Final Remedial Investigation/ Feasibility Study Work Plan

Colville Post and Poles
Stevens County, Washington

for
Washington State Department of Ecology

November 3, 2016

GeoEngineers
Earth Science + Technology

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File No. 0504-098-01

November 3, 2016

Prepared for:

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GEOENGINEERS

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1.0 INTRODUCTION

This Work Plan presents the scope of services and schedule to conduct a remedial investigation and feasibility study (RI/FS) at the former Colville Post and Poles, Inc. (CPPI) site located at 396 Highway 395 North near Colville in Stevens County, Washington (herein referred to as the “Site”). The Site location is shown on the Vicinity Map, Figure 1. Soil and groundwater contamination have been documented at the Site during several previous assessments including our recent Pre-RI site assessment (GeoEngineers 2016). Review of the previous assessment and remediation reports indicate that soil, sediment and groundwater at the Site contain contaminants of concern (COC) at concentrations greater than Washington Model Toxics Control Act (MTCA) cleanup levels and the magnitude and extent of contamination has not yet been assessed to the degree required to propose a satisfactory remedial approach.

The Site is currently managed by the Washington State Department of Ecology (Ecology); previous assessment and removal activities were managed by the United States Environmental Protection Agency (EPA). Ecology plans to conduct this RI/FS to determine the nature and extent of remaining contamination and screen potential cleanup actions.

1.1. Work Plan Organization

This Work Plan describes the tasks and activities required to complete an RI/FS for the Site, including descriptions of the methods, equipment and procedures pertaining to the field work. This Work Plan was prepared in general accordance with the requirements defined by MTCA (Washington Administrative Code [WAC] 173-340-350), and provides details regarding the proposed field investigation, data analysis program, anticipated schedule and reporting. Analytical data from the previous assessments and remedial actions are summarized and presented as Figures A-1 through A-13 in Appendix A. The project Sampling and Analysis Plan (SAP) is presented in Appendix B and the project Quality Assurance Project Plan (QAPP) is presented in Appendix C. GeoEngineers, Inc.’s (GeoEngineers’) site-specific Health and Safety Plan (HASP) for the project is presented in Appendix D.

1.2. Scope of Services

GeoEngineers’ scope of services for this project was provided to Ecology in our proposal dated December 4, 2013, and was based on the Proposed Work Assignment received from Ecology on October 14, 2013. Based on our review of the previous assessment and remediation work conducted at the Site, several site visits and our discussions with Ecology, we conducted a Pre-RI site assessment (GeoEngineers 2016), which included an interim action, to inform this RI/FS work plan.

Our specific scope of services included the following:

- Reviewed publically available documents related to the environmental background of the site. This included reviewing Ecology and EPA documents and preparing a brief list of data gaps that should be addressed during the Pre-RI site assessment and the RI.
- Met with Ecology to discuss data gaps, Pre-RI site assessment tasks, and necessary steps to conduct a comprehensive RI.

- Prepared an Interim Action Work Plan (GeoEngineers 2015) to address general housekeeping issues at the Site, protect wetland areas, and conduct Pre-RI site assessment activities which included an updated wetland delineation.
- Implemented the Interim Action Work Plan and reported the results (GeoEngineers 2016).
- Prepared this RI/FS Work Plan including: a background summary, evaluation of existing data and conceptual site model (CSM), SAP, QAPP and HASP.
- Conducted general project management activities including: coordinating with Ecology's technical and contracts staff; attending meetings, upon request; monthly tracking of project schedule and budget; submitting monthly invoices and progress reports; and managing subcontractors and project files.

2.0 BACKGROUND INFORMATION

2.1. Existing Site Conditions

The Site is about 23 acres and formerly was occupied by the CPPI wood-treating facility. The Site is located north of the Colville River, south of a BNSF Railway right-of-way (ROW) and tracks, east of a residential/agricultural property, and west of the former Bonanza Mill site (a former metals beneficiation facility). US Highway 395 is located north of the BNSF Railway ROW. The Site generally is flat and vegetated with native/invasive grasses, shrubs, trees and other plants. Previous assessments and the recent Pre-RI assessment conducted by GeoEngineers (GeoEngineers 2016) identified wetland areas, including streams draining to the Colville River, in the central and southern portions of the Site. These wetland areas likely are remnant meanders of the Colville River (Ecology and Environment, Inc. 2009). The extent of the wetland areas was updated during the recent Pre-RI site assessment conducted by GeoEngineers. Current Site features and historic operational areas are depicted on Historical Site Operational Areas and Current Layout, Figure 2.

2.1.1. Operational History

CPPI and its predecessors operated a wood-treating facility at the Site from sometime in the 1940s until January 2005. CPPI treated various wood products in dip tanks located inside a dedicated treatment building using a solution consisting of about 95 percent diesel and 5 percent pentachlorophenol (PCP). CPPI used aboveground storage tanks (ASTs) to store both diesel and PCP/diesel solutions. Freshly treated wood products were placed above drip pads to allow the excess PCP solution to drain into a sump; the recovered PCP solution was then stored in a separate tank. Former key facility features are depicted on Figure 2.

2.1.2. Geology

The Site is located in the Colville River Valley, a valley formed by glacio-fluvial activity (Herrera 2005). Based on the United States Geological Survey (USGS) Washington geologic map, the subsurface conditions generally consist of unconsolidated alluvium from the Holocene Epoch. The alluvium is characterized by mostly unconsolidated silt, sand and gravel fill with some clay. Local deposits might include low-level terrace, marsh, peat, artificial fill and glacial deposits.

Subsurface conditions encountered during previous assessments conducted by EPA's contractors and consultants and the Pre-RI site assessment conducted by GeoEngineers for Ecology, generally concur with the published USGS geologic map. Available boring logs indicate subsurface conditions generally include interbedded sand, gravel and silt over laying a clay unit. The clay unit was encountered at depths ranging between about 10 to 24 feet below ground surface (bgs). The clay layer is reportedly at least 380 feet thick (Herrera 2005). This clay unit is thought to be a contiguous aquitard beneath the Site and a subsurface horizon limiting the downward migration of dense, non-aqueous phase liquid (DNAPL) contaminants (like PCP), which would pool above this unit and spread laterally through the more overlying porous materials.

A three-dimensional model based on topography data obtained from digital elevation models (DEMs) and data obtained from historical and recent borings was prepared to depict the top of the clay surface beneath the Site. This task was completed to better visualize the horizon where DNAPL contamination might be present. The top of the clay layer model is presented in Site Plan, Figure 3. Based on the model results, several elevational low spots in the top of clay exist at the following locations:

- Near the central portion of the site (near borings DP-26 through DP-30);
- Near the western property boundary (near boring DP-8); and
- Near two locations in the north central portion of the site (between borings DP-19 and DP-20 and near borings DP-22 and DP-23).

To further visualize the subsurface geology, GeoEngineers prepared cross sections A to A’, B to B’, C to C’, and D to D’. Cross sections were generated from available boring logs from previous assessments and GeoEngineers’ Pre-RI site assessment along the transects shown on Figure 3. The cross sections are shown on Cross Section A-A’, Cross Section B-B’, Cross Section C-C’, and Cross Section D-D’, Figures 4 through 7, respectively.

2.1.3. Hydrogeology

Groundwater conditions were assessed during EPA’s assessment and remediation actions and the Pre-RI assessment. During the previous assessment actions, 19 groundwater monitoring wells (MW-1 through MW-4, W-01 through W-08, and MW-9 through MW-15) were installed throughout the Site and 4 additional wells (MW-16 through MW-19) were installed downgradient, on properties to the west and northwest. A shallow, unconfined aquifer was encountered in the alluvium above the clay layer at depths as shallow as about 2 feet bgs. Localized groundwater flow in the unconfined aquifer is connected to and recharges the Colville River (Herrera 2005).

Based on the groundwater elevation measurements obtained from the monitoring wells during groundwater monitoring events conducted between 2005 and 2009, the general groundwater flow direction beneath the Site is to the west (Ecology and the Environment 2010). From 2005 to 2009 the average hydraulic gradients calculated ranged between 0.0008 feet per foot (ft/ft) and 0.0022 ft/ft. The estimated groundwater velocity range varied from 0.067 feet per day (ft/day) to 15 ft/day (Ecology and the Environment 2010).

2.1.4. Wetlands

As discussed above, wetlands have been identified in areas of the Site that likely are former meanders of the Colville River. In 2005, Herrera Environmental Consultants, Inc. (Herrera) delineated one wetland that was approximately 6.2 acres and was classified as a Category II (Herrera 2005). Herrera identified this wetland as having forested, scrub-shrub and emergent wetland components that required a 150-foot buffer in accordance with Stevens County Code (SCC 13.30.020(6)_2003). No other wetlands were delineated by Herrera during the 2005 survey.

In 2015, GeoEngineers identified, delineated and assessed two wetlands on Site (GeoEngineers 2016): Wetland A and Wetland B. Wetland A was classified as a palustrine emergent/scrub-shrub/forested Category II wetland approximately 212,140 square feet (4.9 acres). Wetland B was classified as a palustrine emergent Category III wetland approximately 4,880 square feet (0.1 acres). The locations of Wetlands A and B are depicted on Figure 2.

2.2. Previous Assessment and Remediation Actions

Prior to conducting Removal Actions (RAs), the EPA divided the Site into four decision areas; these decision areas are depicted on Figure 2 and include the:

- Process Area – About 1 acre in the northern portion of the Site. Wood-treating and maintenance activities generally occurred in this area. The treatment building, dip tanks, drip pads and ASTs were located in this area.
- North Stockpile Area – About 7 acres in the northwest portion of the Site. Historically this area primarily was used to store un-treated wood products. Treated wood, equipment and wood waste also were stored in this area. During the RAs, contaminated soil was stockpiled in this area prior to transport and disposal off-site.
- South Stockpile Area – About 6½ acres located generally south of the Process Area. Treated wood products and abandoned ASTs were stored in this area. Bark and sawdust wood waste also was accumulated in this area.
- Drainage Area – About 8 acres consisting of two drainage ditches and low-lying areas adjacent to the Colville River.

Documentation regarding historical releases, assessments, and remedial actions was obtained from Ecology and the EPA. The historical sample locations and the remedial actions conducted prior to the Pre-RI site assessment are depicted on Figures A-1 through A-13. Chemical analytical data from the historical assessments is summarized in Tables A-1 through A-6. Previous environmental responses, assessments and remedial actions conducted at the Site are summarized below:

- 1989 – Reportedly, a 10,000-gallon AST containing PCP wood-treating solution ruptured and released solution to the ground. No records were obtained indicating the release was addressed, except as documented below.
- 1991 – CPPI hired Century West Engineering Corporation (Century West) to conduct a limited site assessment and remediation focused near the ASTs. Soil and groundwater samples obtained during the assessment were contaminated with PCP and heavy oils. About 50 cubic yards (cy) of contaminated soil were excavated and stockpiled on site.
- 1991 – Ecology followed up Century West's assessment with an investigation that included soil samples collected from the treated-wood storage area, near the dip tanks, potential run-off areas, and a background sample. The investigation concluded that soil contamination was restricted to the area near the ASTs (Ecology 1994).

- 1994 to 1997 – CPPI's consultants (Total Consultants, Inc. and Techcon) conducted a limited assessment and remediation near the ASTs. Assessment included installing monitoring wells MW-1 through MW-4. Elevated total phenol and heavy oil concentrations were observed in MW-3. About 150 cubic yards (cy) of PCP-contaminated soil were excavated near the ASTs and stockpiled on-site in 1997. The final stockpile location was not described in the available documentation. An additional 20 cy of contaminated soil were removed from near the treatment building and also stockpiled at an unknown location.
- 2002 – EPA's consultant, Herrera, conducted a Removal Site Evaluation (RSE). The RSE included surface soil, subsurface soil, sediment, groundwater and surface water assessment. Free product was observed in the Process Area and surface soils contained polycyclic aromatic hydrocarbons (PAH), PCP, dioxins, petroleum hydrocarbons and volatile organic compounds (VOC) at "elevated…concentrations" (EPA 2009).
- January 2005 – Wood-treating operations ceased in January 2005 and shortly thereafter, the EPA began a Phase I RA. During the Phase I RA, the EPA disposed of excess wood-treating solution and secured the facility to reduce the risk of direct-contact with contaminated materials. Actions included removing wood-treating solution from tanks and sumps, collecting sediment and soil samples, and installing a fence around the Process Area to limit access.
- June 2005 – EPA returned to the site to conduct a Phase II RSE. EPA's contractors collected surface soil samples at depths less than 6 inches bgs, subsurface soil samples from depths between 1 and 11 feet bgs, and groundwater samples. Eight new monitoring wells (W-01 through W-08) were installed at this time. Ground-penetrating radar was used to search the site for additional buried tanks (only a small pile of scrap metal was found in the South Stockpile Area). The Phase II RSE identified free product in the Process Area and a PCP groundwater plume extending from the Process Area to the west (the interpreted groundwater flow direction), beneath the North Stockpile Area, and to the property boundary. Petroleum hydrocarbons, PCP and dioxin contamination were identified in subsurface and/or surface soils.
- Fall 2006 – The EPA conducted the Phase II RA from September 2006 through March 2007. The contaminant action levels established for the RA included:
  - PCP in soil: 8 milligrams per kilogram (mg/kg), based on the MTCA Method B cleanup level (Method B CUL) at the time of the RA.
  - PCP in sediment: 0.36 mg/kg, based on research conducted by the Oak Ridge National Laboratory.
  - Dioxins/furans in soil: 1 microgram per kilogram (µg/kg).

  EPA demolished the treatment and storage buildings. Contaminated debris (concrete and wood) and drummed wastes were characterized and disposed according to their contaminant levels at appropriate facilities. After building demolition, EPA's contractor excavated soil and sediment to the action levels described above. Site excavations are shown in Figure A-12 and included the following:

  - Main Excavation Area – This area was located in the Process Area near the treatment building. Confirmation sidewall and base samples were analyzed either using a field kit or laboratory testing. The excavation measured about 165 feet by 50 feet and was about 9 feet deep. Free product was observed floating on infiltrated groundwater in the bottom of the excavation. Product recovery skimmers were used to capture about 300 gallons of free product. EPA ceased excavation activities in the Main Excavation Area because of sidewall instability and infiltrating groundwater; however, contaminated soil remained. Field test kits and/or laboratory results indicated contaminant concentrations in 19 soil confirmation samples exceeded the established action levels for PCP.

- South Stockpile Area – Contaminated soil mounds were present in the South Stockpile Area, possibly from the historic remediation actions described above. Targeted excavations addressed specific locations where contaminated soil was encountered during the RSE assessments. Confirmation soil sample contaminant concentrations were less than the established action levels except one sample location (associated with historic sample location SAW08). Two additional sample locations adjacent to the wetlands contained dioxins at concentrations greater than the MTCA Method B CUL.

- North Stockpile Area – Previous assessment data indicated contaminants were spread across the area in surface soils. Five sample locations contained dioxin concentrations greater than the MTCA Method B CUL. This area also was used during the RA as a contaminated stockpile staging area. After the stockpiles were disposed, about 6 inches of soil was removed from a large portion of this area. No confirmation samples were collected from this area following soil removal.

- Drainage Area (Channel) – The drainage area located south of the Process Area (described as a pond) was excavated until confirmation samples indicated the sediment PCP concentration was less than the established action level. The excavation was about 175 feet long by 50 feet wide and ranged between 1 and 4 feet in depth. Sediment confirmation sample PCP concentrations were less than the action levels.

- Railroad ROW – A ROW section located north of the Process Area was previously used to store treated wood products. An area about 90 feet long and 10 feet wide and 2 feet deep was excavated. PCP concentrations in soil confirmation samples were less than the established action levels except one sample location.

- Contaminated soil excavated from these areas was stockpiled, profiled and disposed. Stockpiles containing PCP concentrations less than 74 mg/kg (the land disposal restriction [LDR] limit) were disposed at Waste Management's Subtitle C landfill located in Arlington, Oregon (ChemWaste); approximately 4,811 tons of soil with PCP concentrations less than the LDR were disposed at ChemWaste.

- Most of the stockpiled soil with PCP concentrations less than the LDR also contained dioxins/furans at concentrations greater than applicable LDRs. To avoid the additional expense of treating this soil, a variance was obtained (based on adjusted concentrations using toxic equivalency factors) to directly dispose the soil at ChemWaste. An additional 2,180 tons of soil with PCP concentrations greater than the LDR were treated prior to disposal at the same facility.

- Each excavated area (except the North Stockpile Area) were backfilled with imported pit run gravel to approximately 1 foot below surrounding site grades. Imported topsoil was used to backfill excavated areas, including the North Stockpile Area, to match surrounding grades. The site was hydroseeded with a wild grass mixture in the spring of 2007.

During backfill operations, six product recovery wells (RW-01 through RW-06) were installed in the Process Area to continue removing product. The recovery wells operated from about December 2006 to October 2008, only about 21 liters of product was recovered during the operational period. Additionally, 11 monitoring wells (MW-9 through MW-19) were installed to monitor groundwater conditions following the RA. Wells MW-9 through MW-15 were installed onsite and wells MW-16 through MW-18 were installed on the adjacent private property to the west. Monitoring well MW-19 was installed on the property to the northwest.

- June 2005 to August 2009 – Groundwater monitoring was conducted from June 2005 to August 2009. In 2010, EPA concluded that the groundwater plume had stabilized and contaminant concentrations were declining and decommissioned the 22 existing monitoring wells (MW-1, MW-2 and MW-4 [MW-3 was previously decommissioned]; W-01 through W-08; and MW-9 through MW-19).

2.2.1. Pre-RI Site Assessment and Interim Remedial Action

During a Site reconnaissance conducted April 25, 2014, GeoEngineers and Ecology representatives observed debris scattered throughout the Site (including within ponded surface water in wetland areas) as well as several large debris stockpiles. Debris piles generally consisted of treated and un-treated wood waste, scrap metal, concrete (including foundations that appeared to formerly support ASTs), tires, vehicle maintenance waste and general solid waste. Treated lumber was observed near and in surface water in multiple locations. A large wood waste pile was observed approximately in the center of the property.

Based on the observations from the site reconnaissance and prior to conducting the formal RI/FS process, Ecology decided to conduct a Pre-RI site assessment and Interim Action. The Pre-RI site assessment goals included:

- Collecting soil and groundwater samples and chemical analytical data to support preparation of this RI/FS Work Plan;
- Better define the top surface of the previously documented clay layer underlying the site and, if possible, identify low spots where DNAPL (like PCP) might accumulate. These potential low spots could be ongoing sources to groundwater contamination if not addressed; and
- Updating the wetlands delineation (described in Section 2.1.4)

2.2.1.1. Pre-RI Assessment

The soil and groundwater site assessment activities consisted of advancing 37 direct-push soil borings at the locations depicted on Figure 3. Borings were advanced to depths between 1 to 26 feet bgs and 59 soil samples were submitted for chemical analysis of one or more of the following:

1. Diesel- and oil-range petroleum hydrocarbons (DRPH and ORPH, respectively),
2. Semi-volatile organic compounds (SVOCs);
3. Polycyclic aromatic hydrocarbons (PAHs); and/or
4. Gasoline-range petroleum hydrocarbons (GRPH).

Soil samples analyzed did not contain the above-listed contaminants at concentrations greater than their respective MTCA cleanup levels.

Groundwater samples were obtained from temporary well screens installed in 10 of the direct-push borings. Groundwater grab samples were analyzed for: benzene, toluene, ethylbenzene and total xylenes (BTEX), DRPH, ORPH and SVOCs, including PCP and PAHs. PCP and/or DRPH were detected at concentrations greater than their respective MTCA cleanup levels in five groundwater samples located between the Process Area and the western property boundary (see Figure 3).

2.2.1.2. Interim Remedial Action

The interim remedial action was conducted to address conditions that could potentially harm wetland habitat at the site and to remove debris that restricted access to areas requiring assessment during RI field activities. The interim remedial action consisted of removing and consolidating debris from wetland and former stockpile areas. Debris generally consisted of metal, plastic, and treated and untreated lumber. Debris was placed in lined stockpile areas in the former Northern Stockpile Area. Metal and plastic debris were separated from the lumber and were transported to the Steven's County Landfill for disposal.

2.3. Contaminants of Concern

Based on Site assessment data available to date, the site COCs, in both soil and groundwater, include the following:

- PCP;
- Diesel-range petroleum hydrocarbons (DRPH); and
- Dioxins and furans (commonly found in PCP).

Additionally, cadmium and mercury also are considered COC for soil in certain areas of the Site.

PCP – PCP was detected in surface and shallow subsurface soil samples during previous assessment actions. The soil sample locations with PCP concentrations greater than the established action levels generally were overexcavated and disposed offsite during the Phase II RA. Nineteen confirmation soil samples collected from the excavation base in the Process Area contained PCP concentrations greater than the established action levels. Soil samples collected during the Pre-RI site assessment from the direct-push borings, including borings drilled in the Process Area, did not contain PCP concentrations greater than the MTCA Method B cleanup level (2.5 mg/kg). According to the available documentation, five soil and sediment sample locations (sample locations NASS0100, NASS0300, SAB19, DASD0500, and SASS3500) contained PCP at concentrations greater than action levels but were not addressed during the Removal Actions.

PCP also was analyzed during groundwater monitoring events conducted from June 2005 through 2009 and from the grab groundwater samples obtained during the Pre-RI site assessment. PCP was detected at concentrations greater than the MTCA Method B groundwater cleanup level from most of the historical samples collected from the Process Area and North Stockpile Area. PCP also exceeded the groundwater MTCA Method B cleanup levels from six different locations in the South Stockpile Area. During the Pre-RI assessment, PCP concentrations exceeded the MTCA Method B cleanup level in five, out of nine, grab groundwater samples collected in the Process Area and the North Stockpile Area. PCP also was detected during each monitoring event in the off-site well MW-17, located about 200 feet west of the property boundary.

Dioxins/Furans – Dioxins/furans were analyzed in 13 surface soil samples collected throughout the site during the previous assessments. Dioxin/furan analysis included eight samples from the North Stockpile Area; three samples from the South Stockpile Area, and two samples from the Process Area. Dioxins/furans were detected in every sample analyzed. Dioxin concentrations were greater than the state background level of 5 picograms per gram (pg/g) in each sample except two locations in the North Stockpile Area (samples NASSW0400 and NASSW0500). Additionally, dioxins were detected at concentrations greater than LDR concentrations in the stockpiled soil waiting for transport and offsite disposal during the Removal Action.

Diesel- And Oil-Range Petroleum Hydrocarbons – DRPH and ORPH were analyzed in numerous subsurface and surface soil samples during the previous assessment and remediation. Except for two surface soil samples in the North Stockpile Area (sample location NAVEG and NASS0300), DRPH- and ORPH-contaminated sample locations were addressed during the Removal Action.

DRPH and/or ORPH exceeded the MTCA Method A cleanup level in most historic groundwater samples obtained from the Process Area. DRPH also exceeded the MTCA Method A groundwater cleanup level from six sample locations in the North Stockpile Area and one location in the South Stockpile Area. DRPH exceeded the MTCA cleanup level in three grab groundwater samples obtained from the North Stockpile Area during the Pre-RI site assessment.

Metals (Cadmium and Mercury) – During previous assessments 13 sediment samples were collected from the South Stockpile Area and Drainage Area and analyzed for mercury and cadmium. Both mercury and cadmium exceeded their respective MTCA Method A cleanup levels in one sediment sample (SASS2800). The metals were not detected or were detected at concentrations less than MTCA Method A cleanup levels in the remainder of the samples analyzed.

2.4. Proposed Cleanup Levels

Proposed cleanup levels established for the COC listed above are based on the MTCA Method A or B cleanup levels:

TABLE 1: CLEANUP LEVELS

Contaminant	Regulatory Authority	Soil		Groundwater	
		Units	**CUL**	**Units**	**CUL**
PCP	MTCA Method B (Cancer)	mg/kg	2.5	µg/L	0.219
DRPH	MTCA Method A	mg/kg	2,000	µg/L	500
ORPH	MTCA Method A	mg/kg	2,000	µg/L	500
Mercury	MTCA Method A	mg/kg	2	µg/L	2
Cadmium	MTCA Method A	mg/kg	2	µg/L	5
Dioxin/Furans (2,3,7,8 TCDD Toxic Equivalent Concentration)	"Natural Background for Dioxins/Furans in WA Soils" (soil) and MTCA Method B (Cancer) (water)	ng/kg	5.2	ng/L	673,000

Notes: µg/L = micrograms per liter; ng/kg = nanograms per kilogram; ng/L = nanograms per liter.

Cleanup values will be protective of environmental receptors. Preliminary Terrestrial Ecological Evaluation (TEE) analysis suggests that mercury, DRPH and ORPH will be adjusted downward.

3.0 PRELIMINARY CONCEPTUAL SITE MODEL

GeoEngineers prepared a preliminary CSM to describe surface and subsurface site conditions, define the nature and extent of known contamination, and to identify potential exposure pathways to Site COC and potential receptors. GeoEngineers developed the preliminary CSM from data contained in the previous studies listed above, available monitoring well logs, results of the Pre-RI site assessment and our observations from Site visits. The CSM is graphically depicted in Conceptual Site Model, Figure 10 and further described below.

3.1. Potential Exposure Pathways and Receptors

The sources of contamination at the Site are from historic wood treatment operations. Treatment operations primarily occurred in the Process Area; however, treated lumber, contaminated soil, and other wastes were placed throughout the Site impacting the ground surface and shallow soils. Because the Process Area was the primary source area, the extent of contamination extended deeper, impacting shallow groundwater. PCP- and diesel-contaminated groundwater has been observed in monitoring wells to the west of the Process Area and in groundwater grab samples from borings. A residence located about 700 feet west of the Site uses a private well that might be an exposure pathway to COCs.

Receptors of COC at the Site include: nearby residents, Site trespassers, the Site owner, wildlife (including terrestrial and birds), and aquatic organisms in the wetland. Release mechanisms, exposure points, and exposure routes for contamination contained at the Site generally are:

1. Direct contact with exposed contaminated surface soil and sediments (dermal contact and inhalation/ingestion of dust and contaminants);
2. Direct contact with/ingestion of groundwater contaminated with Site COCs. Groundwater contact/ingestion can occur at downgradient residential wells or, during high-water events, groundwater might seep into the wetland areas or onto the ground surface. Additionally, contaminants present in surface soil and sediments might infiltrate into shallow groundwater.
3. Direct contact with/ingestion of surface water runoff into wetland areas.

