Upper Columbia River
Upland Soil Sampling Study
Stevens County, Washington

Prepared for
Washington State
Department of Ecology

May 6, 2013
17800-36

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UPPER COLUMBIA RIVER
UPLAND SOIL SAMPLING STUDY

1.0 INTRODUCTION

This report provides an initial assessment of surface and shallow subsurface soil conditions in a part of the upper Columbia River valley near the United States/Canada border (Figure 1). The study area covers a limited portion of northeast Washington State where severe vegetation damage and impairment was documented in the 1920s and 1930s. These historical vegetation impacts, affecting primarily timbered lands, were caused by smelter stack emissions from past operations of the smelter in Trail, British Columbia (International Joint Commission [IJC], 1938 and 1941). Sulfur dioxide (SO_2) was the primary cause for the historical vegetation impacts.

Fine particulates and aerosols containing heavy metals also were discharged from the smelter stacks to the atmosphere, and were deposited downwind from the smelter. This soil sampling study initiates an evaluation of the distribution of heavy metals in upland soil from within a sub-portion of the previously defined SO_2 impact area. Information from this study builds upon other previous soil studies and investigation work performed in the United States and Canada, which have shown enrichment of certain metals sourced primarily from the Trail BC smelter.[1]

The two primary objectives of this study were to:

- Collect representative surface and shallow subsurface soil samples from a portion of northeast Washington near the United States/Canada border and analyze these samples for smelter-related heavy metals and other selected soil parameters.

- Evaluate potential spatial patterns and statistical variability of smelter-related metals concentrations in study area soils and assess potential correlation to historically documented SO_2 impact areas.

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[1] Various sources cited in this report have referred to hazardous substances in the smelter emissions as metals or as heavy metals. For the purposes of this report, these terms are interchangeable and include metalloids such as arsenic.

Upland soil sampling was conducted in northern Stevens County, Washington. The study area is generally defined as an approximately 15- to 20-square-mile area extending roughly 4 miles east and 6.5 miles west of the Columbia River, within approximately 2 miles of the United States/Canada border (Figure 1).

2.0 SITE BACKGROUND

The smelter in Trail, British Columbia, has operated for over 100 years, and today is one of the largest fully integrated lead-zinc smelters in the world. The smelter is on the western bank of the Columbia River approximately 7 miles due north (or approximately 10 river miles upstream) of the United States/Canada border. After the Trail smelter began operations in 1896, capacity and output steadily increased for several decades. In 1925 and 1927, new stacks were constructed and the smelter greatly increased daily smelting of lead and zinc ores and associated stack emissions (IJC 1938 and 1941).

Smelter stack emissions consisting of gases and particulates were transported to the south and southeast by prevailing winds, and were carried across the international border into Washington State. Visible areas of forest and orchard tree injury caused by sulfur dioxide (SO_2) were mapped by the US Department of Agriculture (USDA) and Canadian representatives starting in 1929 (IJC 1938 and 1941; Fraser et al. 2012).

As stated by the IJC Trail Tribunal report, "As early as 1925 (and there is some evidence earlier) suggestions were made to the Trail Smelter that damage was being done to property in the northern part of Stevens County. The first formal complaint was made, in 1926, by one J. H. Stroh, whose farm was located a few miles south of the boundary line." In a discussion of "fumigation" transport, the Tribunal also noted "... that the concentrations of sulphur dioxide fall off very rapidly from Trail to a point about 16 miles downstream from the Smelter, or 6 miles from the boundary line, measured by the general course of the river; and that at distances beyond this point, the concentrations of sulphur dioxide is lower and fall off more gradually and less rapidly." (IJC 1938 and 1941)

The tribunal archives include forest injury maps which graphically delineate the observed areal extent of historical SO_2 related impacts. Figures 2 and 3 show footprint information from the timber injury map (Hedgcock 1936), established as part of the IJC Tribunal (Fraser et al. 2012).

More recently, work by the Trail Lead Program documented widespread metal particulate impacts from smelter air transport in the Trail community (Hilts, S. R. 2001). The Trail ecological risk assessment further traced metals contamination along the Columbia River valley corridor southward to the international border (Appendix A). In a description of historical smelter operations, the 2001 Trail Lead Program report states:

> "*Between 1896 and 1916, smelting operations were primitive at best...smelting operations were a tremendous source of particulate contamination. In the 1920s, fume collectors, acid plants and tall stacks were constructed to remove sulphur dioxide and disperse emissions from the plants.*"

In a description of more contemporary conditions, the 2001 Trail Lead Program report states:

> "*Contamination of the community has occurred through aerial transport of pollutants. Lead bearing particles are introduced to the atmosphere by stack emissions, upsets in the blast furnaces (prior to construction of the KIVCET smelter in 1997), other fugitive process emissions, or by general dust picked up by the wind....Airborne contaminants are either removed from the air by precipitation or dispersed by air movement until they fall to the ground. The deep valley of the Columbia River at Trail provides a channel which influences the dispersion of air emissions from the smelter....Dispersion of smelter emissions by wind can occasionally result in high levels of fine lead particles suspended in the air several kilometers from the smelter.*"

The atmospheric dispersion pattern for particulates and aerosols away from the smelter stack is expected to exhibit some partial spatial correlation relationships with the historic SO_2 transport dispersion pattern. In other words, metals transport should, in part, show a correlation to the vegetation impact areas documented by the IJC in the 1920s and 1930s. Therefore, areas of confirmed vegetation impacts from SO_2 exposure would be expected to show elevated heavy metal concentrations in the shallow soil profile where these metals would initially sorb and accumulate. This hypothesis, in part, guided the development of the study area chosen for this initial upland soil evaluation.

Several past soil sampling studies support the expected positive correlation between historical SO_2 vegetation impacts and contemporary evidence of elevated heavy metals within the shallow soil profile.

Data and information generated in support of the Canadian Trail Smelter ecological risk assessment and other smelter studies (McMartin et al. 1999; Intrinsik 2011; Glass 2003) confirm that elevated concentrations of heavy metals are typically within the top 3 to 6 inches of the soil column. The Trail study area included soil samples collected as far as 13 km (8miles) south-southeast of the

Trail smelter. The more common Trail smelter-related metals evaluated in soils north of the border included arsenic, cadmium, lead, mercury, and zinc (Cantox 2001a; Cantox 2003).

Recently, U.S. Customs and Border Protection built a new Land Port of Entry facility at the Boundary/Waneta border crossing station. The station is located approximately 10 miles north of Northport, Washington, along the eastern edge of the Columbia River Valley. During construction, shallow soils (typically within the upper 6 inches) were found to be contaminated with heavy metals. Heavy metal concentrations in some of the construction areas were high enough to require remediation to comply with State of Washington soil cleanup standards. Arsenic, lead, and cadmium were measured as high as 73, 1,800, and 17 mg/Kg, respectively. The investigators concluded the nature and location of the observed contamination was consistent with atmospheric emissions from the Trail smelter.

Trail smelter terrestrial assessment work conducted exclusively within Canada (Cantox 2001b; Cantox 2003) demonstrated that heavy metals enrichment in surface soil, and associated terrestrial ecological impacts, was highest in the immediate vicinity of the smelter and declines outward with increasing distance. Factors and possible correlations such as elevation, topographic features (sheltering, aspect), and distance from Trail were evaluated. While these factors were thought to influence atmospheric transport of contaminants, no strong relationships were observed. Higher metal concentrations did, however, tend to occur in relatively lower elevations of the valley and along hill slopes that face toward (rather than away from) the smelter. Review of the soil data from these studies suggests that a combination of river valley orientation, mountainous terrain, and seasonal atmospheric patterns (including both near-surface and high elevation airmass movements) exert the most influence over the transport, dispersion, and deposition of smelter-related stack emissions. Dispersion patterns become more complex as distance increases beyond the smelter.

In 2011, ICF International (ICF) evaluated historical data and documents from studies of potential environmental impacts from the Teck-Cominco facility in Trail, British Columbia (ICF 2011). ICF's review of the meteorological data set re-affirmed the historically-documented wind patterns. The IJC Tribunal records established that air emissions from the Trail facility were transported southward down the Columbia River Valley into Stevens County in response to typical air flow patterns and air mass movements within this region. Other investigators performing Trail area smelter studies discuss similar wind patterns (Goodarzi et. al. 2001)

ICF used a regional-scale Community Multiscale Air Quality (CMAQ) modeling approach in 2011 to preliminarily examine the atmospheric dispersion pattern for individual metals emitted from the Trail smelter. The model integrated reported stack emission data from 1990 (ICF 2011). The ICF work predicted dispersion of various smelter-related metals (including mercury, lead and zinc) over a broad region including the Upper Columbia River Basin and parts of the Colville Indian Reservation.

In 2011, a Washington State Department of Ecology (Ecology)-sponsored study of upland lakes in northeast Washington reported the likely presence of smelter impacts to lakes located within the upper Columbia River Valley. Elevated metals concentrations are present in upland lake sediment at levels that may adversely affect organisms that inhabit these upland water bodies (Johnson et al. 2011 and 2011b; EPA 2008). The 2011 Ecology study also indicated a potential for localized metal enrichment around a smaller historical smelter operation (Le Roi smelter) located in Northport, Washington. In 2004, the U.S. Environmental Protection Agency (EPA) performed targeted cleanup of contaminated soil within the immediate footprint of the historical smelter. This EPA-sponsored work also included emergency residential cleanup actions in parts of the Northport community (EPA 2005).

3.0 DESCRIPTION OF FIELD INVESTIGATION

The technical basis and rationale explaining the purpose, objectives, data quality objectives, field sampling procedures, laboratory analytical methods, sampling locations and specific QA/QC criteria associated with this study are described in the working field draft and final *2012 Sampling and Analysis Plan and Quality Assurance Project Plan, Upper Columbia River, Upland Soil Sampling Study, Washington State* (Hart Crowser 2012a and 2012b). Soil samples were collected in general accordance with the procedures described in the combined Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP, Appendix B).

The boundaries and areal extent of the current initial field investigation area were influenced by several factors and considerations, including:

- Previously documented SO_2 vegetation impacts;
- Identifying areas in the Columbia River Valley, both north and south of the United States/Canada border, where elevated soil metals were observed as part of previous studies or investigations (see Section 2);
- Accessing sites and property ownership constraints;

- Assessing a range of variables such as elevation, slope, and aspect, which could affect the deposition and distribution of airborne smelter emissions, and corresponding metals concentrations in the upper few inches of the soil profile;

- Considering soil type and underlying geology as variables that could affect metal concentrations in the local soil profile; and

- Targeting minimally disturbed soils.

A total of 120 individual surface soil composite samples, and 13 vertical profile soil samples (including discrete samples from four designated depth horizons) were targeted in 13 irregularly shaped subareas within approximately 2 miles of the United States/Canada border (Figures 3 and 4). Each subarea was approximately 1 to 2 square miles. The total study area covered approximately 15 to 20 square miles and extended roughly 4 miles east and 6.5 miles west of the Columbia River. Figure 4 shows the major soil units within the study area as mapped by the Natural Resources Conservation Service (1982), and Figure 5 shows the underlying geology in the study area as mapped by the Washington Department of Natural Resources (DNR) Division of Geology and Earth Resources (2010). The defined sampling areas consisted mostly of privately-owned, or state-managed timber lands.

In each of the 13 subareas, eight to ten surface soil samples were collected A four-point composite approach was used to collect surface soil samples from within an approximately 20-foot radius of a fixed station point. Surface soil included the upper 3 inches of the soil horizon, below any non-decomposed surface litter. The surface sample locations were geographically distributed within each subarea to encompass varying soil types, underlying geology, elevation, slope, and aspect. Sample location information including coordinates, soil type, underlying geology, elevation, slope, and aspect are summarized in Table 1.

In each of the 13 subareas, a shallow borehole up to 2 feet deep also was hand excavated to evaluate vertical changes in metal concentration within the shallow soil column. Vertical profile samples included soil material from four discrete depth intervals: 0 to 3 inches; 3 to 6 inches, 6 to 12 inches, and 12 to 24 inches. Field sample collection logs, photographs, and other documentation also are presented in Appendix C; soil descriptions for subsurface profile samples are presented in Table C-1.

In summary, the SAP/QAPP plans anticipated:

- Collecting 120 composite surface soil samples from the 13 subareas;
- Collecting 13 secondary composite surface soil samples, one from each subarea within a 20-foot radius of the primary sample, to provide an estimate of short range variability; and
- Collecting four vertical soil profile samples at 13 locations, one from each subarea.

All samples identified in the SAP/QAPP were collected except for:

- SA5-6C – Surface Sample. Local law enforcement reported grizzly bear activity near the site.
- SA12-5C – Surface Sample. Local law enforcement reported grizzly bear activity near the site.
- SA10-2P-4 – Vertical Profile. Bedrock was encountered at 12 inches below the ground surface so the vertical profile sample could not be collected from 12 to 24 inches deep.

Additional details on sample location protocols and soil sampling procedures are provided in the SAP/QAPP (Appendix B).

4.0 ANALYTICAL RESULTS

4.1 Sample Analysis

Samples were prepared (sieved) and analyzed by Analytical Resources Inc. (ARI) laboratory in Tukwila, Washington. All soil samples were sieved (U.S. Standard No. 10 screen) to measure the 2 millimeter and finer size fraction. Soil samples were analyzed for:

- Total EPA target analyte list (TAL) metals (silver, aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, lead, potassium, sodium, antimony, selenium, thallium, vanadium, zinc) by EPA Methods 6010B and 6020, as required to meet quantitation limits specified in the SAP;
- Total mercury by EPA Method 7471A;
- Total Organic Carbon (TOC) by Plumb, 1981;
- Soil pH by EPA Method 9045; and
- Total solids by Standard Methods (SM) 2540B.

4.2 Data Quality Review

A data quality review of the chemical analytical results was performed to assess:

- The adequacy of the reported detection limits in achieving the project screening levels for soil;
- The precision, accuracy, representativeness, and completeness of the data; and
- The usability of the analytical data for project objectives.

The data quality review followed the format of the EPA National Functional Guidelines for Inorganic (EPA 2010) Superfund Data Review, modified to include project-specific requirements and criteria. Data were determined to be acceptable with only minor qualification, which did not affect data usability.

The data quality review findings and laboratory reports are presented in Appendix D.

4.3 Sample Results

Surface soil and vertical profile analytical results are presented in Appendix D. In addition, subarea-specific results are provided in Tables D-1 through D-13. Discussions of summary statistics, statistical analysis, and sample analytical results are presented in Section 5.

5.0 DATA EVALUATION AND DISCUSSION

Statistical evaluation of data was performed using ProUCL 4.1 software.

5.1 Summary Statistics

Summary statistics for each of the 13 subareas were calculated on raw (untransformed) full datasets using ProUCL's summary statistics module. Percentiles were calculated using the full datasets with nondetects set equal to the reporting limit.

Surface soil metal concentration summary statistics and percentiles by individual subarea are presented in Appendix E, Tables E-1 and E-2, respectively. Combined soil profile metal concentration summary statistics and percentiles for the 13 subareas are presented by depth interval in Appendix E, Tables E-3 and E-4, respectively.

5.2 Multivariate Analysis

Multivariate data analyses are statistical techniques for simultaneously analyzing data with many variables to identify patterns and relationships among the variables. The power of these methods is that they rely on the multidimensional patterns in the data to identify sources, with few underlying assumptions. These methods are widely used in environmental forensic investigations for identification of contaminant sources and apportionment (Johnson et al. 2007).

Principal components analysis (PCA), one of many multivariate statistical methods available, was performed to determine if there were certain correlations among metals and other variables including soil type, elevation, slope, and aspect. PCA is a technique to combine correlated variables in a dataset and create a new, reduced set of variables (factors) that are linear combinations of the original variables. The relative contribution of each original variable to each component or factor is typically referred to as the "loading of variable x to Factor A." The loading of the individual metals to each factor serves as a geochemical signature. For example, a factor indicating high smelter metals content would have a high loading in metals associated with smelter emissions and a low loading for other, non-smelter related metals. A specific soil sample with a high score, or value, for this smelter factor can then be interpreted as having a high smelter input.

While the total number of PCA factors derived is equal to the number of original variables, the observed variability in soil metal concentrations is generally explained by the first few PCA factors. The first three PCA factors account for 93 percent of the observed variability in samples collected as part of this investigation. Increasing the number of factors evaluated or plotted has no impact on correlations among variables or statistical conclusions and, therefore, a detailed evaluation of a large number of factors was not performed. The metal loadings for all PCA factors are presented in Appendix E in Table E-5.

PCA correlation matrices and factor loading plots assist in evaluating correlations among variables. PCA correlation matrices quantitatively show the degree of correlation among variables. A correlation coefficient of 1.0 is a perfect correlation; a coefficient of 0.0 indicates no correlation among variables; and a coefficient of -1.0 demonstrates a negative correlation. The PCA loadings correlation matrix is presented in Appendix E on Table E-6.

Factor loading plots provide a visual representation of correlations among variables. Variables that plot close to one another in principal components (factor) space are strongly correlated while variables plotted further apart are less correlated.

In general, as defined in section E.3, there are moderate to strong metal-to-metal correlations among arsenic, cadmium, lead, mercury, silver, thallium, and zinc—all of which are expected smelter-related metals (Cantox 2003; Johnson et al. 2010). Correlations for metals are presented visually on the PCA loadings plots (Figures 6 and 7).

A report prepared by the Geological Survey of Canada (Goodarzi et al. 2001) postulated that organic carbon content may influence the spatial variation of soil metal concentrations. This investigation found only a moderate correlation between organic carbon and soil metal concentrations (Table E-6 and Figure 7).

Also, no notable statistical correlation was found between metal concentrations and elevation, aspect, slope, or soil type for this data set (Table E-6 and Figure 6). One or more of these factors may potentially correlate to metals deposition beyond the areas evaluated by this study. As additional soil data is obtained from a broader area, and/or the data from this study is pooled with similarly collected soil data from outside the study area, statistically significant correlations between these variables may be identified.

5.3 Surface Soil Results

5.3.1 pH and TOC

The soil sample analysis included pH and TOC in the composited surface soil samples and the discrete vertical soil profile samples. The observed range of values associated with shallow composite surface soil (0 to 3 inches) samples is discussed below.

pH

Surface soil is moderately to slightly acidic with pH ranging from 4.69 to 6.79. The range of subarea mean pH is 5.59 to 6.27 percent, while the lower 10th percentile concentrations range from 5.21 to 6.11 percent.

TOC

Surface soil TOC concentrations range from 1.2 to 23.4 percent and primarily reflect the amount of decomposed organic matter (vegetation and forest duff) in the samples. The range of subarea mean TOC ranges from 3.8 to 9.7 percent and the 90th percentile concentrations range between 6.3 and 14.5 percent.

5.3.2 Inorganics

Figures 8 through 12 present concentrations of selected surface-soil metals (arsenic, cadmium, lead, mercury, and zinc). The map view for these five metals along with subarea box plot patterns (Appendix E) indicate:

- Surface soil metal concentrations in the sampled areas generally are highest closest to and along the Columbia River Valley corridor. Concentrations of the five smelter-related metals depicted on Figures 8 through 12 appear to consistently decline with increasing lateral (general east-west) distance away from the river valley corridor.

- Highest surface soil metal concentrations appear to overlap with historically documented maximum vegetation impact areas attributed to historical smelter-related SO_2 emissions (see Figures 2 and 3, sampling locations with timber injury map overlay).

5.4 Surface Soil Variability

5.4.1 Field Variability

Short-range metal concentration variability was assessed by collecting two nearby surface soil samples from each of the 13 subareas. After the primary four-point composite sample points were identified within a 20-foot radius, a second composite sample was collected by rotating the primary sample locations 45 degrees clockwise. The average relative percent difference (RPD) between primary and secondary samples ranged from 0.0 to 42.6 percent. RPDs for the full set of individual primary and secondary samples from within each of the 13 subareas ranged from 0 to 118 percent. In general, the highest variability for most metals was observed in SA-11. Detailed results showing RPDs for each metal by subarea are presented in Appendix E, Table E-7.

5.4.2 Subarea Surface Soil Variability

Statistics for the range and variability of pooled surface metal results by subarea are summarized in Tables E-1 and E--2 of Appendix E and are presented visually in box and whisker plots on Figures E-1 through E-23. The subarea-specific ranges and variability for arsenic, cadmium, lead, mercury, silver, thallium, and zinc—all of which are expected smelter-related metals (Cantox 2003; Johnson et al. 2010) are summarized in Table 2.

5.5 Soil Profile Results

Depth-specific soil samples from the upper 24 inches of the soil column were collected at 12 of the 13 subareas. The vertical profile from subarea SA-10 encountered bedrock material at approximately 12 inches deep (successful samples were collected at 0 to 3 inches, 3 to 6 inches, and 6 to 12 inches). Soil descriptions for subsurface profile samples are presented in Appendix C in Table C-1. Soil profile concentrations for arsenic, cadmium, lead, mercury, and zinc, are presented graphically on Figures 12 through 16, respectively. These plots show metal concentrations at each depth-specific interval within each of the 13 subareas. Calculated mean and median concentrations for the 8 to 10 individual surface soil composite samples collected within each corresponding subarea also are included for comparison purposes.[2]

In general, metal concentrations at any given sampled profile location are typically highest in the uppermost (0 to 3 inches deep) discrete sampling interval and decrease with depth. On a metal-by-metal basis, this pattern of surface soil metals enrichment was observed:

- At 9 of 13 stations for arsenic;
- At 12 of 13 stations for cadmium;
- At 12 of 13 stations for lead;
- At 11 of 13 stations for mercury; and
- At 11 of 13 stations for zinc.

The calculated mean and median concentration values for the composite surface soil samples (0 to 3 inches deep) also are higher, in most instances, than the deeper interval results (6 to 12 inches and 12 to 24 inches). At some locations, however, for certain metals the zone of maximum metals enrichment extends below the uppermost 3 inches of the soil column. These results indicate that at any given location, enrichment can occur in lower (deeper) soil horizons. Variability from location to location is demonstrated by the results.

Taken together, these soil sampling results consistently demonstrate preferential enrichment of the shallow soil horizon with smelter-related metals. This

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[2] Profile results for subarea SA-10 exhibited greater metals enrichment than other subareas. Metal concentrations in the soil profile sample for subarea SA-10 were well above mean and median surface soil concentrations for the subarea. The SA-10-2 profile sample was dark brown, slightly silty gravel with abundant organic material (30.6 percent TOC, above average subarea values; see Appendix C).

concentration pattern is similar to conditions observed by other investigators (McMartin et al. 1999; Hilts 2001; Intrinsik 2011; Glass 2003) who have examined metal distribution and enrichment patterns near other smelter facilities in the United States and Canada.

5.6 Subsurface Soil Profile Variability

Summary statistics and percentiles for pooled soil profile metal concentrations are presented by depth interval in Appendix E in Tables E-3 and E-4.

5.6.1 Concentration and Variability by Depth Intervals

Pooled soil profile concentrations for arsenic, cadmium, lead, mercury, and zinc are presented graphically by depth interval on Figures E-24 through E-28, respectively.

As discussed in Section 5.5, the highest soil metal concentrations and greatest variability are observed in the shallowest (0 to 3 inch depth) profile soil samples with concentrations and variability decreasing with depth. This pattern is consistent with smelter impacts to shallow soil, with lesser impacts to deeper native soil.

5.6.2 The 12- to 24-Inch Depth Interval Samples

Concentration ranges and variability for arsenic, cadmium, lead, mercury, and zinc in the pooled 12 to 24 inch depth profile samples are summarized below:

Soil metal concentrations from the deeper subsurface horizon intervals suggest less variability than surface soil and are believed to often approach naturally occurring, pre-industrial soil metal concentrations that are found in this portion of northeast Washington (see section 5.8).

5.7 Relative Magnitude of Metals Enrichment in Surface Soils

The vertical soil profile results were used to compute the magnitude of metal enrichment in the shallow (0 to 3 inches) soil horizon relative to deeper soil. The surface soil enrichment (enrichment ratio) was calculated on a metal-by-metal basis for each subarea. The enrichment ratio is computed as the mean composite surface soil (0 to 3 inches) concentration for each of the subareas divided by the mean concentration of the 12 available samples from the12- to 24-inch soil profile. The 12- to 24-inch soil profile mean was calculated using the data distribution with the best fit correlation coefficient from ProUCL goodness of fit (GOF) calculations (Appendix E Table E-8).

Arsenic concentrations best fit a normal distribution and, therefore, the arithmetic mean was used to calculate arsenic enrichment ratios. Cadmium, lead, mercury, and zinc concentrations best fit lognormal distributions and the geometric mean was used to calculate enrichment ratios for these metals. In practice, there was little difference between the arithmetic and geometric means. The best fit data distributions, arithmetic means, and geometric means are summarized in Table E-9.

An example map view of the lead surface soil enrichment ratios for all shallow soil sample locations within the study area is presented on Figure 18. Similar presentations for arsenic, cadmium, lead, mercury, and zinc are provided in Appendix E on Figures E-29 through E-32. The computed range of metal enrichment ratios for five smelter-related metals is summarized below.

- Arsenic: ~1 to 11times higher
- Cadmium: ~2 to 135 times higher
- Lead: ~3 to 171 times higher
- Mercury: ~1 to 33 times higher
- Zinc: ~1 to 23 times higher

The degree of maximum enrichment for cadmium and lead is notably higher than the enrichment for the other three metals evaluated. While not evaluated in detail here, additional metals results such as antimony and thallium also indicate apparent enrichment. Surface soils east and west of the river, along the lateral limits of the study area, show strong evidence of widespread metal enrichment. From a spatial perspective, higher surface soil metal enrichment is broadly evident in areas in or adjacent to the Columbia River Valley corridor.

5.8 Comparison to Regional Soil Study Results and Background Values

Table 4 compares the shallow surface soil results from this study to previously reported regional soil background values. This includes a 1994 eastern Washington soil study (Ecology 1994), and an assessment of geochemical background from the National Uranium Resource Evaluation (NURE) program specific to the Upper Columbia area performed by Church Geoscience Consulting (Church 2010). The NURE dataset applied by Church is composed of stream, sediment, and soil samples and were conservatively sieved to <149 micron. In addition, Table 4 also includes median and 90th percentile metal values for the pooled set of soil profile samples from this study, collected from the 12- to 24-inch depth interval. Median and 90th percentile concentrations were calculated using ProUCL 4.1.

The comparative values in Table 4 further demonstrate concentration enrichment for several smelter-related metals (including arsenic, cadmium, lead, mercury, zinc) in the shallow soil horizon compared to typical soil background values for northeast Washington, and to corresponding subsurface (>12 inch depth) soil metal concentrations typically present within the study area. As discussed earlier, concentrations of other smelter-related metals including antimony and thallium also show apparent enrichment.

6.0 CONCLUSIONS

Composite surface soil samples and discrete-depth subsurface soil samples were collected from a near-border study area in the vicinity of the Upper Columbia River in northeast Washington State. Samples were analyzed to determine concentrations of TAL metals, and other supporting parameters (pH, TOC, percent solids). Concentrations of several smelter-emitted metals including arsenic, cadmium, lead, mercury, and zinc in the shallow soil horizon (0 to 3 inches) were detected at elevated levels throughout the approximate 15 to 20 square mile extent of the study area. The current upland soil study area lies within a sub-portion of the historic Trail smelter SO_2 impact zone; results from a recent air dispersion and transport model also indicate that Trail smelter emissions likely were dispersed over a much broader area than is depicted in the historical SO_2 forest injury maps.

In the study area, the highest surface soil metals concentrations and enrichment appear to be found in samples collected closer to the Columbia River Valley. This concentration enrichment pattern may reflect the atmospheric deposition of metals being generally more pronounced nearer the river valley. The metal distribution documented by this limited study appears to coincide and be consistent with, to some degree, the historically documented areas of vegetation impacts attributed to historical Trail smelter SO_2 emissions.

Metal concentrations within surface soils from the current study area—composed principally of undisturbed timber-dominated forest lands—indicate a substantial degree of spatial variability. More study will be necessary to accurately characterize the extent, distribution patterns, and magnitude of Trail-smelter-related metal enrichment beyond the study areas. This includes representative agricultural, municipal, commercial and residential land-use areas. Also, in the immediate vicinity of the Northport community, more soil study is appropriate to better understand soil metal distribution patterns and the potential localized, additive effects of metal-related emissions from the smaller-scale historical Le Roi smelter operations.

Considering the magnitude of metal concentrations in the surface soil horizon (as described in Section 5.3), and the calculated enrichment ratios, an anomalous enrichment of heavy metals exists within this study area. The degree of enrichment appears to vary by an order of magnitude or more across the study area for the five smelter-related metals examined. These results, in conjunction with other studies in the area including the Trail smelter ecological risk assessment in Canada, support the conclusion that the predominant mechanism and source for the observed elevated metals was airborne transport and downwind deposition of particulate and/or aerosol-based metals from historical metal smelting operations in Trail, British Columbia.

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Table 1 - Sample Locations and Characteristics

Sample ID	Sample Elevation (feet)	Aspect (Degrees from North)	Percent Slope	Soil Map ID[1]	Geology Map Symbol[2]	Latitude	Longitude	Land use
SA1-1C	4,002	270	0	12	Eva	48.9886925	-117.7853534	Undeveloped Forest Land
SA1-2C	4,229	0	10	11	Eva	48.9974733	-117.7816431	Undeveloped Forest Land
SA1-3C/3P	3,969	158	25	7	Qgt	48.9951111	-117.7781781	Undeveloped Forest Land
SA1-4C	3,872	30	15	7	Qgt	48.9920350	-117.7785749	Undeveloped Forest Land
SA1-5C	4,261	145	18	10	Eia(s)	48.9972403	-117.7713444	Undeveloped Forest Land
SA1-6C	3,988	152	2	10	Eia(s)	48.9926296	-117.7694668	Undeveloped Forest Land
SA1-7C	3,847	46	25	10	Eia(s)	48.9983312	-117.7647595	Undeveloped Forest Land
SA1-8C	3,921	82	14	12	Eia(s)	48.9906560	-117.7641637	Designated Forest Land
SA2-1C	2,763	115	18	180	Qgt	48.9977902	-117.7304913	Designated Forest Land
SA2-2C/1P	2,213	305	15	36	Qgt	48.9981738	-117.7226310	Designated Forest Land
SA2-3C	3,092	288	20	12	Qgt	48.9905519	-117.7168586	Designated Forest Land
SA2-4C	2,187	110	38	10	Qgt	48.9934482	-117.7277954	Designated Forest Land
SA2-5C	2,155	90	8	98	Qa	48.9848242	-117.7300349	Designated Forest Land
SA2-6C	2,246	160	19	233	CDmt	48.9800764	-117.7206612	Designated Forest Land
SA2-7C	2,721	230	10	168	Qgt	48.9842749	-117.7211995	Designated Forest Land
SA2-8C	2,789	308	15	12	Qgt	48.9972780	-117.7166574	Designated Forest Land
SA3-1C	3,386	316	22	12	Qgt	48.9985904	-117.7087758	Designated Forest Land
SA3-2C	3,662	20	8	11	Qgt	48.9966084	-117.7036234	Designated Forest Land
SA3-3C	3,375	296	30	12	Qgt	48.9941083	-117.7121431	Designated Forest Land
SA3-4C/1P	3,576	150	12	168	Qgt	48.9940827	-117.7035616	Designated Forest Land
SA3-5C	3,301	155	13	168	Qgt	48.9894913	-117.7109191	Designated Forest Land
SA3-6C	3,261	133	30	77	Qgt	48.9913148	-117.7033894	Designated Forest Land
SA3-7C	3,324	50	5	77	Qgt	48.9965166	-117.6967035	Designated Forest Land
SA3-8C	3,175	115	17	12	Qgt	48.9979245	-117.6922897	Designated Forest Land
SA4-1C/1P	2,212	140	25	233	Qgt	48.9800014	-117.7111435	Designated Forest Land
SA4-2C	2,817	182	21	235	CDmt	48.9851250	-117.7110064	Designated Forest Land
SA4-3C	2,287	95	30	235	CDmt	48.9828401	-117.7021707	Designated Forest Land
SA4-4C	2,949	167	15	77	Qgt	48.9874724	-117.7055827	Designated Forest Land
SA4-5C	2,583	141	18	168	Qgt	48.9875332	-117.6970440	Designated Forest Land
SA4-6C	1,966	180	19	235	Qgt	48.9839858	-117.6906449	Designated Forest Land
SA4-7C	2,798	174	16	168	Qgt	48.9891664	-117.6994361	Designated Forest Land
SA4-8C	2,836	150	15	12	Qgt	48.9936024	-117.6913678	Designated Forest Land

Table 1 - Sample Locations and Characteristics

Sample ID	Sample Elevation (feet)	Aspect (Degrees from North)	Percent Slope	Soil Map ID[1]	Geology Map Symbol[2]	Latitude	Longitude	Land use
SA5-1C	2,833	98	8	12	Qgt	48.9987740	-117.6826201	Designated Forest Land
SA5-2C	2,515	161	26	180	CDmt	48.9913989	-117.6861059	Designated Forest Land
SA5-3C	2,054	90	7	9	Qgt	48.9873340	-117.6823198	Designated Forest Land
SA5-4C	2,046	190	7	234	CDmm	48.9888803	-117.6704161	Designated Forest Land
SA5-5C/5P	2,504	200	19	197	Qgt	48.9935713	-117.6697760	Designated Forest Land
SA5-7C	2,024	172	17	72	Qgt	48.9912660	-117.6583640	Undeveloped Forest Land
SA5-8C	2,495	121	24	197	Eia(s)	48.9974239	-117.6499825	Agricultural Current Use
SA6-1C	1,879	130	2	35	Qls	48.9741763	-117.7278322	Designated Forest Land
SA6-2C	1,746	150	2	216	Qgo	48.9742120	-117.7176718	Designated Forest Land
SA6-3C	1,640	170	4	217	Qa	48.9757746	-117.7030769	Designated Forest Land
SA6-4C/4P	1,766	233	4	30	Qgo	48.9760882	-117.6880831	Designated Forest Land
SA6-5C	1,515	169	36	89	Qgl	48.9746466	-117.6811135	Designated Forest Land
SA6-6C	1,610	100	8	89	Qls	48.9733500	-117.6880509	Designated Forest Land
SA6-7C	1,835	160	4	248	Qa	48.9823775	-117.6893802	Designated Forest Land
SA6-8C	1,811	0	0	88	Qgo	48.9821184	-117.6790817	Designated Forest Land
SA7-1C	1,554	151	10	226	Qa	48.9837439	-117.6716944	Designated Forest Land
SA7-2C	1,663	140	45	31	Qa	48.9799330	-117.6755988	Designated Forest Land
SA7-3C	1,403	177	0	30	Qgo	48.9744273	-117.6685321	Designated Forest Land
SA7-4C	1,763	90	15	30	Qgo	48.9822048	-117.6612508	Undeveloped Forest Land
SA7-5C	1,418	120	1	227	Qgo	48.9825504	-117.6466774	Undeveloped Forest Land
SA7-6C/1P	1,707	0	1	88	Qgo	48.9847184	-117.6522055	Agricultural Current Use
SA7-7C	2,040	82	16	12	CDmm	48.9954893	-117.6470071	Agricultural Current Use
SA7-8C	1,480	100	40	12	CDmm	48.9930923	-117.6426513	Undeveloped Forest Land
SA8-1C	1,659	110	3	35	Qgo	48.9999822	-117.6184240	Undeveloped Forest Land
SA8-2C/2P	1,410	90	1	85	Qgo	48.9806220	-117.6339914	Undeveloped Forest Land
SA8-3C	1,576	250	30	34	Qgo	48.9849227	-117.6290891	Undeveloped Forest Land
SA8-4C	1,814	225	5	35	Qgo	48.9776655	-117.6295425	Undeveloped Forest Land
SA8-5C	1,769	290	10	30	Qgd	48.9908639	-117.6239315	Designated Forest Land
SA8-6C	1,650	90	15	88	Qgd	48.9991714	-117.6213904	Residential and Forest Land
SA8-7C	1,770	245	12-5	88	Qgd	48.9951544	-117.6200219	Residential and Forest Land
SA8-8C	1,608	270	0	34	Qgo	48.9934081	-117.6281837	Forest Land

Table 1 - Sample Locations and Characteristics

Sample ID	Sample Elevation (feet)	Aspect (Degrees from North)	Percent Slope	Soil Map ID[1]	Geology Map Symbol[2]	Latitude	Longitude	Land use
SA9-1C	2,927	331	39	169	Eia(s)	48.9932733	-117.6087922	Designated Forest Land
SA9-2C	2,200	295	21	163	CDmm	48.9933307	-117.6153150	Designated Forest Land
SA9-3C	3,076	230	25	163	Eia(s)	48.9903639	-117.6088043	Designated Forest Land
SA9-4C	2,618	Flat	0	189	Eia(s)	48.9856004	-117.6138114	Designated Forest Land
SA9-5C	1,920	270	13	8	Qgd	48.9821576	-117.6201374	Designated Forest Land
SA9-6C	2,315	271	21	189	CDmm	48.9787386	-117.6201529	Designated Forest Land
SA9-7C/7P	1,954	335	10	6	Qgt	48.9728238	-117.6328616	Designated Forest Land
SA9-8C	2,880	307	36	8	CDmm	48.9677892	-117.6279067	Forest Land
SA9-9C	2,196	306	25	6	Qgt	48.9689673	-117.6358230	Designated Forest Land
SA9-10C	2,294	126	21	12	Qgt	48.9729244	-117.6265885	Forest Land
SA10-1C	3,095	167	9	163	Eia(s)	48.9854363	-117.6076618	Designated Forest Land
SA10-2C/2P	3,160	84	34	8	CDmm	48.9820299	-117.6089904	Designated Forest Land
SA10-3C	3,308	270	7	8	CDmm	48.9782421	-117.6110227	Designated Forest Land
SA10-4C	3,149	350	5	189	Qgd	48.9736177	-117.6131446	Forest Land
SA10-5C	3,131	270	17	12	CDmm	48.9714735	-117.6200819	Forest Land
SA10-6C	3,324	155	12	189	CDmt	48.9699816	-117.6144413	Designated Forest Land
SA10-7C	3,415	90	20	189	Qgd	48.9683325	-117.6185318	Forest Land
SA10-8C	3,324	290	18	104	CDmt	48.9664236	-117.6245851	Forest Land
SA11-1C	3,091	127	20	180	CDmt	48.9687955	-117.6114160	Designated Forest Land
SA11-2C	2,261	50	25	171	Qgd	48.9898971	-117.5922499	Designated Forest Land
SA11-3C	2,133	75	17	200	Qgd	48.9749865	-117.5980079	Designated Forest Land
SA11-4C	2,787	128	40	200	Eia(s)	48.9740664	-117.6050103	Designated Forest Land
SA11-5C	2,212	70	12	168	Eia(s)	48.9859222	-117.5924234	Designated Forest Land
SA11-6C	2,944	210	11	163	Eia(s)	48.9899242	-117.6022769	Designated Forest Land
SA11-7C	2,775	20	40	169	Eia(s)	48.9938194	-117.6020076	Designated Forest Land
SA11-8C/8P	2,143	39	16	7	Qgd	48.9952505	-117.5967094	Forest Land
SA11-9C	3,036	87	31	8	CDmm	48.9802697	-117.6058805	Designated Forest Land
SA12-1C	2,461	182	26	200	CDmm	48.9996630	-117.5799598	Designated Forest Land
SA12-2C	2,233	30	10	35	Qgd	48.9985955	-117.5685284	Designated Forest Land
SA12-3C/3P	2,170	100	5	172	Qgd	48.9974362	-117.5643422	Designated Forest Land
SA12-4C	2,611	290	21	107	Qgd	48.9939112	-117.5551675	Designated Forest Land
SA12-6C	2,184	96	17	34	Qgd	48.9881129	-117.5712024	Designated Forest Land

Table 1 - Sample Locations and Characteristics

Sample ID	Sample Elevation (feet)	Aspect (Degrees from North)	Percent Slope	Soil Map ID[1]	Geology Map Symbol[2]	Latitude	Longitude	Land use
SA12-7C	2,328	200	3	200	CDmm	48.9954727	-117.5699786	Designated Forest Land
SA12-8C	2,237	220	13	35	Qgd	48.9991934	-117.5582422	Designated Forest Land
SA12-9C	2,775	331	17	106	Qgd	48.9992843	-117.5461825	Designated Forest Land
SA13-1C	2,136	75	20	200	Eia(s)	48.9657430	-117.6008327	Designated Forest Land
SA13-2C	2,139	155	4	170	Eia(s)	48.9708674	-117.5996403	Designated Forest Land
SA13-3C	2,127	40	33	89	Qgd	48.9836651	-117.5762366	Designated Forest Land
SA13-4C	2,242	0	2	98	Qgd	48.9827625	-117.5598095	Designated Forest Land
SA13-5C	2,104	300	14	6	Qgd	48.9959493	-117.5835220	Designated Forest Land
SA13-6C/1P	2,144	0	2	36	Qgd	48.9828947	-117.5839489	Designated Forest Land
SA13-7C	2,017	270	5	181	Qgd	48.9886177	-117.5818849	Designated Forest Land
SA13-8C	2,484	72	10	80	Qgd	48.9769247	-117.5460082	Designated Forest Land

Notes:

1 See Figure 2 for Soil Descriptions

2 See Figure 3 for geologic units

Table 2 – Subarea Surface Soil Concentration Ranges and Variability

Metal	Concentration Range	Mean Concentration Range	Median Concentration Range	Standard Deviation Range	Coefficient of Variation Range
Arsenic	5.3 to 55.5	11.8 to 23.7	10.7 to 26.3	3.4 to 15.8	0.239 to 0.644
Cadmium	0.6 to 37.3	1.68 to 13.1	1.6 to 10.5	0.748 to 11.2	0.34 to 0.909
Lead	31 to 1,920	78.3 to 611	72.5 to 503	34.2 to 552	0.308 to 1.02
Mercury	0.04 to 0.527	0.0453 to 0.147	0.036 to 0.115	0.0102 to 0.142	0.203 to 0.964
Zinc	70 to 1,330	152 to 549	147 to 490	31.2 to 376	0.205 to 0.741

Table 3 – Subsurface (12 to 24-inch) Soil Profile Concentration Ranges and Variability

Metal	Concentration Range	Mean Concentration	Median Concentration	Standard Deviation	Coefficient of Variation
Arsenic	1.3 to 10	5.05	5.35	2.69	0.532
Cadmium	0.1 to 0.8	0.336	0.25	0.232	0.692
Lead	4.95 to 26	13.2	9.15	7.70	0.584
Mercury	0.007 to 0.058	0.0204	0.0145	0.0154	0.753
Zinc	24 to 166	65.8	57.5	39.0	0.593

Table 4 - Comparison of Current Soil Descriptive Statistical Values with Selected Eastern WA Soil Background Values

Metal (E. median or 90th)[1]	Church, 2010[2]	Ecology, 1994[3]	Subsurface Soil (12-24") Pooled median and 90th Percentile Values[4]	Surface Soils - Range of median and 90th Percentile Values for the 13 Subareas
Aluminum - median		16,600	17,000	8,800 to 22,200
Aluminum - 90th		28,300	26,200	15,600 to 30,800
Arsenic - median (or geometric mean[5])	2.13	2.95	5.4	10 to 24
Arsenic - 90th	7	7.61	7.8	17 to 41
Beryllium - median		0.72	0.5	0.3 to 0.8
Beryllium - 90th		1.27	1.0	0.4 to 1.3
Cadmium - median (or geometric mean[5])	0.17	0.45	0.3	1.6 to 10.2
Cadmium - 90th	0.33	0.81	0.7	2.2 to 24
Chromium - median		13.2	24	12 to 26
Chromium - 90th		31.9	29	17 to 96
Copper - median (or geometric mean[5])	11.5	16.3	23	16 to 35
Copper - 90th	26	28.4	34	22 to 45
Iron - median		22,100	23,000	12,300 to 22,800
Iron - 90th		36,600	27,400	17,100 to 36,600
Lead - median (or geometric mean[5])	8.9	7.8	9.2	70 to 470
Lead - 90th	25	13.1	25.5	100 to 1,100
Manganese - median		490	380	470 to 2,300
Manganese - 90th		840	450	860 to 4,000
Mercury - median (or geometric mean[5])	0.013	0.014	0.016	0.03 to 0.11
Mercury - 90th	0.06	0.04	0.035	0.06 to 0.20
Nickel - median		12.5	19	11 to 28
Nickel - 90th		24.5	30	15 to 76
Zinc - median (or geometric mean[5])	35	51	58	140 to 470
Zinc - 90th	68	81	100	180 to 900

Notes:

All values in mg/kg

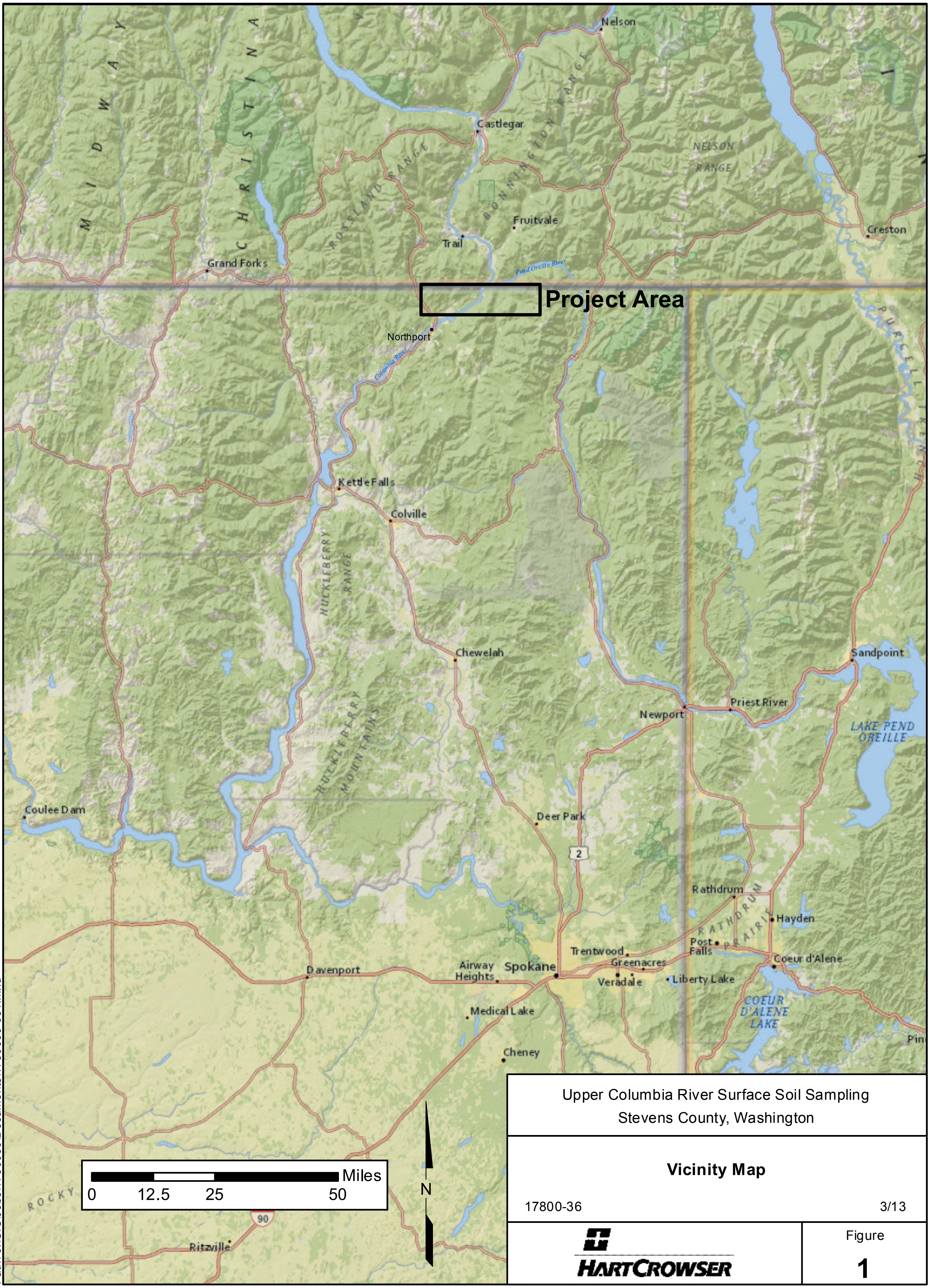
[1] Eastern Washington Soil Data from Benton, Spokane, Lincoln, Adams, Okanogan, and Whitman Counties

[2] Church, S. E.. August 2010. Assessment of Geochemical Background from NURE Sediment, Upper Columbia Watershed, N.E. Washington. (Prepared in support of Pakootas, et al vs. Teck Cominco Metals, Ltd.)

[3] Department of Ecology. October 1994. Natural Background Soil Metals Concentrations in Washington State. Toxics Cleanup Program Publication No. 94-115.

[4] 90th percentile value based on pooled results for soil samples collected from the 12"-24" depth interval at 12 of 13 subareas included in this current study

[5] Church, 2010. Concentrations are Geometric Mean.



