clothing; keep skin dry and protected from wind.
3. Protect injured parts (do not rub or break blisters; avoid pressure).
4. Do not allow limb to thaw if there is chance it may refreeze before evacuation is complete or if patient must walk to transportation.
5. Rewarm minor “frostnip” areas by placing in rescuer’s armpit or against body trunk under clothing.
6. Maintain core temperature by keeping patient warm with blankets and warm fluids.
7. Transport patient with frostbitten areas supported and elevated, if feasible.
8. If transportation is prolonged, and there is no chance of refreezing, immerse frostbitten part in lukewarm water.

C. SPECIAL CONSIDERATIONS

1. Thawing is extremely painful; it should be done under controlled conditions, preferably in the hospital. Pain medication, monitoring, slow rewarming, and sterile handling are necessary.
2. Partial rewarming or rewarming followed by refreezing is more injurious to tissues than delay in rewarming. Do not rewarm prematurely; rarely should rewarming be done in the field.
3. Do not give the patient alcohol; avoid rubbing frostbitten extremities with snow or rewarming with stoves or heaters.

Heat Stress

Workers will be encouraged to drink small volumes throughout the day to remain hydrated and reduce the likelihood of heat stress. Co-workers should be alert for signs and symptoms of heat stress in others. Those who take medications that may compromise normal physiologic functioning will be counseled and monitored for heat strain. Workers will also be encouraged to maintain healthy life-styles, ideal body weight, and electrolyte balance.

Of particular concern in heat stress monitoring is the use of personal protective clothing, which decreases natural body ventilation and greatly increases the temperature and humidity to the skin. If precautions are not taken, heat stress will progress into a heat-related injury. Heat-related injuries fall into three major categories: heat cramps, heat exhaustion, and heat stroke.

A summary of the symptoms and emergency treatment for each are summarized in this section, along with methods to prevent and measure heat stress is described in EHS 4-06.

A. SIGNS AND SYMPTOMS

Heat Fatigue

- Severe muscle cramps and pain, especially of the upper legs, calves, and abdomen, and occasionally in the arms
- Sweating
- Faintness and dizziness
- Prickly heat bumps (heart rash)

Heat Exhaustion

- Profuse sweating
- Pale, cool, sweaty skin
- Extreme thirst
- Weak and rapid pulse (120-200 beats per minute)
- Headache and extreme weakness, fatigue
- Nausea and possible vomiting
- Increasing lightheadedness, dizziness or weakness
- Collapse and possible brief unconsciousness
- Body core temperature normal, may even be slightly below normal

Heat Stroke

- Oral temperature of 104°F or higher
- Hot, reddish skin, skin is usually dry (no sweating)
- Headache
- Dry mouth
- Shortness of breath
- Nausea or vomiting
- Increasing dizziness and weakness
- Mental confusion and anxiety; victims may show unusual irritability, aggression, combative agitation, or hysterical behavior
- Convulsions, sudden collapse and possible unconsciousness; all heat stroke victims having varying levels of consciousness, ranging from disorientation to coma

It is important to note that a person can suffer heat stroke without suffering any of the other symptoms prior to collapsing.

Note: The most reliable and distinct differences between heat stroke and heat exhaustion are as follows:

Heat Stroke

- Skin flushed (red); may be dry; hot to touch
- Oral temperature above 104°F

Heat Exhaustion

- Skin pale; wet or clammy; cool to touch
- Oral temperature usually normal

B. STABILIZATION AND BASIC LIFE SUPPORT

Immediate and effective treatment must be provided to an employee to prevent more serious harm.

Heat Fatigue

- Remove victim from the hot environment.
- Provide water or Gatorade (the fluids should be kept reasonably chilled before consumption); allow victim to sip this solution at the rate of one-half glassful every 15 minutes.

- To relieve pain, gently stretch the involved muscle group; gently massage cramps as long as it does not increase the pain or discomfort.
- The victim should avoid exertion of any kind for 12 hours. A victim of heat cramps is prone to recurrence.

Heat Exhaustion

- Remove victim from the hot environment and out of the EZ.
- Lie victim down with feet slightly raised (6-8 inches).
- Remove as much clothing as reasonable (especially personal protective clothing); loosen what cannot be removed.
- Apply cold, wet compresses to the skin; fanning will also aid in cooling.
- If the victim is fully alert, allow him/her to drink water or the same solution, at the same rate that was used for the emergency care of heat cramps.
- If the victim vomits, do not give fluids by mouth, transport him/her to a hospital immediately (dehydration is the most critical problem in heat exhaustion victim; intravenous fluids will have to be given).
- Transport to a hospital immediately and start sponging him/her off with cool water and/or use “cool packs” at the pulse points and glandular area at the back of the neck or under arms.

Heat Stroke

- Remove the victim from the hot environment and from the EZ.
- Call for trained emergency medical personnel immediately (911).
- Remove as much clothing as reasonable (especially personal protective clothing); cut clothing with bandage scissors, if necessary, being careful not to injure victim.
- Spray large amounts of cool water over the victim, avoiding his nose and mouth. To achieve cooling of the core body temperature.
- Fan the victim.
- Place cold packs under the arms and against neck and ankles.
- Wrap victim in a wet blanket.
- Continue a combination of these methods until medical transport arrives (take measures to prevent chilling, if necessary, i.e., use slower cooling if the victim starts shivering).

- Elevate the head and shoulders slightly during cooling.
- Never give the victim anything to drink unless fully conscious and vomiting is unlikely.

Because heat stroke involves the entire body, a number of complications may result: brain swelling, convulsions, coma, kidney failure, liver failure, high blood pressure, and heart failure. Always transport the victim to a hospital, even if the body core temperature has lowered to near normal.

If visual monitoring indicates that a worker is suffering from excessive heat exposure, or if conditions/PPE requirements warrant, workers will be evaluated for heat strain by monitoring their heart rate, body core temperature, and heat strain symptomology. Excessive heat strain may be marked by one or more of the following measures, and an individual's exposure to heat stress will be discontinued when any of the following occur:

- Sustained heart rate is in excess of 180 beats per minute (bpm) minus the individual's age in years, for individuals with assessed normal cardiac performance
- Recovery heart rate at one minute after a peak work effort is greater than 110 bpm
- There are symptoms of sudden and severe fatigue, nausea, dizziness, or lightheadedness

Workers who appear to be disoriented or confused, or suffer inexplicable irritability, malaise, or flu-like symptoms, will also stop work and rest in a cool location with rapidly circulating air and be kept under skilled observation.

9q FIRE PREVENTION PLAN

Fire hazards at the site include work vehicles (internal combustion engines and fuel tanks) and refueling activities. Responses to fires and explosions are described above in Section 9b, Emergency Response Procedures.

- Flammable liquids shall be kept in closed and approved containers or tanks when not in use. Only labeled/listed (by a nationally-recognized testing laboratory) containers and portable tanks shall be allowed.
- Smoking shall be prohibited in all areas where flammable, combustible, or oxidizing materials are stored. Fire lanes providing access to all areas shall be established and maintained free of obstruction. Smoking is allowed only in areas designated by the SSHO or SS.
- At least one portable fire extinguisher rated 20-BC shall be provided on all tank trucks or other vehicles used for transporting and/or dispensing flammable or combustible liquids.

- Dispensing fuel will adhere to the following precautions:

    1. All pumping equipment used for the transfer of flammable and combustible liquids shall be listed by a nationally recognized testing laboratory or approved by, and labeled or tagged in accordance with, the Federal agency having jurisdiction, such as the Department of Transportation.
    2. Flammable and combustible liquid dispensing systems shall be electrically bonded and grounded. All fuel tanks, hoses, and containers of 5 gallons (18.9 liters) or less shall be kept in metallic contact while flammable and combustible liquids are being transferred; transfer of flammable and combustible liquids in containers in excess of 5 gallons shall be done only when the containers are electrically bonded and grounded.
    3. Flammable or combustible liquids shall be drawn from, or transferred into, vessels, containers, or tanks outside only through a closed piping system, from safety cans, by means of a device drawing through the top, or from a container, or portable tanks, by gravity or pump, through an approved self-closing valve. Transferring by means of air pressure on the container or portable tanks is prohibited.
    4. Areas in which flammable or combustible liquids are transferred in quantities greater than 5 gallons (18.9 liters) from one tank or container to another shall be separated from other operations by at least 25 feet.

9s HAZARDOUS ENERGY CONTROL PLAN

The following program will be followed when lockout/tagout procedures are required. This program applies to all SES-Tt operations (EHS 6-04), except as follows:

- Work on cord and plug connected electrical equipment where the plug is under the control of the employee performing the work.
- Hot tap operations.
- Work involving minor changes and adjustments to equipment during routine operations (such as small tooling adjustments).

Responsibilities

Authorized Employees - Authorized employees lock out or implement a lockout/tagout system procedure on machines or equipment. Authorized employees shall lockout and tag all energy isolation devices which are required to be locked out by this procedure. The employee shall complete all permits and tags in accordance with instructions and shall remove their locks and tags and return them at the end of their shift or the end of the procedure.

File Operations Lead - The FOL shall ensure proper implementation of the lockout/tagout procedure including approval of permits, maintenance of personal locks, and a log of lock

assignments. In group lockout procedures, the SS shall lock and tag all the appropriate energy isolation devices and deposit his/ her key in the lockbox.

Project Personnel - The SSHO is responsible for providing the required training in this procedure to supervisors and trade employees and conducting periodic inspections to ensure this procedure is effectively implemented. The SSHO shall also implement lockout/tagout procedures as required.

General Requirements

The steps to be followed include preparing for, applying, and releasing a machine or piece of equipment from lockout. These steps shall be completed in order in accordance with applicable permit requirements. While work is being performed under the lockout, a copy of the completed permit shall be posted at the equipment controls or work area as appropriate.

1. Complete the general information in Section A of the permit included in Attachment 6.
2. Identify Isolation Points

   The first step required to isolate a piece of equipment is to identify the sources of hazardous energy present. To identify the sources, the authorized employee shall complete the following steps:

   - Survey the equipment and related schematics, blueprints, or as-builts, if available, for hazardous energy sources;
   - Identify the isolation points and device positions for controlling each source of hazardous energy; and
   - Identify the isolation method to be used on each source.

   The above information shall be documented in Section B of the Lockout/Tagout Permit as each point is identified.

3. Notifications

   Prior to applying a lockout, the authorized employee shall notify affected employees of the equipment to be locked out and sign Section C of the Lockout/Tagout Permit on the “Notifier” line.

4. Equipment Shutdown

   Shut down the equipment or place into the desired configuration using normal operating procedures. The authorized employee shall sign Section C of the Lockout/Tagout Permit on the “Shutdown by” line.

5. Equipment Isolation

To apply a lockout to a piece of equipment, the authorized employees will complete the following steps:

- Place each energy isolation device into a position that will prevent the transmission of hazardous energy.
- Place lock on each energy isolation device and control the key for each lock at all times (only one key is permitted per lock).

Complete Section D of the permit as each device is placed and sign the "Isolator" line in Section C.

6. Release of Stored Energy
   After the equipment has been locked and tagged as required in Section D all remaining stored energy must be released. Methods for the release of stored energy include, but are not limited to the following:

   - Discharge and grounding of capacitors.
   - Bleeding pressure from vessels and lines.
   - Releasing mechanical sources of energy to engage blocks.

   Stored energy has the potential to re-accumulate; therefore, verification of isolation shall continue until work is complete. After releasing stored energy complete Section E of the permit.

7. Lockout/Tagout Verification
   After completing the lockout of the desired piece of equipment, the effectiveness of the lockout must be verified by the authorized employee by attempting to operate the machine. After attempting to operate the machine, sign Section C of the permit on the "Verifier" line.

8. Performance of Work
   After verifying and receiving the SS's approval signature, work may be performed on the equipment which was locked and tagged.

9. Lockout/Tagout Removal
   After work has been completed, the following steps shall be followed to release equipment from lockout/tagout:

   - Inspect the area affected by the lockout to ensure that releasing the machine does not present a hazard to people and property;
   - Remove locks and tags.

- Return isolation devices to their operating positions.
- Start the equipment.
- Notify affected employees of the release.

Section F of the permit shall be completed as the equipment is returned to service.

Testing/Positioning

When necessary to interrupt lockout/tagout for testing or repositioning, the steps outlined above shall be followed.

Group Lockouts

When multiple people are scheduled to work on a system, the following group lockout procedure should be implemented as follows:

- The SS shall place his/her lock on the energy isolation device(s) using a multi-lock hasp.
- Authorized employees shall place their individual locks on the multi-lock hasp.
- When the group has completed their work, the SS shall verify all employee locks have been removed before the SS removes his/her lock.

Tagout

The use of tags without locks is prohibited, except in those cases where it is physically impossible to attach a locking device to an isolation point. When it is necessary to use tags without locks the following shall be completed.

- The isolation point shall be placed in the correct position to prevent the flow of energy.
- The device shall be physically disconnected.
- A tag shall be placed on the disconnected device.
- Employees shall be warned not to tamper with the tag or isolation point.

Equipment-Specific Lockout/Tagout Procedures

Should it become necessary to repetitively lockout the same piece of equipment, specific procedures and permits for the equipment will be developed.

Shift Changes

When necessary to maintain the status of a locked out machine or device past the end of the shift when the lockout was initially installed, the following procedures shall be adhered to:

- The incoming authorized employee shall place their lock hasp on the lockout point and complete a new permit.
- The outgoing employees shall remove their lock(s) after the new lock(s) are applied.
- If multiple shifts are not used, the initial locks may be left in place until the following day or until the equipment is released from lockout/tagout.
- The new shift supervisor shall sign the permit before work is begun on the new shift. The last supervisor whose name is on the Lockout/Tagout Permit is responsible for all activities related to the work activity.

Failure to Clear Locks

If a person should fail to clear a lockout and their lock remains in place, the SS will attempt to contact the person who applied the lock and resolve the issue.

If the person cannot be contacted, the SS will contact the PHSM or the PM to discuss the situation. The SS must obtain permission from the PHSM or the PM before taking any additional actions. Once permission has been granted, the SS will continue to investigate the situation and determine that removal of the lock will not create a hazard in the work zone. The SS will then verify that the work zone is clear, blocking devices have been removed, and the system has been restored to the normal configuration. The SS will then cut the lock off and restore energy to the system. The individual whose lock was cut off must be notified as soon as possible.

Subcontractors

The SS shall be familiar with the nature of any subcontractor work on-site that may involve hazardous energy and ensure that they follow work practices that are at least as strict as this procedure.

For any lockout/tagout requirements, the SS shall review and approve all subcontractor work set up, apply his locks to the scheme, and sign the appropriate lockout/tagout procedure checklist.

9u CONTINGENCY PLAN FOR SEVERE WEATHER

Weather conditions in Washington State are typically punctuated by severe winds and rain. In the event of adverse weather, the designated SSHO will determine if work can continue without sacrificing the health and safety of field workers or should be stopped. Some of the items for the SSHO to consider include:

- Extreme warm temperatures (see Section 9n)
- High temperatures (see Section 9n)
- Sustained wind > 25 miles per hour or gusts > 40 miles per hour

- Limited visibility (caused by heavy precipitation or dense fog)
- Lightning strikes within a 10-mile radius of the site
- Potential for accidents

The SSHO must address weather conditions by checking on predicted local conditions in the morning, or more frequently as warranted by conditions. If predicted conditions could adversely affect working conditions at the site, (sustained winds, heavy precipitation, dense fog, freezing conditions), then the SSHO would continue to check weather updates throughout the day. The SSHO must suspend operations if weather conditions threaten the safety of operations using available information and professional judgment.

10.0 RISK MANAGEMENT PROCESSES

AHA tables have been developed for each project activity that has significant safety and health hazards in accordance with Section 01.A.13 of EM 385-1-1. These AHAs are included below and they will be updated, as appropriate, to address changing site conditions.

Each hazard in the AHA tables has been rated with a risk assessment code (RAC). The RAC represents the degree of risk associated with a hazard considering the elements of hazard severity and mishap probability. Hazard severity is the worst potential consequence as defined by the degree of injury, illness or property damage resulting from the hazard. Mishap probability is the probability a hazard will result in a mishap or loss.

RAC definitions (from most to least severe) are:

1. Catastrophic
2. Critical
3. Marginal
4. Negligible

AHA tables for this project include the following:

- Mobilization/demobilization
- Drill Rig Operations

Groundwater Monitoring Well Sampling

- ISCO Injections
- Well Abandonment
- Demobilization and Waste Load Out

Table 10-1. Activity Hazard Analysis

Activity Hazard Analysis (AHA) #1

Job/Task: Mobilization/Demobilization	**Overall Risk Assessment Code (RAC) (Use highest code)**	**M**
Project Location: : JBLM and Yakima Training Center, WA	**Risk Assessment Code (RAC) Matrix**	
Contract Number: W912DW-11-D-1031; (MATOC)		
Date Prepared: August 11, 2014		
Prepared by (Name/Title): Dana Ramquist, Scientist		
Reviewed by (Name/Title): Roger Margotto, CIH, CSP, CHMM, Health and Safety Manager		

Severity	**Probability**				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	**E**	**E**	**H**	**H**	**M**
Critical	**E**	**H**	**H**	**M**	**L**
Marginal	**H**	**M**	**M**	**L**	**L**
Negligible	**M**	**L**	**L**	**L**	**L**

Notes: (Field Notes, Review Comments, etc.)
In addition to the information listed in this AHA, all field personnel must review and be familiar with all provisions of the approved APP.
TtEC Corporate Safety Programs and the EM 385-1-1 will also be available on-site for review of specific materials and mitigation measures.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (see above).

"Probability" is the likelihood to cause an incident, near miss, or accident and is identified as Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and is identified as Catastrophic, Critical, Marginal, or Negligible.