3.1.1. Shallow Surface Soil and Sediments

Based on the historic assessments, shallow surface soils and sediments were contaminated with PCP, petroleum hydrocarbons (DRPH and ORPH), metals (mercury and cadmium) and dioxins/furans at concentrations greater than their established regulatory cleanup levels. Shallow contamination was removed from portions of the Process Area, North and South Stockpile Areas, and from the Drainage Area during the Removal Action. The Process Area and the North Stockpile Area also were capped with about 1 foot of topsoil. However, based on the available data, several shallow soil and sediment sample locations with one or more contaminants exceeding cleanup levels were not addressed during the previous Removal Action. Also, dioxins/furans were detected in every surface soil sample analyzed and only two of the analyzed samples were less than the state background level of 5.2 ng/kg.

The Site is heavily vegetated; however, the surface soils and sediments are an exposure pathway for direct contact. During dryer seasons of the year, dust stirred up on the site might contain contaminants, which could establish the inhalation/ingestion exposure pathway.

3.1.2. Groundwater

Historical groundwater monitoring and recent grab groundwater samples collected during the Pre-RI site assessment indicate that a contaminated groundwater plume extends from the Process Area to the western boundary of the Site and beyond. The groundwater contaminant plume likely extends off-site beyond the western property boundary which could impact nearby residential wells.

GeoEngineers observed surface water seepage in low areas (such as tire ruts) during the recent Interim Action. The surface water seepage is a potential direct contact/ingestion exposure point, though it is only likely during spring precipitation runoff and other high-water events.

3.1.3. Surface Water

Precipitation infiltrating through the contaminated surface soil and sediment might also mobilize contaminants toward the shallow aquifer, contributing to the groundwater contamination. Surface water runoff comes in contact with shallow soil contamination and can migrate COC into wetland areas, offsite ditches, and neighboring properties.

4.0 DATA GAPS

Based on our review of the available data regarding the Site, we have identified the following data gaps that will be addressed during the RI:

1. One sediment sample (SASS2800), collected from a wetland area in the southeast portion of the Site, contained mercury and cadmium concentrations at concentrations greater than their respective MTCA Method A cleanup levels. This sample location was not removed or capped during the Removal Action and the extent of the metals-contaminated sediment was not explored.
2. DRPH was detected in two surface soil samples (NAVEG and NASS0300) at concentrations greater than the MTCA Method A cleanup level. These locations were not addressed during the Removal Action. DRPH was detected at a third sample location (NASS0100), located in the northwest corner of the Site, at a concentration of 1,900 mg/kg, only slightly less than the MTCA Method A cleanup level of 2,000 mg/kg. The extent of the DRPH-impacted surface soil at these locations was not defined during the previous assessments.
3. Four surface soil or sediment samples (sediment sample DASD0500 and surface soil samples NASS0300, SAB19 and SASS3500) contained PCP concentrations greater than the MTCA Method B (carcinogenic) cleanup level. PCP was not detected in an additional surface soil sample (NASS0100); however, the laboratory PCP reporting limit was greater than the MTCA Method B cleanup level. These samples were located in various locations at the site and were not contiguous. These sample locations were not addressed during the Removal Action and the extent of PCP-contaminated surface soil was not defined.
4. Dioxins/furans were detected in 13 surface soil samples analyzed; concentrations in 11 of the samples exceeded state background concentrations. Most samples analyzed for dioxins (eight samples) were collected from the North Stockpile Area; two samples were analyzed for dioxins in the Process Area (these sample locations were overexcavated during the Removal Action); and three samples were analyzed from the South Stockpile Area. Dioxins also were detected at elevated concentrations (greater

than the applicable LDR concentrations) from stockpiled soil during the Removal Action. Based on the historical sample results, it appears that dioxins might be present in surface soil across the Site.

5. Regional dioxin background analysis has not been performed. The regional background value might be higher than the statewide values presented in the referenced background document (Table 1) resulting from long-term industrial activity in the Colville River Valley.

5.0 PROPOSED REMEDIAL INVESTIGATION ACTIONS

5.1. General

Based on the review of the previous efforts at the Site, additional assessment and remediation is needed to comply with MTCA regulations and obtain a No Further Action determination for the Site. This RI will be conducted to assess soil and groundwater for the COC previously identified. The RI will include monitoring well installation to assess groundwater conditions and shallow surface soil sampling. GeoEngineers will provide the project management and field oversight during the RI. Protocols for sampling and analysis are included in Appendix B.

5.1.1. Public Comments

The draft version of this Work Plan was published for public comment during the summer of 2016. Based on the comments received from the Colville Confederated Tribes, the proposed RI assessment was modified to include an additional monitoring well located near the Colville River in the southwest portion of the property and two groundwater seep sample locations on the river bank.

5.2. Monitoring Well Installation

Groundwater chemical analytical results obtained during previous assessments, including the Pre-RI Assessment, indicate PCP- and DRPH-contaminated groundwater is present in a plume that approximately extends from the Process Area to the west, through the North Stockpile Area to the site boundary. Monitoring wells will be installed to better define the extent of the groundwater contamination in this area and to monitor the contaminant concentrations within the plume. Select monitoring wells will be installed where previous boring log data indicates the top of the clay layer is depressed, creating likely areas where PCP might accumulate. The remaining wells will be installed at upgradient and crossgradient locations to help assess the extent of the contaminant plume. The proposed monitoring well locations are depicted on Proposed Explorations and Analyses, Figure 8 and are described by the following:

1. MW-20 through MW-23 and MW-29 will be installed along the western property boundary.
    a. MW-20 will be placed north of direct-push boring DP-4 and south of DP-1 to define the northern extent of the contaminated groundwater plume at the western property boundary.
    b. MW-21 will be placed near direct-push boring DP-4 to assess contaminant migration offsite.
    c. MW-22 will be installed near boring DP-6 outside of the wetland boundary to better assess the southern extent of the contaminated groundwater plume at the western property boundary.
    d. MW-23 will be constructed near DP-8, within an interpreted depression in the clay layer where PCP might accumulate. This well also will be used to help assess the southern extent of the plume at the western property boundary.

e. MW-29 will be installed near the southwest corner of the site. This well was added based on the comments received during the public comment period and will be used to assess groundwater interaction with the Colville River.

2. MW-24 will be installed north of the suspected plume to define the northern boundary of the plume.
3. MW-25 will be installed near the middle of the suspected contaminated plume, near boring DP-15. The purpose of this well is to observe contaminant concentration trends in groundwater.
4. MW-26 will be installed near the middle of the suspected contaminated plume, near boring DP-20. The purpose of this well is to observe contaminant concentration trends in groundwater. This location also is in a suspected low spot in the top of clay elevation.
5. MW-27 will be installed northwest of the previous excavation completed by EPA located in the historical process area.
6. MW-28 will be installed upgradient of the suspected groundwater plume to assess the eastern extent of the contaminant plume.

Specific tasks associated with the monitoring well installation include:

1. Coordinate a utility locate using the one-call system and a private utility locator. Proposed boring locations will be marked prior to coordinating the utility locates.

   Subcontract a qualified driller to advance nine soil borings using sonic drilling techniques at the approximate locations depicted on Figure 8. The borings will be advanced about 1 to 2 feet into the underlying clay layer. The soil recovered from the borings will be logged and field screened using methods described in Appendix B Sampling Analysis Plan, and select samples will be obtained for potential chemical analysis at an accredited laboratory.
2. Submit up to two soil samples per boring to a qualified laboratory for analysis of DRPH using Northwest Method NWTPH-Dx and PCP using EPA Method 8270 SIM; the remaining soil samples collected will be submitted to the laboratory and held for potential analysis. Samples will be analyzed based on the results of field-screening for petroleum hydrocarbons (visual observation, headspace vapor measurements using a photoionization detector (PID), and sheen testing) by the field representative. Samples with field-screening results indicating the presence of petroleum hydrocarbons will preferentially be submitted for DRPH analysis. In the absence of field-screening results indicating the presence of petroleum hydrocarbons, the sample collected from directly above saturated conditions and the sample collected from directly above the clay layer will be submitted for DRPH analysis. Ecology will be consulted before analyzing more than two samples from any boring. The sample coolers will be delivered to the analytical laboratory under standard chain-of-custody procedures. Samples will be submitted for analysis on a standard turn-around time.
3. Samples submitted for PCP testing will be obtained at and near the interface of the underlying clay layer (within 1 foot above and below the top of the clay). Additionally, samples indicating contamination from field screening will be tested. Soil samples will be submitted on a standard turn-around time.
4. Install 2-inch-diameter groundwater monitoring wells (MW-20 through MW-28) in the soil borings. The monitoring wells will be completed with stickup monuments and the bottom 5 feet of each well will be screened. Each well will be developed by surging and pumping until the water is visibly clear.

5. Drum and label investigation-derived waste (IDW), consisting of excess soil cuttings, development and decontamination water, and place the drums in an area approved by Ecology pending chemical analytical results. A qualified contractor will be retained to profile and transport the waste to a permitted facility.
6. Subcontract a professional surveyor to survey the locations and elevations of the monitoring wells.

5.3. Groundwater Sampling

1. Collect groundwater samples from the monitoring wells using low-flow groundwater sampling methods. Groundwater samples will be analyzed for DRPH and PCP using the methods listed above. Groundwater samples will be collected quarterly from all site wells for four consecutive quarters and additional sampling might occur based on the results from the initial sampling events. Groundwater samples will be submitted for chemical analysis on a standard turn-around time. Dioxins also will be analyzed during the one quarterly groundwater monitoring event. Assuming dioxins are not detected at concentrations greater than the state background levels, they will not be included in the analytical suite during subsequent events. Ecology will decide on how to proceed during future sampling events.
2. Collect groundwater samples from residential wells. Groundwater samples will be analyzed for DRPH and PCP using the methods listed above. Groundwater samples from residential wells will be collected for up to four consecutive quarters. Ecology will assist with residential well access and be a point of contact with the local residents as necessary.
3. Drum and label IDW, consisting of purge and decontamination water, and place the drums in an area approved by Ecology pending chemical analytical results. A qualified contractor will be retained to profile and transport the waste to a facility permitted for disposal.
4. Prepare and submit to Ecology quarterly reports documenting the results of groundwater monitoring following each sampling event. The first report will be included in the RI/FS report following field activities.

5.4. Shallow Soil Sampling

Based on our review of the previous assessments and Removal Actions, shallow soil contaminated with PCP, DRPH and metals at concentrations greater than MTCA cleanup/state background levels remains on-site. The primary purpose of shallow soil assessment is to better define the areas where COC were observed at concentrations greater than applicable regulatory cleanup levels and to better assess the site-wide dioxin impact in shallow soils. Shallow soil sample locations are summarized by the following:

1. HA-1 through HA-14, HA-17 through HA-23, HA-25 HA-31, HA-32 and HA-38 will be analyzed for dioxins/furans to assess the site-wide shallow contamination.
2. HA-1, HA-36 and HA-37 will be analyzed for DRPH and PCP to determine the contaminant extent near historical sample NASS0100.
3. HA-15 through HA-17 will be analyzed for DRPH to assess the shallow soil near historical sample NAVEG.
4. HA-33 through HA-35 will be analyzed for PCP to assess sediments near historical sample DASD0500.
5. HA-24 through HA-26 will be analyzed for PCP to assess the shallow soil near historical sample SASS3500.

6. HA-29 through HA-31 will be analyzed for PCP to assess the shallow soil near historical sample SAB19.
7. HA-27, HA-28 and HA-30 will be analyzed for cadmium and mercury to assess the sediments near historical sample SASS2800.

The specific scope of services associated with the collections of shallow sediment and soil samples includes:

1. Conduct shallow soil and sediment sampling at 38 locations approximately as depicted on Figure 8. Samples will be collected using hand tools (stainless steel augers and/or shovels) that will be decontaminated between each sample location using Liquinox and distilled water. Surface vegetation will be removed from the proposed sample locations and soil samples will be collected from the ground surface to depths of about 18 inches below ground surface. Three soil samples will be collected from each location (one sample every 6 inches) for potential chemical analysis. Soil samples will be field screened for the presence of petroleum-related contaminants using water sheen testing, headspace vapor measurements and visual observation.
2. Submit at least one soil sample from each location for the chemical analyses indicated on Figure 8. The chemical analyses specified for each proposed sample location are based on the historic sample results:
    a. We anticipate about 50 soil samples from 25 sampling locations will be analyzed for dioxins/furans using EPA Method 8290A (see Figure 8). Samples will be collected from the ground surface (0 to 6 inches bgs), about 6 to 12 inches bgs, and about 12 to 18 inches bgs. Surface samples will be analyzed for dioxins/furans. If the surface samples contain concentrations of dioxins/furans that are greater than state background levels, the samples collected from 6 to 12 inches in those locations also will be submitted for dioxin/furan analysis. The remaining samples will be held for potential chemical analysis.
        i. We anticipate the regional dioxin background analysis will require about 20 soil samples from 20 sampling locations (see Public Lands for Potential Regional Dioxin Background Sampling, Figure 9) using EPA Method 8290A. Regional dioxin samples will be collected from the ground surface (0 to 6 inches bgs) in accessible (publicly owned) locations near the site.
    b. About 15 soil samples will be analyzed for PCP using EPA Method 8270 SIM.
    c. About nine soil samples will be analyzed for DRPH and ORPH using Northwest Method NWTPH-Dx.
    d. About three soil samples will be analyzed for cadmium and mercury using EPA 6000/7000 Series Methods.
    e. Collect and analyze quality assurance/quality control (QA/QC) soil samples at the locations and frequency specified in the QAPP (see Appendix B).
    f. The samples will be submitted on a standard turn-around time.

5.5. Groundwater Seep Samples

Groundwater seeps will be sampled from two locations on the bank of the Colville River in the southwest portion of the site. Additional sediment samples will be collected from the river bed adjacent to the groundwater seep sample locations if results of the groundwater seep samples contain detectable concentrations of COCs. Specific scope of services include:

- Identify two locations on the river where groundwater appears to be seeping from the bank sediments into the Colville River.
- Collect groundwater seep samples from the selected locations.
- Submit the groundwater seep samples for DRPH and ORPH using Northwest Method NWTPH-Dx. PCP using EPA Method 8270, and cadmium and mercury using EPA 6000/7000 Series Methods.
- Collect sediment samples, if COCs are detected in the seep samples, from the river bed adjacent to the seep sample location and analyze them for the detected COCs.

5.6. RI/FS Report and Project Management

1. Prepare a draft and final Remedial Investigation and Feasibility Study report in accordance with Washington Administrative Code (WAC) 173-340-350. The report will be submitted to Ecology for review and comment before being finalized. We assume one meeting will be required with Ecology to discuss comments before finalizing the report.
2. Upload the soil and groundwater chemical analytical data into Ecology's Environmental Information Management (EIM) database.
3. Provide project management services, including monthly progress reports, contractor management and invoicing.

6.0 FEASIBILITY STUDY

The FS will include development of proposed cleanup levels for the Site and evaluate hazardous substances in soil and groundwater by comparing analytical results to appropriate cleanup levels. The FS will develop and evaluate cleanup action alternatives for contaminated media so that cleanup actions can be selected. The FS will:

1. Develop cleanup levels, points of compliance and establish remediation levels;
2. Determine the Applicable, Relevant and Appropriate Requirements (ARARs) specific to the Site;
3. Delineate affected media where evaluation of remedial action is appropriate;
4. Develop remedial action objectives;
5. Screen and evaluate specific cleanup alternatives and recommend a preferred alternative; and
6. Present in a written report along with the results of the RI (the RI/FS report).

The following sections provide the details of the FS process that will be completed, if necessary, for the Site.

6.1. Establish Cleanup Levels, Points of Compliance and Remediation Levels

Cleanup standards, including cleanup levels and points of compliance, will be developed for soil and groundwater in accordance with MTCA requirements. Exposure pathways and receptors will be identified as part of cleanup level development. As needed, remediation levels might also be established for specific cleanup alternatives. A preliminary TEE analysis will be performed, if necessary, to protect environmental receptors. The TEE analysis could modify cleanup levels of DRPH, ORPH and mercury, all in the top 6 feet of soil.

6.2. Determine Site Specific ARARs

The FS will describe the ARARs specific to the Site for the remediation alternatives screened. ARARs might include various permits from local, state, or federal agencies and jurisdictions. Likely agencies that might have permit requirements for the remediation alternatives screened in the FS include Stevens County (grading permits, construction stormwater permits and noise and nuisance ordinances) and the Army Corps of Engineers (wetlands permits). Other potential ARARs will be explored during the FS.

Federal and state regulations also will be compared to determine the appropriate regulatory level for Site contaminants relative to the affected media. Regulations that might have priority include MTCA, WAC 173-200, and the Clean Water Act. The ARARs will be reviewed during the RI and Site specific cleanup levels will be determined based on the contaminant type, the effective media, the potential receptors and the applicable regulations. The chosen cleanup levels will be used to guide the selection of appropriate remediation actions selected during the FS.

6.3. Delineate Media Requiring Remedial Action

The FS will evaluate if soil and groundwater analytical results exceed cleanup levels and, if so, identify the locations where analyses of samples exceeded applicable MTCA cleanup levels. Based on exceedances and the established points of compliance, the FS will estimate the extent of contamination that requires remedial action.

6.4. Develop Remedial Action Objectives

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

6.5. Screening Cleanup Alternatives

Cleanup alternatives will be developed for each medium of concern. Initially, general remediation technologies will be identified for the purpose of meeting RAOs for each medium. General remediation technologies consist of specific remedial action technologies and process options and will be considered and evaluated based on the media type and the properties of any contaminant(s). These might include institutional controls, containment or other engineering controls, and removal.

Specific remedial action technologies and representative process options will be selected for evaluation based on documented development or documented successful use for the particular medium and COC. Cleanup alternatives will be developed from the general and specific remedial technologies and process options consistent with Ecology expectations identified in WAC 173-340-370 using best professional judgment and guidance documents as appropriate. The selected remediation technology or process will protect human and ecological receptors and reduce or eliminate exposure pathways identified in the CSM. Specifically, the direct contact and drinking water exposure pathways will be addressed by the selected remedy.

During the development of cleanup alternatives, both the current and planned future land use will be considered.

6.6. Evaluate Cleanup Alternatives

MTCA requires that cleanup alternatives be compared to a number of criteria as set forth in WAC 173-340-360 to evaluate the adequacy of each alternative in achieving the intent of the regulations, and as a basis for comparing the relative merits of the developed cleanup alternatives. Consistent with MTCA, the alternatives will be evaluated with respect to compliance with threshold requirements, permanence and restoration timeframe, and a disproportionate cost analysis. Additionally, the alternatives will be evaluated relative to the "other requirements" listed in WAC 173-340-360 which include using permanent solutions, Site restoration in a reasonable time frame, and consideration of public comments. The results of the evaluation will be documented in the RI/FS report.

7.0 SCHEDULE AND REPORTING

Following completion of the RI field activities and receipt of analytical data, reports will be prepared as follows:

1. Monthly progress memorandums describing field work conducted, analytical results obtained, and documentation prepared.
2. Memoranda evaluating specific assessment results that might affect future assessment actions (as required).
3. Prepare draft and final RI/FS Reports containing applicable sections as outlined in Chapter 173-340-350 of the WAC.
4. Sampling data will be submitted to Ecology in both printed and electronic formats in accordance with Ecology's Toxics Cleanup Program Policy 840.

The proposed schedule for the project milestones is listed below:

1. Prepare Public Review Draft RI/FS Work Plan and submit to Ecology: February 2016
2. Public Comment Period: June through September 2016
3. Prepare Final RI/FS Work Plan and submit to Ecology: November 2016
4. RI Site Characterization Activities: November 2016
5. Prepare Draft RI/FS Report and submit to Ecology: December 2016 (following the first quarterly groundwater monitoring event)
6. Ecology review of Draft RI/FS Report: January 2017 – determined by Ecology
7. Prepare Public Review Draft RI/FS Report and submit to Ecology: 2 to 4 weeks after receiving Ecology's comments

8. Public comment period: determined by Ecology
9. Ecology Responsiveness Summary: determined by Ecology
10. Prepare Final RI/FS Report and submit to Ecology: 2 to 4 weeks after receiving Ecology's comments

For the purpose of planning this Work Plan, Ecology review periods are assumed to be 30 days for draft documents and 15 days for final documents. Final schedule will be determined by Ecology based on project progress and other factors. Documents become final upon written approval by Ecology.

8.0 LIMITATIONS

We have prepared this Work Plan for use by the Washington State Department of Ecology. This Work Plan is not intended for use by others, and the information contained herein is not applicable to other sites.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this work plan was prepared. No warranty or other conditions express or implied should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc.

9.0 REFERENCES

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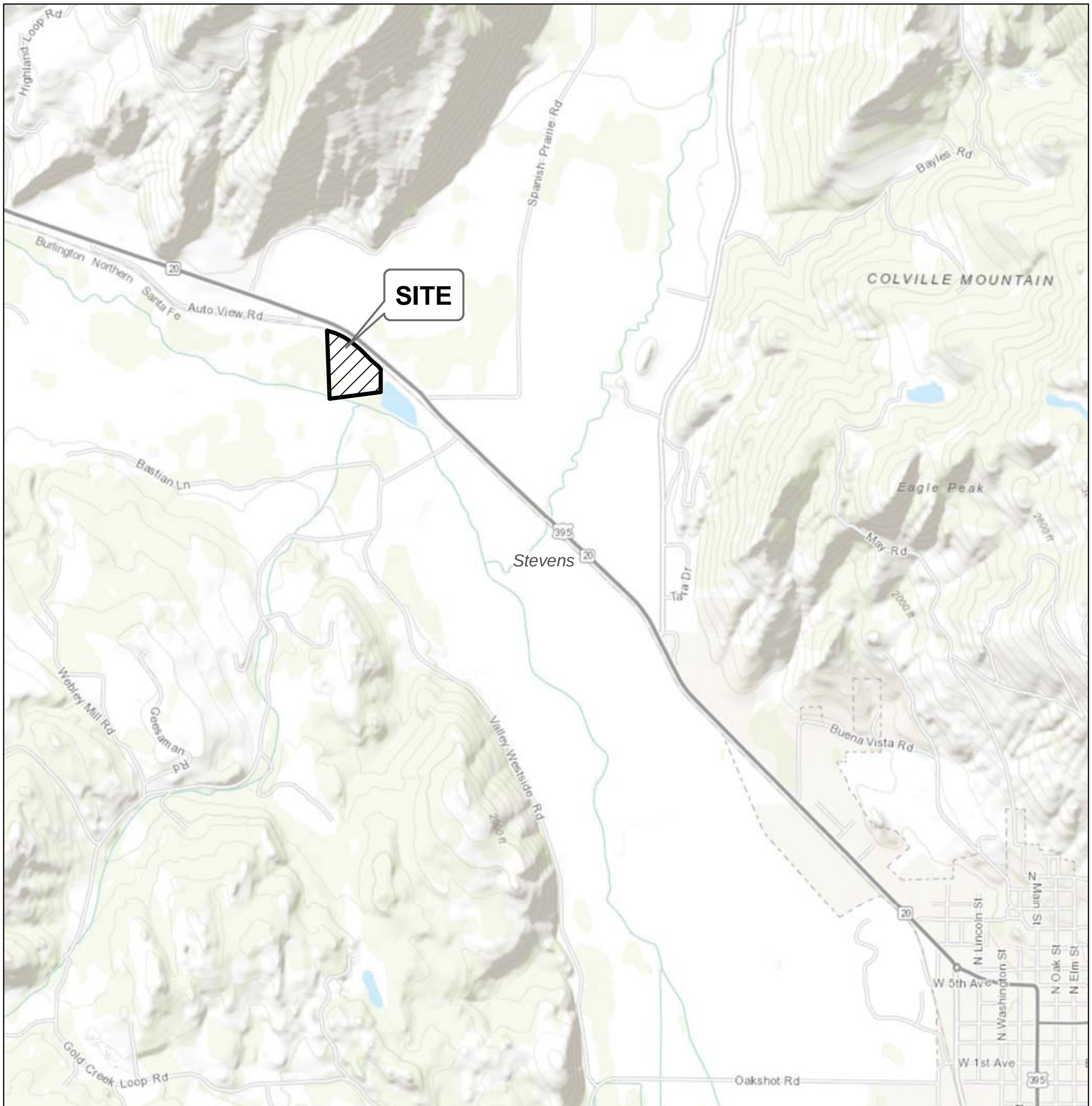
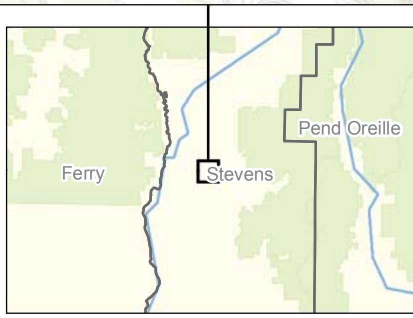
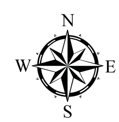
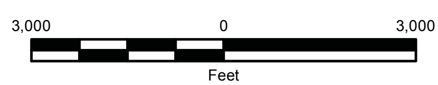
FIGURES









Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
Data Sources: ESRI Data & Maps, Street Maps 2008.
Base map from ESRI Data Online.
Projection: NAD 1983, UTM Zone 11 North.

Vicinity Map

Colville Post and Pole
Colville, Washington

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Figure 1

Map Revised: 02 November 2016 cchelf

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Map Revised: 02 November 2016 cchelf

Path: P:\0\0504098\GIS\MXD\050409801_F2_HistoricalSitePlan.mxd

Data Source: 2004 Aerial base from Goole Earth Pro.
Siteboundary provided by EPA and Washington Department of Ecology.