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Vicinity Map

17800-36 3/13

HARTCROWSER

Figure
1

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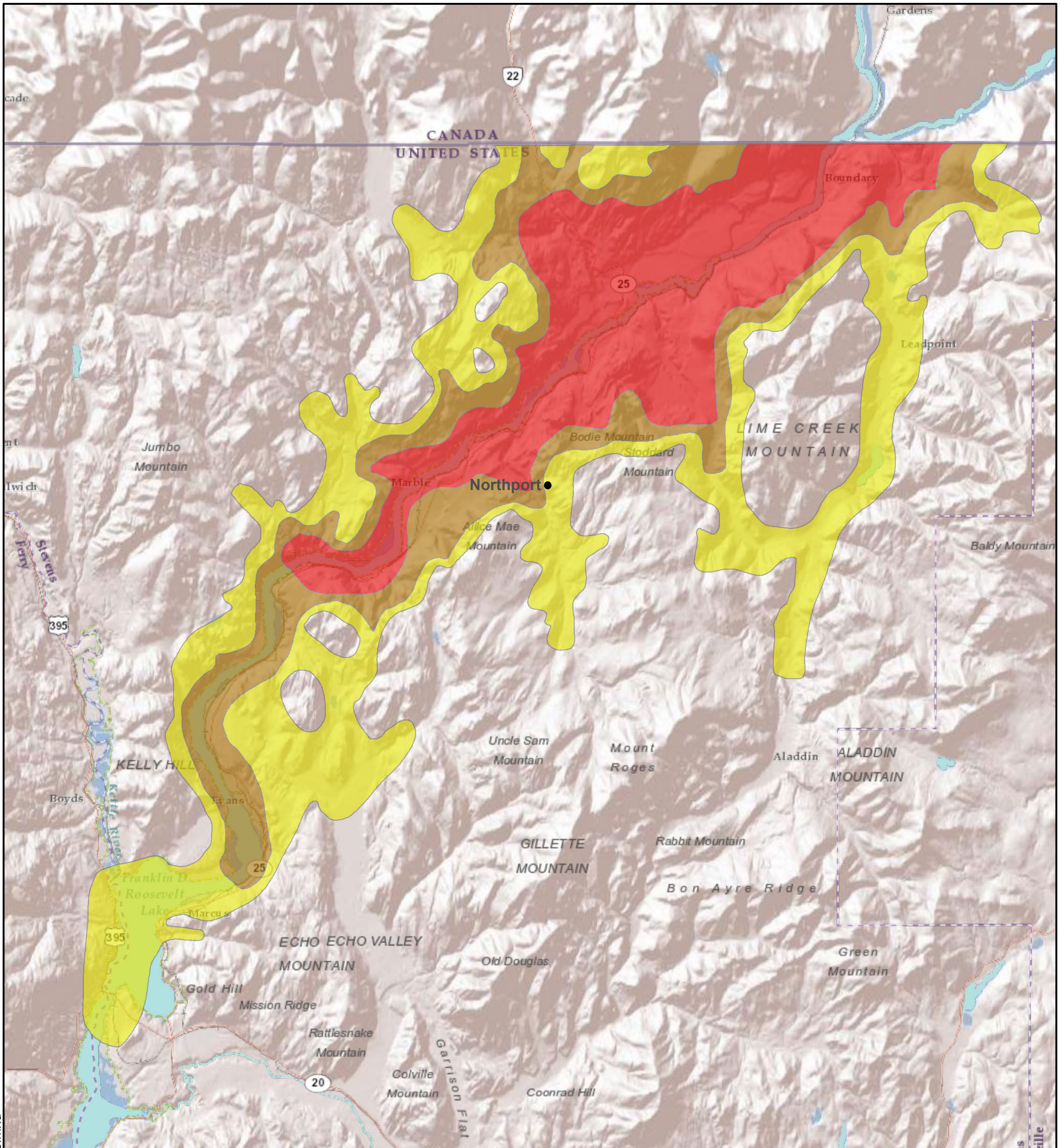

SO2 Plume - 1930

% Injury

- 60 to 100% Injury
- 30 to 60% Injury
- 1 to 30% Injury

Note:
SO2 Injury Layer from Hedgcock, 1936 (digitization courtesy of Environment International, Ltd).

Miles
0 3 6 12

N

Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Trail Smelter Sulfur Dioxide Timber Injury Area

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Figure
2

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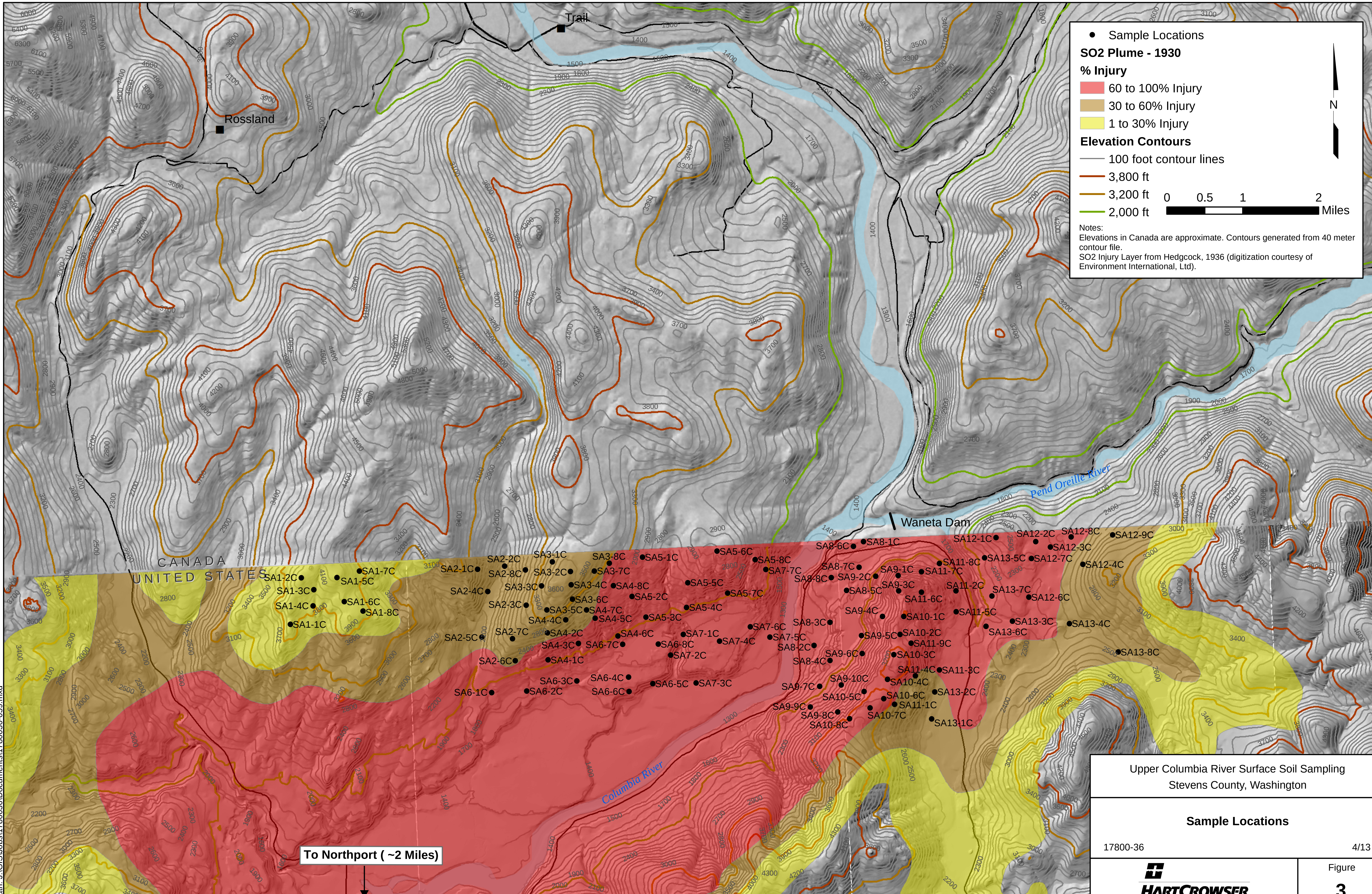

Sample Locations
SO2 Plume - 1930
% Injury
60 to 100% Injury
30 to 60% Injury
1 to 30% Injury
Elevation Contours
100 foot contour lines
3,800 ft
3,200 ft
2,000 ft
0 0.5 1 2 Miles
N
Notes:
Elevations in Canada are approximate. Contours generated from 40 meter contour file.
SO2 Injury Layer from Hedgcock, 1936 (digitization courtesy of Environment International, Ltd).
Trail
Rossland
Waneta Dam
Pend Oreille River
Columbia River
CANADA
UNITED STATES
To Northport (~2 Miles)
Upper Columbia River Surface Soil Sampling
Stevens County, Washington
Sample Locations
17800-36
4/13
HARTCROWSER
Figure
3
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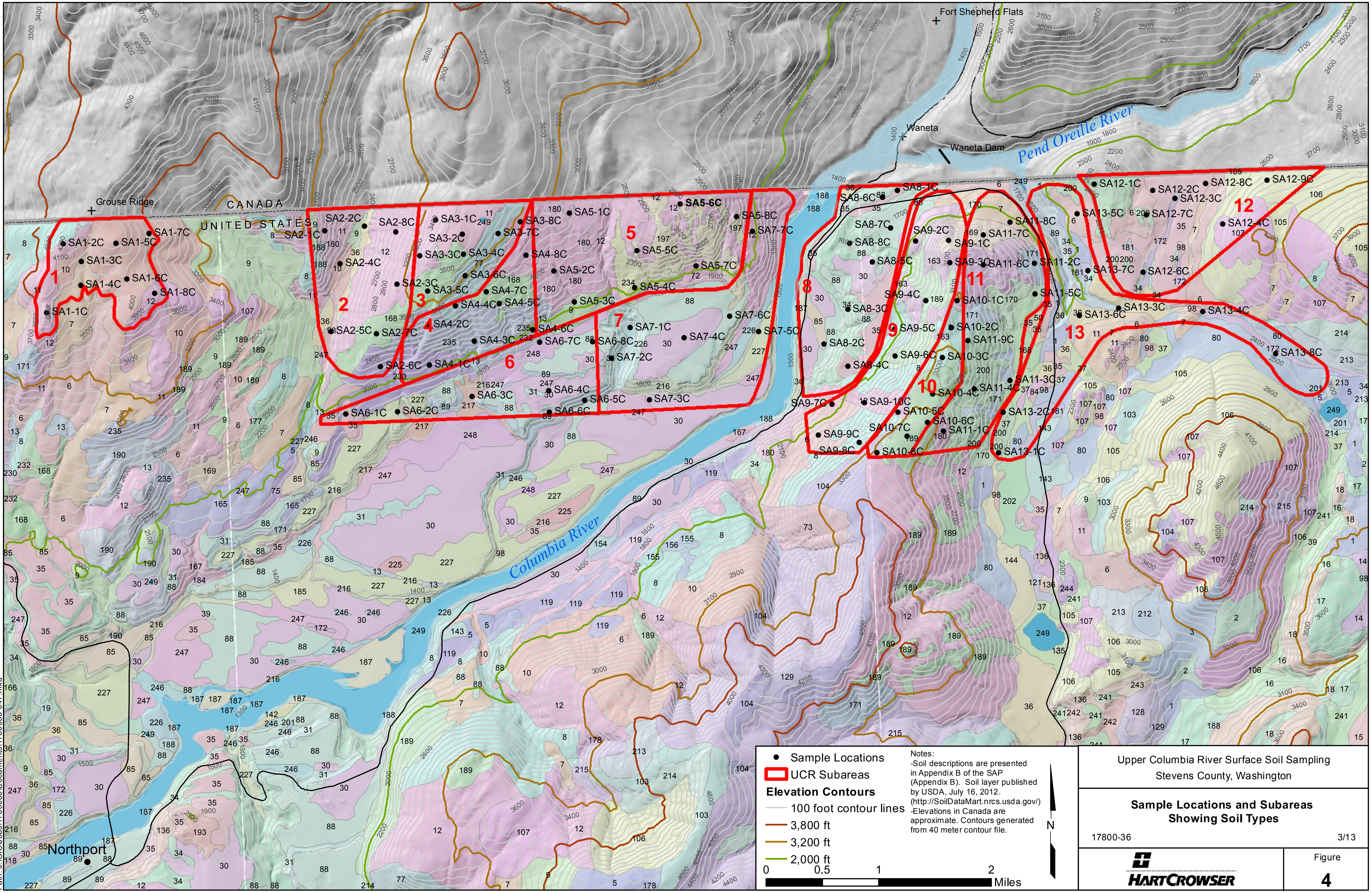

- Sample Locations
- UCR Subareas

Elevation Contours

- 100 foot contour lines
- 3,800 ft
- 3,200 ft
- 2,000 ft

0 0.5 1 2 Miles

N

Notes:
-Soil descriptions are presented in Appendix B of the SAP (Appendix B). Soil layer published by USDA, July 16, 2012. (http://SoilDataMart.nrcs.usda.gov/)
-Elevations in Canada are approximate. Contours generated from 40 meter contour file.

Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Sample Locations and Subareas Showing Soil Types

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Figure
4

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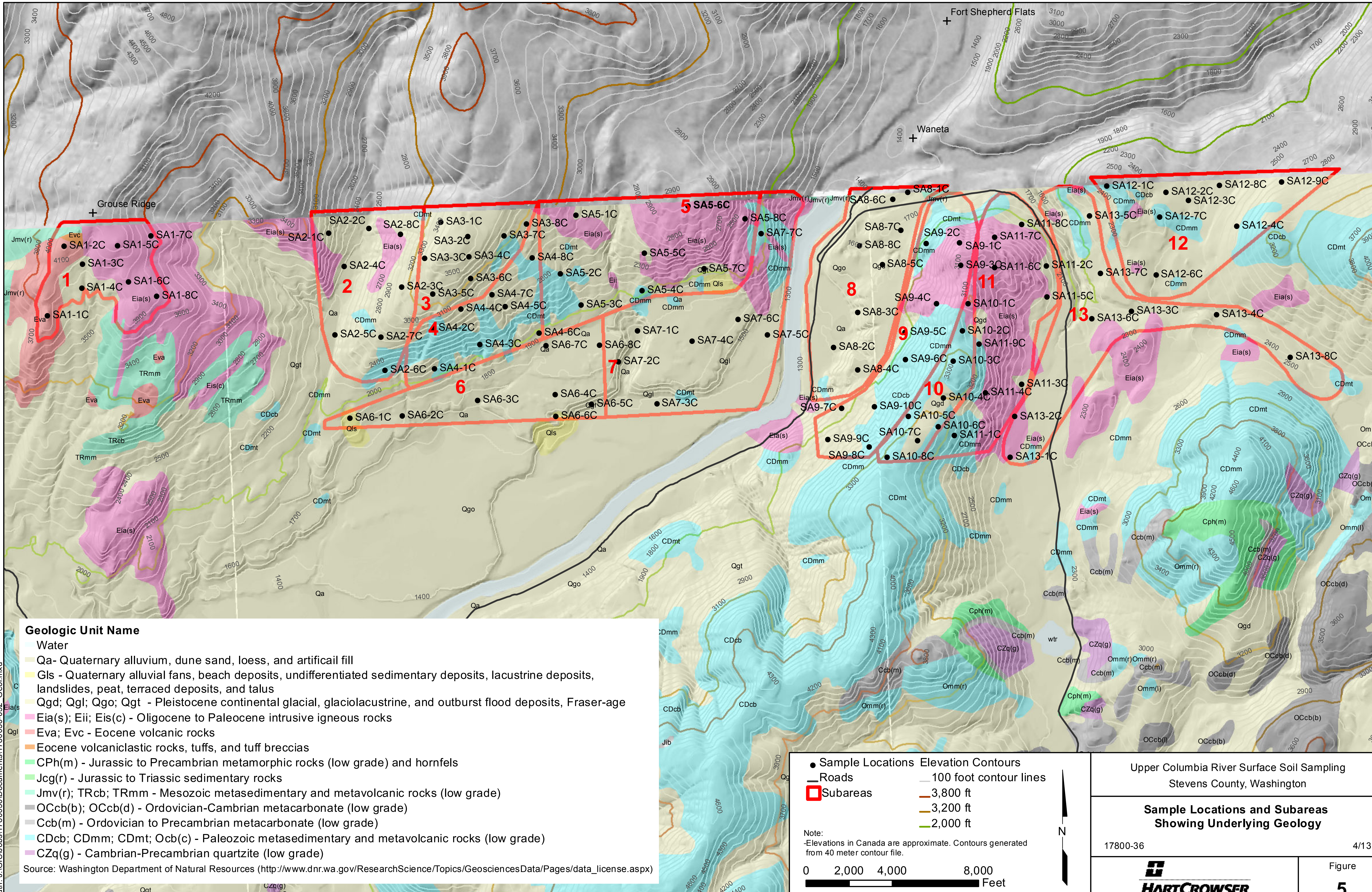


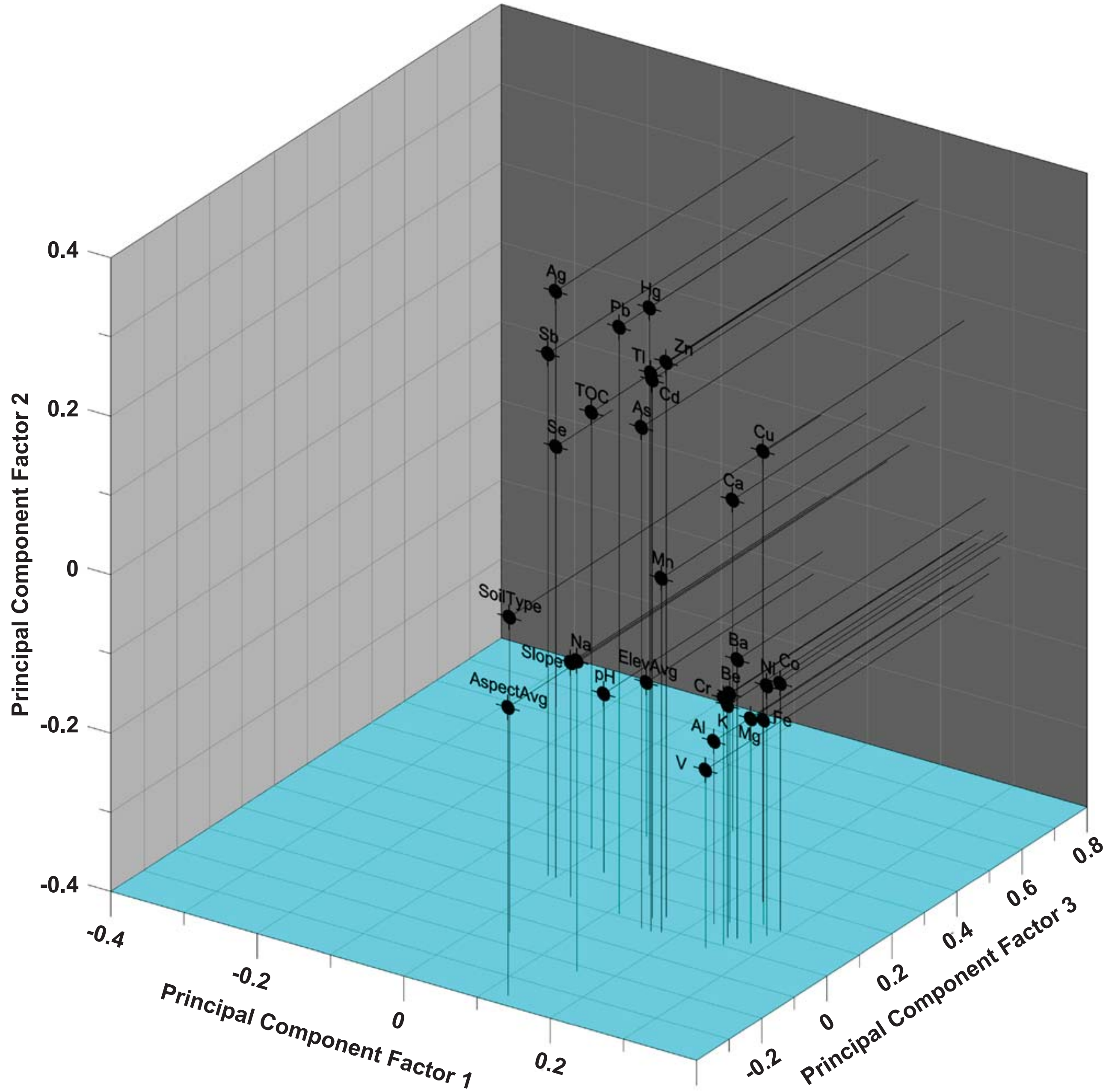
Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Sample Locations and Subareas Showing Underlying Geology

17800-36 4/13

HARTCROWSER

Figure 5



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

PCA Metal Loading Factor Plot (all variables)

17800-36 4/13

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Figure

6

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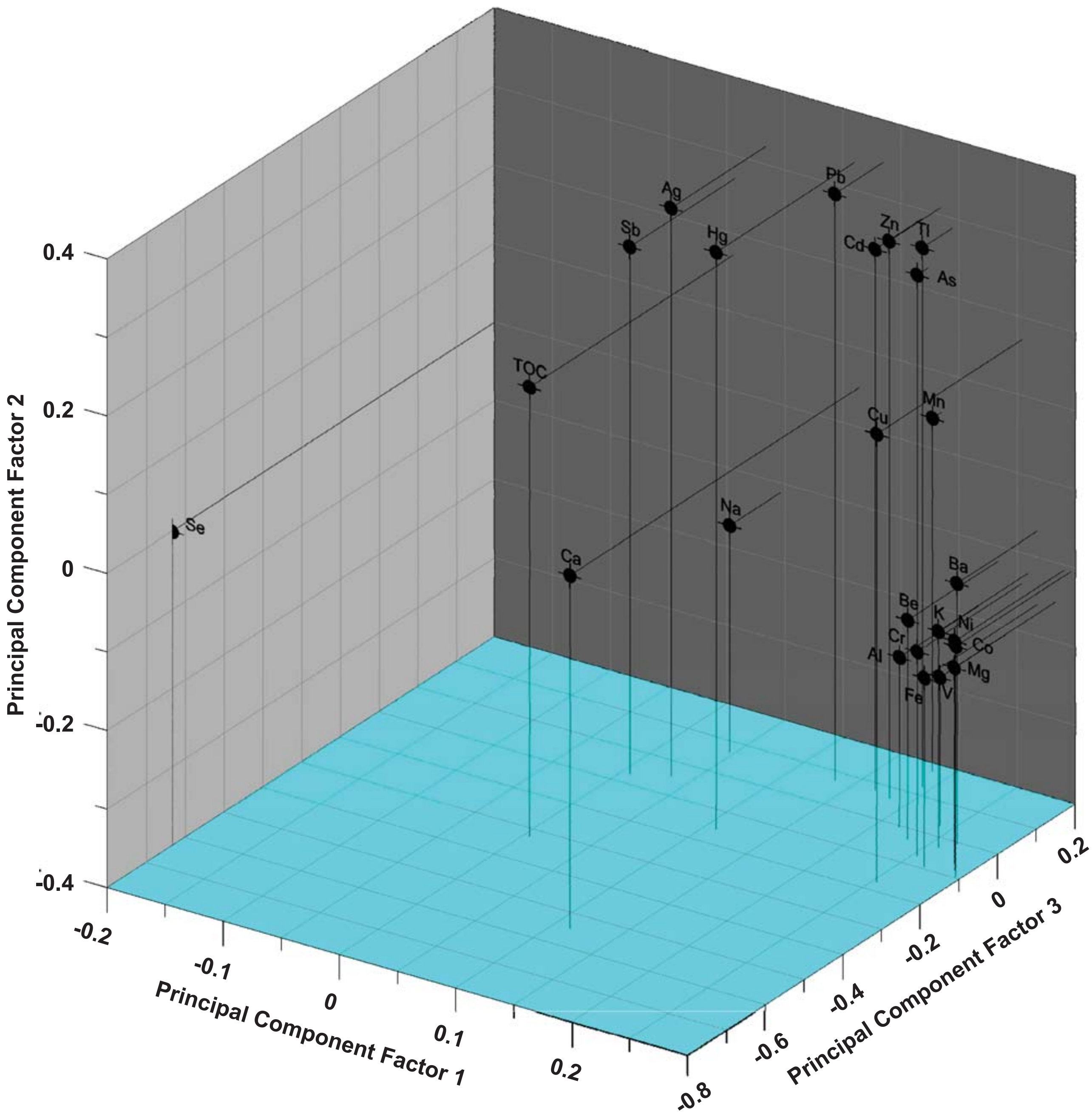

Upper Columbia River Surface Soil Sampling
Stevens County, Washington

PCA Metal Loading Factor Plot (TOC and Metals)

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Figure

7

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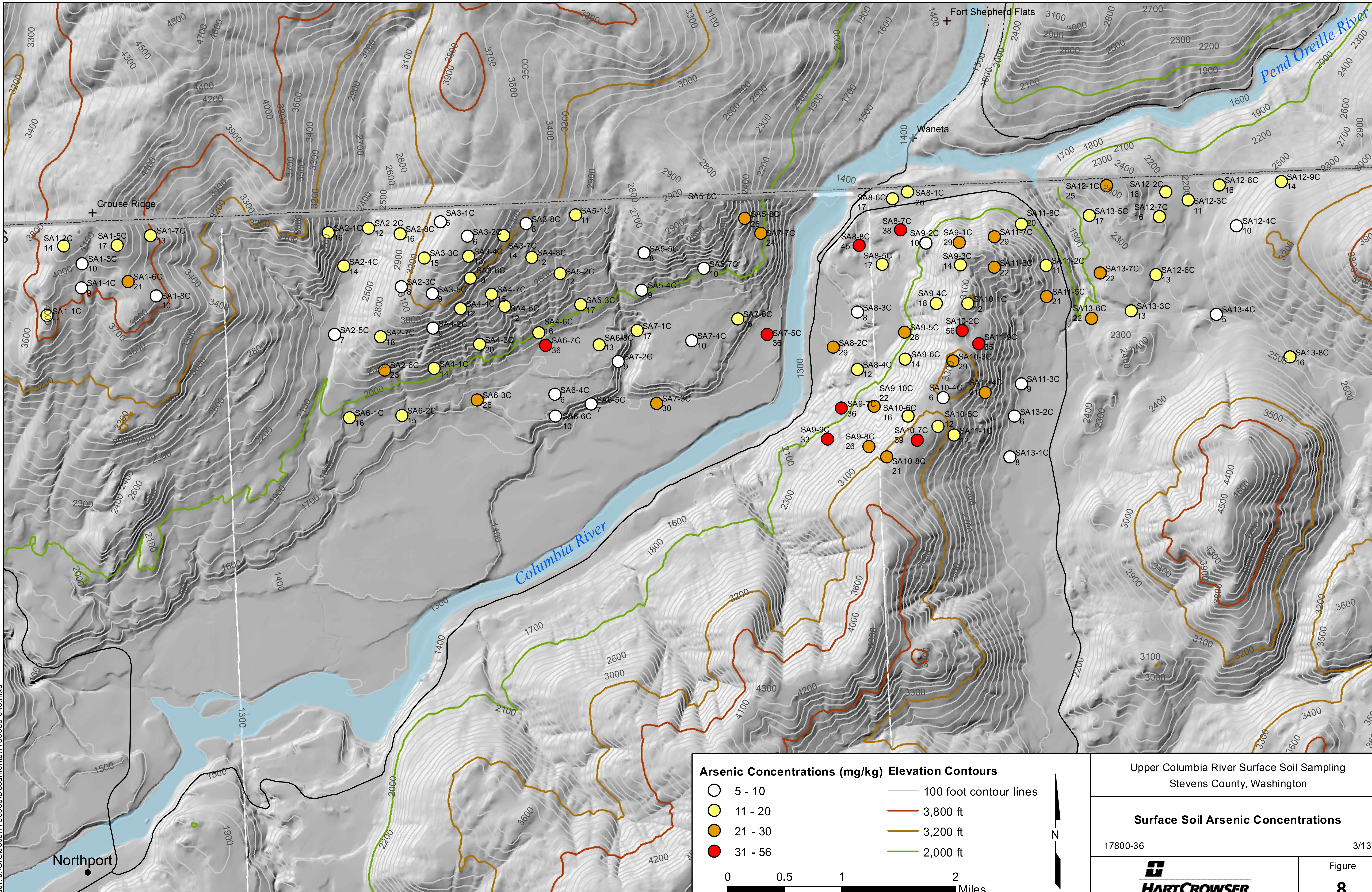

Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Surface Soil Arsenic Concentrations

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Figure 8

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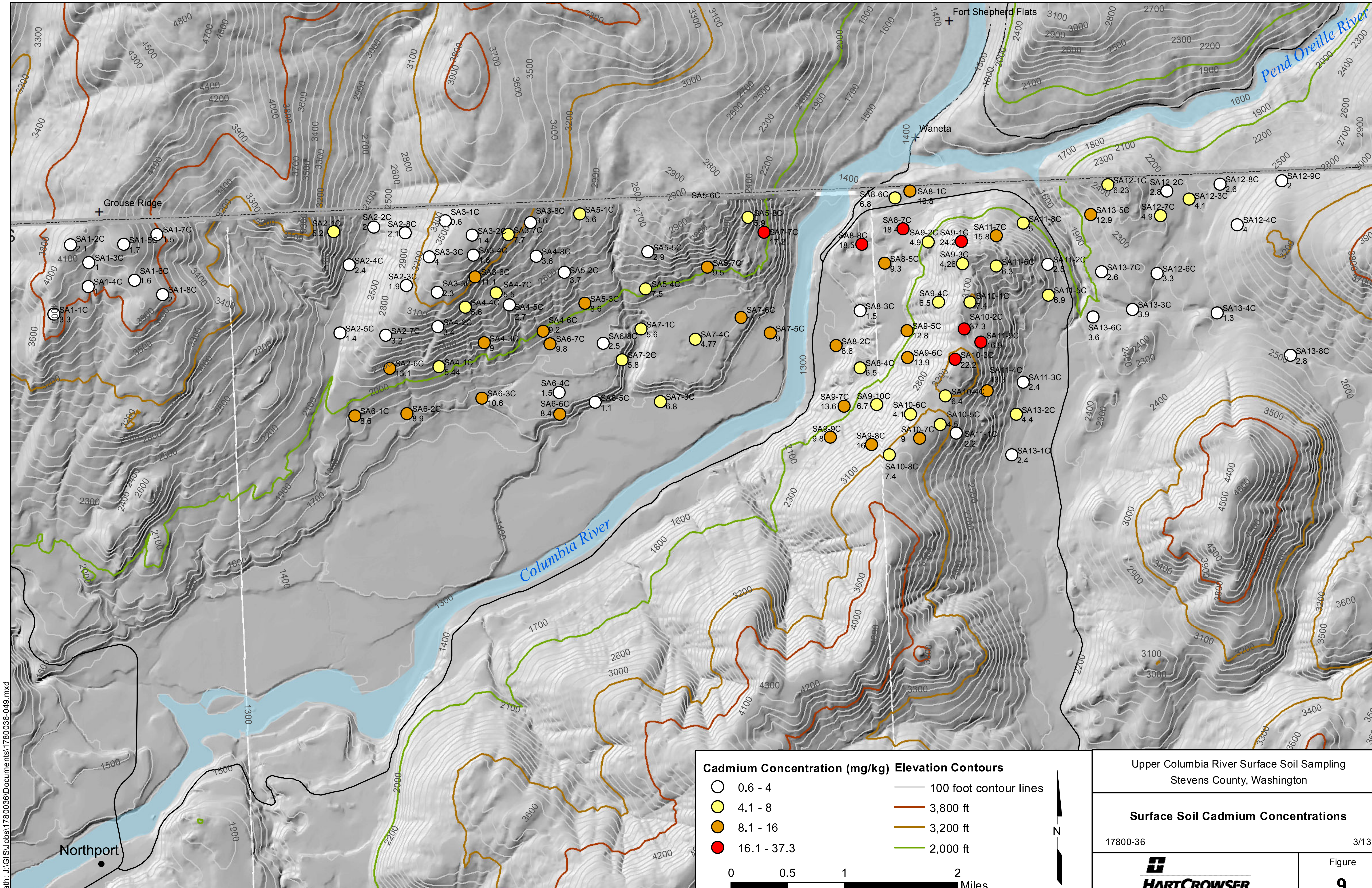
Fort Shepherd Flats
Pend Oreille River
Waneta
Grouse Ridge
Columbia River
Northport
Cadmium Concentration (mg/kg)
0.6 - 4
4.1 - 8
8.1 - 16
16.1 - 37.3
Elevation Contours
100 foot contour lines
3,800 ft
3,200 ft
2,000 ft
N
0 0.5 1 2 Miles
Upper Columbia River Surface Soil Sampling
Stevens County, Washington
Surface Soil Cadmium Concentrations
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3/13
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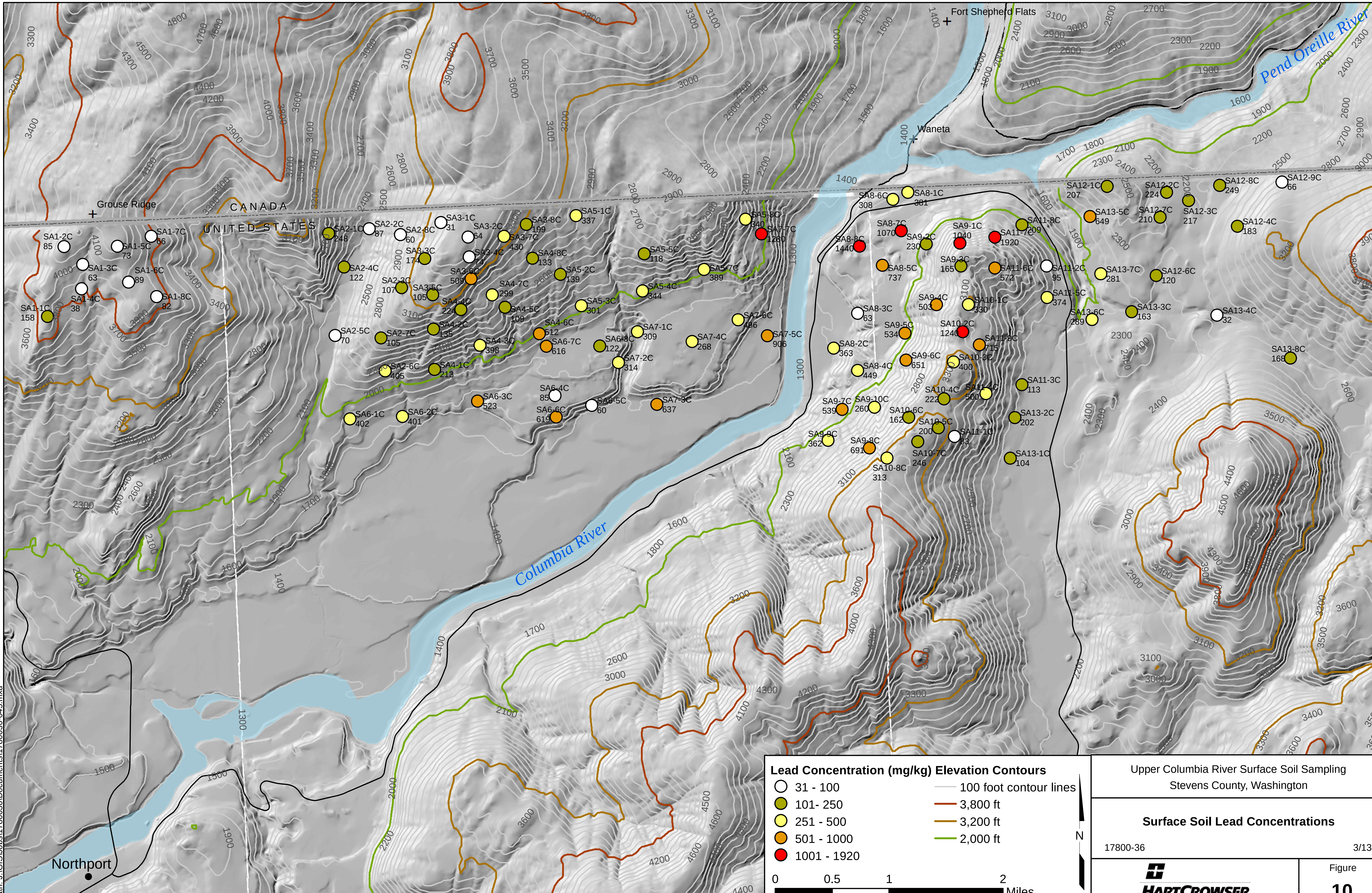
Figure
9
Path: J:\GIS\Jobs\1780036\Documents\1780036-049.mxd



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Surface Soil Lead Concentrations

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Figure
10

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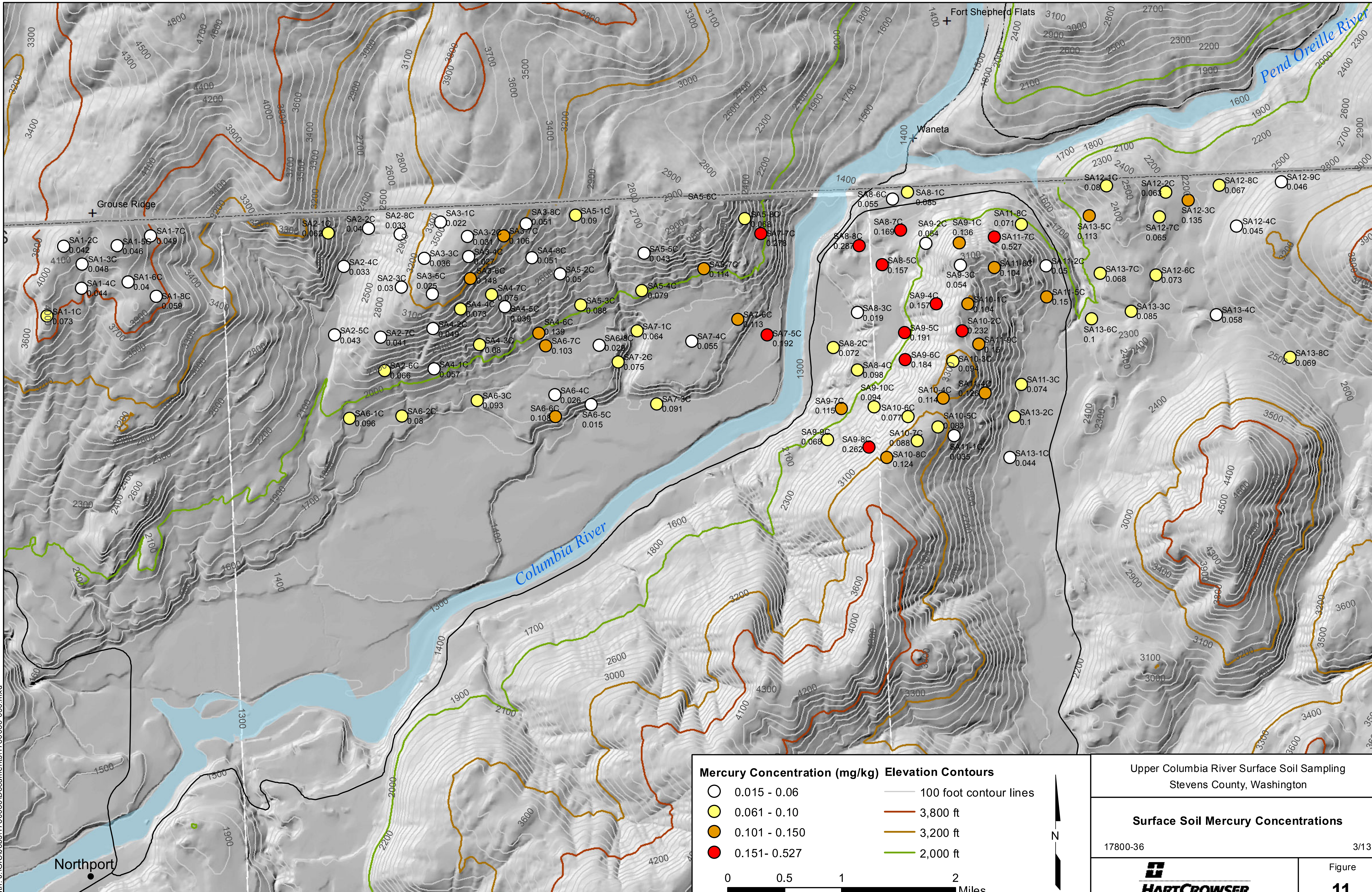

Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Surface Soil Mercury Concentrations

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HARTCROWSER

Figure 11

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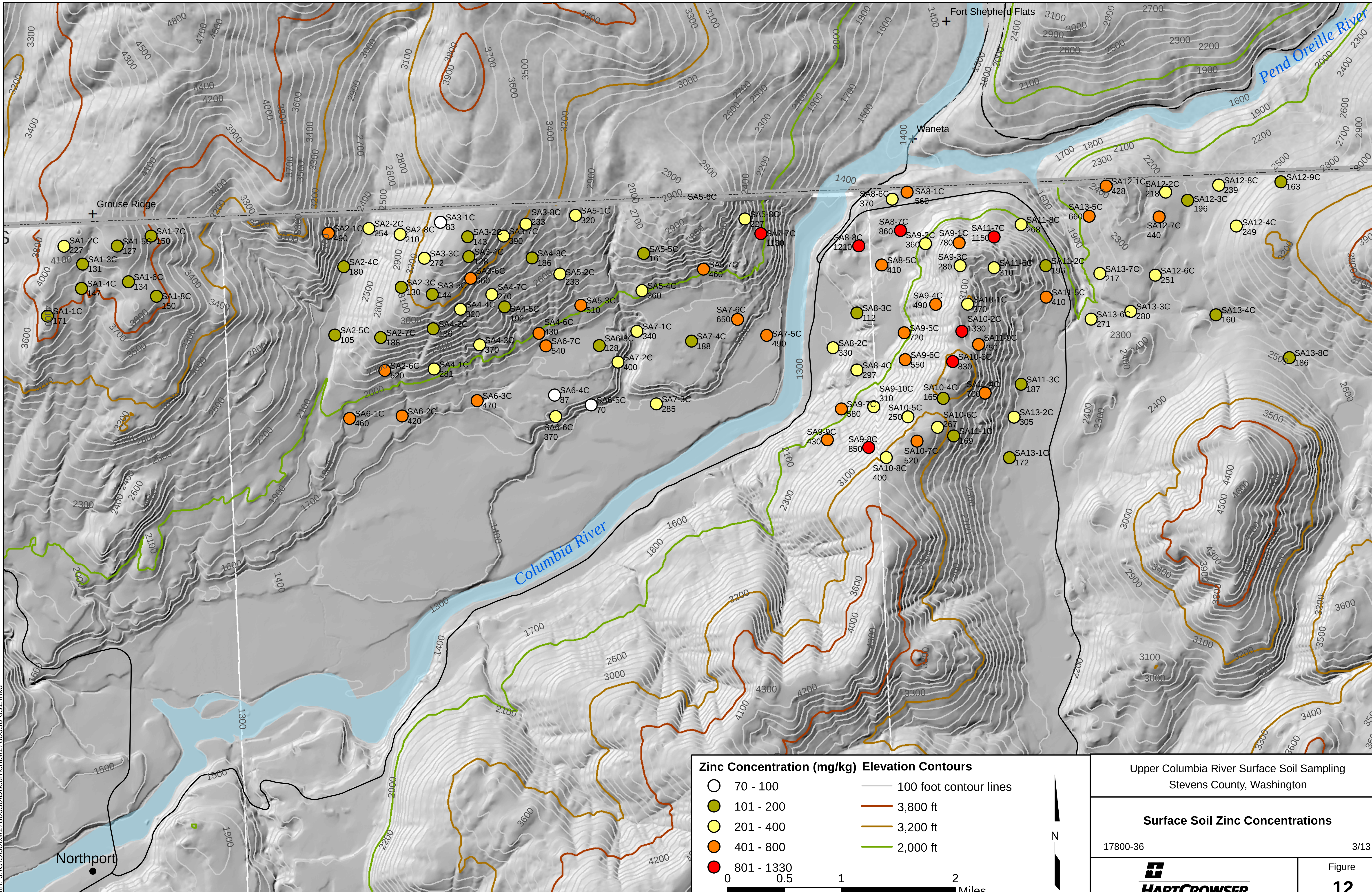

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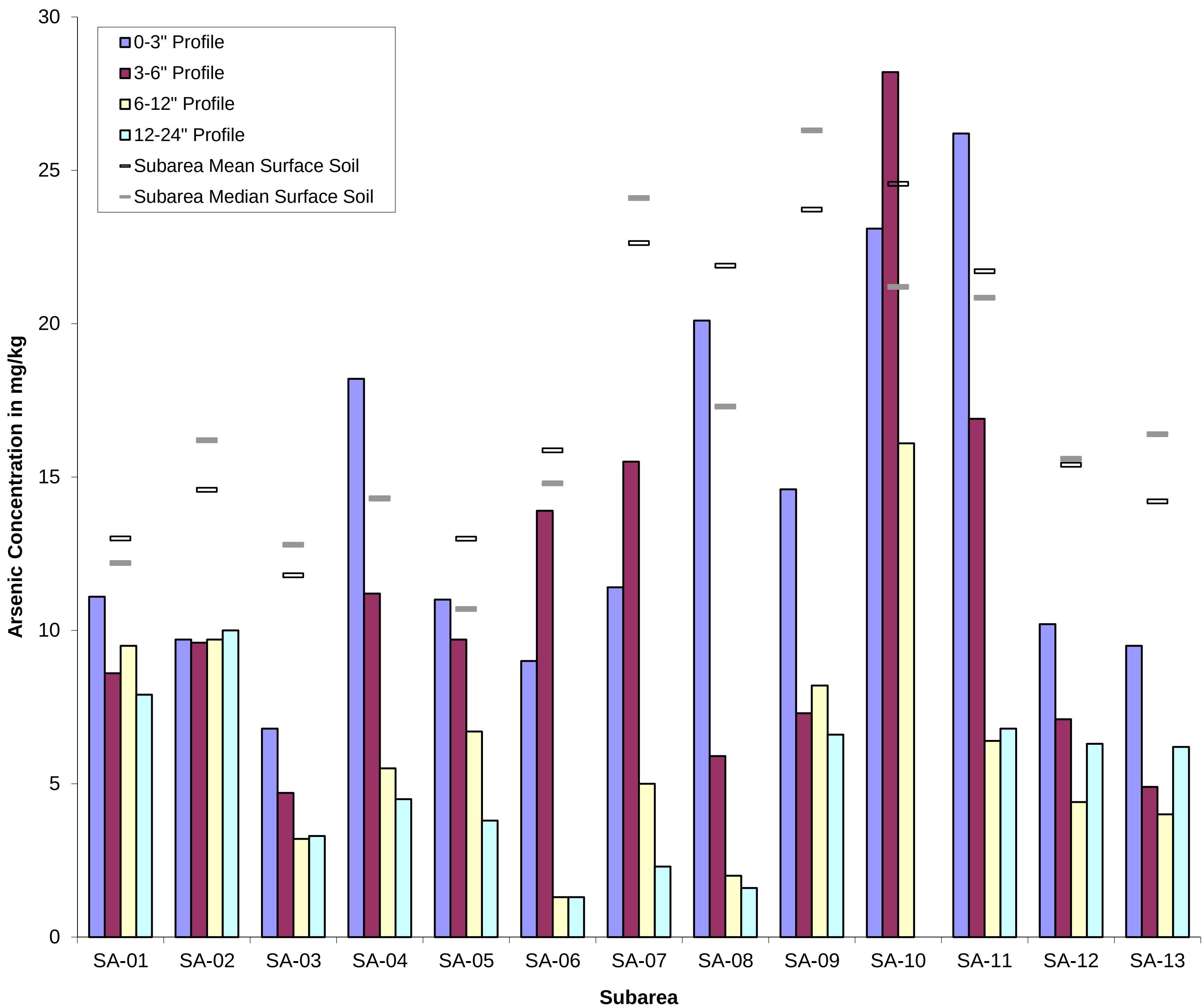


Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Soil Profile Arsenic Concentrations Compared to Surface Soil Mean and Median Concentrations