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on the AHA. Annotate the overall highest RAC at the top of the AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
1. Mobilize equipment	Improper lifting or moving of materials and equipment could cause sprains and/or strains, including back injuries.	– Follow proper lifting procedures in EHS 3-1. – Use team lifts or equipment to lift heavier or awkward objects. Do not lift loads greater than 50 pounds without assistance. – Size up the load, path of travel, and receiving area before beginning the move. – Never lift while turning; lift with legs, not your back.	**M**
	Items not properly secured could shift and fall.	– Secure items to prevent inadvertent movement. – Stack heavier items on bottom.	
2. Travel to work site	Vehicle accident.	– Ensure vehicle has been fully inspected and serviced as needed before travel. – Ensure driver has valid driver's license and insurance. – Ensure driver is well rested. – Take breaks as needed. – Obey traffic laws.	**M**

Table 10-1. Activity Hazard Analysis (Continued)

Job Steps	Hazards	Controls	RAC
3. Arrive at work site	Struck by vehicles while parking or entering/exiting vehicles.	– Look before opening doors and exiting or entering the vehicle or street. – Try to park in location where there are no blind spots. – Wear high-visibility safety vests. – Obey local traffic laws and parking area restrictions. – Do not drive unimproved roads at night.	**M**
4. Set up work areas.	Workers could be exposed to chemical hazards.	Delineate exclusion zones and use PPE as required by type of material being used. Refer to MSDSs. Ambient air monitoring and visual observation will be used to verify selection of PPE. Identify all chemical hazards and receive training (MSDSs) regarding safe handling of chemicals. The SSHO will file copies of all MSDSs at the site.	M
	Noise could cause hearing loss.	Hearing protection is required when sound levels exceed 84 dBA continuously. Usually this will only be for workers working in unenclosed cabs of heavy equipment or ground workers working near heavy equipment.	
	Slip, trip, and fall hazards could be present.	Work areas will be visually inspected and slip, trip, and fall hazards will be marked, barricaded, or eliminated, when feasible. Work areas will be kept neat and in an orderly state of housekeeping. Supplies and materials will always be placed in areas away from normal foot traffic routes. Equipment and tools will always be placed in a safe location and will not present a trip hazard to nearby workers. Maintain proper illumination in all work areas. Work is authorized normally during daylight hours only. Refer to EHS Procedure 3-8 (EHS 3-8), Fall Protection, when performing work at heights above 6 feet. Do not walk on slopes greater than 45° (1:1).	
	Sharp objects could cause punctures.	Wear cut-resistant work gloves when sharp edges or other objects may cause the possibility of lacerations or other injury. When possible, sharp edges will be blunted. Workers should not stand or walk on equipment or supplies.	
	Strains from manually moving materials and equipment could occur.	Personnel will be directed to use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use of hand truck will be encouraged. Employees will not lift more than 50 pounds alone. Obtain assistance from another worker or use a mechanical device when possible. Refer to EHS 3-1, Ergonomics.	
	Workers could be exposed to extreme temperatures.	Monitor for heat stress in accordance with EHS 4-6, Temperature Extremes. Provide fluids and rest breaks during warm weather and while wearing impermeable protective clothing.	

Table 10-1. Activity Hazard Analysis (Continued)

Job Steps	Hazards	Controls	RAC
	Eye hazards could be present.	Safety glasses are the minimum required eye protection for all work areas.	
	Electrocution could occur from generator used for power tools.	Only qualified electricians are allowed to hook up or disconnect electrical circuits. Follow lockout/tagout protocols. Inspect all extension cords daily for structural integrity, ground continuity, and damaged areas. Extension cord must be rated for hard usage or extra hard usage (Table 400-4, National Electrical Code). The SSHO will inspect electrical cords and connections daily. Use GFCIs on all outdoor 115- to 120-volt, 20-ampere or less circuits. Elevate or cover electric wire or flexible cord passing through work area to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching (cover only in accordance with National Electrical Code requirements). Keep plugs and receptacles out of water, unless they are approved, submersible types. Ground all electrical circuits in accordance with the National Electrical Code or other applicable standards and regulations. If a generator is used, be sure it is a type that does not require grounding. If it requires grounding, follow manufacturer's directions. National Electrical Code 250-6 lists the exceptions for grounding portable and vehicle-mounted generators.	
	Lack of communication in widely dispersed areas could lead to delayed response in an emergency.	Ensure that each work team has a telephone or access to a telephone for communication. In addition, workers must have a 2-way radio that can contact someone who has access to a phone if they are not in line of sight of other workers. If more than one team at a time is working, ensure that there is communication between the work teams and project management. Use the buddy system.	
	Workers could be struck by or against heavy equipment.	Wear high-visibility reflective vests when exposed to vehicle traffic. Make eye contact with operators before approaching equipment. Understand and review posted hand signals. Traffic barricades, signs, flags, and backup spotters will be used during field activities.	
	Biological hazards such as snakes, insects, ticks, or spiders could cause poisoning, disease.	Look carefully for animals before stepping into any area or before placing hands near the ground. If traversing through chaparral, use a walking stick to identify rattlesnakes. Watch for snakes when disturbing rubble or debris. Use insect repellant as necessary. Wear long sleeves when walking through thick brush.	

Table 10-1. Activity Hazard Analysis (Continued)

Job Steps	Hazards	Controls	RAC
5. Install barricades, fences, and other support structures as needed.	Improper use of power and hand tools could cause injury or damage tools.	Inspect all tools before each use. Personnel will be trained in the proper use of hand tools. All power tools will be grounded, protected by GFCI, or double-insulated.	M
	Material handling could cause injury.	Identify and avoid pinch points. Maintain communication with others involved in material handling. Use appropriate PPE.	
	Strains from handling materials could occur.	Personnel will be directed to use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use of hand trucks will be encouraged. Personnel will work at a steady pace. Refer to EHS 3-1, Ergonomics.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Vehicle operations, heavy equipment, hand tools	Only trained equipment operators may operate heavy equipment; only DMV-licensed personnel will operate trucks and vehicles to and from site. Specific training for power tools, hand tools, and electrical safety is required.	Inspect daily, and before use. Use the equipment safety checklist found in the SSHP. The SSHO will inspect electrical cords and connections daily.

Abbreviations and Acronyms:

AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
CIH – Certified Industrial Hygienist
CSP – Certified Safety Professional
DMV – Department of Motor Vehicles
EHS – Environmental Health and Safety
EM – Engineer Manual
GFCI – ground fault circuit interrupter
MSDS – material safety data sheet
PPE – personal protective equipment
RAC – Risk Assessment Code
SSHP – Site Safety and Health Plan
SSHO – Site Safety and Health Officer
TtEC – SES-Tt SES-Tt Team, Inc

Activity Hazard Analysis (AHA) #2

Job Task: Drill Rig Operations	Overall Risk Assessment Code (RAC) (Use highest code)	M
Project Location: JBLM and Yakima Training Center, WA		
Contract Number: W912DW-11-D-1031; TO 0001		
Date Prepared: August 11, 2014		
Prepared by (Name/Title): Dana Ramquist, FOL		
Reviewed by (Name/Title): Roger Margotto, CIH, CSP, CHMM, Health and Safety Manager		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)
In addition to the information listed in this AHA, all field personnel must review and be familiar with all provisions of the approved IPP.
TtEC Corporate Safety Programs and the EM 385-1-1 will also be available on-site for review of specific materials and mitigation measures.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
1. Pre-survey the area over which the Air Rotary rig will be driven. Park vehicle	The vehicle could run over unstable ground surface or other hazards.	Mark all physical hazards. The weight of the rig can be significant, so verify the stability of all routes of travel. Do not drive rig over electrical cords or pressurized pneumatic/ hydraulic hoses,	L
	Vehicle location could create a traffic hazard.	Locate vehicle in an area that will not obstruct traffic. Demarcate vehicle with cones/delineators.	
2. Pre-survey the area to ensure that underground locator services have marked all utilities and that as-built drawings have been reviewed.	Accidental contact with underground utilities could cause the release of gas or water; electrocution if an underground power line is struck; damage to communication lines.	Verify that there are no utilities present, and lead shield electrical service lines. Review drawings, nearby utility connections, and scan, locate and mark. Call Dig Alert (811) for the connection to the closest one. Call before you dig utility location services. They should have already been contacted, and the area marked.	L
3. Unload equipment and materials.	Load could have shifted during transport or be poorly tied down, causing load to be unstable.	If load has shifted or tie-downs are poorly installed, do not stand near truck or load. If necessary, remove each tie-down carefully and position heavy equipment on side where tie-down is being removed to prevent load from falling on that side.	L
	Lifting of equipment and materials from vehicle could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift. Perform flex/stretch exercises.	

Job Steps	Hazards	Controls	RAC
	Cuts and abrasions could occur while moving equipment and materials.	Use leather gloves when moving objects with sharp contact points.	
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only work on walking/working surfaces that have the strength and integrity to support employees safely. Openings 18 inches or more in diameter must be covered and marked. All openings less than 18 inches in diameter and all holes must be marked or barricaded.	
4. Inspect the drill rig.	Improper inspection of the rig could cause workers to be exposed to hazards associated with operating mechanical devices.	Ensure that the rig and all associated equipment are inspected by a competent person, and that the rig is in a safe operating condition. Inspect equipment, including brakes, tire pressure, cables, and hydraulic and pneumatic hoses, before use and at the start of each shift. Tag and remove from service any faulty or unsafe equipment. Verify that emergency shutdown systems (at least two) are clearly marked, and that all site workers know the locations. Verify that shutdown systems work properly when trip wires are pulled or pushed. Verify that all operator controls are clearly marked. The operator's manual must be available and reviewed prior to operation.	L
5. Hand auger first 6 feet of each boring (in areas close to underground utilities)	Hand augering, digging, or post-holing could cause injury to lower back.	Bend knees and use proper posture and back support while hand augering, digging, or post-holing boring location. If hand augering, bend knees and use two people, if necessary, to remove auger from hole. If post holing, ensure area is clear before striking ground with pike used to break up ground surface.	M
	Hand augering, digging, or post-holing over long periods of time could cause muscle strain.	Maintain steady pace and follow rest periods given on job. Select a position during hand clearing to minimize following stressors: chronic muscle contraction or steady force; extreme or awkward positions; repetitive forceful motions; or excessive gripping, pinching, or pressing.	
	Slip, trip, and fall hazards could be present due to boreholes.	Protect all open boreholes as any open excavation if left unattended (on this project, all boreholes should be filled before end of day.)	
	Worker could be struck by vehicles.	Wear high-visibility reflective vests at all times in work areas. Make eye contact with operators of vehicles. Barricade and mark drilling sites for visibility. If necessary, perform traffic controls in accordance with the Traffic Control Plan.	
	Worker could experience strain from use of tools.	Inspect all tools for damage before use. Do not use damaged tools (mark and tag "out of service"). Maintain steady pace and follow rest periods given on job. Select hand tools to minimize following stressors: chronic muscle contraction or steady force; extreme or awkward finger/hand/arm positions; repetitive forceful motions; or excessive gripping, pinching, or pressing with hands and fingers.	

Job Steps	Hazards	Controls	RAC
	Worker could be exposed to chemical contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE and respiratory protection as specified in the SSHP. Visual inspection and ambient air monitoring will determine selection of PPE and respiratory protection. Remove PPE properly and wash hands.	
6. Begin drilling operations: set up the work area and move the rig into position.	Failure to review the site layout plan could cause exposure to potential hazards such as electrocution, damage to underground utilities, or tipping the rig over in unstable soil conditions.	Do not move drill rig into any work area until the site layout plan has been completed, and the route of travel to any work site has been assessed for hazards (overhead lines and stability of roads and ground). At the pre-activity safety briefing, discuss the site layout plan and analysis of the route of travel, along with AHAs. Use a spotter for positioning, as necessary. Set the brake and place wheel chocks under front wheels of the mobile rig. The vehicle must be level to the vertical and horizontal planes. Do not position wheels (loads) or rig over manholes, vaults, valve boxes, etc.	M
	The rig could come into contact with overhead lines (including power lines), if it is transported with the rig mast raised, potentially causing electric shock.	Never move the rig when the mast is extended. If the Air Rotary rig has a mast extending above 10 feet above ground surface, do not place the rig within 15 feet of any overhead electrical lines above 50 kV.	
	The vehicle may move if not properly set up.	Use a spotter to properly position the vehicle. Set the brakes, and place wheel chocks under front wheels of the mobile rig. Extend stabilizer jacks, and ensure that footing is sound. If outriggers are employed, ensure that the ground can support the weight of the unit and any outriggers. Do not place outriggers on manholes, vaults, valve boxes, etc. The vehicle must be level to the vertical and horizontal planes.	
	When raising the rig, it may not install properly due to the condition of the rig and its connecting cables.	Inspect all components of the rig to determine its condition. Make all repairs before raising the rig.	
	A worker may become pinned between the rig and other truck components, or the worker could be pinned under the truck rig if the rig must be serviced from under the truck.	When any part of the rig or equipment is in motion, the worker will stand far enough away from the moving parts so that he/she is not pinned between the moving parts. Workers will not manually guide any moving part of the rig when it is being raised. Workers will not work under the rig or under the truck. If work must be done under the rig or truck, the drill crew supervisor will contact the Project Supervisor to ascertain a safe method for lock-out of the equipment to ensure that adequate blocking is installed.	
	High winds could destabilize the rig. Also, the mast could act as a conductor during a thunderstorm.	Check weather conditions and forecasts to determine if conditions are acceptable for use of the rig. Do not operate the rig if winds exceed the manufacturer's recommended tolerances.	
	Excessive noise exposure could cause hearing loss.	The Air Rotary operator and personnel in the vicinity of the Air Rotary rig will wear earplugs while the direct push equipment is operated.	

Job Steps	Hazards	Controls	RAC
	Pinch points can cause injury to workers' hands.	Avoid placing hands close to moving machinery. Wear gloves, as appropriate. Pinch points must be clearly labeled and painted in bright color. Operator control levers must be labeled- color coding helps differentiate operator control levers. Discuss the importance of keeping all limbs away from pinch-points at all times, during tailgate safety meetings.	
	Vehicular traffic in the area of drilling could injure workers.	Wear high-visibility reflective safety vests. Barricade and mark drilling sites for visibility. Use a flagger, if necessary, to direct traffic away from drilling areas.	
7. Conduct drilling operations: start up the drill and perform drilling.	Unqualified operators or personnel working on site who are not trained in drilling safety procedures.	Ensure that personnel are trained in the proper use of drilling equipment. Ensure that the operator has current certifications to operate the equipment. Ensure that a 10-lb dry chemical ABC fire extinguisher is readily available. Ensure that a spill control kit is available at the drilling location. Ensure that there is a first aid kit, eyewash, and an emergency air horn nearby.	M
.	Pressurized hydraulic lines could rupture, causing the release of hot hydraulic fluid. Hot fluid could ignite if contact is made with an engine. Hot fluid could also burn workers, and the fluid could cause environmental contamination.	Inspect all hydraulic lines before placing the rig in service. Any damaged hoses or connections must be replaced before the unit is used. Immediately shut down equipment if any lines rupture. Ensure that a 10-lb dry chemical ABC fire extinguisher is readily available. Ensure that a spill control kit is available at the drilling location. If rupture occurs, as quickly as possible berm the liquid to minimize the area over which the liquid spreads. Ensure that all pressurized lines have whip checks.	
	Air hoses, or hydraulic hoses under pressure, could suddenly release, whip, and hit workers, causing severe injury.	Do not disconnect air hoses and compressors until the hose line has been bled. Visually inspect all connections of any lines under pressure. Use safety clamps to connect each side of the connection to the other if the connection breaks. (The safety clamps will keep the hoses from whipping under the sudden release of pressure.) Tie back, or attach hoses wherever possible, to minimize the length of hose that could whip around if there is a sudden release of pressure.	
	Strains to workers could result from manually moving materials, equipment, and drums.	Personnel will be directed to use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment. Mechanical equipment will be used as much as possible. Use care when handling direct push drill rods. Avoid standing under any load. Do not lift more than 50 pounds without assistance.	

Job Steps	Hazards	Controls	RAC
	Atmospheric and contact hazards from chemical agents could occur.	Ambient air/visual monitoring will be used to verify the selection of PPE. Use a PID to determine if the recently drilled hole is off-gassing vapors. An MSDS for any drilling fluids will be obtained/reviewed with workers. Decontaminate drilling implements after use (or cover contaminated parts when moving to the next drilling site). Avoid exposure to dust. Use dust control as necessary and possible. PPE will be used. Drum and label all soil cuttings, if applicable. Determine if PPE is contaminated (based on exposure to contaminants). Place contaminated PPE in a separate, properly labeled container. Discard other PPE, as approved by Project Manager. Do not place the face or head over the hole.	
	Slips, trips, falls	Avoid using plastic sheeting, if possible. If plastic sheeting must be used, dig out a small depression, place the plastic on the ground, and cover it with the removed soil. This way the plastic sheeting should not become too slippery, as it will be covered by the removed soil. (This creates a larger volume of soil to be disposed, but it is a safer method than working on slippery plastic.)	
	The drill mast could be used to lift other objects as it is being raised, causing potential failure of the mast.	Masts shall only be used in a manner specified by the manufacturer and should never be loaded beyond their capacity.	
	Workers could trip or fall by stepping on a borehole.	Cover the open surface with a sturdy plate/ board and mark the location with a traffic cone.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Drill rig	Drivers must have current state-issued driver's license. Only trained equipment operators may operate equipment. Qualified operators will be identified upon assignment. All drillers and driller's helpers must have documented training on use of drill rig and associated equipment.	Receipt inspection by equipment supervisor and SSHO. If serviced or repaired, a copy of the certification by the mechanic that the vehicles meet EM 385-1-1 requirements. Daily equipment inspection by operators. An operator's manual for the drill rig must be available at the job site.
2. Hand tools	Instruction in proper tool use and ergonomic hazards.	Receipt inspection by equipment supervisor/ driller before each use.
3. Fire extinguishers in vehicles and on site	Fire extinguisher training including use and limitations.	At least monthly by SSHO or designee.
4. First aid kits and other emergency equipment	Use of emergency equipment and first aid kits must be done by personnel familiar with this plan; use and inspection criteria of the equipment, and what the equipment is used for, are by or under direction of the SSHO.	Initially, and at least weekly thereafter, or after use for restocking (29 CFR 1926.50[d][2]). First aid kits must be filled per EM 385-1-1 Table 3-1. Kits will be in field vehicles as well as at the site trailer.

Abbreviations and Acronyms:

AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
CIH – Certified Industrial Hygienist
CFR – Code of Federal Regulations
CSP – Certified Safety Professional
DPT – direct push technology
EHS – Environmental Health and Safety
EM – Engineer Manual
MSDS – Material Safety Data Sheet
OSHA – Occupational Safety and Health Administration
PID – photo-ionization detector
PPE – personal protective equipment
RAC – Risk Assessment Code
SSHO – Site Safety and Health Officer
TtEC – SES-Tt SES-Tt Team, Inc.