Projection: NAD 1983 UTM Zone 11N

Notes:
1. The locations of all features shown are approximate and are referenced from the Herrera 2003 "Removal Site Evaluation Report."
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Historical Site Operational Areas and Current Layout

Colville Post and Poles
Colville, Washington

GeoEngineers

Figure 2

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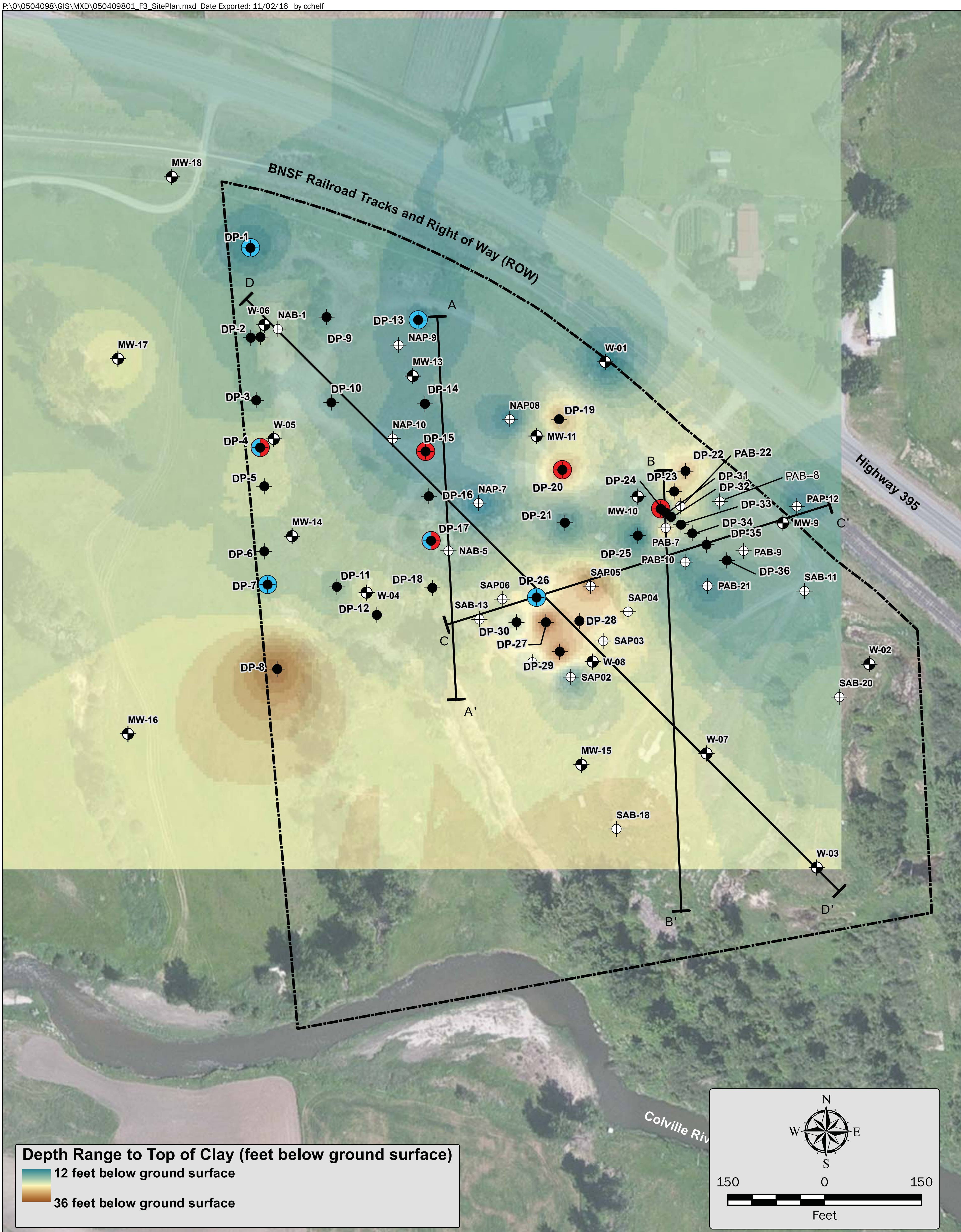

Legend

	Site Boundary	W-02	Historic Monitoring Wells (Various Consultants; 1994, 2005, 2006)		Pentachlorophenol (PCP) exceeds MTCA Method B Cleanup Level of 0.219 ug/L in Groundwater
A A'	Cross Section Transect	PAB-21	Historic Direct-push Borings (Herrera; 2003, 2005)		Diesel Range Petroleum Hydrocarbon (DRPH) exceeds MTCA Method A Cleanup Level of 0.5 mg/L in Groundwater
DP-1	Direct-Push Soil Boring Location (GeoEngineers, 2015)		Groundwater Grab Sample Location		

Notes:

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Data Source: Imagery from ESRI ArcGIS Online. Site boundary provided by EPA and Washington Department of Ecology

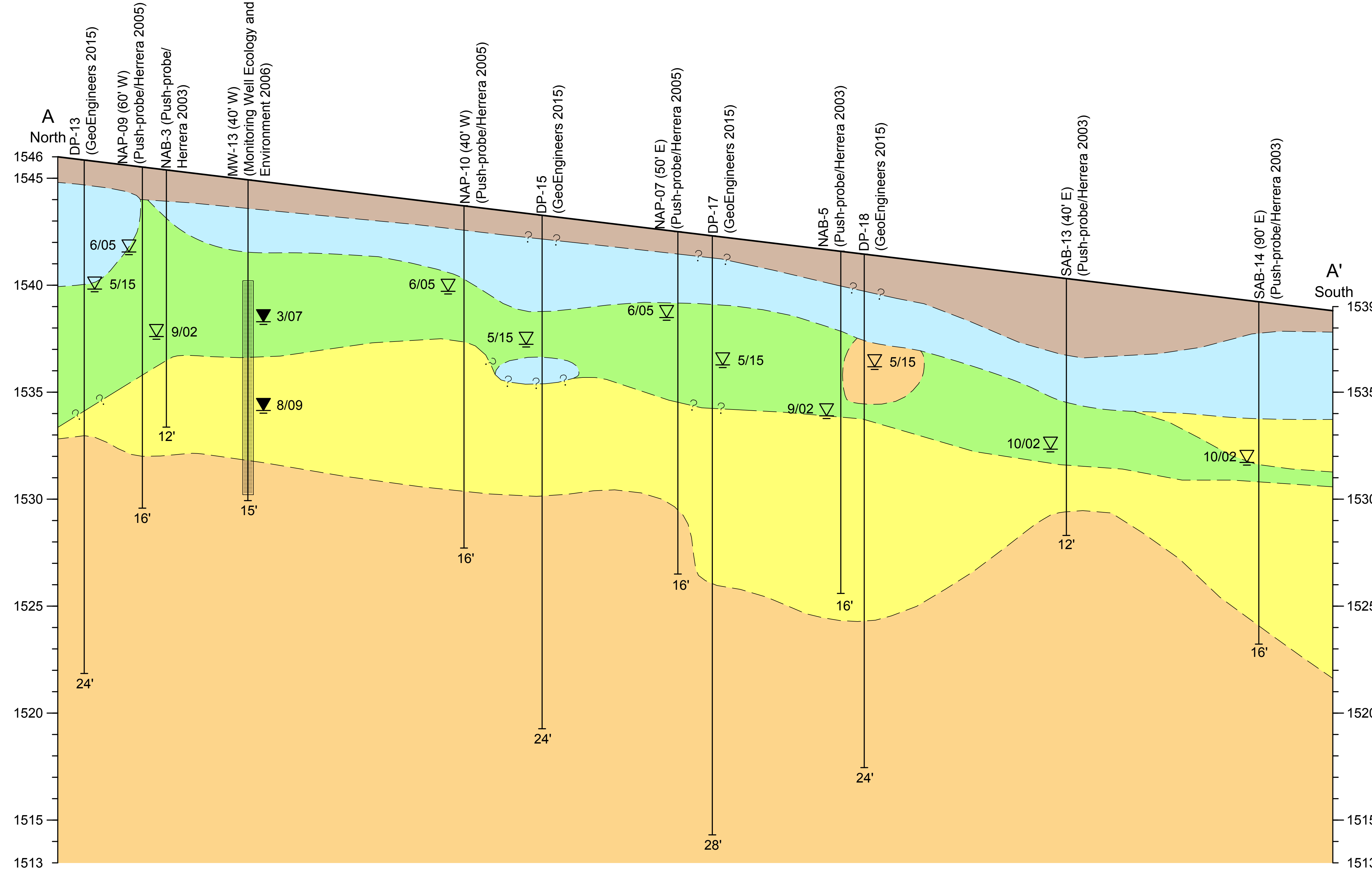
Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Site Plan

Colville Post and Poles
Colville, Washington

GEOENGINEERS

Figure 3



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3. Approximate ground surface elevations are based on aerial imagery (assumed flat or sloped).
4. GeoEngineers Inc. completed direct-push borings using a DT22 soil sampling system which recovers a 1.125 inch soil core. In our opinion, this system underestimates the gravel content of a soil unit. Based on this, gravel contacts are inferred from previous subsurface investigations.

Legend

- Fill-Clay, Silt, Sand, Gravel, Cobbles, Wood Chips
- Silt
- Sand With Variable Fines Content
- Gravel With Variable Sand and Fines Contents
- Clay
- Groundwater Level Observed During Drilling and Date Drilled
- Groundwater Levels Measured in Well and Date Measured

50 0 50
Horizontal Scale in Feet

5 0 5
Vertical Scale in Feet
Vertical Exaggeration: 10X

Cross Section A-A'

Colville Post and Poles
Colville, Washington

GeoEngineers

Figure 4

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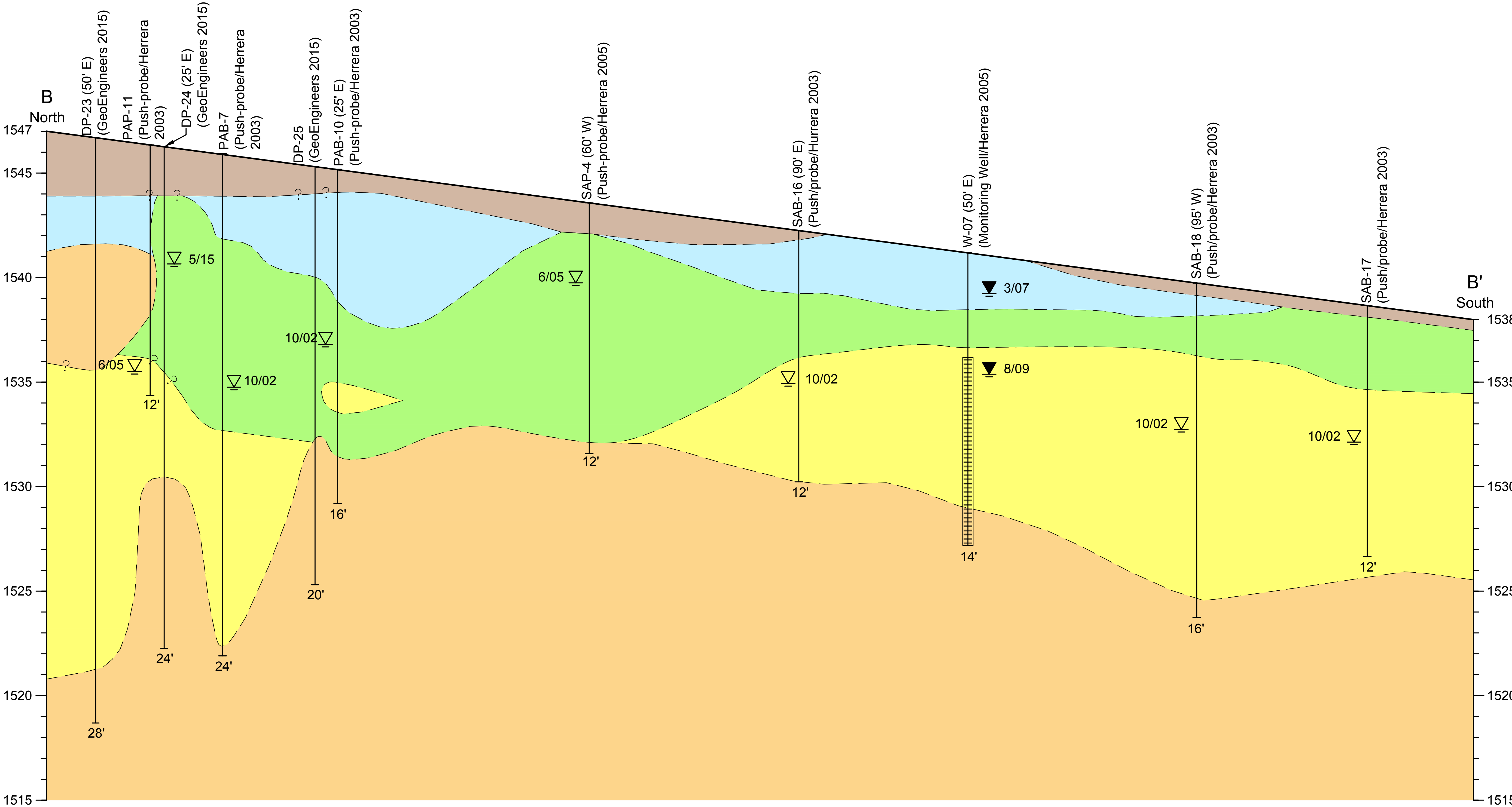

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Legend

- Fill-Clay, Silt, Sand, Gravel, Cobbles, Wood Chips
- Silt
- Sand With Variable Fines Content
- Gravel With Variable Sand and Fines Contents
- Clay
- Groundwater Level Observed During Drilling and Date Drilled
- Groundwater Levels Measured in Well and Date Measured

50 0 50
Horizontal Scale in Feet

5 0 5
Vertical Scale in Feet
Vertical Exaggeration: 10X

Cross Section B-B'

Colville Post and Poles
Colville, Washington

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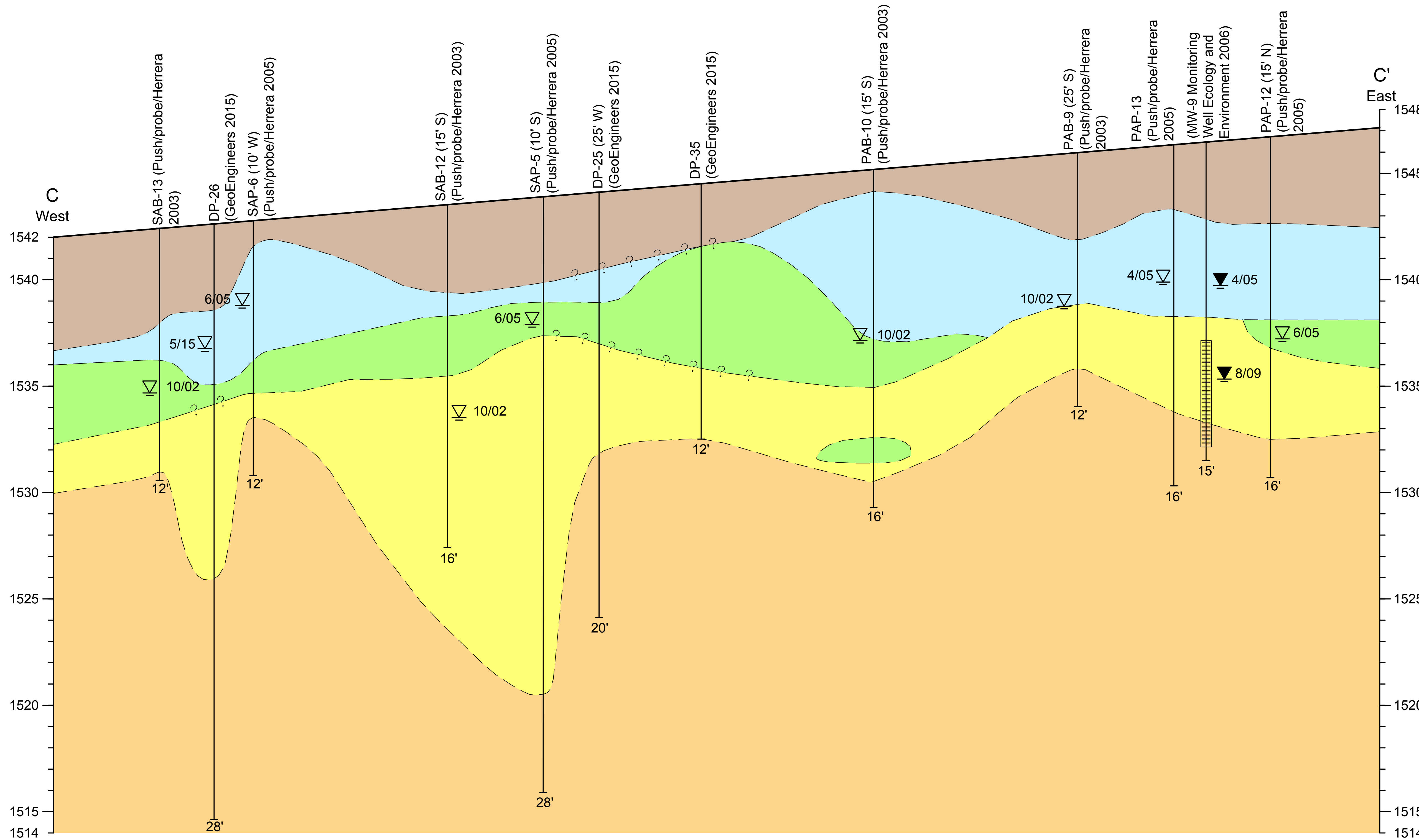
Figure 5



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Legend

- Fill-Clay, Silt, Sand, Gravel, Cobbles, Wood Chips
- Silt
- Sand With Variable Fines Content
- Gravel With Variable Sand and Fines Contents
- Clay
- Groundwater Level Observed During Drilling and Date Drilled
- Groundwater Levels Measured in Well and Date Measured

50 0 50
Horizontal Scale in Feet

5 0 5
Vertical Scale in Feet
Vertical Exaggeration: 10X

Cross Section C-C'

Colville Post and Poles
Colville, Washington

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Figure 6

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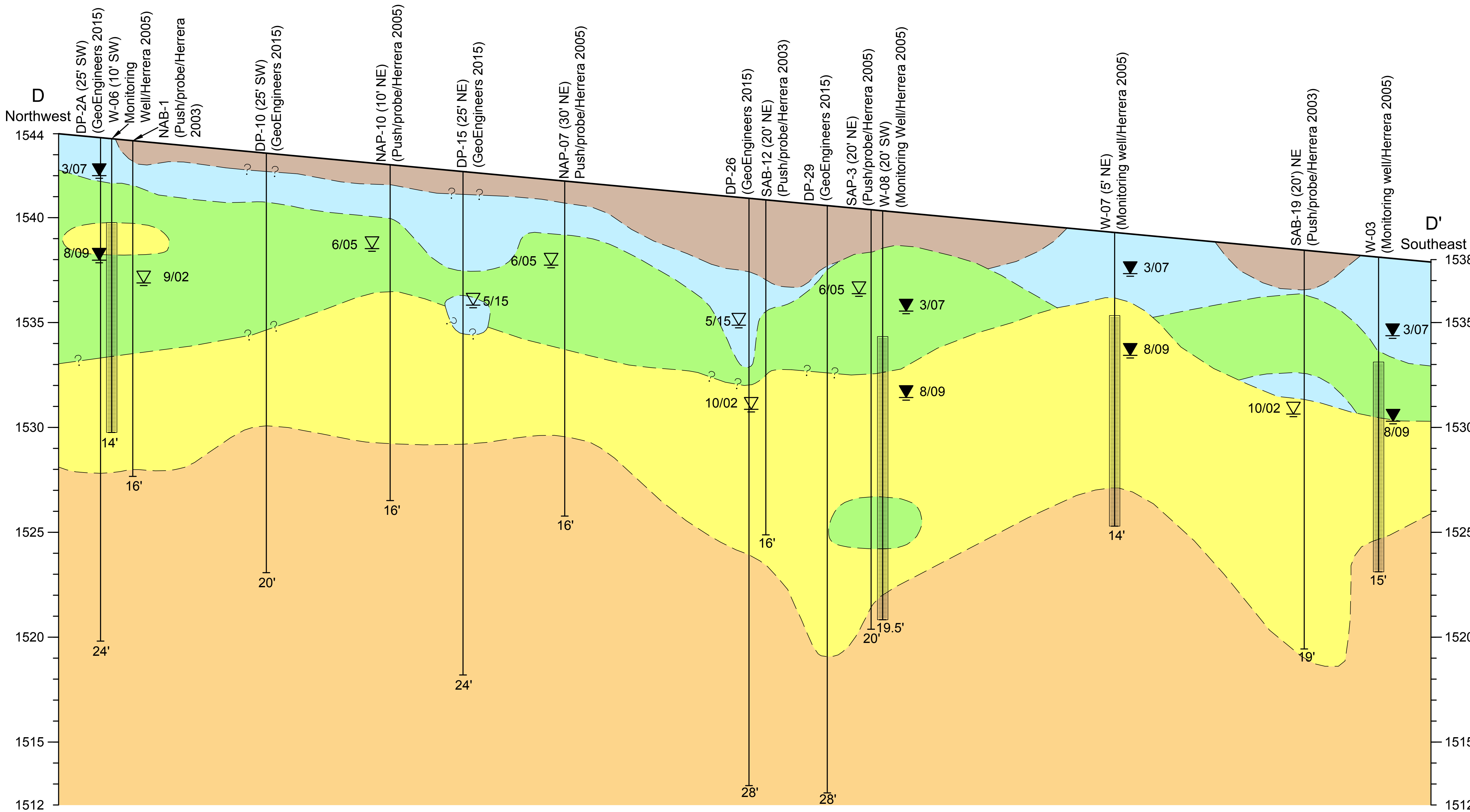

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3. Approximate ground surface elevations are based on aerial imagery (assumed flat or sloped).
4. GeoEngineers Inc. completed direct-push borings using a DT22 soil sampling system which recovers a 1.125 inch soil core. In our opinion, this system underestimates the gravel content of a soil unit. Based on this, gravel contacts are inferred from previous subsurface investigations.

Legend

- Fill-Clay, Silt, Sand, Gravel, Cobbles, Wood Chips
- Silt
- Sand With Variable Fines Content
- Gravel With Variable Sand and Fines Contents
- Clay
- Groundwater Level Observed During Drilling and Date Drilled
- Groundwater Levels Measured in Well and Date Measured

100 0 100
Horizontal Scale in Feet

5 0 5
Vertical Scale in Feet
Vertical Exaggeration: 20X

Cross Section D-D'

Colville Post and Poles
Colville, Washington

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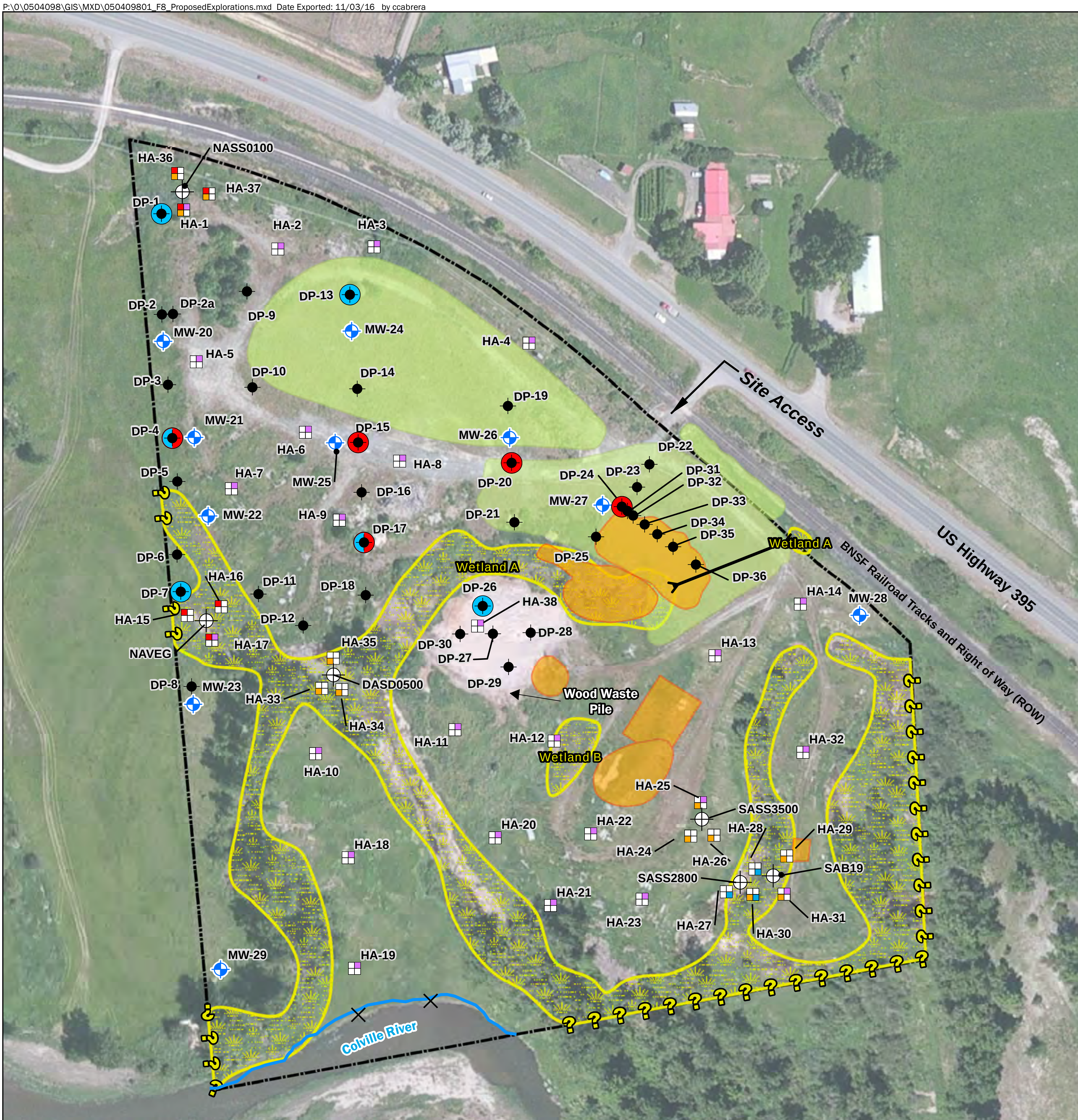
Figure 7

P:\0\0504098\GIS\MXD\050409801_F8_ProposedExplorations.mxd Date Exported: 11/03/16 by ccabrera



Legend

Wetland Boundary (GeoEngineers 2015)	DP-1	Direct-Push Soil Boring Location (GeoEngineers, 2015)		PCP Analysis	
Wetland Boundary	MW-1	Proposed Monitoring Well Location		Cadmium and Mercury Analysis	
Site Boundary	NASS0100	Historical Shallow Soil and Sediment Sample Locations with Contaminant Concentrations Greater than CULs		Groundwater Grab Sampling Location	
Capped Area (Ecology and Environment, 2009)	HA-1	Proposed Hand Auger Soil Sample Location		Pentachlorophenol (PCP) exceeds MTCA Method B Cleanup Level of 0.219 ug/L in Groundwater	
Excavated Area (Ecology and Environment, 2009)		DRPH Analysis		Diesel Range Petroleum Hydrocarbon (DRPH) exceeds MTCA Method A Cleanup Level of 0.5 mg/L in Groundwater	
Proposed Groundwater Seep Sample Location		Dioxins Analysis			

N
W E
S

150 0 150

Feet

Notes:

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Data Source: Imagery from ESRI ArcGIS Online.