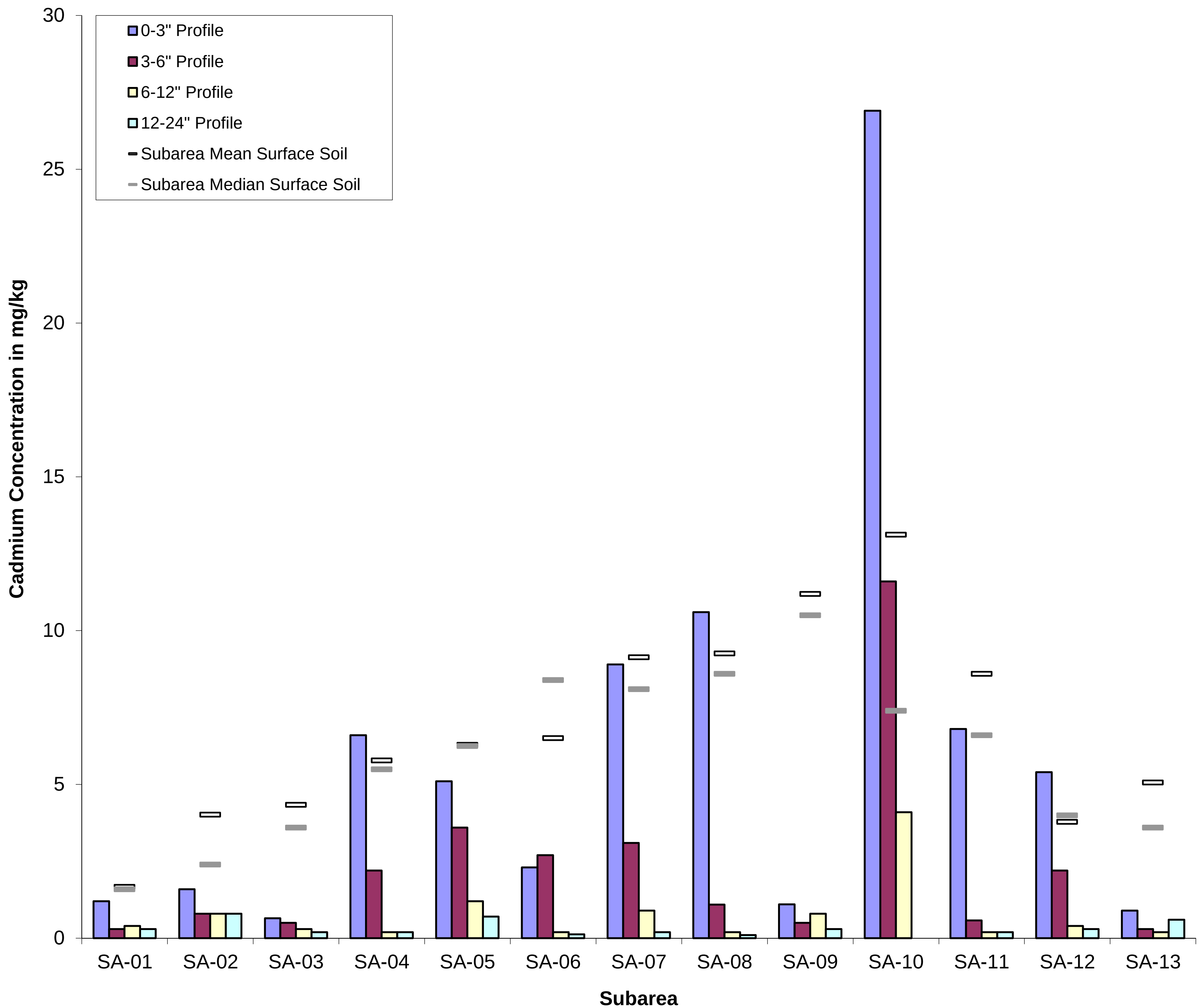
17800-36

4/13

Figure

13

EAL 04/08/13 1780036-AD.xls



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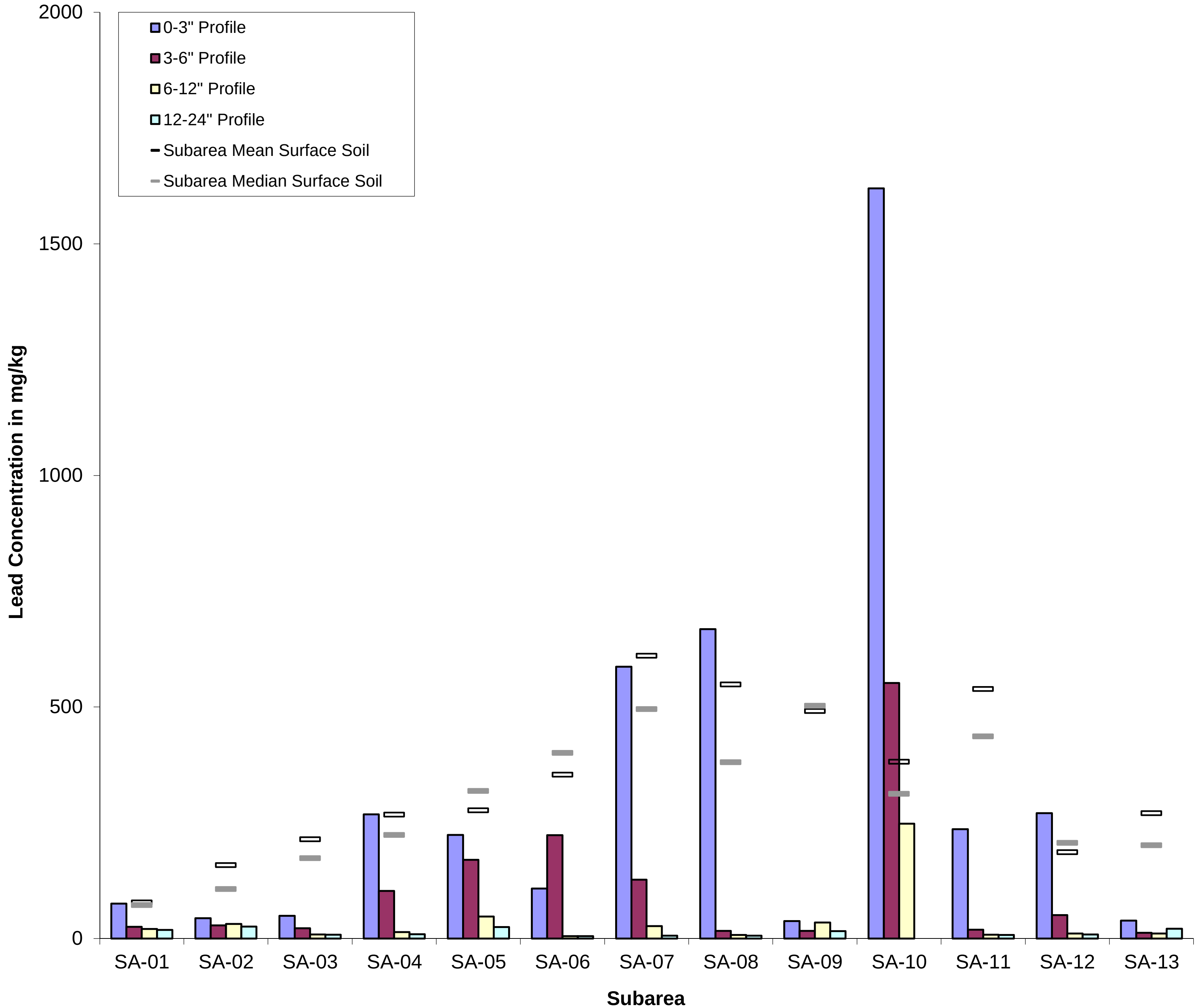
Soil Profile Cadmium Concentrations Compared to Surface Soil Mean and Median Concentrations

Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Figure

14



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Soil Profile Lead Concentrations Compared to Surface Soil Mean and Median Concentrations

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Figure **15**

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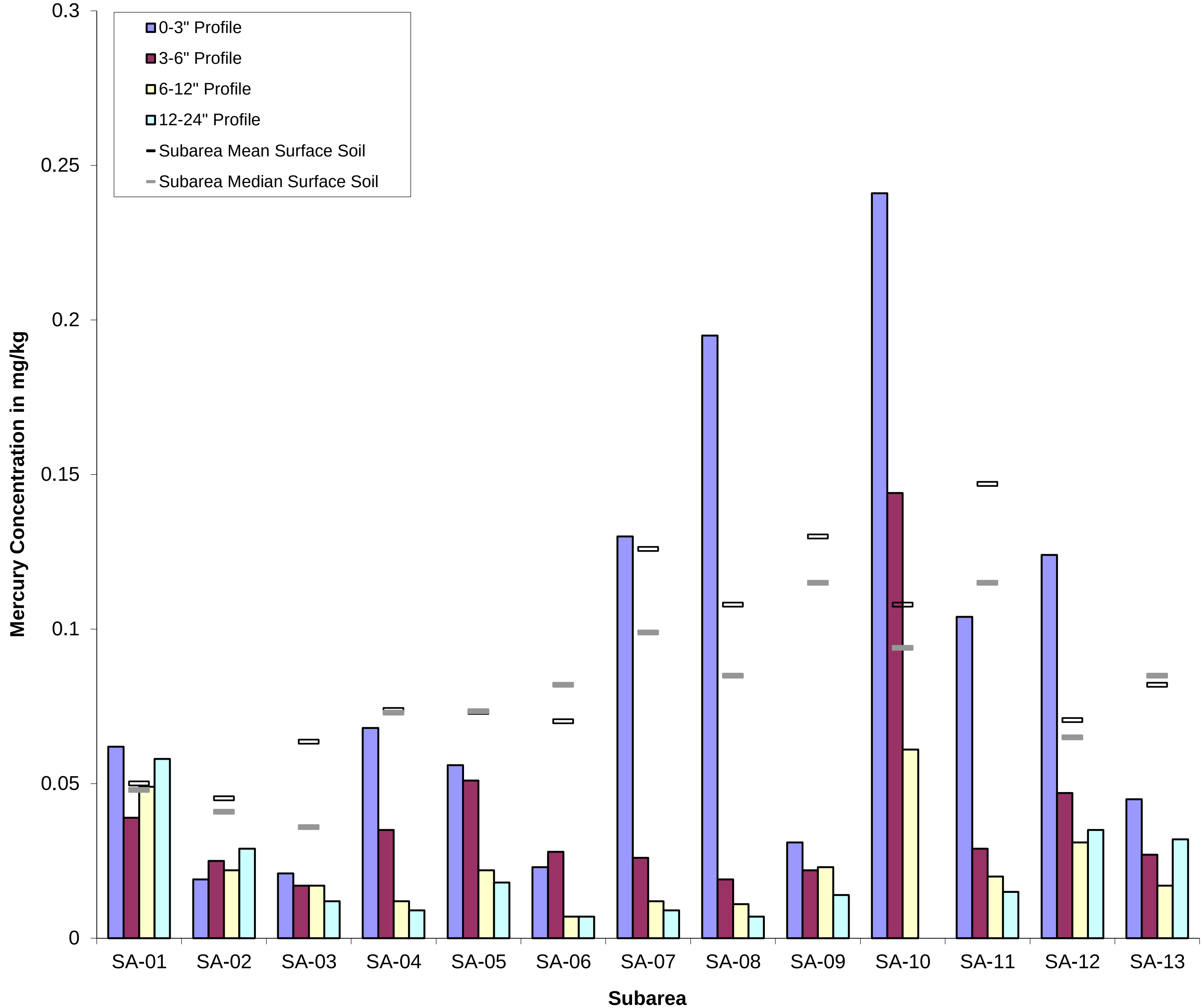

Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Soil Profile Mercury Concentrations Compared to Surface Soil Mean and Median Concentrations

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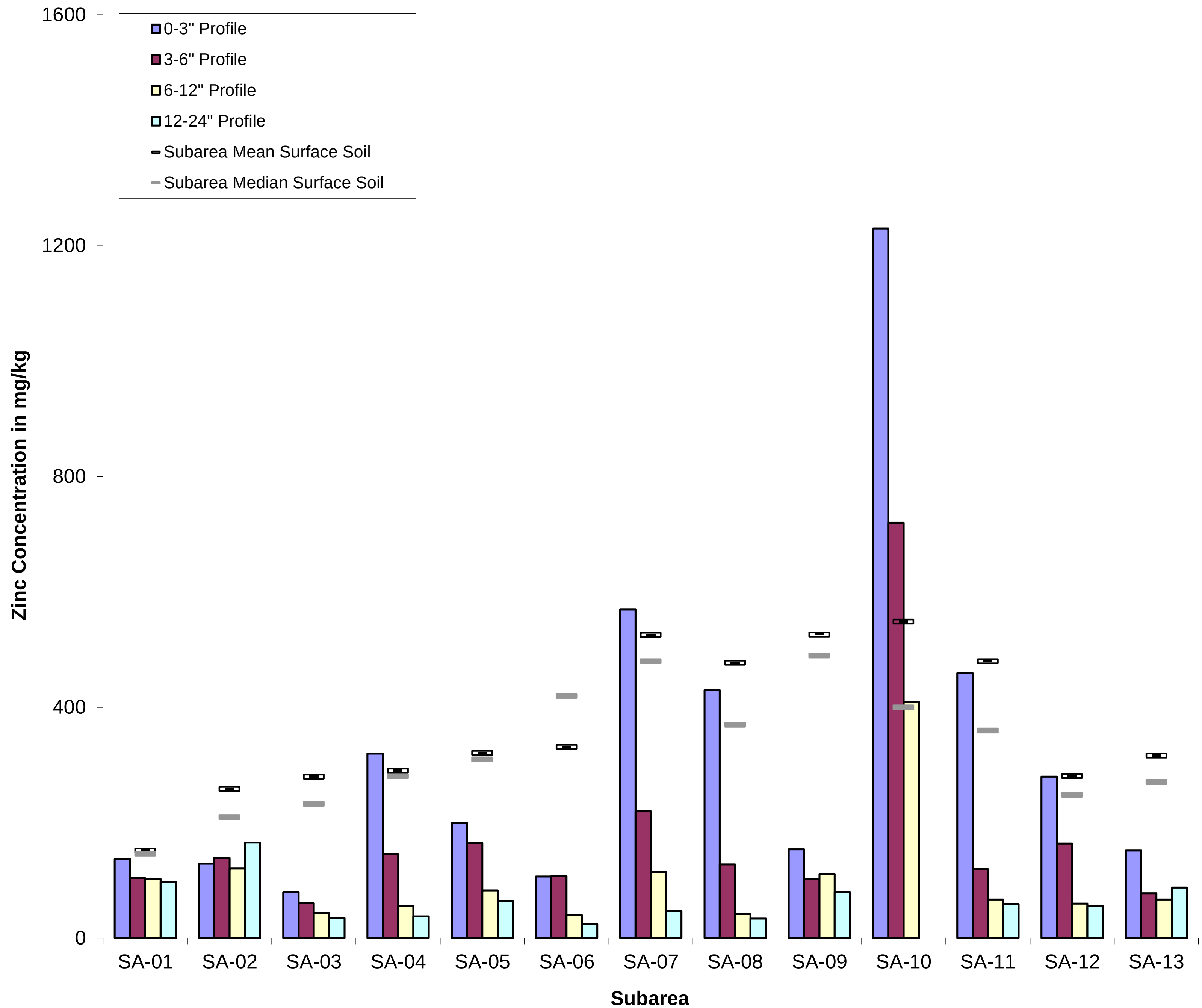
Figure

16



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Soil Profile Zinc Concentrations Compared to Surface Soil Mean and Median Concentrations

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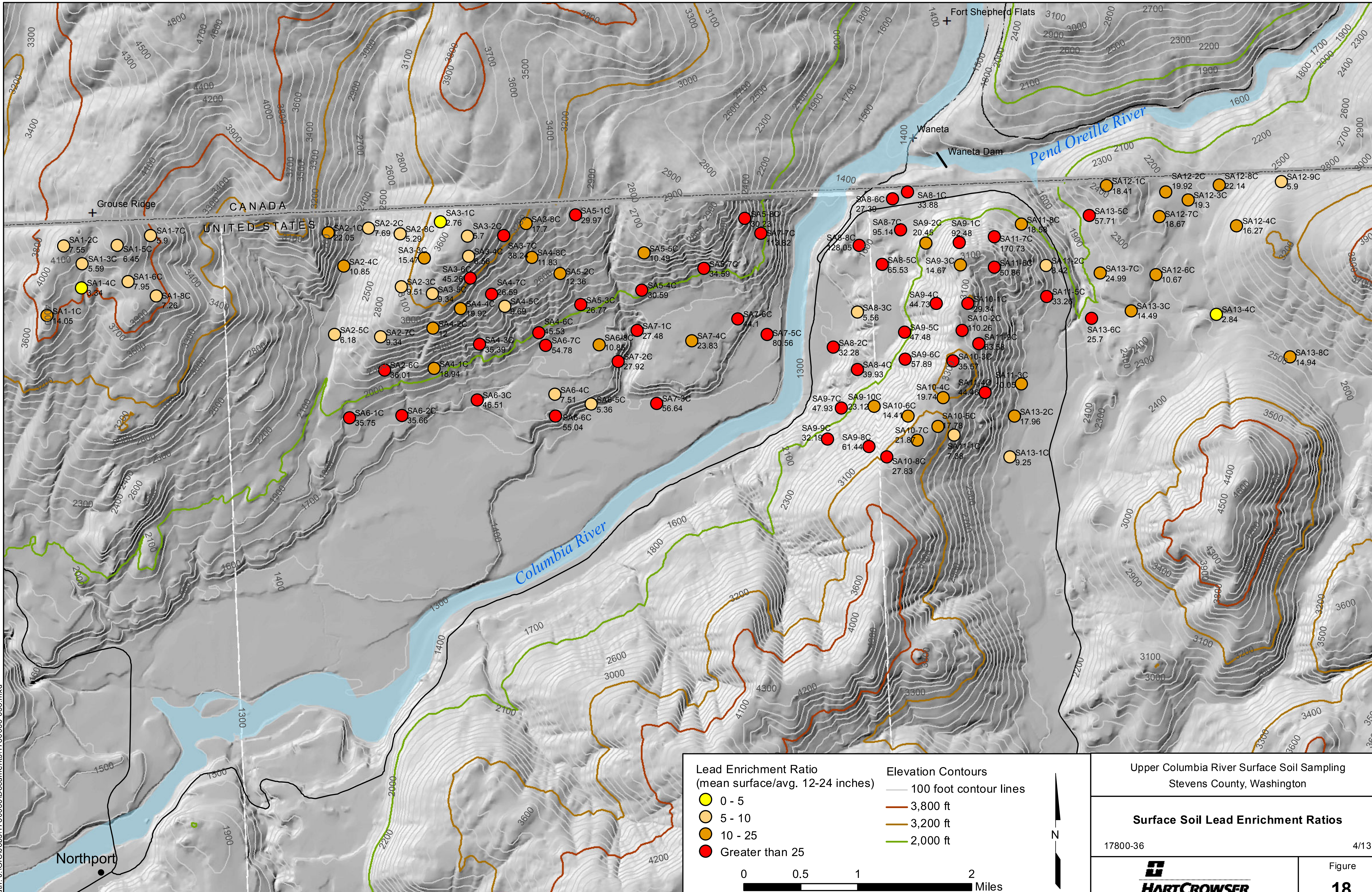
Figure

17



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Surface Soil Lead Enrichment Ratios

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Figure 18

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APPENDIX A
CANTOX MAPS OF MEASURED AND INTERPOLATED CONCENTRATIONS OF METALS IN SOIL

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APPENDIX B2

Maps of
Measured and Interpolated
Concentrations of Metals in Soil

Sampling of soils by

Larkspur Biological Consultants Limited, Castlegar, B.C.

Map production and kriging interpolation by

Teck Cominco Metals Ltd.

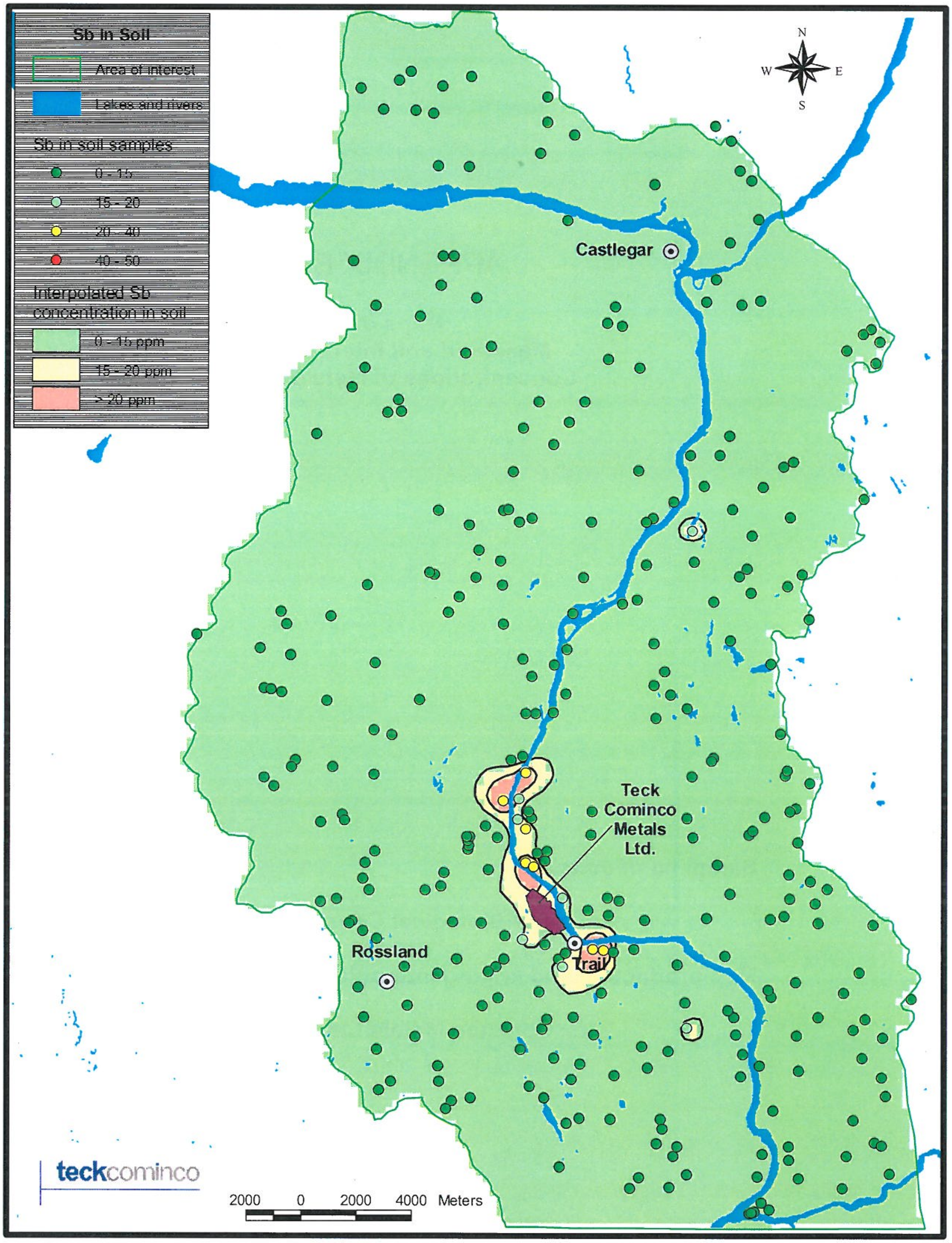

Figure B2.1. Interpolated and measured antimony concentrations in soil in the Teck Cominco Ecological Risk Assessment area of interest.

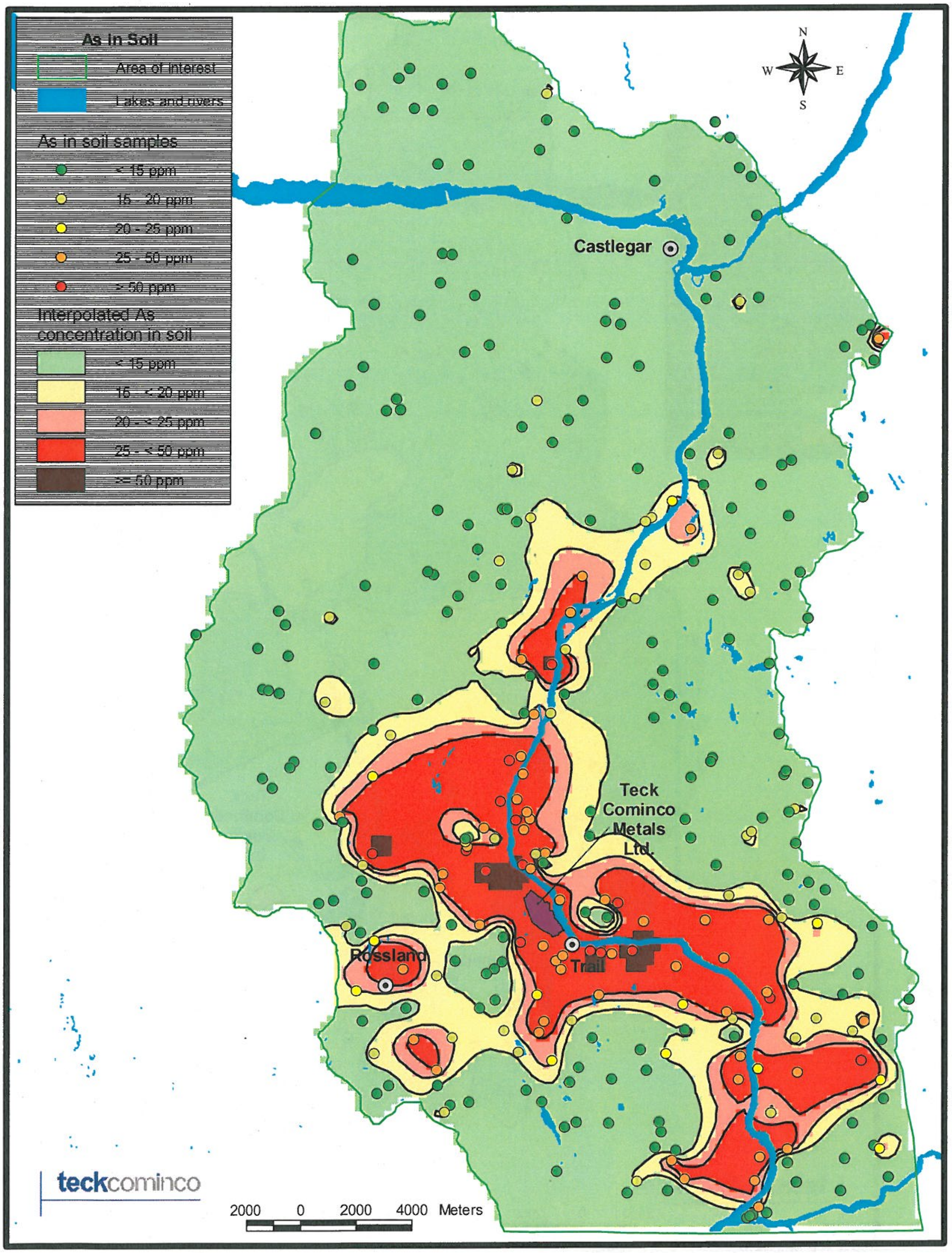

Figure B2.2. Interpolated and measured arsenic concentrations in soil in the Teck Cominco Ecological Risk Assessment area of interest.

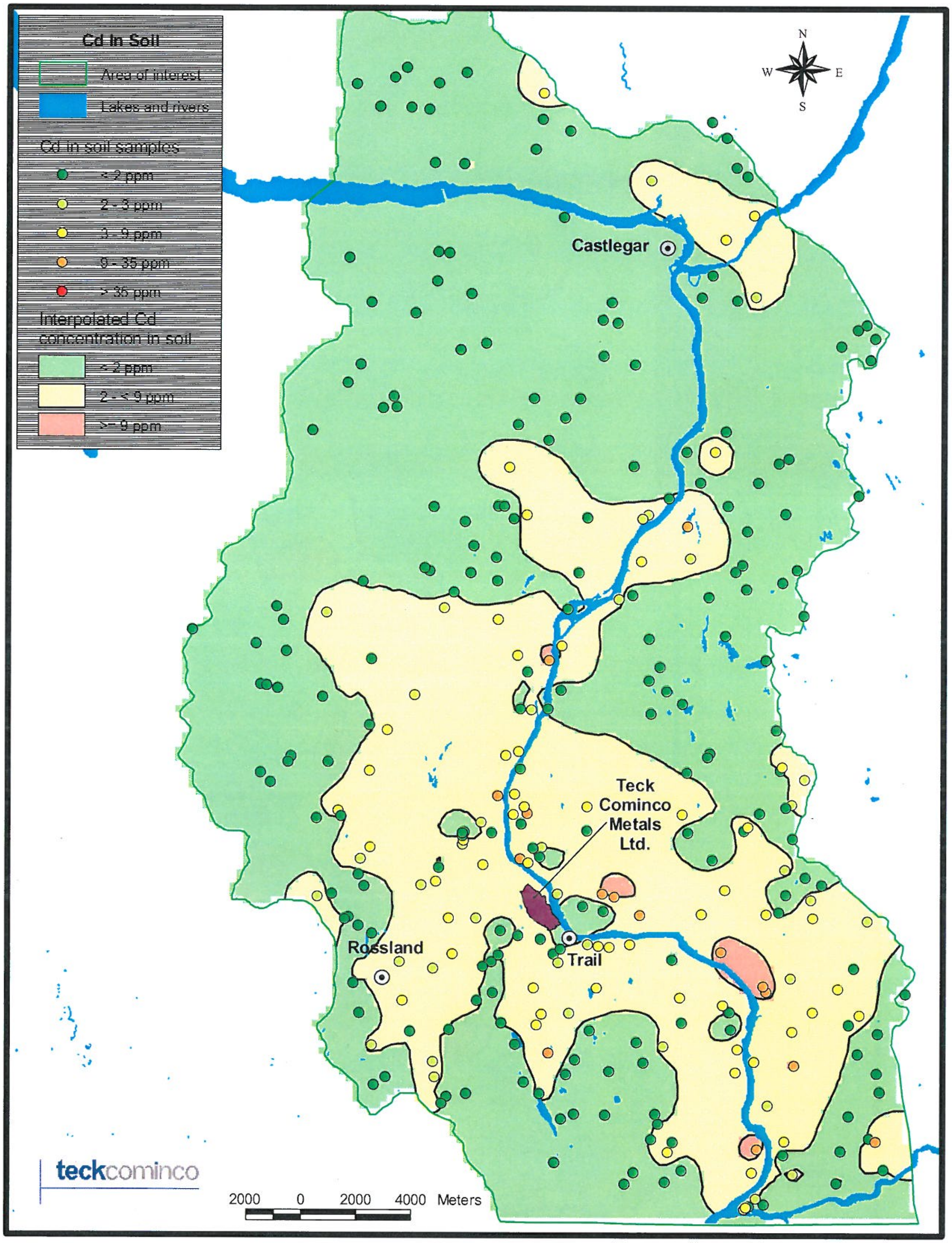

Figure B2.3. Interpolated and measured cadmium concentrations in soil in the Teck Cominco Ecological Risk Assessment area of interest.

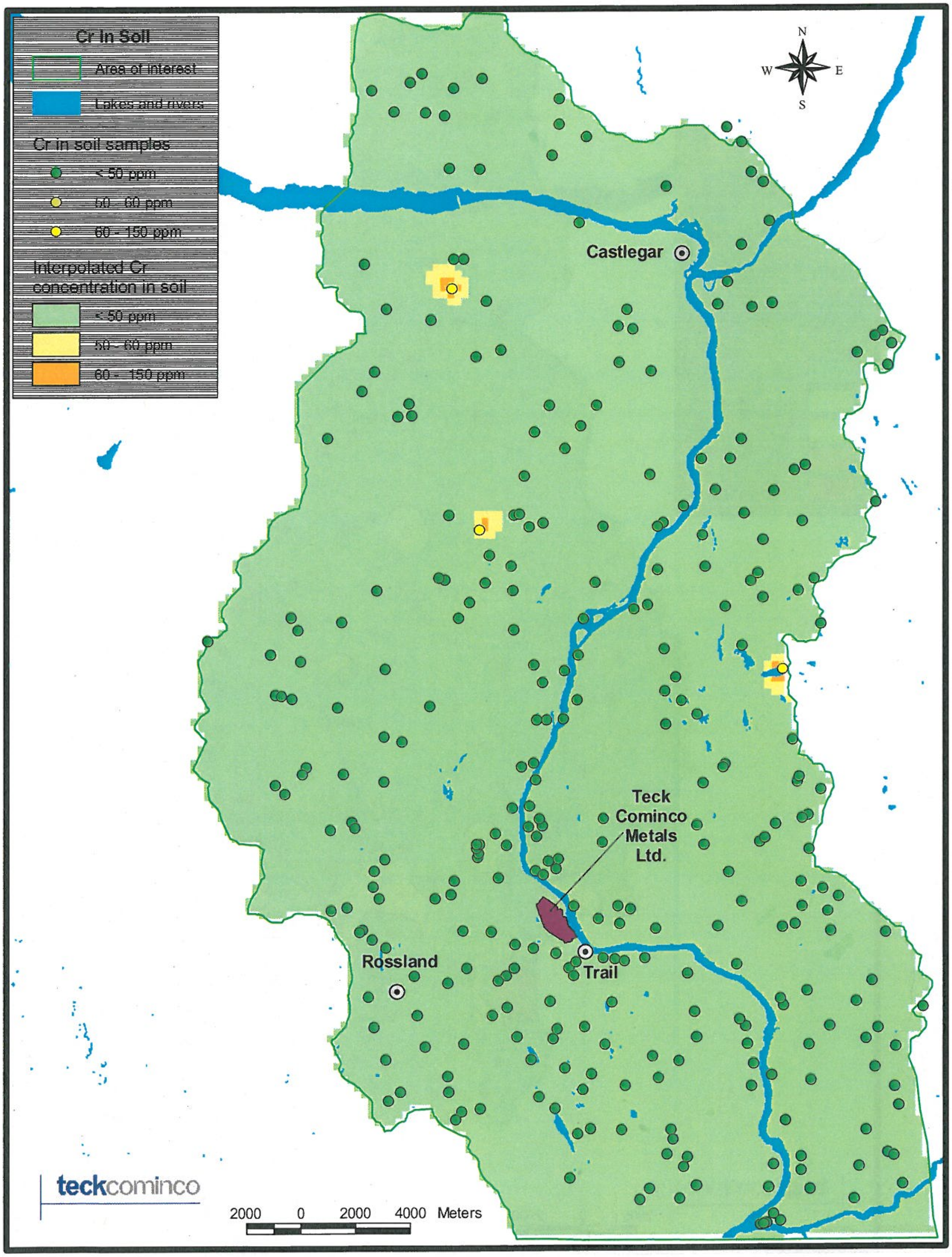

Figure B2.4. Interpolated and measured chromium concentrations in soil in the Teck Cominco Ecological Risk Assessment area of interest.

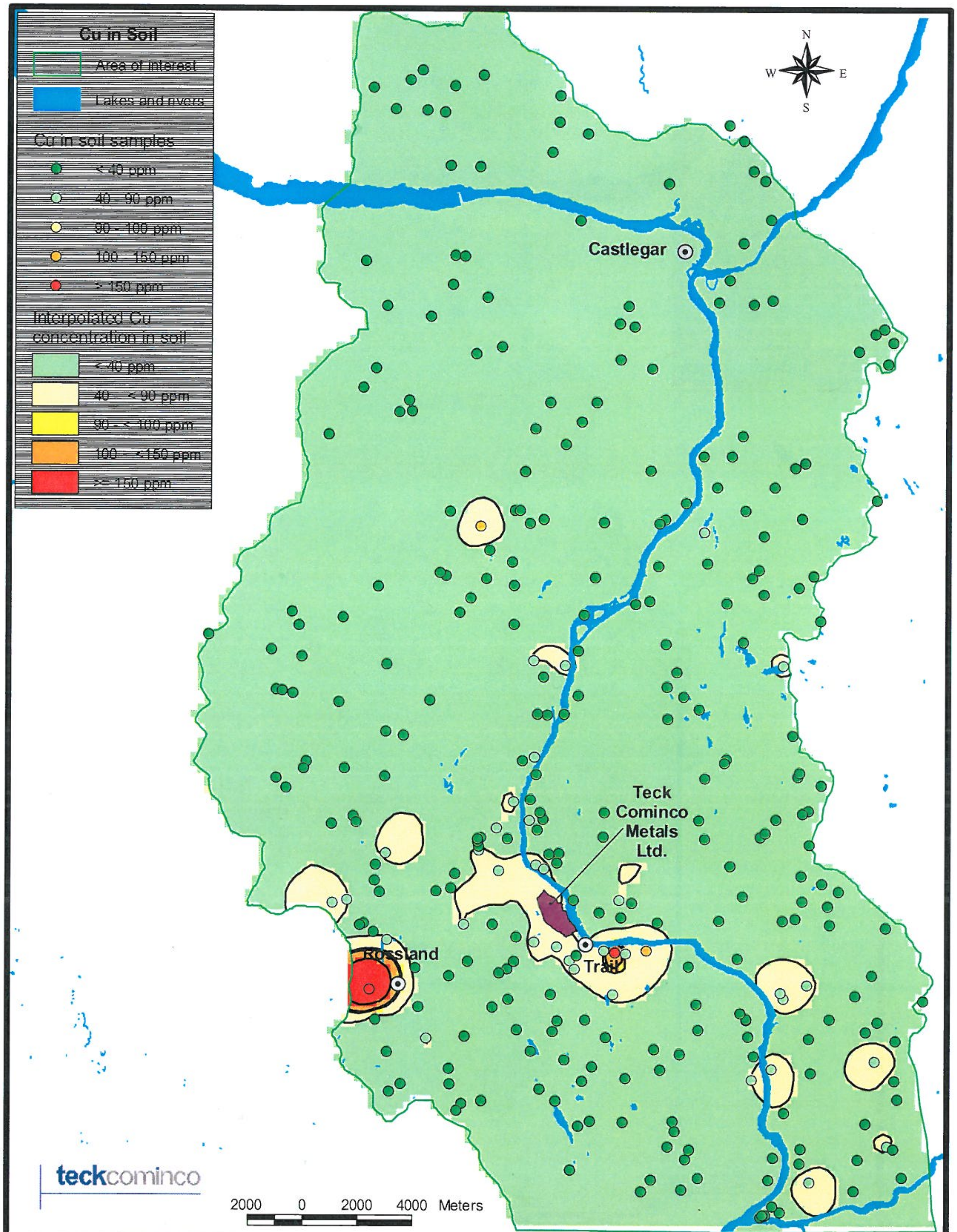

Figure B2.5. Interpolated and measured copper concentrations in soil in the Teck Cominco Ecological Risk Assessment area of interest.

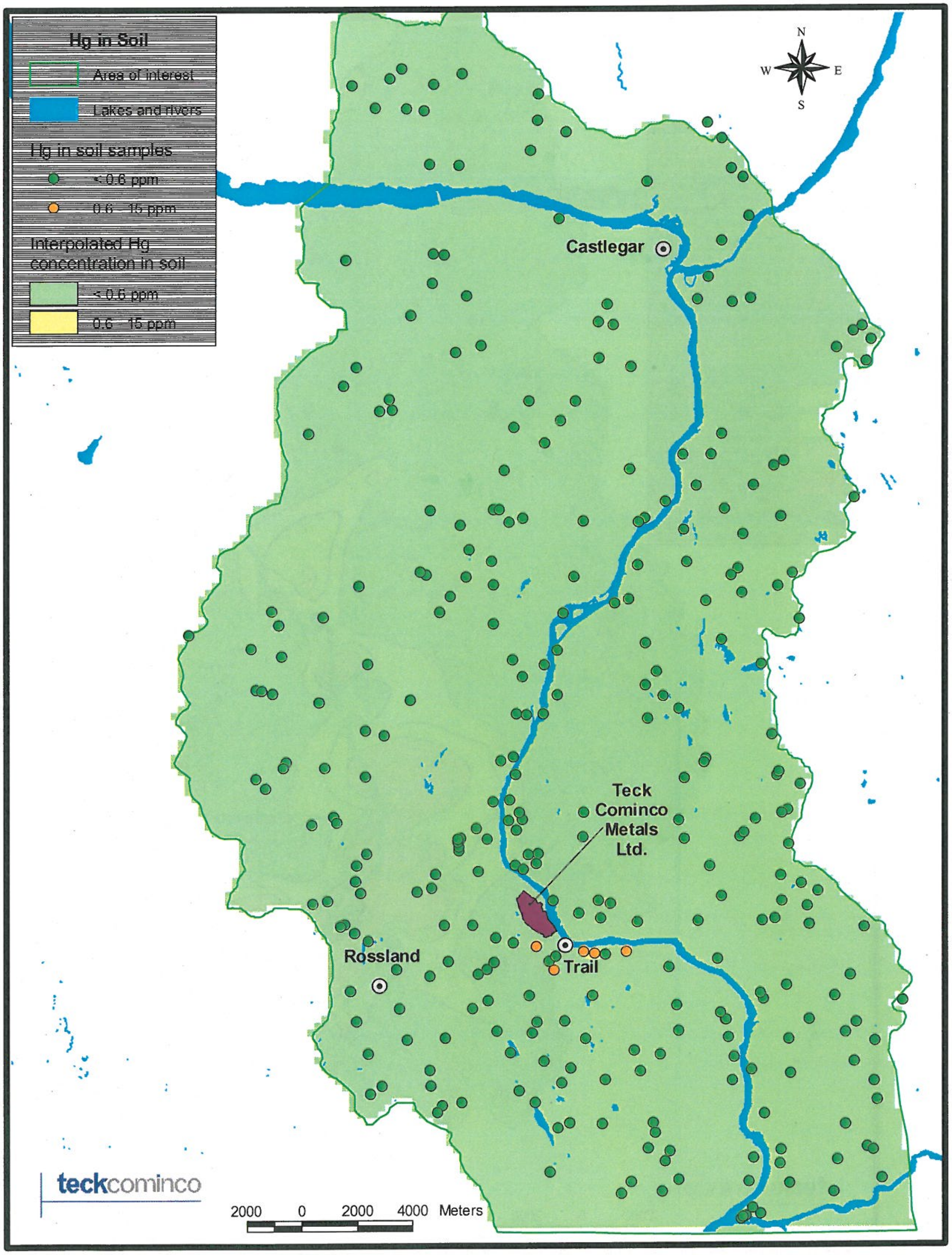

Figure B2.6. Interpolated and measured mercury concentrations in soil in the Teck Cominco Ecological Risk Assessment area of interest.

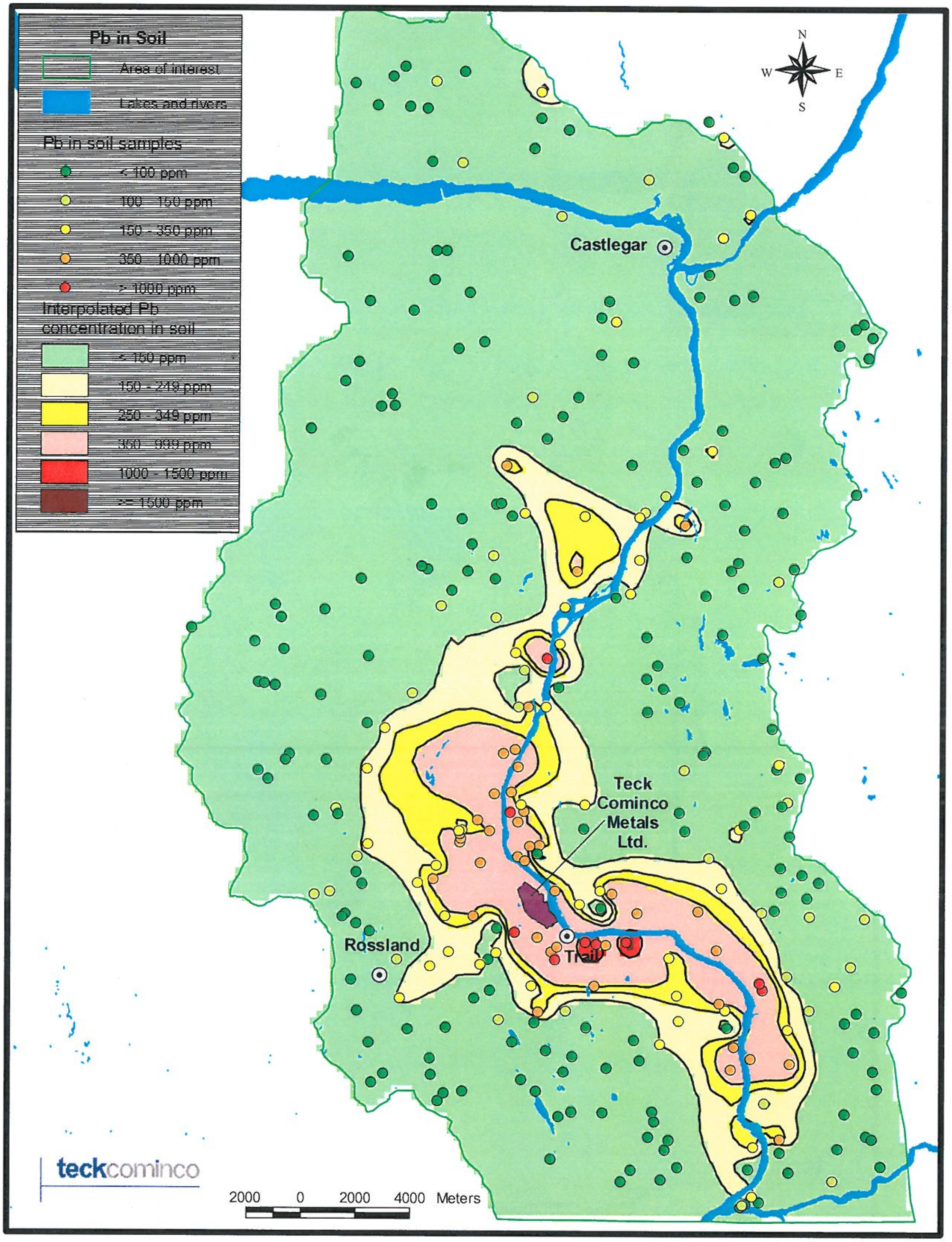

Figure B2.7. Interpolated and measured lead concentrations in soil in the Teck Cominco Ecological Risk Assessment area of interest.

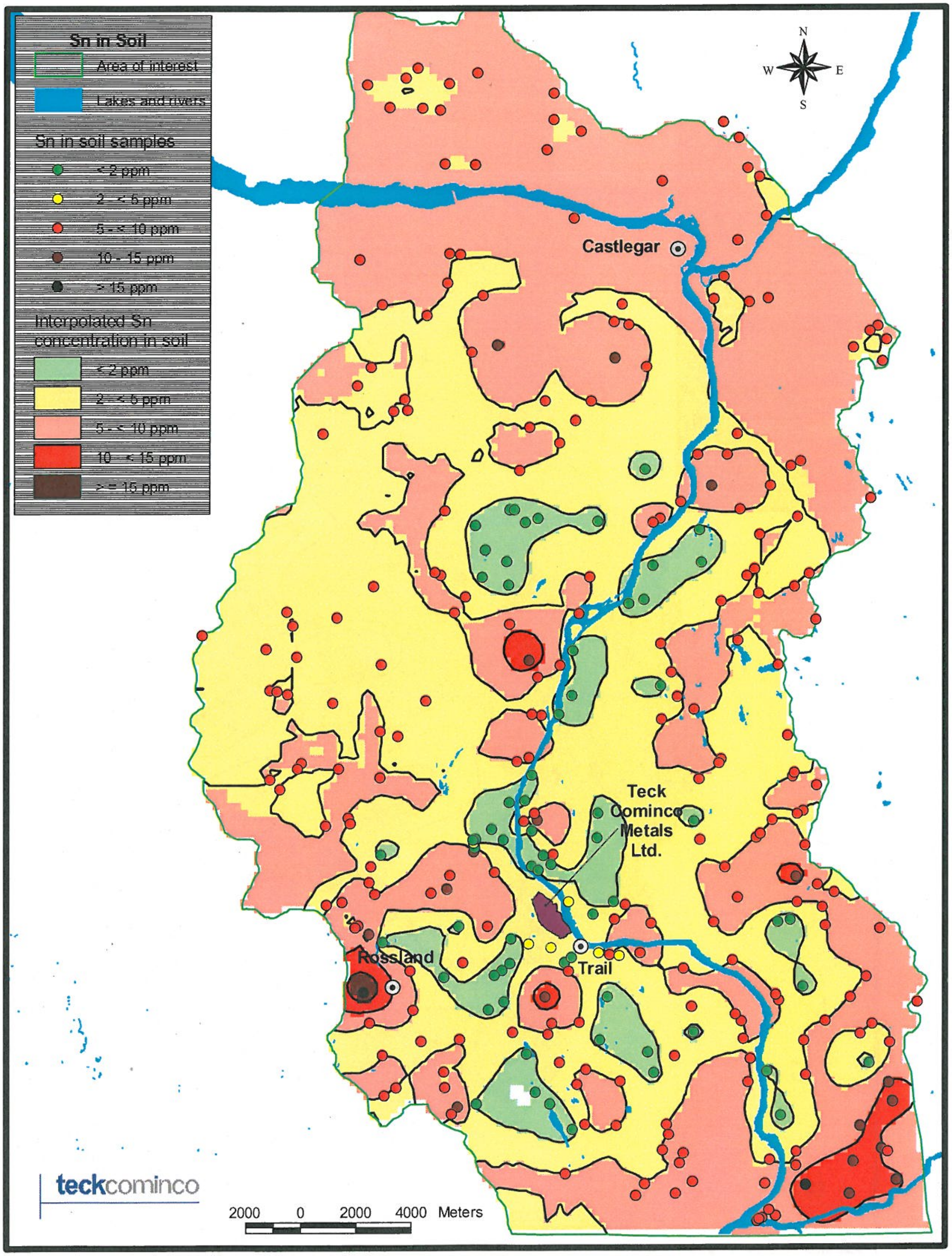

Figure B2.8. Interpolated and measured tin concentrations in soil in the Teck Cominco Ecological Risk Assessment area of interest.

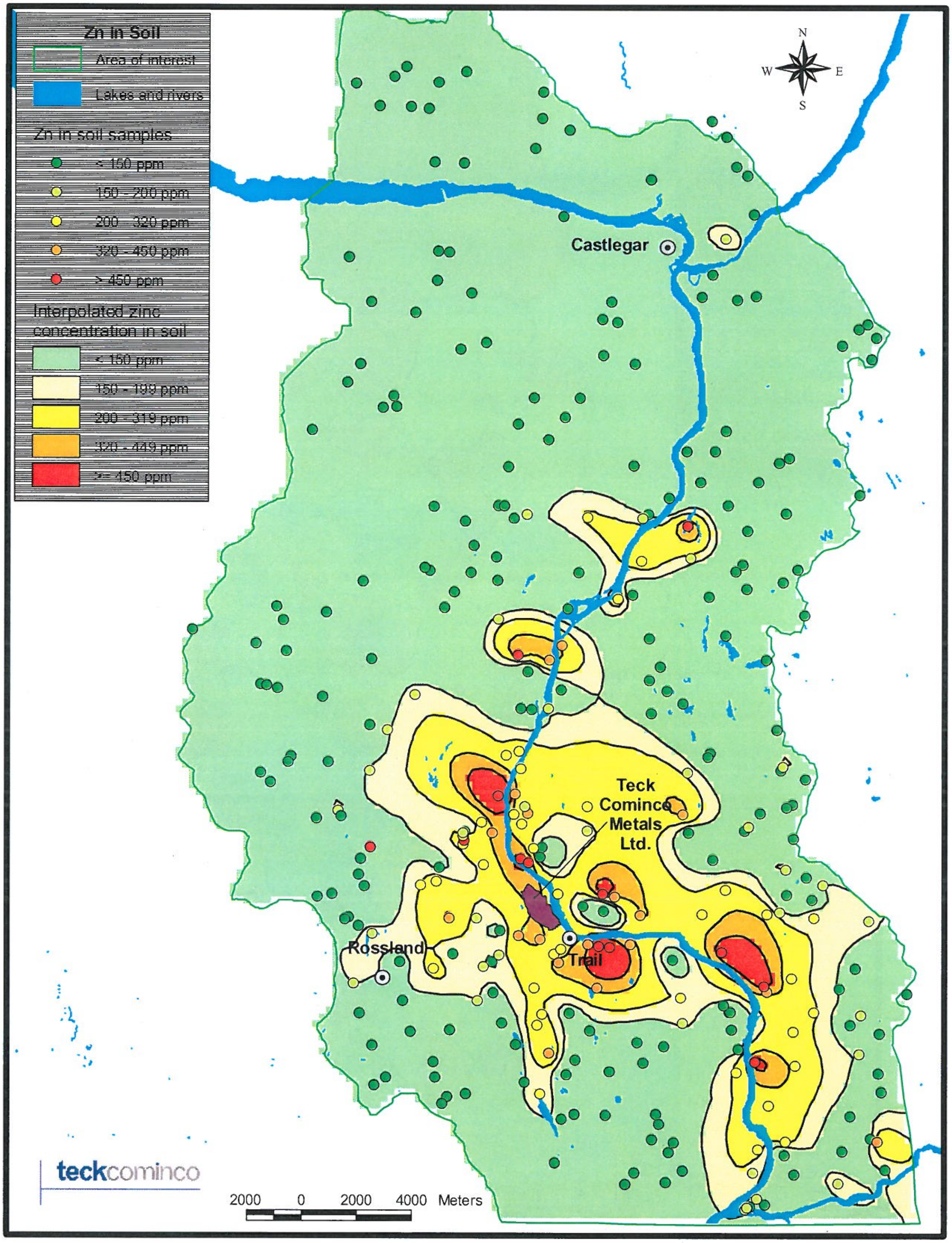

Figure B2.9. Interpolated and measured zinc concentrations in soil in the Teck Cominco Ecological Risk Assessment area of interest.