Activity Hazard Analysis (AHA) #3

Job/Task: Groundwater Monitoring Well Sampling	Overall Risk Assessment Code (RAC) (Use highest code)					M
Project Location: BLM and Yakima Training Center, WA	**Severity**	**Probability**				
Contract Number: W912DW-11-D-1031; TO 0001	**Risk Assessment Code (RAC) Matrix**					
Date Prepared: September 2, 2014		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Dana Ramquist, Scientist	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by (Name/Title): Roger Margotto, CIH, PESM	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**

Notes: (Field Notes, Review Comments, etc.)
In addition to the information listed in this AHA, all field personnel must review and be familiar with all provisions of the approved APP/SSHP. TtEC Corporate Safety Programs and the EM 385-1-1 will also be available on-site for review of specific materials and mitigation measures.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as Catastrophic, Critical, Marginal, or Negligible.

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

E = Extremely High Risk

H = High Risk

M = Moderate Risk

L = Low Risk

AHA #3 – Groundwater Sampling

Job Steps	Hazards	Controls	RAC
1. Sample groundwater monitoring well.	The improper handling of equipment could cause strain to a worker.	Use care when walking so that there are no sudden jerks or missteps that can cause the worker to strain to maintain control of the equipment. Get assistance from other workers, if needed. For loads greater than 50 pounds, use two people to carry.	M
	Slip, trip, and fall hazards could be present.	Maintain good housekeeping in the work area. Mark, or remove, all identified trip, slip, and fall hazards from the sampling area. Maintain proper illumination in the work area.	

AHA #3 – Groundwater Sampling			
Job Steps	**Hazards**	**Controls**	**RAC**
	Back strains and pinch points.	Hand tools shall be selected to minimize the following stressors: chronic muscle contraction or steady force; extreme or awkward finger/hand/arm positions; repetitive forceful motions; excessive gripping, pinching, and/or pressing with hand and fingers. Do not lift more than 50 pounds. Avoid prolonged repetitive motion. Rotate job tasks with other workers. Get help or use mechanical lifting devices for heavy loads. Perform stretch/flex exercises prior to tasks. Wear leather gloves when opening monitoring well lids.	
Sample groundwater monitoring well. (Continued)	Workers could be exposed to chemical contaminants and atmospheric hazards.	Wear required PPE (nitrile gloves and standard work uniform) and utilize the PID when opening the well cap. The intent of PPE is to prevent contact with groundwater that may have low levels of contaminants. (Although these contaminants are low in concentration, they can still be absorbed by the skin or cause skin irritation.) Visual inspection and ambient air monitoring will determine the selection of PPE and respiratory protection. Decontaminate exteriors of sample containers. Avoid spills. Ensure that spill cleanup supplies are available.	
	Chemical exposure to sample preservative.	Review MSDS for preservative. Wear PPE specified by the MSDS and consult with the PESM.	
2. Handle samples.	Atmospheric and contact hazards from contaminated soil or water.	Wear required PPE and respiratory protection. Visual inspection and ambient air monitoring will determine selection of PPE and respiratory protection. Decontaminate exteriors of sample containers. Avoid spills. Ensure that spill cleanup supplies are available. Note: The intent of PPE is to prevent contact with groundwater that may have low levels of contaminants. (Although these contaminants are low in concentration, they still can be absorbed by the skin or cause irritation to the skin.)	M
	Cuts or abrasions from broken sample bottle.	Handle all glassware with care. Bottles may break if dropped; use leather gloves when cleaning up broken glass.	
3. Pack samples for shipment.	Manually moving materials and equipment could cause strains to workers.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky or heavy materials and equipment. Use a hand-truck when handling more than one box at a time. Try to pack shipping boxes so that each box does not exceed 50 pounds. For loads greater than 50 pounds, use two people to carry the load.	L
	Contents of sample containers could leak, causing exposure to the worker and, possibly, to people handling the shipping box.	Ensure that each container top is securely tightened. Pack each container in such a manner as to prevent damage to the container during handling of the shipping box and during transportation. Ensure that boxes meet required packaging standards, based on the mode of transportation used	

AHA #3 – Groundwater Sampling			
Job Steps	**Hazards**	**Controls**	**RAC**
		for shipping.	
4. Decontaminate all reusable materials and equipment.	Worker could come into contact with contaminants.	Avoid spills. Wear designated PPE. Remove PPE properly and wash hands.	M
5. Decontaminate all reusable materials and equipment. (Continued)	Lifting equipment and materials could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, and limiting twisting. Get help when moving bulky/heavy materials and equipment. Use hand-truck if needed. For loads greater than 50 pounds, use two people to lift.	
	Worker could be exposed to chemical contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE and respiratory protection as specified in the SSHP. Visual inspection and ambient air monitoring will determine selection of PPE and respiratory protection. Remove PPE properly and wash hands.	
	Decontamination area may become slippery.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards as feasible. Maintain proper illumination in all work areas. If decontaminating on plastic sheeting, use caution since plastic sheeting is extremely slippery. Wear boots with good traction.	

AHA #3 – Groundwater Sampling		
Equipment to be Used	**Training Requirements/Competent or Qualified Personnel Name(s)**	**Inspection Requirements**
Vehicles – pickup trucks	Department of Motor Vehicles-licensed personnel will operate vehicles.	Inspect daily, and before use. Use the equipment safety checklist found in the SSHP.
Hand tools – drills, mixing elements, screwdrivers, hammers, pliers, etc.	Personnel must have reviewed operator's manual and have been trained on power tools. Only qualified person will operate equipment.	Inspect hand tools before each use following manufacturers' requirements. Discard or tag out-of-service, any tools that are damaged. Do not use power tools that have frayed cords or exposed wiring. All power tools must have a grounding plug or be double insulated.
Sampling Equipment	Use of equipment must be done by personnel familiar with this plan; use and inspection criteria of the equipment, and what the equipment is used for, by or under direction of the SSHO.	Daily inspection and calibration by users/operators.
Fire extinguishers	Fire extinguisher training including use/limitations is required.	At least monthly by SSHO or designee.

AHA #3 – Groundwater Sampling		
Equipment to be Used	**Training Requirements/Competent or Qualified Personnel Name(s)**	**Inspection Requirements**
First-aid kits and other emergency equipment	Emergency equipment/first-aid kits must be used by personnel familiar with this plan; use and inspection criteria of the equipment, and what the equipment is used for, by or under direction of the SSHO.	Initially and at least weekly thereafter or after use for restocking (29 CFR 1926.50[d][2]). First-aid kits must be filled per EM 385-1-1 Table 3-1.

Abbreviations and Acronyms:

AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
Cal-OSHA – California Occupational Safety and Health Administration
CCR – California Code of Regulations
CFR – Code of Federal Regulations
CIH – Certified Industrial Hygienist
CTO – Contract Task Order
EM – Engineer Manual
GFCI – ground fault circuit interrupter
kV – kilovolts
MSDS – Material Safety Data Sheet
NEC – National Electrical Code
PESM – Project Environmental Safety Manager
PG – Professional Geologist
PID – photoionization detector
PPE – personal protective equipment
PVC – polyvinyl chloride
RAC – Risk Assessment Code
SSHO – Site Safety and Health Officer
SSHP – Site Safety and Health Plan
TtEC – SES-Tt SES-Tt Team, Inc.
UST – Underground Storage Tank

Activity Hazard Analysis (AHA) # 4

Job/Task: ISCO Injection	**Overall Risk Assessment Code (RAC) (Use highest code)**	**M**
Project Location: JBLM and Yakima Training Center, WA	**Risk Assessment Code (RAC) Matrix**	
Contract Number: W912DW-11-D-1031, TO 0001		
Date Prepared: August 18, 2014		
Prepared by (Name/Title): Dana Ramquist, FOL		
Reviewed by (Name/Title): Roger Margotto, CIH, PESM		
Notes: (Field Notes, Review Comments, etc.) In addition to the information listed in this AHA, all field personnel must review and be familiar with all provisions of the approved APP/SSHP. TtEC Corporate Safety Programs and the EM 385-1-1 will also be available on-site for review of specific materials and mitigation measures.		

Severity	**Probability**				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	**E**	**E**	**H**	**H**	**M**
Critical	**E**	**H**	**H**	**M**	**L**
Marginal	**H**	**M**	**M**	**L**	**L**
Negligible	**M**	**L**	**L**	**L**	**L**

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (see above).

"Probability" is the likelihood to cause an incident, near miss, or accident and is identified as Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and is identified as Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on the AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

E = Extremely High Risk

H = High Risk

M = Moderate Risk

L = Low Risk

AHA # 4 – Job/Task: ISCO Injection

Job Steps	Hazards	Controls	RAC
1. Assess injection location safety.	Vehicles could travel over unstable surfaces or hazards.	Mark all physical hazards. Weight of trailer can be significant; verify stability of all routes of travel.	M
Assess injection location safety (continued).	Biological hazards such as snakes, spiders, scorpions, ticks, and other insects could cause poisoning, disease.	Look carefully for snakes before stepping into any grassy/brush. If traversing through chaparral or rocks, use a walking stick to identify rattle snakes. Watch for snakes when disturbing rubble or debris. Use insect repellant as necessary. The Project Superintendent will obtain leg and foot protection for snakebites if	

AHA # 4 – Job/Task: ISCO Injection			
Job Steps	**Hazards**	**Controls**	**RAC**
		the work area is not clear of brush and rocks, and cannot be cleared.	
	Vehicle traffic patterns, intersections.	Establish a safe Traffic Control Plan that avoids crossing traffic patterns with the backhoe, excavator, haul trucks, and ground workers.	
Inspect injection trailer, vehicles and equipment.	Improper inspection of equipment could cause workers to be exposed to hazards associated with operating mechanical devices.	Ensure that the trailer and all associated equipment are inspected by a competent person and that the equipment is in safe operating condition. Inspect equipment, including brakes, tire pressure, cables, and water hoses, before use and at start of each shift. Tag and remove from service faulty or unsafe equipment.	M
1. Set up work area and move injection materials and associated equipment into position.	Failure to review site layout plan could cause exposure to potential hazards such as tipping trailer over in unstable soil conditions.	Do not move injection trailer into any work area until site layout plan has been completed and route of travel to any work site has been assessed for hazards (overhead lines and stability of roads and ground). At the pre-activity safety briefing, discuss site layout plan and analysis of route of travel, along with AHAs. Use a spotter for positioning as necessary. Set brake and place wheel chocks under front wheels. Vehicle must be level to vertical and horizontal planes. Do not position wheels (loads) or trailer over manholes, vaults, valve boxes, etc.	M
	High winds could destabilize equipment. Equipment could act as a conductor during a thunderstorm.	Check weather conditions and forecasts to determine if conditions are acceptable for use of injection equipment. Do not operate the injector if winds exceed manufacturer's recommended tolerances. TtEC policy requires an evaluation any time wind exceeds 25 miles per hour.	
	Excessive noise exposure could cause hearing loss.	When necessary, earplugs will be worn.	
	Workers could be exposed to pinch points.	Avoid placing hands close to moving machinery. Wear gloves, as appropriate.	
	Traffic in area of injection could injure workers because vehicles fail to see to workers or workers fail to see the vehicles.	Wear high-reflective safety vests. Barricade and mark injection sites for visibility. Use a flagger, if necessary, to direct traffic away from drilling areas.	
2. Mix injection materials and perform injection.	Unqualified operators and personnel in area may not have sufficient knowledge of hazards.	Ensure that personnel are trained in use of equipment. Ensure that a 20-pound dry chemical ABC fire extinguisher is readily available. Ensure that a spill-control kit is available at injection location. Ensure that there is a first-aid kit, eyewash, and an emergency air horn nearby.	L
	Strains could result from manually moving materials, equipment, and drums.	Personnel will be directed to use proper lifting techniques such as keeping the back straight, lifting with the legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment.. Do not lift more than 35 pounds without assistance.	

AHA # 4 – Job/Task: ISCO Injection			
Job Steps	**Hazards**	**Controls**	**RAC**
	Workers could be exposed to atmospheric dust and come into contact with hazards from chemical agents.	Ambient air/visual monitoring will be used to verify selection of PPE, including monitoring of airborne particluates with mini RAM or equivalent monitoring device. An MSDS for any injection materials is inlcuded in the Work Plan and will be reviewed with workers. Decontaminate injection implements after use (or cover contaminated parts when moving to the next injection site). Avoid exposure to dust. Use dust control as necessary and possible. PPE will be used. Determine if PPE is contaminated (based on exposure to contaminants). Place contaminated PPE in a separate, properly labeled, container. Discard other PPE, as approved by the PESM. Do not place face or head over injection wells.	

AHA # 4 – Job/Task: ISCO Injection		
Equipment to be Used	**Training Requirements/Competent or Qualified Personnel name(s)**	**Inspection Requirements**
Injection equipment and rig/ trailer	Only Department of Motor Vehicles-licensed personnel will operate vehicles. Specific training for use of injection rig will be documented and provided prior to work.	Daily and before use. Inspect equipment before each use following manufacturers' requirements. Document inspection on an inspection form or in a logbook.
Vehicles – pickup trucks	Only Department of Motor Vehicles-licensed personnel will operate vehicles.	Daily and before use. Inspect equipment before each use following manufacturers' requirements. Document inspection on an inspection form or in a logbook.
Hand tools	Specific training for hand tools.	Inspect hand tools before each use following manufacturers' requirements. Discard defective tools. Personnel must have reviewed operators' manual and have been trained on power tools. Only qualified personnel will operate generator or compressor, if used.

Abbreviations and Acronyms:
AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
CIH – Certified Industrial Hygienist
CTO – Contract Task Order
EM – Engineer Manual
IR – Installation Restoration (Program)
PESM – Project Environmental Safety Manager
PPE – personal protective equipment
RAC – Risk Assessment Code
SSHP – Site Safety and Health Plan
TtEC – SES-Tt SES-Tt Team, Inc.

Activity Hazard Analysis (AHA) # 5

Job/Task: Well Decommissioning	**Overall Risk Assessment Code (RAC) (Use highest code)**	**H**
Project Location: Joint Base Lewis McChord and Yakima Training Center, WA	**Risk Assessment Code (RAC) Matrix**	
Contract Number: W912W-11-D-1031, TO 0003		
Date Prepared: August 26,2014		
Prepared by (Name/Title): Dana Ramquist, Scientist		
Reviewed by (Name/Title): Roger Margotto, CIH, CSP, Program CIH		

Severity	**Probability**				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	**E**	**E**	**H**	**H**	**M**
Critical	**E**	**H**	**H**	**M**	**L**
Marginal	**H**	**M**	**M**	**L**	**L**
Negligible	**M**	**L**	**L**	**L**	**L**

Notes: (Field Notes, Review Comments, etc.)

This AHA is an addendum to the APP/SSHP to address additional work described in the additional work plan section 4.5.15

In addition to the information listed in this AHA, all field personnel must review and be familiar with all provisions of the approved APP/SSHP. TtEC Corporate Safety Programs and the EM 385-1-1 will also be available on-site for review of specific materials and mitigation measures.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (see above).

"Probability" is the likelihood to cause an incident, near miss, or accident and is identified as Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and is identified as Catastrophic, Critical, Marginal, or Negligible.

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on the AHA. Annotate the overall highest RAC at the top of the AHA.

RAC Chart

E = Extremely High Risk

H = High Risk

M = Moderate Risk

L = Low Risk

AHA #5 – Job/Task: Well Decommissioning

Job Steps	Hazards	Controls	RAC
Pressure Grouting Method			
1. Survey the site.	Slips, trips, and falls from various agents.	Work areas will be visually inspected and preexisting slip, trip, and fall hazards will be marked, barricaded, or eliminated as is feasible. Work areas will be kept neat and in an orderly state of housekeeping. Proper illumination will be maintained in work areas.	L
	Failure to properly survey site could cause exposures to electrical hazards and ground hazards.	Conduct survey properly to identify all overhead electrical hazards, including electrical hazards in the path of the equipment as it being transported. Ensure that ground has no hazards such as unstable soil or underground utilities. Ensure that the findings of the survey and controls for all potential hazards become part of this hazard analysis.	
2. Pressure grout operations – inspect drill rig.	Improper inspection of rig could cause workers to be exposed to hazards associated with	The rig and all associated equipment will be inspected by a competent mechanic and be certified to be in safe operating condition.	L

AHA #5 – Job/Task: Well Decommissioning			
Job Steps	**Hazards**	**Controls**	**RAC**
	operating a mechanical device.	Equipment will be inspected before use and at the beginning of each shift. Faulty or unsafe equipment will be tagged and removed from service. No faulty equipment or damaged items will be allowed in the work area. Verify that the emergency shutdown system, which consists of trip wires located at the right and left rear of the drill, works. (Located on each side – one for the driller and one for the driller's helper). Ensure that each wire shuts down the system when the trip wire is pulled or pushed. There must be two kill switches on the rig, located on different sides. Inspect the brakes and tire pressure on the drill rig.	
	Defective cables could break. Defective hoses and their connection could suddenly release and whip and hit workers causing severe injury.	Inspect all cables on the rig. Inspect all hydraulic and pneumatic hoses. Whip checks on all pressurized hoses	
3. Pressure grout operations – set up work area and move rig into position.	Failure to review the site layout plan could cause exposure to potential hazards such as electrocution, damaging underground utilities, and tipping over the rig in unstable soil conditions.	A site layout plan will become part of this hazard analysis as soon as it is completed. The drilling rig will not be moved into any work area until the site layout plan has been completed and the route of travel to any work site has been assessed for hazards (overhead lines, stability of roads and ground). The site layout plan and the analysis of the route of travel will be covered at the pre-activity safety briefing along with this AHA.	M
	Damage to existing utilities.	Obtain and review all pertinent drawings before working near utilities. Locate, scan and mark all utilities prior to intrusive work. Mark utilities using the APWA guidelines. Ensure that National One Call (811) has been contacted. Assure that weight of rig on ground is evenly distributed and is not so heavy as to damage any underground lines that may be near the surface.	
	Rig could contact overhead lines, including power lines if it is transported with rig raised.	Never move rig when mast is extended.	