Projection: NAD 1983 HARN StatePlane Washington North FIPS 4601 Feet

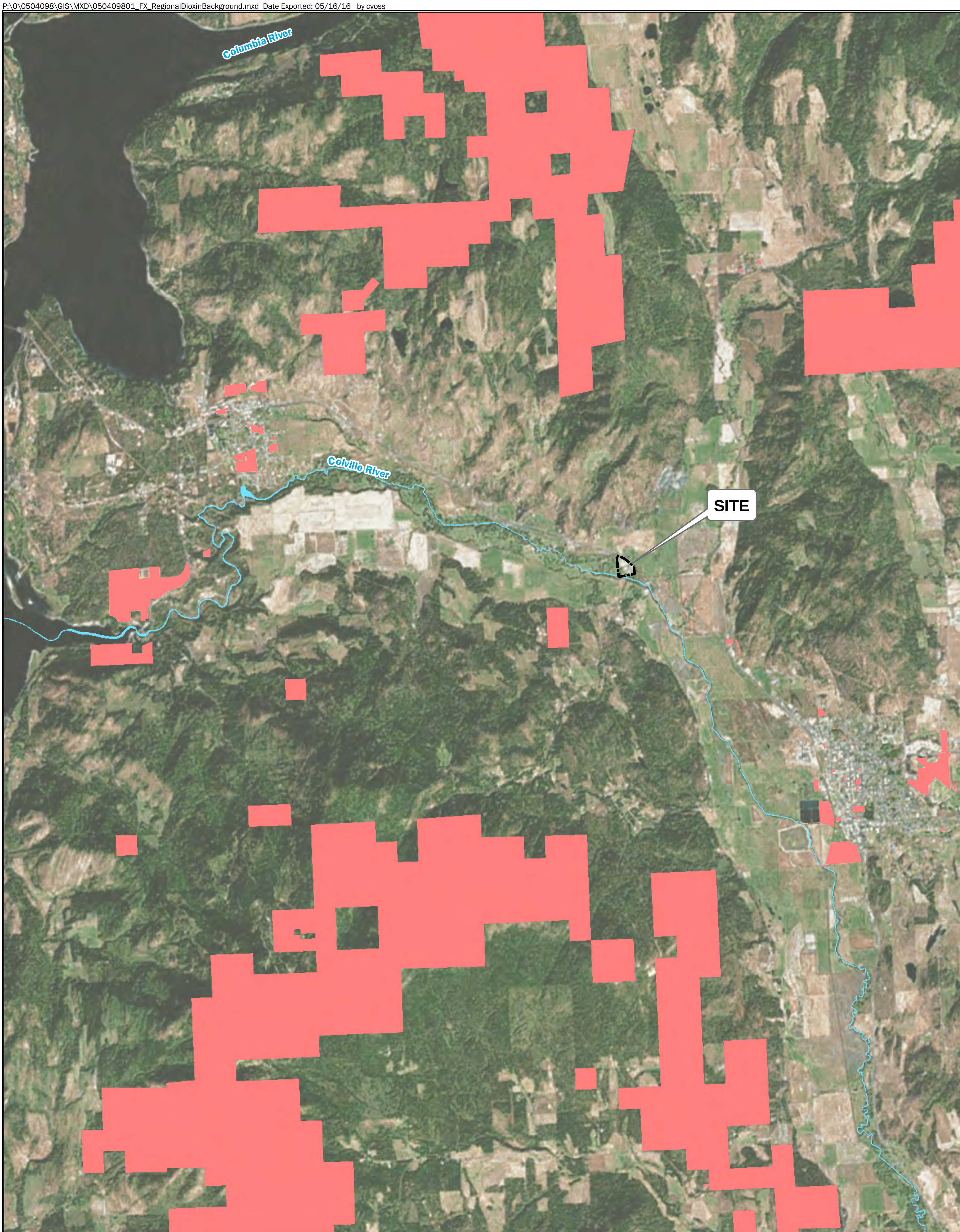
Proposed Explorations and Analyses

Colville Post and Poles
Colville, Washington

GEOENGINEERS

Figure 8

P:\0\0504098\GIS\MXD\050409801_FX_RegionalDioxinBackground.mxd Date Exported: 05/16/16 by cvoss



Legend

Site Boundary

Public Lands

N W E S

7,000 0 7,000

Feet

Public Lands for Potential Regional Dioxin Background Sampling

Colville Post and Poles
Colville, Washington

GEOENGINEERS

Figure 9

Notes:
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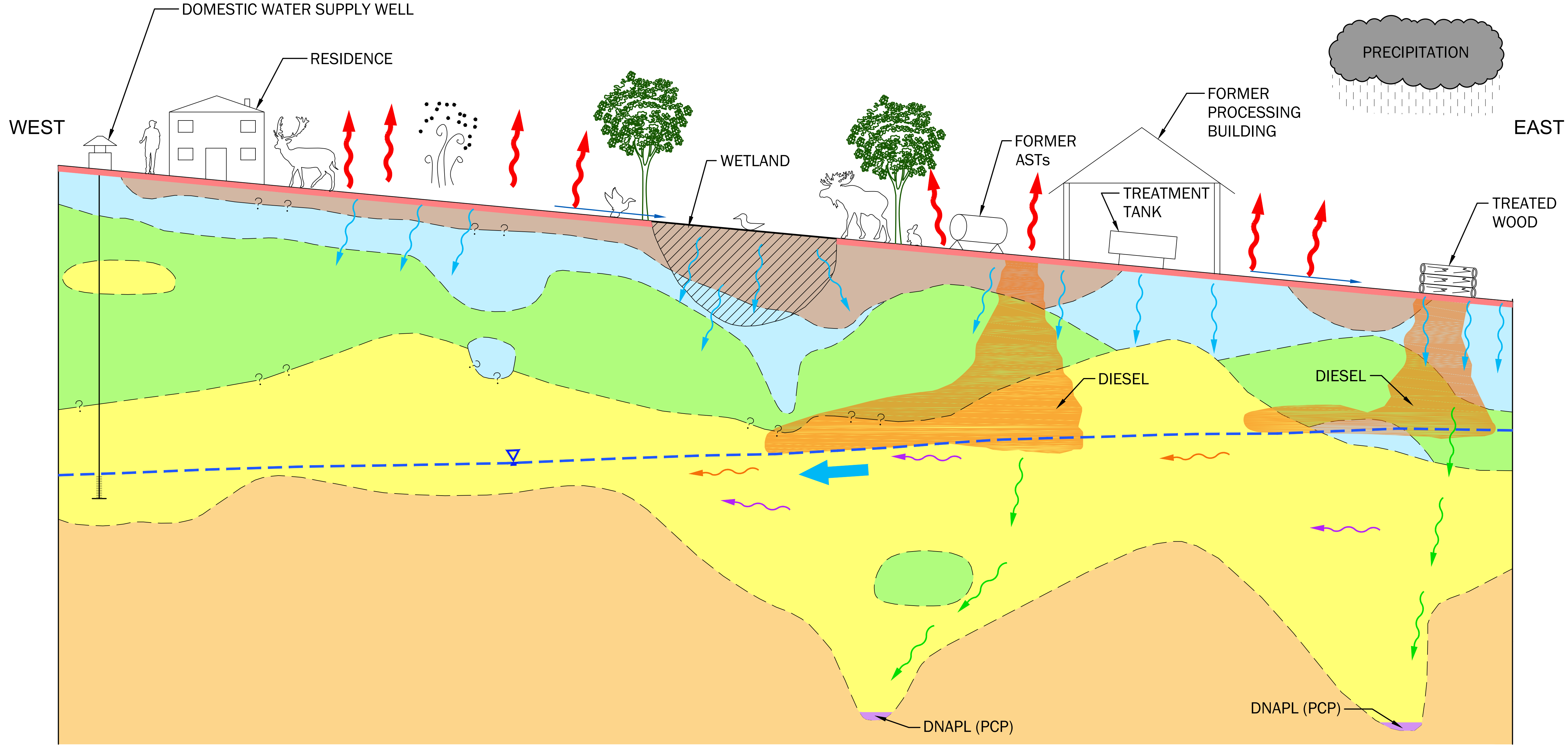
Data Source: Public Lands Data and Imagery from ESRI ArcGIS Online.

Projection: NAD 1983 HARN StatePlane Washington North FIPS 4601 Feet



Legend

- Fill-Clay, Silt, Sand, Gravel, Cobbles, Wood Chips
- Silt
- Sand With Variable Fines Content
- Gravel With Variable Sand and Fines Contents
- Clay
- Dioxins and Other Surface Contamination
- Groundwater
- Prevailing Groundwater Flow
- Direct Contact Exposure Pathway (Dioxins, PCP, and DRPH)
- Infiltration Pathway (Dioxins, PCP, and DRPH)
- Dissolved Phase PCP
- Diesel
- Dense Non Aqueous Phase Liquid
- Surface Runoff
- Dust

NOT TO SCALE

Notes:
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Conceptual Site Model

Colville Post and Poles
Colville, Washington

GEOENGINEERS

Figure 10

P:\0\0504098\01\CAD\T400_RI_FS Project Plan\0504098-01_Fig 10 (Conceptual Site Model).dwg TAB:F10 Date Exported: 11/02/16 - 12:16 by syi

APPENDICES

Appendix A
Historical Data

Map Revised: 17 May 2016 cvoss

Data Source: Aerial base from ESRI Data Online.
Site boundary provided by EPA.

Projection: NAD 1983 UTM Zone 11N

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Path: P:\0\0504098\GIS\MXD\050409800_A-1_SurfaceSoil.mxd

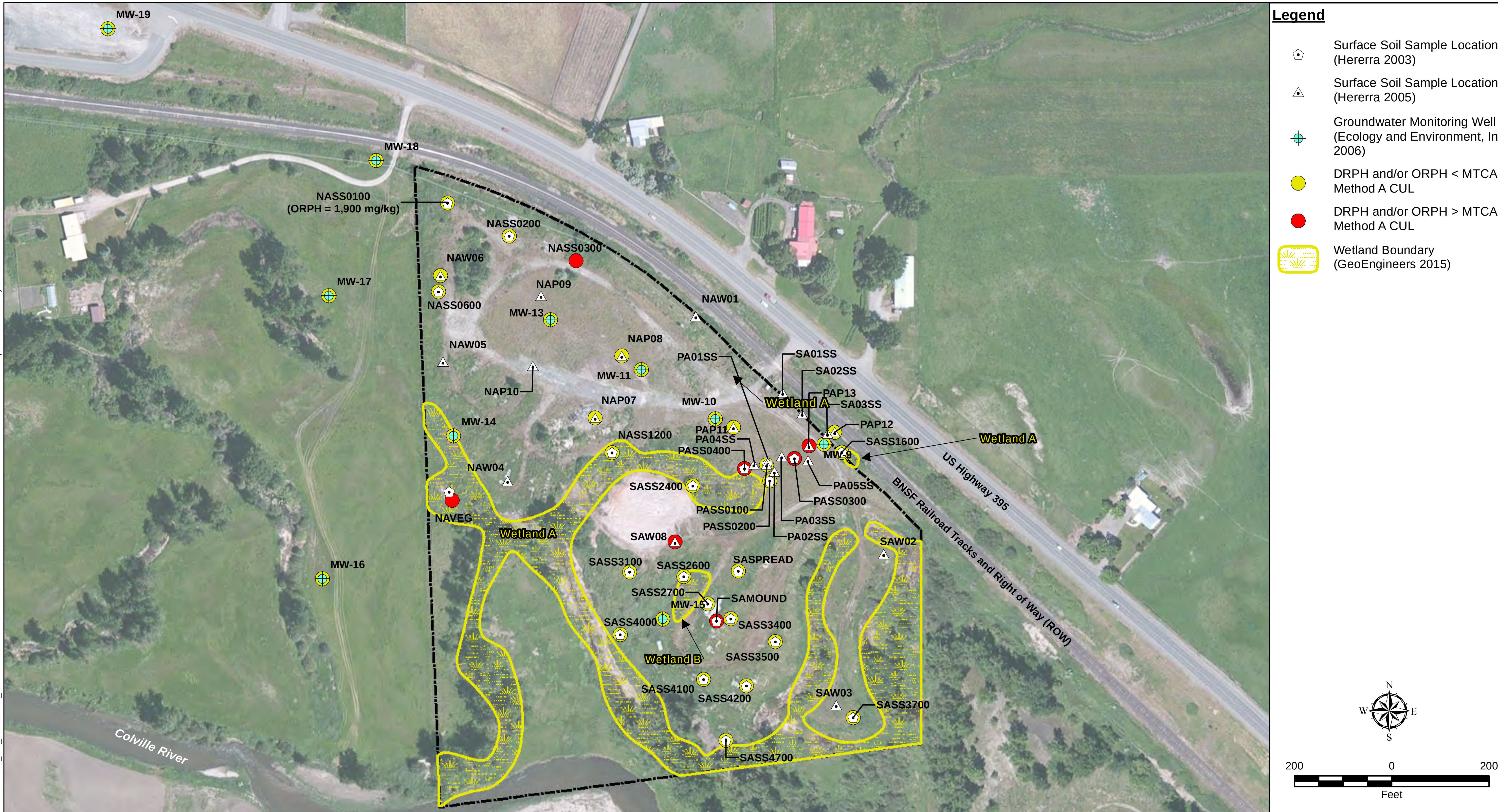
Office: PORT

Surface Soil Assessment Sample Locations

Colville Post and Poles
Colville, Washington

GEOENGINEERS

Figure A-1



Map Revised: 17 May 2016 cvoss

Path: P:\0\0504098\GIS\MXD\050409800_A-2_SurfaceSoil_DRPH.mxd

Office: PORT

Data Source: Aerial base from ESRI Data Online.
Site boundary provided by EPA.

Projection: NAD 1983 UTM Zone 11N

Notes:
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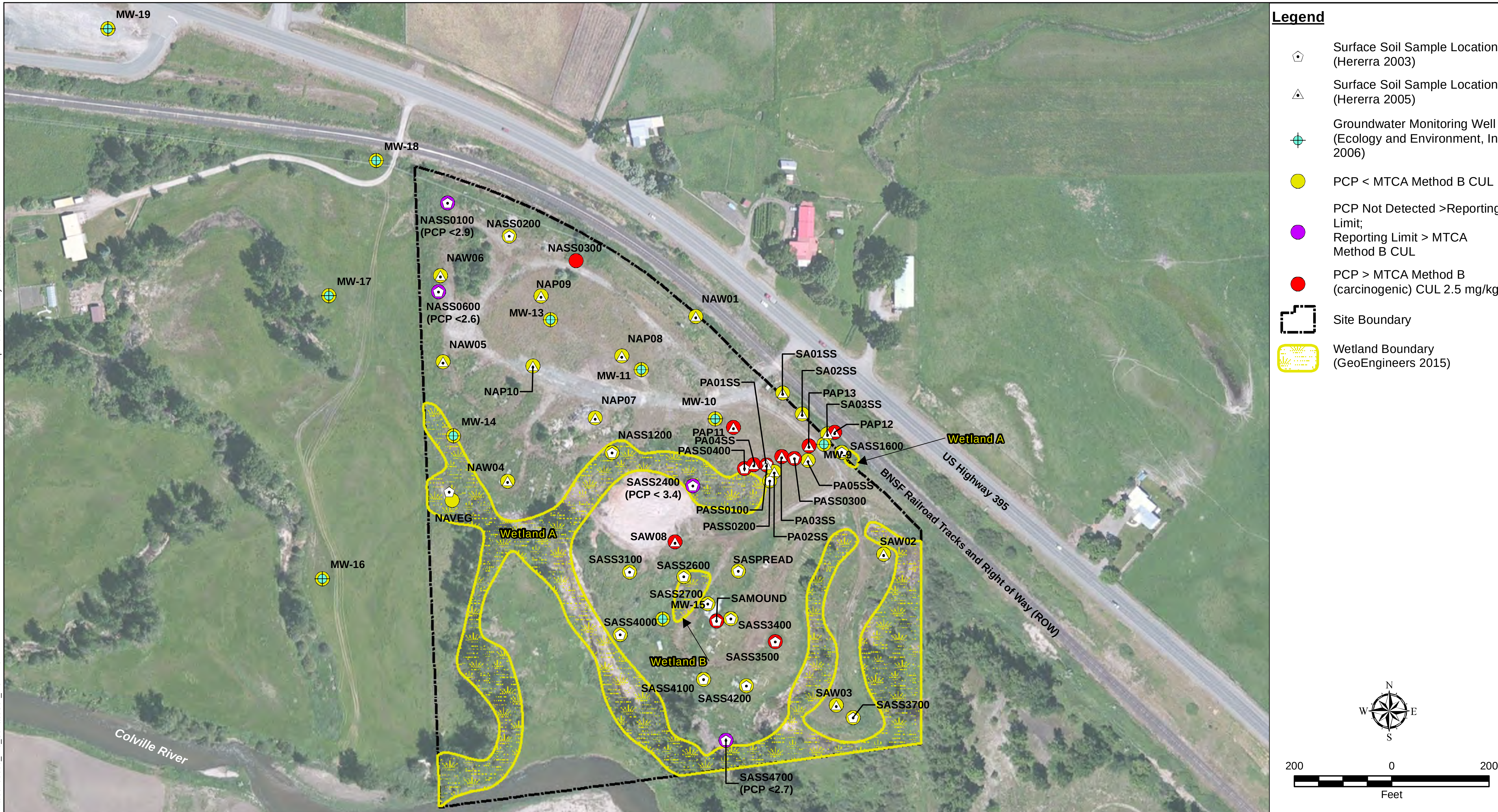
3. CUL = Cleanup Levels

Surface Soil Assessment Sample Locations
Petroleum Hydrocarbons Concentrations

Colville Post and Poles
Colville, Washington

GEOENGINEERS

Figure A-2



Map Revised: 17 May 2016 cvoss

Path: P:\0\0504098\GIS\MXD\050409800_A-3_SurfaceSoil_PCP.mxd

Office: PORT

Data Source: Aerial base from ESRI Data Online.
Site boundary provided by EPA.

Projection: NAD 1983 UTM Zone 11N

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Surface Soil Assessment Sample Locations PCP Concentrations

Colville Post and Poles
Colville, Washington

GeoEngineers

Figure A-3

Map Revised: 17 May 2016 cvoss

Path: P:\0\0504098\GIS\MXD\050409800_A-4_SurfaceSoil_Dioxins.mxd

Office: PORT

Data Source: Aerial base from ESRI Data Online.
Site boundary provided by EPA.

Projection: NAD 1983 UTM Zone 11N

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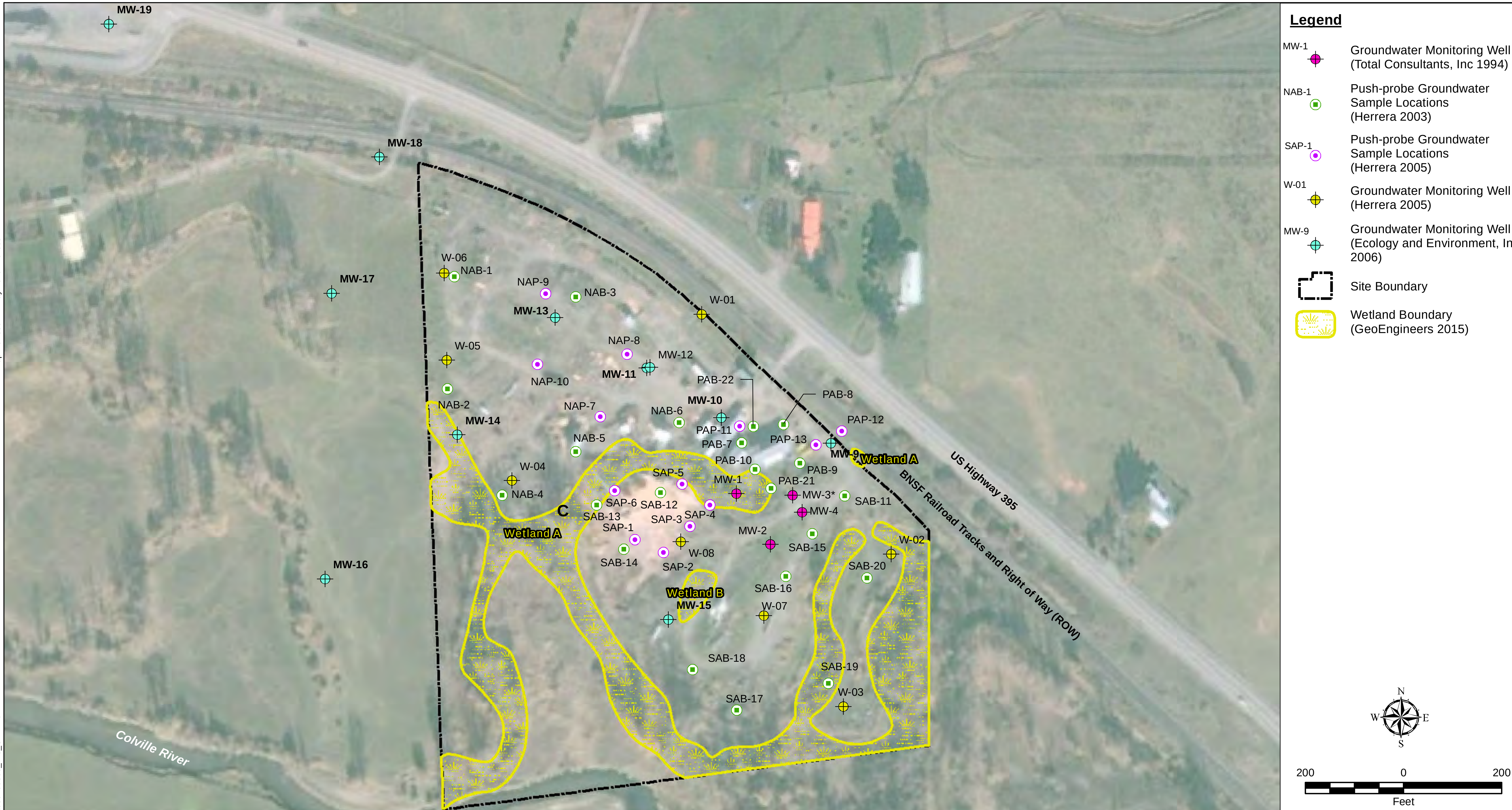
Surface Soil Assessment Sample Locations
Dioxin Concentrations

Colville Post and Poles
Colville, Washington

GeoEngineers

Figure A-4



Map Revised: 17 May 2016 cvoss

Data Source: 2004 Aerial base from Goole Earth Pro.
Site boundary provided by EPA.

Projection: NAD 1983 UTM Zone 11N

Notes:
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3. * MW-3 was removed by 1995.

Path: P:\0\0504098\GIS\MXD\050409800_A-5_GW.mxd

Office: PORT

Groundwater Sample Locations

Colville Post and Poles
Colville, Washington

GeoEngineers

Figure A-5

Legend

- MW-1 Groundwater Monitoring Well (Total Consultants, Inc 1994)
- NAB-1 Push-probe Groundwater Sample Locations (Herrera 2003)
- SAP-1 Push-probe Groundwater Sample Locations (Herrera 2005)
- W-01 Groundwater Monitoring Well (Herrera 2005)
- MW-9 Groundwater Monitoring Well (Ecology and Environment, Inc., 2006)
- Approximate Groundwater Flow Direction
- DRPH and/or ORPH Either Not Detected or Detected and Concentrations < MTCA Method A CUL
- DRPH and/or ORPH > MTCA Method A CUL
- Site Boundary
- Wetland Boundary (GeoEngineers 2015)

Data Source: 2004 Aerial base from Goole Earth Pro.
Site boundary provided by EPA.

Projection: NAD 1983 UTM Zone 11N

Notes:
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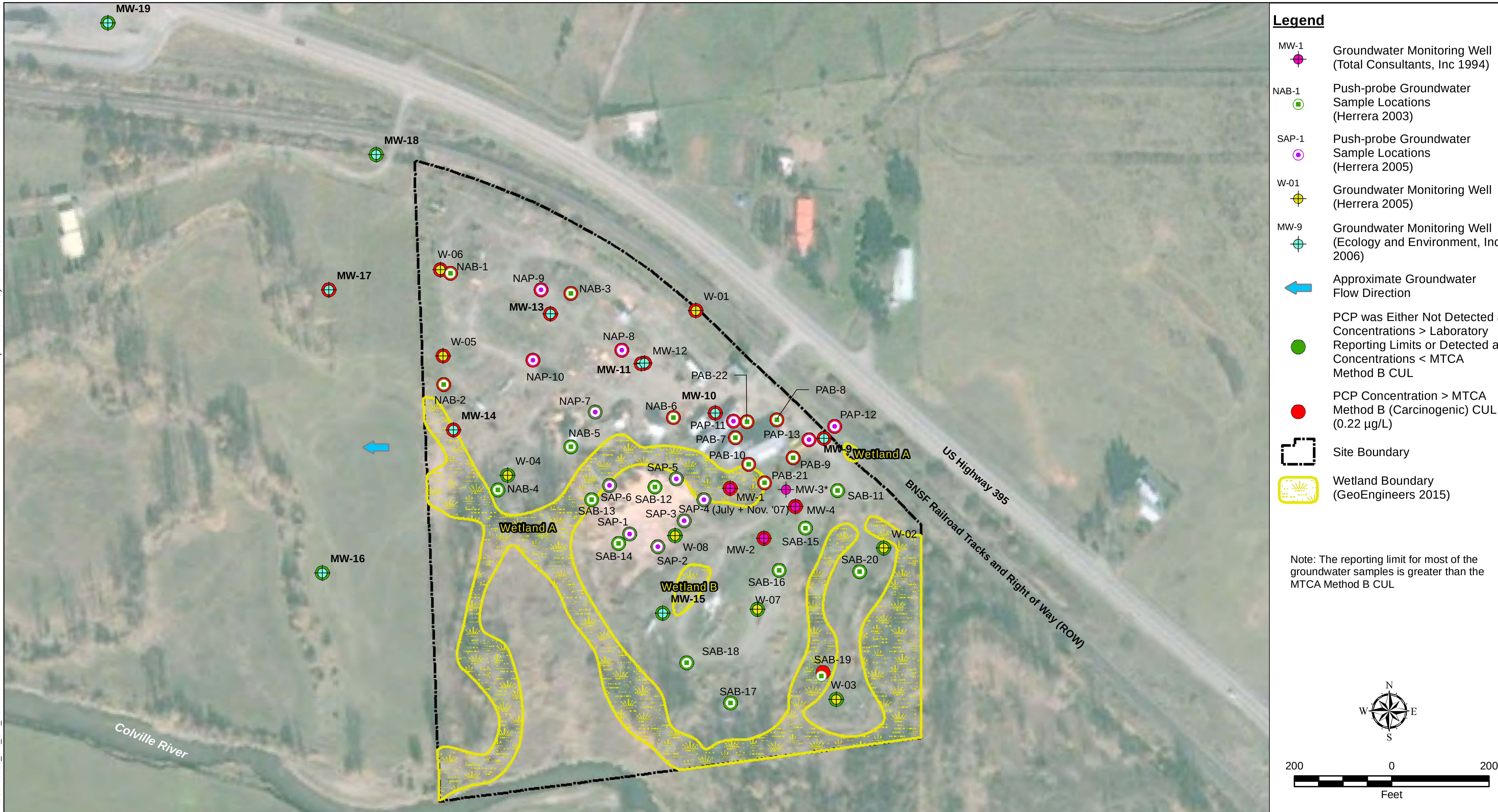
3. * MW-3 was removed by 1995.
4. CUL = Cleanup Levels

Groundwater Sample Locations
Petroleum Hydrocarbon Concentrations

Colville Post and Poles
Colville, Washington

GEOENGINEERS

Figure A-6



Map Revised: 17 May 2016 cvoss

Path: P:\0\0504098\GIS\MXD\050409800_A-7_GW_PCP.mxd

Office: PORT

Data Source: 2004 Aerial base from Goole Earth Pro.
Site boundary provided by EPA.