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APPENDIX B
SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN (SAP/QAPP) (DVD)

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Final
2012 Sampling and Analysis Plan
Quality Assurance Project Plan
Upper Columbia River
Upland Soil Sampling Study
Washington State

Prepared for
Washington State
Department of Ecology

December 12, 2012
17800-36

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Final 2012 Sampling and Analysis Plan
Quality Assurance Project Plan
Upper Columbia River
Upland Soil Sampling Study
Washington State

Prepared for
Washington State
Department of Ecology

December 12, 2012
17800-36

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FIGURES

FINAL
SAMPLING AND ANALYSIS PLAN/
QUALITY ASSURANCE PROJECT PLAN
UPPER COLUMBIA RIVER UPLAND SOIL STUDY

1.0 INTRODUCTION

This Final Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) describes sampling, laboratory, and data evaluation processes for the upland soil study in northern Stevens County, Washington. A Working Field Draft of the SAP/QAPP was submitted to Ecology on October 30, 2012. In November 2012, Ecology approved the document titled "Working Field Draft SAP/QAPP for Upland Soil Study in Northern Stevens County, Washington."

The working draft was approved with the understanding that there may be additional changes to sampling locations before and during the sampling effort. The authorization allowed field teams to complete sample collection before the onset of prohibitive 2012 winter conditions in the study area. Changes made to the working draft SAP/QAPP to finalize the document are described in section 1.1.

1.1 Revision of Working Field Draft

The working draft SAP/QAPP identified 13 subareas in which soil samples would be collected. During the start of field work, a limited number of subareas and proposed soil sample locations were tentative, based on obtaining access to various properties. To begin the field work, these tentative subareas were scheduled later in the field effort. The final proposed modifications to subareas and sample locations were approved by Ecology and field work was completed. These modifications have been incorporated into the following table and figures:

- Table 1 presents the revised information on the final proposed sample locations, aspect, percent slope, soil Map ID, Geology Map ID, and land use.

- Figures 1 and 2 present the revised 13 subareas in the study area, proposed sample locations, soils, and topography.

- Figures 3 and 4 present the revised 13 subareas in the study area, final proposed sample locations, geology, and topography.

No other changes (except for text in Section 1.0) of the working draft document have been made. The final investigation report for the study will present the final sample locations and identify deviations from the working draft SAP/QAPP and this addendum based on field observations and deviations made at the time of sample collection.

1.2 Purpose of Sampling and Analysis Plan/Quality Assurance Project Plan

This combined Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) describes the sampling subareas, locations, field sampling procedures, laboratory analytical methods, data evaluation procedures, and quality control criteria to support the Washington State Department of Ecology (Ecology) upper Columbia River upland soil study. This study will provide, on an area-based scale, an assessment of ambient surface soil conditions near the upper Columbia River valley near the U.S./Canada border. The study focuses on a portion of the general geographic area where historical documents indicate that vegetation has been damaged by operation of the Teck smelter in Trail, British Columbia. The purpose of this study is to collect sufficient data to initially evaluate potential aerial deposition patterns and statistical variability of metals concentrations in surface soil across a portion of the near-border landscape.

Upland soil sampling will be conducted in northern Stevens County, Washington. The study area is generally defined as an approximately 15- to 20-square-mile area extending across either side of the Columbia River, within approximately 2 miles of the U.S./Canada border.

Ecology is expediting this study so that sample collection may be completed before the onset of 2012 winter conditions. The short preparation time before field work may affect obtaining property access to some or all preliminary sampling locations identified in the 13 study subareas (Figures 1 and 2). The final SAP identifies final sampling point locations in the subareas.

2.0 BACKGROUND

The Teck smelter in Trail, British Columbia, has operated for over 100 years, and is one of the largest lead-zinc smelters in the world. The smelter is approximately 10 river miles north of the U.S./Canada border. Air emissions from the smelter have crossed the international border into Washington State. Visible areas of injury to forests caused by the effects of sulfur dioxide were mapped by the US Department of Agriculture (USDA) starting in 1929 (Fraser et al. 2012).

3.0 PROJECT OBJECTIVES AND SUMMARY

The objectives of this study include:

- Assess the concentrations of smelter-related metals in surface soil near the U.S./Canada border in an area that has historically been influenced by the Trail smelter.

- Evaluate potential spatial patterns and statistical variability of smelter-related metals concentrations in study area surface soil across a limited portion of the near-border landscape.

An anticipated 174 surface soil samples (including replicates and profile samples) will be collected (see Figures 1 and 2). These soil samples will be analyzed for:

- EPA Target Analyte List (TAL) metals (silver, aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, lead, potassium, sodium, antimony, selenium, thallium, vanadium, zinc, and mercury)
- pH
- Total Organic Carbon (TOC)
- Total solids

A quality assurance data validation review will be performed on analytical sample results. Validated data will be entered into Ecology's Environmental Information Management (EIM) system. Sampling results and laboratory data will be compiled and evaluated. Statistical data evaluation will be performed using EPA's ProUCL 4.0 software.

Sampling locations, procedures, analytical methods, and evaluation of results are discussed in subsequent sections of this SAP/QAPP.

4.0 PROJECT TEAM AND RESPONSIBILITIES

Key staff members and their project functions are listed below.

- Steven Hughes, LG, LHG, Project Manager, Geologist, Hydrogeologist

- Roger McGinnis, PhD, Chemist, Laboratory oversight, sampling design, and statistical evaluation

- Phil Cordell, LG, Geologist, GIS

- Anne Conrad, MS, Geochemist, Data Quality Review, Health and Safety Manager

The following subcontractors will provide support services:

- Chemical analysis will be performed by Analytical Resources, Inc. (ARI), located in Tukwila, Washington. ARI is accredited by the State of Washington. The ARI project manager will be Kelly Bottem.

- If additional field staff are needed to meet the short sampling schedule, TerraGraphics may supply the additional field staff.

5.0 SAMPLING LOCATIONS

Soil samples are planned to be collected from 13 irregularly shaped subareas identified by Ecology's Toxics Cleanup Program (TCP) within approximately 2 miles of the U.S./Canada border. On Figures 1 and 2, subareas with identified soil types are shown, while on Figures 3 and 4, subareas with geologic mapping units are shown. Each subarea is approximately 1 to 2 square miles in extent. The total area evaluated will span approximately 15 to 20 square miles and extend roughly 5 to 6 miles east and 5 to 6 miles west of the Columbia River (Figures 1, 2, 3, and 4). Eight four-point composite samples and one vertical profile sample will be collected from each subarea, as feasible. The eight sample points will be judgmentally selected and geographically distributed within each subarea. The eight sampling point locations collected from within each subarea will each be obtained using a compositing approach, further explained in Section 6.1 and as provided below.

5.1 Sampling Location Selection

A geographic information system (GIS) was used to identify the subareas to be included in this study. The following criteria were used to select a representative range of subarea and composite sample site locations:

The following topological characteristics were used to evaluate and select proposed sample subareas and sampling point locations:

- Geology - Sample locations were selected as feasible to represent major geological units present in the study area.

- Pedology (Soil Type) - Sample locations were selected as feasible to represent major soil types present in the study area.

- Elevation – By judgmentally selecting topographic patterns, subareas have been, in part, selected with respect to a range of elevation conditions. The following zones will be evaluated for distinct differences in metal concentration patterns among plateaus, ridges, valleys, and intermediate slopes:

  - Less than 2,000 feet
  - 2,000 to 3,200 feet
  - 3,200 to 3,800 feet
  - Greater than 3,800 feet

- Slope aspect – Slope aspect also was evaluated when configuring sampling subareas. North-, south- east-, and west-facing slope orientations may enable evaluation of potential smelter plume deposition patterns. Elevation and slope aspect were further considered relative to ridges and valleys to evaluate other potential metals transport and deposition pathways.

- Percent slope – Slope was a secondary evaluation factor. In general, sample locations were selected in areas with less than 30 percent slope for ease of sample collection and to ensure sufficient soil to obtain representative samples was present within the individual sub-sampling areas.

Based on these selection criteria, a list of 122 sample locations (not including replicate sample locations) was developed (Table 1). Sample locations depend on obtaining site access and on site conditions, and may be modified.

6.0 FIELD SAMPLING METHODS

The concentration of air-deposited contaminants in surface soil may vary over short distances. These differences may be the result of small-scale differences in deposition patterns and/or soil characteristics. The resources available for this study and size of the chosen subareas preclude collecting and independently testing multiple, high-density, discrete sampling point locations from each subarea. Therefore, the decision was made to collect eight composite point samples from each subarea in this study to represent soil values. To obtain a composite sample, four sub-samples will be collected within an approximate 20-foot radius and composited to reduce short-range sample variability.

Uppermost soil intervals are anticipated to be the most representative of potential human or ecological contact with and exposure to soil contaminants and, absent physical disturbance of the soil, these intervals may contain the highest concentrations of air-deposited chemicals at a sampling location. For this study, Ecology infers that the upper 3 inches are likely to include and retain metals deposited by historical smelter emission operations. Therefore, a depth interval of 0 to 3 inches below non-decomposed surface litter will be sampled.

Discrete depth profile samples will be collected from one of the eight composite locations in each subarea, typically near the center of the subarea. The profile sampling is discussed further in Section 6.4.

A list of equipment supplies for the field effort is included as Appendix A.

6.1 Selection of Sample Location

Preferred sampling points shall be identified and placed on a site map before beginning field activities. These locations may be modified during the site visit.

After selecting a sampling point, four subsample locations will be established and marked on the ground using pin flags. A default design for collecting subsamples will be used as a point of departure for modification by field personnel using their best judgment on collecting representative samples. Collectively, the set of four subsamples will be composited to represent conditions at the sampling point.

The default design will be to collect and composite four subsamples within a roughly 1,200-square-foot circular sample compositing zone (about a 20-foot radius). This layout may be modified if necessary to avoid obstacles or excluded areas as long as subsamples are separated by at least 20 feet. If this is not possible, an alternate location should be considered for sampling.

After establishing the center point, a measuring tape will be extended for approximately 20 feet in a specific direction (e.g., to the north) and a pin flag placed. Based on local conditions, the sampler may walk along the circumference of the circle for 90 degrees, and place the next pin flag, and continue the same way for two more subsample locations. Alternatively, the sampler may measure out 20 feet to the north and mark with a pin flag, then return to the center point and measure out 20 feet to the west, east, and south marking each location. Table 1 presents the Aspect (degrees from North) that will be used to establish the direction from the center point to the first subsample location.

After marking subsample locations with pin flags, a photograph of the sampling point will be taken and recorded in the field log book. A site sketch of landmarks on the property, the sample location point, land use, topography, geology, and soil description will be recorded on the field sampling form. In addition, field staff will record the latitude and longitude at the center of the circle using a global positioning system (GPS) device.

6.2 Sample Exclusion Criteria

Surface soil sampling points will be selected from the least-disturbed portions of the sample locations. The sampling point subsamples should represent a consistent set of soil and vegetation conditions at each sampling point location. The following areas will be excluded when selecting sampling points:

- Disturbed areas and areas of animal burrowing activity;
- Areas composed primarily of rocks or gravel, with no significant soil content;
- Areas near constructed structures and developed or altered lands;
- High-traffic areas (e.g., roads, logging areas, and hiking trails);
- Hummocks, paths used by animals or humans, and other areas disturbed by treefall or animal digging;
- Burn pits, fire pits, other incineration sources, and presence of charcoal or other foreign materials observed in soil,
- Areas where there is evidence of recent fires; and
- Areas near forest roads where wind-blown transport or other disturbances are more likely to occur. All sampling will be performed a minimum of 500 feet from roadways.

If the planned sampling location meets any of the listed exclusion criteria, samples will not be collected and a new sample location will be established from an area with similar geographical characteristics within the same subarea. Alternate sample collection locations will be attempted as near to the original locations as feasible. Alternate locations will be scoped and selected in the field, as needed.

6.3 Surface Soil Sample Collection

Sample collection will be performed in a consistent manner by field personnel at all sampling locations to support data representativeness objectives. Samples collected should be representative of the targeted 0- to 3-inch depth profile. Care should be taken to collect all size fractions (smaller than 2 mm) and avoid loss of fine material. If soil is scraped from the sidewall of the sampling hole, the bottom of the shallow excavation may be lined with plastic to ensure the entire sample is recovered. Excess soil will be collected so that material can be archived for future additional analyses.

The sample location and site conditions will be recorded in field books and on field sampling forms.

6.3.1 Remove Groundcover

Groundcover may consist of snow, grass, other vegetation, leaves, conifer needles, or rocks/pebbles. An area of approximately 8 inches by 8 inches will need to be uncovered. The actual area may vary by site depending on how rocky the soil is and how much vegetation is present. Groundcover removal procedures include:

- Remove the surface layer of snow, grass, leaves, needles, rocks, or twigs at each subsample point by gloved hand, spade, or trowel. The groundcover should only be removed to the point where primarily decomposed matter and soil is exposed, being careful not to disturb the soil below. An effort should be made to collect soil adhering to roots by shaking or brushing into the collection bowl.

- In forested areas, forest litter (undecomposed identifiable dead plant material) and forest duff (partially decomposed organic material with identifiable plant material) will be removed using a spade or trowel. Scraping the sidewall during sample collection will include the humus horizon (completely decomposed organic material) that underlies the forest duff.

- If the sampling point location does not contain vegetation, then any rocks or pebbles can be brushed aside by the sampler(s) using a gloved hand.

6.3.2 Subsample Collection

Samples will be collected from each of the four sampling point locations from the upper 0 to 3 inches of soil using a precleaned stainless steel spoon, trowel, bulb planter, or other coring device. Sufficient soil must be collected for chemical analytical tests (one 8-ounce jar). Organic matter such as roots, leaves, twigs, pinecones, and debris, should be excluded from the sample. Rocks, pebbles, and gravel should be removed from the sample collected for chemical analysis.

Surface soil (0 to 3 inches) subsamples will be collected as follows:

- Put on a clean pair of nitrile gloves.
- Excavate soil to a depth of 3 inches with a clean spade, spoon, bulb planter, or trowel. Use a ruler to accurately determine the depth.
- Place soil into a stainless steel bowl.
- Repeat this process at all subsample locations collecting a generally uniform amount of soil from each of the four sampling point locations.
- Remove any large fragments of organic matter such as sticks or roots from the bowl, taking care to retain soil particles adhered to debris to the extent practical.
- Using a clean gloved hand, remove any large rocks or gravel from the bowl, taking care to retain soil particles adhered to debris to the extent practical.
- Homogenize the soil in the bowl by mixing with a collection spoon and then separate the soil into four equal aliquots by drawing an "X" in the soil with the spoon.
- Place one spoonful of soil from each quarter into a clean 8-oz sample container until full. Take care to ensure the soil placed in the jars is representative of the vertical distribution in the sample.
- Once containers are full, the rims should be wiped using a clean paper towel or Kimwipe, and the lids tightly screwed on.
- The sample jars should be labeled with the date, time, and sample identification and placed in a ziplock bag. The sample identification should also be marked on the jar lid and the ziplock bag.
- Place the labeled sample containers into an iced cooler as soon as feasible.
- Remove pin flags once soil samples have been collected and return site to original grade as best as possible.

6.3.3 Field Replicate

One field replicate sample shall be collected from each of the 13 subareas. After the primary composite sample location is identified, a second composite sample will be collected by rotating the primary sample locations 45 degrees clockwise. The field replicate sample collection will follow the procedure listed above. The field replicate will be submitted to the laboratory for the same sample analysis.

6.4 Profile Sample Collection

Within each of the 13 subareas, a single discrete depth profile station will be established and sampled. This station will be located at the center point of a composite sampling point location. Sample collection will be performed in a consistent manner by field personnel at all sampling locations to support data representativeness objectives. Care should be taken to preserve all size fractions smaller than 2 mm and avoid loss of fine material. Adequate soil will be collected so that material can be archived.

The sample location and site conditions will be recorded in field books and on field sampling forms.

After the sampling point location is confirmed, the area will be cleared of surface organic materials, following the procedure described for the subsample locations.

6.4.1 Profile Interval Collection

Using a cleaned auger, shovel, or trowel, depending on soil conditions, a hole will be excavated down to 24 inches or bottom of the soil horizon (e.g. bedrock, rejection, etc.). The following depth intervals will be sampled and submitted for chemical analysis:

- 0 to 3 inches
- 3 to 6 inches
- 6 to 12 inches
- 12 to 24 inches or to bottom of soil horizon

Each profile will be photo-documented and described by a geologist or an environmental scientist.

6.5 Sample Sieving

The soil sample collected for chemical analysis will be sieved by the laboratory using an ASTM No. 10 (2 mm) screen, to obtain finer-grained material consistent with MTCA requirements (WAC 173-340(7)(a)). Additional details are provided in Section 8.0.

6.6 Equipment Decontamination Procedures

Precleaned equipment will be used for all soil sampling. All reusable or nondedicated field equipment (e.g., sampling spoons, mixing bowls, spade/shovel, etc.) will be decontaminated before use. Decontamination will not be required between collection of subsamples that will be composited. Clean sample equipment will be used for each depth interval for the profile samples. Equipment will be cleaned in the following manner:

- Nitrile gloves (or equivalent) must be worn during decontamination.
- Excess soil will be removed using paper towels or by dry brushing.
- Rinse with potable water.
- Wash with a spray bottle containing Liquinox™ (or equivalent nonphosphate detergent) and water and clean with the stiff-bristle brush until all evidence of soil or other material has been removed.
- Rinse with site water or tap water ensuring that all soap from the previous step has been removed.
- Rinse with deionized or distilled water.
- Place the equipment on a piece of plastic to air dry.
- A trash bag should be provided for waste paper towels, used nitrile gloves, etc.

6.7 Disposal of Investigation-Derived Waste

6.7.1 Disposal of Incidental Trash

Incidental trash generated during this investigation (including discarded nitrile gloves, aluminum foil, paper towels, and disposable equipment) will be placed in plastic trash bags and disposed of as solid waste.

6.7.2 Decontamination Water Disposal

Wash water and rinse water volumes will be small and will be poured onto the ground.

6.8 Sample Containers and Labels

Sample container requirements vary according to analyte. Precleaned sample containers will be obtained from the analytical laboratory. Sample containers shall be cleaned following the requirements described in Specifications and Guidance for Contaminant-Free Sample Containers (EPA 1992a, OSWER Directive 92.0-05a). Required sample containers are summarized in Table 2.

Samples will be identified by the subarea, type of sample, and consecutive number. For example, the first composite sample collected from subarea 8 would be labeled:

- SA8-1C

The profile samples would be labeled with the uppermost sample collected having the lowest number. For example, the profile sample collected from subarea 6, collected at composite sample location 5, would be labeled:

- SA6-5P-1 (0 to 3″ depth)
- SA6-5P-2 (3 to 6″ depth)
- SA6-5P-3 (6 to 12″ depth)
- SA6-5P-4 (12 to 24″ depth)

Field replicates will be labeled with a “D,” for example:

- SA8-1D

6.9 Field Documentation

Field notes will be maintained during sampling and processing operations. The following will be included in the field notes:

- Subarea number;

- Date and time of entry;

- Names of the field sampler collecting and logging the samples;

- Weather conditions;
- Date, time, and identification of each sample, including number of jars and tests requested;
- Observations on land use, topography, geology, and soil characteristics;
- Approximate distances and orientation from nearby roadways or observed areas of disturbance.
- Documentation of photographs;
- Details of sample collection, including GPS coordinates; actual sampling point locations will be recorded on a sketch map;
- Soil description (including visual horizons, grain characteristics, color, root and organic matter)
- Any deviation from the approved SAP; and
- General observations.

7.0 SAMPLE HANDLING PROCEDURES

7.1 Sample Preservation and Holding Times

Samples will be preserved according to the requirements of the specific analytical methods to be employed, and all samples will be extracted and analyzed within method-specified holding times. Required sample containers, preservatives, and holding times are summarized in Table 2.

7.2 Chain of Custody and Shipping Procedures

7.2.1 Chain of Custody Procedures

Chain of custody forms will be used to document the collection, custody, and transfer of samples from their initial collection location to the laboratory, and their ultimate use and disposal. Entries for each sample will be made on the custody form after each sample is collected.

Sample custody procedures will be followed to provide a documented record that can be used to follow possession and handling of a sample from collection through analysis. A sample is considered to be in custody if it meets at least one of the following conditions:

- The sample is in someone's physical possession or view;
- The sample is secured to prevent tampering (i.e., custody seals); and/or
- The sample is locked or secured in an area restricted to authorized personnel.

A chain of custody form will be completed in the field as samples are packaged. At a minimum, the information on the custody form shall include the sample number, date and time of sample collection, sampler, analysis, and number of containers. Two copies of the custody form will be placed in the cooler prior to sealing for delivery to the laboratory with the respective samples. The other copy will be retained and placed in the project files after review by the Project Chemist. Custody seals will be placed on each cooler or package containing samples so the package cannot be opened without breaking the seals.

7.2.2 Sample Shipping Procedures

After sample containers have been filled, they will be packed on ice in coolers. The coolers will be transferred to ARI for chemical analysis. Chain of custody procedures will commence in the field and will track delivery of the samples to the analytical laboratories. Specific procedures are as follows:

- Samples will be packaged and shipped in accordance with U.S. Department of Transportation regulations as specified in 49 CFR 173.6 and 49 CFR 173.24;
- Individual sample containers will be packed to prevent breakage;
- The coolers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the cooler, and the Hart Crowser office name and address) to enable positive identification;
- A sealed envelope containing custody forms will be enclosed in a plastic bag and taped to the inside lid of the cooler;
- Signed and dated custody seals will be placed on all coolers prior to shipping;
- Samples will either be shipped by overnight courier or will be hand delivered to the laboratory by Hart Crowser personnel; and

- Upon transfer of sample possession to the testing laboratories, the custody form will be signed by the persons transferring custody of the coolers. Upon receipt of samples at the laboratory, the shipping container custody seal will be broken and the laboratory sample-receiving custodian will compare samples to information on the chain of custody form and record the condition of the samples received.

8.0 LABORATORY METHODS

Samples will be individually sieved by the laboratory using decontaminated Number 10 (2mm) sieves. If samples are too wet to sieve, they will be air dried at room temperature to remove excess moisture. Drying should only be performed if necessary. If drying is required, the entire bulk sample should be evenly spread on a tray, approximately 1/2 to 1 inch thick. Dry at ambient room temperature only until the soil matrix is amenable to sieving. Drying at elevated temperature, i.e. "baking," is not allowed. Turning the soil on a daily basis may be necessary to facilitate drying.

8.1 Analytical Methods

Samples will be analyzed according to EPA methods as described in Update III to Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846 (EPA 1986), and Standard Methods as summarized below.

Soil samples will be analyzed for:

- Total metals (silver, aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, lead, potassium, sodium, antimony, selenium, thallium, vanadium, zinc) by EPA Methods 6010B/6020
- Total mercury by EPA Method 7471A
- Total Organic Carbon (TOC) by Plumb, 1981
- pH by EPA Method 9045
- Total solids by SM 2540B or equivalent

Laboratory methods, practical quantitation limits (PQL; reporting limits) and method detection limits are presented in Table 3.

9.0 QUALITY ASSURANCE AND QUALITY CONTROL

The quality of analytical data generated is assessed by the frequency and type of internal QC checks developed for analysis type. The quality of laboratory measurements will be assessed by reviewing results for analysis of method blanks, matrix spikes, duplicate samples, laboratory control samples, surrogate compound recoveries, instrument calibrations, performance evaluation samples, interference checks, etc., as specified in the analytical methods to be used. The following general procedures will be followed for all laboratory analyses:

- Laboratory blank measurements at a minimum frequency of 5 percent or one per batch of 20 samples or fewer for each matrix;

- Matrix spike (MS) analysis to assess accuracy and precision at a minimum frequency of 5 percent or one per batch of 20 samples or fewer for each matrix;

- Laboratory duplicate sample analysis to assess precision at a minimum frequency of 5 percent or one per batch of 20 samples or fewer for each matrix; and

- Laboratory control sample analysis to assess accuracy in the absence of any matrix effect at a minimum frequency of 5 percent or one per batch of 20 samples or fewer for each matrix.

Laboratory quality control procedures, criteria, and corrective action are summarized in Tables 4 and 5 for the various analyses.

9.1 Data Quality Indicators

The overall quality assurance objectives for field sampling, field measurements, and laboratory analysis are to produce data of known and appropriate quality to support the Ecology Upper Columbia River upland soil study. The procedures and quality control checks specified herein will be used so that known and acceptable levels of accuracy and precision are maintained for each data set. This section defines the objectives for accuracy and precision for measurement data. These goals are primarily expressed in terms of acceptance criteria for the quality control checks performed.

The quality of analytical data generated is controlled by the frequency and type of internal quality control checks developed for analysis type. Laboratory results will be evaluated by reviewing results for analysis of method blanks, matrix spikes, duplicate samples, laboratory control samples, calibrations, performance evaluation samples, interference checks, etc., as specified in the analytical methods to be used.

9.1.1 Precision

Precision is the degree of reproducibility or agreement between independent or repeated measurements. Analytical variability will be expressed as the relative percent difference (RPD) between laboratory replicates and between matrix spike and matrix spike duplicate analyses. RPD will be used to measure precision for this investigation and is defined as follows:

$$RPD = \frac{(D_1 - D_2)}{(D_1 + D_2)/2} \times 100$$

Where,

D_1	=	Sample value
D_2	=	Duplicate sample value

Composite samples will be collected at each site to minimize sampling variability.

9.1.2 Accuracy

Accuracy is the agreement between a measured value and its true or accepted value. While it is not possible to determine absolute accuracy for environmental samples, the analysis of standards and spiked samples provides an indirect assessment of accuracy.

Laboratory accuracy will be assessed as the percent recovery of matrix spikes, matrix spike duplicates, and laboratory control samples. Accuracy will be defined as the percentage recoverable from the true value and is defined as follows:

$$\%Recovery = \frac{(SSR\text{-}SR)}{SA} \times 100$$

Where,

SSR = spiked sample result
SR = sample results
SA = amount of spike added

9.1.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Care will be taken in the design of the sampling program to ensure sample locations are selected properly, sufficient numbers of samples are collected and subsamples are blended to accurately reflect conditions at the site, and samples are representative of sampling locations. A sufficient volume of sample will be collected at each sampling point to minimize bias or errors associated with sample particle size and heterogeneity.

9.1.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. In order to insure results are comparable, samples will be analyzed using standard EPA methods and protocols as described in *Test Methods for Evaluating Solid Wastes Physical/Chemical Methods* (EPA 1986). Data will also be reviewed to verify that precision and accuracy criteria have been achieved and, if not, that data have been appropriately qualified.

As discussed in Section 6.3, sample collection will be performed in a consistent manner by field personnel at all sampling locations to ensure all data collected as part of this study are comparable. Comparability is attained by careful adherence to standardized sampling and analytical procedures, based on rigorous documentation of sample locations (including depth, time, and date).

9.1.5 Completeness

Completeness is the percentage of measurements made that are judged to be valid. Completeness will be calculated separately for each analytical group, e.g., metals. Results must also contain all quality control check analyses required to verify the precision and accuracy of results to be considered complete. Data qualified as estimated during the validation process will be considered complete. Nonvalid measurements will be results that are rejected during the validation review or samples for which no analytical results were obtained. Completeness will be calculated for each analysis using the following equation:

$$\text{Completeness} = \frac{\text{valid data points obtained}}{\text{total data points planned}} \times 100$$

The target goal for completeness is a minimum of 95 percent. Completeness will be monitored on an on-going basis so that archived sample extracts can be reanalyzed, if required, without remobilization.

9.2 Data Quality Assurance Review

A project chemist at Hart Crowser will perform an independent data quality review of the chemical analytical results provided by ARI and summarize the results in a report. The report will assess the adequacy of the reported detection limits in achieving the project screening levels for soil; the precision, accuracy, representativeness, and completeness of the data; and the usability of the analytical data for project objectives. Exceedances of analytical control limits will be summarized and evaluated.

A data evaluation review will be performed on all results using QC summary sheet results provided by the laboratory for each data package. The data evaluation review is based on the Quality Control Requirements previously described and follows the format of the EPA National Functional Guidelines for Inorganic (EPA 2010) Superfund Data Review, modified to include specific criteria of individual analytical methods. Raw data (instrument tuning, calibrations, instrument printouts, bench sheets, and laboratory worksheets) will be available for review if any problems or discrepancies are discovered during the routine evaluation. The following is an outline of the data evaluation review format:

- Verify that sample numbers and analyses match the chain of custody request;
- Verify sample preservation and holding times;
- Verify that instrument tuning, calibration, and performance criteria were achieved;
- Verify that laboratory blanks were performed at the proper frequency and that no analytes were present in the blanks;
- Verify that laboratory duplicates, matrix spikes, and laboratory control samples were run at the proper frequency and that control limits were met; and
- Verify that required detection limits have been achieved.

Data qualifier flags, beyond any applied by the laboratory, will be added to sample results that fall outside the QC acceptance criteria. An explanation of data qualifiers to be applied during the review is provided below:

U The compound was analyzed for but was not detected. The associated numerical value is the sample reporting limit.

J The associated numerical value is an estimated quantity because QC criteria were slightly exceeded.

UJ The compound was analyzed for, but not detected. The associated numerical value is an estimated reporting limit because QC criteria were not met.

T The associated numerical value is an estimated quantity because reported concentrations were less than the practical quantitation limit (lowest calibration standard).

R Data are not usable because of significant exceedance of QC criteria. The analyte may or may not be present; resampling and/or reanalysis are necessary for verification.

10.0 DATA ANALYSIS AND REPORTING

10.1 Laboratory Reports

The laboratory data reports will consist of complete data packages that will contain complete documentation and all raw data to allow independent data reduction and verification of analytical results from laboratory bench sheets, and instrument raw data outputs. Each laboratory data report will include the following:

- Case narrative identifying the laboratory analytical batch number, matrix and number of samples included, analyses performed and analytical methods used, and description of any problems or exceedance of QC criteria and corrective action taken. The laboratory manager or their designee must sign the narrative.

- Copy of chain of custody forms for all samples included in the analytical batch.

- Tabulated sample analytical results with units, data qualifiers, percent solids, sample weight or volume, dilution factor, laboratory batch and sample number, Hart Crowser sample number, and dates sampled, received, extracted, and analyzed all clearly specified.

- All calibration, quality control, and sample raw data including quantitation reports and other instrument output data.

- Blank summary results indicating samples associated with each blank.

- MS/MSD result summaries with calculated percent recovery and relative percent differences.

- Laboratory control sample results, when applicable, with calculated percent recovery.

- Electronically formatted data deliverable (CD) results.

10.2 Data Evaluation and Analysis

Following the planned field work, sample analysis, and data quality review, statistical evaluation of the data will be accomplished. Statistical evaluation will be performed using ProUCL 4.0 software.

The following evaluations are currently anticipated to be performed, but may vary based on consultation with Ecology:

- Summary statistics to include minimum, maximum, mean, and median will be calculated for all samples and each individual subarea. Results will be evaluated to determine if data follow normal, lognormal, gamma, or nonparametric distributions. The upper 90th percentile metals concentration will be calculated using the appropriate data distributions for all soil samples and each individual subarea.

- Analysis of variance (ANOVA) will be used to compare metal concentrations among subareas.

- If the budget and time permit, exploratory multivariate analysis will be used to investigate potential correlations among metals, geology, soil characteristics, elevation, slope aspect, and slope direction.

10.3 Hart Crowser Reports

In addition to data quality evaluation reporting, Hart Crowser will prepare a draft data and interpretation report summarizing sampling procedures and laboratory testing results. The report will include a map(s) with sampling locations, tabulated analytical testing data, and laboratory analytical documentation. The report or separate memoranda will include field notes, site sketches, and photographs. The statistical evaluation will be incorporated within the report.

A final report will be completed following discussions with Ecology.

11.0 SCHEDULE

A schedule of deliverables is listed below:

Task	Anticipated Completion Date
Submit Draft SAP/QAPP/HASP	October 19, 2012
Ecology Review	October 24, 2012
Submit Final SAP	October 26, 2012
Perform field work	October 29 to November 5, 2012
Samples received by contract laboratory	November 1 through November 7, 2012
Sample analytical results received	December 16, 2012
Data validation completed	December 21, 2012
Data Analysis and Statistical Evaluation	January 31, 2013
Draft Report Submittal	February 15, 2013
Ecology Review	February 29, 2013
Revised Report	March 15, 2013
Project Closeout	March 2013

12.0 REFERENCES

American Society of Testing Materials (ASTM) 2006. ASTM Standard D4700 Standard Guide for Soil Sampling from the Vadose Zone. ASTM International West Conshohocken, PA, 2006.

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Table 1 - Sample Locations and Characteristics

Sample ID	Sample Elevation (feet)	Aspect (Degrees from North)	Percent Slope	Soil Map ID[1]	Geology Map Symbol[2]	Latitude	Longitude	Land use
SA1-1C	4,002	270	0	12	Eva	48.9886925	-117.7853534	Land
SA1-2C	4,229	0	10	11	Eva	48.9974733	-117.7816431	Land
SA1-3C/1P	3,969	158	25	7	Qgt	48.9951111	-117.7781781	Land
SA1-4C	3,872	30	15	7	Qgt	48.9920350	-117.7785749	Land
SA1-5C	4,261	145	18	10	Eia(s)	48.9972403	-117.7713444	Land
SA1-6C	3,988	152	2	10	Eia(s)	48.9926296	-117.7694668	Land
SA1-7C	3,847	46	25	10	Eia(s)	48.9983312	-117.7647595	Land
SA1-8C	3,921	82	14	12	Eia(s)	48.9906560	-117.7641637	Designated Forest Land
SA2-1C	2,763	115	18	180	Qgt	48.9977902	-117.7304913	Designated Forest Land
SA2-2C/1P	2,213	305	15	36	Qgt	48.9981738	-117.7226310	Designated Forest Land
SA2-3C	3,092	288	20	12	Qgt	48.9905519	-117.7168586	Designated Forest Land
SA2-4C	2,187	110	38	10	Qgt	48.9934482	-117.7277954	Designated Forest Land
SA2-5C	2,155	90	8	98	Qa	48.9848242	-117.7300349	Designated Forest Land
SA2-6C	2,246	160	19	233	CDmt	48.9800764	-117.7206612	Designated Forest Land
SA2-7C	2,721	230	10	168	Qgt	48.9842749	-117.7211995	Designated Forest Land
SA2-8C	2,789	308	15	12	Qgt	48.9972780	-117.7166574	Designated Forest Land
SA3-1C	3,386	316	22	12	Qgt	48.9985904	-117.7087758	Designated Forest Land
SA3-2C	3,662	20	8	11	Qgt	48.9966084	-117.7036234	Designated Forest Land
SA3-3C	3,375	296	30	12	Qgt	48.9941083	-117.7121431	Designated Forest Land
SA3-4C/1P	3,576	150	12	168	Qgt	48.9940827	-117.7035616	Designated Forest Land
SA3-5C	3,301	155	13	168	Qgt	48.9894913	-117.7109191	Designated Forest Land
SA3-6C	3,261	133	30	77	Qgt	48.9913148	-117.7033894	Designated Forest Land
SA3-7C	3,324	50	5	77	Qgt	48.9965166	-117.6967035	Designated Forest Land
SA3-8C	3,175	115	17	12	Qgt	48.9979245	-117.6922897	Designated Forest Land
SA4-1C/1P	2,212	140	25	233	Qgt	48.9800014	-117.7111435	Designated Forest Land
SA4-2C	2,817	182	21	235	CDmt	48.9851250	-117.7110064	Designated Forest Land
SA4-3C	2,287	95	30	235	CDmt	48.9828401	-117.7021707	Designated Forest Land
SA4-4C	2,949	167	15	77	Qgt	48.9874724	-117.7055827	Designated Forest Land
SA4-5C	2,583	141	18	168	Qgt	48.9875332	-117.6970440	Designated Forest Land
SA4-6C	1,966	180	19	235	Qgt	48.9839858	-117.6906449	Designated Forest Land
SA4-7C	2,798	174	16	168	Qgt	48.9891664	-117.6994361	Designated Forest Land
SA4-8C	2,836	150	15	12	Qgt	48.9936024	-117.6913678	Designated Forest Land
SA5-1C	2,833	98	8	12	Qgt	48.9987740	-117.6826201	Designated Forest Land
SA5-2C	2,515	161	26	180	CDmt	48.9913989	-117.6861059	Designated Forest Land
SA5-3C	2,054	90	7	9	Qgt	48.9873340	-117.6823198	Designated Forest Land

Table 1 - Sample Locations and Characteristics

Sample ID	Sample Elevation (feet)	Aspect (Degrees from North)	Percent Slope	Soil Map ID[1]	Geology Map Symbol[2]	Latitude	Longitude	Land use
SA5-4C	2,046	190	7	234	CDmm	48.9888803	-117.6704161	Designated Forest Land
SA5-5C/1P	2,504	200	19	197	Qgt	48.9935713	-117.6697760	Designated Forest Land
SA5-7C	2,024	172	17	72	Qgt	48.9912660	-117.6583640	Land
SA5-8C	2,495	121	24	197	Eia(s)	48.9974239	-117.6499825	Agricultural Current Use
SA6-1C	1,879	130	2	35	Qls	48.9741763	-117.7278322	Designated Forest Land
SA6-2C	1,746	150	2	216	Qgo	48.9742120	-117.7176718	Designated Forest Land
SA6-3C	1,640	170	4	217	Qa	48.9757746	-117.7030769	Designated Forest Land
SA6-4C/1P	1,766	233	4	30	Qgo	48.9760882	-117.6880831	Designated Forest Land
SA6-5C	1,515	169	36	89	Qgl	48.9746466	-117.6811135	Designated Forest Land
SA6-6C	1,610	100	8	89	Qls	48.9733500	-117.6880509	Designated Forest Land
SA6-7C	1,835	160	4	248	Qa	48.9823775	-117.6893802	Designated Forest Land
SA6-8C	1,811	0	0	88	Qgo	48.9821184	-117.6790817	Designated Forest Land
SA7-1C	1,554	151	10	226	Qa	48.9837439	-117.6716944	Designated Forest Land
SA7-2C	1,663	140	45	31	Qa	48.9799330	-117.6755988	Designated Forest Land
SA7-3C	1,403	177	0	30	Qgo	48.9744273	-117.6685321	Designated Forest Land
SA7-4C	1,763	90	15	30	Qgo	48.9822048	-117.6612508	Land
SA7-5C	1,418	120	1	227	Qgo	48.9825504	-117.6466774	Land
SA7-6C/1P	1,707	0	1	88	Qgo	48.9847184	-117.6522055	Agricultural Current Use
SA7-7C	2,040	82	16	12	CDmm	48.9954893	-117.6470071	Agricultural Current Use
SA7-8C	1,480	100	40	12	CDmm	48.9930923	-117.6426513	Land
SA8-1C	1,659	110	3	35	Qgo	48.9999822	-117.6184240	Land
SA8-2C/1P	1,410	90	1	85	Qgo	48.9806220	-117.6339914	Land
SA8-3C	1,576	250	30	34	Qgo	48.9849227	-117.6290891	Land
SA8-4C	1,814	225	5	35	Qgo	48.9776655	-117.6295425	Land
SA8-5C	1,769	290	10	30	Qgd	48.9908639	-117.6239315	Designated Forest Land
SA8-6C	1,650	90	15	88	Qgd	48.9991714	-117.6213904	Land
SA8-7C	1,770	245	12-5	88	Qgd	48.9951544	-117.6200219	Land
SA8-8C	1,608	270	0	34	Qgo	48.9934081	-117.6281837	Land
SA9-1C	2,927	331	39	169	Eia(s)	48.9932733	-117.6087922	Designated Forest Land
SA9-2C	2,200	295	21	163	CDmm	48.9933307	-117.6153150	Designated Forest Land
SA9-3C	3,076	230	25	163	Eia(s)	48.9903639	-117.6088043	Designated Forest Land
SA9-4C	2,618	Flat	0	189	Eia(s)	48.9856004	-117.6138114	Designated Forest Land
SA9-5C	1,920	270	13	8	Qgd	48.9821576	-117.6201374	Designated Forest Land
SA9-6C	2,315	271	21	189	CDmm	48.9787386	-117.6201529	Designated Forest Land

Table 1 - Sample Locations and Characteristics

Sample ID	Sample Elevation (feet)	Aspect (Degrees from North)	Percent Slope	Soil Map ID[1]	Geology Map Symbol[2]	Latitude	Longitude	Land use
SA9-7C/1P	1,954	335	10	6	Qgt	48.9728238	-117.6328616	Designated Forest Land
SA9-8C	2,880	307	36	8	CDmm	48.9677892	-117.6279067	Land
SA9-9C	2,196	306	25	6	Qgt	48.9689673	-117.6358230	Designated Forest Land
SA9-10C	2,294	126	21	12	Qgt	48.9729244	-117.6265885	Land
SA10-1C	3,095	167	9	163	Eia(s)	48.9854363	-117.6076618	Designated Forest Land
SA10-2C/1P	3,160	84	34	8	CDmm	48.9820299	-117.6089904	Designated Forest Land
SA10-3C	3,308	270	7	8	CDmm	48.9782421	-117.6110227	Designated Forest Land
SA10-4C	3,149	350	5	189	Qgd	48.9736177	-117.6131446	Land
SA10-5C	3,131	270	17	12	CDmm	48.9714735	-117.6200819	Land
SA10-6C	3,324	155	12	189	CDmt	48.9699816	-117.6144413	Designated Forest Land
SA10-7C	3,415	90	20	189	Qgd	48.9683325	-117.6185318	Land
SA10-8C	3,324	290	18	104	CDmt	48.9664236	-117.6245851	Land
SA11-1C	3,091	127	20	180	CDmt	48.9687955	-117.6114160	Designated Forest Land
SA11-2C	2,261	50	25	171	Qgd	48.9898971	-117.5922499	Designated Forest Land
SA11-3C	2,133	75	17	200	Qgd	48.9749865	-117.5980079	Designated Forest Land
SA11-4C	2,787	128	40	200	Eia(s)	48.9740664	-117.6050103	Designated Forest Land
SA11-5C	2,212	70	12	168	Eia(s)	48.9859222	-117.5924234	Land
SA11-6C	2,944	210	11	163	Eia(s)	48.9899242	-117.6022769	Designated Forest Land
SA11-7C	2,775	20	40	169	Eia(s)	48.9938194	-117.6020076	Designated Forest Land
SA11-8C/1P	2,143	39	16	7	Qgd	48.9952505	-117.5967094	Land
SA11-9C	3,036	87	31	8	CDmm	48.9802697	-117.6058805	Land
SA12-1C	2,461	182	26	200	CDmm	48.9996630	-117.5799598	Designated Forest Land
SA12-2C	2,233	30	10	35	Qgd	48.9985955	-117.5685284	Designated Forest Land
SA12-3C/1P	2,170	100	5	172	Qgd	48.9974362	-117.5643422	Designated Forest Land
SA12-4C	2,611	290	21	107	Qgd	48.9939112	-117.5551675	Designated Forest Land
SA12-6C	2,184	96	17	34	Qgd	48.9881129	-117.5712024	Designated Forest Land
SA12-7C	2,328	200	3	200	CDmm	48.9954727	-117.5699786	Designated Forest Land
SA12-8C	2,237	220	13	35	Qgd	48.9991934	-117.5582422	Designated Forest Land
SA12-9C	2,775	331	17	106	Qgd	48.9992843	-117.5461825	Designated Forest Land
SA13-1C	2,136	75	20	200	Eia(s)	48.9657430	-117.6008327	Designated Forest Land
SA13-2C	2,139	155	4	170	Eia(s)	48.9708674	-117.5996403	Designated Forest Land
SA13-3C	2,127	40	33	89	Qgd	48.9836651	-117.5762366	Designated Forest Land
SA13-4C	2,242	0	2	98	Qgd	48.9827625	-117.5598095	Designated Forest Land
SA13-5C	2,104	300	14	6	Qgd	48.9959493	-117.5835220	Designated Forest Land

Table 1 - Sample Locations and Characteristics

Sample ID	Sample Elevation (feet)	Aspect (Degrees from North)	Percent Slope	Soil Map ID[1]	Geology Map Symbol[2]	Latitude	Longitude	Land use
SA13-6C/1P	2,144	0	2	36	Qgd	48.9828947	-117.5839489	Designated Forest Land
SA13-7C	2,017	270	5	181	Qgd	48.9886177	-117.5818849	Designated Forest Land
SA13-8C	2,484	72	10	80	Qgd	48.9769247	-117.5460082	Designated Forest Land

Notes:

1 See Figures 1 and 2 and Appendix B for Soil Descriptions

2 See Figures 3 and 4

Table 2 - Sample Containers, Preservation, and Holding Times

Sample Type	Sample Preservation Technique	Maximum Holding Time
Total solids[1]	Cool, <6°C	14 days
Total organic carbon[1]	Cool, <6°C Freeze	14 days 6 months
Metals (except mercury)[1]	Cool, <6°C	6 months
Mercury[1]	Cool, <6°C	28 days
Soil pH (Hydrogen ion) [1]	-	14 days

Notes:

[1] Soil sample for chemical analysis will be collected in one 8 ounce (or larger) wide mouth glass jar. Unused sample will be archived by the laboratory.