AHA #5 – Job/Task: Well Decommissioning			
Job Steps	**Hazards**	**Controls**	**RAC**
	When raising the rig, it may not install properly due to the condition of rig and connecting cables.	Inspect all components of rig to determine condition. Make all repairs before raising rig.	
	When raising rig, the mast could come in contact with or close proximity to overhead power lines causing electrocution of workers.	Mast and other equipment must be at least 15 feet from any overhead utility lines. Verify the voltage of any overhead power lines. If any lines are above 50 kV, the clearance distance must be greater than 15 feet. Refer to EM 385-1-1, Section 11, Table 11-3 for clearance required for voltages above 50 kV.	
	Vehicle may move if not properly set up.	Use spotter to properly position vehicle. Set brakes and place wheel chocks under front wheels of mobile rig. Extend stabilizer jacks and ensure that footing is sound. Vehicle must be level to the vertical and horizontal planes.	
	Worker may become pinned between rig and other truck components, or worker could be pinned under truck rig if servicing of rig from under the truck is required.	When any part of the rig or equipment is in motion, workers will stand a sufficient distance from the moving parts so that the worker is not pinned between the moving parts. Workers will not manually “guide” any moving part of the rig when it is raised up. Workers will not work under the rig or the truck. If work must be done under the truck or rig, the drill crew supervisor will contact the SSHO to ascertain a safe method for lockout of the equipment to ensure that adequate blocking is installed.	
	High winds could destabilize rig. Mast could act as a conductor during a thunderstorm.	Check weather conditions and forecasts to determine whether conditions are acceptable for use of rig. Do not operate the rig if winds exceed manufacturer’s recommended tolerances.	
	Pinch points could injure workers.	Avoid placing hands in places close to moving machinery. Wear gloves, as appropriate but not near rotating or moving parts. Keep limbs, hands, feet from being placed between stationary and moving parts.	
	Flying objects can strike workers or equipment.	Wear safety glasses and hard hats. Do not lean shovels against rigs or equipment which is supported on outriggers.	
	Traffic in area of drilling.	Wear high visibility safety vests. Barricade and mark drilling sites for visibility. Use a flagger, if necessary, to direct traffic away from drilling areas.	

AHA #5 – Job/Task: Well Decommissioning			
Job Steps	**Hazards**	**Controls**	**RAC**
4. Pressure grout operations – start up rig and perform well destruction.	Failure to have permit to do well destruction could cause notice of violation.	Obtain permit from local Environmental Health Division and have it available on-site before beginning well destruction. Ensure well destruction activities follow California Well Standards, Bulletin 74-90 and the Environmental Health Division permit	H
	Pressurized hydraulic lines could rupture causing release of hot hydraulic fluid. Hot fluid can ignite if contact is made with engine. Hot fluid can burn workers. Fluid can cause environmental contamination.	Personnel will have been trained in the use of drilling equipment. Inspect all hydraulic lines before placing rig in service. Any damaged hoses or connections must be replaced before unit is used. Ensure the use of whip checks on all pressurized hoses. Immediately shut down the equipment. Ensure that first aid kit is readily available to treat injured workers. Ensure that a 20-pound dry chemical ABC fire extinguisher is readily available. A spill control kit consisting of a shovel, absorbent material, and disposal drum must be available at the drilling location. As quickly as possible, berm the liquid to minimize the area over which the liquid spreads. Loose protective clothing, if worn, will be restrained with duct tape to prevent entanglement in moving parts.	
	Air hoses or hydraulic hoses under pressure could suddenly release, whip, and hit workers causing severe injury.	Do not disconnect air hoses and compressors until hose line has been bled. Visually inspect all connection of any lines under pressure. Use whip checks to connect each side of connection to the other in the event the connection breaks. (The safety clamps will keep the hoses from whipping under the sudden release of pressure.) Tie back or attach hoses wherever possible to minimize the length of hose that could whip around in the event there is a sudden release of pressure.	
	Strains from manually moving materials, equipment, and drums.	Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, and limiting twisting. Get help in moving bulky/heavy materials and equipment. Mechanical equipment will be used as much as possible. Use care when handling augers or drill rods. Avoid standing under any load. Get help for lifting any item that weighs 50 pounds or more.	
	Atmospheric and contact hazards from chemical agents.	Ambient air/visual monitoring will be used to verify selection of PPE. See SSHP, Table 6-1) An MSDS for any drilling fluids will be obtained/reviewed with workers. Decontaminate drilling implements after use. Avoid exposure to dust. Use dust control as necessary and possible.	

AHA #5 – Job/Task: Well Decommissioning			
Job Steps	**Hazards**	**Controls**	**RAC**
		PPE to be worn, at a minimum encompasses hard hat, safety glasses, hard toe safety boots, and nitrile gloves. Wear other PPE as specified by the SSHP, Table 6-1. (Attachment 1 of this APP). For example, if operation causes cement or bentonite dust; wear a half face dust mask meeting the NIOSH N-95 requirements. Drum and label all soil cuttings and removed well components (pipe pieces, sand, screens) Determine if PPE is contaminated (based on exposure to contaminants). Place contaminated PPE in a separate, properly labeled container. Discard other PPE as approved by the Project Manager and PESM.	
	Sometimes workers use plastic sheeting in the area where they are drilling to protect the surrounding ground. This sheeting becomes very slippery when drilling muds are placed on it.	Avoid using plastic sheeting, if possible. Many drillers today build a small bermed area where they place the drilling muds. It is easier to clean up the surface of the soil than to have workers slip on plastic sheeting. If plastic sheeting must be used, dig out a small depression, place the plastic on the ground and cover the plastic with the removed soil. This way, the plastic sheeting should not become too slippery as it will be covered by the removed soil. (This creates a larger volume of soil to be disposed of, but it is a safer method than working on slippery plastic.)	
	The mast could be used to lift other objects as it is being raised causing potential failure of the mast.	Masts will be used in a manner specified by the manufacturer and should never be loaded beyond their capacity.	
	Workers could climb drill mast and expose themselves to a fall hazard.	Climbing on the mast is not allowed.	

AHA #5 – Job/Task: Well Decommissioning			
Job Steps	**Hazards**	**Controls**	**RAC**
	Workers could place hands into moving parts of the rig, or loose clothing could become entangled in moving machine parts, either of which could injure a worker.	Chains, sprockets, and moving parts will be guarded. Workers will not wear loose clothing, or any jewelry. Workers will not place their hands or any part of their body between the drill auger or rod and the drill plate. Workers should never place themselves in a position where they can come in contact with the moving drill rods or augers. The operator will verbally alert all workers and visually ensure that all workers are clear from dangerous parts of equipment before starting or engaging equipment. Workers will avoid contact with any moving auger. Means will be provided to guard against employee contact with the auger. (For example, use a barricade around the perimeter of the auger or an electronic brake activated by a presence-sensing device.)	
	Workers could injure themselves by cleaning the augers while they are rotating.	Augers will be cleaned only when they are stopped and in neutral. They will not be restarted until the worker has given a verbal all clear to the operator and the operator has visually determined that the worker is clear of the auger. Only long handled shovels will be used to move cuttings from the auger.	
	Workers could trip or fall by the borehole.	Cap and flag open boreholes. All open boreholes will be protected as any open excavation if they are left unattended. (On this project, all boreholes should be filled before the end of the day.)	
	Pinch points- worker can become entangled in moving machinery.	Avoid placing hands in places close to moving machinery. Wear gloves, as appropriate. Keep constantly alert.	
	Workers could be injured by well debris as the rig bores out the existing well.	Maintain a safe distance from the rig as the well is drilled out. Wear proper PPE, especially hard hat and safety glasses. Face shield may be necessary for further protection. Observers should stand well back of the operation.	
Alternate Method: Over-drilling			
1. Park contractor vehicle carrying drill rig and equipment.	Vehicle could hit someone or something.	Use spotters when positioning vehicle if needed. Ensure that spotters know how to communicate with driver of vehicle.	L

AHA #5 – Job/Task: Well Decommissioning			
Job Steps	**Hazards**	**Controls**	**RAC**
_____	Location could create a traffic hazard.	Locate vehicle in an area that will not obstruct traffic. Use cones, barriers, and warning signs, if necessary.	
2. Unload equipment and materials.	Load could have shifted during transport or be poorly tied down, causing it to be unstable.	If load has shifted or tie-downs are poorly installed, do not stand near truck or load. If necessary, remove each tie-down carefully and position heavy equipment on side where tie-down is being removed to prevent load from falling on that side.	M
_____	Lifting of equipment and materials from vehicle could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with the legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use a hand truck if needed. For loads greater than 50 pounds, use two people to lift.	
_____	Cuts and abrasions could occur while moving equipment and materials.	Use leather gloves when moving objects with sharp contact points.	
_____	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only work on walking/working surfaces that have the strength and integrity to support employees safely. Openings 18 inches or more in diameter must be covered and marked. All openings less than 18 inches in diameter and all holes must be marked or barricaded. Keep work area neat and orderly.	
3. Inspect drill rig.	Improper inspection of rig could cause workers to be exposed to hazards associated with operating mechanical devices.	Ensure that rig and all associated equipment are inspected by a competent person and that rig is in safe operating condition. Inspect equipment; including brakes, tire pressure, cables, and hydraulic and pneumatic hoses, before use and at start of each shift. Tag and remove from service faulty or unsafe equipment. Verify that emergency shutdown systems (at least two) are clearly marked, and that all site workers know locations. Verify that shutdown systems work properly when trip wires are pulled or pushed. Ensure that a barrier or cage around the auger is present.	M
4. Position and set up drill rig and associated equipment.	Electrocutions, explosions, disastrous events, etc. could occur.	*Obtain and examine copies of all pertinent drawings prior to performing this task. Locate and mark existing underground utilities using universal marking codes. Obtain Underground Service Alert clearance (811) prior to work. Inspect the area of drilling activity for overhead obstructions. Contact service facility engineer before working near utilities. Ensure that weight of rig is evenly distributed on ground and is not so heavy as to damage any underground lines that may be near the surface (e.g., shallow buried PVC lines). When mast is raised workers must stand back from mast. Never place hands on mast as it is being raised.*	M

AHA #5 – Job/Task: Well Decommissioning			
Job Steps	**Hazards**	**Controls**	**RAC**
	Failure to review site layout plan could cause exposure to potential hazards such as electrocution, damaging of underground utilities, or tipping rig over in unstable soil conditions.	*Do not move drill rig into any work area until site layout plan has been completed and route of travel to any work site has been assessed for hazards (overhead lines and stability of roads and ground). At the pre-activity safety briefing, discuss site layout plan and analysis of route of travel, along with AHAs. Use a spotter for positioning as necessary. Set brake and place wheel chocks under front wheels of mobile rig. Extend stabilizer jacks and ensure sound footing. Vehicle must be level to vertical and horizontal planes. Do not position wheels (loads) or rig over manholes, vaults, valve boxes, etc. Do not place rig within 15 feet of any overhead electrical lines. Verify voltage of any overhead power line. If any lines are above 50kV, the clearance must be greater. Refer to EM 385-1-1; Section 11; Table 11-1 for clearances required for voltage above 50kV.*	
	Rig could contact overhead lines if transported with mast raised, causing electric shock.	Never move rig when mast is extended.	
	Worker could become pinned between rig and other truck components, or worker could be pinned under rig if rig is serviced from under the truck.	*When any part of rig or equipment is in motion, stand far enough away from moving parts to avoid being pinned between moving parts. Do not work under rig or truck while rig is supported by lifting jacks. If work must be done under rig or truck, drill crew supervisor must contact SHSS to ascertain a safe method for lockout of equipment to ensure that adequate blocking is installed.*	
	High winds could destabilize rig. Mast could act as a conductor during a thunderstorm.	Check weather conditions and forecasts to determine if conditions are acceptable for use of rig. Do not operate rig if winds exceed manufacturer's recommended tolerances.	
	Workers could be exposed to noise.	*Wear earplugs whenever drill rig is in operation, if necessary.*	
	Workers could be exposed to pinch points, which may cause loss of limbs, hands, fingers, toes, etc.	Avoid placing hands or any other body part close to moving machinery. Wear leather gloves, as appropriate. (Do not wear gloves when near moving parts as gloves or clothing may become entangled in the moving part. Long hair must be tucked under hard hat.) Wear steel-toe boots.	
5. Start up rig and perform over-drilling.	Pressurized hydraulic lines could rupture, causing release of hot hydraulic fluid. Hot fluid could ignite if contact is made with engine, burn workers, and cause environmental contamination.	Ensure that personnel are trained in use of drilling equipment. Ensure that the operator has current certifications to operate the equipment. Inspect all hydraulic lines before placing rig in service. Any damaged hoses or connections must be replaced before unit is used. Immediately shut down equipment if lines rupture. Ensure that first aid kit is readily available to treat injured workers. Ensure that a 20-pound dry chemical ABC fire extinguisher is readily available. Ensure that a spill control kit is available at drilling location. If rupture occurs, as quickly as possible, berm the liquid to minimize the area over which the liquid spreads. Ensure that all pressurized lines have whip checks.	H

AHA #5 – Job/Task: Well Decommissioning			
Job Steps	**Hazards**	**Controls**	**RAC**
	Air hoses or hydraulic hoses under pressure could suddenly release, whip, and hit workers causing severe injury.	*Do not disconnect air hoses and compressors until hose line has been bled. Visually inspect all connections of any lines under pressure. Use safety clamps (whip checks) to connect each side of connection to other if connection breaks (safety clamps will keep hoses from whipping under sudden release of pressure). Tie back or attach hoses wherever possible to minimize length of hose that could whip around if there is sudden release of pressure.*	
.	Worker could be exposed to chemical agents	*Verify selection of PPE with ambient air/visual monitoring. Review all MSDSs. Decontaminate drilling implements after use (or cover contaminated parts when moving to the next drilling site). Avoid exposure to dust. Use dust control as necessary and possible. Drum and label all soil cuttings. Determine if PPE is contaminated (based on exposure to contaminants) and place contaminated PPE in a separate, properly labeled, container.*	
	Workers could place hands into moving parts of rig, or loose clothing could become entangled in moving machine parts, either of which could cause injury.	*Guard all chains, sprockets, and moving parts. Do not wear loose clothing or any jewelry. Ensure that all long hair will be secured. Workers will not place their hands or any parts of their body between the drill auger or rod and the drill plate. Workers should never place themselves in a position where they can come into contact with the moving drill rods or augers. Ensure that operator verbally alerts all workers and visually verifies that all workers are clear of dangerous parts of equipment before starting or engaging it. (Ensure that a guard or cage is around the drilling auger.)*	
	Lifting of equipment and materials could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with the legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use a hand truck if needed. For loads greater than 50 pounds, use two people to lift.	
	Workers could be exposed to noise.	Wear earplugs whenever drill rig is in operation, if necessary.	
	Workers could be exposed to pinch points.	Avoid placing hands close to moving machinery. Wear gloves, as appropriate. Keep constantly alert.	
Management of soils, debris, closure of bore hole			
1. Filling drums or roll-offs with debris and/or soils.	Use of heavy equipment could cause injury to worker if struck by the equipment.	Always maintain eye contact with operator of heavy equipment. Wear high visibility safety vest. Avoid swing radius of equipment. Use a spotter.	M
	Workers could be struck by the debris or come in contact with contaminated material as drums or roll-offs are loaded.	Do not stand near material as containers are being filled by mechanical equipment. If manually placing material into containers, avoid contact with the debris already in the container.	

AHA #5 – Job/Task: Well Decommissioning			
Job Steps	**Hazards**	**Controls**	**RAC**
	Improper labeling of drums or roll-offs could cause improper disposal or notice of violation from a regulatory agency.	Always label container immediately after it is loaded or partially loaded before closing cover to container. Label the container as required by the Sampling and Analysis Plan.	
2. Manage water, sands, soils, and well debris in storage.	Handling of drums and roll-offs can expose workers to injury.	If handling drums, use a drum dolly, a pallet on a forklift, or a drum grabber attached to a backhoe or excavator to move the drums into storage. If handling drums, inspect the path that the drum must be moved over. Ensure that there are no ruts or other obstacles over the surface being traversed that could cause the drum to tip over or be difficult to handle. Place drums in an approved storage area. When manually handling drums, avoid placing hands between drums, since you may pinch your fingers. Wear leather work gloves. If drums have to be manually positioned, be sure you know how to "break and roll" a drum. Avoid manually positioning drums if at all possible. Only one person should break and roll a drum if it must be manually moved without mechanical assistance.	M
	Containers may leak exposing workers or the environment to the contaminants.	Inspect all containers on a regular basis (weekly for nonhazardous material; daily for hazardous material). Have spill cleanup supplies and equipment readily available. Surface may become slippery. Wear work boots with good traction soles. Avoid exposure to the material. Wear appropriate PPE. Clean up all spills immediately. Notify supervisor.	
3. Load the truck.	Drums could fall as they are being loaded causing injury to workers or damage to the truck, drums, or nearby objects. Damaged drums could leak and expose workers or the environment.	Use a truck that has a Tommy Lift® and move the drum onto the lift using a drum dolly. Be sure the drum is secure and will not roll when the lift is raised. Wheel the drum to the best location on the truck for transport. Be sure to evenly distribute the weight of the load on the bed of the truck. Secure drums in place on the truck. If drums are loaded using a drum handling device attached to a backhoe or excavator, stand away from the truck as the drum is placed there. Once the drum is placed and the loader moves away from the truck, use a drum dolly on the truck to position the drum. Avoid placing pallets of drums on a truck unless the pallets can be positioned where they are going to remain for transport. (It is very difficult to move loaded pallets manually.)	M

AHA #5 – Job/Task: Well Decommissioning			
Job Steps	**Hazards**	**Controls**	**RAC**
4. Mix cement or cement–bentonite mixture.	Workers could be exposed to the dust from bags of material as they are poured into container or when water is added to mixing container.	Wear dust masks, N-95 or better, when pouring bags of concrete, cement, or bentonite. Avoid creating a lot of dust by slowly pouring the bags. Avoid forcefully applying water into container so as to avoid generating dust.	M
	Workers could be injured by the weight of the material bags or when handling the mixer.	Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, and limiting twisting. Get help in moving bulky/heavy materials and equipment. Mechanical equipment will be used as much as possible. Use care when handling the mixer. Never lift anything above shoulder height. Get help for lifting any item that weighs 50 pounds or more.	
5. Fill borehole with cement or cement-bentonite mixture.	Workers can be exposed to the mixture slurry causing irritation or burns to the skin or eyes.	Wear PPE as specified in the SSHP, Table 6-1 and/or the MSDS for dry bentonite or cement. Wear gloves and safety glasses.	M
	Workers could fall into hole or trip on hole as mixture is poured or “topped off”.	Do not come too close to edge of borehole. Use care as heavy material is loaded into borehole, watch your step and use buddy for lifting over 50 lbs.	
	The mixture is heavy, and workers could be injured if an attempt is made to manually “top off” the hole.	Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, and limiting twisting. Get help in moving bulky/heavy materials and equipment. Mechanical equipment will be used as much as possible. Avoid standing under any load. Get help for lifting any item that weighs 50 pounds or more.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
1. Vehicles – pickup trucks	Department of Motor Vehicles-licensed personnel will operate vehicles.	Inspect daily, and before use. Use the equipment safety checklist found in the SSHP.
2. Equipment – PID/FID	Ensure all personnel performing calibration have been properly trained.	Operational and calibration checks for air monitoring equipment will be performed as required by the manufacturer and the SSHP. Document the calibration checks on a calibration form or in a logbook.
3. Drilling rig heavy equipment for loading and lifting	An operators' manual for the drill rig must be available at the job site. Only trained and qualified equipment operators may operate heavy equipment; only DMV-licensed personnel will operate trucks. All drillers and drillers' helpers must have documented training on use of the rig.	Daily or before use. Use inspection checklist. Complete form and sign.
4. Drums, roll-off boxes	Personnel handling drums must have received training on drum handling to include opening and closing drum, moving drums, and positioning drums. Personnel must be familiar with the hazards of roll-off boxes.	Inspect all drums and roll-off boxes for damages. Do not use any drums that are damaged.
5. Hand tools – hand augers, pry bar, hammers, pliers, etc.	Workers will have been given specific training for use of tools.	Inspect each tool before use. Discard damaged tools.