Projection: NAD 1983 UTM Zone 11N

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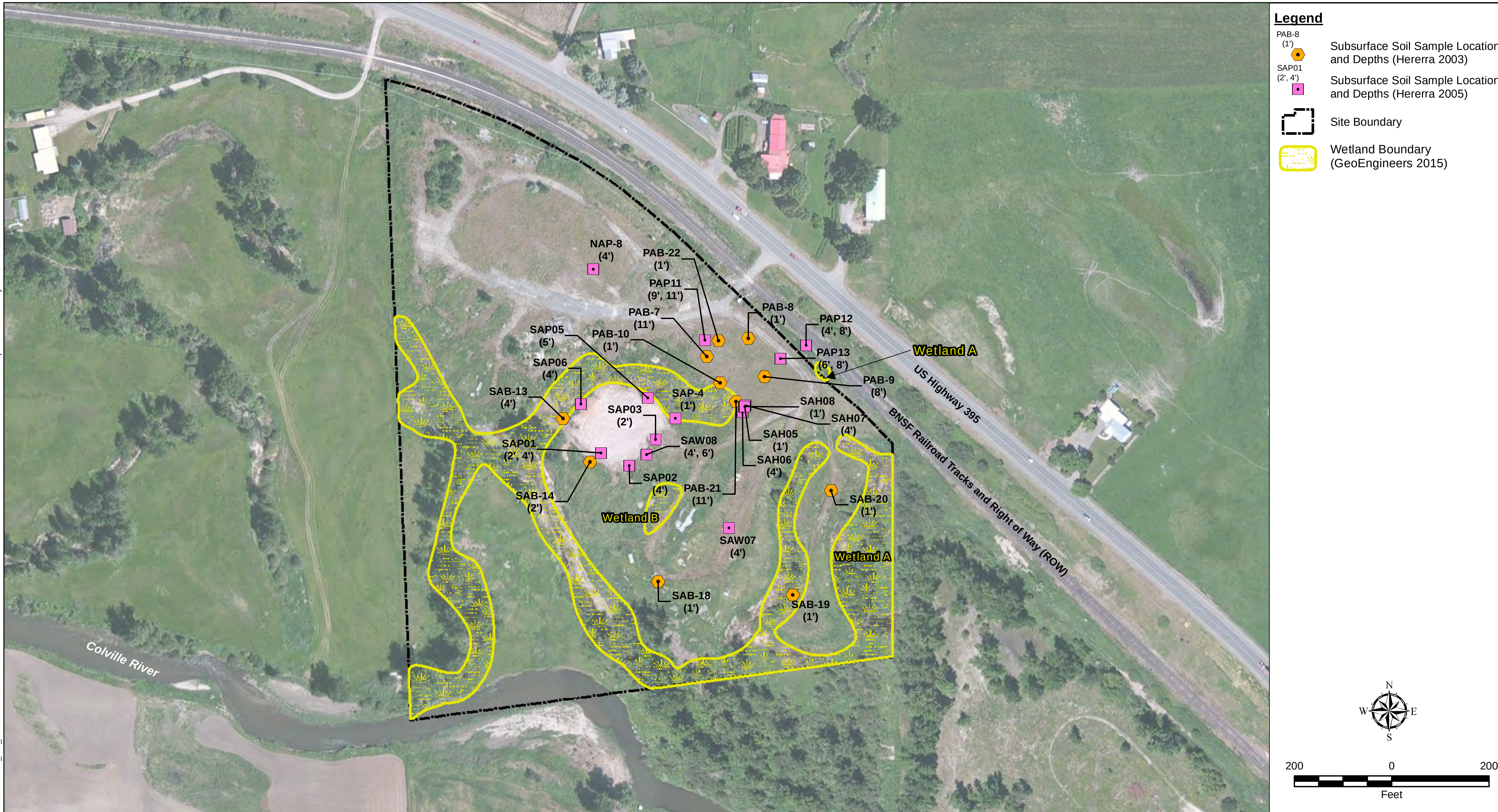
3. * MW-3 was removed by 1995.
4. CUL = Cleanup Levels

Groundwater Sample Locations
PCP Concentrations

Colville Post and Poles
Colville, Washington

GeoEngineers

Figure A-7



Map Revised: 17 May 2016 cvoss

Path: P:\0\0504098\GIS\MXD\050409800_A-8_SubSurfaceSoil.mxd

Office: PORT

Data Source: Aerial base from ESRI Data Online.
Site boundary provided by EPA.

Projection: NAD 1983 UTM Zone 11N

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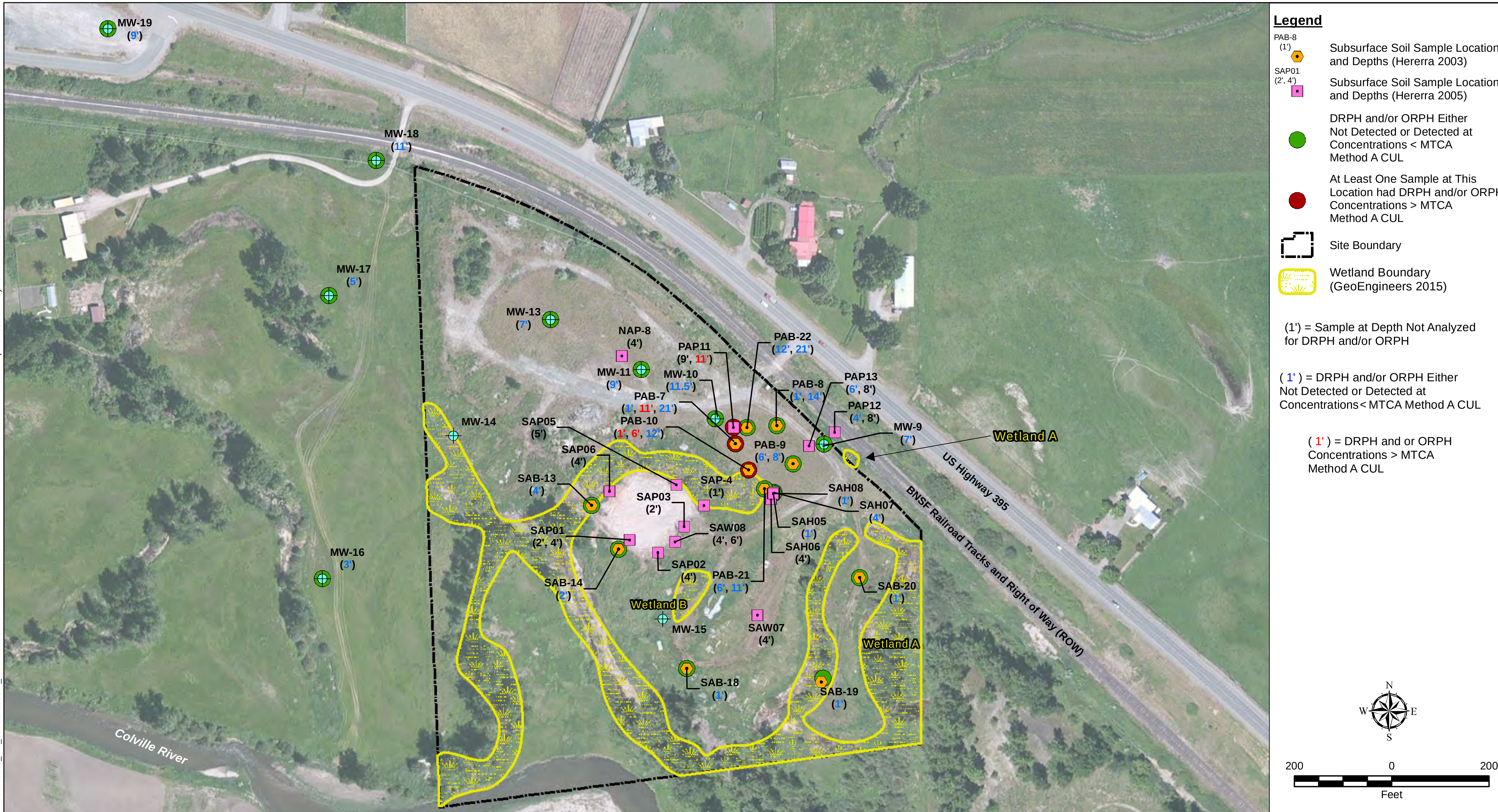
Subsurface Soil Sample Locations

Colville Post and Poles
Colville, Washington

GeoEngineers

Figure A-8



Map Revised: 17 May 2016 cvoss

Path: P:\0\0504098\GIS\MXD\050409800_A-9_SubSurfaceSoil_DRPH.mxd

Office: PORT

Data Source: Aerial base from ESRI Data Online.
Site boundary provided by EPA.

Projection: NAD 1983 UTM Zone 11N

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Subsurface Soil Sample Locations
Petroleum Hydrocarbon Concentrations

Colville Post and Poles
Colville, Washington

GEOENGINEERS

Figure A-9

Legend

PAB-8 (1') — Subsurface Soil Sample Locations and Depths (Hererra 2003)

SAP01 (2', 4') — Subsurface Soil Sample Locations and Depths (Hererra 2005)

PCP Either Not Detected or Detected at Concentrations < MTCA Method B CUL

At Least One Sample at This Location had PCP Concentrations > MTCA Method B CUL

Site Boundary

Wetland Boundary (GeoEngineers 2015)

(1') = Sample at Depth Not Analyzed for PCP

(1') = PCP Either Not Detected or Detected at Concentrations< MTCA Method B CUL

(1') = PCP Concentrations > MTCA Method B CUL

N
W E
S

200 0 200

Feet

Map Revised: 17 May 2016 cvoss

Path: P:\0\0504098\GIS\MXD\050409800_A-10_SubSurfaceSoil_PCP.mxd

Office: PORT

Data Source: Aerial base from ESRI Data Online.
Site boundary provided by EPA.

Projection: NAD 1983 UTM Zone 11N

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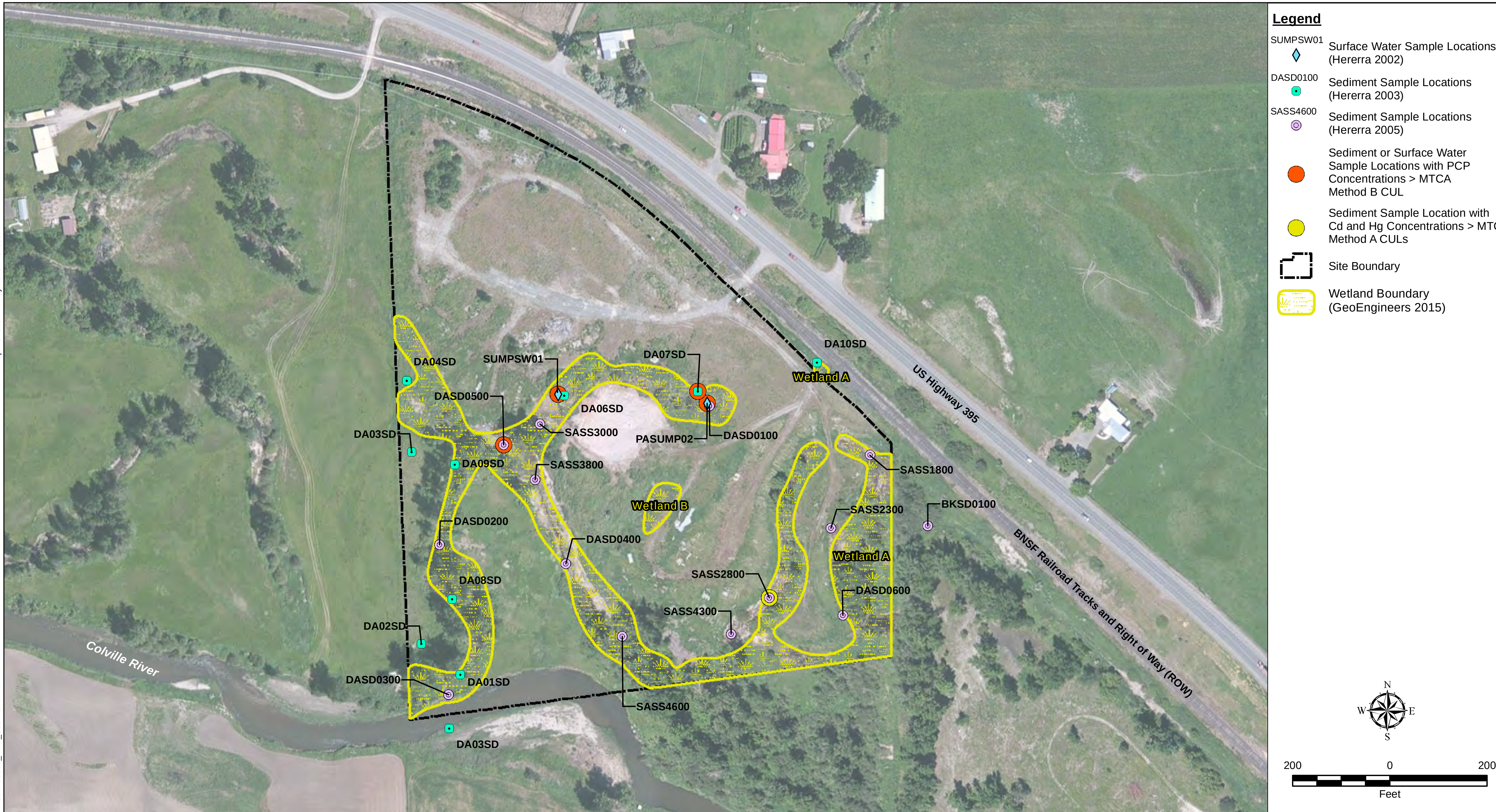
Subsurface Soil Sample Locations
PCP Concentrations

Colville Post and Poles
Colville, Washington

GEOENGINEERS

Figure A-10



Data Source: Aerial base from ESRI Data Online.
Site boundary provided by EPA.

Projection: NAD 1983 UTM Zone 11N

Notes:
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Sediment and Surface Water Sample Locations

Colville Post and Poles
Colville, Washington

GeoEngineers

Figure A-11

Office: PORT Path: P:\0\0504098\GIS\MXD\050409800_A-11_Sediment.mxd Map Revised: 17 May 2016 cvoss

Map Revised: 17 May 2016 cvoss

Path: P:\0\0504098\GIS\MXD\050409800_A-12_PhaseIRemoval.mxd

Office: PORT

Data Source: 2004 Aerial base from Goole Earth Pro.
Site boundary provided by EPA. Temporary fence and Primary Phase I removal action area and streams from Ecology and environment, inc, Figure 3-1, 9/6/2007.

Projection: NAD 1983 UTM Zone 11N

Notes:
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Phase I Removal Action Area
January 2005

Colville Post and Poles
Colville, Washington

GEOENGINEERS

Figure A-12

Map Revised: 17 May 2016 cvoss

Path: P:\0\0504098\GIS\MXD\050409800_A-13_PhaseIIRemoval.mxd

Office: PORT

Data Source: Aerial base from ESRI Data Online.
Site features from Ecology and environment, inc, Figure 3-2, 9/22/2009.

Projection: NAD 1983 UTM Zone 11N

Notes:
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Phase II Removal Action Area
Fall 2006

Colville Post and Poles
Colville, Washington

GeoEngineers

Figure A-13

APPENDIX B
Sampling Analysis Plan

APPENDIX B
SAMPLING AND ANALYSIS PLAN (SAP)

INTRODUCTION

This SAP presents sampling and analysis protocols to be implemented during the RI field investigation at the former CPPI (the Site) located at 396 Highway 395 North near Colville in Stevens County, Washington. The scope of the project includes sampling shallow soil and sediment at 38 locations, installing eight groundwater monitoring wells using hollow-stem auger drilling, collecting groundwater samples from each of the wells for laboratory analysis, evaluating laboratory data, and preparing a RI/FS report documenting the RI field investigation methods and results.

SITE CHARACTERIZATION PROCEDURES

This section contains standard procedures for field data collection that are anticipated during the RI and will include the following:

- Monitoring well installation, development and surveying;
- Shallow soil and sediment sampling;
- Groundwater elevation measurement;
- Groundwater sampling;
- Handling of IDW; and
- Sample location control.

Monitoring Well Installation

Monitoring well borings will be advanced in nine locations using sonic drilling techniques at the approximate locations shown on Figure 8. The borings will be advanced approximately 1 to 2 feet into the underlying clay unit. Continuous soil samples will be obtained during drilling using sonic drilling techniques. Soil samples will be collected at approximate 5-foot-depth intervals for potential chemical analysis. Sampling equipment will be decontaminated between each sampling attempt using the procedure described in "Decontamination Procedures" below.

Soil will be removed from the sample bag (typically representing 5- or 10-foot continuous sections) using a decontaminated soil knife or new, clean nitrile gloves, and transferred into a laboratory-prepared container, labeled with a water proof pen, and placed on "gel" ice or double bagged "wet" ice in a clean plastic-lined cooler. Each sample will be documented on a daily field log including sample name, sample collection date and time, sample type, and sample depth.

Two soil samples from each boring will be submitted for laboratory analysis; the remaining soil samples will be submitted to the laboratory and held for potential follow up analysis. Samples will be submitted based on the results of field-screening for petroleum hydrocarbons (visual observation, headspace vapor measurements using a PID, and sheen testing) by the field representative. Samples with field-screening results indicating the presence of petroleum hydrocarbons will preferentially be submitted for analysis. In the absence of field-screening results indicating the presence of petroleum hydrocarbons, the sample collected from directly above saturated conditions and the sample collected from directly above the clay layer will be submitted for analysis. Ecology will be consulted before analyzing more than two samples from any boring. The sample coolers will be delivered to the analytical laboratory under standard chain-of-custody procedures. Samples will be submitted for analysis on a standard turn-around time.

Each boring will be continuously monitored by a GeoEngineers field representative to observe and classify the soil encountered and prepare a detailed log of each boring. Soil encountered in the borings will be classified in the field in general accordance with ASTM D 2488, the Standard Practice for Classification of Soils, Visual-Manual Procedure. Soil samples also will be field-screened using the procedures described in "Soil Field Screening Methods" below.

Monitoring Well Construction

Groundwater monitoring wells will be constructed in accordance with WAC 173-160, Section 400, resource protection well construction standards. Groundwater monitoring well installation records will be submitted in accordance with these standards. GeoEngineers' field representative will observe and document the monitoring well installation, including maintaining a detailed log of the well construction materials, depths of materials, and depths of each well. Well construction details will be recorded on a monitoring well construction log.

Each monitoring well will be constructed using 2-inch-diameter, schedule 40 polyvinyl chloride (PVC) well casing and 5 feet of 0.01-slot screen positioned at the bottom of the well. The annular space around the screened interval will be backfilled with Colorado silica sand and the sand will extend at least 2 feet above the screened interval. The annular space in each well will be sealed between the top of the filter pack and the ground surface seal with bentonite to prevent infiltration into the well bore from shallower zones and/or surface water. The top of each well will be sealed with concrete from ground surface to a minimum of 1 foot bgs. A compression-type cap will be installed in the top of the PVC well casing. Monitoring well casings will extend approximately 3 feet above ground surface and will be encased in a lockable monument. The concrete surface seal will be placed around the monument at the ground surface to divert surface water away from the well location. A minimum of three steel bollards will be installed around the monuments to protect each well.

Monitoring Well Development and Survey

Each monitoring well will be developed to remove water introduced into the well during drilling (if any), stabilize the filter pack and formation materials surrounding the well screen, and restore the hydraulic connection between the well screen and the surrounding soil. The depth to water in the monitoring well will be measured prior to development. The total depth of the well also will be measured and recorded. The monitoring wells will be developed by pumping, surging, bailing or a combination of these methods after construction. Development of each well will continue until the water is as free of sediment as practicable with respect to the composition of the subsurface materials within the screened interval. The removal rate and amount of groundwater removed will be recorded during well development procedures.

Water generated during development will be drummed, labeled, and stored in a safe location on Site until chemical analytical results are obtained. After development, wells will be allowed to equilibrate a minimum of 72 hours prior to sampling.

The horizontal locations and elevations of the monitoring wells will be surveyed by a licensed surveyor subcontracted to GeoEngineers. A survey reference mark will be established on the north side of each monitoring well casing as a reference for measuring groundwater elevations. The elevation of the surface seal and ground surface on the north side of the monument also will be surveyed.

Shallow Soil Sampling

Shallow soil samples (ground surface to about 1½ feet bgs) will be collected using hand tools (stainless steel augers and/or shovels) at the approximate locations shown on Figure 8. Surface vegetation will be removed from the proposed sample locations and soil samples will be collected from the ground surface. Samples will be collected at approximately 0 to 6 inches, 6 to 12 inches, and 12 to 18 inches bgs. Each sample will be field-screened as described in "Soil Field Screening Methods" below.

Soil selected for each sample will be removed from the sampling instrument using new, clean nitrile gloves, and transferred into a laboratory-prepared container, labeled with a waterproof pen, and placed on gel ice or double bagged wet ice in a clean plastic-lined cooler. Each sample will be documented on a daily field log including sample name, sample collection date and time, sample type and sample depth.

A GeoEngineers field representative will prepare a detailed log of each sample location and classify the soil encountered. Soil encountered at the sample locations will be classified in the field in general accordance with ASTM D 2488, the Standard Practice for Classification of Soils, Visual-Manual Procedure. Soil samples also will be field-screened using the procedures described in "Soil Field Screening Methods" below.

At least one soil sample from each sample location will be submitted for the chemical analyses indicated on Figure 8 and in the QAPP; remaining soil samples will be submitted to the laboratory and held for potential analysis. The sample coolers will be delivered to the analytical laboratory under standard chain-of-custody procedures. Samples will be submitted on a standard turn-around time.

The chemical analyses specified for each proposed sample location are based on the historic sample results:

- Approximately 50 soil samples from 25 sampling locations will be analyzed for dioxins/furans using EPA Method 8290A. If samples collected from between 0 and 6 inches contain dioxin/furan concentrations greater than state background levels, the samples collected from between 6 and 12 inches in those locations also will be submitted for dioxin/furan analysis. The remaining samples, from 12 to 18 inches, will be held for potential chemical analysis.
- Approximately 15 soil samples will be analyzed for PCP using EPA Method 8270 SIM.
- About nine soil samples will be analyzed for diesel- and oil-range petroleum hydrocarbons using Northwest Method NWTPH-Dx.
- About three soil samples will be analyzed for cadmium and mercury using EPA 6000/7000 Series Methods.
- Collect and analyze QA/QC soil samples at the locations and frequency specified in the QAPP (Appendix C).

Soil Field-Screening Methods

Field screening tasks will be performed during Site exploration activities to evaluate the presence of COC in soil. Initial screening will be based on visual examination; water sheen screening and headspace vapor screening using a PID will also be conducted. Visual screening consists of inspecting the soil for discoloration indicative of the presence of contaminants in the sample. Water sheen screening involves placing approximately 1 tablespoon of soil in water and observing the water surface for signs of oil sheen. Sheen classifications are as follows:

No Sheen	No visible sheen on the water surface;
Slight Sheen	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly. Natural organic matter in the soil might produce a slight sheen;
Moderate Sheen	Light to heavy sheen; might have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on water surface; and
Heavy Sheen	Heavy sheen with color/iridescence; spread is rapid; entire water surface might be covered with sheen.

Headspace vapor screening involves placing about 2 tablespoons of soil sample in a plastic bag. Air is captured in the bag and sealed. The bag is then shaken to expose the soil to the air trapped inside the bag. The probe of a PID is inserted into the bag, and used to measure VOC vapor concentrations in parts per million (ppm). Prior to use each day, the PID will be calibrated to 100 ppm isobutylene. The PID is designed to quantify VOC vapor concentrations in the range between 1 ppm and 2,000 ppm with an accuracy of 10 percent of the reading, and between 2,000 ppm and 10,000 ppm with an accuracy of 20 percent of the reading

Soil samples will be field-screened using the methods described above during exploration activities. Samples with field-screening results indicating contamination might be present will be submitted for laboratory testing. Soil samples submitted for analyses also will be selected based on the boring location and sample depth in order to provide multiple data points to better understand Site conditions.

Field-screening results are site specific. The results vary with temperature, soil type, type of contaminant, and soil moisture content. Water sheen testing equipment will be disposable or decontaminated before field-screening each sample using a Liquinox® soap solution with a water rinse. Decontamination water will be stored on-site in a labeled Department of Transportation (DOT)-approved drum pending disposal with IDW.

Measurement of VOC and Groundwater Elevations

VOCs will be measured in the well headspace by inserting the PID probe into the well casing immediately after removal of the well cap. PID measurements will be recorded on the daily field log. Depths to groundwater relative to the monitoring well casing rims will be measured using an electronic water level indicator and recorded in a daily field log. Depths to water will be measured to the nearest 0.01 foot. The electronic water level indicator will be decontaminated with Liquinox® solution wash and a distilled water rinse prior to use in each well. Groundwater elevations will be calculated by subtracting the water table depth from the surveyed casing rim elevations at the time of measurement and recorded on the daily field log. Measurement of free product, if present, will be completed using an interface probe capable of detecting light nonaqueous phase liquid, dense nonaqueous phase liquid and water.

Groundwater Sampling

Groundwater samples will be collected no sooner than 72 hours after development of new wells. Each groundwater sample will be collected using low-flow purging methods, unless use of low-flow procedures is not possible. Groundwater sampling will occur at all wells for four consecutive quarters, and additional sampling may occur based on the results from the initial sampling events. During well purging, water quality parameters (temperature, pH, conductivity, dissolved oxygen, oxidation-reduction potential [ORP], and turbidity) will be monitored and recorded. The groundwater samples will be transferred in the field to laboratory-prepared sample containers and kept cool with either gel ice or wet ice during storage and transport to the testing laboratory. The sample containers will be filled according to analytical/sampling method requirements. COC procedures will be observed from the time of sample collection to delivery to the testing laboratory.

Groundwater samples will be analyzed for DRPH and PCP using the methods listed in the QAPP. Groundwater samples will be collected quarterly for four consecutive quarters to assess potential changes to the magnitude and extent of groundwater contamination that vary with seasonal changes in groundwater elevation. Groundwater samples will be submitted for chemical analysis on a standard turn-around time. Dioxins also will be analyzed during the first quarterly groundwater monitoring event. Assuming dioxins are not detected at concentrations greater than the state background levels, they will not be included in the analytical suite during subsequent events. If dioxins are detected during the first quarterly sampling event, we will consult with Ecology on how they wish to proceed during future sampling events.