Table 3 - Recommended Methods of Sample Preparation and Analysis, Practical Quantitation Limits (PQL), and Method Detection Limits (MDL)

Parameter	Prep Method	Analysis Method	Recommended Practical Quantitation Limits[1]	Method Detection Limits
CONVENTIONALS:				
Total Solids in %	---	SM 2540B	0.1% (wet weight)	
Total Organic Carbon in %	---	Plumb, 1981	0.01	0.005
METALS			**mg/kg (dry weight)**	**mg/kg (dry weight)**
Aluminum	EPA 3050B	EPA 6010B	5	2.5
Antimony	EPA 3050B	EPA 6020	0.2	0.01
Arsenic	EPA 3050B	EPA 6020	0.5	0.025
Barium	EPA 3050B	EPA 6020	0.5	0.025
Beryllium	EPA 3050B	EPA 6020	0.2	0.01
Cadmium	EPA 3050B	EPA 6020	0.1	0.005
Calcium	EPA 3050B	EPA 6010B	5	2.5
Chromium	EPA 3050B	EPA 6020	0.5	0.025
Cobalt	EPA 3050B	EPA 6020	0.2	0.01
Copper	EPA 3050B	EPA 6020	0.5	0.025
Iron	EPA 3050B	EPA 6010B	5	2.5
Lead	EPA 3050B	EPA 6020	0.1	0.005
Magnesium	EPA 3050B	EPA 6010B	5.0	2.5
Manganese	EPA 3050B	EPA 6020	0.5	0.025
Mercury	EPA 7471A	EPA 7471A	0.01	0.002
Nickel	EPA 3050B	EPA 6020	0.5	0.025
Potassium	EPA 3050B	EPA 6010B	50	25
Selenium	EPA 3050B	EPA 6020	0.5	0.025
Silver	EPA 3050B	EPA 6020	0.2	0.01
Sodium	EPA 3050B	EPA 6010B	50	25
Thallium	EPA 3050B	EPA 6020	0.2	0.01
Vanadium	EPA 3050B	EPA 6020	0.2	0.01
Zinc	EPA 3050B	EPA 6020	4.0	0.2

Notes:

1. Recommended practical quantitation limits and method detection limits are taken from Analytical Resources Inc (ARI).

Table 4 - Quality Control Procedures for Metals Analysis

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Instrument Quality Assurance/Quality Control			
Initial Calibration	Daily	Correlation coefficient ≥0.995	Laboratory to optimize and recalibrate the instrument and reanalyze any affected samples
Initial Calibration Verification	Immediately after initial calibration	90 - 110 % recovery for ICP-MS and ICP-OES 85 - 115 % for mercury	Laboratory to resolve discrepancy prior to sample analysis
Continuing Calibration Verification	After every 10 samples or every 2 hours, whichever is more frequent, and after the last sample	90 - 110 % recovery for ICP-MS and ICP-OES 85 - 115 % for mercury	Laboratory to recalibrate and reanalyze affected samples
Initial and Continuing Calibration Blanks	Immediately after initial calibration, then 10 percent of samples or every 2 hours, whichever is more frequent, and after the last sample	Analyte concentration < PQL	Laboratory to recalibrate and reanalyze affected samples
ICP Interelement Interference Check Samples	At the beginning and end of each analytical sequence or twice per 8 hour shift, whichever is more frequent	80 - 120 percent of the true value	Laboratory to correct problem, recalibrate, and reanalyze affected samples
Method Quality Assurance/Quality Control			
Holding Times	Not applicable	See Table 2	Qualify data or collect fresh samples
Detection Limits	Not applicable	See Table 3	Laboratory must initiate corrective actions and contact the QA/QC coordinator and/or the project manager immediately
Method Blanks	With every sample batch or every 20 samples, whichever is more frequent	Analyte concentration ≤ PQL	Laboratory to redigest and reanalyze samples with analyte concentrations < 10 times the highest method blank
Analytical (Laboratory) Replicates and Matrix Spike Duplicates	One duplicate analysis with every sample batch or every 20 samples, whichever is more frequent	RPD ≤ 35 % applied when the analyte concentration is > 5x PQL	Laboratory to redigest and reanalyze samples if analytical problems suspected, or to qualify the data if sample homogeneity problems suspected and the project manager consulted

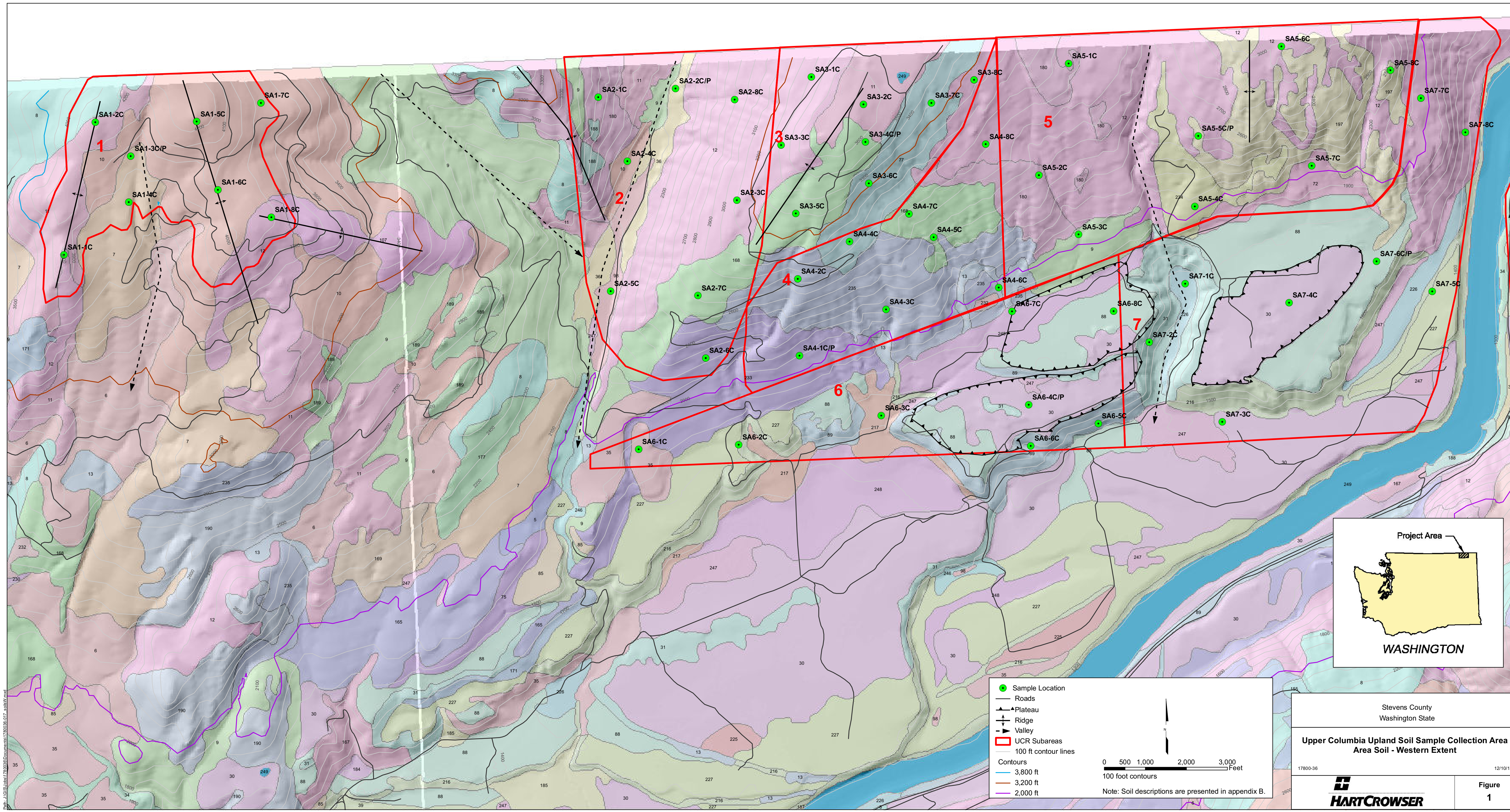
Table 4 - Quality Control Procedures for Metals Analysis (Continued)

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Matrix Spikes	With every sample batch or every 20 samples, whichever is more frequent	75 - 125 % recovery (ICP-MS) applied when the sample concentration is < 4 times the spiked concentration for a particular analyte 80 - 120 % (mercury)	Laboratory may be able to correct or minimize problem; or qualify and accept data
Laboratory Control Samples	Overall frequency of 5 percent of field samples	80 - 120 % recovery	Laboratory to correct problem to verify the analysis can be performed in a clean matrix with acceptable precision and recovery; then reanalyze affected samples
Field Quality Assurance/Quality Control			
Field Replicates	10 percent of field samples	RPD $\leq$ 50 % applied when the analyte concentration is > 5x PQL	Laboratory to redigest and reanalyze samples if analytical problems suspected, or to qualify the data if sample homogeneity problems suspected and the project manager consulted

Notes:
ICP-MS - inductively coupled plasma/mass spectrometry
ICP-OES – inductively coupled plasma/optical emission spectrometry
PQL - practical quantitation limit
RPD - relative percent difference

Table 5 - Quality Control Procedures for Conventionals Analysis

	Suggested Control Limits						
Analyte	**Initial Calibration**	**Continuing Calibration**	**Calibration Blanks**	**Laboratory Control Samples**	**Matrix Spikes**	**Laboratory Replicates**	**Method Blank**
Total organic carbon	Correlation coefficient ≥0.995	90–110 % recovery	Analyte concentration ≤ PQL	80–120 % recovery	75–125 % recovery	20 % RSD	Analyte concentration ≤ PQL
Total solids	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	20 % RSD	Analyte concentration ≤ PQL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SA1-2C
SA1-3C/P
SA1-4C
SA1-5C
SA1-6C
SA1-7C
SA1-8C
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SA2-2C/P
SA2-3C
SA2-4C
SA2-5C
SA2-6C
SA2-7C
SA2-8C
SA3-1C
SA3-2C
SA3-3C
SA3-4C/P
SA3-5C
SA3-6C
SA3-7C
SA3-8C
SA4-1C/P
SA4-2C
SA4-3C
SA4-4C
SA4-5C
SA4-6C
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SA4-8C
SA5-1C
SA5-2C
SA5-3C
SA5-4C
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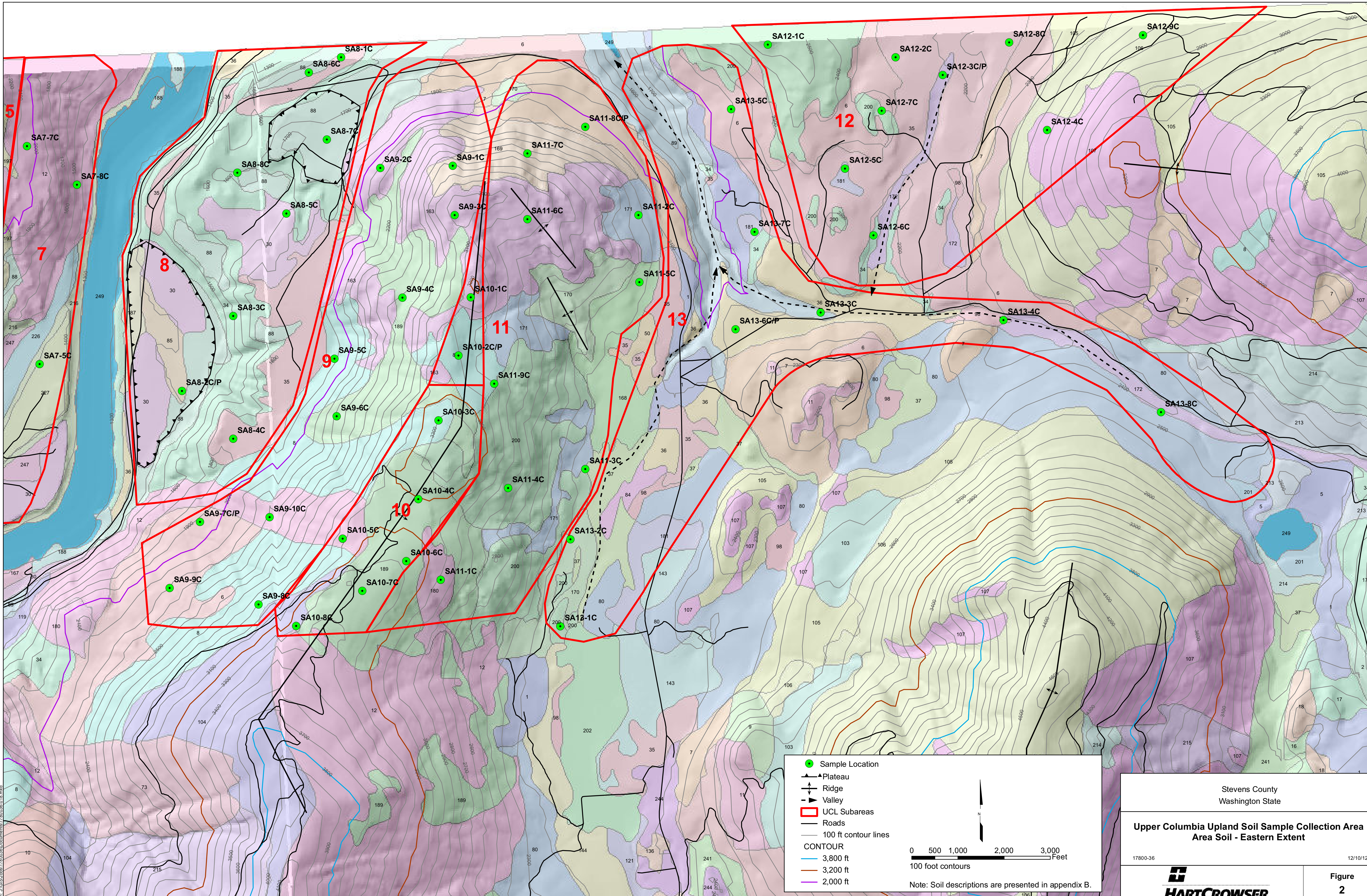
SA5-6C
SA5-7C
SA5-8C
SA6-1C
SA6-2C
SA6-3C
SA6-4C/P
SA6-5C
SA6-6C
SA6-7C
SA6-8C
SA7-1C
SA7-2C
SA7-3C
SA7-4C
SA7-5C
SA7-6C/P
SA7-7C
SA7-8C
Project Area
WASHINGTON
Sample Location
Roads
Plateau
Ridge
Valley
UCR Subareas
100 ft contour lines
Contours
3,800 ft
3,200 ft
2,000 ft
N
0 500 1,000 2,000 3,000 Feet
100 foot contours
Note: Soil descriptions are presented in appendix B.
Stevens County
Washington State
Upper Columbia Upland Soil Sample Collection Area
Area Soil - Western Extent
17800-36
12/10/12
HARTCROWSER
Figure
1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SA7-8C
SA7-5C
SA8-1C
SA8-6C
SA8-7C
SA8-8C
SA8-5C
SA8-3C
SA8-2C/P
SA8-4C
SA9-2C
SA9-1C
SA9-3C
SA9-4C
SA9-5C
SA9-6C
SA9-7C/P
SA9-10C
SA9-9C
SA9-8C
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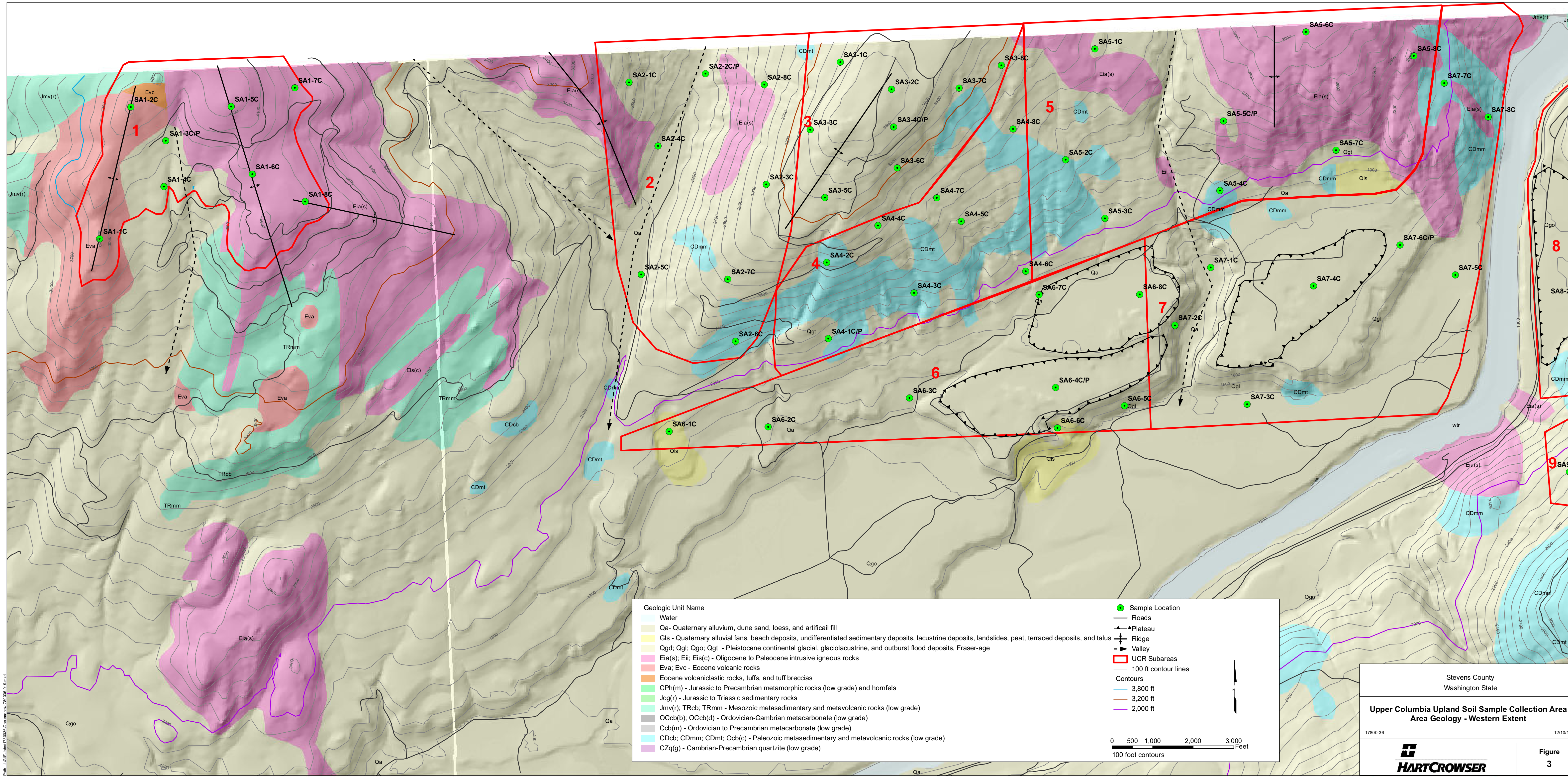
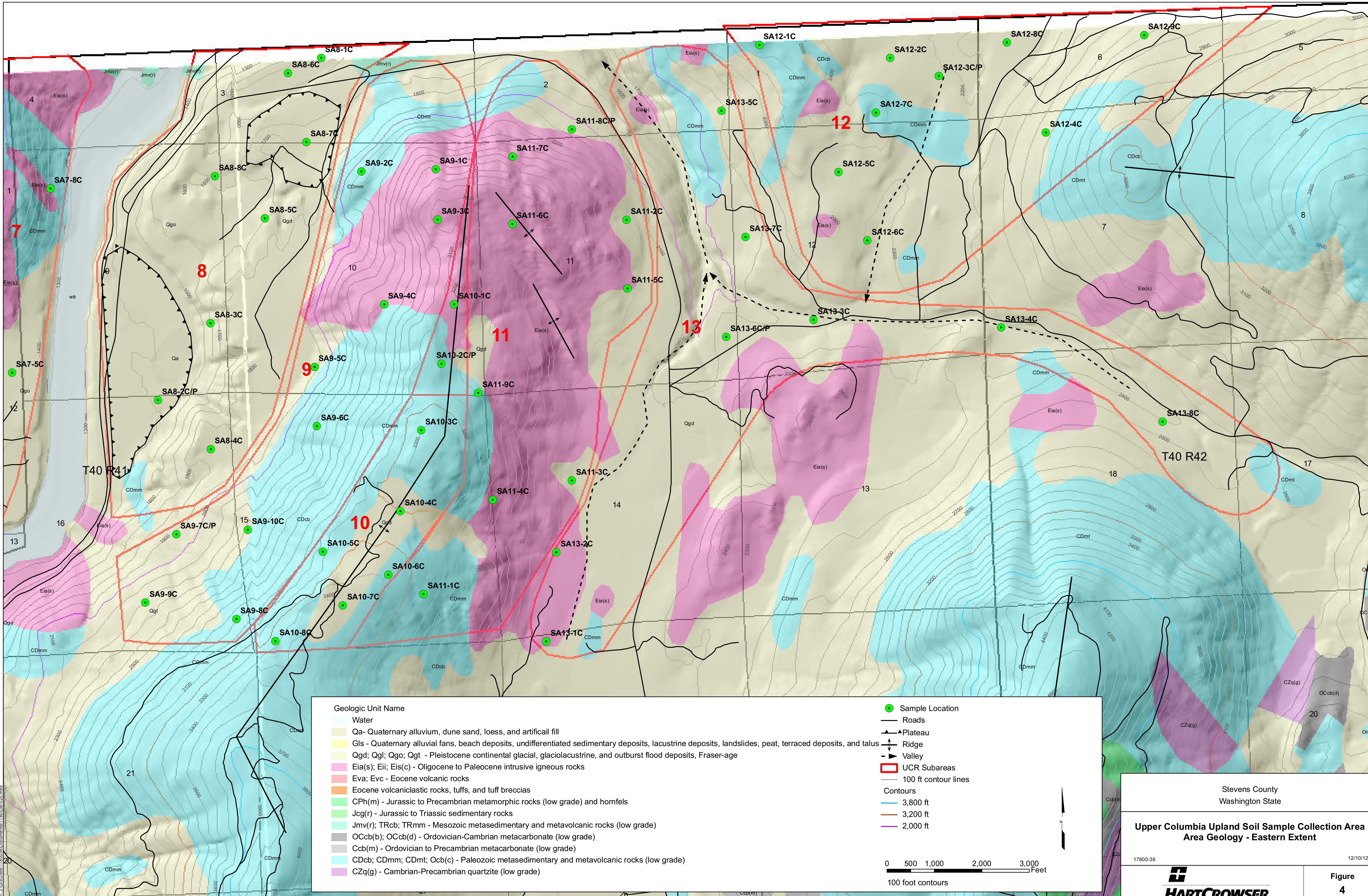
SA10-5C
SA10-6C
SA10-7C
SA10-8C
SA11-8C/P
SA11-7C
SA11-6C
SA11-2C
SA11-5C
SA11-9C
SA11-3C
SA11-4C
SA11-1C
SA12-1C
SA12-2C
SA12-8C
SA12-9C
SA12-3C/P
SA12-7C
SA12-4C
SA12-5C
SA12-6C
SA13-5C
SA13-7C
SA13-3C
SA13-6C/P
SA13-4C
SA13-8C
SA13-2C
SA13-1C
5
7
8
9
10
11
12
13
Sample Location
Plateau
Ridge
Valley
UCL Subareas
Roads
100 ft contour lines
CONTOUR
3,800 ft
3,200 ft
2,000 ft
0 500 1,000 2,000 3,000 Feet
100 foot contours
Note: Soil descriptions are presented in appendix B.
N
Stevens County
Washington State
Upper Columbia Upland Soil Sample Collection Area
Area Soil - Eastern Extent
17800-36
12/10/12
HARTCROWSER
Figure
2



Upper Columbia Upland Soil Sample Collection Area
Area Geology - Western Extent

Figure 3



Upper Columbia Upland Soil Sample Collection Area
Area Geology - Eastern Extent

Figure 4

APPENDIX A
FIELD EQUIPMENT SUPPLY LIST

Field Equipment/Supplies Checklist

Item	Need	Quantity	Have	Loaded in Vehicle
Forms				
SAP/QAPP				
Health and Safety Plan				
Surface Soil Sample Collection Forms				
Field Notebook				
Maps / Coordinates				
HC Chain of Custody				
Cooler Custody Seals, Address labels, FedEx				
Sample Labels				
Packing Materials				
Large Trash Bags				
Large Ziploc Bags (1 gallon / 2 gallon)				
Medium Ziploc Bags (quart)				
Ice / Ice bags				
Scissors				
Clear tape/ strapping tape/ duct tape				
Coolers				
Sampling Containers				
8-oz jars				
Large plastic bags/ buckets with lids				
Sampling Equipment				
Large Bowls (Stainless Steel)				
Large Stainless Steel Spoons				
No. 10 Sieve				
Trowels / Bulb planter				
Disposable aluminum trays				
Stakes and flags				
Plastic sheeting				
Decon Equipment				
Potable water				
Lab Grade DI water				
Liquinox				
Sprayers for DI water and Liquinox				
Buckets & Lids				
Paper Towels				
Aluminum foil				
Brushes (big and small)				
Recording/Miscellaneous Equipment				
Camera				
GPS				
Compass				
Field Phone				
Grass Clippers / Pruners				
Shovel/Spade				
Hand Auger				
75' Tape Measure / small ruler				
PPE				
Raingear				
Field gear, including boots, coat				
Nitrile Gloves				
Heavy gloves / leather gloves				
First Aid Kit				
Miscellaneous				
Clipboards				
Sharpies (big and small), pencils, pens				
Tools (calculator, spare batteries, chargers)				

APPENDIX B
ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 1 - Ahren loam, 2 to 20 percent slopes

Component: Ahren (75%)

The Ahren component makes up 75 percent of the map unit. Slopes are 2 to 20 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map unit: 2 - Ahren loam, 20 to 40 percent slopes

Component: Ahren (75%)

The Ahren component makes up 75 percent of the map unit. Slopes are 20 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map unit: 3 - Ahren loam, 40 to 65 percent slopes

Component: Ahren (75%)

The Ahren component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 4 - Ahren-Rock outcrop complex, 40 to 65 percent slopes

Component: Ahren (60%)

The Ahren component makes up 60 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Component: Rock outcrop (25%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 5 - Aits loam, 0 to 15 percent slopes

Component: Aits (80%)

The Aits component makes up 80 percent of the map unit. Slopes are 0 to 15 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 6 - Aits loam, 15 to 25 percent slopes

Component: Aits (80%)

The Aits component makes up 80 percent of the map unit. Slopes are 15 to 25 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 7 - Aits loam, 25 to 40 percent slopes

Component: Aits (80%)

The Aits component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 8 - Aits loam, 40 to 65 percent slopes

Component: Aits (80%)

The Aits component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 9 - Aits stony loam, 0 to 40 percent slopes

Component: Aits (80%)

The Aits component makes up 80 percent of the map unit. Slopes are 0 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Map unit: 10 - Aits stony loam, 40 to 65 percent slopes

Component: Aits (80%)

The Aits component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 11 - Aits-Rock outcrop complex, 0 to 40 percent slopes

Component: Aits (70%)

The Aits component makes up 70 percent of the map unit. Slopes are 0 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 12 - Aits-Rock outcrop complex, 40 to 65 percent slopes

Component: Aits (70%)

The Aits component makes up 70 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over calcareous glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 13 - Aquolls, sloping

Component: Aquolls (85%)

The Aquolls component makes up 85 percent of the map unit. Slopes are 5 to 40 percent. This component is on drainageways on hills. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April, May. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6w. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 14 - Belzar silt loam, 5 to 25 percent slopes

Component: Belzar (75%)

The Belzar component makes up 75 percent of the map unit. Slopes are 5 to 25 percent. This component is on hills. The parent material consists of volcanic ash and loess over residuum and colluvium derived from calcareous limestone and shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Map unit: 15 - Belzar silt loam, 25 to 40 percent slopes

Component: Belzar (75%)

The Belzar component makes up 75 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over residuum and colluvium derived from calcareous limestone and shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Map unit: 16 - Belzar silt loam, 40 to 65 percent slopes

Component: Belzar (75%)

The Belzar component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over residuum and colluvium derived from calcareous limestone and shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 17 - Belzar-Rock outcrop complex, 5 to 40 percent slopes

Component: Belzar (65%)

The Belzar component makes up 65 percent of the map unit. Slopes are 5 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over residuum and colluvium derived from calcareous limestone and shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 18 - Belzar-Rock outcrop complex, 40 to 65 percent slopes

Component: Belzar (65%)

The Belzar component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over residuum and colluvium derived from calcareous limestone and shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 19 - Bernhill very stony loam, 0 to 40 percent slopes

Component: Bernhill (85%)

The Bernhill component makes up 85 percent of the map unit. Slopes are 0 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 20 - Bernhill very stony loam, 40 to 65 percent slopes

Component: Bernhill (80%)

The Bernhill component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 21 - Bernhill silt loam, 0 to 15 percent slopes

Component: Bernhill (85%)

The Bernhill component makes up 85 percent of the map unit. Slopes are 0 to 15 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 22 - Bernhill silt loam, 15 to 25 percent slopes

Component: Bernhill (85%)

The Bernhill component makes up 85 percent of the map unit. Slopes are 15 to 25 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 23 - Bernhill silt loam, 25 to 40 percent slopes

Component: Bernhill (80%)

The Bernhill component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 24 - Bernhill silt loam, 40 to 65 percent slopes

Component: Bernhill (80%)

The Bernhill component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 25 - Bernhill-Rock outcrop complex, 0 to 25 percent slopes

Component: Bernhill (70%)

The Bernhill component makes up 70 percent of the map unit. Slopes are 0 to 25 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 26 - Bernhill-Rock outcrop complex, 25 to 65 percent slopes

Component: Bernhill (70%)

The Bernhill component makes up 70 percent of the map unit. Slopes are 25 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 27 - Bestrom silt loam, 0 to 15 percent slopes

Component: Bestrom (85%)

The Bestrom component makes up 85 percent of the map unit. Slopes are 0 to 15 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 28 - Bestrom silt loam, 15 to 25 percent slopes

Component: Bestrom (85%)

The Bestrom component makes up 85 percent of the map unit. Slopes are 15 to 25 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 29 - Bestrom silt loam, 25 to 40 percent slopes

Component: Bestrom (80%)

The Bestrom component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 30 - Bisbee loamy fine sand, 0 to 15 percent slopes

Component: Bisbee (85%)

The Bisbee component makes up 85 percent of the map unit. Slopes are 0 to 15 percent. This component is on terraces. The parent material consists of wind worked sandy outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 31 - Bisbee loamy fine sand, 25 to 45 percent slopes

Component: Bisbee (80%)

The Bisbee component makes up 80 percent of the map unit. Slopes are 25 to 45 percent. This component is on terraces. The parent material consists of wind worked sandy outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 32 - Bong sandy loam, 0 to 15 percent slopes

Component: Bong (85%)

The Bong component makes up 85 percent of the map unit. Slopes are 0 to 15 percent. This component is on terraces. The parent material consists of mixed sandy glacial outwash with a component of loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 33 - Bong sandy loam, 15 to 25 percent slopes

Component: Bong (85%)

The Bong component makes up 85 percent of the map unit. Slopes are 15 to 25 percent. This component is on terraces. The parent material consists of mixed sandy glacial outwash with a component of loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 34 - Bonner gravelly sandy loam, 30 to 65 percent slopes

Component: Bonner (80%)

The Bonner component makes up 80 percent of the map unit. Slopes are 30 to 65 percent. This component is on escarpments. The parent material consists of volcanic ash and loess over glacial outwash. Depth to a root restrictive layer, strongly contrasting textural stratification, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 35 - Bonner silt loam, 0 to 10 percent slopes

Component: Bonner (85%)

The Bonner component makes up 85 percent of the map unit. Slopes are 0 to 10 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial outwash. Depth to a root restrictive layer, strongly contrasting textural stratification, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 36 - Bonner cobbly silt loam, 0 to 10 percent slopes

Component: Bonner (85%)

The Bonner component makes up 85 percent of the map unit. Slopes are 0 to 10 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3s. This soil does not meet hydric criteria.

Map unit: 37 - Bossburg muck

Component: Bossburg (85%)

The Bossburg component makes up 85 percent of the map unit. Slopes are 0 to 3 percent. This component is on alluvial cones, depressions. The parent material consists of mixed volcanic ash alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very high. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during February, March, April, May. Organic matter content in the surface horizon is about 43 percent. This component is in the R044XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Map unit: 38 - Brickel stony loam, 20 to 60 percent slopes

Component: Brickel (80%)

The Brickel component makes up 80 percent of the map unit. Slopes are 20 to 60 percent. This component is on mountains. The parent material consists of residuum, colluvium and glacial till derived from granitic rock mixed with a component of volcanic ash and loess. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R043AY704WA Subalpine Park 24+ Pz ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 39 - Bridgeson silt loam

Component: Bridgeson (80%)

The Bridgeson component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains, terraces. The parent material consists of mixed alluvium with igneous material, lacustrine sediments, volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 12 inches during February, March, April, May, June. Organic matter content in the surface horizon is about 3 percent. This component is in the R044XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Map unit: 40 - Bridgeson silt loam, drained

Component: Bridgeson (90%)

The Bridgeson component makes up 90 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of mixed alluvium with igneous material, lacustrine sediments, volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 36 inches during February, March, April, May, June. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Map unit: 41 - Buhrig very stony loam, 25 to 40 percent slopes

Component: Buhrig (80%)

The Buhrig component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum derived from metasedimentary and igneous rocks. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Map unit: 42 - Buhrig very stony loam, 40 to 65 percent slopes

Component: Buhrig (80%)

The Buhrig component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum derived from metasedimentary and igneous rocks. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 43 - Buhrig-Rock outcrop complex, 25 to 40 percent slopes

Component: Buhrig (65%)

The Buhrig component makes up 65 percent of the map unit. Slopes are 25 to 40 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum derived from metasedimentary and igneous rocks. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 44 - Buhrig-Rock outcrop complex, 40 to 65 percent slopes

Component: Buhrig (65%)

The Buhrig component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum derived from metasedimentary and igneous rocks. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 45 - Cedonia silt loam, 0 to 5 percent slopes

Component: Cedonia (85%)

The Cedonia component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 2e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent.

Map unit: 46 - Cedonia silt loam, 5 to 15 percent slopes

Component: Cedonia (85%)

The Cedonia component makes up 85 percent of the map unit. Slopes are 5 to 15 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent.

Map unit: 47 - Cedonia silt loam, 5 to 25 percent slopes, eroded

Component: Cedonia (70%)

The Cedonia component makes up 70 percent of the map unit. Slopes are 5 to 25 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent.

Map unit: 48 - Cedonia silt loam, 15 to 30 percent slopes

Component: Cedonia (85%)

The Cedonia component makes up 85 percent of the map unit. Slopes are 15 to 30 percent. This component is on terraces, escarpments. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 49 - Cedonia silt loam, 30 to 65 percent slopes

Component: Cedonia (80%)

The Cedonia component makes up 80 percent of the map unit. Slopes are 30 to 65 percent. This component is on escarpments. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent.

Map unit: 50 - Chamokane gravelly sandy loam

Component: Chamokane (90%)

The Chamokane component makes up 90 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of mixed alluvium. Depth to a root restrictive layer, strongly contrasting textural stratification, is 20 to 40 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 36 inches during January, February, March, April. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Map unit: 51 - Chamokane loam

Component: Chamokane (90%)

The Chamokane component makes up 90 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of mixed alluvium. Depth to a root restrictive layer, strongly contrasting textural stratification, is 20 to 40 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 36 inches during January, February, March, April. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Map unit: 52 - Cheney silt loam, 0 to 15 percent slopes

Component: Cheney (85%)

The Cheney component makes up 85 percent of the map unit. Slopes are 0 to 15 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial outwash. Depth to a root restrictive layer, strongly contrasting textural stratification, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R009XY102WA Loamy 16-24 Pz ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 53 - Cheney stony silt loam, 5 to 25 percent slopes

Component: Cheney (85%)

The Cheney component makes up 85 percent of the map unit. Slopes are 5 to 25 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial outwash. Depth to a root restrictive layer, strongly contrasting textural stratification, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R009XY102WA Loamy 16-24 Pz ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Map unit: 54 - Cheney stony silt loam, 25 to 65 percent slopes

Component: Cheney (80%)

The Cheney component makes up 80 percent of the map unit. Slopes are 25 to 65 percent. This component is on escarpments. The parent material consists of volcanic ash and loess over glacial outwash. Depth to a root restrictive layer, strongly contrasting textural stratification, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R009XY102WA Loamy 16-24 Pz ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 55 - Chewelah fine sandy loam

Component: Chewelah (80%)

The Chewelah component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on terraces. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 36 inches during February, March, April, May. Organic matter content in the surface horizon is about 4 percent. This component is in the R044XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil does not meet hydric criteria.

Map unit: 56 - Clayton fine sandy loam, 0 to 5 percent slopes

Component: Clayton (85%)

The Clayton component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on terraces. The parent material consists of mixed glaciofluvial deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 2e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 57 - Clayton fine sandy loam, 5 to 15 percent slopes

Component: Clayton (80%)

The Clayton component makes up 80 percent of the map unit. Slopes are 5 to 15 percent. This component is on terraces. The parent material consists of mixed glaciofluvial deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 58 - Colville silt loam

Component: Colville (80%)

The Colville component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains, depressions. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very high. Shrink-swell potential is moderate. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 9 inches during February, March, April, May, June. Organic matter content in the surface horizon is about 3 percent. This component is in the R009XY401WA Alkali Bottom 16-24 Pz ecological site. Nonirrigated land capability classification is 5w. Irrigated land capability classification is 4w. This soil meets hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 59 - Colville silt loam, drained

Component: Colville (80%)

The Colville component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very high. Shrink-swell potential is moderate. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 36 inches during February, March, April, May, June. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 60 - Dart loamy coarse sand, 0 to 8 percent slopes

Component: Dart (85%)

The Dart component makes up 85 percent of the map unit. Slopes are 0 to 8 percent. This component is on terraces. The parent material consists of mixed sandy alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 4s. Irrigated land capability classification is 4s. This soil does not meet hydric criteria.

Map unit: 61 - Dearyton silt loam, 0 to 5 percent slopes

Component: Dearyton (85%)

The Dearyton component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 24 inches during February, March, April. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Map unit: 62 - Dearyton silt loam, 5 to 15 percent slopes

Component: Dearyton (80%)

The Dearyton component makes up 80 percent of the map unit. Slopes are 5 to 15 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 24 inches during February, March, April. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 63 - Dehart gravelly sandy loam, 15 to 25 percent slopes

Component: Dehart (85%)

The Dehart component makes up 85 percent of the map unit. Slopes are 15 to 25 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till and colluvium derived from metasedimentary rocks. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 64 - Dehart gravelly sandy loam, 25 to 40 percent slopes

Component: Dehart (80%)

The Dehart component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till and colluvium derived from metasedimentary rocks. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 65 - Dehart gravelly sandy loam, 40 to 65 percent slopes

Component: Dehart (75%)

The Dehart component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till and colluvium derived from metasedimentary rocks. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 66 - Dehart cobbly loam, 5 to 20 percent slopes

Component: Dehart (80%)

The Dehart component makes up 80 percent of the map unit. Slopes are 5 to 20 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till and colluvium derived from metasedimentary rocks. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4s. This soil does not meet hydric criteria.

Map unit: 67 - Dehart cobbly loam, 20 to 40 percent slopes

Component: Dehart (80%)

The Dehart component makes up 80 percent of the map unit. Slopes are 20 to 40 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till and colluvium derived from metasedimentary rocks. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 68 - Dehart cobbly loam, 40 to 65 percent slopes

Component: Dehart (80%)

The Dehart component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till and colluvium derived from metasedimentary rocks. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 69 - Dehart-Rock outcrop complex, 40 to 65 percent slopes

Component: Dehart (65%)

The Dehart component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till and colluvium derived from metasedimentary rocks. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 70 - Donavan loam, 0 to 8 percent slopes

Component: Donavan (85%)

The Donavan component makes up 85 percent of the map unit. Slopes are 0 to 8 percent. This component is on hills. The parent material consists of glacial till mixed with a component of volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 2e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 71 - Donavan loam, 8 to 25 percent slopes

Component: Donavan (85%)

The Donavan component makes up 85 percent of the map unit. Slopes are 8 to 25 percent. This component is on hills. The parent material consists of glacial till mixed with a component of volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 72 - Donavan loam, 25 to 40 percent slopes

Component: Donavan (80%)

The Donavan component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of glacial till mixed with a component of volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 73 - Donavan loam, 40 to 65 percent slopes

Component: Donavan (75%)

The Donavan component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of glacial till mixed with a component of volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 74 - Donavan stony loam, 0 to 30 percent slopes

Component: Donavan (85%)

The Donavan component makes up 85 percent of the map unit. Slopes are 0 to 30 percent. This component is on hills. The parent material consists of glacial till mixed with a component of volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 75 - Donavan stony loam, 30 to 65 percent slopes

Component: Donavan (75%)

The Donavan component makes up 75 percent of the map unit. Slopes are 30 to 65 percent. This component is on hills. The parent material consists of glacial till mixed with a component of volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 76 - Donavan-Rock outcrop complex, 0 to 30 percent slopes

Component: Donavan (65%)

The Donavan component makes up 65 percent of the map unit. Slopes are 0 to 30 percent. This component is on hills. The parent material consists of glacial till mixed with a component of volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 77 - Donavan-Rock outcrop complex, 30 to 65 percent slopes

Component: Donavan (65%)

The Donavan component makes up 65 percent of the map unit. Slopes are 30 to 65 percent. This component is on hills. The parent material consists of glacial till mixed with a component of volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 78 - Dragoon silt loam, 8 to 25 percent slopes

Component: Dragoon (85%)

The Dragoon component makes up 85 percent of the map unit. Slopes are 8 to 25 percent. This component is on hills. The parent material consists of residuum derived from granitic rock mixed with a component of volcanic ash and loess. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 79 - Dragoon silt loam, 25 to 45 percent slopes

Component: Dragoon (80%)

The Dragoon component makes up 80 percent of the map unit. Slopes are 25 to 45 percent. This component is on hills. The parent material consists of residuum derived from granitic rock mixed with a component of volcanic ash and loess. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 80 - Eloika silt loam, 0 to 15 percent slopes

Component: Eloika (80%)

The Eloika component makes up 80 percent of the map unit. Slopes are 0 to 15 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial outwash and glacial till. Depth to a root restrictive layer, strongly contrasting textural stratification, is 40 to 59 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 81 - Eloika very stony silt loam, 0 to 25 percent slopes

Component: Eloika (80%)

The Eloika component makes up 80 percent of the map unit. Slopes are 0 to 25 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial outwash and glacial till. Depth to a root restrictive layer, strongly contrasting textural stratification, is 40 to 59 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 82 - Eloika very stony silt loam, 25 to 40 percent slopes

Component: Eloika (75%)

The Eloika component makes up 75 percent of the map unit. Slopes are 25 to 40 percent. This component is on escarpments. The parent material consists of volcanic ash and loess over glacial outwash and glacial till. Depth to a root restrictive layer, strongly contrasting textural stratification, is 40 to 59 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 83 - Garrison loam, 0 to 5 percent slopes

Component: Garrison (85%)

The Garrison component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on terraces. The parent material consists of glacial outwash mixed with a component of volcanic ash and loess. Depth to a root restrictive layer, strongly contrasting textural stratification, is 20 to 40 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 3s. Irrigated land capability classification is 3s. This soil does not meet hydric criteria.

Map unit: 84 - Garrison loam, 5 to 15 percent slopes

Component: Garrison (85%)

The Garrison component makes up 85 percent of the map unit. Slopes are 5 to 15 percent. This component is on terraces. The parent material consists of glacial outwash mixed with a component of volcanic ash and loess. Depth to a root restrictive layer, strongly contrasting textural stratification, is 20 to 40 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 85 - Garrison gravelly loam, 0 to 5 percent slopes

Component: Garrison (80%)

The Garrison component makes up 80 percent of the map unit. Slopes are 0 to 5 percent. This component is on terraces. The parent material consists of glacial outwash mixed with a component of volcanic ash and loess. Depth to a root restrictive layer, strongly contrasting textural stratification, is 20 to 40 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 3s. Irrigated land capability classification is 3s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 86 - Green Bluff silt loam, 0 to 5 percent slopes

Component: Green Bluff (80%)

The Green Bluff component makes up 80 percent of the map unit. Slopes are 0 to 5 percent. This component is on plateaus. The parent material consists of glacial till mixed with a component of volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria.

Map unit: 87 - Green Bluff silt loam, 5 to 15 percent slopes

Component: Green Bluff (80%)

The Green Bluff component makes up 80 percent of the map unit. Slopes are 5 to 15 percent. This component is on plateaus. The parent material consists of glacial till mixed with a component of volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 88 - Hagen sandy loam, 0 to 15 percent slopes

Component: Hagen (80%)

The Hagen component makes up 80 percent of the map unit. Slopes are 0 to 15 percent. This component is on terraces. The parent material consists of mixed sandy outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 89 - Hagen sandy loam, 15 to 40 percent slopes

Component: Hagen (80%)

The Hagen component makes up 80 percent of the map unit. Slopes are 15 to 40 percent. This component is on terraces, escarpments. The parent material consists of mixed sandy outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 90 - Hardesty silt loam

Component: Hardesty (85%)

The Hardesty component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on depressions, alluvial fans. The parent material consists of alluvium derived from volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 45 inches during January, February, March, April, December. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 2e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria.

Map unit: 91 - Hartill silt loam, 0 to 15 percent slopes

Component: Hartill (80%)

The Hartill component makes up 80 percent of the map unit. Slopes are 0 to 15 percent. This component is on mountains. The parent material consists of volcanic ash over colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 92 - Hartill silt loam, 15 to 25 percent slopes

Component: Hartill (80%)

The Hartill component makes up 80 percent of the map unit. Slopes are 15 to 25 percent. This component is on mountains. The parent material consists of volcanic ash over colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 93 - Hartill silt loam, 25 to 40 percent slopes

Component: Hartill (75%)

The Hartill component makes up 75 percent of the map unit. Slopes are 25 to 40 percent. This component is on mountains. The parent material consists of volcanic ash over colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 94 - Hartill silt loam, 40 to 65 percent slopes

Component: Hartill (75%)

The Hartill component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountains. The parent material consists of volcanic ash over colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 95 - Hesseltine silt loam, 0 to 8 percent slopes

Component: Hesseltine (80%)

The Hesseltine component makes up 80 percent of the map unit. Slopes are 0 to 8 percent. This component is on hills. The parent material consists of volcanic ash, loess and glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria.

Map unit: 96 - Hesseltine stony silt loam, 0 to 15 percent slopes

Component: Hesseltine (80%)

The Hesseltine component makes up 80 percent of the map unit. Slopes are 0 to 15 percent. This component is on terraces. The parent material consists of volcanic ash, loess and glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Map unit: 97 - Hesseltine-Rock outcrop complex, 0 to 25 percent slopes

Component: Hesseltine (65%)

The Hesseltine component makes up 65 percent of the map unit. Slopes are 0 to 25 percent. This component is on hills. The parent material consists of volcanic ash, loess and glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 97 - Hesseltine-Rock outcrop complex, 0 to 25 percent slopes

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 98 - Histosols, ponded

Component: Histosols (100%)

The Histosols component makes up 100 percent of the map unit. Slopes are 0 to 2 percent. This component is on depressions. The parent material consists of organic material and volcanic ash alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very high. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, May, June, July, August, November, December. Organic matter content in the surface horizon is about 65 percent. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Map unit: 99 - Hodgson silt loam, 0 to 3 percent slopes

Component: Hodgson (85%)

The Hodgson component makes up 85 percent of the map unit. Slopes are 0 to 3 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent.

Map unit: 100 - Hodgson silt loam, 3 to 15 percent slopes

Component: Hodgson (80%)

The Hodgson component makes up 80 percent of the map unit. Slopes are 3 to 15 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 101 - Hodgson silt loam, 15 to 25 percent slopes

Component: Hodgson (80%)

The Hodgson component makes up 80 percent of the map unit. Slopes are 15 to 25 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent.

Map unit: 102 - Hodgson silt loam, 25 to 40 percent slopes

Component: Hodgson (80%)

The Hodgson component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on escarpments. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent.

Map unit: 103 - Huckleberry silt loam, 0 to 15 percent slopes

Component: Huckleberry (80%)

The Huckleberry component makes up 80 percent of the map unit. Slopes are 0 to 15 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 104 - Huckleberry silt loam, 15 to 25 percent slopes

Component: Huckleberry (80%)

The Huckleberry component makes up 80 percent of the map unit. Slopes are 15 to 25 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 105 - Huckleberry silt loam, 25 to 40 percent slopes

Component: Huckleberry (80%)

The Huckleberry component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 106 - Huckleberry silt loam, 40 to 65 percent slopes

Component: Huckleberry (80%)

The Huckleberry component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 107 - Huckleberry-Rock outcrop complex, 30 to 65 percent slopes

Component: Huckleberry (65%)

The Huckleberry component makes up 65 percent of the map unit. Slopes are 30 to 65 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 108 - Hunters silt loam, 0 to 5 percent slopes

Component: Hunters (85%)

The Hunters component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on terraces. The parent material consists of volcanic ash and loess mixed with glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 2e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent.

Map unit: 109 - Hunters silt loam, 5 to 15 percent slopes

Component: Hunters (85%)

The Hunters component makes up 85 percent of the map unit. Slopes are 5 to 15 percent. This component is on terraces. The parent material consists of volcanic ash and loess mixed with glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent.

Map unit: 110 - Inkler silt loam, 0 to 20 percent slopes

Component: Inkler (85%)

The Inkler component makes up 85 percent of the map unit. Slopes are 0 to 20 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till, residuum and colluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 111 - Inkler gravelly silt loam, 20 to 40 percent slopes

Component: Inkler (85%)

The Inkler component makes up 85 percent of the map unit. Slopes are 20 to 40 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till, residuum and colluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 112 - Inkler gravelly silt loam, 40 to 65 percent slopes

Component: Inkler (80%)

The Inkler component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till, residuum and colluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 113 - Inkler-Rock outcrop complex, 20 to 40 percent slopes

Component: Inkler (65%)

The Inkler component makes up 65 percent of the map unit. Slopes are 20 to 40 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till, residuum and colluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 114 - Inkler-Rock outcrop complex, 40 to 65 percent slopes

Component: Inkler (65%)

The Inkler component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till, residuum and colluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 115 - Kegel loam

Component: Kegel (80%)

The Kegel component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on terraces. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 18 inches during January, February, March, April, May. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 4w. This soil does not meet hydric criteria.

Map unit: 116 - Kiehl gravelly silt loam, 0 to 20 percent slopes

Component: Kiehl (85%)

The Kiehl component makes up 85 percent of the map unit. Slopes are 0 to 20 percent. This component is on terraces. The parent material consists of volcanic ash, loess and glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 117 - Kiehl gravelly silt loam, 20 to 65 percent slopes

Component: Kiehl (80%)

The Kiehl component makes up 80 percent of the map unit. Slopes are 20 to 65 percent. This component is on escarpments. The parent material consists of volcanic ash, loess and glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 118 - Koerling fine sandy loam, 0 to 5 percent slopes

Component: Koerling (85%)

The Koerling component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on terraces. The parent material consists of volcanic ash and loess mixed into glaciofluvial material over stratified, calcareous glacial lake sediment. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 119 - Koerling fine sandy loam, 5 to 15 percent slopes

Component: Koerling (85%)

The Koerling component makes up 85 percent of the map unit. Slopes are 5 to 15 percent. This component is on terraces. The parent material consists of volcanic ash and loess mixed into glaciofluvial material over stratified, calcareous glacial lake sediment. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 120 - Koerling silt loam, 30 to 65 percent slopes

Component: Koerling (80%)

The Koerling component makes up 80 percent of the map unit. Slopes are 30 to 65 percent. This component is on escarpments. The parent material consists of volcanic ash and loess mixed into glaciofluvial material over stratified, calcareous glacial lake sediment. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 121 - Konner silty clay loam

Component: Konner (80%)

The Konner component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 18 inches during February, March, April, May. Organic matter content in the surface horizon is about 4 percent. This component is in the R044XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 4w. This soil does not meet hydric criteria.

Map unit: 122 - Konner silty clay loam, drained

Component: Konner (80%)

The Konner component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 48 inches during February, March, April, May. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 123 - Koseth loam, 15 to 40 percent slopes

Component: Koseth (80%)

The Koseth component makes up 80 percent of the map unit. Slopes are 15 to 40 percent. This component is on hills. The parent material consists of calcareous till mixed with volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent.

Map unit: 124 - Koseth loam, 40 to 65 percent slopes

Component: Koseth (75%)

The Koseth component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of calcareous till mixed with volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent.

Map unit: 125 - Koseth-Rock outcrop complex, 30 to 65 percent slopes

Component: Koseth (65%)

The Koseth component makes up 65 percent of the map unit. Slopes are 30 to 65 percent. This component is on hills. The parent material consists of calcareous till mixed with volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent.