Abbreviations and Acronyms

AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
Apwa – American Public Works Association
CIH – Certified Industrial Hygienist
DMV – Department of Motor Vehicles
EM – Engineer Manual
FID – flame ionization detector
kV – kilovolt
MSDS – Material Safety Data Sheet
PESM – Project Environmental Safety Manager
PID – photoionization detector
PG – Professional Geologist
PPE – personal protective equipment
RAC – Risk Assessment Code
SSHO – Site Safety and Health Officer
SSHP – Site Safety and Health Plan

Activity Hazard Analysis (AHA) #6

Job/Task: Operation and Maintenance (O&M) of GAC Treatment System	**Overall Risk Assessment Code (RAC) (Use highest code)**					**M**
Project Location: BLM and Yakima Training Center, WA	**Severity**	**Probability**				
Contract Number: W912DW-11-D-1031; TO 0001	**Risk Assessment Code (RAC) Matrix**					
Date Prepared: September 2, 2014		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Dana Ramquist, Scientist	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by (Name/Title): Roger Margotto, CIH, PESM	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**

Notes: (Field Notes, Review Comments, etc.)
In addition to the information listed in this AHA, all field personnel must review and be familiar with all provisions of the approved APP/SSHP. TtEC Corporate Safety Programs and the EM 385-1-1 will also be available on-site for review of specific materials and mitigation measures.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as Catastrophic, Critical, Marginal, or Negligible.

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart
E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

AHA #6 – Operation and Maintenance (O&M) of GAC Treatment System			
Job Steps	**Hazards**	**Controls**	**RAC**
5. Operate System	Potential exposure to chemical hazards.	Identify all chemical hazards and receive training (MSDS) regarding safe handling of chemicals. The SHSS will file copies of all MSDSs at site.	M

AHA #6 – Operation and Maintenance (O&M) of GAC Treatment System			
Job Steps	**Hazards**	**Controls**	**RAC**
	Noise exposure.	Hearing protection is required when sound levels exceed 84 dBA continuously. Areas where hearing protection is required will display warning signs requiring hearing protection. Use baffles or sound absorbing materials to reduce noise levels.	
	Slip, trip, and fall hazards could be present.	Maintain good housekeeping in the work area. Work areas shall be visually inspected and slip, trip, and fall hazards shall be marked, barricaded, or eliminated, if feasible. Maintain proper illumination in the work area.	
	Back strains and pinch points.	Hand tools shall be selected to minimize the following stressors: chronic muscle contraction or steady force; extreme or awkward finger/hand/arm positions; repetitive forceful motions; excessive gripping, pinching, and/or pressing with hand and fingers. Do not lift more than 50 pounds. Avoid prolonged repetitive motion. Rotate job tasks with other workers. Get help or use mechanical lifting devices for heavy loads. Perform stretch/flex exercises prior to tasks. Wear leather gloves when opening monitoring well lids.	
	Sharp objects/punctures.	Inspect all equipment and supplies for sharp edges or that may have parts that can cause punctures (for example, a loose fence wire). Wear cut resistant work gloves when sharp edges or other objects may cause the possibility of lacerations or other injury. When possible, sharp edges will be blunted. Workers should not stand or walk on equipment or supplies.	
	Strains from manually moving materials and equipment.	Personnel shall be directed to use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use of hand truck shall be encouraged. Employees will not lift more than 50 pounds.	
	Exposure to extreme temperatures.	Monitor for heat stress in accordance with EHS Procedure 4-6 "Temperature Extremes." Provide fluids and rest breaks during warm weather and while wearing impermeable protective clothing.	M
	Lack of communication.	Ensure there is a telephone or access to a telephone for communication.	
6. Maintenance of operating system	Electrocution.	Only qualified electricians are allowed to hook up or disconnect electrical circuits.	L

AHA #6 – Operation and Maintenance (O&M) of GAC Treatment System			
Job Steps	**Hazards**	**Controls**	**RAC**
		Inspect all extension cords daily for structural integrity, ground continuity, and damaged areas. Inspect extension cord connection. Use GFCIs on all outdoor 115 to 120 volts, 20 amps or less circuits. Elevate or cover electric wire or flexible cord passing through work area to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching. (Cover only in accordance with National Electrical Code requirements.) Keep plugs and receptacles out of water unless they are approved submersible types. Ground all electrical circuits in accordance with the National Electrical Code or other applicable standards and regulations.	
	Power and hand tools.	Inspect all tools before each use. Personnel will be trained in the proper use of hand tools. All power tools will be grounded or double insulated.	M
	Material handling pinch points.	Identify and avoid pinch points. Maintain communication with others involved in material handling. Use appropriate PPE, such as leather work gloves.	M
	Strains from handling materials.	Personnel shall be directed to use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Never lift 50-pounds or more without assistance or a mechanical device. Use of hand trucks shall be encouraged. Personnel shall work at a steady pace.	
	Inadvertent activation of equipment while working on equipment.	Follow lockout/tagout procedures. Ensure equipment cannot be started or operated before working on equipment.	
	No other person in area while performing maintenance.	Maintenance activities, which intrude into the plumbing, electrical, pneumatic or hydraulic systems, or wells requires at least two persons. Ensure that there is communication by cellular telephone.	

AHA #6 – Operation and Maintenance (O&M) of GAC Treatment System		
Equipment to be Used	**Training Requirements/Competent or Qualified Personnel Name(s)**	**Inspection Requirements**
7. Compressor Operations, if used	Potential for sudden release of high pressure.	Inspect all hose lines and ensure all hose lines have safety clamps (whip checks). Inspect all connections to ensure that they are sound and tight. Inspect pressure relief valve. Test pressure relief valve periodically as required by the O&M Manual that must be available on-site. If there is a storage tank with the compressor unit, the tank must be certified for the pressure and level of service. Contact the PESM for further details. (If the tank is not owned by the federal government, the air receiver tank requires a state permit to operate.)
8. Demobilize system	Failure to have an established dismantling plan could cause injury to workers. Failure to ensure that all energized sources have been disconnected and the system has been placed in a "zero energy" state. Failure to secure and lift system on to transport vehicle.	Prepare and review a plan for shutdown of the system. Clear all lines of the system. Ensure all GAC is removed from the treatment tank (see AHA on GAC change out). Ensure that all pumps have been turned off, and ensure that no lines remain pressurized by slowly opening all valves. Ensure that all power is turned off and that circuit has been disconnected and that power source is locked out. Validate that power has been turned off to all components. Disconnect components in reverse order of installation. Secure and lift systems off pad following the AHA requirements for installation of the system and lifting. Ensure truck is appropriate for load, and inspect load tie downs and ensure system is safe to transport.
9. Vehicles – pickup trucks, vacuum truck	Inspect daily and before use.	Only Department of Motor Vehicles-licensed personnel will operate vehicles.
10. Equipment – treatment system, compressor, pumps, ladders	Inspect equipment before each use following manufacturers' requirements. Document inspection on an inspection form or in a logbook.	Specific training on O&M system will be provided or worker already has documented training. Training on lockout/tagout procedures.
Hand tools (basic) –screwdrivers, hammers, pliers, etc.	Inspect hand tools before each use following manufacturers' requirements.	Personnel must have reviewed operators' manual and have been trained on power tools. Only qualified personnel will operate generator or compressor, if used.
11. Fire extinguishers	Fire extinguisher training including use/limitations is required.	Inspect st least monthly by SSHO or designee.
12. First-aid kits and other emergency equipment	Emergency equipment/first-aid kits must be used by personnel familiar with this plan; use and inspection criteria of the equipment, and what the equipment is used for, by or under direction of the SSHO.	Initially and at least weekly thereafter or after use for restocking (29 CFR 1926.50[d][2]). First-aid kits must be filled per EM 385-1-1 Table 3-1.

Abbreviations and Acronyms:

AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
Cal-OSHA – California Occupational Safety and Health Administration
CCR – California Code of Regulations
CFR – Code of Federal Regulations
CIH – Certified Industrial Hygienist
CTO – Contract Task Order
EM – Engineer Manual
GFCI – ground fault circuit interrupter
kV – kilovolts
MSDS – Material Safety Data Sheet
NEC – National Electrical Code
PESM – Project Environmental Safety Manager
PG – Professional Geologist
PID – photoionization detector
PPE – personal protective equipment
PVC – polyvinyl chloride
RAC – Risk Assessment Code
SSHO – Site Safety and Health Officer
SSHP – Site Safety and Health Plan
TtEC – SES-Tt SES-Tt Team, Inc.
UST – Underground Storage Tank

Activity Hazard Analysis (AHA) #6

Job/Task: Demobilization and Waste Load Out	Overall Risk Assessment Code (RAC) (Use highest code)	M
Project Location JBLM and Yakima Training Center, WA		
Contract Number: W912DW-11-D-1031, TO 0001		
Date Prepared: August 17, 2014		
Prepared by (Name/Title): Dana Ramquist, FOL		
Reviewed by (Name/Title): Roger Margotto, CIH, CSP, Program CIH		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)
In addition to the information listed in this AHA, all field personnel must review and be familiar with all provisions of the approved IPP.
TtEC Corporate Safety Programs and the EM 385-1-1 will also be available on-site for review of specific materials and mitigation measures.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (see above).

"Probability" is the likelihood to cause an incident, near miss, or accident and is identified as Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and is identified as Catastrophic, Critical, Marginal, or Negligible.

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on the AHA. Annotate the overall highest RAC at the top of the AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
1. Disassemble equipment and move it or pack it up for removal from site	Electrical hazards with equipment that is plugged in.	– Unplug equipment before disassembly.	M
	Pinch points, cuts, abrasions, punctures, lacerations could occur when handling equipment with sharp edges.	– Ensure equipment is secured and guards or cutting surfaces are secured and in locked position (as applicable). – Wear leather palm gloves when handling equipment. – Use box knives in safe manner and cut away from the body. – Close knives after use so blade is not exposed, or use safety knife.	
	Back injuries, trip hazards, and falls could occur.	– Use correct lifting techniques, and be aware of potential hazards in the area. – Use buddy system when lifting heavy or awkward loads.	
	Mini excavator could tip or fall from trailer when loaded	– Ensure qualified operator loads excavator onto truck bed and that truck operator secures the load properly.	

Job Steps	Hazards	Controls	RAC
2. Secure closed waste containers (if present)	Workers could be struck or pinched by tool when securing drum rings.	– Review procedure for safe use of tool. – Wear leather gloves and safety glasses.	**M**
3. Identify driver requirements prior to drum pickup (if drummed wastes are generated)	Lack of inspections could lead to citations or tickets.	– Ensure that driver has a current commercial driver's license. If waste is regulated for transport, ensure proper hazardous materials documentation.	**L**
4. Queue truck at selected site	Truck could cause traffic hazard.	– Locate truck in an area that will not obstruct traffic and use spotters to back up truck to trailer hitch	**M**
5. Position truck into selected area	Truck could hit someone or something.	– Use spotters when positioning truck. – Ensure that spotters know how to communicate with driver of truck. – Wear high-visibility garments.	**M**
6. Make sure truck is secured	Truck could roll.	– Set parking brake and chock wheels to prevent truck from rolling.	**M**
7. Load and remove drums (if generated)	Improper cribbing could cause drum to tip over.	– Ensure that drums are placed on stable ground or cribbing.	**M**
	Drums could fall during loading.	– Ensure that nonessential personnel stay clear of operation. – Ensure proper means of loading drums are used. – Ensure drums are secure during lifting.	
	Positioning drums could cause pinch points.	– Do not place hands in straps, or between drums when positioning. – Ensure gloves are worn.	
	Noise and sharp edges could be present.	– Ensure that hearing and hand protection is worn when installing securing straps.	
8. Remove sanitary facilities	Portable toilet or hand wash station could fall when being hoisted onto truck by vendor.	– Ensure stations are centered and secured (with straps) on lift gate before lift is raised.	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
1. Site vehicles	Drivers must have current state-issued driver's license and be listed on corporate insurance policy. Qualified operators will be identified upon assignment.	Receipt inspection by Equipment Supervisor (FOL). A copy of the certification by the mechanic that the vehicles meet EM 385-1-1 requirements must be provided. Daily vehicle inspection by drivers.

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
2. Heavy equipment, power tools, and hand tools	Qualified operators will be identified upon assignment. Only trained equipment operators may operate heavy equipment (if used); only Department of Motor Vehicles-licensed personnel will operate trucks. Specific training for power tools, hand tools, and electrical safety is required.	Inspect daily and before use using the form in TtEC's Procedure CP-7. All heavy equipment must be inspected by the FOL upon arrival at the site. A copy of the certification by the mechanic that the heavy equipment meets EM 385-1-1 requirements must be provided.
3. Hand tools and power tools	Training in use of hand tools and power tools by the SSHO or designee and review of operating manual is required. Use proper hand tool for the task.	Daily inspection by users/operators. Discard damaged tools.
4. Fire extinguishers	Fire extinguisher training including use and limitations.	At least monthly by SSHO or designee.
5. First aid kits and other emergency equipment	Use of first aid kits and emergency equipment must be done by personnel familiar with this plan; use and inspection criteria of the equipment, and what the equipment is used for, are by or under direction of the SSHO.	Initially and at least weekly thereafter, or after use for restocking (29 CFR 1926.50[d][2]). First aid kits must be filled per EM 385-1-1 Table 3-1. Kits will be in both field vehicles as well as at the site trailer. Kits must be on-site until work is completed.

Abbreviations and Acronyms:

AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
CFR – Code of Federal Regulations
CIH – Certified Industrial Hygienist
CSP – Certified Safety Professional
EM – Engineer Manual
FOL – Field Operations Lead
OSHA – Occupational Safety and Health Administration
RAC – Risk Assessment Code
SSHO – Site Safety and Health Officer
TtEC – SES-Tt SES-Tt Team, Inc.

ATTACHMENT 1
SITE SAFETY AND HEALTH PLAN

Environmental Remediation Program Services Joint Base Lewis McChord and Yakima Training Center, Washington

Site Safety and Health Plan

Prepared for

U.S. Department of the Army
Seattle District, Corps of Engineers

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Contract # W912DW-11-D-1031; Task Order 0001

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ACRONYMS AND ABBREVIATIONS

AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
APP	Accident Prevention Plan
ARD	Acid Rock Drainage
AMD	Acid Mine Drainage
amsl	Above mean sea level
CFR	Code of Federal Regulations
COPC	Contaminant of Potential Concern
CP/QC	Contractor Production / Quality Control
dBA	decibel A-Weighted scale
DCN	Design Change Notice
DHSE	Director of Health, Safety, and Environmental Programs
EM	Engineering Manual
EPA	United States Environmental Protection Agency
EZ	Exclusion Zone
FOL	Filed Operations Lead
FCR	Field Change Request
HAZMAT	hazardous material
HAZWOPER	Hazardous Waste Operations and Emergency Response Standard
GFCI	ground fault circuit interrupter
LMP	Licensed Medical Provider
MSDS	Material Safety Data Sheet
NEC	National Electrical Code
NRR	noise reduction rating
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PHSM	Program Health and Safety Manager
PM	Project Manager
PPE	personal protective equipment
PVC	polyvinyl chloride
RI	Remedial Investigation
SES- Tt Team	Sealaska-Tetra Tech Team
SSHO	Site Safety and Health Officer

SSHP	Site Safety and Health Plan
SZ	Support Zone
USACE	U.S. Army Corps of Engineers

1.0 SITE HISTORY AND DESCRIPTION

Joint Base Lewis-McChord (JBLM) is located in the heart of the Pacific Northwest's Puget Sound region and south of Tacoma, Washington (Figure 1-1). JBLM provides installation support to more than 40,000 Active Duty, Guard, and Reserve Service members and about 15,000 civilian workers. The base supports 60,000 family members who live on and off base, and nearly 30,000 military retirees living within 50 miles.

JBLM was formally established as one of 12 joint bases worldwide on October 1, 2010. The merger of the former Fort Lewis and McChord Air Force Base was directed by the 2005 Base Realignment and Closure Commission.

JBLM consists of former Fort Lewis and the former McChord Air Force Base which were combined in 2010. JBLM encompasses an area of 90,837 acres within King, Pierce and Thurston Counties in Washington State. Yakima Training Center (YTC) is a sub-installation of JBLM and is located approximately 100 miles east of the base, about 10 miles north of the City of Yakima. It encompasses 327,231 acres within Yakima and Kittitas Counties in central Washington State.

Parts of both former Fort Lewis and the Former McChord Air Force Base are on the National Priorities List (NPL) under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Program. The NPL determination was based on specific sites, therefore the entire facility is not subject to NPL listing requirements.

Both former Fort Lewis and McChord Air Force Base were performing cleanup actions under State of Washington administrative orders and are preforming cleanup actions under applicable standards of the State of Washington's Model Toxics Control (MTCA) regulations.