Seep groundwater samples will be collected from the bank of the Colville River in the southwest portion of the site. Samples will be collected directly from the seeps into the sample containers, with efforts to minimize the amount of sediment introduced into the sample containers. Water quality parameters will be measured by collecting groundwater seep samples into unpreserved sample containers.

Decontamination Procedures

The objective of the decontamination procedure is to minimize the potential for cross-contamination between sample locations. A designated area will be established for decontamination of drilling equipment and reusable sampling equipment. Drilling equipment will be cleaned using high-pressure/low-volume cleaning equipment.

Sampling equipment for monitoring well installation will be decontaminated in accordance with the following procedures before each sampling attempt or measurement.

1. Brush equipment with a nylon brush to remove large particulate matter.
2. Rinse with potable tap water.
3. Wash with non-phosphate detergent solution (Liquinox® and potable tap water).
4. Rinse with potable tap water.
5. Rinse with distilled water.

Steps 3 through 5 will be repeated a second time to decontaminate the sampling equipment (hand augers, shovels, etc.) used to obtained the shallow soil and sediment samples because of the low detection levels for dioxins/furans. Wash water will be replaced regularly to avoid cross-contamination.

Handling of Investigation-Derived Waste

IDW, which consists of mainly drill cuttings and decontamination/purge water, will be placed in Washington State DOT-approved 55-gallon drums (soil and/or water) or roll-off boxes (soil) and/or poly tanks (water). Each container will be labeled with the project name, general contents, date and source location (boring number) of contents. The drummed IDW will be stored on-site pending analysis and disposal.

Disposable items, such as sample tubing, disposable bailers, bailer line, gloves and protective overalls, paper towels, etc., will be placed in plastic bags after use and deposited in trash receptacles for disposal.

Sample Location Control

Vertical and horizontal sample control will be maintained throughout the project. Benchmarks will be established for vertical and horizontal survey control by a Washington-licensed professional land surveyor. Horizontal and vertical control for monitoring wells will be tied to datums that are acceptable to Ecology's EIM System. The elevations of monitoring wells will be surveyed by the licensed surveyor. Ground elevations of the surface sample explorations will be estimated from their horizontal locations and topographic survey.

Sampling and Analytical Methods

Field sampling methods, including quality control (QC) and maintenance of field instrumentation, for soil and groundwater sampling will adhere to the requirements of the QAPP (Appendix C).

Analytical methods requirements also will adhere to the QAPP. During laboratory procurement, analytical method reporting limits for each proposed analysis will be compared to the reporting limits listed in the QAPP to ensure that data generated will be sufficient for assessment purposes.

Sample Handling and Custody Requirements

Samples will be handled in accordance with the QAPP. A complete discussion of the sample identification and custody procedures is provided in the QAPP.

Field Measurements and Observations Documentation

Field measurements and observations will be recorded in project logs. Daily logs will be dated, and pages will be consecutively numbered. Entries will be recorded directly and legibly in the daily log and signed and dated by the person conducting the work. If changes are made, the changes will not obscure the previous entry, and the changes will be signed and dated. At a minimum, the following data will be recorded in the log book:

- Purpose of activity;
- Location of activity;
- Description of sampling reference point(s);
- Sample number identification;

- Sample number and volume;
- Sample transporting procedures;
- Field measurements made;
- Calibration records for field instruments;
- Visitors to site;
- Relevant comments regarding field activities; and
- Signatures of responsible personnel.

Sufficient information will be recorded in the log book so that field activities can be reconstructed without reliance on personnel memory.

Data Management and Documentation

Data logs and data report packages will be located in the project file system in GeoEngineers' Spokane, Washington office. Data reports will be available in both hard copy and electronic formats. Laboratory data reports will include internal laboratory QC checks and sample results. Data logs and packages that are anticipated to be generated during the investigation including laboratory data report packages, boring logs, field sampling data sheets and COC forms.

Analytical data will be supplied to GeoEngineers in both Electronic Data Deliverable (EDD) format and hard copy format. The hard copy will serve as the official record of laboratory results. The EDD will be compatible with Earthsoft EQUIS environmental data management software, and will include the following minimum data requirements in unique cells within the EDD:

- Sample identification;
- The reported concentration;
- The method reporting limit;
- Any flags assigned by the laboratory;
- The sampling date and time; and
- The Chemical Abstracts Service (CAS) registry number.

Upon receipt of the analytical data, the EDD will be uploaded to an EQUIS database and reduced into summary tables for each group of analytes and media. Upon completion of the summary tables, the accuracy of the data reduction will be verified using the hard copy of the data received from the laboratory. Any exceptions will be noted and corrections will be made. The EDD data will be submitted to Ecology's EIM system.

DATA VALIDATION AND USABILITY

Upon receipt of the sample data from the laboratory, the data will be validated and evaluated for usability in accordance with the QAPP.

APPENDIX C
Quality Assurance Project Plan

APPENDIX C
QUALITY ASSURANCE PROJECT PLAN

This QAPP was developed for RI/FS investigation activities at the Colville Post and Poles Site (herein designated Site) located at 396 Highway 395 North near Colville in Stevens County, Washington.

Sampling procedures are outlined in the SAP. The QAPP serves as the primary guide for the integration of quality assurance (QA) and quality control (QC) functions into assessment activities. The QAPP presents the objectives, procedures, organization, functional activities, and specific QA and QC activities designed to achieve data quality goals established for the project. This QAPP is based on guidelines specified in Chapter 173-340-820 of the WAC and the EPA Requirements for Quality Assurance Project Plans (EPA 2004b).

Throughout the project, environmental measurements will be conducted to produce data that are scientifically valid, of known and acceptable quality, and meet established objectives. QA/QC procedures will be implemented so that precision, accuracy, representativeness, completeness and comparability of data generated meet the specified data quality objectives.

PROJECT ORGANIZATION AND RESPONSIBILITY

Descriptions of the responsibilities, lines of authority and communication for the key positions in the QA/QC are provided below. This organization facilitates the efficient production of project work, allows for an independent quality review, and permits resolution of QA issues before submittal.

Project Leadership and Management

The Project Manager's (PM) duties consist of providing concise technical work statements for project tasks, selecting project team members, determining subcontractor participation, establishing budgets and schedules, adhering to budgets and schedules, providing technical oversight and providing overall production and review of project deliverables. Scott Lathen, Licensed Professional Engineer (PE) is the PM for activities at the Site. The Principal-in-Charge, Bruce Williams, is responsible to Ecology for fulfilling contractual and administrative control of the project.

Field Coordinator

The Field Coordinator is responsible for the daily management of activities in the field. Specific responsibilities include the following:

1. Provide technical direction to the field staff.
2. Develop schedules and allocate resources for field tasks.
3. Coordinate data collection activities to be consistent with information requirements.
4. Supervise the compilation of field data and laboratory analytical results.
5. Assure that data are correctly and completely reported.
6. Implement and oversee field sampling in accordance with project plans.

7. Supervise field personnel.
8. Coordinate work with on-site subcontractors.
9. Schedule sample shipment with the analytical laboratory.
10. Confirm that appropriate sampling, testing and measurement procedures are followed.
11. Coordinate the transfer of field data, sample tracking forms, and log books to the PM for data reduction and validation.
12. Participate in QA corrective actions as required.

The Field Coordinator for exploration activities at the Site is the assigned field engineer or geologist for each given field task.

QA Leader

The GeoEngineers project QA Leader is under the direction of Scott Lathen and Bruce Williams, who are responsible for the project's overall QA. The Project QA Leader is responsible for coordinating QA/QC activities as they relate to the acquisition of field data. Denell Warren is the QA Leader. The QA Leader has the following responsibilities:

1. Serve as the official contact for laboratory data QA concerns.
2. Respond to laboratory data and QA needs, resolve issues, and answer requests for guidance and assistance if needed.
3. Review the implementation of the QAPP and the adequacy of the data generated from a quality perspective.
4. Maintain the authority to implement corrective actions as necessary.
5. Evaluate the laboratory's final QA report for any condition that adversely impacts data generation if data qualifiers are reported.

Laboratory Management

The Laboratory QA Coordinator administers the analytical laboratory's QA/QC Plan and is responsible for QC. Specific responsibilities of this position include:

1. Ensure implementation of the QA Plan.
2. Serve as the laboratory point of contact.
3. Activate corrective action for out-of-control events.
4. Issue the final QA/QC report.
5. Administer QA sample analysis.
6. Comply with the specifications established in the project plans as related to laboratory services.
7. Participate in QA audits and compliance inspections.

The Laboratory QA Coordinator will be determined by the Ecology-accredited analytical laboratory selected for the project.

Health and Safety

A Site-specific HASP will be used for Site characterization field activities and is presented as Appendix D. The Field Coordinator will be responsible for implementing the HASP during sampling activities. The PM will discuss health and safety issues with the Field Coordinator on a routine basis during the completion of field activities.

The Field Coordinator will conduct a tailgate safety meeting each morning before beginning daily field activities. The Field Coordinator will terminate any project field work activities that do not comply with the HASP. Companies providing services for this project on a subcontracted basis will be responsible for developing and implementing their own HASP. GeoEngineers will review subcontractor HASPs before commencement of their work at the Site.

DATA QUALITY OBJECTIVES

The QA objective for technical data is to collect environmental monitoring data of known, acceptable and documentable quality. The QA objectives established for the project are:

1. Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis and data reporting that will facilitate consistency and thoroughness of data generated.
2. Achieve the acceptable level of confidence and quality required so that data generated are scientifically valid and of known and documented quality. This will be performed by establishing criteria for precision, accuracy, representativeness, completeness and comparability, and by testing data against these criteria.

The sampling design, field procedures, laboratory procedures and QC procedures are set up to provide high-quality data for use in this project. Specific data quality factors that may affect data usability include quantitative factors (precision, bias, accuracy, completeness and reporting limits) and qualitative factors (representativeness and comparability). The measurement quality objectives associated with these data quality factors are summarized in Table C-1 and are discussed below.

Analytes and Matrices of Concern

Samples of soil and groundwater will be collected during the assessment. Tables C-2 and C-3 summarize the chemical analyses to be performed on Site soil and groundwater samples, respectively.

Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Individual instruments often can detect but not accurately quantify compounds at concentrations lower than the MDL, referred to as the instrument detection limit (IDL). Although results reported near the MDL or IDL provide insight to site conditions, QA dictates that analytical methods achieve a consistently reliable level of detection known as the practical quantitation limit (PQL). The contract laboratory will provide numerical results for all analytes and report them as detected above the PQL or undetected at the PQL.

Achieving a stated detection limit for a given analyte is helpful in providing statistically useful data. Intended data uses, such as comparison to numerical criteria or risk assessments, typically dictate specific project target reporting limits (TRLs) necessary to fulfill stated objectives. The PQLs for Site COCs are presented in Tables C-2 and C-3 for soil and groundwater, respectively. These reporting limits were obtained from an Ecology-accredited laboratory (TestAmerica, Laboratories, Inc., Spokane Valley, Washington). Other criteria include State of Washington (WAC 173-201) and federal Ambient Water Quality Criteria.

The analytical methods and processes selected will provide PQLs less than the TRLs under ideal conditions. However, the reporting limits in Tables C-2 through C-3 are considered targets because several factors may influence final detection limits including:

1. Moisture and other physical soil conditions affect detection limits.
2. Analytical procedures might require sample dilutions or other practices to accurately quantify a particular analyte at concentrations above the range of the instrument. The effect is that other analytes could be reported as undetected but at a value much higher than a specified TRL. Data users must be aware that high non-detect values, although correctly reported, can bias statistical summaries and careful interpretation is required to correctly characterize site conditions.

Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicate or split samples, replicate analyses and duplicate spiked environmental samples (matrix spike duplicates). The closer the measured values are to each other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample comparisons of various matrices and field duplicate comparisons for water samples. This value is calculated by:

$$RPD(\%) = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} X\ 100,$$

Where

D_1	=	Concentration of analyte in sample
D_2	=	Concentration of analyte in duplicate sample

The calculation applies to split samples, replicate analyses, duplicate spiked environmental samples (matrix spike duplicates), and laboratory control duplicates. The RPD will be calculated for samples and compared to the applicable criteria. Precision can also be expressed as the percent difference (%D) between replicate analyses. Persons performing the evaluation must review one or more pertinent documents (EPA 1999; EPA 2004a) that address criteria exceedances and courses of action. Relative percent difference goals for this effort are 30 percent in groundwater and 40 percent in soil for all analyses, unless the duplicate sample values are within 5 times the reporting limit.

Accuracy

Accuracy is a measure of bias in the analytic process. The closer the measurement value is to the true value, the greater the accuracy. This measure is defined as the difference between the reported value versus the actual value and is often measured with the addition of a known compound to a sample. The amount of known compound reported in the sample, or percent recovery, assists in determining the performance of the analytical system in correctly quantifying the compounds of interest.

Since most environmental data collected represent one point spatially and temporally rather than an average of values, accuracy plays a greater role than precision in assessing the results. In general, if the percent recovery is low, non-detect results may indicate that compounds of interest are not present when in fact these compounds are present. Detected compounds may be biased low or reported at a value less than actual environmental conditions. The reverse is true when recoveries are high. Non-detect values are considered accurate while detected results may be higher than the true value.

Accuracy will be expressed as the percent recovery of a surrogate compound (also known as "system monitoring compound"), a matrix spike (MS) result, or from a standard reference material where:

$$Recovery\,(\%) = \frac{Sample\ Result}{Spike\ Amount}\ X\ 100$$

Persons performing the evaluation must review one or more pertinent documents (EPA 1999; EPA 2004a) that address criteria exceedances and courses of action. Accuracy criteria for surrogate spikes, MS, and laboratory control spikes (LCS) are found in Table C-1 of this QAPP.

Representativeness, Completeness and Comparability

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. The determination of the representativeness of the data will be performed by completing the following:

1. Comparing actual sampling procedures to those delineated within this Work Plan and QAPP;
2. Comparing analytical results of field duplicates to determine the variations in the analytical results; and
3. Invalidating non-representative data or identifying data to be classified as questionable or qualitative. Only representative data will be used in subsequent data reduction, validation and reporting activities.

Completeness establishes whether a sufficient amount of valid measurements were obtained to meet project objectives. The number of samples and results expected establishes the comparative basis for completeness. Completeness goals are 90 percent useable data for samples/analyses planned. If the completeness goal is not achieved, an evaluation will be made to determine if the data are adequate to meet study objectives.

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to determine overall usefulness of data sets, following the determination of both precision and accuracy.

Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Some analytical methods specify a holding time for analysis only. For many methods, holding times may be extended by sample preservation techniques in the field. If a sample exceeds a holding time, then the results may be biased low. For example, if the extraction holding time for volatile analysis of soil sample is exceeded, then the possibility exists that some of the organic constituents have volatilized from the sample or degraded. Results for that analysis will be qualified as estimated to indicate that the reported results may be lower than actual site conditions. Holding times are presented in Table C-4.

Blanks

According to the *National Functional Guidelines for Organic Data Review* (EPA 1999), "The purpose of laboratory (or field) blank analysis is to determine the existence and magnitude of contamination resulting from laboratory (or field) activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks, instrument blanks, trip blanks and equipment blanks)." Trip blanks are placed with samples during shipment; method blanks are created during sample preparation and follow samples throughout the analysis process; equipment blanks are generated in the field to provide QA/QC for decontamination procedures.

Analytical results for blanks will be interpreted in general accordance with *National Functional Guidelines for Organic Data Review* and professional judgment.

SAMPLE COLLECTION, HANDLING AND CUSTODY

Sampling Equipment Decontamination

Sampling equipment decontamination procedures are described in "Decontamination Procedures" of the SAP.

Sample Containers and Labeling

The Field Coordinator will establish protocols to manage field sample collection, handling and documentation. Soil and groundwater samples obtained during this study will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Table C-4.

Sample containers will be labeled with the following information at the time of collection:

1. Project name and number;
2. Sample name, which will include a reference to depth (soil) or date (water) as appropriate; and
3. Date and time of collection.

Examples:

1. Soil – "HA-1 (1-1.5)"
2. Groundwater – "MW-20 (061016)" [for a sample collected on June 10, 2016]

The sample collection activities will be noted in the field log books. The Field Coordinator will monitor consistency between the Work Plan, sample containers/labels, field log books and the COC forms.

Sample Storage

Samples will be placed in a cooler with "blue ice" or double-bagged "wet ice" immediately after they are collected. The objective of the cold storage will be to attain a sample temperature of 4 degrees Celsius. Holding times will be observed during sample storage. Holding times for the project analyses are summarized in Table C-4.

Sample Shipment

The samples will be transported and delivered to the analytical laboratory in the coolers. Field personnel will transport and hand-deliver samples that are being submitted to a local laboratory for analysis. Samples that are being submitted to an out-of-town laboratory for analysis will be transported by a commercial express mailing service on an overnight basis. The Field Coordinator will confirm that the shipping container (cooler) has been properly secured using clear plastic tape and custody seals.

Measures will be implemented to minimize the potential for sample breakage, which includes packaging materials and placing sample bottles in the cooler in a manner intended to prevent damage. Sample bottles will be appropriately wrapped with bubble wrap or other protective material before being place in coolers.

COC Records

Field personnel are responsible for the security of samples from the time the samples are taken until the samples have been received by the shipper or laboratory. A COC form will be completed by the end of each field day for samples collected. Information to be included on the COC form includes:

1. Project name and number;
2. Sample identification;
3. Date and time of sampling;
4. Sample matrix (soil, water, etc.) and number of containers from each sampling point, including preservatives used (as applicable);
5. Analyses to be performed; and
6. Names of sampling personnel and transfer of custody acknowledgment spaces.

The original COC record will be signed by a member of the field team and bear a unique tracking number. Field personnel shall retain carbon copies and place the original and remaining copies in a plastic bag, placed within the cooler or taped to the inside lid of the cooler before sealing the container for shipment. This record will accompany the samples during transit by carrier to the laboratory.

Laboratory Custody Procedures

The laboratory will follow their standard operating procedures (SOPs) to document sample handling from time of receipt (sample log-in) to reporting. Documentation will include at a minimum, the analysts name or initial, time and date.

Field Documentation

Field documentation provides important information about potential problems or special circumstances surrounding sample collection. Field personnel will maintain daily field logs while on-site. The field logs will be prepared on field report forms or in a bound logbook. Entries in the field logs and associated sample documentation forms will be typed in the field made in waterproof ink, and corrections will consist of line-out deletions that are initialed and dated. Individual logbooks will become part of the project files at the conclusion of the site characterization field explorations.

At a minimum, the following information will be recorded during the collection of each sample:

1. Sample location and description;
2. Site or sampling area sketch showing sample location and measured distances;
3. Sampler's name(s);
4. Date and time of sample collection;
5. Designation of sample as composite or discrete;
6. Type of sample (soil or water);
7. Type of sampling equipment used;
8. Field instrument readings;
9. Field observations and details that are pertinent to the integrity/condition of the samples (e.g., weather conditions, performance of the sampling equipment, sample depth control, sample disturbance, etc.);
10. Preliminary sample descriptions (e.g., lithologies, noticeable odors, colors, field-screening results);
11. Sample preservation;
12. Shipping arrangements (overnight air bill number); and
13. Name of recipient laboratory.

In addition to the sampling information, the following specific information also will be recorded in the field log for each day of sampling:

1. Team members and their responsibilities;
2. Time of arrival/entry on site and time of site departure;
3. Other personnel present at the site;
4. Summary of pertinent meetings or discussions with regulatory agency or contractor personnel;
5. Deviations from sampling plans, Site safety plans and QAPP procedures;
6. Changes in personnel and responsibilities with reasons for the changes;
7. Levels of safety protection; and
8. Calibration readings for any equipment used and equipment model and serial number.

The handling, use and maintenance of field log books are the field coordinator's responsibilities.

CALIBRATION PROCEDURES

Field Instrumentation

Equipment and instrumentation calibration facilitates accurate and reliable field measurements. Field and laboratory equipment used on the project will be calibrated and adjusted in general accordance with the manufacturer's recommendations. Methods and intervals of calibration and maintenance will be based on the type of equipment, stability characteristics, required accuracy, intended use and environmental conditions. The basic calibration frequencies are described below.

The PID used for vapor measurements will be calibrated daily, if required (based on the model used), for site safety monitoring purposes in general accordance with the manufacturer's specifications. If daily calibration is not required for a specific PID model, calibration of the PID will be checked to make sure it is up to date and a calibration check will be performed using a calibration gas. The calibration results/check will be recorded in the field logbook.

The water quality measuring system will be calibrated prior to each monitoring event in general accordance with the manufacturer's specifications. The calibration results will be recorded in the field report.

Laboratory Instrumentation

For analytical chemistry, calibration procedures will be performed in general accordance with the methods cited and laboratory standard operating procedures. Calibration documentation will be retained at the laboratory and readily available for a period of 6 months.

DATA REPORTING AND LABORATORY DELIVERABLES

Laboratories will report data in formatted hardcopy and digital form. Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the field sample identification, the laboratory identification, reporting units, qualifiers, analytical method, analyte tested, analytical result, extraction and analysis dates and detection limit (PQL only). Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues. Laboratory EDD will be established by GeoEngineers, Inc., with the contract laboratory. Final results will be sent to the PM.

INTERNAL QC

Table C-5 summarizes the types and frequency of QC samples to be collected during the site characterization, including both field QC and Laboratory QC samples.

Field QC

Field QC samples serve as a control and check mechanism to monitor the consistency of sampling methods and the influence of off-site factors on environmental samples. Off-site factors include airborne volatile organic compounds and potable water used in drilling activities.

Field Duplicates

In addition to replicate analyses performed in the laboratory, field duplicates also serve as measures for precision. Under ideal field conditions, field duplicates, are created when a volume of the sample matrix is thoroughly mixed, placed in separate containers and identified as different samples. This tests both the precision and consistency of laboratory analytical procedures and methods, and the consistency of the sampling techniques used by field personnel.

One field duplicate will be collected during each groundwater sampling event. The duplicate samples will be analyzed for the COCs specified for the given sample location or well.

Laboratory QC

Laboratory QC procedures will be evaluated through a formal data validation process. The analytical laboratory will follow standard method procedures that include specified QC monitoring requirements. These requirements will vary by method but generally include:

1. Method blanks;
2. Internal standards;
3. Calibrations;
4. MS/matrix spike duplicates (MSD);
5. LCS/laboratory control spike duplicates (LCSD);
6. Laboratory replicates or duplicates; and
7. Surrogate spikes.

Laboratory Blanks

Laboratory procedures employ the use of several types of blanks but the most commonly used blank for QA/QC assessments are method blanks. Method blanks are laboratory QC samples that consist of either a soil like material having undergone a contaminant destruction process or high performance liquid chromatography (HPLC) water. Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. Method blanks are particularly useful during volatiles analysis since VOCs can be transported in the laboratory through the vapor phase. If a substance is found in the method blank, then one (or more) of the following occurred:

1. Measurement apparatus or containers were not properly cleaned and contained contaminants.
2. Reagents used in the process were contaminated with a substance(s) of interest.
3. Contaminated analytical equipment was not properly cleaned.
4. Volatile substances in the air with high solubility or affinities toward the sample matrix contaminated the samples during preparation or analysis.

It is difficult to determine which of the above scenarios took place if blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. Given method blank results, validation rules assist in determining which substances in samples are considered "real," and which ones are attributable to the analytical process. Furthermore, the guidelines (EPA 2004b) state, ". . . there may be instances where little or no contamination was present in the associated blank, but qualification of the sample is deemed necessary. Contamination introduced through dilution water is one example."

Calibrations

Several types of calibrations are used, depending on the method, to determine whether the methodology is 'in control' by verifying the linearity of the calibration curve and to assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations and continuing calibration verification.

MS/MSD

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. For example, extreme pH affects the results of SVOCs. Or, the presence of a particular compound may interfere with accurate quantitation of another analyte. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix affects cannot be determined due to dilution and/or high levels of related substances in the sample. A MS is evaluated by spiking a known amount of one or more of the target analytes ideally at a concentration of 5 to 10 times higher than the sample result. A percent recovery is calculated by subtracting the sample result from the spike result, dividing by the spiked amount, and multiplying by 100.

The samples for the MS and MSD analyses should be collected from a boring or sampling location that is believed to exhibit low-level contamination. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to determine the presence of matrix interferences, which can best be achieved with low levels of contaminants. Additional sample volume will be collected for these analyses. This MS/MSD sample will be a composite to achieve a level of representativeness and reproducibility in the data.

LCS/LCSD

Also known as blanks spikes, LCSs are similar to MSs in that a known amount of one or more of the target analytes are spiked into a prepared media and a percent recovery of the spiked substances are calculated. The primary difference between a MS and LCS is that the LCS media is considered "clean" or contaminant free. For example, HPLC water is typically used for LCS water analyses. The purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance and analyst performance. LCS data must be reviewed in context with other controls to determine if out-of-control events occur.

Laboratory Replicates/Duplicates

Laboratories often utilize MS/MSDs, LCS/LCSDs, and/or replicates to assess precision. Replicates are a second analysis of a field collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process, but most commonly occur as a second analysis on the extracted media.

Surrogate Spikes

The purposes of using a surrogate are to verify the accuracy of the instrument being used and extraction procedures. Surrogates are substances similar to, but not one of, the target analytes. A known concentration of surrogate is added to the sample and passed through the instrument, noting the surrogate recovery. Each surrogate used has an acceptable range of percent recovery. If a surrogate recovery is low, sample results may be biased low and depending on the recovery value, a possibility of false negatives may exist. Conversely, when recoveries are above the specified range of acceptance a possibility of false positives exist, although non-detected results are considered accurate.

DATA REDUCTION AND ASSESSMENT PROCEDURES

Data Reduction

Data reduction involves the conversion or transcription of field and analytical data to a useable format. The laboratory personnel will reduce the analytical data for review by the PM and QA leader (if needed).

Field Measurement Evaluation

Field data will be reviewed at the end of each day by following the QC checks outlined below and procedures in the Work Plan. Field data documentation will be checked against the applicable criteria as follows:

1. Sample collection information;
2. Field instrumentation and calibration;
3. Sample collection protocol;
4. Sample containers, preservation and volume;
5. Field QC samples collected at the frequency specified;
6. Sample documentation and COC protocols; and
7. Sample shipment.

Cooler receipt forms and sample condition forms provided by the laboratory will be reviewed for out-of-control incidents. The final report will contain what effects, if any, an incident has on data quality. Sample collection information will be reviewed for correctness before inclusion in a final report.

Field QC Evaluation

A field QC evaluation will be conducted by reviewing field log books and daily reports, discussing field activities with staff and reviewing field QC samples (trip blanks and field duplicates). Trip blanks will be evaluated using the same criteria as method blanks.