Component: Rock outcrop (25%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 126 - Laketon silt loam, 0 to 5 percent slopes

Component: Laketon (85%)

The Laketon component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during February, March, April. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil does not meet hydric criteria.

Map unit: 127 - Laketon silt loam, 5 to 15 percent slopes

Component: Laketon (80%)

The Laketon component makes up 80 percent of the map unit. Slopes are 5 to 15 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during February, March, April. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 128 - Leadpoint silt loam, 0 to 25 percent slopes

Component: Leadpoint (80%)

The Leadpoint component makes up 80 percent of the map unit. Slopes are 0 to 25 percent. This component is on hills. The parent material consists of glacial till, colluvium and residuum derived from shale mixed with loess in the upper part. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 129 - Leadpoint silt loam, 25 to 40 percent slopes

Component: Leadpoint (80%)

The Leadpoint component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of glacial till, colluvium and residuum derived from shale mixed with loess in the upper part. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 130 - Leadpoint silt loam, 40 to 65 percent slopes

Component: Leadpoint (75%)

The Leadpoint component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of glacial till, colluvium and residuum derived from shale mixed with loess in the upper part. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 131 - Leadpoint-Rock outcrop complex, 25 to 40 percent slopes

Component: Leadpoint (65%)

The Leadpoint component makes up 65 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of glacial till, colluvium and residuum derived from shale mixed with loess in the upper part. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 132 - Leadpoint-Rock outcrop complex, 40 to 65 percent slopes

Component: Leadpoint (65%)

The Leadpoint component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of glacial till, colluvium and residuum derived from shale mixed with loess in the upper part. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 133 - Maki gravelly loam, 25 to 40 percent slopes

Component: Maki (85%)

The Maki component makes up 85 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of glacial till, calcareous colluvium and residuum mixed with volcanic ash and loess. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Map unit: 134 - Maki gravelly loam, 40 to 65 percent slopes

Component: Maki (80%)

The Maki component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of glacial till, calcareous colluvium and residuum mixed with volcanic ash and loess. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Map unit: 135 - Maki-Rock outcrop complex, 25 to 40 percent slopes

Component: Maki (60%)

The Maki component makes up 60 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of glacial till, calcareous colluvium and residuum mixed with volcanic ash and loess. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Component: Rock outcrop (25%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 136 - Maki-Rock outcrop complex, 40 to 65 percent slopes

Component: Maki (60%)

The Maki component makes up 60 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of glacial till, calcareous colluvium and residuum mixed with volcanic ash and loess. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Component: Rock outcrop (25%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 137 - Manley silt loam, 0 to 20 percent slopes

Component: Manley (80%)

The Manley component makes up 80 percent of the map unit. Slopes are 0 to 20 percent. This component is on hills. The parent material consists of volcanic ash over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 138 - Manley silt loam, 20 to 40 percent slopes

Component: Manley (80%)

The Manley component makes up 80 percent of the map unit. Slopes are 20 to 40 percent. This component is on hills. The parent material consists of volcanic ash over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 139 - Manley silt loam, 40 to 65 percent slopes

Component: Manley (75%)

The Manley component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 140 - Manley-Rock outcrop complex, 0 to 40 percent slopes

Component: Manley (70%)

The Manley component makes up 70 percent of the map unit. Slopes are 0 to 40 percent. This component is on hills. The parent material consists of volcanic ash over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Component: Rock outcrop (15%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 141 - Manley-Rock outcrop complex, 40 to 65 percent slopes

Component: Manley (70%)

The Manley component makes up 70 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (15%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 142 - Marble loamy sand, 5 to 25 percent slopes

Component: Marble (80%)

The Marble component makes up 80 percent of the map unit. Slopes are 5 to 25 percent. This component is on terraces. The parent material consists of wind worked mixed sandy outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 143 - Martella silt loam, 0 to 5 percent slopes

Component: Martella (85%)

The Martella component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 19 percent.

Map unit: 144 - Martella silt loam, 5 to 15 percent slopes

Component: Martella (80%)

The Martella component makes up 80 percent of the map unit. Slopes are 5 to 15 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 19 percent.

Map unit: 145 - Martella silt loam, 15 to 25 percent slopes

Component: Martella (80%)

The Martella component makes up 80 percent of the map unit. Slopes are 15 to 25 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 19 percent.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 146 - Martella silt loam, 25 to 40 percent slopes

Component: Martella (75%)

The Martella component makes up 75 percent of the map unit. Slopes are 25 to 40 percent. This component is on escarpments. The parent material consists of volcanic ash and loess over glacial lake sediments. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. Irrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 19 percent.

Map unit: 147 - Merkel stony sandy loam, 0 to 40 percent slopes

Component: Merkel (85%)

The Merkel component makes up 85 percent of the map unit. Slopes are 0 to 40 percent. This component is on hills. The parent material consists of glacial till derived from granite mixed with volcanic ash in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Map unit: 148 - Merkel stony sandy loam, 40 to 65 percent slopes

Component: Merkel (85%)

The Merkel component makes up 85 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of glacial till derived from granite mixed with volcanic ash in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 149 - Merkel-Rock outcrop complex, 0 to 40 percent slopes

Component: Merkel (65%)

The Merkel component makes up 65 percent of the map unit. Slopes are 0 to 40 percent. This component is on hills. The parent material consists of glacial till derived from granite mixed with volcanic ash in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 149 - Merkel-Rock outcrop complex, 0 to 40 percent slopes

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 150 - Merkel-Rock outcrop complex, 40 to 65 percent slopes

Component: Merkel (65%)

The Merkel component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of glacial till derived from granite mixed with volcanic ash in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 151 - Mobate gravelly loam, 0 to 30 percent slopes

Component: Mobate (80%)

The Mobate component makes up 80 percent of the map unit. Slopes are 0 to 30 percent. This component is on hills. The parent material consists of residuum weathered from granite mixed with a component of loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Map unit: 152 - Mobate gravelly loam, 30 to 65 percent slopes

Component: Mobate (80%)

The Mobate component makes up 80 percent of the map unit. Slopes are 30 to 65 percent. This component is on hills. The parent material consists of residuum weathered from granite mixed with a component of loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 153 - Molcal gravelly loam, limestone substratum, 25 to 65 percent slopes

Component: Molcal (80%)

The Molcal component makes up 80 percent of the map unit. Slopes are 25 to 65 percent. This component is on hills. The parent material consists of loess and volcanic ash over glacial till derived from calcareous shale, and glacial lake deposits. Depth to a root restrictive layer, bedrock, paralithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R043AY101WA Dry Loamy 16-24 Pz ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent.

Map unit: 154 - Molcal silt loam, 0 to 8 percent slopes

Component: Molcal (85%)

The Molcal component makes up 85 percent of the map unit. Slopes are 0 to 8 percent. This component is on hills. The parent material consists of loess and volcanic ash over glacial till derived from calcareous shale, and glacial lake deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R043AY101WA Dry Loamy 16-24 Pz ecological site. Nonirrigated land capability classification is 2e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent.

Map unit: 155 - Molcal silt loam, 8 to 15 percent slopes

Component: Molcal (85%)

The Molcal component makes up 85 percent of the map unit. Slopes are 8 to 15 percent. This component is on hills. The parent material consists of loess and volcanic ash over glacial till derived from calcareous shale, and glacial lake deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R043AY101WA Dry Loamy 16-24 Pz ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 156 - Molcal gravelly silt loam, 0 to 25 percent slopes

Component: Molcal (80%)

The Molcal component makes up 80 percent of the map unit. Slopes are 0 to 25 percent. This component is on hills. The parent material consists of loess and volcanic ash over glacial till derived from calcareous shale, and glacial lake deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R043AY101WA Dry Loamy 16-24 Pz ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent.

Map unit: 157 - Molcal gravelly silt loam, 25 to 40 percent slopes

Component: Molcal (80%)

The Molcal component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of loess and volcanic ash over glacial till derived from calcareous shale, and glacial lake deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R043AY101WA Dry Loamy 16-24 Pz ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent.

Map unit: 158 - Molcal gravelly silt loam, 40 to 65 percent slopes

Component: Molcal (80%)

The Molcal component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of loess and volcanic ash over glacial till derived from calcareous shale, and glacial lake deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R043AY101WA Dry Loamy 16-24 Pz ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 159 - Moscow silt loam, 0 to 25 percent slopes

Component: Moscow (85%)

The Moscow component makes up 85 percent of the map unit. Slopes are 0 to 25 percent. This component is on mountains. The parent material consists of volcanic ash and loess over residuum and colluvium derived from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 160 - Moscow silt loam, 25 to 40 percent slopes

Component: Moscow (80%)

The Moscow component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on mountains. The parent material consists of volcanic ash and loess over residuum and colluvium derived from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 161 - Moscow silt loam, 40 to 65 percent slopes

Component: Moscow (75%)

The Moscow component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountains. The parent material consists of volcanic ash and loess over residuum and colluvium derived from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 162 - Moscow-Rock outcrop complex, 0 to 30 percent slopes

Component: Moscow (65%)

The Moscow component makes up 65 percent of the map unit. Slopes are 0 to 30 percent. This component is on mountains. The parent material consists of volcanic ash and loess over residuum and colluvium derived from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 162 - Moscow-Rock outcrop complex, 0 to 30 percent slopes

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 163 - Moscow-Rock outcrop complex, 30 to 65 percent slopes

Component: Moscow (65%)

The Moscow component makes up 65 percent of the map unit. Slopes are 30 to 65 percent. This component is on mountains. The parent material consists of volcanic ash and loess over residuum and colluvium derived from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 164 - Narcisse silt loam

Component: Narcisse (80%)

The Narcisse component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of mixed alluvium with volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 48 inches during February, March, April, May. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Map unit: 165 - Newbell silt loam, 0 to 25 percent slopes

Component: Newbell (80%)

The Newbell component makes up 80 percent of the map unit. Slopes are 0 to 25 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 166 - Newbell silt loam, 25 to 40 percent slopes

Component: Newbell (80%)

The Newbell component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 167 - Newbell silt loam, 40 to 65 percent slopes

Component: Newbell (75%)

The Newbell component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 168 - Newbell stony silt loam, 0 to 40 percent slopes

Component: Newbell (80%)

The Newbell component makes up 80 percent of the map unit. Slopes are 0 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Map unit: 169 - Newbell stony silt loam, 40 to 65 percent slopes

Component: Newbell (75%)

The Newbell component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 170 - Newbell-Rock outcrop complex, 15 to 40 percent slopes

Component: Newbell (35%)

The Newbell component makes up 35 percent of the map unit. Slopes are 15 to 30 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Component: Rock outcrop (30%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 171 - Newbell-Rock outcrop complex, 40 to 65 percent slopes

Component: Newbell (65%)

The Newbell component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 172 - Peone silt loam

Component: Peone (80%)

The Peone component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on alluvial fans. The parent material consists of mixed alluvium with diatomite and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 12 inches during February, March, April, May. Organic matter content in the surface horizon is about 4 percent. This component is in the R044XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Map unit: 173 - Peone silt loam, drained

Component: Peone (80%)

The Peone component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of mixed alluvium with diatomite and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April, May. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Map unit: 174 - Phoebe sandy loam, 0 to 5 percent slopes

Component: Phoebe (85%)

The Phoebe component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on terraces. The parent material consists of volcanic ash, loess and glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 2e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria.

Map unit: 175 - Phoebe sandy loam, 5 to 15 percent slopes

Component: Phoebe (85%)

The Phoebe component makes up 85 percent of the map unit. Slopes are 5 to 15 percent. This component is on terraces. The parent material consists of volcanic ash, loess and glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 176 - Raisio shaly loam, 0 to 20 percent slopes

Component: Raisio (85%)

The Raisio component makes up 85 percent of the map unit. Slopes are 0 to 20 percent. This component is on mountains. The parent material consists of residuum derived from shale mixed with some glacial till and volcanic ash. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 4s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 177 - Raisio shaly loam, 20 to 40 percent slopes

Component: Raisio (80%)

The Raisio component makes up 80 percent of the map unit. Slopes are 20 to 40 percent. This component is on mountains. The parent material consists of residuum derived from shale mixed with some glacial till and volcanic ash. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 178 - Raisio shaly loam, 40 to 65 percent slopes

Component: Raisio (75%)

The Raisio component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountains. The parent material consists of residuum derived from shale mixed with some glacial till and volcanic ash. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 179 - Raisio-Rock outcrop complex, 25 to 40 percent slopes

Component: Raisio (65%)

The Raisio component makes up 65 percent of the map unit. Slopes are 25 to 40 percent. This component is on mountains. The parent material consists of residuum derived from shale mixed with some glacial till and volcanic ash. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 180 - Raisio-Rock outcrop complex, 40 to 65 percent slopes

Component: Raisio (65%)

The Raisio component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountains. The parent material consists of residuum derived from shale mixed with some glacial till and volcanic ash. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 181 - Rathdrum silt loam

Component: Rathdrum (80%)

The Rathdrum component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions on terraces. The parent material consists of alluvial volcanic ash over outwash material. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3c. Irrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 182 - Republic gravelly sandy loam, 0 to 25 percent slopes

Component: Republic (85%)

The Republic component makes up 85 percent of the map unit. Slopes are 0 to 25 percent. This component is on hills. The parent material consists of alluvium and till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 183 - Republic gravelly sandy loam, 25 to 40 percent slopes

Component: Republic (80%)

The Republic component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of alluvium and till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Map unit: 184 - Republic silt loam, 0 to 8 percent slopes

Component: Republic (85%)

The Republic component makes up 85 percent of the map unit. Slopes are 0 to 8 percent. This component is on alluvial fans. The parent material consists of alluvium and till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Map unit: 185 - Republic silt loam, 8 to 15 percent slopes

Component: Republic (85%)

The Republic component makes up 85 percent of the map unit. Slopes are 8 to 15 percent. This component is on alluvial fans. The parent material consists of alluvium and till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Map unit: 186 - Republic silt loam, 15 to 40 percent slopes

Component: Republic (80%)

The Republic component makes up 80 percent of the map unit. Slopes are 15 to 40 percent. This component is on alluvial fans. The parent material consists of alluvium and till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Map unit: 187 - Riverwash

Component: Riverwash (100%)

Generated brief soil descriptions are created for major soil components. The Riverwash is a miscellaneous area.

Map unit: 188 - Rock outcrop

Component: Rock outcrop (100%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 189 - Rock outcrop-Aits complex, 30 to 65 percent slopes

Component: Rock outcrop (50%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: Aits (35%)

The Aits component makes up 35 percent of the map unit. Slopes are 30 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 190 - Rock outcrop-Donavan complex, 30 to 65 percent slopes

Component: Rock outcrop (50%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: Donavan (35%)

The Donavan component makes up 35 percent of the map unit. Slopes are 30 to 65 percent. This component is on hills. The parent material consists of glacial till mixed with a component of volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 191 - Rock outcrop-Huckleberry complex, 30 to 65 percent slop es

Component: Rock outcrop (55%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: Huckleberry (30%)

The Huckleberry component makes up 30 percent of the map unit. Slopes are 30 to 65 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 192 - Rock outcrop-Inkler complex, 30 to 65 percent slopes

Component: Rock outcrop (55%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 192 - Rock outcrop-Inkler complex, 30 to 65 percent slopes

Component: Inkler (30%)

The Inkler component makes up 30 percent of the map unit. Slopes are 30 to 65 percent. This component is on hills. The parent material consists of volcanic ash, loess, glacial till, residuum and colluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 193 - Rock outcrop-Maki complex, 30 to 65 percent slopes

Component: Rock outcrop (55%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: Maki (30%)

The Maki component makes up 30 percent of the map unit. Slopes are 30 to 65 percent. This component is on hills. The parent material consists of glacial till, calcareous colluvium and residuum mixed with volcanic ash and loess. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Map unit: 194 - Rock outcrop-Merkel complex, 30 to 50 percent slopes

Component: Rock outcrop (55%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: Merkel (30%)

The Merkel component makes up 30 percent of the map unit. Slopes are 30 to 50 percent. This component is on hills. The parent material consists of glacial till derived from granite mixed with volcanic ash in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 195 - Rock outcrop-Moscow complex, 30 to 65 percent slopes

Component: Rock outcrop (55%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: Moscow (30%)

The Moscow component makes up 30 percent of the map unit. Slopes are 30 to 65 percent. This component is on mountains. The parent material consists of volcanic ash and loess over residuum and colluvium derived from granite. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 196 - Rock outcrop-Spokane complex, 30 to 65 percent slopes

Component: Rock outcrop (55%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: Spokane (30%)

The Spokane component makes up 30 percent of the map unit. Slopes are 30 to 65 percent. This component is on mountains. The parent material consists of colluvium and residuum derived from granite mixed with loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 197 - Rock outcrop-Stevens complex, 30 to 65 percent slopes

Component: Rock outcrop (55%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 197 - Rock outcrop-Stevens complex, 30 to 65 percent slopes

Component: Stevens (30%)

The Stevens component makes up 30 percent of the map unit. Slopes are 30 to 65 percent. This component is on hills. The parent material consists of glacial till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the F043XY803WA Pinus Ponderosa Var. Ponderosa/purshia Tridentata/achnatherum Hymenoides ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Map unit: 198 - Rock outcrop-Thout complex, 30 to 65 percent slopes

Component: Rock outcrop (55%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: Thout (30%)

The Thout component makes up 30 percent of the map unit. Slopes are 30 to 65 percent. This component is on hills. The parent material consists of residuum, colluvium and glacial till mixed with volcanic ash. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 199 - Rufus shaly loam, 30 to 65 percent slopes

Component: Rufus (80%)

The Rufus component makes up 80 percent of the map unit. Slopes are 30 to 65 percent. This component is on mountains. The parent material consists of colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 200 - Rufus-Rock outcrop complex, 30 to 65 percent slopes

Component: Rufus (65%)

The Rufus component makes up 65 percent of the map unit. Slopes are 30 to 65 percent. This component is on mountains. The parent material consists of colluvium and residuum derived from shale. Depth to a root restrictive layer, bedrock, lithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 201 - Saltese muck

Component: Saltese (85%)

The Saltese component makes up 85 percent of the map unit. Slopes are 0 to 2 percent. This component is on depressions. The parent material consists of organic material mixed with alluvium, diatomite and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very high. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during February, March, April, May. Organic matter content in the surface horizon is about 65 percent. This component is in the R044XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Map unit: 202 - Saltese muck, drained

Component: Saltese (90%)

The Saltese component makes up 90 percent of the map unit. Slopes are 0 to 2 percent. This component is on depressions. The parent material consists of organic material mixed with alluvium, diatomite and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very high. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April, May. Organic matter content in the surface horizon is about 65 percent. Nonirrigated land capability classification is 4w. This soil meets hydric criteria.

Map unit: 203 - Scoap gravelly loam, 5 to 20 percent slopes

Component: Scoap (85%)

The Scoap component makes up 85 percent of the map unit. Slopes are 5 to 20 percent. This component is on hills. The parent material consists of glacial till and colluvium mixed with volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 204 - Scoap gravelly loam, 20 to 40 percent slopes

Component: Scoap (85%)

The Scoap component makes up 85 percent of the map unit. Slopes are 20 to 40 percent. This component is on hills. The parent material consists of glacial till and colluvium mixed with volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6e. Irrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 205 - Scoap gravelly loam, 40 to 65 percent slopes

Component: Scoap (80%)

The Scoap component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of glacial till and colluvium mixed with volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 206 - Scoap-Rock outcrop complex, 30 to 65 percent slopes

Component: Scoap (65%)

The Scoap component makes up 65 percent of the map unit. Slopes are 30 to 65 percent. This component is on hills. The parent material consists of glacial till and colluvium mixed with volcanic ash and loess. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 206 - Scoap-Rock outcrop complex, 30 to 65 percent slopes

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 207 - Scrabblers very fine sandy loam, 0 to 20 percent slopes

Component: Scrabblers (85%)

The Scrabblers component makes up 85 percent of the map unit. Slopes are 0 to 20 percent. This component is on terraces. The parent material consists of volcanic ash and loess over glacial outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 208 - Scrabblers very fine sandy loam, 30 to 65 percent slopes

Component: Scrabblers (80%)

The Scrabblers component makes up 80 percent of the map unit. Slopes are 30 to 65 percent. This component is on escarpments. The parent material consists of volcanic ash and loess over glacial outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 209 - Skanid loam, 0 to 25 percent slopes

Component: Skanid (85%)

The Skanid component makes up 85 percent of the map unit. Slopes are 0 to 25 percent. This component is on mountains. The parent material consists of residuum derived from granite mixed with loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 210 - Skanid loam, 25 to 40 percent slopes

Component: Skanid (85%)

The Skanid component makes up 85 percent of the map unit. Slopes are 25 to 40 percent. This component is on mountains. The parent material consists of residuum derived from granite mixed with loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 211 - Skanid loam, 40 to 65 percent slopes

Component: Skanid (80%)

The Skanid component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountains. The parent material consists of residuum derived from granite mixed with loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 212 - Smackout loam, 0 to 5 percent slopes

Component: Smackout (85%)

The Smackout component makes up 85 percent of the map unit. Slopes are 0 to 5 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 213 - Smackout loam, 5 to 20 percent slopes

Component: Smackout (80%)

The Smackout component makes up 80 percent of the map unit. Slopes are 5 to 20 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 214 - Smackout loam, 20 to 40 percent slopes

Component: Smackout (75%)

The Smackout component makes up 75 percent of the map unit. Slopes are 20 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 215 - Smackout loam, 40 to 65 percent slopes

Component: Smackout (75%)

The Smackout component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 216 - Spens extremely gravelly loamy sand, 30 to 65 percent slopes

Component: Spens (80%)

The Spens component makes up 80 percent of the map unit. Slopes are 30 to 65 percent. This component is on escarpments. The parent material consists of mixed glacial outwash and colluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is very high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 217 - Spens stony loamy sand, 25 to 45 percent slopes

Component: Spens (80%)

The Spens component makes up 80 percent of the map unit. Slopes are 25 to 45 percent. This component is on escarpments. The parent material consists of mixed glacial outwash and colluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is very high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 218 - Spokane loam, 0 to 25 percent slopes

Component: Spokane (85%)

The Spokane component makes up 85 percent of the map unit. Slopes are 0 to 25 percent. This component is on mountains. The parent material consists of colluvium and residuum derived from granite mixed with loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 4s. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 219 - Spokane loam, 25 to 40 percent slopes

Component: Spokane (85%)

The Spokane component makes up 85 percent of the map unit. Slopes are 25 to 40 percent. This component is on mountains. The parent material consists of colluvium and residuum derived from granite mixed with loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 220 - Spokane loam, 40 to 65 percent slopes

Component: Spokane (80%)

The Spokane component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountains. The parent material consists of colluvium and residuum derived from granite mixed with loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 221 - Spokane stony loam, 0 to 40 percent slopes

Component: Spokane (85%)

The Spokane component makes up 85 percent of the map unit. Slopes are 0 to 40 percent. This component is on mountains. The parent material consists of colluvium and residuum derived from granite mixed with loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 222 - Spokane stony loam, 40 to 65 percent slopes

Component: Spokane (80%)

The Spokane component makes up 80 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountains. The parent material consists of colluvium and residuum derived from granite mixed with loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 223 - Spokane-Rock outcrop complex, 0 to 40 percent slopes

Component: Spokane (65%)

The Spokane component makes up 65 percent of the map unit. Slopes are 0 to 40 percent. This component is on mountains. The parent material consists of colluvium and residuum derived from granite mixed with loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 224 - Spokane-Rock outcrop complex, 40 to 65 percent slopes

Component: Spokane (65%)

The Spokane component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountains. The parent material consists of colluvium and residuum derived from granite mixed with loess and volcanic ash. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 225 - Springdale sandy loam, 0 to 15 percent slopes

Component: Springdale (85%)

The Springdale component makes up 85 percent of the map unit. Slopes are 0 to 15 percent. This component is on terraces. The parent material consists of volcanic ash, loess and glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4s. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 226 - Springdale gravelly sandy loam, 0 to 15 percent slopes

Component: Springdale (85%)

The Springdale component makes up 85 percent of the map unit. Slopes are 0 to 15 percent. This component is on terraces. The parent material consists of volcanic ash, loess and glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4s. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 227 - Springdale cobbly sandy loam, 0 to 15 percent slopes

Component: Springdale (85%)

The Springdale component makes up 85 percent of the map unit. Slopes are 0 to 15 percent. This component is on terraces. The parent material consists of volcanic ash, loess and glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4s. This soil does not meet hydric criteria.

Map unit: 228 - Stevens silt loam, 0 to 8 percent slopes

Component: Stevens (85%)

The Stevens component makes up 85 percent of the map unit. Slopes are 0 to 8 percent. This component is on hills. The parent material consists of glacial till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the F043XY803WA Pinus Ponderosa Var. Ponderosa/purshia Tridentata/achnatherum Hymenoides ecological site. Nonirrigated land capability classification is 2e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 229 - Stevens silt loam, 8 to 15 percent slopes

Component: Stevens (85%)

The Stevens component makes up 85 percent of the map unit. Slopes are 8 to 15 percent. This component is on hills. The parent material consists of glacial till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the F043XY803WA Pinus Ponderosa Var. Ponderosa/purshia Tridentata/achnatherum Hymenoides ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 230 - Stevens channery silt loam, 8 to 25 percent slopes

Component: Stevens (85%)

The Stevens component makes up 85 percent of the map unit. Slopes are 8 to 25 percent. This component is on hills. The parent material consists of glacial till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the F043XY803WA Pinus Ponderosa Var. Ponderosa/purshia Tridentata/achnatherum Hymenoides ecological site. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 231 - Stevens channery silt loam, 25 to 40 percent slopes

Component: Stevens (85%)

The Stevens component makes up 85 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of glacial till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the F043XY803WA Pinus Ponderosa Var. Ponderosa/purshia Tridentata/achnatherum Hymenoides ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 232 - Stevens stony silt loam, 0 to 40 percent slopes

Component: Stevens (85%)

The Stevens component makes up 85 percent of the map unit. Slopes are 0 to 40 percent. This component is on hills. The parent material consists of glacial till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the F043XY803WA Pinus Ponderosa Var. Ponderosa/purshia Tridentata/achnatherum Hymenoides ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Map unit: 233 - Stevens stony silt loam, 40 to 65 percent slopes

Component: Stevens (85%)

The Stevens component makes up 85 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of glacial till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the F043XY803WA Pinus Ponderosa Var. Ponderosa/purshia Tridentata/achnatherum Hymenoides ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Map unit: 234 - Stevens-Rock outcrop complex, 25 to 40 percent slopes

Component: Stevens (65%)

The Stevens component makes up 65 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of glacial till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the F043XY803WA Pinus Ponderosa Var. Ponderosa/purshia Tridentata/achnatherum Hymenoides ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 235 - Stevens-Rock outcrop complex, 40 to 65 percent slopes

Component: Stevens (65%)

The Stevens component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of glacial till mixed with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the F043XY803WA Pinus Ponderosa Var. Ponderosa/purshia Tridentata/achnatherum Hymenoides ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 236 - Thout-Rock outcrop complex, 8 to 40 percent slopes

Component: Thout (65%)

The Thout component makes up 65 percent of the map unit. Slopes are 8 to 40 percent. This component is on hills. The parent material consists of residuum, colluvium and glacial till mixed with volcanic ash. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 237 - Thout-Rock outcrop complex, 40 to 65 percent slopes

Component: Thout (65%)

The Thout component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of residuum, colluvium and glacial till mixed with volcanic ash. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 237 - Thout-Rock outcrop complex, 40 to 65 percent slopes

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 238 - Vassar silt loam, 30 to 65 percent slopes

Component: Vassar (85%)

The Vassar component makes up 85 percent of the map unit. Slopes are 30 to 65 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum weathered from granite and gneiss. Depth to a root restrictive layer, bedrock, paralithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 239 - Vassar silt loam, shaly substratum, 30 to 65 percent slopes

Component: Vassar (80%)

The Vassar component makes up 80 percent of the map unit. Slopes are 30 to 65 percent. This component is on mountains. The parent material consists of volcanic ash and loess over colluvium and residuum weathered from granite and gneiss. Depth to a root restrictive layer, bedrock, paralithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 240 - Waits loam, 0 to 15 percent slopes

Component: Waits (85%)

The Waits component makes up 85 percent of the map unit. Slopes are 0 to 15 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 15 percent.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 241 - Waits loam, 15 to 25 percent slopes

Component: Waits (80%)

The Waits component makes up 80 percent of the map unit. Slopes are 15 to 25 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 15 percent.

Map unit: 242 - Waits loam, 25 to 40 percent slopes

Component: Waits (80%)

The Waits component makes up 80 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 15 percent.

Map unit: 243 - Waits loam, 40 to 65 percent slopes

Component: Waits (75%)

The Waits component makes up 75 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 15 percent.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 244 - Waits-Rock outcrop complex, 25 to 40 percent slopes

Component: Waits (65%)

The Waits component makes up 65 percent of the map unit. Slopes are 25 to 40 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 15 percent.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 245 - Waits-Rock outcrop complex, 40 to 65 percent slopes

Component: Waits (65%)

The Waits component makes up 65 percent of the map unit. Slopes are 40 to 65 percent. This component is on hills. The parent material consists of volcanic ash and loess over glacial till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 15 percent.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 246 - Wethey loamy sand

Component: Wethey (85%)

The Wethey component makes up 85 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of mixed sandy alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 36 inches during February, March, April, May. Organic matter content in the surface horizon is about 2 percent. This component is in the R044XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 247 - Wolfeson very fine sandy loam

Component: Wolfeson (80%)

The Wolfeson component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of glaciofluvial deposits with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during February, March, April, May. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Map unit: 248 - Wolfeson very fine sandy loam, wet

Component: Wolfeson (80%)

The Wolfeson component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of glaciofluvial deposits with loess and volcanic ash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 18 inches during February, March, April, May. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 4w. This soil does not meet hydric criteria.

Map unit: 249 - Water

Component: Water (100%)

Generated brief soil descriptions are created for major soil components. The Water is a miscellaneous area.

Map unit: 1001 - Bridgeson ashy silt loam, 0 to 3 percent slopes

Component: Bridgeson (80%)

The Bridgeson component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on drainageways, valleys. The parent material consists of Alluvium derived from glaciolacustrine sediments with an influence of volcanic ash in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very high. Shrink-swell potential is moderate. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 12 inches during February, March, April, May. Organic matter content in the surface horizon is about 8 percent. This component is in the R044XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 1040 - Hardesty ashy silt loam, 0 to 3 percent slopes

Component: Hardesty (75%)

The Hardesty component makes up 75 percent of the map unit. Slopes are 0 to 3 percent. This component is on stream terraces, valleys, drainageways, depressions, scablands. The parent material consists of alluvium derived from volcanic ash mixed with loess in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. A seasonal zone of water saturation is at 23 inches during February. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 2w. This soil does not meet hydric criteria.

Map unit: 1050 - Hoodoo-Kronquist complex, 0 to 3 percent slopes

Component: Hoodoo (45%)

The Hoodoo component makes up 45 percent of the map unit. Slopes are 0 to 3 percent. This component is on valleys, flood plains. The parent material consists of Alluvium derived from volcanic ash with loess mixed in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very high. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, May. Organic matter content in the surface horizon is about 4 percent. This component is in the R044XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Component: Kronquist (40%)

The Kronquist component makes up 40 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains, valleys. The parent material consists of alluvium mixed with volcanic ash and loess in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 10 inches during April. Organic matter content in the surface horizon is about 4 percent. This component is in the R044XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Map unit: 1092 - Hoodoo ashy silt loam, 0 to 3 percent slopes

Component: Hoodoo (70%)

The Hoodoo component makes up 70 percent of the map unit. Slopes are 0 to 3 percent. This component is on valleys, flood plains. The parent material consists of Alluvium derived from volcanic ash with loess mixed in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very high. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, May. Organic matter content in the surface horizon is about 4 percent. This component is in the R044XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 1130 - Colburn ashy loam, 0 to 3 percent slopes

Component: Colburn (80%)

The Colburn component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on valleys, drainageways. The parent material consists of mixed alluvium with an influence of loess and volcanic ash in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 22 inches during April. Organic matter content in the surface horizon is about 75 percent. This component is in the R044XY602WA Semi-wet Meadow 15+ Pz ecological site. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Map unit: 1200 - Endoaquolls and Fluvaquents, 0 to 3 percent slopes

Component: Endoaquolls (40%)

The Endoaquolls component makes up 40 percent of the map unit. Slopes are 0 to 3 percent. This component is on stream terraces, drainageways, valleys, flood plains. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April. Organic matter content in the surface horizon is about 5 percent. This component is in the R009XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Component: Fluvaquents (40%)

The Fluvaquents component makes up 40 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains, valleys, drainageways, stream terraces. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April. Organic matter content in the surface horizon is about 1 percent. This component is in the R009XY601WA Wet Meadow 16-24 Pz ecological site. Nonirrigated land capability classification is 5w. This soil meets hydric criteria.

Map unit: 3030 - Bonner ashy fine sandy loam, 0 to 8 percent slopes

Component: Bonner (70%)

The Bonner component makes up 70 percent of the map unit. Slopes are 0 to 8 percent. This component is on outwash terraces, valleys. The parent material consists of thick mantle of volcanic ash mixed with loess over outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 3031 - Bonner-Wapal complex, 8 to 15 percent slopes

Component: Bonner (60%)

The Bonner component makes up 60 percent of the map unit. Slopes are 8 to 15 percent. This component is on outwash terraces, valleys. The parent material consists of thick mantle of volcanic ash mixed with loess over outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Component: Wapal (20%)

The Wapal component makes up 20 percent of the map unit. Slopes are 8 to 15 percent. This component is on outwash terraces, valleys. The parent material consists of sandy and gravelly glaciofluvial deposits with minor amounts of volcanic ash and loess in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4s. This soil does not meet hydric criteria.

Map unit: 3055 - Clayton-Hagen complex, 8 to 25 percent slopes

Component: Clayton (55%)

The Clayton component makes up 55 percent of the map unit. Slopes are 8 to 25 percent. This component is on valleys, terraces. The parent material consists of Sandy glaciofluvial deposits with minor amounts of volcanic ash and loess in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Component: Hagen (25%)

The Hagen component makes up 25 percent of the map unit. Slopes are 8 to 25 percent. This component is on outwash terraces, valleys. The parent material consists of sandy glaciofluvial deposits with minor amounts of loess and volcanic ash in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 3070 - Eloika ashy very fine sandy loam, 0 to 8 percent slopes

Component: Eloika (65%)

The Eloika component makes up 65 percent of the map unit. Slopes are 0 to 8 percent. This component is on valleys, outwash plains. The parent material consists of thick mantle of volcanic ash mixed with loess over outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 3c. This soil does not meet hydric criteria.

Map unit: 3074 - Eloika ashy very fine sandy loam, moist, 0 to 8 percent slopes

Component: Eloika, moist (65%)

The Eloika, moist component makes up 65 percent of the map unit. Slopes are 0 to 8 percent. This component is on valleys, outwash plains. The parent material consists of thick mantle of volcanic ash mixed with loess over outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 3c. This soil does not meet hydric criteria.

Map unit: 3120 - Marble loamy sand, 0 to 8 percent slopes

Component: Marble (80%)

The Marble component makes up 80 percent of the map unit. Slopes are 0 to 8 percent. This component is on outwash plains, valleys. The parent material consists of Sandy glaciofluvial deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4s. This soil does not meet hydric criteria.

Map unit: 3143 - Spens very gravelly loamy coarse sand 30 to 65 percent slopes

Component: Spens (60%)

The Spens component makes up 60 percent of the map unit. Slopes are 30 to 65 percent. This component is on valleys, outwash terraces. The parent material consists of sandy and gravelly glaciofluvial deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is very high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 3202 - Torboy-Blackprince complex, 8 to 15 percent slopes

Component: Torboy (55%)

The Torboy component makes up 55 percent of the map unit. Slopes are 8 to 15 percent. This component is on valleys, outwash terraces. The parent material consists of Sandy and gravelly glaciofluvial deposits with minor amounts of volcanic ash and loess in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4s. This soil does not meet hydric criteria.

Component: Blackprince (20%)

The Blackprince component makes up 20 percent of the map unit. Slopes are 15 to 20 percent. This component is on hills, mountains. The parent material consists of Loess mixed with minor amounts of volcanic ash over residuum derived from granite. Depth to a root restrictive layer, bedrock, paralithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 3220 - Stapaloop ashy fine sandy loam, 0 to 8 percent slopes

Component: Stapaloop (75%)

The Stapaloop component makes up 75 percent of the map unit. Slopes are 0 to 8 percent. This component is on valleys, outwash plains. The parent material consists of glaciofluvial deposits with an influence of volcanic ash and loess in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3c. This soil does not meet hydric criteria.

Map unit: 3221 - Stapaloop-Kaniksu, dry complex, 8 to 25 percent slopes

Component: Stapaloop (55%)

The Stapaloop component makes up 55 percent of the map unit. Slopes are 8 to 25 percent. This component is on valleys, outwash plains. The parent material consists of glaciofluvial deposits with an influence of volcanic ash and loess in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 3221 - Stapaloop-Kaniksu, dry complex, 8 to 25 percent slopes

Component: Kaniksu, dry (30%)

The Kaniksu, dry component makes up 30 percent of the map unit. Slopes are 8 to 25 percent. This component is on valleys, outwash plains. The parent material consists of sandy glaciofluvial deposits with minor amounts of volcanic ash and loess in the upper part. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 3301 - Scrabblers ashy fine sandy loam, 3 to 8 percent slopes

Component: Scrabblers (75%)

The Scrabblers component makes up 75 percent of the map unit. Slopes are 3 to 8 percent. This component is on valleys, outwash plains. The parent material consists of thin mantle of volcanic ash mixed with loess over outwash. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 3s. This soil does not meet hydric criteria.

Map unit: 4040 - Wolfeson-Fan Lake complex, 0 to 8 percent slopes

Component: Wolfeson (60%)

The Wolfeson component makes up 60 percent of the map unit. Slopes are 0 to 3 percent. This component is on outwash plains, valleys, terraces. The parent material consists of Loess mixed with minor amounts of volcanic ash over glaciofluvial and glacialacustrine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 21 inches during February, March, April. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Component: Fan Lake (25%)

The Fan Lake component makes up 25 percent of the map unit. Slopes are 0 to 8 percent. This component is on terraces, outwash plains, valleys. The parent material consists of thin mantle of volcanic ash mixed with loess over glaciolfluvial deposits or latah formation. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 16 inches during April. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 4w. This soil does not meet hydric criteria.

Map unit: 4041 - Wolfeson ashy very fine sandy loam, 0 to 3 percent slopes

Component: Wolfeson (85%)

The Wolfeson component makes up 85 percent of the map unit. Slopes are 0 to 3 percent. This component is on outwash plains, valleys, terraces. The parent material consists of Loess mixed with minor amounts of volcanic ash over glaciofluvial and glacialacustrine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 21 inches during February, March, April. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3w. This soil does not meet hydric criteria.

Map unit: 4050 - Fan Lake ashy very fine sandy loam, 0 to 8 percent slopes

Component: Fan Lake (85%)

The Fan Lake component makes up 85 percent of the map unit. Slopes are 0 to 8 percent. This component is on outwash plains, valleys, terraces. The parent material consists of thin mantle of volcanic ash mixed with loess over glaciolfluvial deposits or latah formation. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 16 inches during April. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 4w. This soil does not meet hydric criteria.

Map unit: 5026 - Micapeak-Spokane complex, 15 to 30 percent slopes

Component: Micapeak (40%)

The Micapeak component makes up 40 percent of the map unit. Slopes are 15 to 30 percent. This component is on mountains, hills. The parent material consists of residuum and/or colluvium derived from granite, gneiss and schist with an influence of volcanic ash and loess in the upper part. Depth to a root restrictive layer, bedrock, paralithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Component: Spokane (30%)

The Spokane component makes up 30 percent of the map unit. Slopes are 15 to 30 percent. This component is on hills, mountains. The parent material consists of loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granite, gniess or schist. Depth to a root restrictive layer, bedrock, paralithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 5037 - Spokane-Rock outcrop complex, 30 to 55 percent slopes

Component: Spokane (45%)

The Spokane component makes up 45 percent of the map unit. Slopes are 30 to 55 percent. This component is on hills, mountains. The parent material consists of loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granite, gniess or schist. Depth to a root restrictive layer, bedrock, paralithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (25%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 5040 - Spokane-Swakane complex, 3 to 15 percent slopes

Component: Spokane (40%)

The Spokane component makes up 40 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills, mountains, ridges on mountains. The parent material consists of loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granite, gniess or schist. Depth to a root restrictive layer, bedrock, paralithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4s. This soil does not meet hydric criteria.

Component: Swakane (35%)

The Swakane component makes up 35 percent of the map unit. Slopes are 3 to 15 percent. This component is on mountains, hills, ridges on mountains. The parent material consists of loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granite. schist or gneiss. Depth to a root restrictive layer, bedrock, lithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 5067 - Quinnamose-Micapeak complex, 15 to 30 percent slopes

Component: Quinnamose (40%)

The Quinnamose component makes up 40 percent of the map unit. Slopes are 15 to 30 percent. This component is on mountains, hills, mountains. The parent material consists of loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granitie and schist. Depth to a root restrictive layer, bedrock, paralithic, is 43 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Component: Micapeak (30%)

The Micapeak component makes up 30 percent of the map unit. Slopes are 15 to 30 percent. This component is on mountains, hills, ridges, mountains. The parent material consists of residuum and/or colluvium derived from granite, gneiss and schist with an influence of volcanic ash and loess in the upper part. Depth to a root restrictive layer, bedrock, paralithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 5068 - Quinnamose-Micapeak complex, 30 to 55 percent slopes

Component: Quinnamose (45%)

The Quinnamose component makes up 45 percent of the map unit. Slopes are 30 to 55 percent. This component is on mountains, hills, mountains. The parent material consists of loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granitie and schist. Depth to a root restrictive layer, bedrock, paralithic, is 43 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Micapeak (35%)

The Micapeak component makes up 35 percent of the map unit. Slopes are 30 to 55 percent. This component is on mountains, hills, ridges, mountains. The parent material consists of residuum and/or colluvium derived from granite, gneiss and schist with an influence of volcanic ash and loess in the upper part. Depth to a root restrictive layer, bedrock, paralithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 5070 - Lenz-Spokane complex, 3 to 15 percent slopes

Component: Lenz (45%)

The Lenz component makes up 45 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills, mountains. The parent material consists of Loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granitic and metamorphic rocks. Depth to a root restrictive layer, bedrock, lithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4s. This soil does not meet hydric criteria.

Component: Spokane (35%)

The Spokane component makes up 35 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills, mountains. The parent material consists of loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granite, gniess or schist. Depth to a root restrictive layer, bedrock, paralithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4s. This soil does not meet hydric criteria.

Map unit: 5071 - Lenz-Spokane complex, 15 to 30 percent slopes

Component: Lenz (45%)

The Lenz component makes up 45 percent of the map unit. Slopes are 15 to 30 percent. This component is on hills, mountains. The parent material consists of Loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granitic and metamorphic rocks. Depth to a root restrictive layer, bedrock, lithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Component: Spokane (30%)

The Spokane component makes up 30 percent of the map unit. Slopes are 15 to 30 percent. This component is on hills, mountains. The parent material consists of loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granite, gniess or schist. Depth to a root restrictive layer, bedrock, paralithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 5073 - Lenz-Rock outcrop complex, 15 to 30 percent slopes

Component: Lenz (50%)

The Lenz component makes up 50 percent of the map unit. Slopes are 15 to 30 percent. This component is on hills, mountains. The parent material consists of Loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granitic and metamorphic rocks. Depth to a root restrictive layer, bedrock, lithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 5074 - Lenz-Rock outcrop complex, 30 to 60 percent slopes

Component: Lenz (45%)

The Lenz component makes up 45 percent of the map unit. Slopes are 30 to 60 percent. This component is on hills, mountains. The parent material consists of Loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granitic and metamorphic rocks. Depth to a root restrictive layer, bedrock, lithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (25%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 5090 - Brevco-Ardtoo complex, 3 to 15 percent slopes

Component: Brevco (50%)

The Brevco component makes up 50 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills, mountains, mountains. The parent material consists of Loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granite. Depth to a root restrictive layer, bedrock, lithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4s. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 5090 - Brevco-Ardtoo complex, 3 to 15 percent slopes

Component: Ardtoo (25%)

The Ardtoo component makes up 25 percent of the map unit. Slopes are 3 to 15 percent. This component is on mountains, hills, mountains. The parent material consists of loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granite. Depth to a root restrictive layer, bedrock, paralithic, is 41 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4s. This soil does not meet hydric criteria.

Map unit: 5091 - Brevco gravelly ashy sandy loam, 15 to 30 percent slopes

Component: Brevco (70%)

The Brevco component makes up 70 percent of the map unit. Slopes are 15 to 30 percent. This component is on mountains, mountains, hills. The parent material consists of Loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granite. Depth to a root restrictive layer, bedrock, lithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 5092 - Brevco-Rock outcrop complex, 30 to 60 percent slopes

Component: Brevco (60%)

The Brevco component makes up 60 percent of the map unit. Slopes are 30 to 60 percent. This component is on mountains, mountains, hills. The parent material consists of Loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granite. Depth to a root restrictive layer, bedrock, lithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (15%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 5093 - Blackprince-Ardtoo complex, 15 to 30 percent slopes

Component: Blackprince (40%)

The Blackprince component makes up 40 percent of the map unit. Slopes are 15 to 30 percent. This component is on hills, mountains, mountains. The parent material consists of Loess mixed with minor amounts of volcanic ash over residuum derived from granite. Depth to a root restrictive layer, bedrock, paralithic, is 21 to 41 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Component: Ardtoo (35%)

The Ardtoo component makes up 35 percent of the map unit. Slopes are 15 to 30 percent. This component is on mountains, hills, mountains. The parent material consists of loess mixed with minor amounts of volcanic ash over residuum and/or colluvium derived from granite. Depth to a root restrictive layer, bedrock, paralithic, is 41 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: 5130 - Brodeer ashy silt loam, 3 to 15 percent slopes

Component: Brodeer (70%)

The Brodeer component makes up 70 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills, mountains. The parent material consists of thick mantle of volcanic ash over residuum weathered from granite, gniess or quartz-monzonite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 4c. This soil does not meet hydric criteria.