YTC is a sub-installation of JBLM. The sub-installation is not on the NPL and is not subject to any orders with the state of Washington. Site at YTC are being remediated under the State of Washington's MTCA regulations.

The types of environmental remediation program services include:

- Remediation systems operation, maintenance, monitoring, and reporting.
- Contaminant fate, transport, nature and extent investigations and monitoring.
- Technical, regulatory, and programmatic analysis, advice, and reporting
- Land use control and other site management.
- Managing and disposing of all waste generated.

2.0 DESCRIPTION OF WORK

See Section 2d of the Accident Prevention Plan (APP).

3.0 PROJECT ORGANIZATION

See Section 4b of the APP.

4.0 HAZARD CHARACTERIZATION

4.1 CHEMICAL CONTAMINANTS

Table 4-1 lists the potential contaminants of concern (COCs) that may be found in soil and groundwater at the JBLM and YTC sites. The table also includes the current occupational exposure limits, primary toxicological effects, and relevant physical properties for each COC. The table contains physical and toxicological data derived from studies on concentrated (pure) forms of the contaminants and does not accurately represent the trace quantities or minimal exposure conditions that will be encountered by site personnel working on the project.

The concentration of airborne contaminants generated during remediation activities are not expected to be present at levels that could be considered significant from an occupational exposure standpoint, when compared with Washington Industrial Safety and Health Act (WISHA) Permissible Exposure Limits (PELs) where inhalation of the offending chemical agent is the exposure route of concern. However, air monitoring will be conducted during sampling activities. See Section 10 for details on air monitoring.

Dermal exposure to some contaminants could result in adverse health effects (see American Conference of Governmental Industrial Hygienists Threshold Limit Values with “Skin” notations) or produce other adverse dermal effects (i.e., dermatitis, skin cancer). These materials could include lead, petroleum products, and VOCs. Appropriate chemical protective clothing will be worn whenever a potential for significant skin contact with these materials exists. Decontamination measures will also reduce contaminant contact and minimize the spread of contamination in the work area.

Other Potentially Hazardous Material

Table 4-2 lists the hazardous materials (HAZMAT) that may be used by site personnel or subcontractors during site activities. The material safety data sheets (MSDS) for these compounds are kept on site in the field vehicle and are updated based on manufacturer’s changes. Site personnel will consult the product label instructions and the product’s MSDS for information on proper personal protective equipment (PPE) to be worn when using the product.

Table 4-1. Physical and Toxicological Properties of Chemicals of Concern

Chemical	OSHA PEL or TLV	Exposure Routes	Symptoms of Exposure	Target Organs	Physical Data
Inorganic Lead	0.05 mg/m^3 TWA	Inhalation, skin absorption, ingestion, skin and/or eye contact	Weakness, insomnia, headache, eye irritation, facial pallor, constipation, abdominal pain, colic, anemia, gingival lead line, tremor, paralysis of wrist or ankles, encephalopathy, kidney disease.	Nervous system, kidneys, reproductive system, blood formation system, gastrointestinal tract.	BP: 3164 °F MP: 621.5 °F VP: 1.7 mmHg Sp.G.: 11.34 Reactivity: strong oxidizers, hydrogen peroxide, acids Solubility: insoluble
Benzene	1.0 ppm TWA 5 ppm STEL	Inhalation Skin contact	Eye, nose, or throat irritation, headache, weakness fatigue, appetite loss, bone marrow damage, anemia, leukemia, dizziness, intoxication, convulsions, nausea, euphoria	Blood, central nervous system, bone marrow, eyes, skin, upper respiratory tract	BP: 176 °F VP: 100 mmHg F.Pt.: 12 °F LEL: 1.3% UEL: 7.1% Sp.G.: 0.87 Oxidizers: diborane
Toluene	100 ppm TWA 150 ppm STEL	Inhalation, skin absorption, skin and/or eye contact, ingestion	Eye or nose irritation, lassitude, confusion, euphoria, dizziness, headache, pupil dilation, lacrimation anxiety, muscle fatigue, insomnia, paresthesia, dermatitis, liver or kidney damage	Eyes, respiratory system, central nervous system, liver, kidneys	BP: 232 °F VP: 21 mmHg F.Pt.: 40 °F LEL: 1.1% UEL: 7.1% Sp.G.: 0.87
Xylenes	100 ppm TWA 150 ppm STEL	Inhalation Skin absorption Ingestion Skin or eye contact	Eye, skin, nose, or throat irritation, dizziness, excitement, drowsiness, incoordination, staggering gait, corneal vacuolization	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	BP: 292 °F VP: 7.0 mmHg F.Pt.: 90 °F LEL: 0.9% UEL: 6.7% Sp.G.: 0.88

Table 4-1. Physical and Toxicological Properties of Chemicals of Concern (continued)

Chemical	OSHA PEL or TLV	Routes of Exposure	Symptoms of Exposure	Target organs	Physical data
TCE	50 ppm TWA	Inhalation, ingestion, skin absorption, eye contact	Eye and skin irritation, headache, visual disturbance, lassitude, dizziness, tremor, drowsiness, nausea, vomiting; dermatitis, cardiac arrhythmia, paresthesia, liver injury, potential occupational carcinogen-liver and kidneys	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system	Sp.G.= 1.46; BP= 189°F; LEL= 8%; UEL= 10.5%; FP= - 94°F

Notes:

C – Celsius
BP – Boiling Point
F – Fahrenheit
F.Pt. – Flash Point
LEL – Lower Explosive Limit
mg/m^3 – milligram per cubic meter
mmHg – millimeters of mercury
MP – Melting Point
PEL – Permissible Exposure Limit
Sp.G. – Specific Gravity
STEL – Short-Term Exposure Limit
TLV – ACGIH Threshold Limit Value
TWA – time-weighted average
UEL – Upper Explosive Limit
VP – Vapor Pressure
OSHA – Occupational Safety and Health Administration

Other Potentially Hazardous Material

Table 4-2 lists the hazardous materials that may be used by site personnel or subcontractors during project activities. The Material Safety Data Sheet (MSDS) or Safety Data Sheets (SDS) for these compounds are kept on site in the field trailer and are updated based on manufacturer's changes. Site personnel will consult the product label instructions and the product's MSDS/SDS for information on proper personal protective equipment (PPE) to be worn when using the product.

Table 4-2. Hazardous Material Table

Hazardous Material Name	Estimated Quantities to be Used (gallons)
Unleaded Gasoline	10
Diesel	20
Lubricating Oil	10
WD 40	<5
PVC Cement	<5
PVC Primer/Cleaner	<5
Potassium Permanganate (1% solution)	<160,000

Note:
PVC – polyvinyl chloride

4.2 PHYSICAL HAZARDS

Several physical hazards are likely to be associated with the planned work, including heavy lifting accidents; slip, trip, and fall hazards; noise exposure; and thermal stress; mechanical, electrical, and drilling equipment dangers; hand and power tool accidents. To mitigate the risk of injury, standard work practices and engineering controls will be applied to the specific site activities where these hazards are present. A general discussion of these hazards and the work practices that will be used to control them is presented below. A more detailed listing of hazard control strategies for specific high-hazard tasks is included in the Activity Hazard Analysis (AHA) table (Table 10-1) in the APP. In addition to these task-specific operating procedures, all site workers will comply with the General Work Rules listed in Attachment 5 of the APP.

4.2.1 Heavy Lifting

Routine activities at the site carry the risk of back and muscle strain from heavy lifting. To control this hazard, workers will maintain ergonomically safe lifting postures when moving heavy loads. These techniques will include using mechanical lifting devices whenever feasible to move equipment or supplies. When lifting exceptionally heavy loads, workers must have others help them if mechanical lifting devices cannot be used.

4.2.2 Slip, Trip, and Fall Hazards

The YTC site is located in a remote area of central Washington in somewhat rugged terrain. There are likely to be slip, trip, and fall hazards on site. These hazards will be controlled by keeping the work area free of debris and other litter. Workers will wear high-traction, steel-toed safety boots and will pay careful attention to surface conditions to prevent trip and fall injuries. All work areas will be inspected before the start of work each day to identify any hazards that could cause injury. The results of these inspections will be communicated to site personnel during the daily site safety briefings.

4.2.3 Noise Exposures

Operation of the treatment systems or completing maintenance-related tasks may produce noise levels in excess of 85 decibels (dBA). These activities are generally sporadic and unpredictable. SES-Tt Team project personnel will use hearing protection (earplugs or ear muffs, noise reduction rating [NRR] > 25) when in proximity to noisy activities.

4.2.4 Thermal Stress

Because all of the planned work activities will be conducted outside where temperature conditions are unpredictable, there is a risk that workers could develop heat or cold stress. The likelihood of this occurring is dependent on environmental conditions, the level of work activity, and the personal control measures that are used to manage heat loads (work/rest cycles, use of clothing or cooling devices, hydration, etc.). Appropriate control measures will be taken to manage these thermal stress concerns. For example, the Site Safety and Health Officer (SSHO) will monitor ambient temperatures in the work area and determine the need for personal protective and administrative controls. Additionally, all workers will be instructed in the recognition and control of thermal stress symptoms and in the treatment procedures listed in Section 9n of the APP.

4.2.5 Working with Electrical Equipment

During maintenance of the process piping and pumps there is a risk of electrocution and mechanical injury (muscular strain from heavy lifting, contusions, etc.). A complete description of the site lockout/tagout procedure is included in Section 9s of the APP.

For other electrical equipment, the SSHO will inspect all electrical connections prior to the start of field activities to prevent accidents caused by electric shock. The SSHO will remove any equipment from service that is found to have frayed or loose connections until the damaged equipment is repaired or replaced. All electrical equipment must be listed by a Nationally Recognized Testing Laboratory (NRTL) as required by OSHA.

Any portable equipment used must meet the requirements for grounding as specified in the National Electrical Code (NEC) National Fire Protection Association 70. NEC 250-6 has certain

exemptions for the grounding of portable and vehicle-mounted generators. Refer to the code in Engineering Manual (EM) 385-1-1, Section 11 for additional details. Portable fuel-powered equipment will be operated in open air only where there is sufficient ventilation as to prevent accumulation of exhaust gases including carbon monoxide. The generator routinely used by SES-Tt Team personnel to supply power for sampling does contains ground fault circuit interrupters (GFCIs).

Requirements for electrical safety include:

- All electrical wiring and equipment will be listed by a recognized testing laboratory.
- Flexible cords (extension cords) will contain the number of conductors required for service plus a ground wire. Cords will be rated for hard or extra hard usage (S, SE, SEO, SO, SOO, ST, STO, and STOO). Flexible cords are not allowed to pass through doors, windows, or be placed on the ground where they are subject to being run over by vehicles. If flexible cords must pass through walls, the cords will be protected by bushings or fittings.
- Flexible cords will not be secured with staples, hung from nails or suspended by pare wire (plastic tie straps are acceptable).

4.2.6 Hand and Power Tools

Power tools can cause injury if their wiring is defective, guards are missing, emergency shutoff switches are broken, metal fatigue or cracks are present in reciprocating cutting appliances, or they are used in a manner other than for what they were designed.

To control these hazards, tools will be inspected prior to use, used by trained personnel, and used in accordance with the manufacturer's instructions. Appropriate guards will be in place and emergency shutoff switches will be operational. Hand and power tools will be in good repair and used only for the purpose for which designed. Any damaged tool will be immediately tagged-out and removed from service. Only non-sparking or intrinsically safe tools will be used in locations where sources of ignition may cause fire or explosion. Throwing tools or materials from one location to another, from one person to another, or dropping them to lower levels will not be permitted. Tools not in use will be kept out from under foot. Portable tools will be stored in a clean, secure area after each day’s use.

All electrical equipment will be provided with GFCIs with five milliamp protection. All equipment will be inspected for its integrity prior to each use. Extension cords will be protected from physical damage and kept out from under foot.

4.2.7 Contact with Mechanical Equipment

Examples of mechanical contact hazards include exposed gear drives and shafts on pumps, drill rigs, and vacuum trucks. Hazards may exist if this equipment is not properly guarded. To address this hazard, all electrical and mechanical equipment will be inspected before use to ensure guards are in place and electrical circuits are properly insulated, grounded, and/or connected to GFCIs.

4.2.8 Drilling and Heavy Equipment Hazards

Light duty pickup trucks, drill rigs, vacuum trucks, and forklifts will be used on site during the project. There is a potential for workers to be struck by these vehicles or to be injured by contact with exposed moving parts on mechanical equipment. To control these hazards, safe distances will be maintained between workers and mechanical equipment. Mobile equipment will be furnished with backup alarms and spotters will be utilized as necessary to direct equipment operators when moving. Personnel needing to approach heavy equipment while in operation will observe the following protocols:

- Make eye contact with the operator (and spotter).
- Signal the operator to cease heavy equipment activity.
- Approach the equipment and inform the operator of intentions.

All site workers will wear American National Standards Institute (ANSI)/International Safety Equipment Association 107-2004 Class 2 compliant reflective road vests when heavy equipment or vehicular traffic is in the vicinity. Workers will avoid standing in the blind areas behind vehicles, particularly when they are backing up.

The drilling subcontractor will ensure that the equipment they bring to the site is in proper working order and that all exposed mechanical moving parts are appropriately guarded. The driller will also follow safe work practices such as parking their drill rig on level, stable ground with outriggers fully extended; not moving the rig while mast is extended; keeping hands clear of the drilling auger; making sure emergency kill switches are operational; inspecting the drill rig before use; using only experienced drill rig operators; and shutting down and securing the drill rig when not in use.

An underground utility search will also be conducted before drilling. A copy of the utility clearance documentation from the company performing the work will be kept on-file at the jobsite and discussed with site personnel before intrusive work begins. In addition, drilling equipment will be positioned so that minimum clearances between equipment (including the top of the mast) and overhead power lines, as specified in Table 16-3 of EM 385 1-1 (reproduced below as Table 4-3), is maintained.

Another hazard associated with drilling is exposure to chemicals. When constructing groundwater monitoring and injection wells, drillers will ensure that all solvents and glues used to assemble the wells are used outside in well ventilated areas. In addition, bentonite grout and cement used to seal the wells and wellheads will be wetted when handled to control dust exposures. Chemical protective clothing will also be worn to keep these grouting materials from contacting skin and clothing.

Table 4-3. Minimum Clearance from Energized Overhead Electric Lines (EM 385 1-1, Table 16-3)

Voltage (nominal, kV, alternating current)	Minimum rated clearance
Up to 50	10 ft (3 m)
51 – 200	15 ft (4.6 m)
201 – 350	20 ft (6 m)
351 – 500	25 ft (7.6 m)
501 – 650	30 ft (9.1 m)
651 – 800	35 ft (10.7 m)
801 – 950	40 ft (12.2 m)
951 – 1100	45 ft (13.7 m)

Notes:
All dimensions are distances from live part to employee.
Clearance values calculated using: (Initial kV-50kV) x (4 in/10 kV) x (1 ft/12 in) = increased distance (ft) over 10 ft
Add this value to 10 ft to yield minimum rated clearance
ft – foot/feet
m - meter

4.3 Biological and Environmental Hazards

Biological and environmental hazards which may pose a threat to project personnel include:

- Noxious flora.
- Poisonous spiders or stinging insects.
- Disease vectors, such as ticks and rodents.
- Wild animals.

Site workers will inspect protected areas before reaching into them or entering them in any way. Workers will wear long pants and, if necessary, long-sleeved shirts and gloves to protect them from insect bites and sharp or irritating plants.

4.3.1 Poisonous Plants

Poison ivy, poison oak, and poison sumac are identified by three or five leaves radiating from a stem. Poison ivy is in the form of a vine, whereas oak and sumac are bush-like. All produce a delayed allergic hypersensitivity. The plant tissues have an oleoresin, which is active in live,

dead, and dried parts. The oleoresin may be carried through smoke, dust, contaminated articles, and the hair of animals. Symptoms usually occur 24 to 48 hours after exposure and include burning, stinging, and weeping or crusted blisters. Should exposure to any of these plants occur, workers will wash (but not scrub) the affected area with a mild soap and water. The best antidote for exposure to poisonous plants is recognition and avoidance. Physical hazards are also posed by native vegetation in the area including thistles and other thorny weeds.

4.3.2 Ticks

Ticks are vectors of many different diseases, including Rocky Mountain spotted fever, Q fever, tularemia, Colorado tick fever, and Lyme disease. Lyme disease is the most prevalent type of disease transmitted by ticks in the United States. Ticks attach to their host's skin and intravenously feed on its blood, creating an opportunity for disease transmission. Covering exposed areas of the body and using tick repellent are two ways to prevent tick bites. Periodically during the workday, employees will inspect themselves for the presence of ticks. Employees will be given this procedural list to follow if a tick is discovered:

- Use fine-tipped tweezers to remove a tick. Do not try to detach a tick with your bare fingers; microorganisms from a crushed tick may be able to penetrate even unbroken skin.
- Grip the tick as close to your skin as possible and gently pull it straight away from the skin until it releases its hold.
- Do not twist the tick as you pull, and do not squeeze its bloated body. These approaches may actually cause microorganisms to be injected into your skin.
- Thoroughly wash your hands and the bite area with soap and water. Then apply an antiseptic to the bite area.
- Save the tick in a small container with the date, the body location of the bite, and where you think the tick came from.
- Notify the SSHO of any tick bites as soon as possible.

4.3.3 Spiders

Well vaults attract several species of spider, including the aggressive hobo spider, which has an extremely toxic bite. Employees will take precautions when entering well vaults and other confined or enclosed spaces. These precautions include wearing long-sleeved shirts and gloves and selective eradication of identified hobo spiders. More benign spiders will be left alone because they serve to control the hobo spider. A hobo spider bite will be treated as soon as possible, as amputation of affected body parts is not an uncommon outcome for ignored bites.

4.3.4 Wasps

Well vaults in particular attract paper wasps, which are relatively unaggressive but are often present in large numbers with multiple nests. These nests can be controlled by spraying with commercial wasp spray to protect workers. Yellow jackets and bald faced hornets are also potential hazards because one insect can sting multiple times and the danger is compounded if a nest is disturbed. Stings will be carefully monitored as sensitivity can develop even in individuals who have shown no previous reaction. Individuals with known sensitivity will have a prescribed epinephrine injection (EpiPen) available.