Precision for field duplicate soil samples will not be evaluated because even a well-mixed sample is not entirely homogenous due to sampling procedures, soil conditions and contaminant transport mechanisms.

Laboratory Data QC Evaluation

The laboratory data assessment will consist of a formal review of the following QC parameters:

1. Holding times;
2. Method blanks;

3. MS/MSD;
4. LCS/LCSD;
5. Surrogate spikes; and
6. Replicates.

In addition to these QC mechanisms, other documentation such as cooler receipt forms and case narratives will be reviewed to fully evaluate laboratory QA/QC.

Table C-1

Measurement Quality Objectives

Colville Post and Poles

Stevens County, Washington

		Surrogate Standards (SS) %R Limits[1,2,3]	Check Standard (LCS) %R Limits[2,3]		Matrix Spike (MS) %R Limits[3]		MSD Samples or Lab Duplicate (Dup) RPD Limits[4]		Field Duplicate Samples RPD Limits[4]
Laboratory Analysis	**Reference Method**	**Soil/Water**	**Soil**	**Water**	**Soil**	**Water**	**Soil**	**Water**	**Water**
Diesel-range Petroleum Hydrocarbons	NWTPH-Dx	50%-150% (soil) 50%-150% (water)	73%-133%	54.4%-136%	70.1-%-139%	54.5%-136%	≤25% (MSD) ≤40% (Dup)	≤32.5% (MSD) ≤25% (Dup)	≤20%
Heavy-Oil range Petroleum Hydrocarbons	NWTPH-Dx	50%-150% (soil) 50%-150% (water)	73%-133%	54.4%-136%	70.1-%-139%	54.5%-136%	≤25% (MSD) ≤40% (Dup)	≤32.5% (MSD) ≤25% (Dup)	≤20%
Pentachlorophenol (PCP)	EPA 8270D SIM	Varies per surrogate and per matrix	50%-150%	30%-149%	32.6%-144%	30%-149%	≤35%	≤20%	≤20%
Dioxins & Furans, 17 Isomers & Totals	EPA 8290A	NA	Varies per analyte	Varies per analyte	Varies per analyte	Varies per analyte	≤20%	≤20%	≤20%
Cadmium	EPA 6020A	NA	80%-120%	80%-120%	80%-120%	80%-120%	≤20%	≤20%	≤20%
Mercury	EPA 7471B/70A	NA	80%-120%	80%-120%	80%-120%	80%-120%	≤20%	≤20%	≤20%

Notes:

[1]Individual surrogate recoveries are compound specific.

[2]Recovery Ranges are estimates. Actual ranges will be provided by the laboratory when contracted.

[3]Percent Recovery Limits are expressed as ranges based on laboratory control limits. Limits will vary for individual analytes.

[4]RPD control limits are only applicable if the concentration are greater than 5 times the method reporting limit (MRL). For results less than 5 times the MRL, the difference between the sample and duplicate must be less than 2X the MRL for soils and 1X the MRL for waters.

Method numbers refer to EPA SW-846 Analytical Methods or Washington State Department of Ecology (Ecology) recommended analytical methods.

%R = percent recovery; LCS = Laboratory Control Sample; MS/MSD = Matrix Spike/Matrix Spike Duplicate;

RPD = Relative Percent Difference; NA = Not Applicable

Table C-2

Methods of Analysis and Target Reporting Limits (Soil)

Colville Post and Poles
Stevens County, Washington

Analyte	Analytical Method	Practical Quantitation Limit[1] (mg/kg)	Cleanup Level (mg/kg)
Total Petroleum Hydrocarbons (TPH)			
TPH-Diesel Range	NWTPH-Dx	10	20,002
TPH-Heavy Oil	NWTPH-Dx	10	20,002
Semi - Volatile Organic Compounds			
Pentachlorophenol (PCP)	EPA 8270 SIM	0.050	2.5[3]
Dioxins & Furans, 17 Isomers & Totals	EPA 8290A	Vary	5.2[4]
Heavy Metals			
Cadmium	EPA 6020A	0.20	22
Mercury	EPA 7471B	0.050	22

Notes:

[1]Practical quantitation limist (PQLs) based on information provided by TestAmerica Laboratories, Inc.

[2]Model Toxics Control Act (MTCA) Method A Cleanup levels

[3]Method B Cleanup levels

[4]Washington State background levels in picograms per gram (pg/g)

mg/kg = milligrams per kilogram

Table C-3

Methods of Analysis and Target Reporting Limits (Groundwater)

Colville Post and Poles
Stevens County, Washington

Analyte	Analytical Method	Practical Quantitation Limit[1] (µg/L)	MTCA Method A Cleanup Levels (µg/L)
Total Petroleum Hydrocarbons			
TPH-Dielsel Range	NWTPH-Dx	240	500
TPH-Heavy Oil	NWTPH-Dx	240	500
Semi-Volatile Organic Compounds			
Pentachlorophenol (PCP)	EPA 8270 SIM	0.02	2.5 [2]
Dioxins & Furans, 17 Isomers & Totals	EPA 8290A	Varies per analyte	Varies per analyte

Notes:

[1]Practical quantitation limist (PQLs) based on information provided by TestAmerica Laboratories, Inc.

[2]Model Toxics Conrol Act (MTCA) Method B Cleanup levels

µg/L = micrograms per liter; NE = not established

Table C-4

Test Methods, Sample Containers, Preservation and Holding Time[1]

Colville Post and Poles

Stevens County, Washington

Analysis	Method	Soil				Groundwater			
		Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times
Diesel-Range Hydrocarbons	NWTPH-Dx	30 g	4 or 8 oz glass wide-mouth with Teflon-lined lid	Cool 4°C	14 days	125 mL	125 ml amber glass	Cool 4° C HCl to pH < 2	14 days
Diesel-Heavy Oil Hydrocarbons	NWTPH-Dx	30 g	4 or 8 oz glass wide-mouth with Teflon-lined lid	Cool 4°C	14 days	125 mL	125 ml amber glass	Cool 4° C HCl to pH < 2	14 days
Pentachlorophenol (PCP)	EPA 8270 SIM	30 g	4 or 8 oz glass wide-mouth with Teflon-lined lid	Cool 4°C	14 days	250 ml	250 ml amber glass	Cool 4°C	7 days
Dioxins & Furans, 17 Isomers & Totals	EPA 8290A	30 g	4 or 8 oz glass wide-mouth with Teflon-lined lid	Cool 4°C	30 days	1000 ml	1000 ml amber glass	Cool 4°C	30 days
Cadmium	EPA 6020A	15 g	4 or 8 oz glass wide-mouth with Teflon-lined lid	No preservation needed	180 days	100 ml	250 ml poly	HNO_3 to pH <2	180 days
Mercury	EPA 7471B	15 g	4 or 8 oz glass wide-mouth with Teflon-lined lid	Cool 4°C	28 days	100 ml	250 ml poly	HNO_3 to pH <2	28 days

Notes:

[1]Holding Times are based on elapsed time from date of collection

HCl = Hydrochloric Acid; HNO_3 = Nitric Acid; oz = ounce; mL = millilieter; L = liter; g = gram; NA = not applicable

Table C-5

Quality Control Samples Type and Frequency

Colville Post and Poles

Stevens County, Washington

Parameter	Field QC		Laboratory QC			
	Field Duplicates	Trip Blanks	Method Blanks	LCS	MS / MSD	Lab Duplicates
Diesel Range Hydrocarbons	1/event-soil samples	NA	1/batch	1/batch	1/batch	1/batch
Diesel Range Hydrocarbons	1/event-groundwater samples	NA	1/batch	1/batch	1/batch	1/batch
Pentachlorophenol (PCP)	1/event-soil samples	NA	1/batch	1/batch	1/batch	1/batch
Pentachlorophenol (PCP)	1/event-groundwater samples	NA	1/batch	1/batch	1/batch	1/batch
Dioxins & Furans, 17 Isomers & Totals	1/event-soil samples	NA	1/batch	1/batch	1/batch	1/batch
Dioxins & Furans, 17 Isomers & Totals	1/20 groundwater samples	NA	1/batch	1/batch	1/batch	1/batch
Cadmium	1/event-soil samples	NA	1/batch	1/batch	1/batch	1/batch
Mercury	1/event-soil samples	NA	1/batch	1/batch	1/batch	1/batch

Notes:

No more than 20 field samples can be contained in one batch.

LCS = Laboratory control sample; MS = Matrix spike sample; MSD = Matrix spike duplicate sample; VOCs = volatile organic compounds; NA = Not applicable

APPENDIX D
Health and Safety Plan

APPENDIX D
HEALTH AND SAFETY PLAN

INTRODUCTION

This Health and Safety Plan (HASP) is to be used in conjunction with the GeoEngineers Safety Program Manual. Together, the written safety programs and this HASP constitute the Site safety plan for the Colville Post and Poles Site. This plan is to be used by GeoEngineers personnel on this Site and must be available at all times that project work is conducted on the Site. If the work entails potential exposures to other substances or unusual situations, additional safety and health information will be included and the plan will be approved by the GeoEngineers Health and Safety Manager. All plans are to be used in conjunction with current standards and policies outlined in the *GeoEngineers Health and Safety Program Manual*.

Liability Clause - This Site Safety Plan is intended for use by GeoEngineers Employees only. It does not extend to the other contractors or subcontractors working on this Site. If requested by subcontractors, this Site safety plan may be used as a minimum guideline for those entities to develop safety plans or procedures for their own staff to work under. In this case, Form 3 shall be signed by the subcontractor.

All personnel participating in this project must receive initial health and safety orientation (Form 1). Thereafter, brief tailgate safety meetings will be held daily and as deemed necessary by the Site Safety and Health Supervisor.

The orientation and the tailgate safety meetings shall include a discussion of emergency response, Site communications and Site hazards.

TABLE D-1. GENERAL PROJECT INFORMATION

Project Name:	**Colville Post and Poles Site**
Project Number:	00504-098-00; Task 500
Type of Project:	Remedial Investigation
Project Address:	396 Highway 395 North, Stevens County, Washington
Start/Completion:	TBD
Subcontractors:	Driller, Private Utility Locator, Surveyor, IDW disposal services

TABLE D-2. ORGANIZATION CHART

Chain of Command	Title	Name	Telephone Numbers
1	Project Manager	Scott Lathen	O: 509.209.2843 C: 509.251.5239
2	Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) Supervisor	Scott Lathen	O: 509.209.2843 C: 509.251.5239

Chain of Command	Title	Name	Telephone Numbers
3	Field Engineer/Geologist	Justin Rice Josh Lee Callan Driscoll	O: 509.209.2840 C: 208.589.3384 O: 509.209.2832 C: 406.239.7810 O: 509.209.2847 C: 406.498.2129
4	Site Safety and Health Supervisor (Site Safety Officer; [SSO])	Justin Rice/Josh Lee/Callan Driscoll	See above
5	Client Assigned Site Supervisor	Jeremy Schmidt	O: 509.329.3484 C:
6	Health and Safety Program Manager (HSM)	Wayne Adams	O: 425.861.6000 C: 253.350.4387

Functional Responsibility

Health and Safety Program Manager, Wayne Adams

GeoEngineers' HSM is responsible for implementing and promoting employee participation in the program. The HSM issues directives, advisories and information regarding health and safety to the technical staff. Additionally, the HSM has the authority to audit on-site compliance with HASPs, suspend work or modify work practices for safety reasons, and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others.

Project Manager

A PM is assigned to manage the activities of various projects and is responsible to the principal-in-charge of the project. The PM is responsible for assessing the hazards present at a job site and incorporating the appropriate safety measures for field staff protection into the field briefing and/or Site Safety Plan.

The PM shall keep the HSM informed of the project's health- and safety-related matters as necessary. The PM shall designate the project SSO and help the SSO implement the specifications of the HASP. The PM is responsible for communicating information in site safety plans and checklists to appropriate field personnel. Additionally, the PM and SSO shall hold a site safety briefing before any field activities begin. The PM is responsible for transmitting health and safety information to the SSO when appropriate.

Site Safety Officer/HAZWOPER

The SSO will have the on-site responsibility and authority to modify and stop work, or remove personnel from the site if working conditions change that may affect on-site and off-site health and safety. The SSO will be the main contact for any on-site emergency situation. The SSO is First Aid and CPR qualified and has current Hazardous Waste Operations and Emergency Response (HAZWOPER) training. The SSO is responsible for implementing and enforcing the project safety program and safe work practices during site activities. The SSO shall conduct daily safety meetings, perform air monitoring as required, conduct site safety inspections as required, coordinate emergency medical care, and ensure personnel are wearing the appropriate personal protective equipment (PPE). The SSO shall have advanced field work experience and shall be familiar with health and safety requirements specific to the project. The SSO has the authority to suspend site activities if unsafe conditions are reported or observed.

Duties of the SSO include the following:

- Implementing the HASP in the field and monitoring compliance with its guidelines by staff.
- Confirming that GeoEngineers field personnel have met the training and medical examination requirements. Advising other contractor employees of these requirements.
- Maintaining adequate and functioning safety supplies and equipment at the site.
- Setting up work zones, markers, signs and security systems, if necessary.
- Performing or supervising air quality measurements. Communicating information on these measurements to GeoEngineers field staff and subcontractor personnel.
- Communicating health and safety requirements and site hazards to field personnel, subcontractors and contractor employees and site visitors.
- Directing personnel to wear PPE and guiding compliance with health and safety practices in the field.
- Consulting with the PM regarding new or unanticipated site conditions, including emergency response activities. If monitoring detects concentrations of potentially hazardous substances at or above the established exposure limits, notify/consult with the PM. Consult with the PM and the HSM regarding new or unanticipated site conditions, including emergency response activities. If field monitoring indicates concentrations of potentially hazardous substances at or above the established exposure limits, the HSM must be notified and corrective action taken.
- Documenting site accidents, illnesses and unsafe activities or conditions, and reporting them to the PM and the HSM.
- Directing decontamination operations of equipment and personnel.

Field Employees

Employees working on-site that have the potential of coming in contact with hazardous substances or physical hazards are responsible for participating in the health and safety program and complying with the site specific health and safety plans. These employees are required to:

- Participate and be familiar with the health and safety program as described in this manual.
- Notify the SSO that when there is need to stop work to address an unsafe situation.
- Comply with the HASP and acknowledge understanding of the plan.
- Report to the SSO, PM or HSM any unsafe conditions and all facts pertaining to incidents or accidents that could result in physical injury or exposure to hazardous materials.
- Participate in health and safety training, including initial 40-hour Occupational Safety and Health Administration (OSHA) course, annual 8-hour HAZWOPER refresher, and First Aid/cardiopulmonary resuscitation (CPR) training.
- Participate in the medical surveillance program if applicable.
- Schedule and take a respirator fit test annually.

- Any field employee working onsite may stop work if the employee believes the work is unsafe.

Contractors under GeoEngineers Supervision

Contractors working on the site under GeoEngineers supervision or direct control that have the potential of coming in contact with hazardous substances or physical hazards shall have their own health and safety program that is in line with the site specific health and safety plan.

TABLE D-3. FIELD PERSONNEL AND TRAINING RECORDS

Name of Employee On Site	Level of HAZWOPER Training (24-/40-hr)	Date of 8-Hour Refresher Training	First Aid/CPR	Date of Respirator Fit Test
Josh Lee	40-hr	03/19/2015	01/05/2016	TBD
Justin Rice	40-hr	03/19/2015	03/13/2015	03/12/2012
Chelsea Voss	40-hr	NA	06/18/2014	03/07/2014
Callan Driscoll	40-hr	NA	01/05/2016	TBD

Site Location

The Site is located at 396 Highway 395 North near Colville in Stevens County, Washington. The Site is bounded by Highway 395 to the North, residential property to the west and east, and the Colville River to the south.

WORK PLAN

The objective of this project is to complete a remedial investigation for the former CPPI (the Site) located at 396 Highway 395 North near Colville in Stevens County, Washington. The scope of the project includes:

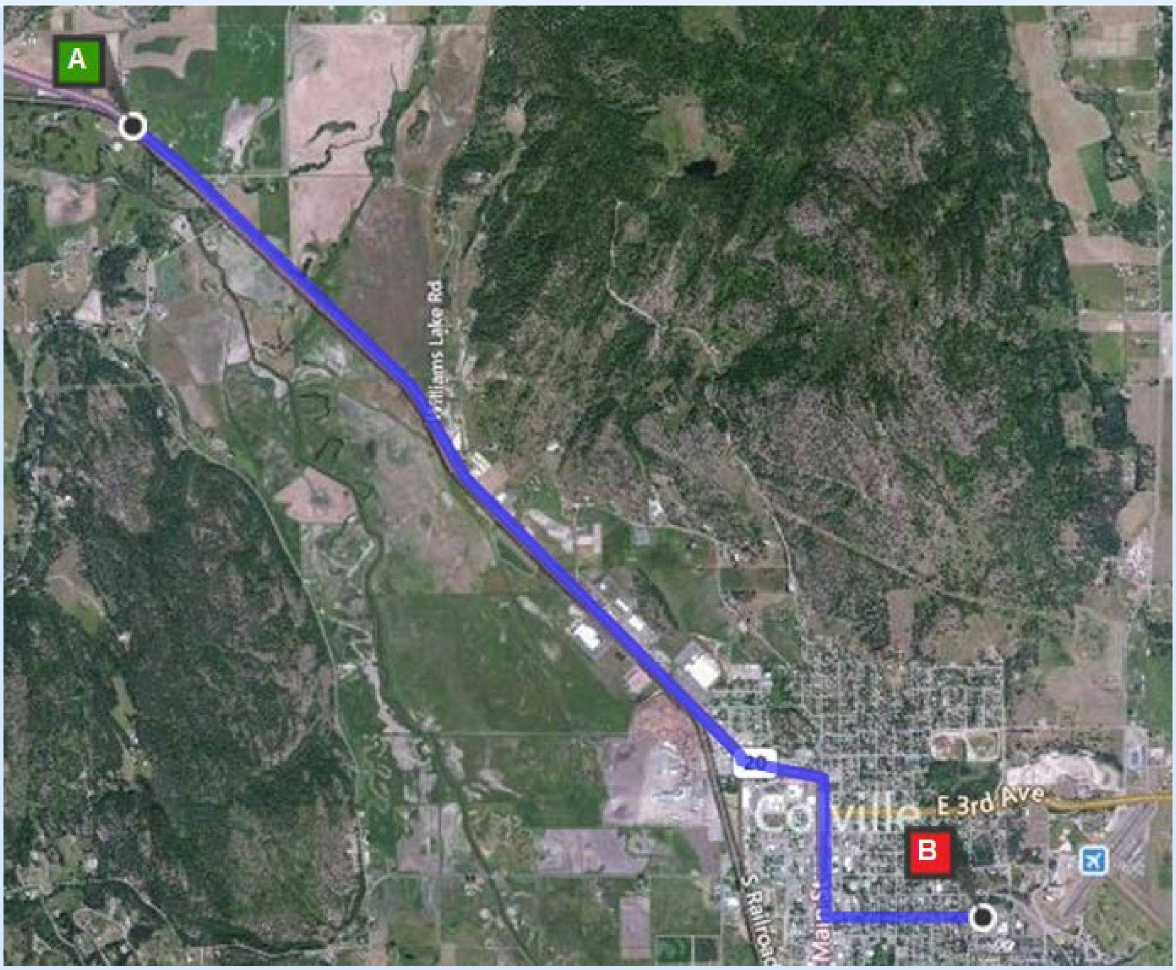
1. Sampling shallow soil in 38 locations;
2. Installing eight monitoring wells using hollow-stem auger drilling techniques;
3. Collecting groundwater samples for laboratory analysis;
4. Evaluating laboratory data; and
5. Preparing a RI/FS report documenting the RI field investigation methods and results.

TABLE D-4. EMERGENCY INFORMATION – COLVILLE POST AND POLES SITE

Hospital Name and Address:	Providence Mt Carmel Hospital 982 East Columbia Avenue, Colville, Washington 99114
Phone Numbers (Hospital ER):	509.685.5100
Distance:	4.6 miles

Route to Hospital:

1. Head southeast on U.S. Highway 395.
2. Take 2nd exit at roundabout.
3. Turn Left at East Columbia Avenue.



Ambulance:	911
Poison Control:	800.222.1222
Police:	911
Fire:	911
Location of Nearest Telephone:	Cell phones are carried by field personnel.
Nearest Fire Extinguisher:	Located in the GeoEngineers vehicle on Site.
Nearest First-Aid Kit:	Located in the GeoEngineers vehicle on Site.

STANDARD EMERGENCY PROCEDURES

1. Get help
    a. Send another worker to phone 911 (if necessary)
    b. As soon as feasible, notify GeoEngineers' project manager
2. Reduce risk to injured person
    a. Turn off equipment
    b. Move person from injury location (if possible)
    c. Keep person warm
    d. Perform CPR (if necessary)
3. Transport injured person to medical treatment facility (if necessary)
    a. By ambulance (if necessary) or GeoEngineers vehicle
    b. Stay with person at medical facility
    c. Keep GeoEngineers' manager apprised of situation and notify human resources manager of situation

TABLE D-5. LIST OF FIELD ACTIVITIES

Check the Activities to be Completed during the Project	
X	Site reconnaissance
X	Shallow soil sampling
	Construction monitoring
X	Surveying
	Test pit exploration
X	Monitoring well installation
X	Monitoring well development
X	Soil sample collection
X	Field screening of soil samples
	Soil Vapor measurements
	Soil Vapor sampling
X	Groundwater sampling
X	Groundwater depth
	Product sample measurement (if any)
	Soil stockpile testing
	Remedial excavation
	Underground storage tank (UST) removal monitoring
	Remediation system monitoring

Check the Activities to be Completed during the Project	
	Recovery of free product

HAZARD ANALYSIS

A hazard analysis has been completed as part of preparation of this HASP. The hazard analysis was performed taking into account the known and potential hazards at the site and surrounding areas, as well as the planned work activities. The results of the hazard analysis are presented in this section. The hazard assessment will be evaluated each day before beginning work.

TABLE D-6. PHYSICAL HAZARDS

Physical Hazards	
X	Drill rigs
	Overhead hazards/power lines
X	Tripping/puncture hazards
X	Snow, rain, ice, freezing temperatures
X	Heat/Cold, Humidity
X	Utilities/ utility locate
X	Contaminated soil
X	Contaminated groundwater
X	Loud noise
	Backhoe
	Trackhoe
	Crane
	Front End Loader
	Excavations/trenching (1:1 slopes for Type B soil)
	Shored/braced excavation if greater than 4 feet of depth

Safe Work Practices

- Utility check list completed.
- Lifting hazards: Use proper techniques, mechanical devices where appropriate.
- Terrain obstacles: Work will be conducted generally in areas without restricted access. Heavy brush, shrubs and trees might limit access to some proposed sampling and well installation locations.
- Personnel will wear high-visibility vests for increased visibility by vehicle and equipment operators.
- Field personnel will be aware constantly of the location and motion of heavy equipment. A safe distance will be maintained between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus. Personnel will approach operating heavy equipment only when they are certain the operator has indicated it is safe to do so.

- Overhead Power Line Clearance Safety: Working equipment around overhead power lines requires distance and a spotter. Heavy equipment and/or vehicles used on this Site will not work within 20 feet of overhead utility lines, if present, without first ensuring that the lines are not energized. This distance may be reduced to 10 feet depending on the client and the use of a safety watch.
- Before a job begins, call the utility company and find out voltage in lines. Have the equipment de-energized if possible. Ensure that the equipment remains de-energized by using some type of lockout and tag procedure, and ensure that the electrician uses grounding lines when they are required.
- Don't operate equipment around overhead power lines unless you are authorized and trained to do so. If an object (scaffolds, crane, etc.) must be moved in the area of overhead power lines, appoint a competent worker whose sole responsibility is to observe the clearance between the power lines and the object. Warn others if the minimum distance is not maintained.
- Never touch an overhead line if it has been brought down by machinery or has fallen. Never assume lines are dead. When a machine is in contact with an overhead line, DO NOT allow anyone to come near or touch the machine. Stay away from the machine and summon outside assistance. Never touch a person who is in contact with a live power line.
- If you are in a vehicle that is in contact with an overhead power line, DON'T LEAVE THE VEHICLE. As long as you stay inside and avoid touching metal on the vehicle, you may avoid an electrical hazard. If you need to get out to summon help or because of fire, jump out without touching any wires or the machine, keep your feet together, and hop to safety.
- When mechanical equipment is being operated near overhead power lines, employees standing on the ground may not contact the equipment unless it is located so that the required clearance cannot be violated even at the maximum reach of the equipment.
- When working near overhead power lines, the use of nonconductive wooden or fiberglass ladders is recommended. Aluminum ladders and metal scaffolds or frames are efficient conductors of electricity.
- Avoid storing materials under or near overhead power lines.
- Personnel will avoid tripping hazards, steep slopes, pit and other hazardous encumbrances. If it becomes necessary to work within 6 feet of the edge of a pit, slope, pier or other potentially hazardous area, appropriate fall protection measures will be implemented by the Site Safety and Health Supervisor in accordance with OSHA/Division of Occupational Safety and Health (DOSH) regulations and the GeoEngineers' Safety Program manual.
- Heat stress control measures must be implemented according to the GeoEngineers program, with water provided on Site. See "Additional Elements" later in this HASP.
- Excessive levels of noise (exceeding 85 decibels [dBA]) are anticipated. Personnel potentially exposed will wear ear plugs or muffs with a noise reduction rating (NRR) of at least 25 dBA whenever it becomes difficult to carry on a conversation 6 feet away from a coworker or whenever noise levels become bothersome. (Increasing the distance from the source will decrease the noise level noticeably.)
- Work may be conducted in rain, freezing rain, snow, or icy conditions. Care will be taken to wear warm water proof clothing that limits exposure to cold.

Biological Hazard Mitigation Measures or Procedures

Site personnel shall avoid contact with or exposures to potential biological hazards encountered.

TABLE D-7. BIOLOGICAL HAZARDS AND PROCEDURES

Y/N	Hazard	Procedures
Y	Poison Ivy or other vegetation	Avoid contact with hazardous vegetation; wear level D PPE; seek medical attention if allergic reaction is observed.
Y	Insects or snakes	Avoid contact/keep safe distances; call pest control to remove nests from work areas if necessary.
Y	Wildlife	Keep safe distances/avoid contact; take shelter in vehicle if threatened and leave site if necessary

Ergonomic Hazard Mitigation Measures and Procedures

Avoiding Lifting Injuries

Back injuries often result from lifting objects that are too heavy or from using the wrong lifting technique. Field personnel will use the following safety precautions when lifting:

1. Minimize reaching by keeping frequently used items within arm's reach, moving your whole body as close as possible to the object.
2. Avoid overextending by standing up when retrieving objects on shelves.
3. Stretch regularly at the start of each workday.
4. Get help from a coworker or use a hand truck if the load is too heavy or bulky to lift alone.