Map unit: 5140 - Jacot-Hysing complex, dry, 3 to 15 percent slopes

Component: Jacot, dry (50%)

The Jacot, dry component makes up 50 percent of the map unit. Slopes are 3 to 15 percent. This component is on mountains, mountains, hills. The parent material consists of thick mantle of volcanic ash over colluvim and residuum derived from granite and/or quartz-monzonite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 5140 - Jacot-Hysing complex, dry, 3 to 15 percent slopes

Component: Hysing, dry (25%)

The Hysing, dry component makes up 25 percent of the map unit. Slopes are 3 to 15 percent. This component is on mountains, hills, mountains. The parent material consists of thick mantle of volcanic ash over residuum derived from granite and/or quartz-monzonite. Depth to a root restrictive layer, bedrock, paralithic, is 42 to 62 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 5142 - Jacot-Hysing complex, 30 to 55 percent slopes

Component: Jacot (50%)

The Jacot component makes up 50 percent of the map unit. Slopes are 30 to 55 percent. This component is on mountains, mountains, hills. The parent material consists of thick mantle of volcanic ash over colluvim and residuum derived from granite and/or quartz-monzonite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Hysing (25%)

The Hysing component makes up 25 percent of the map unit. Slopes are 30 to 55 percent. This component is on mountains, mountains, hills. The parent material consists of thick mantle of volcanic ash over residuum derived from granite and/or quartz-monzonite. Depth to a root restrictive layer, bedrock, paralithic, is 42 to 62 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 75 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 5310 - Kramerhill ashy loam, 3 to 15 percent slopes

Component: Kramerhill (70%)

The Kramerhill component makes up 70 percent of the map unit. Slopes are 3 to 15 percent. This component is on foothills, hills. The parent material consists of residuum and colluvium weathered from saprolitic gneiss, quartzite, Latah Formation mixed with loess and volcanic ash in the upper part. Depth to a root restrictive layer, bedrock, paralithic, is 41 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 60 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Acreage and Proportionate Extent of the Soils

Stevens County, Washington

Map unit: 5412 - Keeler ashy loam, 8 to 15 percent slopes

Component: Keeler (75%)

The Keeler component makes up 75 percent of the map unit. Slopes are 8 to 15 percent. This component is on mountains, mountains, hills. The parent material consists of loess with an influence of volcanic ash over colluvium and resiuum derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 60 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: 5413 - Keeler-Kruse complex, 15 to 30 percent slopes

Component: Keeler (45%)

The Keeler component makes up 45 percent of the map unit. Slopes are 15 to 30 percent. This component is on hills, mountains, mountains. The parent material consists of loess with an influence of volcanic ash over colluvium and resiuum derived from granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 60 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Component: Kruse (40%)

The Kruse component makes up 40 percent of the map unit. Slopes are 15 to 30 percent. This component is on foothills, hills, mountains. The parent material consists of loess mixed with minor amounts of volcanic ash over residiuum and colluvium weathered form granite, gneiss and schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 60 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

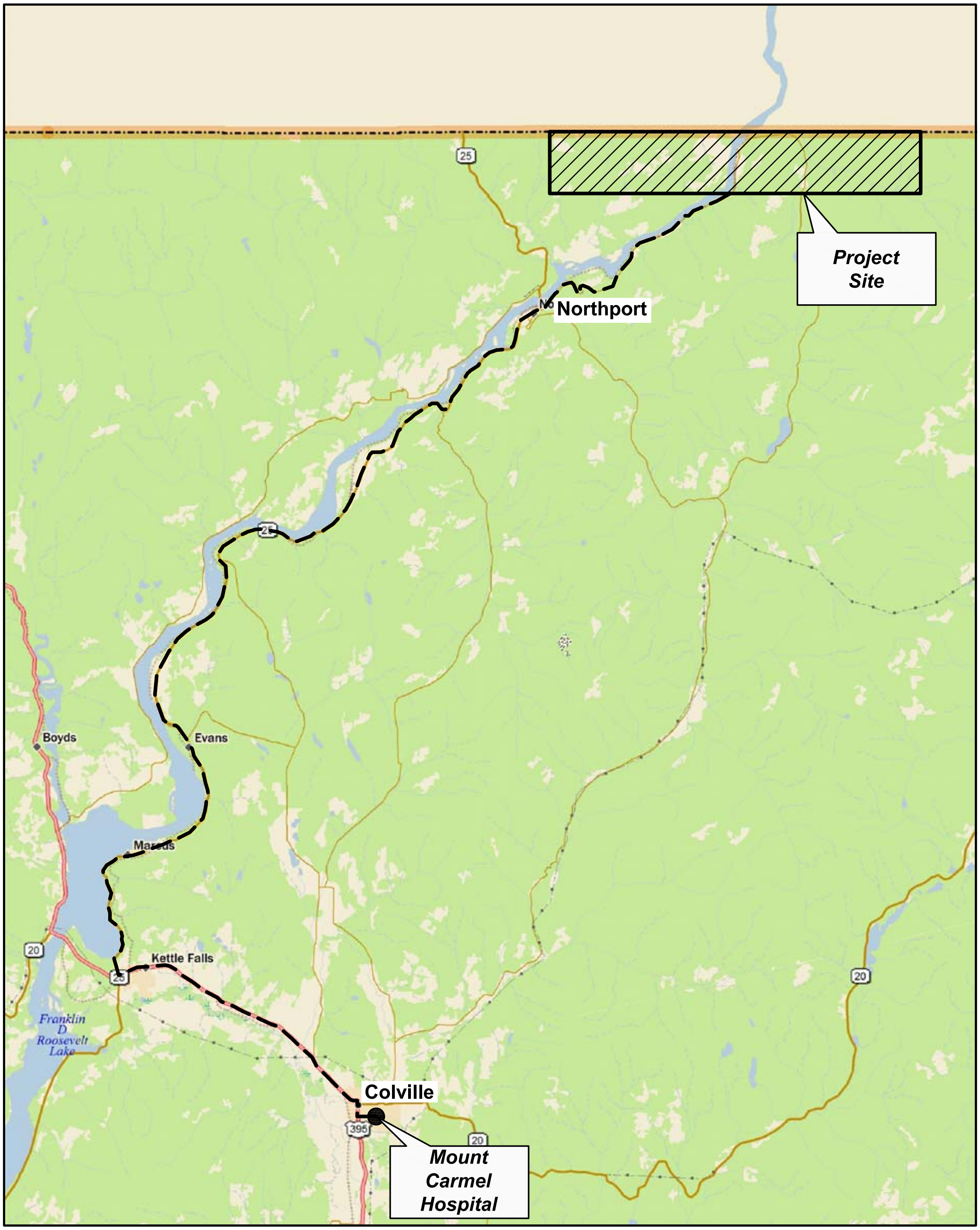
APPENDIX C
HEALTH AND SAFETY PLAN

APPENDIX C
HEALTH AND SAFETY PLAN
UPPER COLUMBIA RIVER UPLAND SOIL SAMPLING STUDY
WASHINGTON STATE
DATE PREPARED: October 30, 2012

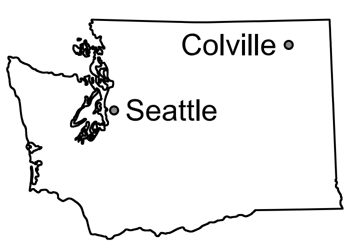
EMERGENCY CONTINGENCY INFORMATION

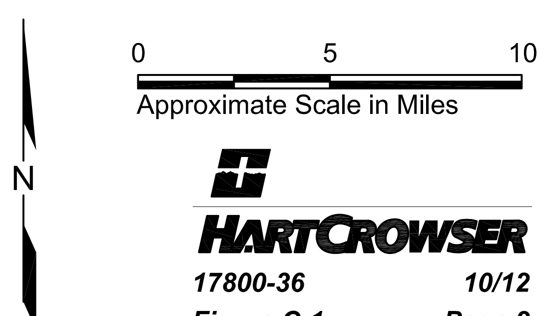
SITE LOCATION	Northern Stevens County
NEAREST HOSPITALS	Mt. Carmel Hospital East Columbia Avenue Colville, WA 99114 (509) 684-2561 The route to the hospital is depicted on Figure C-1
EMERGENCY RESPONDERS	Police Department ....911 Fire Department .... 911 Ambulance 911
EMERGENCY CONTACTS	Hart Crowser, Seattle Office ....(206) 324-9530 Steve Hughes …………………………………(206) 719-3478 (cell) Roger McGinnis .... (206) 612-5732 (cell) Client Emergency Contact (John Rowland) (509) 329-3581 National Response Center......... ....(800) 424-8802 Washington Emergency Management. .... (800) 258-5990 Ecology Eastern Regional Office .... (509) 329-3400 EPA Emergency Response Team .... (908) 321-6660 Poison Control Center.. (800) 222-1222 Chemtrec ....(800) 424-9300
IN EVENT OF EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE	Give the following information: ➔ **Where You Are**. Address, cross streets, or landmarks ☎ **Phone Number** you are calling from ?? **What Happened**. Type of injury, accident # **How many persons** need help ?? **What is being done** for the victim(s) !! **You hang up last.** Let whomever you called hang up first

Route to Hospital Map



Source: Base map prepared from DeLorme Topo 7.0, 2007.





HARTCROWSER

17800-36 *10/12*

Figure C-1 *Page 2*

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SITE HEALTH AND SAFETY PLAN SUMMARY

LOCATION: Northern Stevens County, Washington State.

PROPOSED DATES OF ACTIVITIES: October 29 – November 5, 2012.

TYPE OF FACILITY: Rural Undeveloped Land.

LAND USE OF AREA SURROUNDING FACILITY: Heavily forested, primarily undeveloped land.

POTENTIAL SITE CONTAMINANTS: Metals; concentrations anticipated to be below MTCA screening criteria or at ambient background levels.

ROUTES OF ENTRY: Not applicable.

OTHER SPECIFIC SAFETY HAZARDS: Forested areas around the site may contain hazardous plants and animals. Work activities may occur during hunting season. Work activities are limited to surface and near-surface soil sampling. Potential safety hazards include wildlife and severe weather.

PROTECTIVE MEASURES: Sturdy hiking boots/safety-toe work boots, work gloves, nitrile gloves, warm and protective clothing, field safety vest, safety glasses, hard hats, bear spray, GPS device, hand-held radios, and cellular phones.

1.0 INTRODUCTION

1.1 Purpose and Regulatory Compliance

This site-specific Health and Safety Plan (H&S Plan) addresses procedures to minimize the risk of physical accidents to on-site workers, as well as environmental contamination. The H&S Plan covers each of the 11 required plan elements as specified in 29 CFR 1910.120 or equivalent state regulations. Table C-1 lists the sections of this plan that apply to each of these required elements. When used together with the Hart Crowser General H&S Plan, this site-specific plan meets all applicable regulatory requirements.

Table C-1 - Location of Required Health and Safety Plan Elements in This Site-Specific H&S Plan

Required H&S Plan Element	Section in this Site-Specific H&S Plan
Decontamination	7.0 Decontamination
Emergency response plan	11.0 Emergency Response Plan
Medical surveillance	12.0 Medical Surveillance
Monitoring program	2.3 Air Monitoring and Action Levels
Names of key personnel	1.3 Chain of Command
Personal protective equipment	3.0 Protective Equipment, 4.0 Safety Equipment List
Safety and hazard analysis	2.0 Hazard Evaluation and Control Measures
Site control	5.0 Exclusion Areas, 9.0 Site Security and Control
Spill containment	10.0 Spill Containment
Training	13.0 Training Requirements

1.2 Distribution and Approval

This H&S Plan will be made available to all Hart Crowser personnel involved in field work on this project. It will also be made available to subcontractors and other non-employees who may need to work on the site under Hart Crowser's direction. For non-employees, it must be made clear that the plan represents minimum safety procedures and that they are responsible for their own safety while present on site. The plan has been approved by the Hart Crowser Corporate Health and Safety (H&S) Manager. By signing the documentation form provided with this plan (Table C-4 located at the end of plan), project workers also certify their acknowledgement and agreement to comply with the plan.

1.3 Chain of Command

The Hart Crowser chain of command for health and safety on this project involves the following individuals:

Corporate Health and Safety Manager: Anne Conrad

The Hart Crowser Corporate Health and Safety Manager has overall responsibility for preparation and modification of this H&S Plan. In the event that health and safety issues arise during site operations, he will attempt to resolve them with the appropriate members of the project team.

Project Manager: Steve Hughes

The Project Manager has overall responsibility for the successful outcome of the project. The Project Manager, in consultation with the Corporate H&S Manager, makes final decisions regarding questions concerning the implementation of the site-specific H&S Plan. The Project Manager may delegate this authority and responsibility to the Project and/or Field H&S Managers.

Project Health and Safety Manager: Roger McGinnis

The Project Health and Safety Manager has overall responsibility for health and safety on this project. This individual ensures that everyone working on the project understands this H&S Plan. This individual will serve as liaison with the Hart Crowser Project Manager so that all relevant health and safety issues are communicated effectively to project workers.

Field Health and Safety Manager: Phil Cordell

The Field Health and Safety Manager is responsible for implementing this H&S Plan in the field. This individual also observes subcontractors to verify that they are following these procedures, at a minimum. The Field H&S Manager will also assure that proper personal protective equipment (PPE) is available and used in the correct manner; decontamination activities are carried out properly; and that employees have knowledge of the local emergency medical system should it be necessary.

1.4 Site Work Activities

The following work tasks will be accomplished:

- Collection of soil samples.

The expected duration of this project is October 29 – November 5, 2012.

1.5 Site Description

Upland soil sampling will be conducted in Northern Stevens County, Washington. The study area is defined as a 12-mile-wide corridor extending 6 miles on either side of the Columbia River and south from the U.S./Canada border for 2 miles. The site consists of forested and unforested land, lakes, streams, and rocky terrain.

2.0 HAZARD EVALUATION AND CONTROL MEASURES

2.1 Toxicity of Chemicals of Concern

Based on previous site information and knowledge of the types of activities conducted at this location, the areas to be sampled are not expected to contain significant levels of chemicals of concern. Metal concentrations are anticipated to be below MTCA screening criteria or at ambient background levels.

2.2 Potential Exposure Routes

As there are no known or suspected chemicals of concern at the rural parks, this section is Not Applicable.

2.3 Air Monitoring and Action Levels

Air monitoring will not be conducted since there are no known or suspected chemicals of concern at the rural state parks.

2.4 Fire and Explosion Hazard

Fire danger is low due to recent rain.

2.5 Heat and Cold Stress

Wearing impermeable clothing reduces the cooling ability of the body due to evaporation reduction. This may lead to heat stress. Cold stress, or hypothermia, can result from abnormal cooling of the core body temperature.

Heat Stress

Signs of Heat Stress

Heat stress is a term that is used to describe progressively more serious symptoms, as follows:

- An initial rise in skin temperature due to increased blood flow to the skin (skin redness);
- Increase in heart rate, to more than 30 beats/minute above the resting level;
- Collapse, or heat exhaustion, due to inadequate blood flow to the brain;
- Dehydration, due to excessive sweating;
- Hyperventilation, resulting in a reduction of the normal blood carbon dioxide concentrations;

- Tingling around the lips, dizziness, cramping of muscles of hands and feet, and blackout; and finally
- Heat stroke, characterized by unconsciousness, hot dry skin, and absence of sweating.

Control of Heat Stress

On hot, sunny days (high radiant heat load), if using impermeable work clothing, maintain appropriate work-rest cycles (progressively longer rest breaks in a cool location or the shade as temperature and work tasks increase) and drink water or electrolyte-rich fluids (Gatorade or equivalent) to minimize heat stress effects. Impermeable clothing will only be worn when absolutely necessary for control of hazardous chemicals.

Also, when ambient temperatures exceed 70° F, employees will conduct monitoring of their heart (pulse) rates, as follows:

- Each employee will check his or her own pulse rate at the beginning of each break period;
- Take the pulse at the wrist for 6 seconds, and multiply by 10; and
- If the pulse rate exceeds 110 beats per minute, then reduce the length of the next work period by one-third.

Example: After a one-hour work period at 80 degrees, a worker has a pulse rate of 120 beats per minute. The worker must therefore shorten the next work period by one-third, resulting in a work period of 40 minutes until the next break.

Treatment of Heat Stress

Individuals affected by mild forms of heat stress (heat exhaustion, dehydration, or cramping) should take a break in a cool or shaded location, drink liquids, and sit or lay down until they feel better. Work periods should be shortened until the temperature cools off.

Individuals affected by heat stroke are in critical condition. Summon emergency aid immediately, remove clothing, and continually bathe the individual in cool water to bring down the core body temperature.

Hypothermia

Signs of Hypothermia

Hypothermia can result from abnormal cooling of the core body temperature. It is caused by exposure to a cold environment and wind-chill. Wetness or water immersion can play a significant role in causing hypothermia. The following discusses signs and symptoms as well as treatment for hypothermia.

Typical warning signs of hypothermia include fatigue, weakness, lack of coordination, apathy, and drowsiness. A confused state is a key symptom of hypothermia. Shivering and pallor are usually absent, and the face may appear puffy and pink. Body temperatures below 90° F require immediate treatment to restore temperature to normal.

Treatment of Hypothermia

Current medical practice recommends slow rewarming as treatment for hypothermia, followed by professional medical care. This can be accomplished by moving the person into a sheltered area and wrapping them with blankets in a warm room. In emergency situations where core body temperature falls below 90° F and heated shelter is not available, use a sleeping bag, blankets and/or body heat from another individual to help restore normal body temperature.

2.6 Other Physical Hazards

Staff is reminded to have work boots, a safety vest, and other appropriate safety equipment when working at a job site.

2.6.1 Stream Safety

Working in and around streams poses human health and safety risks which can be prevented through proper training, risk awareness, and detailed safety guidelines. These threats to human safety can be obvious, such as fast-moving water, inclement weather, or working in remote locations. Not so obvious safety hazards can include slippery surfaces, potential of glass or metal debris out of sight on the stream bed, presence of toxic substances, or pathogens. This section of the Health and Safety Plan is intended to provide a guideline for properly conducting stream work in any capacity but is by no means comprehensive. Additional resources on this subject can be obtained through the Environmental Protection Agency (EPA) Environmental Monitoring and Assessment Program (EMAP).

Considerations

Field investigations conducted near rivers, streams, and creeks should always be approached with caution. Human health and safety is the highest priority. Each individual should come to the project site with prior knowledge of obvious and potential threats to human health. Team members working in remote locations or for extended periods of time should be in good physical condition and participate in regular physical exams. It is a good idea for the project team to be aware of every member's health issues (allergies, medications, pre-existing conditions etc.,) and abilities (can they swim?). Also, team members should be familiar with field equipment, instruments, and sampling methods, as distractions caused by uncertainty can be a tremendous threat to human health and safety. Just as dangerous to human health is fatigue, poor environmental conditions, and malfunctioning equipment. Knowledge of potential weather conditions and having proper field clothing are important considerations when preparing for any field effort. See section 2.5 above for heat and cold stress hazards.

Equipment

2.6.2 Wildlife

General

Do not approach, attempt to touch, or assist any wild animal. Remember that all wild animals are more dangerous if their young are nearby. Do not hesitate to retreat from any situation that seems dangerous. You can always come back later to finish your work.

Bears

All bears are considered potentially dangerous. Sow bears with cubs are considered an **IMMINENT THREAT**; retreat to a safe distance immediately (see below for retreat methods). Black bears are common in the Cascades and will be very active in the lower elevations foraging for fish and berries.

Avoidance Tactics

Avoid bear contact by warning them of your presence. Surprising a bear is very dangerous. **BE NOISY!** Blowing a whistle, wearing bells, blowing an air horn, or talking and singing are all effective ways of giving warning.

Keep yourself clean (wash after meals or snacks) and clear your work area of food waste or open food containers. Avoid foods such as dried or smoked fish and other foods with a strong odor that could entice bears.

When working in black bear habitat, each team member will carry a whistle, a spray can of bear repellant, and any other PPE that may be warranted. Transportation of bear repellant is controlled by regulations controlling the shipment of hazardous materials. Bear repellant is prohibited on passenger aircraft. Fill out proper shipping documents prior to shipment or, if possible, obtain bear repellant upon arrival at your destination. Chemical bear repellents and bear sprays contain a derivative of cayenne pepper. When sprayed directly into an animal's face, these products cause eye and upper respiratory tract irritation. Although such sprays can be effective when used properly, wind and other conditions may alter their effect on the animal. Therefore, use them with caution and always follow the manufacturer's directions. Bear sprays do not guarantee your safety.

Surviving Bear Encounters

Never run from a bear! Back away slowly while maintaining eye contact.

Defensive Attack: If you are attacked by a bear, drop to the ground, curl into a fetal position, and interlock your fingers behind your neck to protect yourself. Do not fight or scream once you have been attacked; play dead. After the attack stops, do not move until you are sure that the bear has left the area. Bear attacks are rarely fatal if these guidelines are followed.

Offensive Attack: (From website for Parks Canada (http://www.pc.gc.ca/docs/v-g/oursnoir-blackbear/page4_E.asp) This is the most serious and potentially deadly attack a black bear might make. It occurs when a bear appears to stalk or follow you and then chooses to attack, or the bear attacks you at night. **In this situation, playing dead is not appropriate.** Try to escape to a secure place such as a vehicle or hard-sided camper.

Climbing a tree is an option, but remember that **black bears can climb trees easily**. If you cannot escape and if a bear continues its pursuit, react aggressively and try to intimidate the bear. If this fails, fight back with anything at hand such as bear spray, rocks, sticks, knives or other possible weapons to let the bear know that you are not easy prey. Act as a group if you are part of one. Don’t forget to yell; help may be close by.

Rabies

Foxes are the primary carriers of rabies. Avoid any fox that appears sick, aggressive, or unusually tame (i.e., fearlessly approaches humans). If you suffer any bite or scratch by a wild animal, no matter how minor the wound, seek medical treatment IMMEDIATELY.

Bee Stings

Bee stings can produce life-threatening allergic reactions. Symptoms include pain, swelling of the throat, redness or discoloration of the wound, itching, hives, decreased consciousness, and labored or noisy breathing. If you know you are allergic to bee stings, carry an anaphylactic shock kit, which can be obtained from your physician.

Ticks

Ticks are small blood-feeding parasites that can transmit diseases to people. Some types of ticks perch on the edge of low-lying vegetation and grab onto animals, and people, as they brush past. When working, camping, or walking in a tick habitat - wooded, brushy, or grassy places - a few simple precautions can reduce your chance of being bitten.

- Wear long pants and a long-sleeved shirt. Tuck your pant legs into socks or boots and shirt into pants. This can help keep ticks on the outside of your clothing where they can be more easily spotted and removed.

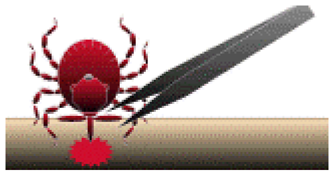
- Wear light colored, tightly woven clothing which will allow the dark tick to be seen more easily. The tight weave makes it harder for the tick to attach itself.

- Use tick repellent when necessary, and carefully follow instructions on the label. Products containing DEET or permethrin are very effective in repelling ticks.

- Check yourself thoroughly for ticks. Carefully inspect areas around the head, neck, ears, under arms, between legs, and back of knees. Look for what may appear like a new freckle or speck of dirt.

To remove a tick:

- Promptly remove the tick using fine-tipped tweezers. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Avoid removing the tick with bare hands. Don't twist or jerk the tick — this may cause the mouthparts to break off and remain in the skin. If this happens, remove the mouthparts with tweezers.



- After removing the tick, disinfect the bite site and wash your hands.

Note the date that you found the tick attached to you, just in case you become ill. If a fever, rash, or flu-like illness occurs within a month, let your health care provider know that you were bitten by a tick. This information may assist your health care provider in diagnosing your illness. For further information, see:

http://www.doh.wa.gov/ehp/ts/Zoo/watickdiseases.htm

Rattlesnakes

Rattlesnakes are the largest of the venomous snakes in the United States. They can accurately strike at up to one-third their body length. Rattlesnakes use their rattles or tails as a warning when they feel threatened. Rattlesnakes may be found sunning themselves near logs, boulders, or open areas. These snakes may be found in most work habitats including the mountains, prairies, deserts, and beaches. The Western Rattlesnake is the only snake in Washington with a rattle and facial pits.

Rattlesnakes occur east of the Cascade Mountains, and have been found in the Colville National Forest. Western Rattlesnakes primarily occur in shrub-steppe habitats but are also found in Oregon white oak, ponderosa pine and other open forest types. Talus and basalt rock outcroppings are used for overwintering.

Rattlesnakes are active during the day when temperatures are moderate but switch to nocturnal activity during the hottest months of the year. When not active, they shelter under shrubs and rocks.

In most of the Columbia Basin, rattlesnakes emerge from their overwintering sites (hibernacula or dens) in April. Activity is limited to the vicinity of the overwintering site for 2 to 3 weeks and then they disperse to their summer foraging areas. Reproduction takes place in the spring near the den site. Young start to appear in late August. Adults return to the overwintering sites starting in late September, although activity may continue until late October depending on location and temperatures.

Preventing Snake Bites

Workers should take the following steps to prevent a snake bite:

- Do not try to handle any snake.
- Stay away from tall grass and piles of leaves when possible.
- Avoid climbing on rocks or piles of wood where a snake may be hiding.
- Be aware that snakes tend to be active at night and in warm weather.
- Wear boots and long pants when working outdoors.
- Wear leather gloves when handling brush and debris.

First Aid

Workers should take the following steps if they are bitten by a snake:

- Seek medical attention as soon as possible (dial 911 or call local Emergency Medical Services.)
- Try to remember the color and shape of the snake, which can help with treatment of the snake bite.
- Keep still and calm. This can slow down the spread of venom.
- Inform your supervisor.
- Apply first aid if you cannot get to the hospital right away.
- Lay or sit down with the bite below the level of the heart.
- Wash the bite with soap and water.
- Cover the bite with a clean, dry dressing.

Do NOT do any of the following:

- Do not pick up the snake or try to trap it.
- Do not wait for symptoms to appear if bitten, seek immediate medical attention.
- Do not apply a tourniquet.
- Do not slash the wound with a knife.
- Do not suck out the venom.
- Do not apply ice or immerse the wound in water.
- Do not drink alcohol as a painkiller.
- Do not drink caffeinated beverages.

For further information, see:

http://www.cdc.gov/niosh/topics/snakes/

http://www1.dnr.wa.gov/nhp/refdesk/herp/html/4crvi.html

2.6.3 Poisonous Plants

Poison Oak and Poison Ivy

Poison oak is common in western Washington, and poison ivy is found in eastern Washington. See Attachment A for identification, prevention, and treatment.

2.6.4 Vehicle Safety

Seat belts will be worn at all times when driving and rules of the road will be obeyed while engaged in company business. Drivers must be legally licensed to drive.

2.6.5 Trips/Falls

As with all field work sites, caution will be exercised to prevent slips on rain-slick surfaces, snow-covered ground, stepping on sharp objects, etc. Work will not be performed on excessively steep slopes (>75%) or in the vicinity of vertical drop-offs without fall protection.

2.6.7 Hunting Season Safety

Some field work may occur on forest service land during hunting season. For protection of workers, high visibility clothing will be required during sampling and investigation events. Blaze/fluorescent orange clothing is preferred. Make yourself heard. You needn't be excessively loud, but keep up a steady conversation with a partner. If you're alone, whistle, sing, or talk to make yourself heard.

Hunting season dates for the Van Stone Mine site are provided in Attachment B.

2.6.8 Lightning and Forest Fire Safety

Lightning strikes and associated forest fires are a possible safety hazard during field work at this site. The following safety measures should be followed and implemented if thunderstorms are observed during field activities (derived from National Lightning Safety Institute website).

- ***PLAN*** *in advance your evacuation and safety measures.* When you first see lightning or hear thunder, activate your emergency plan. Now is the time to go to a building or a vehicle. Lightning often precedes rain, so don't wait for the rain to begin before suspending activities. A rule of thumb to determine the distance of a thunderstorm: Count the seconds between when you see the lightning and hear the thunder, and divide by five to get an estimate of the number of miles to the storm.

- ***IF OUTDOORS...****Avoid water. Avoid the high ground. Avoid open spaces.* Avoid all metal objects including electric wires, fences, machinery, motors, power tools, etc. Unsafe places include underneath canopies, small picnic or rain shelters, or near trees. Where possible, find shelter in a substantial building or in a fully enclosed metal vehicle such as a car, truck or a van with the windows completely shut. If lightning is striking nearby when you are outside, you should:

  - ***Crouch down***. Put feet together. Place hands over ears to minimize hearing damage from thunder.

  - ***Avoid proximity*** (minimum of 15 ft.) to other people.

- ***IF INDOORS...*** *Avoid water. Stay away from doors and windows. Do not use the telephone. Take off head sets.* Turn off, unplug, and stay away from appliances, computers, power tools, & TV sets. Lightning may strike exterior electric and phone lines, inducing shocks to inside equipment.

- ***SUSPEND ACTIVITIES*** for 30 minutes after the last observed lightning or thunder.

- ***INJURED PERSONS*** *do not carry an electrical charge and can be handled safely.* Apply First Aid procedures to a lightning victim if you are qualified to do so. Call 911 or send for help immediately.

If a forest fire occurs during sampling events, evacuate the area. The following is a list of forest fire survival tips:

- Fires generally travel faster in the direction of the wind. In addition, fires travel faster uphill than downhill so take these things into account.

- Try to find a natural fire break such as a river or a large empty clearing.

- Should you be forced to try to break through the fire, cover your face and mouth with a wet cloth (or dry if no water is available) and run as fast as possible through the flames. Should your clothes catch fire, extinguish them by rolling and padding.

- Once you are in safety, notify the proper authorities even if you think someone else might have called in already.

2.8 Hazard Analysis and Applicable Safety Procedures by Task

The work tasks and associated hazards that may be anticipated during the operations described elsewhere in this site-specific H&S Plan, and suitable control measures are presented in Table C-3.

Table C-2 - Hazard Analysis by Task

Work Task	Hazards	Protective Measures[a,b]
Hiking	Trips and falls, wildlife.	Buddy teams, work gloves, exposure protection, climbing helmets, bear spray.
Soil sample collection	Trips and falls, wildlife.	Level D PPE, Nitrile gloves, bear spray.

[a]Protection levels are defined in Table C-4.
[b]Protection levels may require upgrade based on site monitoring or other information.

3.0 PERSONAL PROTECTIVE EQUIPMENT

Table C-3 presents a summary of minimum personal protective equipment requirements based on the potential route of contact and the potential contaminants. These requirements are classified in the designated Level D category as discussed below. Situations requiring Level A, B, or C protection are not anticipated for this project. As noted previously, should they occur, work will stop and this Site-specific H&S Plan will be amended as required prior to resuming work.

Table C-3 - Minimum Personal Protection Level Requirements

Potential Route of Contact: Types of Contaminants	Required Protection Level	Required Equipment								
		Safety Glasses	Hard Hat	Safety Boots	Tyvek	Poly Tyvek	Nitrile Gloves	Neoprene Gloves	Respirator	
									Half-Face	Full-Face
None Anticipated	Level D(a)	b	c	X			X			

Notes:

a. Level D protection required when atmosphere contains no known hazard and work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.
b. Safety glasses are required if dusty or high wind conditions are encountered.
c. Hard hat is required where risk of striking overhead objects exists.

3.1 Level D Activities

Workers performing general site activities where skin contact with free product or contaminated materials is not likely and inhalation risks are not expected will wear regular work clothes with long pants, eye protection (as required), hard hat (as required), nitrile- or neoprene-coated work gloves (as required), and safety boots.

4.0 SAFETY EQUIPMENT LIST

The following Safety Equipment must be available on site:

- First Aid Kit;
- 10-lb ABC Fire Extinguisher;
- Eye and Ear Protection;
- Hand-held Radios;
- Cellular phone;
- Personal safety GPS device;
- Appropriate weather gear;
- DOT-approved helmet for ATV usage;
- Hard hats;
- Bear repellant and bear bells;
- High Visibility Safety Vest;
- Field Boots/Safety boots; and
- Nitrile or Leather Outer Gloves/Nitrile or Latex Inner Gloves

All safety gear and PPE must be cleaned following use and stored in a secure manner to avoid damage. Avoid storing gear in direct sunlight or exposed to weather conditions. Safety equipment and PPE should be checked periodically and damaged or worn out gear should be disposed of and replaced. First Aid kits should be checked on a monthly basis during active field programs to ensure that they are adequately stocked and maintained.

5.0 EXCLUSION AREAS

Field work being performed for this project consists of sampling activities in remote locations that will not result in migration of contaminants or increased exposure to human health or the environment. Establishment of exclusion, contaminant reduction, and support zones is not necessary for this field investigation.

6.0 MINIMIZING CONTAMINATION

Not applicable.

7.0 DECONTAMINATION

Decontamination is not necessary for personnel due to no known or suspected chemicals of concern at the rural state parks. Decontamination of sampling equipment is described in the Sampling and Analysis Plan (SAP).

8.0 DISPOSAL OF CONTAMINATED MATERIALS

Not applicable.

9.0 SITE SECURITY AND CONTROL

Site security and control will be the responsibility of the Project Manager. Any security or control problems will be reported to appropriate authorities.

10.0 SPILL CONTAINMENT

Sources of bulk chemicals subject to spillage are not expected to be encountered in this project. Accordingly, a spill containment plan is not required for this project.

11.0 EMERGENCY RESPONSE PLAN

The Hart Crowser Emergency Response Plan outlines the steps necessary for appropriate response to emergency situations. The following paragraphs summarize the key Emergency Response Plan procedures for this project.

11.1 Plan Content and Review

The principal hazards addressed by the Emergency Response Plan include the following: medical emergencies, wildlife, and hypothermia. However, to help anticipate potential emergency situations, field personnel shall always exercise caution and look for signs of potentially hazardous situations, including the following as examples:

- Visible or odorous chemical contaminants;
- Drums or other containers;
- General physical hazards (traffic, moving equipment, sharp or hot surfaces, slippery or uneven surfaces, etc.,);

- Live electrical wires or equipment;
- Underground pipelines or cables;
- Adverse weather conditions; and
- Poisonous plants or dangerous animals.

These and other potential problems should be anticipated and steps taken to prevent problems before they occur.

The Emergency Response Plan shall be reviewed and rehearsed, as necessary, during the on-site health and safety briefing. This ensures that all personnel will know what their duties are if an actual emergency occurs.

11.2 Plan Implementation

The Field H&S Manager will evaluate the situation and act as the lead individual in the event of an emergency. He or she will determine the need to implement the emergency procedures, in concert with other resource personnel including client representatives, the Project Manager, and the Corporate H&S Manager. Other on-site field personnel will assist the Field H&S Manager as required during an emergency.

In the event the Emergency Response Plan is implemented, the Field H&S Manager or designee is responsible for alerting all personnel at the affected area by use of a signal device (such as a hand-held air horn) or visual or shouted instructions, as appropriate.

Emergency evacuation routes and safe assembly areas shall be identified and discussed in the on-site health and safety briefing, as appropriate. The "buddy system" will be employed during evacuation to ensure safe escape, and the Field H&S Manager shall be responsible for roll call to account for all personnel.

11.3 Emergency Response Contacts

Site personnel must know whom to notify in the event of Emergency Response Plan implementation. The following information will be readily available at the site in a location known to all workers:

- Emergency Telephone Numbers: see list at the beginning of this plan;

- Route to Nearest Hospital: due to the various locations of the rural state parks, the response for an emergency is to call 911;

- Site Descriptions: see the description at the beginning of this plan; and

- If a significant environmental release of contaminants occurs, the federal, state, and local agencies noted in this plan must be immediately notified. If the release to the environment includes navigable waters also notify:

  - National Response Center at (800) 424-8802
  - EPA at (908) 321-6660

In the event of an emergency situation requiring implementation of the Emergency Response Plan (fire or explosion, serious injury, tank leak or other material spill, presence of chemicals above exposure guidelines, inadequate personal protection equipment for the hazards present, etc.), cease all work immediately. Offer whatever assistance is required, but do not enter work areas without proper protective equipment. Workers not needed for immediate assistance will decontaminate per normal procedures (if possible) and leave the work area, pending approval by the Field H&S Manager for restart of work. The following general emergency response safety procedures should be followed.

11.4 Fires

Hart Crowser, Inc., personnel will attempt to control only <u>very small</u> fires. If an explosion appears likely, evacuate the area immediately. If a fire occurs that cannot be controlled with a 10-pound ABC fire extinguisher, immediate intervention by the local fire department or other appropriate agency is imperative. Use these steps:

- Evacuate the area to a previously agreed upon, upwind location;

- Contact the fire agency identified in the site-specific plan; and

- Inform the Project Manager or Field H&S Manager of the situation.

11.5 Medical Emergencies

Contact the agency listed in the site-specific plan if a medical emergency occurs. If a worker leaves the site to seek medical attention, another worker should accompany the patient. When in doubt about the severity of an accident or exposure, always seek medical attention as a conservative approach. Notify the Project Manager of the outcome of the medical evaluation as soon as possible. For minor cuts and bruises, an on-site first aid kit will be available.

- If a worker is seriously injured or becomes ill or unconscious, immediately contact 911.

11.6 Other Emergencies

Depending on the type of project, other emergency scenarios may be important at a specific work site. These scenarios will be considered as part of the site-specific H&S Plan and will be discussed during the on-site safety briefing, as required.

11.7 Plan Documentation and Review

The Field H&S Manager will notify the Project H&S Manager as soon as possible after the emergency situation has been stabilized. The Project Manager or H&S Manager will notify the appropriate client contacts, and regulatory agencies, if applicable. If an individual is injured, the Field H&S Manager or designate will file a detailed Accident Report with the Corporate H&S Manager within 24 hours.

The Project Manager and the Field, Project, and Corporate H&S Managers will critique the emergency response action following the event. The results of the critique will be used in follow-up training exercises to improve the Emergency Response Plan.

12.0 MEDICAL SURVEILLANCE

A medical surveillance program has been instituted for Hart Crowser employees having exposure to hazardous substances. Exams are given before assignment, annually thereafter (biannually for Associates and above), and upon termination. Content of exams is determined by the Occupational Medicine physician in compliance with applicable regulations and is detailed in the General H&S Plan.

Each team member will undergo a physical examination, as noted above, to verify that he or she is physically able to use PPE, work in hot environments, and not be predisposed to occupationally induced disease. Additional exams may be needed to evaluate specific exposures or unexplainable illness, including excessive exposure to lead.

13.0 TRAINING REQUIREMENTS

Hart Crowser employees who perform site work must understand potential health and safety hazards. All employees potentially exposed to hazardous substances, health hazards, or safety hazards will have completed 40 hours of off-site initial hazardous materials health and safety training or will possess equivalent training by past experience. They will also have a minimum of three days of actual field experience under the direction of a trained supervisor. The Hart Crowser Human Resources Department will maintain employee health and safety training records. Employees will also complete annual refresher, supervisor, and other training as required by applicable regulations.

Prior to the start of each work day, the Field H&S Manager will review applicable health and safety issues with all employees and subcontractors working on the site, as appropriate. These briefings will also review the work to be accomplished, with an opportunity for questions to be asked.

14.0 REPORTING, REPORTS, AND DOCUMENTATION

In the event that accidents or injuries occur during site work, the Project Manager will be informed, and they will notify the client immediately. Hart Crowser personnel and subcontractors on this site will sign the Record of H&S Communication document (Table C-4), which will be kept on site during work activities and recorded in the project files.

Field Health & Safety Report

HARTCROWSER

Field Health & Safety Report

Job No.____________

Date____________

S M T W Th F S

Arrival Time:____________

Departure Time:____________

Job____________

Location____________

Client____________

Field Representative____________ Project Manager____________

Field H&S Manager____________ Project H&S Manager____________

Names of personnel on site____________

Site Activities____________

Potential Hazards____________

Hazard Control Used____________

Protective Measures Taken____________

Comments of Observations____________

Sketch position of equipment relative to exploration
Indicate monitoring point(s) and prevailing wind direction

Exploration No.____________

Air Monitoring Log

Meter Number 1, Type____________ Calibrated____________ Checked____________

Meter Number 2, Type____________ Calibrated____________ Checked____________

Background Reading: Meter 1____________ Meter 2____________

Time	Meter 1	Meter 2	Comments

Table C-4 - Record of Health and Safety Communication*

PROJECT NAME: Upper Columbia River Upland Soil Sampling Study	**PROJECT NUMBER:** 17800-36
SITE CONTAMINANTS: None	

PPE REQUIREMENTS (check all that apply):

	Safety glasses	x	**Gloves (specify)**	Work gloves, nitrile
	Safety boots	x	**Clothing (specify)**	Safety vest
	Hard hat		**Respirator (specify)**	
			Other (specify)	

The following personnel have reviewed a copy of the Site-specific Health and Safety Plan. By signing below, these personnel indicate that they have read the plan, including all referenced information, and that they understand the requirements which are detailed for this project.

PRINTED NAME	SIGNATURE	PROJECT DUTIES	DATE

***PROJECT MANAGER: PLEASE ROUTE A COPY OF THIS FORM TO THE JOB FILES WHEN COMPLETED.**

L:\Jobs\1780036\SAPP-QAPP-HASP\Final\UCR HASP.doc

ATTACHMENT A
POISON OAK AND POISON IVY FACT SHEET

PNW 108 • Revised May 1994

Poison Oak and Poison Ivy

Rhus diversiloba T. & G and Rhus radicans L.

L.C. Burrill, R.H. Callihan, and R. Parker

Poison oak is common in western Oregon and Washington. Its near relative, poison ivy, is found in eastern Oregon and Washington, throughout Idaho, and eastward. Both plants are native to the Pacific Northwest.

They are so similar in their appearance, growth, effects on humans, and responses to control efforts that their common names often are interchanged.

These plants are found in fencerows, waste areas, open forests, hill pastures, cut-over forest lands, stream banks, and rocky canyons in most Pacific Northwest counties. Each autumn, their brilliant red foliage attracts unsuspecting people who gather them for house decoration and then suffer poisoning, sometimes requiring hospitalization.

Poisonings are not limited to autumn, however. Swimmers, boaters, fishermen, hikers, and picnickers are most frequently exposed to and poisoned by these plants. These two plants substantially limit the use and enjoyment of our natural environment.

Figure 1.—Shiny, reddish, three-part leaves should be a warning sign in the early spring.

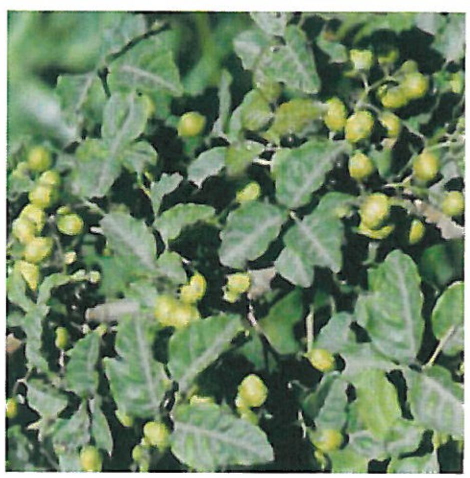


Figure 2.—Three-part leaves and a fruit that is often shining yellowish or white and ridged are typical of both poison oak and poison ivy.

Figure 3.—Poison ivy leaflets are smoother than poison oak, and ivy's two lateral leaflets have short stalks.

Larry C. Burrill, Extension weed specialist, Oregon State University; Robert H. Callihan, Extension weed specialist, University of Idaho; and Robert Parker, Extension seed scientist, Washington State University.

Value and Use

Poison oak and poison ivy are eaten by goats and sheep as well as deer and other wildlife. Animals do not appear to be sensitive to the poison. Bees make a popular honey from their pollen, the only part of the plant that does not contain the toxic substance. Birds feed on the fruits during the winter and are largely responsible for the number of plants, especially near trees and fences.

These values generally are not considered significant virtues, however, since many nonpoisonous and desirable plant species, both native and introduced, provide equal or better animal forage and erosion control. The colorful autumn foliage adds to the scenic beauty of the countryside, but is a deceptively sinister attraction.

Identification

Poison oak and poison ivy are in the Sumac (*Anacardiaceae*) family. The major taxonomic authority in this region, *Vascular Plants of the Pacific Northwest* (by Hitchcock, et al.), assigns the name *Rhus diversiloba* T. & G to poison oak and *Rhus radicans* L. to poison ivy. The names *Toxicodendron diversilobum* for poison oak and *T. radicans* L. or *T. rydbergii* for poison ivy also have been used.

Poison ivy and poison oak normally grow as shrubs from 3 to 10 feet tall, but they also grow as woody vines that twine around trees and larger shrubs. They reproduce both by seed and by lateral underground rootstocks. The vine develops rootlets on the stems, enabling the vines to adhere to tree trunks and other surfaces.

Poison ivy and poison oak are readily identified by their leaves. Young leaves are shiny red, turning to shiny green. Leaflets are from ½ to nearly 2 inches long. They grow in groups of three on a common stem and resemble oak or ivy leaves. Each of the three leaflets of poison ivy has a stalk, whereas only the terminal leaflets of poison oak have stalks. The tips of poison ivy leaflets are acutely pointed, while poison oak leaflets are more rounded. The leaf surface is glossy and may have a blistered appearance. Flowers are greenish-white, about ¼ inch across, and are borne in clusters on a slender stem. The fruits are white, berrylike, glossy and dry when ripe, with a striped stone inside the papery shell. Berries of poison ivy are about ⅙ inch in diameter, whereas those of poison oak are slightly larger.

Poisoning

Caution: If you know or suspect that you are susceptible and you intend to work near poison ivy or poison oak, avoid both direct and indirect contact with the plants. Wear rubber gloves and other protective clothing.

All parts of poison ivy and poison oak plants except the pollen contain an extremely poisonous oily substance, urushiol, during the entire year. This toxin causes painful irritation and blistering of the skin. Poison ivy and poison oak dermatitis is apparently an anaphylactic reaction; that is, it occurs only after sensitization by previous exposure. Human reactions vary from extreme susceptibility to near immunity. Many people are immune when young, but suddenly or gradually become sensitive with age, possibly due to sensitization through repeated exposure.

A few cases have resulted in death because the poison affected large areas of the body or was severe internally. Such cases are rare, but doctors should be consulted in moderate to extreme cases.

To cause poisoning, the oil usually must contact the skin, either directly by touching the plant, or indirectly by touching things that have touched the plant such as gloves or other clothing, tools, animals, water, or firewood. The toxin may move systemically within the body after penetrating the skin. Broken blisters will not spread the poison because their content is solely body fluid. The harmful oil infiltrates the inner skin almost immediately. The exact time depends upon the amount of oil the skin has come in contact with.

Symptoms can begin within a few hours after contact, or can arise 3 to 5 days later. Washing is important to remove excess poison which might be transmitted to other parts of the body or to another person.

People who are exposed to poison ivy or poison oak should thoroughly wash the exposed skin with soap and cold water, followed with rubbing alcohol or a solution of water and alcohol in equal proportions to dissolve the unabsorbed poison. This solution must be used liberally to remove the poison, because the solution only flushes away the poison—it does not inactivate it. Bathing only spreads the toxic liquid to contaminate other body parts because the oil is transported by water.

Contaminated clothing and bedding can carry the poisonous oil for years. If poisoning occurs even after laundering, dry cleaning may be necessary. Do not wash contaminated clothes with other clothes. Take care to rinse the washing machine thoroughly.

Smoke from burning poison ivy and poison oak has poisoned people who were otherwise immune. Inhalation of such smoke results in lung poisoning that can require hospitalization and intensive care. The oil is not volatile at bonfire temperatures. Any transmission from smoke is by droplets on particles of dust and ash in the smoke, rather than from vapors.

Control

Mechanical Control

Poison ivy and poison oak plants can be removed by grubbing or hand pulling in areas that contain valuable ornamentals. All precautions discussed above should be followed. Persons who are sensitive to poison ivy and poison oak probably should not attempt hand methods of control. Roots and rootstocks can be removed most easily when the soil is thoroughly wet. Grubbing or pulling when the soil is dry and hard is almost futile because roots break off in the ground, leaving large pieces that can sprout vigorously later.

Poison ivy and poison oak vines climbing on trees should be cut at the base, and as much of the vine as possible should be pulled away from the tree. Often, tree roots and poison ivy roots are so intertwined that grubbing is impossible without injuring the tree.

Remember that the roots and stems removed during grubbing are poisonous.

A poison ivy or poison oak seedling 2 months old usually has a root system that a single mowing will not kill. Seedling plants at the end of the first year have well established rootstocks that only grubbing or herbicides will kill. Seedlings will recur as long as seedbearing plants are in the general area.

Mowing with a scythe or sickle is not an efficient means of controlling poison ivy and poison oak. It has little effect on roots unless it is repeated frequently. Cutting plants and allowing the sap to be exposed can present considerable risk to those who might come into contact with it.

A single plowing is of little value in combating poison ivy and poison oak, but good seedbed preparation and planting cultivated crops for 1 or 2 years will control them.

Weed burners are not practical or efficient for controlling poison ivy and poison oak.

Biological Control

Though some animals graze poison ivy and poison oak and may limit abundance of those plants, grazing will not eliminate the weeds or stop their spread unless it continues intensively for several years. No parasitic insects or microorganisms have been found to suppress poison oak or poison ivy.

Caution: Poisonous oils may be transferred from animals grazing in or moving through poison ivy or poison oak to people who handle those animals.

Chemical Control

Several commonly used brush killers control poison ivy or poison oak. Foliage spraying should be done in the late spring or early summer (June in most areas) after poison ivy or poison oak are in full leaf. Regrowth and missed plants should be resprayed the same year. Herbicides may drift if sprayed during breezy conditions and must be applied carefully in areas where susceptible plants are growing.

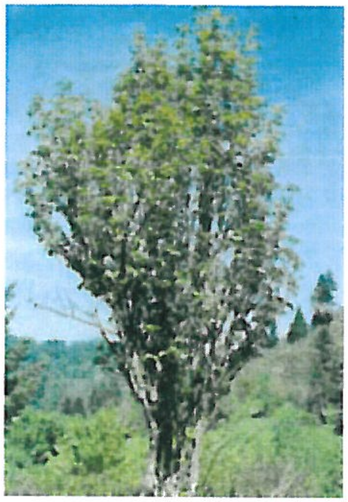
Selective herbicides can remove poison oak and poison ivy without destroying grass. Those herbicides can damage valuable plants such as ornamentals, however, so herbicides must be carefully applied. Some of these herbicides can be obtained in pre-mixed, ready-to-use forms in small consumer packages in garden and lawn stores.

Poison oak and poison ivy can be effectively controlled by treating the lower stems with herbicides registered for such a method in the winter when the plants are leafless and dormant.

Winter application is relatively safer than in other times of the year because there are fewer ornamental and other valuable plants nearby that may be injured by carelessness or accidental spraying. Also, leafless stems provide less exposure of the operator to the poisonous plants.

The purchase and use of some of these herbicides requires an applicator's license.

Soil-applied herbicides of some types are appropriate for control of poison oak and poison ivy in certain cases, but such herbicides are less selective and should not be used where susceptible plants are growing. If used at high rates, such herbicides may kill



Figures 4-6.—Poison oak and poison ivy can grow as shrubs, vines, or trees.

Figure 7.—In the winter, the leafless branches of poison oak or poison ivy still hold the harmful oils.

plants of all kinds on the site, leaving the soil bare for several years. Be sure that the long-range effects are desired on the site before using soil herbicides.

As with most perennial weeds, repeat applications over several years should be anticipated for complete control.

For suggested herbicides, refer to the *Pacific Northwest Weed Control Handbook*, an annually revised Extension publication available from the Extension Services of Oregon State University, Washington State University, and the University of Idaho.

Carefully read and follow label directions when using any herbicide.

Photographs provided by Larry Burrill, Extension weed specialist, Oregon State University.

Pacific Northwest Extension publications are jointly produced by the three Pacific Northwest states—Oregon, Washington, and Idaho. Similar crops, climate, and topography create a natural geographic unit that crosses state lines. Since 1949 the PNW program has published more than 450 titles. Joint writing, editing, and production have prevented duplication of effort, broadened the availability of faculty specialists, and substantially reduced the costs for participating states.

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ATTACHMENT B
HUNTING SEASON DATES

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ATTACHMENT B

Below are the hunting seasons in Stevens County near Van Stone Mine during the months of September, October, November, and December.

Sept 1 to March 15: Small game (modern firearm, archery)
Sept 1 to Sept 23: Deer season (archery)
Oct 15 to Oct 28: Deer season (modern firearm)
Sept 6 to Set 18: Elk (archery)
Oct 29 to Nov 6: Elk season (modern firearm)
Nov 23 to Dec 28: Elk season (muzzleloaders)

For more information on hunting, please contact the WDFW Wildlife Program.
Phone: 360-902-2515
wildthing@dfw.wa.gov

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APPENDIX C
FIELD COLLECTION LOGS
AND PHOTOGRAPHS

TABLES (HARD COPY AND DVD)

C-1 Soil Descriptions of Subsurface Profile Samples

FIELD COLLECTION LOGS (DVD)

PHOTOGRAPHS (DVD)

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APPENDIX C
FIELD COLLECTION LOGS AND PHOTOGRAPHS

Appendix C includes surface and subsurface soil sample collection forms and photographs taken at sampling location in a subarea.