4.3.5 Hantavirus

Rodents, such as deer mice can carry Hantavirus, which affects the respiratory system in humans. Deer mice usually live at higher elevations and can be distinguished from other rodents by their small size (2 to 4 inches long) and their bicolor tail. However, the Centers for Disease Control and Prevention believes that other rodents also have the potential to carry the virus, so precautions will be taken when any species of rodent is encountered. It is not possible to distinguish whether a rodent carries the Hantavirus by observation.

Hantavirus is transferred to humans primarily from inhalation of infected rodent excreta that have become airborne or from ingesting excreta that have clung to hands or clothing. It can also be contacted from rodent bites or transferred through broken skin. The first symptoms of a Hantavirus infection can occur at any time up to 45 days after exposure and include one or more of the following: fever, muscle aches, headache, and coughing. These symptoms progress rapidly into a severe lung disease that often requires intensive care treatment. Although the illness caused by Hantavirus is severe, it is a relatively rare illness that can be prevented by simple precautions and common sense. The best way to avoid contact with Hantavirus is avoiding contact with rodents and their excreta. Workers will not leave food or garbage where rodents have access to them, including food items and wrappers in vehicles.

4.3.6 Wild Animals

Due to the remoteness of the work area, it may be possible to encounter wild animals during the work.

Encounters with wild animals should always be handled with caution and follow a practice of avoidance. The smaller animals could harbor rabies. The larger animals can inflict serious bodily harm. When confronted by a large animal and avoidance is not possible, look the animal in the eye, make loud noises, and withdraw slowly to the safety of your vehicle. Do not turn and run since this could elicit an immediate attack. Report all animal encounters to the SSHO. The SSHO will track and log these reports and make the information available to all site personnel so future encounters can be avoided.

5.0 SITE CONTROL MEASURES AND COMMUNICATIONS

5.1 CONTROL ZONES

Regulated work areas will be established around site activities where excessive contact with contaminated groundwater is possible. If the potential for excessive contact is identified by the SSHO, these activities will be regulated by establishing an Exclusion Zone (EZ) around each applicable work area (i.e., well head) to prevent non-qualified personnel from being exposed to these contaminated substances. Personnel working in the EZ will be required to wear PPE specified in Section 8 of this Site Safety and Health Plan (SSHP). Smoking, eating, or drinking is not allowed in the EZ.

For the well monitoring activities, work will be taking place at multiple localized areas where little to no pedestrian traffic is anticipated. As the work is completed in each area, the operation will move to the next. The need to establish an EZ is not anticipated during monitoring activities. If needed, an EZ will be established by barricading off a small area surrounding the activity.

The area outside of these regulated control zones will be designated the Support Zone (SZ). The SZ will remain a clean area where equipment will be stored and administrative functions will take place. Personnel working in this area will not be required to have special hazardous material (HAZMAT) training or qualifications. Site access and the majority of site operations will be controlled from this location. The SZ will contain provisions for team communications and serve as a staging area for emergency response resources, such as fire extinguisher, communications, first aid kit, and spill equipment.

Visitors will not be allowed without an escort to enter the EZ or any other areas where there is a potential for contact with site contaminants. They will be escorted at all times and will be required to wear the Level D PPE specified in Section 8.1. Visitors also will be required to review and sign this SSHP before entering the site.

For most tasks, project personnel will follow the buddy system when working on site. For task where the buddy system is not required (see Table 10-1 of the APP) or a buddy may not be available, the worker should notify SSHO or Project Manager (PM) at the beginning of task with a location and an approximate time for task completion. The SSHO or TOM will confirm that the activity can be completed alone before the worker proceeds. The worker must then check back with the SSHO or PM once the task is complete. If the worker does not check back at the designated time, the SSHO or PM must locate the worker by phone or physically find them.

5.2 COMMUNICATIONS

Communications within the work zones will be by verbal commands or hand signals, as workers will be within visual range at all times. In the event of an emergency, cellular telephones will be

used for communications. All site personnel will have immediate access to these telephones. The telephone numbers for all emergency services, including the telephone numbers for the project personnel, are provided in Table 9-1 of the APP. These telephone numbers will be posted in each site vehicle.

6.0 MEETINGS, RECORDKEEPING, AND HAZARD IDENTIFICATION AND CONTROL

6.1 DAILY SITE SAFETY BRIEFINGS

Daily site safety briefings will be conducted by the SSHO prior to the beginning of work each day. During these sessions, each worker (subcontractors included) will be encouraged to share their observations, thoughts, and experiences on safety and health-related issues pertinent to the job site. This venue also allows site management to share important hazard communication topics with the workers, such as plan-of-the-day activities, associated hazards and controls, required use of PPE, decontamination procedures, emergency procedures, safe work practices, and SSHP changes.

Site briefings may be repeated during the day if new hazards arise which must be communicated to site personnel or if other workers arrive at the job site later in the day. The Daily Briefing Sign-In Sheet will be used to document these meetings and will include a listing of topics discussed, hazards identified, recommended remedial controls, other pertinent issues, and the names of all attendees. The information gathered in these sessions will be used to correct any unsafe conditions or work practices at the job site and amend the SSHP as appropriate. Copies of Daily Briefing Sign-In Sheets will be maintained at the job site. Copies of these forms are included in Attachment 6 of the APP.

6.2 RECORDKEEPING REQUIREMENTS

All health and safety recordkeeping requirements mandated by 29 Code of Federal Regulation (CFR) 1910.120, 29 CFR 1926, and 29 CFR 1904 will be followed. These records include Field Change Requests (FCRs), Design Change Notices (DCNs), Daily Tailgate Safety Briefings, Contractor Production/Quality Control (CP/QC) Report and field logbooks. Copies of forms applicable to the APP are included in Attachment 6 of the APP. See Section 8b of the APP for information regarding reporting requirements for mishaps, injuries, and incidents.

6.3 Hazard Identification and Control

Job site hazards will be identified during health and safety inspections of all work areas on a routine basis, accidents will be investigated, and daily tailgate safety meetings will be held. Site health and safety inspections will be conducted weekly by the SSHO. Copies of the inspection reports will be kept on file and be available for review by the DHSE Programs.

The DHSE will conduct task-specific health and safety inspections per Section 7 of the APP.

When an accident occurs, the Site Superintendent (SS) or SSHO will perform an initial investigation and conduct reporting as described in Section 8b of the APP.

7.0 MEDICAL SURVEILLANCE AND FITNESS FOR DUTY

SES-Tt Team site personnel who spend thirty or more days in the field as well as any subcontractors who enter the EZ will participate in either the SES-Tt Team Medical Surveillance program or in a comparable surveillance program chosen by their employer that meets the requirements of 29 CFR 1910.120(f). This program requires a complete pre-employment physical with associated laboratory tests. SES-Tt Team site personnel to whom this requirement applies must pass this examination and have a copy of their medical clearance on file at the site before they will be allowed to enter the EZ. This clearance letter, applicable to both SES-Tt Team and subcontractor personnel, must include the physician's opinion as to whether the employee has any detected medical conditions that would increase the risk of material impairment of the employee's health from work in hazardous waste operations, emergency response, or respirator use. It must also list any limitations on the employee's assigned work.

An annual or biennial physical examination (as performed by the occupational health physician) is also required for all personnel participating in this program. Subcontractors must also certify that they will comply with the drug-free workplace requirements of the Anti-Drug Abuse Act of 1988.

The medical examinations and immunizations will be provided by clinics that meet the requirements of our Licensed Medical Provider (LMP), in accordance with 29 CFR 1910.120 (f). SES-Tt Team's LMP is WorkCare, with headquarters at 333 South Anita Drive, Suite 630, in Orange, California (Telephone: 1-800-455-6155). Actual employee medical exams will be conducted by WorkCare-affiliated clinics located near the project site or near the employee's residence.

8.0 PERSONAL PROTECTIVE EQUIPMENT

8.1 PPE REQUIREMENTS

Prior to the start of work, the Program Health and Safety Manager (PHSM) will review all applicable work plans, site historical records, remedial investigation results, etc., and evaluate each major work activity to determine the appropriate level of PPE needed for the work. This evaluation will include consideration of potential chemical, physical, and biological hazards present; work operations to be performed; potential routes of exposure; concentrations of contaminants present; and characteristics, capabilities, and limitations of PPE including any hazards that the PPE may create or exacerbate (i.e., heat stress). Evaluation findings and recommendations for the project to date are listed in the AHAs found in Section 10 of the APP. The PHSM will conduct follow-up and job site inspections of PPE use to verify the adequacy of PPE requirements. PPE changes may be made, as appropriate, depending on the results of these job site inspections.

The SSHO will also evaluate daily the PPE use at the job site and determine the necessary PPE for specific activities or portions of activities not included in the AHA. If necessary, at the concurrence of the PHSM, the SSHP will be amended to reflect new or modified PPE requirements via a DCN. All new or modified PPE requirements will be communicated to the site personnel during the daily site safety briefings and hazard communication training sessions. At a minimum, all field activities will require the use of safety glasses and safety-toe footwear.

Two levels of PPE – Level D and Modified Level D – will be available for use during the planned project activities. A more detailed listing of specific PPE requirements per task is included in Table 8-1.

Table 8-1. Personal Protective Equipment

Task	Head	Eye/Face	Feet	Hands	Body	Hearing	Respiration
Well installation, groundwater and soil sampling, well development, and ISCO injection	HH	SG or Chem goggle	STB	LWG or Nitrile, as needed	Cot Cov, PolyTyvek, or PVC	EP as need	Level D or Mod. Level D
Wellhead installation	HH	SG	STB	LWG	Cot Cov	EP as need	Level D

Notes

Head Protection
HH=hard hat

Eye/Face Protection
Face shield (polycarbonate)
SG = safety glasses

Foot Protection
Neo = neoprene
STB = leather steel-toed boots
PVC = polyvinyl chloride with steel toe

Hearing Protection
EP=ear plugs

Hand Protection
Cot = cotton
But = butylene
LWG = leather work glove
Neo = neoprene
PVC = polyvinyl chloride
CWG = cotton work glove

Body Protection
Cot Cov = cotton coveralls
SWC = standard work clothes
Poly = poly-coated Tyvek coveralls
Saran = Saranex coated Tyvek coveralls
Chaps=ASTM nylon protective leg chaps
PFD = personal flotation device / Type III or V
PVC-RNG= PVC raingear

Level D

For all activities not presenting a risk of significant contact with contaminated groundwater, site personnel will wear Level D PPE. It is expected that most, if not all, work can be completed wearing Level D PPE unless an upgrade is required by the SSHO. Level D PPE will consist of the following:

- Cotton coveralls or standard work clothes.
- ANSI-approved hard hat (when overhead hazards exist) and safety glasses.
- Leather work boots with steel toe or hard toe meeting ASTM F2412 or F2413, or polyvinyl chloride (PVC) steel-toed boots if significant contact with contaminated groundwater is anticipated.
- Nitrile gloves when sampling monitoring wells or handling floating product.
- Hearing protection, as needed.
- High visibility reflective vests (Class 2) when working in vehicle traffic areas.

Some of the site operations that are likely to result in minimal contact with contaminated media include monitoring well installation, treatment plant upgrades, and tying-into the existing groundwater conveyance system. Personnel performing these tasks will wear Level D PPE unless the SSHO determines an upgrade is necessary.

Modified Level D

Modified Level D will be worn by site personnel directly engaged in activities that could result in excessive exposure to contaminated groundwater. Modified Level D will consist of the following items:

- Disposable Polyethylene coated coveralls or PVC raingear.
- Nitrile gloves and PVC steel-toe boots.
- ANSI-approved hard hat (when overhead hazards exist) and safety glasses.
- Chemical protective goggles and face shield (if needed).
- Hearing protection (as needed).
- High visibility reflective vests (Class 2) if working in vehicle traffic areas.

8.2 PPE SELECTION, USE, AND MAINTENANCE

PPE will be selected by the methodology discussed in Section 8.1 above. Employees assigned to use PPE are required to inspect the equipment before and after each use, discard any equipment that is defective, clean and maintain the equipment according to manufacturer recommendations, and store their PPE in a clean, secure area. Specific PPE inspection, cleaning, and maintenance procedures vary according to the type of equipment being used. Employees will be informed of these equipment-specific use and maintenance procedures before being assigned to their jobs. Training in PPE equipment inspection, cleaning, and maintenance protocols will be provided during the requisite 40-Hour Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) course and in the site-specific orientation training conducted by the SSHO.

At the end of each shift, to identify evidence of breakthrough, the SSHO will examine the inside of a representative sample of protective garments (Tyvek, work gloves, and boots) before they are discarded or cleaned. Such evidence includes any discoloration or staining of the clothing; thinning, blistering, or cracking of the clothing material; and the presence of torn seams and perforations. The SSHO will also note whether the workers themselves have become contaminated while wearing the PPE. If on the basis of this examination it is apparent that the PPE designated for the work is not adequately controlling worker exposures, the level of personal protection will be upgraded.

9.0 DECONTAMINATION

9.1 PERSONNEL DECONTAMINATION

Decontamination for site personnel wearing Level D PPE will consist of having workers remove their hard hats, safety glasses, protective gloves, hearing protectors, and outer protective garments before leaving the site and storing them in a clean area for reuse the next day. Disposable gloves or other PPE are worn, they will be disposed of after each day's use.

Site personnel engaged in activities requiring modified Level D will be required to have their boots and gloves washed, rinsed, and removed before leaving the site or to employ disposable booties. They will also remove their cotton coveralls and provide for regular laundering. Tyvek coveralls will be placed in a plastic bag for disposal. Reusable PVC raingear, if visual evidence of contamination will be rinsed clean with water and taken off site by the employee.

The SSHO will ensure that the above-mentioned decontamination procedures are effectively controlling the spread of contamination in the work area by periodically inspecting the recently cleaned clothing and equipment for evidence of residual contamination. The work area also will be examined for any sign of contamination outside of the work zones. Should it become apparent that contamination is being dispersed into clean areas of the site, work activities will cease until more effective decontamination methods can be devised.

9.2 EQUIPMENT DECONTAMINATION

To prevent the spread of contamination and cross-contamination of wells, down-well monitoring equipment will be cleaned before leaving the work area. Cleaning will consist of a detergent and tap water wash followed by a distilled or deionized water rinse to remove contaminants from the probes and meters or as modified by the SSHO.

10.0 EXPOSURE MONITORING

Exposure monitoring is not anticipated as part of this project. Respirator usage will not be required on this project.

11.0 EMERGENCY RESPONSE PROCEDURES

See Section 9b and Table 9-1 of the APP for emergency response details, including emergency response and key personnel phone numbers.

12.0 SITE SAFETY AND HEALTH PLAN CERTIFICATION

By their signature, the following undersigned site workers or visitors certify that this plan has been read, or otherwise communicated to them. They further certify that they completely understand this plan and will follow its procedures for the protection of the health and safety of all persons entering this site.

NAME	**DATE**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

ATTACHMENT 2
SES-TT HEALTH AND SAFETY POLICY

Environmental Safety and Quality Policy

Tetra Tech EC, Inc. (TtEC) is committed to ensuring the health, safety, and well being of our employees and the communities in which we work, enhancing and protecting the environment, and providing quality services to our clients. Our Environmental, Safety and Quality (ESQ) Policy provides the framework and underlying principles for our Environmental Management System and is an integral part of how we conduct business.

All TtEC associates have the right to work in a safe and healthful workplace as well as the responsibility to help create and work in a safe and environmentally protective manner:

- We will complete our work successfully, with a great deal of attention to health and safety by:
  - Incorporating pollution prevention and loss prevention principles into our work process.
  - Employing well-trained personnel who understand and have the knowledge to fulfill their ESQ responsibilities.
- We will fully comply with all laws and regulations pertaining to our business, as well as, company policies and procedures
- We will commit ourselves to complying with the terms of our contracts and to meeting the four project objectives—knowing scope, budget, schedule, and level of quality.
- We will provide the level of quality our internal and external clients expect and pay for and use its attainment as our measure of success.
- We will safely and properly plan our work and work our plan.
- We will communicate and document the execution of our work.
- We will gather data and make decisions inclusively and involve employees and others affected by ESQ decisions inclusively.
- We will dedicate ourselves to continuous improvement by:
  - Establishing and periodically updating ESQ improvement objectives and targets.
  - Recognizing outstanding employee and project ESQ performance.

These commitments are defined in, and are fundamental to, our Client Service Quality®, Do It Right®, and Shared Vision®, Zero Incident Performance® operating philosophies.

TETRA TECH EC, INC.

TETRA TECH EC, INC. CORPORATE HEALTH AND SAFETY PROGRAM PROCEDURES LIST

EHS 1-1	Responsibilities for Program Implementation
EHS 1-2	Awareness and Recoginition Program
EHS 1-3	Employee Participation Program
EHS 1-4	Subcontractor Selection and Management
EHS 1-5	Visitor Safety
EHS 1-7	Event Reporting and Investigation
EHS 1-9	Recordkeeping
EHS 1-10	External Regulatory Inspections and Notifications
EHS 1-11	Training
EHS 2-1	Emergency Preparedness
EHS 3-1	Ergonomics
EHS 3-2	Procedures – Environmental Health and Safety Plan(s)
EHS 3-3	EHS Inspections
EHS 3-4	Site and Contamination Control
EHS 3-5	Activity Hazard Analysis
EHS 3-6	Work Rules
EHS 3-7	Hazardous Material Storage and Transportation
EHS 3-8	Fall Protection
EHS 3-9	Hoisting and Rigging
EHS 3-10	Electrical Safety
EHS 3-11	Hand and Portable Power Tools
EHS 3-12	Scaffolding
EHS 3-13	Motorized Vehicles and Equipment
EHS 3-14	Fire Prevention
EHS 3-15	Underground Utilities
EHS 4-1	Bloodborne Pathogens
EHS 4-2	Hazard Communication
EHS 4-3	Radioactive and Mixed Waste Programs
EHS 4-4	Hearing Conservation
EHS 4-5	Medical Screening and Surveillance
EHS 4-6	Temperature Extremes

TETRA TECH EC, INC. CORPORATE HEALTH AND SAFETY PROGRAM PROCEDURES LIST

EHS 5-1	Personal Protective Equipment
EHS 5-2	Respiratory Protection
EHS 6-1	Confined Space Entry
EHS 6-2	Drill Rigs
EHS 6-3	Excavation and Trenching
EHS 6-4	Lockout/Tagout
EHS 6-5	Welding/Hot Work
EHS 6-6	Boating
EHS 6-7	Drum and Container Handling
EHS 6-8	Demolition
EHS 6-9	Line Breaking
EHS 7-1	UXO Initial Site Assessment
EHS 7-2	UXO Drilling Operations
EHS 7-3	UXO Quality Control
EHS 7-4	UXO Safety Concepts
EHS 7-5	UXO Demolition Safety Precautions
EHS 8-1	Asbestos Control

ZIP

Zero Incident Performance®

We value the safety and well being of all associates. We work on the premise that all accidents are preventable. Our goal of **Zero Incident Performance®** is supported by the integration of safety concepts, principles and practices into each work effort and project phase.