Proper Lifting Techniques

1. Face the load; don't twist your body. Stand in a wide stance with your feet close to the object.
2. Bend at the knees, keeping your back straight. Wrap your arms around the object.
3. Let your legs do the lifting.
4. Hold the object close to your body as you stand up straight. To set the load down, bend at the knees, not from the waist.

TABLE D-8. ENGINEERING CONTROLS

	Trench shoring (1:1 slope for Type B Soils)
X	Locate work spaces upwind/downwind direction monitoring
X	Other soil covers (as needed)
	Other (specify ______________

CHEMICAL HAZARDS

TABLE D-9. SUMMARY OF CHEMICAL HAZARDS

Compound/ Description	Exposure Limits/Immediately Dangerous to Life or Health (IDLH)	Exposure Routes	Toxic Characteristics
2,3,7,8-TCDD (Dioxins/Furans)	None established	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, allergic dermatitis, chloracne, porphyria, gastrointestinal, possible reproductive effects, teratogenic effects. In animals: liver, kidney damage, hemorrhaging, carcinogenic
Cadmium as dust	OSHA PEL: TWA 0.005 mg/m^3 IDLH: 9 mg/m^3 TLV–TWA: 0.002 mg/m^3	Respiratory system, kidneys, prostate, blood	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]
Diesel Fuel—liquid with a characteristic odor	OSHA PEL (none) ACGIH has adopted 100 mg/m^3 for a TWA (as total hydrocarbons)	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; and headache; dermatitis.
Mercury (and inorganic compounds as mercury)	IDLH: 10 mg/m^3 TLV-TWA = 0.025 mg/m^3 Ceiling: 0.1 mg/m^3	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritated eyes and skin, coughing, chest pain, difficulty breathing, bronchitis, pneumonitis, tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion), stomatitis, salivation, gastrointestinal disturbance, anorexia, weight loss, proteinuria
Naphthalene	IDLH: 250 ppm NIOSH REL: TWA 50 mg/m^3	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation to eyes, headache, confusion, excitement, malaise (vague feeling of discomfort), nausea, vomiting, abdominal pain, bladder irritation, profuse sweating, jaundice, hematuria, renal shutdown, dermatitis, optical neuritis, corneal damage
Pentachlorophenol (PCP)	IDLH: 2.5 mg/m^3 (based on acute toxicity data in humans) NIOSH REL: TWA 0.5 mg/m^3 [skin]	Inhalation, ingestion, skin absorption, and/or direct contact	Irritation to eyes, nose, throat; sneezing, coughing; lassitude (weakness, exhaustion), anorexia, weight loss; sweating; dizziness, nausea, vomiting; dyspnea (difficulty breathing), chest pain; high fever, dermatitis

Notes: mg/m^3 milligrams per cubic meter
ACGIH American Conference of Governmental Industrial Hygienists
NIOSH National Institute for Occupational Safety and Health Recommended
TLV-TWA Threshold limit value- time weighted average for no more than 8 hours (ACGIH)
IDLH Immediately dangerous to life or health if exposed for more than 30 minutes (NIOSH)
PEL permissible exposure limits
REL recommended exposure limits

Health Hazards of TCDDs/PCDDs (Dioxins/Furans)

Very little human toxicity data from exposure to tetrachlorodibenzodioxins (TCDDs) and/or polychlorinated dibenzodioxins (PCDDs) are available. Health-effect data obtained from occupational settings in humans are based on exposure to chemicals contaminated with dioxins. It produces a variety of toxic effects in animals and is considered one of the most toxic chemicals known. Most of the available toxicity data are from high-dose oral exposures to animals (including tumor production, immunological dysfunction, and teratogenesis). Very little dermal and inhalation exposure data are available in the literature. It is important for field personnel to remember that although dioxins are toxic and carcinogenic (see next section, Health Hazards of Dioxins), most of the information is based on exposure to high doses of liquid product. These products have low volatility; therefore, the primary exposure pathway is direct dermal contact and inhalation/ingestion of soil particles.

The ACGIH recommends a 20 ppm TLV for 1,4 dioxane (an example of numerous dioxin compounds), lists it as being absorbed through the skin, and lists it as potentially carcinogenic as well as toxic to liver and kidneys. This is typical of health effects for dioxin/furan compounds. Care should be taken especially in sampling product from drums and wells known to contain detectable levels of dioxins. Emphasis will be on working outside in well-ventilated areas using proper PPE (as discussed later in this plan). There is a wide range of difference in sensitivity to regarding lethality in animals. The signs and symptoms of poisoning with chemicals contaminated with dioxins in humans, however, are analogous to those observed in animals.

Diesel Fuels

Diesel fuels are similar to fuel oils used for heating (fuel oils no. 1, no. 2, and no. 4). All fuel oils consist of complex mixtures of aliphatic and aromatic hydrocarbons. Diesel fuels predominantly contain a mixture of C10 through C19 hydrocarbons, which include approximately 64 percent aliphatic hydrocarbons, 1-2 percent olefinic hydrocarbons, and 35 percent aromatic hydrocarbons. Workers may be exposed to fuel oils through their skin without adequate protection, such as gloves, boots, coveralls, or other protective clothing. Breathing diesel fuel vapors for a long time may damage your kidneys, increase your blood pressure, or lower your blood's ability to clot. Constant skin contact (for example, washing) with diesel fuel may also damage your kidneys. The International Agency for Research on Cancer (IARC) has determined that residual (heavy) fuel oils and marine diesel fuel are possibly carcinogenic to humans (Group 2B classification).

Mercury

Mercury is a neurotoxic substance that can produce a wide range of health effects depending on the amount and timing of exposure. Mercury is a liquid at room temperature but vaporizes readily; in vapor form it is readily absorbed through the lungs. Repeated exposures to low levels of mercury vapor over long periods have been associated with tremors, irritability, impulsiveness, drowsiness, impaired memory and sleep disturbances. These effects may occur at lower levels of exposure in children than adults.

When mercury attaches to an organic molecule, it may be absorbed into the body through the digestive tract. Methyl mercury, which is produced naturally by certain bacteria, is such a molecule. It can cross the placenta and enter the brain, causing severe brain damage in fetuses. High mercury levels in fish consumed by pregnant women have been linked to severe brain damage and cerebral palsy in newborns. For more information: http://www.ilpi.com/safety/mercury.html.

Pentachlorophenol

PCP is a nonflammable crystalline solid that does not have an ionization potential and is therefore not detected by the PID. Pentachlorophenol exists as colorless or white crystals (when pure) with a sharp, phenolic odor when hot, but very little odor at room temperature. The odor threshold for pentachlorophenol is approximately 12 ppm.

As a wood preservative, it is commonly applied as a 0.1 percent solution in mineral spirits, No. 2 fuel oil, or kerosene. It is absorbed through the skin, and irritating to eyes, nose and mucous membranes. PCP is a potential carcinogen or listed as an animal carcinogen. When inhaled, it can cause cough, dizziness, headache, drowsiness, difficulty breathing and sore throat. It is also hazardous by ingestion (soil particles, etc.) causing abdominal cramps, diarrhea, nausea, vomiting and weakness. Penta has low volatility (VP at 77°F is 0.0001 mmHg) like the others, but often the combination of chemical odors in oils or heavily contaminated soils can cause transient nausea and headache. Penta (liquid) has an IDLH limit of 2.5 mg/m^3 based on acute toxicity data in humans. This may be a conservative value due to the lack of relevant acute toxicity data for workers exposed to concentrations above 2.4 mg/m^3. The OSHA PCP PEL TWA is 0.5 mg/m^3 with a skin notation.

Additional Hazards (Update in Daily Log)

Include evaluation of:

- Physical Hazards (equipment, traffic, tripping, heat stress, cold stress and others)
- Chemical Hazards (odors, spills, free product, airborne particulates and others present)
- Biological Hazards (snakes, spiders, dogs, other animals, poison ivy and others present)

Dust Control/Air Monitoring Plan

Because shallow soil samples will be collected using hand-excavation techniques (hand augers, shovels, etc.) and shallow soil is known to be contaminated with dioxins/furans and possibly PCP, dust control measures will be implemented to protect field representatives. Field representatives will observe site soil conditions prior to and during sampling activities. If site soil conditions are moist at the time of sampling and there is no visible dust, then dust suppression measures will not be required but field representative will wear proper PPE and avoid direct contact with soil. If dust is observed during sampling, the area actively being sampled with be wetted lightly with DI water to suppress the dust. Additionally, field representatives will work upwind if at all possible.

Field representatives will measure dust during sampling using a dust monitor and record readings in the daily field log. Measurements will be taken from the breathing zone during sampling.

Check Instrumentation to be Used

☐ Multi-Gas Detector (may include oxygen, carbon monoxide, hydrogen sulfide, lower explosive limit)

☒ Dust Monitor

☐ Other (i.e., detector tubes or badges) Please specify: Click here to enter text.

Check Monitoring Frequency/Locations and Type (Specify: Work Space, Borehole, Breathing Zone)

☐ Continuous during soil disturbance activities or handling samples

☐ 15 minutes

☐ 30 minutes

☒ Hourly

SITE CONTROL PLAN

An up-to-date site control plan will be developed before field activities begin to minimize employee exposure to hazardous substances and including the following: a Site Plan is included with the Work Plan. The hospital route map is included with this HASP.

Traffic or Vehicle Access Control Plans

The gate to the Site will be kept closed to restrict public vehicular and pedestrian access to the Site.

Site Work Zones

Exclusion zones will be established within approximately 10 feet around each boring or well during drilling/sampling. Only persons with the appropriate training will enter this perimeter while work is being conducted there.

Buddy System

Personnel on-Site should use the buddy system (pairs), particularly whenever communication is restricted. If only one GeoEngineers employee is on-Site, a buddy system can be arranged with subcontractor/ contractor personnel.

Site Communication Plan

Positive communications (within sight and hearing distance or via radio) should be maintained between pairs on-Site, with the pair remaining in proximity to assist each other in case of emergencies. The team should prearrange hand signals or other emergency signals for communication when voice communication becomes impaired (including cases of lack of radios or radio breakdown). In these instances, consider suspending work until communication can be restored; if not, the following are some examples for communication:

1. Hand gripping throat: Out of air, can't breathe.
2. Gripping partner's wrist or placing both hands around waist: Leave area immediately, no debate.
3. Hands on top of head: Need assistance.
4. Thumbs up: Okay, I'm all right; or, I understand.
5. Thumbs down: No, negative.
6. Extended fist: Stop.

Decontamination Procedures

Non-dedicated sampling equipment will be decontaminated with Liquinox™ soap and rinsed with distilled water prior to collecting any samples for analysis.

Personal decontamination consists of removing outer protective Tyvek clothing (if used), washing soiled boots, removing respirator (if used); hands and face will be washed in either a portable wash station or a bathroom facility in the support zone. Employees will perform decontamination procedures and wash prior to eating, drinking or leaving the Site. All disposable personal protective clothing (i.e., nitrile gloves) will be bagged with other miscellaneous waste and discarded in the appropriate refuse receptacle.

PERSONAL PROTECTIVE EQUIPMENT

PPE will consist of standard Level D equipment. Disposable PPE (gloves) will be placed into plastic trash bags and disposed as solid waste. Minimum level of protective equipment for the Site is Level D. After the initial and/or daily hazard assessment has been completed, select the appropriate PPE to preserve worker safety. Task-specific levels of PPE shall be reviewed with field personnel during the pre-work briefing conducted prior to the start of Site operations.

Half-face respirators will be kept on hand during field activities. If dust is observed within the work zone, use of the half-face respirator with a HEPA cartridge will be required.

Check Applicable Personal Protection Equipment to be Used	
X	Hardhat
X	Steel-toed boots
X	Safety glasses
X	Hearing protection
X	Rubber boots (if wet conditions)
Gloves (specify)	
X	Nitrile
	Latex
	Liners
	Leather
	Other (specify) ____________________________________
Protective clothing	
	Tyvek (if dry conditions are encountered, Tyvek is sufficient)
	Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue)
X	Cotton
X	Rain gear (as needed)
X	Layered warm clothing (as needed)
Inhalation hazard protection	

Check Applicable Personal Protection Equipment to be Used	
X	Level D
	Level C (respirators with organic vapor filters/ P100 filters)

Limitations of Protective Clothing

PPE clothing ensembles designated for use during Site activities shall be selected to provide protection against known or anticipated hazards. However, no protective garment, glove, or boot is entirely chemical-resistant, nor does any PPE provide protection against all types of hazards. To obtain optimum performance from PPE, Site personnel shall be trained in the proper use and inspection of PPE. This training shall include the following:

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures, or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.

Respirator Selection, Use and Maintenance

GeoEngineers has developed a written respiratory protection program in compliance with OSHA requirements contained in 29 Code of Federal Regulations (CFR) 1910.134. Site personnel shall be trained on the proper use, maintenance, and limitations of respirators. Site personnel that are required to wear respiratory protection shall be medically qualified to wear respiratory protection in accordance with 29 CFR 1910.134. Site personnel that will use a tight-fitting respirator must have passed a qualitative or quantitative fit test conducted in accordance with an OSHA-accepted fit test protocol. Fit testing must be repeated annually or whenever a new type of respirator is used. Respirators will be stored in a protective container.

Respirator Cartridges

If Site personnel are required to wear air-purifying respirators, the appropriate cartridges shall be selected to protect personnel from known or anticipated Site contaminants. The respirator/cartridge combination shall be certified and approved by NIOSH. A cartridge change-out schedule shall be developed based on known Site contaminants, anticipated contaminant concentrations, and data supplied by the cartridge manufacturer related to the absorption capacity of the cartridge for specific contaminants. Site personnel shall be made aware of the cartridge change-out schedule prior to the initiation of Site activities. Site personnel shall also be instructed to change respirator cartridges if they detect increased resistance during inhalation or detect vapor breakthrough by smell, taste, or feel although breakthrough is not an acceptable method of determining the change-out schedule. At a minimum, cartridges should be changed a minimum of once daily.

Respirator Inspection and Cleaning

The Site Safety and Health Supervisor shall periodically (i.e., weekly) inspect respirators at the project Site. Site personnel shall inspect respirators prior to each use in accordance with the manufacturer's instructions. In addition, Site personnel wearing a tight-fitting respirator shall perform a positive and negative pressure user seal check each time the respirator is donned to ensure proper fit and function. User seal checks shall be performed in accordance with the GeoEngineers respiratory protection program or the respirator manufacturer's instructions.

Facial Hair and Corrective Lenses

Site personnel with facial hair that interferes with the sealing surface of a respirator shall not be permitted to wear respiratory protection or work in areas where respiratory protection is required. Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the sealing surface of the respirator. Site personnel requiring corrective lenses will be provided with spectacle inserts designed for use with full-face respirators. Contact lenses should not be worn with respiratory protection.

ADDITIONAL ELEMENTS

Environmental Conditions

Working in either cold or hot environments can present many hazards to site personnel. The following sections provide guidance to site personnel on identifying symptoms and measures to prevent injuries related to cold or heat related stress.

Cold Stress Related Hazards

Working in cold environments can present many hazards to site personnel that can result in frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature). The combination of wind and cold temperatures increases the degree of cold stress experienced by site personnel. Site personnel shall use the following as a guide to the signs and symptoms of cold-related illnesses and measures to prevent the onset of cold-related injuries.

TABLE D-10. COLD-RELATED ILLNESS: SYMPTOMS AND FIRST AID

Disorder	Symptoms	Signs	Causes	First Aid
Hypothermia	Chills; pain in extremities; fatigue or drowsiness.	Euphoria; slow, weak pulse; slurred speech: collapse; shivering; unconsciousness; body temperature < 95f (35c).	Excessive exposure, exhaustion or dehydration, subnormal tolerance, drug/alcohol abuse.	Move to warm area and remove wet clothing. Modest external warming (external hear packs, etc.). Drink warm, sweet fluids if conscious. Transport to hospital.
Frostbite	Burning sensation at first. Coldness, numbness, tingling.	Skin color white or grayish yellow to reddish violet to black. Blisters. Response to touch depends on depth of freezing.	Exposure to cold, vascular disease.	Move to warm area and remove wet clothing. External warming (warm water). Drink warm, sweet fluids if conscious. Transport to hospital.

Disorder	Symptoms	Signs	Causes	First Aid
Frostnip	Possible itching or pain.	Skin color white.	Exposure to cold (above freezing) and dampness.	Similar to frostbite.
Trench Foot	Severe pain; tingling, itching.	Edema; blisters; response to touch depends on depth of freezing.	Exposure to cold (above freezing) and dampness.	Similar to frostbite.

Heat Stress Hazards

Working in hot environments can present many hazards to site personnel that can result in heat related illness such as heat rash, heat cramps, heat exhaustion or heat stroke. To prevent these illnesses site safety officers shall provide plenty of liquids (other than soda pop or coffee) to jobsite employees. Ideally, plain water is the best option and shall be provided. As an alternative a commercial electrolyte replacement mix may also be used as well.

As a general guideline when in hot weather, 1 gallon of liquids shall be provided per worker per day. In the course of a day's work in the heat, a worker may produce as much as 2 to 3 gallons of sweat. Because so many heat disorders involve excessive dehydration of the body, it is essential that water intake during the workday be about equal to the amount of sweat produced. Therefore, a worker should drink 5 to 7 ounces of fluids every 15 to 20 minutes to replenish the necessary fluids in the body. Heat acclimatized workers lose much less salt in their sweat than do workers who are not adjusted to the heat. Keeping workers hydrated in a hot outdoor environment requires more water be provided than at other times of the year.

Adequate shelter shall also be available to protect personnel from heat and direct sunlight in order to increase physical efficiency and decrease the likelihood of accidents. Field tarps or canopies can be used where other shaded rest areas are not available. Cooling fans and ventilation can help workers stay cool.

Site personnel shall use the following as a guide to the signs and symptoms of heat-related illnesses and the measures to prevent the onset of heat-related injuries.

TABLE D-11. HEAT-RELATED ILLNESS: SYMPTOMS AND FIRST AID

Heat-Related Illness	Symptoms	First Aid
Heat Fatigue	Weakness; impaired motor skills; reduced ability to concentrate.	Take a short break in a cooler area. Pushing yourself to work through the condition can lead to a more serious illness.
Heat Cramps	Painful muscle spasms caused by salt imbalances in the body because of sweating.	Drinking carbohydrate electrolyte replacement liquids may not eliminate the pain, but helps during recovery. Prevent by drinking a small cup of water every 15 to 20 minutes – even if you aren’t thirsty.
Heat Rash	Irritation, especially where skin is wet with sweat or clothing is tight. Can lead to infection.	Move to cooler area. Wash and change clothing.

Heat-Related Illness	Symptoms	First Aid
Heat Collapse	A person suddenly faints. Happens when the brain doesn't get enough oxygen because the blood has pooled in the victim's arms or legs.	Remove the victim to a cooler area to lie down during recovery. Do not give liquids to an unconscious person.
Heat Exhaustion	Headache, nausea, dizziness, thirst and giddiness. Can lead to vomiting and/or fainting. Victim has pale, clammy (moist) skin.	Remove victim to a cool, shaded area. Give water if the victim is alert and not nauseated. Don't leave the person alone. Cool the victim with a spray mist or wet cloth. If the person does not feel better in a few minutes, call for emergency help.
Heat Stroke	Victim has dry, pale skin (no sweating) or hot, red skin (looks like a sunburn) and is confused. Victim may have seizures and pass out.	Call for emergency help. Remove the victim to lie down in a cool, shaded area. Don't leave the person alone. If the victim is alert and not nauseated, give water. Cool the person. Place ice packs under the arm pits and in groin area.

Heat Stress Prevention

Site specific procedures for preventing heat stress include: provide shade, water and frequent breaks.

The State of Washington and the State of California have regulations that provide specific requirements for handling employee exposure to heat stress. GeoEngineers' program complies with both sets of requirements and will be implemented in all areas where heat stress is identified as a potential health issue.

The Washington State requirements for preventing heat stress apply to outdoor work environments from May 1 through September 30, only when employees are exposed to outdoor heat at or above an applicable temperature listed in Table D-12. To determine which temperature applies to each worksite, select the temperature associated with the general type of clothing or PPE each employee is required to wear.

GeoEngineers is prepared to supply at least one quart of drinking water per employee per hour. When employee exposure is at or above an applicable temperature listed in Table D-12 below, Project Managers will ensure that:

- A sufficient quantity of drinking water is readily accessible to employees at all times; and
- All employees have the opportunity to drink at least one quart of drinking water per hour.

TABLE D-12. OUTDOOR TEMPERATURE ACTION LEVELS

All other clothing	89°
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°
Non-breathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°

Emergency Response

Indicate what Site specific procedures you will implement.

- Personnel on-Site should use the "buddy system" (pairs).
- Visual contact should be maintained between "pairs" on-Site, with the team remaining in proximity to assist each other in case of emergencies.
- If any member of the field crew experiences any adverse exposure symptoms while on-Site, the entire field crew should immediately halt work and act according to the instructions provided by the SSO.
- Wind indicators visible to all on-Site personnel should be provided by the SSO to indicate possible routes for upwind escape. Alternatively, the SSO may ask on-Site personnel to observe the wind direction periodically during Site activities.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the project manager, and reevaluation of the hazard and the level of protection required.
- If an accident occurs, the SSO and the injured person are to complete, within 24 hours, an Accident Report for submittal to the project manager, the HSM and human resources. The project manager should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

Contact with Subsurface Site Utilities

If buried utilities are contacted during subsurface exploration activities, stop work immediately, contact the utility company immediately, and contact the project manager. After completing the one call utility locate, attach the list of identified utilities and contact numbers to this HASP.

A sampling and monitoring plan for Drums and Containers

N/A: IDW will be characterized using RI sample results.

Site control measures

Listed above in “Site Control Plan.”

Spill containment plans (Drum and container handling)

Investigation derived waste will be drummed and stored in a location approved by the property owners pending chemical analytical results. Drums will be labeled with applicable information and secured.

Standard operating procedures for sampling, managing, and handling drums and containers

Drums and containers used during the RI shall meet the appropriate DOT, OSHA and EPA regulations for the waste that they contain. Site operations shall be organized to minimize the amount of drum or container movement. When practicable, drums and containers shall be inspected and their integrity shall be ensured before they are moved. Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. Before drums or containers are moved, all employees involved in the transfer operation shall be warned of the potential hazards associated with the contents.

Drums or containers and suitable quantities of proper absorbent shall be kept available and used where spills, leaks or rupture may occur. Where major spills may occur, a spill containment program shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred. Fire extinguishing equipment shall be on hand and ready for use to control incipient fires.

MISCELLANEOUS

Personnel Medical Surveillance

GeoEngineers' employees are not in a medical surveillance program as they do not fall into the category of "Employees Covered" in OSHA 1910.120(f)(2) which states a medical surveillance program is required for the following employees:

1. All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;
2. All employees who wear a respirator for 30 days or more a year or as required by state and federal regulations;
3. All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and
4. Members of hazardous materials (HAZMAT) teams.

Sanitation

Basic sanitation facilities will be provided during drilling/soil sampling activities.

Lighting

Fieldwork will be conducted during daylight hours.

Excavation, Trenching and Shoring

All employees working on project sites where there is an excavation greater than 4 feet in depth shall be trained in excavation safety and shall utilize safe procedures. OSHA designates a 5-foot-depth for instituting excavation safety procedures; however, GeoEngineers will use the more conservative depth of 4 feet as specified by states such as Washington, Oregon and California. This program is for the protection of employees while working in excavations; however, employees should not enter excavations if there is an alternative.

GeoEngineers employees often do not have stop work authority on projects controlled by other contractors. However, any GeoEngineers employee, regardless of job title, working in the field will be responsible for contacting the PM if they observe practices on the job site that are serious safety violations that are not under their control. They will document the unsafe practices and will contact the Site safety coordinator as identified by the client, if applicable. If a client representative is not on-site, the PM, once notified, will contact the client. This action establishes GeoEngineers' commitment to site health and safety on all job sites as our duty of care to the public, contractors and clients.

GeoEngineers is responsible for its subcontractors and will also be providing inspections and corrections of any work that subcontractors perform around excavations.

Other programs

None.

Documentation to Be Completed for HAZWOPER Projects

NOTE: The Field Log is to contain the following information:

- Updates on hazard assessments, field decisions, conversations with subs, client or other parties.
- Air monitoring/calibration results; personnel, locations monitored, activity at the time of monitoring (if performed).
- Actions taken.
- Action level for upgrading PPE and rationale.
- Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).

Required forms:

- Field Log.
- Health and Safety Plan acknowledgment by GeoEngineers' employees (Form 2).
- Contractors Health and Safety Plan Disclaimer (Form 3).
- Conditional forms available at GeoEngineers' office: Accident Report.

APPROVALS

1. Project Manager ________________________ ____________
   Date

2. Plan Approval ________________________ ____________
   PM Signature Date

3. Health & Safety Officer Wayne Adams ____________
   Health and Safety Program Manager Date

FORM 1
HEALTH AND SAFETY PRE-ENTRY BRIEFING
COLVILLE POST AND POLES SITE

Inform employees, contractors and subcontractors or their representatives about:

- The nature, level and degree of exposure to hazardous substances they're likely to encounter;
- All site-related emergency response procedures; and
- Any identified potential fire, explosion, health, safety or other hazards.

Conduct briefings for employees, contractors and subcontractors, or their representatives as follows:

- A pre-entry briefing before any site activity is started; and
- Additional briefings, as needed, to make sure that the Site-specific HASP is followed.

Make sure all employees working on the Site are informed of any risks identified and trained on how to protect themselves and other workers against the Site hazards and risks.

Update all information to reflect current sight activities and hazards.

All personnel participating in this project must receive initial health and safety orientation. Thereafter, brief tailgate safety meetings will be held as deemed necessary by the Site Safety and Health Supervisor.

The orientation and the tailgate safety meetings shall include a discussion of emergency response, Site communications and site hazards.

Date	Topics	Attendee	Company Name	Employee Initials

FORM 2
SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT
COLVILLE POST AND POLES SITE

(All GeoEngineers' Site workers shall complete this form, which should remain attached to the Safety Plan and filed with other project documentation).

I hereby verify that a copy of the current Safety Plan has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on Site. I agree to comply with all required, specified safety regulations and procedures.

Print Name	Signature	Date

FORM 3
SUBCONTRACTOR AND SITE VISITOR SITE SAFETY FORM
COLVILLE POST AND POLES SITE

I verify that a copy of the current Site Safety Plan has been provided by GeoEngineers, Inc. to inform me of the hazardous substances on Site and to provide safety procedures and protocols that will be used by GeoEngineers' staff at the Site. By signing below, I agree that the safety of my employees is the responsibility of the undersigned company.

Print Name	Signature	Firm	Date

Have we delivered World Class Client Service?

Please let us know by visiting **www.geoengineers.com/feedback**.

GeoEngineers