Zero Incident Performance
Zip
Do it safe... Do it right

TETRA TECH EC, INC.

Zero Incident Performance® Pledge

As a member of the Tetra Tech EC, Inc. Team,
I am dedicated to the goal of Zero Incident Performance:

- I believe that all incidents are preventable.
- I believe that Zero Incident Performance is achievable through proper planning, tasking, and execution of plans and procedures as written.
- I believe that the investigation of "near misses" provides an opportunity for improvement before a loss occurs.
- I will make every effort to understand how to properly perform each task that I am assigned.
- I will perform each task in a safe and environmentally protective manner with the appropriate level of quality.
- I will help to fix things that are wrong.
- I will immediately report all incidents including "near misses" to my supervisor.

ATTACHMENT 3
GENERAL WORK RULES

GENERAL WORK RULES

1. All SES-Tt personnel, subcontractors, and visitors under SES-Tt control must attend each day's site-specific orientation training.
2. Any individual who has changes in the types of prescribed medications taken shall inform the SSHO, the DHSE, or the Corporate Medical Consultant (CMC) of that change. The CMC will review the medication and decide whether the employee can safely work on site while taking the medication. The CMC will inform the DHSE and the SSHO of their decision.
3. The personal protective equipment specified by the SSHO and described in the APP/SSHP shall be worn by all site personnel.
4. Facial hair (beards, long sideburns, or mustaches) that may interfere with a satisfactory fit of a respirator mask is not allowed on any person who may be required to wear a respirator.
5. All personnel must sign the site log and the EZ log when used at the site.
6. Personnel must follow proper decontamination procedures.
7. Eating, drinking, chewing tobacco or gum, smoking, and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in the EZ. (Exceptions may be permitted by the SHM to allow fluid intake during heat stress conditions.)
8. All lighters, matches, cigarettes, and other forms of tobacco are prohibited in the EZ.
9. All signs and demarcations shall be followed. Such signs and demarcation shall not be removed except as authorized by the SSHO.
10. No one shall enter a permit-required confined space without a permit. Confined space entry permits shall be implemented as issued.
11. All personnel must follow Hot Work Permits as issued.
12. All personnel must use the Buddy System when operating in the EZ.
13. All personnel must follow the work-rest regimens and other practices required by the heat stress program.
14. All personnel must follow lockout/tagout procedures when working on equipment involving moving parts or hazardous energy sources.
15. No person shall operate equipment unless trained and authorized.
16. Hand and portable power tools must be inspected prior to use. Defective tools and equipment shall not be used.
17. Ground fault interrupters shall be used for cord and plug equipment used outdoors or in damp locations. Electrical cords shall be kept out of walkways and puddles unless protected and rated for the service.
18. Improper use, mishandling, or tampering with safety and health equipment and samples are prohibited.
19. Horseplay of any kind is prohibited.

20. Possession or use of alcoholic beverages, controlled substances, or firearms on any site is forbidden.
21. All incidents, no matter how minor, must be reported immediately to the SSHO.
22. All personnel shall be familiar with the Site Emergency Response Plan.

The above Work Rules are not all inclusive. It is your responsibility to comply with all regulations set forth by OSHA, the HSM, the client, the EM 385-1-1. SES-Tt Site Superintendents, and the SSHO.

ATTACHMENT 4
FIELD FORMS

DAILY EQUIPMENT INSPECTION

PROJECT_____

MANUFACTURER TYPE _____

UNIT #_____MODEL _____ DATE _____

ENGINE HRS/MILEAGE _____ /_____ SHIFT _____

Check appropriate column and describe correction needed.

	If Good (✔)	NA	Correction Needed
Steering Mechanisms[1] *	_____	_____	_____
Service Brakes [2]	_____	_____	_____
Emergency Brakes[1]			
Parking Brake[1]	_____	_____	_____
Transmission & Controls	_____	_____	_____
Suspension & Springs	_____	_____	_____
Hydraulic Leaks	_____	_____	_____
Exhaust System	_____	_____	_____
Warning Gauges	_____	_____	_____
Windshield[1] & Wipers	_____	_____	_____
Lights (Head & Tail)	_____	_____	_____
Brake Lights[1]	_____	_____	_____
Mirrors	_____	_____	_____
Seat and Seat Belts[1] (w/ ROPS)	_____	_____	_____
Tires/Tread[1]	_____	_____	_____
Regular Horn	_____	_____	_____
Audible Back-up Alarm[1]	_____	_____	_____
Steps, Hand-holds	_____	_____	_____
Fire Extinguisher	_____	_____	_____
Engine Coolant	_____	_____	_____
Engine Oil	_____	_____	_____
Hydraulics & Operating Controls	_____	_____	_____
Fenders/Mudflaps	_____	_____	_____
Heater/defroster	_____	_____	_____
All items in cab or bed secured	_____	_____	_____
Cleanliness inside and outside	_____	_____	_____

Remarks:

[1] Items required to be operational by OSHA 1926.602 before use.

[2] Service brake must be capable of stopping and holding equipment fully loaded. _____

_____ _____

Operator Name (Printed) Operator Signature

Review : Superintendent _____

Date Repairs or adjustments completed:_____

Equipment Supervisor/Mechanic:_____

DAILY BRIEFING SIGN-IN SHEET

Date: _____ Office/Project Name/Location: _____

Shift/Department: _____ Person Conducting Meeting/Briefing: _____

1. AWARENESS (e.g., special EHS concerns, pollution prevention, recent incidents, etc.):

2. OTHER ISSUES (ESQ Plan changes, action items, attendee comments, etc.):

3. ATTENDEES (Print Name):

1.	21.
2.	22.
3.	23.
4.	24.
5.	25.
6.	26.
7.	27.
8.	28.
9.	29.
10.	30.
11.	31.
12.	32.
13.	33.
14.	34.
15.	35.
16.	36.
17.	37.
18.	38.
19.	39.
20.	40.

Give completed documentation to SSHO.

OPERATOR/DRIVER TASK OBSERVATION CHECKLIST

Project Name _____ Project Number _____
Operator's Name _____ Observer's Name _____
Date of observation Type/make of equipment operated

Operating Safety Observations		S	U	N	Comments
A.	**Pre-use inspection prior to staring**				
1.	Conducts daily pre-use inspection.				
2.	Mounts & dismounts carefully-3 point contact.				
3.	Uses the seat belt all times while seated. Sounds horn before staring engine.				
4.	Checks equipment warning devices.				
5.	Checks hydraulic systems (if so equipped). Ensures system is filled and free from leakage.				
6.	Checks air system (if so equipped). Ensures all connections are tight.				
7.	Checks engine oil level. Ensures all plugs, filler caps, and other fittings are secure and not leaking.				
8.	Checks for broken, missing, excessively worn or damaged parts, and reports immediately.				
9.	Checks tires. Looks for serious cuts, bulges, irregularities and abnormal wear. Checks inflation pressures and keeps valve caps in place. Checks for tires rubbing.				
10.	For dump trucks, checks front wheel seal oil levels.				
11.	Checks fuel level and for fuel system leaks.				
12.	Coolant check—Should never open a hot system or pour cold coolant into radiator if the engine is very hot.				
13.	For safe visibility, cleans the windshield, mirrors and light lenses.				
14.	For articulating machines, checks to ensure that the steering frame lock or link have been removed and properly stored.				
15.	Checks for and maintains safe access to the cab (3 point contact). For safe mounting, clears the steps, grab rails, and floor and seat of mud and water.				
16.	Secures tools and keeps the floor free of debris.				
17.	For safe operation wipes steering wheel, foot pedals, hand levers and knobs clean of oil and grease.				
18.	Checks first aid kit and fire extinguisher. Reports missing items to the foreman or supervisor.				
19.	Checks equipment for warning tags.				
B.	**Starting**				
1.	Mounts & dismounts carefully-3 point contact.				
2.	Uses the seat belt at all times while seated. Sounds horn before starting engine.				
3.	Checks equipment warning devices.				
4.	Uses job specific PPE (e.g., hard hats, safety shoes, safety glasses, overalls, gloves, traffic vests, and ear protection).				
5.	Ensures the bowl, bucket, etc. is on the ground.				
6.	For starting, checks all controls to be sure they are in proper position.				
7.	Does not crank an electric starter for more than 30 seconds, Allows two minutes to cool prior to next attempt.				
8.	For steering safety, tests before moving. Turns the wheels to full left and full right.				
9.	Checks service and parking breaks for proper operation.				
10.	Checks the backup alarm.				
11.	Ensures head lamps and safety lighting are in working order.				

Operating Safety Observations		S	U	NA	Comments
C.	**Operation**				
1.	Before moving, places the bucket, bowl, blade, etc., into the transport position and secures all accessory equipment.				
2.	Obeys traffic & other posted/published site safety practices & rules.				
3.	Maintains control of equipment at all times.				
4.	Gives right-of-way to loaded machines or trucks.				
5.	Minimizes engine overspeed on downgrades & when shifting.				
6.	Does not transport passengers without proper provisions.				
7.	Does not engage in horseplay.				
8.	Crosses ditches at an angle, proceeding slowly.				
9.	Avoids large obstacles, deep holes & soft edges.				
10.	Slows down before turning.				
11.	Stays in gear on a downgrade.				
12.	When running across a hillside, proceeds slowly. Never turns sharply uphill or downhill.				
13.	Obeys flagmen & spotter signals.				
14.	Maintains safe stopping distance behind other equipment.				
15.	Shifting				
	a. Always stops the machine/truck and runs the engine at low idle speed to shift from forward into reverse.				
	b. Downshifts one speed range at a time.				
	c. Applies the retarder and/or service brakes to reduce speed before entering sharp turns, fill areas, and downgrades.				
	d. For machines, always leaves the shift lever in neutral position when stopped.				
16.	Braking				
	a. Avoids applying brake continuously on a downgrade unless system is so designed.				
	b. Uses the engine for additional brake force-or, if so equipped, the auxiliary retarder.				
	c. Anticipates grade and selects proper gear range accordingly.				
	d. Brakes firmly in one application. Avoids fanning the brake pedal.				
	e. Uses each brake system only for its intended purpose.				
17.	Turning				
	a. Does not cut corners too close when making sharp turns.				
	b. Maintains engine speed high enough for normal steering.				
	c. Downshifts when necessary or appropriate.				
	d. For machines, carries the load as low as conditions permit to maintain stability.				
18.	Hauling				
	a. Regulates speed to road conditions. Reduces speed before turning. Avoids over speeding the engine.				
	b. Downshifts when approaching a downgrade. Downshifts when necessary on an upgrade to avoid stalling the engine.				
	c. Obeys traffic rules and spotters.				
19.	Parking Precautions				
	a. Selects level ground whenever possible.				
	b. When parking on a grade, positions equipment at right angles to the slope; and sets parking brake if so equipped in addition to lowering bowl, bucket, etc.				
	c. Parks a reasonable distance from other equipment.				
	d. When parking on haul roads, picks the safest place, where the equipment is visible from both directions.				

Operating Safety Observations	S	U	NA	Comments
20. Demonstrates proficiency through smooth operation of controls (e.g., speed of operation appropriate for the conditions, not jerky or hesitant).				
21. Maintains eye contact with other operators, drivers, and ground personnel.				
22. Responds appropriately to signals from flaggers, spotters, operators directing equipment movements.				
23. Stops operation when ground personnel are out of line-of-sight.				
24. Positions and orients machine for safe operation (e.g., safe distance from edge of excavations, tracks perpendicular to excavation, clear distance maintained to fixed obstructions).				
25. Barricades, cones, tape set up to maintain clear zone within swing radius of counterweight.				
26. Maintains safe work area (e.g., windrow at edge of stockpiles, safe slopes).				
D. Shutdown				
1. Lowers the bowl, bucket, etc. to the ground. Lowers and secures the bed on dump trucks.				
2. Reduces engine speed. Sets parking brake.				
3. On machines, places transmission in neutral and locks shift lever if so equipped.				
4. Allows hot engine to cool gradually before stopping it.				
5. Secures equipment to prevent unauthorized starting and movement.				
6. Bleeds the air tanks, if so equipped.				
7. Dismounting—doesn't jump off, uses handrails and steps, and faces the machine/truck when getting off.				
8. Warning tags—attaches appropriate warning tags to steering wheel to prevent accidents.				
E. Overall Appraisal				
Overall appraisal of operator/driver				

S = Satisfactory
U = Unsatisfactory
NA = Non applicable
Note: For unsatisfactory observations also indicate the immediate corrective action taken (e.g., training, verbal or written warning, or reassignment).

EHS WEEKLY/MONTHLY CHECKLIST AND ACTION ITEM REPORT

Inspection Type: ☐ **Weekly** ☐ **Monthly**

Project/Location:	**Inspector/s:**	**Time/Date:**
TOPIC	**OBSERVATIONS**	**FINDING (Y/N)**
Work Conditions		
1. Housekeeping		
2. Walking/Working Surfaces		
3. Aisles and Passageways		
4. Platforms/Scaffolding		
5. Ladders		
6. Stairs, Guardrails, Toe-boards		
7. Exits/Egress		
8. Roadways		
9. Ventilation		
10. Lighting		
11. Noise Exposure		
12. Ergonomics		
13. Site Perimeter and Control Zones Identified		
Equipment		
14. Hand/Portable Tool Condition, Storage and Use		
15. Machine, Conditions/Guarding		
16. Mobile/Heavy Equipment a. Physical inspection of equipment b. Review of daily inspection reports c. Review of equipment deficiency corrections logs/records		
Material Handling Equipment		
17. Hoisting and Rigging		
18. Lifting Aids Used When Possible		
19. Proper Lifting Techniques Used		
Electrical Safety		
20. Power Cords		
21. GFCI		
22. Generators		
23. Breaker Box Access/Clearance		
Hazardous Materials		

24. Hazardous Chemical List Current		
25. MSDS		
26. Labeling		
27. Signs/Postings/Color Coding		
28. Proper Storage and Segregation of Hazardous Materials		
29. Compressed Gas Storage and Use		
Emergency Systems		
30. Emergency phone numbers posted		
31. Evacuation routes, rally points shown on site map		
32. Fire extinguishers inspected monthly		
33. Eyewashes and showers periodically inspected, units flushed, and fluids periodically changed		
34. First Aid Kits/Stations		
35. Emergency Rescue Equipment		
Protective Equipment		
36. PPE used, stored, and maintained in accordance with EHS plan		
37. Respirator use, storage, and maintenance		
Hazardous Waste Storage Area(s)/Satellite Accumulation Area		
38. Designated, secured area with "Hazardous Waste" signage. For SAA area is marked "SAA". (SAA)		
39. Containers:		
a. DOT-spec. containers (for wastes to go off-site only)		
b. Intact/in good condition		
c. Waste compatible with containers (e.g., no evidence of corrosion, softening, bulging) (SAA)		
d. Marked "Hazardous Waste"/ visible Accumulation Date. *For SAA, marked "Hazardous Waste"*		
e. Securely closed and stored to prevent rupture/leaking, except when add/remove waste. (SAA)		
f. For SAA only, Stored "at the point of generation" and meets		

quantity limits (Federal: 55 gal; check state requirements).		
40. Reactive/ignitable wastes stored at least fifty (50) feet from property.		
41. Liquid wastes within secondary containment (BMP, check Waste Management Plan to determine state requirements).		
42. Incompatible wastes separated by a dike, wall, berm or other device.		
43. Stored for less than 90 days. *(CERCLA projects may have storage variance).*[1]		
44. Container tracking log accurately reflects containers stored. (SAA)		
45. Area maintained in an orderly fashion and complies with state/EHS plan requirements. (e.g. good housekeeping, adequate aisle space)		
Hazardous Waste Tank Storage Area		
46. Daily written inspection is being conducted and is maintained on site. Inspections include: a. Overfill/spill control b. Aboveground points of tank; monitoring/leak detection c. Surrounding area Cathodic protection systems are inspected bimonthly (& 6 months after installation)		
Waste/Stockpiles		
47. Refer to: a. Attachment C – Hazardous Waste Less Than 90 Days For Hazardous Waste Stockpiles; b. Attachment C – Solid Waste For State Regulated/Non-Hazardous Stockpiles; and/or c. Attachment C – PCB for PCB Stockpiles, if applicable		
TSCA PCB Wastes		
48. Inspected every 30 days at a minimum. Refer to PESM PCB Checklist		
Point Source Discharges		

[1] If stored on-site 75 or more days, TSDF/transporter has been selected (EHS 1-4), pick-up date scheduled and PM/PESM are aware of 90-day limit.

49. Permit conditions are being met.		
50. Monitoring equipment is fully operational.		
51. Equipment calibrations and maintenance is up-to-date.		
52. Discharge sampling performed at required intervals.		
53. Review monitoring results *(Report permit exceedances)*		
54. DMR and Plant Logs properly completed, signed, and submitted (if required).		
55. Fugitive Dust – Appropriate BMPs are instituted for fugitive dust emissions.		
Stormwater and other NPDES Discharge Activities		
56. SWPPP reflects current activities and has been updated as necessary.		
57. BMPs in SWPPP/Soil Plan implemented.		
58. Visual observations indicate stormwater meets water quality criteria.		
59. Stormwater BMP inspections conducted and documented as required (weekly and before/after > 0.5" storm event).		
60. Monitoring/sampling performed at required intervals.		
61. Review monitoring results if required. (*Report permit exceedances)*		

Project/Location:	**Inspector/s:**		**Time/Date:**
ACTION ITEM	**RESPONSIBLE PARTY**	**SCHEDULE**	**DATE COMPLETED**
Other Conditions or Work Practices			
62.			
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Reviewed by: _____ _____

SS / Site Manager Date

cc: Project Manager (monthly only)
PESM (monthly only)