Surface Soil Sample Collection Forms

Proposed sampling locations and location coordinates were identified by subarea (Subareas 1 through 13) in the Sampling and Analysis Plan. In the field, sampling teams used the sample coordinate information to locate each sampling point. The sampling point (or center point) was then used to establish subsample locations for collecting four-point composite samples. The subsample locations were measured off from the center point as follows:

- From the center point, 20 feet was measured off, usually in the upslope direction. The first subsample location was flagged and labeled A on the field forms.

- Starting again from the center point the traverse direction was rotated 90 degrees clockwise from location A. Twenty feet was measured off and this location was flagged and labeled B on the field forms.

- The procedure was repeated two more times to set locations C and D.

- In each subarea, one vertical profile sample was collected. At a sample location where a vertical profile sample was identified for collection, the center point was used.

Sample Location Photographs

At each sample location, photographs were taken to document land development (or lack of development) and general vegetation in the area at and adjacent to the sampling locations. Soil exposed during sample collection was photographed to provide soil colors, and general non-decayed organic material was removed before sampling.

The photographs are organized into folders labeled by subarea on an enclosed DVD. In each subarea folder, photographs are further organized into subfolders by sample location number. The photographic numbering scheme used in sample location folders is described as follows:

- Using Subarea 1 as an example, there is a folder labeled Subarea 1.

- Within the Subarea 1 folder, there are a series of sample location subfolders labeled by the Subarea and sample location number (i.e., SA1 – 1C).

- In each sample location folder, there is a series of photographs. Each photograph is labeled starting with the subarea number and sample location number, and an identifying letter (from A through J).

  - Letters A - D indicate photographs were shot from the center point of the sample location. The letter A indicates the photograph was shot pointing in the direction of subsample location A (see field form), B indicates shot pointing in the direction of subsample B location, etc.

  - Letters E - H indicate that the photographs show soil encountered during subsample collection. The numbering corresponds to subsample locations as follows:

    - E = subsample location A
    - F = subsample location B
    - G = subsample location C
    - H = subsample location D.

  - Where included, letter I and J photos were shot showing the general condition of a sampling area.

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Sample Point	Below Ground Surface	Description Narative
SA1-3P	0-3"	1" duff pine/leaves, damp to moist, dark brown, gravelly, sandy SILT, with abundant organics.
	3-6"	Damp to moist, red-brown, trace gravel, sandy silt to silty SAND, scattered organics.
	6-12"	Damp, red-brown, silty sand to sandy SILT, trace gravel, with scattered organics.
	12-24"	Damp, light brown, slightly gravelly sandy SILT.
	Notes	Roots throughout site.
SA2-2P	0-3"	Moist, brown, gravelly sandy SILT.
	3-6"	Moist, brown, gravelly silty SAND, trace organics.
	6-12"	Moist brown to light brown, gravelly, sandy SILT, few organics.
	12-24"	Moist, brown, gravelly sandy SILT; transitions to damp, red-brown, silty SAND at about 20".
	Notes	
SA3-4P	0-3"	Damp, brown, sandy SILT, trace organics.
	3-6"	Damp, brown, slightly gravelly, sandy SILT, abundant organics.
	6-12"	Damp, brown, slightly gravelly, very sandy SILT, scattered organics.
	12-24"	Damp, brown, slightly gravelly, very coarse sandy SILT.
	Notes	
SA4-1P	0-3"	Moist, dark brown, gravelly, sandy SILT, abundant organics.
	3-6"	Moist, dark brown, gravelly sandy SILT, abundant organics.
	6-12"	Moist, brown, slightly sandy, silty, GRAVEL, scattered organics.
	12-24"	Moist, brown, slightly sandy, silty, GRAVEL, scattered to abundant organics.
	Notes	Root penetration to 16" below ground surface.
SA5-5P	0-3"	Damp, dark brown, sandy SILT, trace gravel with scattered roots and organics.
	3-6"	Damp, dark brown, sandy SILT, trace gravel with scattered roots and organics, but less than 0-3" profile.
	6-12"	Damp, dark brown, slightly gravelly, sandy SILT with scattered organics.
	12-24"	Damp, dark brown, sandy SILT, trace gravel.
	Notes	Could not advance hand auger beyond 18" due to rocks.
SA6-4P	0-3"	Moss at surface. Damp, brown, SAND with scattered roots.
	3-6"	Damp, brown, SAND with scattered roots.
	6-12"	Dry to damp, tan, SAND.
	12-24"	Dry to damp, tan, SAND.
	Notes	
SA7-6P	0-3"	Damp, dark brown to brown, slightly sandy SILT, abundat organics.
	3-6"	Damp, brown, slightly sandy SILT with trace gravel and scattered organics.
	6-12"	Damp, brown, slightly sandy SILT with trace gravel and scattered organics.
	12-24"	Damp, light brown gravelly SILT.
	Notes	

SA8-2P	0-3"	Damp, brown, silty SAND, scattered organics.
	3-6"	Damp, brown, silty SAND, scattered organics.
	6-12"	Damp, light brown, slightly gravelly, silty SAND, trace organics.
	12-24"	Damp, light brown, slightly gravelly, silty SAND, trace organics.
	Notes	
SA9-7P	0-3"	Moist, dark brown, gravelly, sandy SILT, scattered organics.
	3-6"	Moist, red-brown, gravelly, sandy SILT, trace organics.
	6-12"	Moist, brown, gravelly, sandy SILT, trace organics.
	12-24"	NA
	Notes	Refusal at 13", tried several locations. Had to leave site due to light conditions. Returned to collect 12-24" sample on 11/8/2012 at 1602.
SA10-2P	0-3"	Leaves, pine needles at surface. Moist to damp, dark brown, silty GRAVEL with abundant organics (cobbles).
	3-6"	Damp to moist, dark brown, silty GRAVEL with scattered organics.
	6-12"	Damp to moist, dark brown, silty GRAVEL with scattered organics.
	12-24"	NA
	Notes	Could not advance past 12". Tried in 3 places. Gravel as bedrock obstruction. All samples are mostly gravel.
SA11-8P	0-3"	Moss and leaves at surface. 1/4" moist, black, SILT with abundant organics. Moist, brown, sandy SILT with abundant organics.
	3-6"	Moist, brown, gravelly, sandy SILT with abundant organics.
	6-12"	Moist, brown, gravelly, sandy SILT with abundant organics.
	12-24"	Moist, brown, slightly gravelly, sandy SILT, abundant orgtanics.
	Notes	
SA12-3P	0-3"	Damp to moist, dark brown, slightyl sandy organic SILT with abundant organics (roots, wood), more roots than soil ("root matt") in top 2"
	3-6"	3-4" same as above, becomes damp to moist, light brown, slightly sandy SILT with trace gravel and scattered roots.
	6-12"	Moist, light brown, slightly sandy SILT with trace gravel and scattered roots.
	12-24"	At 14-16" changes to a moist, light gray, slightly sandy, slightly gravelly, clayey SILT with scattered roots/organics to bottom.
	Notes	Grass and moss at the surface. Possible root encountered at 23"
SA13-6P	0-3"	Moist, brown, slightly sandy, silty, GRAVEL.
	3-6"	Moist, brown, sandy, silty COBBLES.
	6-12"	Damp, brown to red-brown, sandy, silty, COBBLES.
	12-24"	Damp, brown to red-brown, sandy, silty, COBBLES.
	Notes	Abundant organics down to 10" below ground surface. Refusal at 16"

APPENDIX D
CHEMICAL DATA QUALITY REVIEW AND LABORATORY REPORTS (DVD)

ANALYTICAL RESULTS SUMMARY TABLES (HARD COPY AND DVD)

DATA QUALITY REVIEW (DVD)

LABORATORY REPORTS (DVD)

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Table D1 - Subarea SA-01 Soil Analytical Results

Sample ID	SA1-1C	SA1-2C	SA1-3C	SA1-3C2	SA1-4C	SA1-5C	SA1-6C	SA1-7C
Sampling Date	10/30/2012	10/30/2012	10/30/2012	10/30/2012	10/30/2012	10/30/2012	10/30/2012	10/30/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3	0 to 3 Field Variability Sample[a]	0 to 3	0 to 3	0 to 3	0 to 3
Total Org. Carbon in %	9.54	5.51	5.85	3.93	2.97	8.47	4.75	4.96
Total Solids in %	87.6	94.5	95.7	96.6	94.5	93.2	93	94.9
pH	5.83	5.91	5.9	5.69	5.84	5.87	5.56	5.9
Metals in mg/kg								
Aluminum	21700	23600	23000	26600	26800	17900	20600	20800
Antimony	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ
Arsenic	10.7	13.8	9.8	12.2	9.4	16.9	21.2	12.6
Barium	665	1120	425	426	487	267	261	226
Beryllium	0.8	1.2	1	1	0.8	0.8	0.7	0.7
Cadmium	3.3	2.1	1	0.9	1	1.7	1.6	1.5
Calcium	10800	7500	5140	4980	3690	5000	3110	5720
Chromium	47.1	29.8	27.3	26.7	21.8	23.5	22.9	19.5
Cobalt	10.9	12.3	9.2	10	8.1	8.3	9	7.1
Copper	25	18.2	20.5	21.6	15	19.6	16.7	16
Iron	22700	40800	23700	24900	22100	21900	22500	20700
Lead	158	84.9	62.9	51.2	37.6	72.5	89.4	66.3
Magnesium	8750	6550	5780	6080	4340	5230	5030	4360
Manganese	2320	2340	1030	957	914	1150	1670	1120
Mercury	0.073	0.042	0.048	0.05	0.044	0.046	0.04	0.049
Nickel	33.6	20.9	25.4	26.5	23.4	19.9	24.7	19.8
Potassium	1570	1820	1370	1490	1500	1170	1090	1220
Selenium	0.6 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Sodium	150	130 U	160	170	200	100	160	200
Thallium	0.3	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Vanadium	35.7	42.5	34.6	33.8	32.3	32.7	28.3	27.8
Zinc	171	227	131	133	147	127	134	150

Table D1 - Subarea SA-01 Soil Analytical Results

Sample ID	SA1-8C		SA1-3P-1		SA1-3P-2		SA1-3P-3		SA1-3P-4	
Sampling Date	10/30/2012		10/30/2012		10/30/2012		10/30/2012		10/30/2012	
Sampling Depth in Inches	0 to 3		0 to 3		3 to 6		6 to 12		12 to 24	
Total Org. Carbon in %	7.92		3.93		2.52		2.41		1.5	
Total Solids in %	94.9		92.6		96.2		95.4		95.9	
pH	5.68		6.06		6.06		6.1		6.24	
Metals in mg/kg										
Aluminum	16500		29900		33500		34400		35400	
Antimony	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ
Arsenic	10.4		11.1		8.6		9.5		7.9	
Barium	399		404		376		326		288	
Beryllium	0.7		1.1		1.1		1.1		1.2	
Cadmium	2		1.2		0.3		0.4		0.3	
Calcium	5280		5870		3820		3530		3880	
Chromium	14.7		24.1		32.8		27.6		28.5	
Cobalt	6		9.3		9.5		9.9		9.3	
Copper	14.3		24.5		27.2		32.3		35.3	
Iron	17200		24600		27200		26800		27400	
Lead	81.7		75.6		25.1		20.8		18.4	
Magnesium	3670		6430		6680		6550		7050	
Manganese	1330		857		428		512		449	
Mercury	0.059		0.062		0.039		0.049		0.058	
Nickel	13.1		29.9		28		32.4		26.3	
Potassium	1170		1410		1400		1420		1440	
Selenium	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Silver	0.2	U	0.2		0.3		0.4		0.7	
Sodium	100		210		230		240		280	
Thallium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Vanadium	23		35.8		39.2		40		37.5	
Zinc	150		137		104		103		98	

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA1-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

Table D2 - Subarea SA-02 Soil Analytical Results

Sample ID	SA2-1C	SA2-2C	SA2-3C	SA2-4C	SA2-4C2	SA2-5C	SA2-6C	SA2-7C
Sampling Date	10/31/2012	10/31/2012	10/31/2012	10/31/2012	10/31/2012	10/31/2012	10/31/2012	10/31/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3 Field Variability Sample[a]	0 to 3	0 to 3	0 to 3
Total Org. Carbon in %	6.6	2.37	2.56	3.13 J	3.28	3.87	3.63	6.59
Total Solids in %	95.7	97.1	97.3	95.7	97.9	98.4	98	97.4
pH	5.65	5.73	6.11	5.22	5.27	5.65	5.85	5.8
Metals in mg/kg								
Aluminum	21600	18800	15900	16600	14700	11200	14800	21100
Antimony	0.3 J	0.2 UJ	0.2 UJ	0.2 UJ	0.4 J	0.2 UJ	0.2 J	0.2 UJ
Arsenic	16.2	12.2	8.2	13.9	16.8	7.4	22.7	17.7
Barium	744	344	321	264	308	90.4	203	209
Beryllium	0.7	0.6	0.5	0.5	0.5	0.4	0.5	0.9
Cadmium	5.2	2	1.9	2.4	4.9	1.4	13.1	3.2
Calcium	5730	4150	5010	3370	3390	7760	5940	5230
Chromium	16.4	31.7	15.3	17.3	15.9	20.6	48.6	28.7
Cobalt	6.4	8.5	5.3	6.9	6.4	6.8	9.4	17.6
Copper	20.4	17.5	12	11.9	15.8	19.5	30.4	34.3
Iron	20800	20900	18300	19900	18700	21100	23100	28700
Lead	248	86.5	107	122	229	69.5	405	105
Magnesium	4470	5000	3220	4270	4100	5620	6570	5720
Manganese	2510	1090	818	1240	1270	399	702	1120
Mercury	0.062	0.04	0.03	0.033	0.06	0.043	0.066	0.041
Nickel	14.2	20.7	14.3	13.5	12.9	15.3	26.3	41.2
Potassium	2050	1630	1570	1900	1620	1320	3380	2730
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2	0.2 U
Sodium	190	220	180	180	180	260	170	120 U
Thallium	0.3	0.2 U	0.2 U	0.2	0.3	0.2 U	0.5	0.2
Vanadium	22.6	33.8	17.5	30.1	25.3	34.6	27.7	28.6
Zinc	490	254	130	180	252	105	520	188

Table D2 - Subarea SA-02 Soil Analytical Results

Sample ID	SA2-8C	SA2-2P-1	SA2-2P-2	SA2-2P-3	SA2-2P-4
Sampling Date	10/31/2012	10/31/2012	10/31/2012	10/31/2012	10/31/2012
Sampling Depth in Inches	0 to 3	0 to 3	3 to 6	6 to 12	12 to 24
Total Org. Carbon in %	2.14	1.4	2.1	1.99	1.45
Total Solids in %	97.5	98.8	98.3	98.1	97.4
pH	6.26	5.6	5.34	5.48	5.94
Metals in mg/kg					
Aluminum	23600	13200	18900	20700	26300
Antimony	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ
Arsenic	16.2	9.7	9.6	9.7	10
Barium	392	216	361	264	315
Beryllium	0.8	0.4	0.5	0.7	1
Cadmium	2.1	1.59	0.8	0.8	0.8
Calcium	4590	3250	3650	3740	4520
Chromium	30.3	23.1	26.4	28.8	37.1
Cobalt	8.5	5.9	8.5	8.6	9.4
Copper	17.6	11.2	15.4	22.5	34.3
Iron	23700	18700	22600	23500	26800
Lead	59.5	44.1	28.4	31.3	26
Magnesium	5490	4920	5410	5990	5980
Manganese	1160	704	721	526	1450
Mercury	0.033	0.019	0.025	0.022	0.029
Nickel	31.7	13.7	18.4	23.7	30.5
Potassium	2090	1370	1730	1620	1990
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.2	0.2 U	0.2 U	0.2 U	0.5
Sodium	220	220	200	220	250
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Vanadium	25.7	26.5	30.9	36.7	34.2
Zinc	210	129	139	121	166

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA2-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

Table D3 - Subarea SA-03 Soil Analytical Results

Sample ID	SA3-1C	SA3-2C	SA3-3C	SA3-4C	SA3-5C	SA3-6C	SA3-6C2	SA3-7C
Sampling Date	11/1/2012	11/1/2012	11/1/2012	11/1/2012	11/1/2012	11/1/2012	11/1/2012	11/1/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3 Field Variability Sample[a]	0 to 3
Total Org. Carbon in %	1.76	1.98	2.42	2.42	2.17	6.97	15.7	9.03
Total Solids in %	97.3	97.5	97.5	97.8	98.4	94.5	94.9	95.7
pH	5.97	5.58	6.26	5.87	6.58	5.63	6.41	5.76
Metals in mg/kg								
Aluminum	21900	17200	20300	14800	11000	19700	22100	14700
Antimony	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.6 J
Arsenic	6.5	5.9	15.2	12.8	8.7	17.7	17.3	14.2
Barium	316	442	422	275	269	934	827	301
Beryllium	0.6	0.5	0.9	0.5	0.4	0.8	0.9	0.5
Cadmium	0.6	1.4	4	1.6	2.3	11.1	6.8	7.7
Calcium	4090	2800	6260	2930	2990	14900	15200	7960
Chromium	20.6	11.8	62	12.3	20.6	94	110	20.3
Cobalt	6.4	4.6	11	4.9	5.6	22	23	6.7
Copper	17.5	9.8	21.7	10.3	14.7	47	43.6	28.7
Iron	20400	14200	23300	14700	15100	36300	39100	18000
Lead	31	64.1	174	73.8	105	509	348	430
Magnesium	4260	2350	8830	2670	3420	11800	13800	4570
Manganese	862	1290	1420	983	622	2420	1850	1090
Mercury	0.022	0.031	0.036	0.027	0.025	0.148	0.126	0.106 J
Nickel	19.4	13	55.8	11.4	14	73.9	95.3	21.7
Potassium	1640	990	2800	1090	1120	4310	4730	1810
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.3	0.3	0.2
Sodium	210	220	150	170	110	130 U	130 U	170
Thallium	0.2 U	0.2 U	0.2	0.2 U	0.2 U	0.6	0.5	0.3
Vanadium	23.7	17.5	35	18.7	19.5	36	39	18.3
Zinc	83	143	272	128	144	660	470	390

Table D3 - Subarea SA-03 Soil Analytical Results

Sample ID	SA3-8C	SA3-4P-1	SA3-4P-2	SA3-4P-3	SA3-4P-4
Sampling Date	11/1/2012	11/1/2012	11/1/2012	11/1/2012	11/1/2012
Sampling Depth in Inches	0 to 3	0 to 3	3 to 6	6 to 12	12 to 24
Total Org. Carbon in %	4.02	2.36	1.69	0.989	0.51
Total Solids in %	97.7	98.2	98.3	98.5	99.2
pH	5.94	5.69	5.8	5.91	5.89
Metals in mg/kg					
Aluminum	14600	16000	16400	16400	12900
Antimony	0.2	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ
Arsenic	7.9 UJ	6.8	4.7	3.2	3.3
Barium	313	201	236	138	98
Beryllium	0.4	0.5	0.5	0.5	0.4
Cadmium	3.6	0.65	0.5	0.3	0.2
Calcium	4970	2480	2290	2200	1800
Chromium	14.6	15	13.5	14.3	14.3
Cobalt	5	5	4.7	5	4.7
Copper	13.8	10	9.8	11.8	10.4
Iron	16600	15300	15700	16900	14300
Lead	199	49.3	22	9	8.2
Magnesium	3820	2800	2610	2760	2670
Manganese	902	799	875	299	262
Mercury	0.051	0.021	0.017	0.017	0.012
Nickel	11.9	12.3	12.2	12.3	11.9
Potassium	1450	880	910	850	760
Selenium	0.5	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Sodium	180 U	150	140	150	120
Thallium	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Vanadium	17.5	21.5	19.9	21.4	21.9
Zinc	233	80	61	44	35

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA3-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

Table D4 - Subarea SA-04 Soil Analytical Results

Sample ID	SA4-1C	SA4-2C	SA4-3C	SA4-4C	SA4-5C	SA4-6C	SA4-6C2	SA4-7C
Sampling Date	11/1/2012	11/1/2012	11/1/2012	11/1/2012	11/1/2012	11/2/2012	11/2/2012	11/1/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3 Field Variability Sample[a]	0 to 3
Total Org. Carbon in %	6.59	8.72	9.55	11.4	5.7	12.2	10.2	4.9
Total Solids in %	98.1	96.9	98.1	96.7	98.2	96.6	97.7	96.8
pH	6	6.59	4.69	5.4	6	5.77	5.8	5.9
Metals in mg/kg								
Aluminum	16600	14700	15000	14300	17300	12900	14700	18700
Antimony	0.2 J	0.2 UJ	0.3 J	0.2 J	0.2 UJ	0.3 J	0.2 J	0.2 UJ
Arsenic	14.3	9.1	20.2	11.8	11.9	16.1	17.8	15
Barium	290	168	135	215	175	207	202	383
Beryllium	0.5	0.5	0.5	0.5	0.7	0.5	0.6	0.6
Cadmium	5.44	3.4	9	5.6	2.7	9.2	7.6	5.5
Calcium	5650	7470	4420	7740	4980	6410	5690	7070
Chromium	27.5	21.9	28.9	28	20.7	24.5	30.5	53.8
Cobalt	9.6	7.6	9.7	8.3	9.3	8.4	8.9	9.3
Copper	25.3	22.1	36	27.1	23.5	25.2	23.7	25.9
Iron	22700	21800	23900	19800	21500	19600	22000	22900
Lead	213	135	398	224	109	512	386	299
Magnesium	5120	5440	7580	4830	4370	4830	5660	7900
Manganese	870	574	654	831	842	1040	801	1190
Mercury	0.057	0.049	0.08	0.073	0.039	0.139	0.102	0.075
Nickel	21.2	15.3	17	19.3	21.7	21.3	24.3	35.5
Potassium	2790	3520	2830	2870	2760	2010	2450	1930
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.2	0.2 U	0.2	0.2 U	0.2 U	0.4	0.3	0.3
Sodium	130	160	150	130 U	130 U	140	160	150
Thallium	0.3	0.2	0.4	0.3	0.2	0.4	0.4	0.3
Vanadium	28.6	32.9	43.1	28.6	26.4	23	25.4	29.4
Zinc	281	186	370	320	192	430	380	270

Table D4 - Subarea SA-04 Soil Analytical Results

Sample ID	SA4-8C		SA4-1P-1		SA4-1P-2		SA4-1P-3		SA4-1P-4	
Sampling Date	11/1/2012		11/2/2012		11/2/2012		11/2/2012		11/2/2012	
Sampling Depth in Inches	0 to 3		0 to 3		3 to 6		6 to 12		12 to 24	
Total Org. Carbon in %	5.14		7.71		5.97		0.732		0.458	
Total Solids in %	97.2		97.9		98.3		99.1		99.3	
pH	5.63		5.98		5.79		5.92		6.06	
Metals in mg/kg										
Aluminum	13800		15600		17000		20600		17000	
Antimony	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ
Arsenic	12.5		18.2		11.2		5.5		4.5	
Barium	182		301		302		193		182	
Beryllium	0.5		0.6		0.6		0.7		0.5	
Cadmium	3.6		6.6		2.2		0.2		0.2	
Calcium	4840		5490		4740		3150		3500	
Chromium	13.5		28.3		27.3		26.4		24.4	
Cobalt	6		10.7		10.5		9		7.7	
Copper	17.6		28.7		25.7		22.5		15.3	
Iron	15400		25700		26600		25600		23600	
Lead	133		268		103		13.8		9.3	
Magnesium	3280		5670		5650		5690		5520	
Manganese	612		1010		958		569		433	
Mercury	0.051		0.068		0.035		0.012		0.009	
Nickel	14.5		23.9		23.5		21.8		17.2	
Potassium	1350		2930		2850		2380		2280	
Selenium	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Silver	0.2	U	0.2		0.2	U	0.2	U	0.2	U
Sodium	160		120	U	130		150		160	
Thallium	0.2	U	0.3		0.2	U	0.2	U	0.2	U
Vanadium	18.4		29.7		27.8		31.6		27.8	
Zinc	186		320		146		56		38	

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability. Sample identified as SA4-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

Table D5 - Subarea SA-05 Soil Analytical Results

Sample ID	SA5-1C	SA5-2C	SA5-3C	SA5-4C	SA5-5C	SA5-5C2	SA5-7C	SA5-5P-1
Sampling Date	11/9/2012	11/9/2012	11/3/2012	11/2/2012	11/9/2012	11/2/2012	11/2/2012	11/9/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3 Field Variability Sample[a]	0 to 3	0 to 3
Total Org. Carbon in %	6.81	5.96	3.59	4.69	6.01	5.46	5.54	7.34
Total Solids in %	84.1	94.5	96.4	96.4	94.9	97.2	97.6	95.2
pH	6.47	6.15	6.79	6.12	6.17	6.16	6.19	6.16
Metals in mg/kg								
Aluminum	14300	31600	15500	12000	14500	11800	10700	14700
Antimony	0.5 J	0.2 UJ	0.3 J	0.5 J	0.2 UJ	0.3 J	0.3 J	0.2 UJ
Arsenic	11	12.1	17	8.7	8.4	10.4	10.1	11
Barium	197	773	293	227	160	199	130	159
Beryllium	0.6	0.8	0.6	0.4	0.4	0.4	0.3	0.4
Cadmium	5.6	3.7	8.6	7.5	2.9	6.6	9.5	5.1
Calcium	10300	7540	15300	6910	7000	5960	7260	7770
Chromium	16.5	182	22.2	14	21.1	19.3	15.5	19.6
Cobalt	5	20	7.6	5.2	6.6	5.6	4.8	6.5
Copper	35.2	22.8	30.9	20.4	22.4	19.7	21.7	25.9
Iron	15100	41500	18400	13900	16400	14100	13900	16200
Lead	337	139	301	344	118	250	389	224
Magnesium	3330	24500	4680	3670	4840	3640	3690	5010
Manganese	851	963	1090	539	435	492	427	479
Mercury	0.09	0.05	0.088	0.079	0.043	0.054	0.114	0.056
Nickel	10.8	44.9	23.5	10.8	16.6	12.4	10.9	15.8
Potassium	1120	10400	1690	2360	2600	2560	2060	2410
Selenium	0.6 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.3	0.2 U	0.3	0.3	0.2	0.2	0.4	0.2
Sodium	230	210	190	180	230	140	270	270
Thallium	0.2	0.5	0.4	0.3	0.2	0.3	0.4	0.2
Vanadium	20.5	73	22.9	20.5	26.5	22.1	21.3	26.5
Zinc	320	233	510	360	161	300	460	200

Table D5 - Subarea SA-05 Soil Analytical Results

Sample ID	SA5-5P-2	SA5-5P-3	SA5-5P-4
Sampling Date	11/9/2012	11/9/2012	11/9/2012
Sampling Depth in Inches	3 to 6	6 to 12	12 to 18
Total Org. Carbon in %	7.22	5.17	4.71
Total Solids in %	94.6	96.1	98.2
pH	6.15	6.06	6.13
Metals in mg/kg			
Aluminum	14000	15500	15700
Antimony	0.2 UJ	0.2 UJ	0.2 UJ
Arsenic	9.7	6.7	3.8
Barium	144	141	127
Beryllium	0.4	0.4	0.5
Cadmium	3.6	1.2	0.7
Calcium	6890	6870	6150
Chromium	19.1	19.5	21
Cobalt	6.1	6.4	6.8
Copper	24.2	23	23.8
Iron	16200	17000	17700
Lead	170	47.7	24.9
Magnesium	4690	5170	5220
Manganese	450	455	389
Mercury	0.051	0.022	0.018
Nickel	15.5	16.3	18.7
Potassium	2070	2030	1940
Selenium	0.5 U	0.5 U	0.5 U
Silver	0.2 U	0.2 U	0.2 U
Sodium	260	320	290
Thallium	0.2	0.2 U	0.2 U
Vanadium	25	26.7	28.3
Zinc	165	83	65

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA5-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

Table D6 - Subarea SA-06 Soil Analytical Results

Sample ID	SA6-1C	SA6-2C	SA6-2C2	SA6-3C	SA6-4C	SA6-5C	SA6-6C	SA6-7C
Sampling Date	11/2/2012	11/2/2012	11/2/2012	11/2/2012	11/3/2012	11/3/2012	11/3/2012	11/2/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3 Field Variability Sample[a]	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3
Total Org. Carbon in %	6.74	3.92	4.24	8.08	4.84	2.56	11.2	7.92
Total Solids in %	97.5	97.6	97.5	97.4	99.6	99.7	98.8	97.7
pH	5.91	6.09	5.78	5.46	5.53	6.02	5.18	5.3
Metals in mg/kg								
Aluminum	9020	16400	15600	16200	6060	4590	5190	17100
Antimony	0.3 J	0.3 J	0.4 J	0.2 J	0.2 UJ	0.3 J	1.5 J	0.5 J
Arsenic	15.5	14.8	15.6	25.6	5.7	6.9	9.5	36.3
Barium	352	319	315	340	44.1	34.8	138	295
Beryllium	0.4	0.6	0.5	0.6	0.2	0.2	0.2	0.6
Cadmium	8.6	8.9	7.17	10.6	1.5	1.1	8.4	9.8
Calcium	5920	4790	4070	4800	1590	1310	3010	4950
Chromium	20	20.6	17.3	40.3	8.9	8.3	7.6	27.8
Cobalt	8.3	8.9	8	11.7	2.5	2.2	2.6	9.3
Copper	18.1	28.3	26	33.9	7.5	6.4	20.1	33.1
Iron	16600	21000	19800	25300	8830	8170	7980	27200
Lead	402	401	359	523	84.5	60.3	619	616
Magnesium	3570	4010	3950	6200	1980	1800	2050	6070
Manganese	2020	942	1140	1280	162	182	692	1380
Mercury	0.096	0.08	0.082	0.093	0.026	0.015	0.108	0.103
Nickel	16.6	22.2	20.3	27.3	7.1	6.9	6.6	30.3
Potassium	1490	1830	1800	2280	600	790	740	2480
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.3	0.3	0.3	0.4	0.2 U	0.2 U	0.3	0.3
Sodium	160	180	190	140	120 U	120 U	120 U	160
Thallium	0.3	0.4	0.3	0.4	0.2 U	0.2 U	0.4	0.4
Vanadium	22.2	23.3	20.3	28.5	12.4	11.6	10.6	22.7
Zinc	460	420	440	470	87	70	370	540

Table D6 - Subarea SA-06 Soil Analytical Results

Sample ID	SA6-8C	SA6-4P-1	SA6-4P-2	SA6-4P-3	SA6-4P-4
Sampling Date	11/3/2012	11/3/2012	11/3/2012	11/3/2012	11/3/2012
Sampling Depth in Inches	0 to 3	0 to 3	3 to 6	6 to 12	12 to 24
Total Org. Carbon in %	9.66	4.53	3.49	0.814	0.358
Total Solids in %	99	99.6	99.5	99.2	99.8
pH	6.17	5.11	5.1	6.07	5.98
Metals in mg/kg					
Aluminum	8500	6450	6240	6710	6300
Antimony	0.5 J	0.4 J	0.7 J	0.2 UJ	0.2 UJ
Arsenic	12.9	9	13.9	1.3	1.3
Barium	119	48	44	69.6	57.7
Beryllium	0.3	0.2	0.3	0.3	0.2
Cadmium	2.5	2.3	2.7	0.2	0.13
Calcium	1730	1270	1370	1440	1550
Chromium	9.2	7.4	7.8	7.8	7.5
Cobalt	2.9	2.3	2.2	2.3	2.2
Copper	11.5	8.2	10.7	6.5	5.8
Iron	9680	8380	8420	8140	8020
Lead	122	108	223	5.2	4.95
Magnesium	2090	1870	1840	1940	1840
Manganese	461	190	179	121	114
Mercury	0.029	0.023	0.028	0.007 U	0.007 U
Nickel	9	7.2	7.1	7.5	7.3
Potassium	730	580	580	510	580
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Sodium	120 U	120 U	120 U	120 U	120 U
Thallium	0.2 U	0.2 U	0.2	0.2 U	0.2 U
Vanadium	12.7	10.1	11.5	11.7	11.2
Zinc	128	107	108	40	24

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA6-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

Table D7 - Subarea SA-07 Soil Analytical Results

Sample ID	SA7-1C	SA7-2C	SA7-3C	SA7-4C	SA7-5C	SA7-5C2	SA7-6C	SA7-7C
Sampling Date	11/3/2012	11/3/2012	11/3/2012	11/3/2012	11/3/2012	11/3/2012	11/3/2012	11/9/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3
						Field Variability Sample[a]		
Total Org. Carbon in %	6.63	2.87	8.81	9.91	8.07	6.12	4.26	5.19
Total Solids in %	97.9	98.7	98.6	99.4	96.7	97.1	98.3	96
pH	5.65	6.15	5.48	5.23	5.12	5.43	5.89	5.46
Metals in mg/kg								
Aluminum	12400	8140	10500	4600	17500	20200	11000	13000
Antimony	0.8 J	0.4 J	1.7 J	1.5 J	3.3 J	0.7 J	0.6 J	1.1 J
Arsenic	16.6	8.8	29.5	10	35.5	24.9	15.6	24.1
Barium	292	99.4	120	55	159	167	167	274
Beryllium	0.4	0.3	0.4	0.2	0.5	0.6	0.4	0.4
Cadmium	5.6	5.8	6.8	4.77	9	8.1	11.1	17.2
Calcium	3310	5160	1960	1630	3330	3360	4060	7110
Chromium	16.1	18.1	10.3	7	11.3	15.1	12.5	18.5
Cobalt	5.5	5.6	3.4	2.1	4.3	5.8	4.6	6.4
Copper	18.8	18.7	30.1	12.7	43.5	31.7	22	37.4
Iron	15600	15700	11200	7620	15800	16300	14100	18000
Lead	309	314	637	268	906	356	496	1280
Magnesium	3700	4440	2550	1760	3300	3200	3340	4480
Manganese	1050	362	364	254	395	559	542	933
Mercury	0.064	0.075	0.091	0.055	0.192	0.099	0.113	0.278
Nickel	15.6	14.3	9.8	5.9	11.2	14.5	11.5	16.4
Potassium	1370	2370	860	490	1040	1160	1400	2430
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.6
Silver	0.2	0.3	0.5	0.2	0.9	0.5	0.4	1
Sodium	130	160	140	120 U	180	200	120 U	160
Thallium	0.3	0.4	0.5	0.2	0.6	0.4	0.5	0.8
Vanadium	18.7	23	17.5	9	19.1	23.6	16.7	22.4
Zinc	340	400	285	188 J	490	480	650	1130

Table D7 - Subarea SA-07 Soil Analytical Results

Sample ID	SA7-8C	SA7-6P-1	SA7-6P-2	SA7-6P-3	SA7-6P-4
Sampling Date	11/9/2012	11/3/2012	11/3/2012	11/3/2012	11/3/2012
Sampling Depth in Inches	0 to 3	0 to 3	3 to 6	6 to 12	12 to 24
Total Org. Carbon in %	1.21	7.7	1.03	0.642	0.29
Total Solids in %	97.4	98	98.9	99.4	99.5
pH	5.97	5.64	5.69	5.82	5.69
Metals in mg/kg					
Aluminum	28400	9230	11000	11700	11400
Antimony	0.3 J	1.1 J	0.4 J	0.2 UJ	0.2 UJ
Arsenic	38.7	11.4	15.5	5	2.3
Barium	514	146	146	104	80.6
Beryllium	0.7	0.3	0.3	0.4	0.4
Cadmium	13.9	8.9	3.1	0.9	0.2
Calcium	6730	3880	2420	2130	2110
Chromium	159	12.6	12.7	14.1	13.8
Cobalt	22	4.4	4.2	4.5	4.5
Copper	62	25.4	12.9	10.4	11.3
Iron	41200	12400	13700	14800	14100
Lead	934	587	127	27	6.3
Magnesium	23400	2930	3100	3380	3310
Manganese	1040	445	451	323	236
Mercury	0.17	0.13	0.026	0.012	0.009
Nickel	83.8	11.3	11.4	12.5	12.8
Potassium	13900	1240	1360	1390	1340
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.9	0.6	0.2 U	0.2 U	0.2 U
Sodium	320	120 U	130	120	130
Thallium	0.9	0.5	0.2	0.2 U	0.2 U
Vanadium	75	17	17.1	17.9	19.8
Zinc	770	570	220	115	47

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA7-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

Table D8- Subarea SA-08 Soil Analytical Results

Sample ID	SA8-1C	SA8-2C	SA8-3C	SA8-3C2	SA8-4C	SA8-5C	SA8-6C	SA8-7C
Sampling Date	11/4/2012	11/4/2012	11/3/2012	11/3/2012	11/4/2012	11/4/2012	11/4/2012	11/4/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3	0 to 3 Field Variability Sample[a]	0 to 3	0 to 3	0 to 3	0 to 3
Total Org. Carbon in %	3.85	10.7	1.85	1.27	7.52	18.3	1.82	8.3
Total Solids in %	98	98	99.5	99.4	97.7	96.7	98.7	96.3
pH	5.66	5.32	5.7	5.59	5.62	5.43	5.66	5.56
Metals in mg/kg								
Aluminum	10400	9990	8730	9120	8590	7360	13000	16000
Antimony	0.6 J	0.9 J	0.2 UJ	0.2 UJ	0.4 J	1.2 J	0.2 J	0.7 J
Arsenic	20.2	28.6	7.6	11.9	11.7	17	17.3	37.6
Barium	192	159	75.7	82.9	161	119	191	268
Beryllium	0.4	0.3	0.2	0.3	0.3	0.3	0.4	0.5
Cadmium	10.8	8.6	1.5	3	6.5	9.3	6.8	18.4
Calcium	4010	2280	3250	2820	3540	3810	3070	4830
Chromium	12.2	9.1	17.1	16.9	10.6	11.7	14.5	15.8
Cobalt	4.3	3.6	6.3	6.4	3.5	3.9	5.1	8.3
Copper	20.8	24.7	16.6	17.8	15	29.1	18.6	41
Iron	13100	10600	16700	17000	11200	10700	15400	17600
Lead	381	363	62.5	129	449	737	308	1070
Magnesium	2800	2180	4250	4170	2470	2900	3210	4150
Manganese	713	557	304	376	601	619	856	796
Mercury	0.085	0.072	0.019	0.033	0.098	0.157	0.055	0.169
Nickel	11.5	8.9	14.4	14.7	9.6	10.1	14.1	17.6
Potassium	1110	610	1330	1390	740	790	1670	1480
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.3	0.4	0.2 U	0.2 U	0.2 U	0.6	0.3	0.6
Sodium	130 U	130 U	140	120	130 U	120 U	130	170
Thallium	0.4	0.3	0.2 U	0.2	0.3	0.5	0.3	0.9
Vanadium	15.6	15.6	30.8	29.7	15.7	18.7	19.2	25
Zinc	560	330	112	149	297	410	370	860

Table D8- Subarea SA-08 Soil Analytical Results

Sample ID	SA8-8C		SA8-2P-1		SA8-2P-2		SA8-2P-3		SA8-2P-4	
Sampling Date	11/4/2012		11/4/2012		11/4/2012		11/4/2012		11/4/2012	
Sampling Depth in Inches	0 to 3		0 to 3		3 to 6		6 to 12		12 to 24	
Total Org. Carbon in %	3.79		17.7		6.41		2.4		0.793	
Total Solids in %	93.3		97		98.7		98.9		99.2	
pH	5.76		4.89		5.5		5.66		5.65	
Metals in mg/kg										
Aluminum	15000		7580		10400		11500		10000	
Antimony	2.6	J	5.1	J	0.2	UJ	0.2	UJ	0.2	UJ
Arsenic	45.1		20.1		5.9		2		1.6	
Barium	427		114		92.1		78.4		75.7	
Beryllium	0.4		0.3		0.3		0.4		0.3	
Cadmium	18.5		10.6		1.09		0.2		0.1	
Calcium	7020		3220		1910		1810		1790	
Chromium	11.9		7.6		8.8		8.4		9.9	
Cobalt	4.9		2.8		3.1		3.1		3.2	
Copper	49.4		22.7		9.6		10		9.2	
Iron	11400		9130		11100		10400		10900	
Lead	1440		668		16.6		7.9		6.1	
Magnesium	2600		1960		2410		2190		2310	
Manganese	918		406		355		176		157	
Mercury	0.287		0.195		0.019		0.011		0.007	U
Nickel	11.3		7.7		9.2		9.1		8.2	
Potassium	1410		490		510		530		560	
Selenium	0.7		0.5	U	0.5	U	0.5	U	0.5	U
Silver	1.2		0.6		0.2	U	0.2	U	0.2	U
Sodium	270		130	U	120	U	120		130	
Thallium	1		0.4		0.2	U	0.2	U	0.2	U
Vanadium	12.9		12.7		16.5		15.7		17.5	
Zinc	1210		430		128		42		34	

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA8-Field Duplicate in field notes and laboratory reports.

U = Not detected at the reporting limit indicated.

J = Estimated value.

Table D9 - Subarea SA-09 Soil Analytical Results

Sample ID	SA9-1C	SA9-2C	SA9-3C	SA9-4C	SA9-5C	SA9-6C	SA9-7C	SA9-8C
Sampling Date	11/8/2012	11/9/2012	11/8/2012	11/8/2012	11/7/2012	11/7/2012	11/7/2012	11/8/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3
Total Org. Carbon in %	4.06	3.8	4.78	3.32	5.34	8.4	2.79	12.4
Total Solids in %	95	98	97.4	93	93.8	95.6	96.4	93.7
pH	6.19	6.1	5.96	6.13	6.1	6.44	5.78	5.97
Metals in mg/kg								
Aluminum	20800	28700	29400	15600	18400	15300	18200	21200
Antimony	0.4 J	0.2 UJ	0.2 UJ	0.5 J	1.1 J	0.5 J	0.5 J	0.7 J
Arsenic	28.6	10.3	13.7	17.9	28.1	14.1	36	26.3
Barium	721	2590	597	120	445	368	354	535
Beryllium	0.6	1.5	0.8	0.5	0.6	0.6	0.6	0.6
Cadmium	24.2	4.9	4.26	6.5	12.8	13.9	13.6	16
Calcium	7380	13200	5180	10300	8760	11900	4810	13200
Chromium	43.9	470	89	19.4	18.1	24.9	24.2	33.5
Cobalt	10	24.2	14.4	6.2	7.8	8.6	8.6	11.4
Copper	32.4	50.1	38	25.8	30.5	28.3	30.9	38.4
Iron	25300	40400	33700	14200	17200	19700	22900	28300
Lead	1040	230	165	503	534	651	539	691
Magnesium	8560	34900	15200	2850	3960	5670	5400	8250
Manganese	1730	840	1260	334	1730	1150	1260	2030
Mercury	0.136	0.054	0.054	0.157	0.191	0.184	0.115	0.262
Nickel	20.9	178	37.4	20.7	25.9	27.4	25.9	33.5
Potassium	2390	17200	5570	1150	1510	2020	1800	1860
Selenium	0.5 U	0.5 U	0.5 U	1	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.5	0.5	0.3	0.6	0.6	0.5	0.4	0.5
Sodium	160	310	150	340	200	290	210	150
Thallium	0.8	0.8	0.5	0.4	0.5	0.6	0.6	0.9
Vanadium	36.5	73.5	61.9	18.9	17.3	25.3	28.7	20.9
Zinc	780	360	280	490	720	550	580	850

Table D9 - Subarea SA-09 Soil Analytical Results

Sample ID	SA9-9C	SA9-10C	SA9-10C2	SA9-7P-1	SA9-7P-2	SA9-7P-3	SA9-7P-4
Sampling Date	11/7/2012	11/9/2012	11/9/2012	11/7/2012	11/7/2012	11/7/2012	11/9/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3 Field Variability Sample[a]	0 to 3	3 to 6	6 to 12	12 to 24
Total Org. Carbon in %	3.29	9.18	6.56	1.13	0.717	0.717	0.585
Total Solids in %	97.4	95.9	96	97.7	98.1	98.2	98.8
pH	5.6	6.03	6.11	6.03	6.1	6.11	5.73
Metals in mg/kg							
Aluminum	21000	18700	16200	20400	21000	20300	18700
Antimony	0.2 UJ	0.2 UJ	0.3 J	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ
Arsenic	33.3	22	30.6	14.6	7.3	8.2	6.6
Barium	375	189	186	251	177	167	226
Beryllium	0.6	0.6	0.6	0.7	0.6	0.6	0.5
Cadmium	9.8	6.7	10.5	1.1	0.5	0.8	0.3
Calcium	3590	8250	7230	4140	3930	3760	4170
Chromium	29.7	25.6	26.4	24.7	24.9	28.9	29.6
Cobalt	10.2	8.1	8.2	8.7	8.8	9.1	9.5
Copper	33.1	24.7	23.4	22	24	25.3	25
Iron	28100	22000	20400	23700	25200	25500	26900
Lead	362	260	436	37.5	16.5	34.5	16
Magnesium	6630	6040	5780	5790	6020	6070	7980
Manganese	1340	654	671	738	537	431	434
Mercury	0.068	0.094	0.113	0.031	0.022	0.023	0.014
Nickel	35.5	26.9	26.7	30.5	30.7	30	36.7
Potassium	2900	1890	1530	1740	1850	1870	3040
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.3	0.3	0.3	0.2	0.2	0.3	0.2
Sodium	230	310	210	240	270	270	260
Thallium	0.3	0.3	0.4	0.2	0.2 U	0.2 U	0.2
Vanadium	26.1	26.7	29.1	30	30.5	34.7	36.3
Zinc	430	310	440	154	103	111	80

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA9-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

Table D10 - Subarea SA-10 Soil Analytical Results

Sample ID	SA10-1C	SA10-2C	SA10-3C	SA10-3C2	SA10-4C	SA10-5C	SA10-6C	SA10-7C
Sampling Date	11/8/2012	11/8/2012	11/5/2012	11/5/2012	11/5/2012	11/5/2012	11/5/2012	11/5/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3	0 to 3 Field Variability Sample[a]	0 to 3	0 to 3	0 to 3	0 to 3
Total Org. Carbon in %	8.8	12.8	6.66	4.13	21.3	9.37	11.1	8.72
Total Solids in %	94.3	91.7	95.8	96.4	89.6	95.3	94.7	95.4
pH	6.14	5.96	6.02	6.08	5.97	6.41	5.74	6.12
Metals in mg/kg								
Aluminum	17400	20800	18100	19000	18700	17900	23700	19500
Antimony	0.2 UJ	1.7 J	0.8 J	0.5 J	1.5 J	0.2 J	0.2 UJ	0.4 J
Arsenic	11.9	55.5	28.7	30.9	5.6	11.5	16.4	39.3
Barium	507	498	512	441	132	229	427	502
Beryllium	0.6	1.2	0.7	0.7	0.5	0.5	0.8	0.7
Cadmium	7.4	37.3	22.2	19.8	6.4	4.5	4.1	9
Calcium	8760	14000	9030	7390	21100	10700	7650	9480
Chromium	34	20.6	15	14.9	11.2	26.2	20.4	20.6
Cobalt	9	21.5	12.1	10.6	2.9	8.6	10.6	12.4
Copper	39.1	62.9	41.8	39.2	30.8	20.7	26.5	38.8
Iron	20300	33900	24400	25200	9150	21100	23000	29000
Lead	330	1240	400	328	222	200	162	246
Magnesium	6280	6200	4040	3890	2510	6080	5170	4360
Manganese	1070	5490	2870	2340	43.6	830	2190	3810
Mercury	0.104	0.232	0.094	0.06	0.114	0.083	0.077	0.088
Nickel	24.8	52.9	57.2	54.8	13.1	24.9	25.5	40.9
Potassium	2120	1380	1600	1430	460	1860	1660	1840
Selenium	0.5 U	1.3	0.5	0.5 U	5.2	0.5 U	0.5 U	0.5 U
Silver	0.2 U	0.6	0.4	0.4	0.3	0.2	0.2	0.3
Sodium	130 U	150	200	190	230	250	160	200
Thallium	0.4	1.2	0.4	0.4	0.2 U	0.3	0.3	0.4
Vanadium	42.4	24.6	21.4	20.8	21.5	25.6	26.7	22.3
Zinc	370	1330	830	810	165	250	267	520

Table D10 - Subarea SA-10 Soil Analytical Results

Sample ID	SA10-8C	SA10-2P-1	SA10-2P-2	SA10-2P-3
Sampling Date	11/8/2012	11/8/2012	11/8/2012	11/8/2012
Sampling Depth in Inches	0 to 3	0 to 3	3 to 6	6 to 12
Total Org. Carbon in %	5.02	30.6	18.9	15.6
Total Solids in %	94.9	89.6	92	93.9
pH	6.08	6.21	6.27	6.22
Metals in mg/kg				
Aluminum	20600	18000	21600	25500
Antimony	0.4 J	2.1 J	0.6 J	0.2 J
Arsenic	21.2	23.1	28.2	16.1
Barium	374	445	275	131
Beryllium	0.6	0.9	2.4	2.1
Cadmium	7.4	26.9	11.6	4.1
Calcium	6330	21800	12700	10900
Chromium	21.2	15.6	23.4	26.3
Cobalt	9	19.9	32.3	24.5
Copper	27	69.7	70.4	64
Iron	22500	32600	41600	60200
Lead	313	1620	552	248
Magnesium	5070	6680	10600	13400
Manganese	2840	5920	3590	2690
Mercury	0.124	0.241	0.144	0.061
Nickel	29.8	44.8	78.2	75.6
Potassium	1390	1650	1140	960
Selenium	0.5 U	1.3	1.4	2 U
Silver	0.3	1	0.9	1.4
Sodium	200	140 U	140	160
Thallium	0.5	1	0.5	0.2
Vanadium	25.7	20.7	27.8	32.2
Zinc	400	1230	720	410

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA10-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

Table D11 - Subarea SA-11 Soil Analytical Results

Sample ID	SA11-1C	SA11-2C	SA11-3C	SA11-4C	SA11-5C	SA11-6C	SA11-7C	SA11-8C
Sampling Date	11/8/2012	11/6/2012	11/10/2012	11/8/2012	11/6/2012	11/6/2012	11/6/2012	11/7/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3
Total Org. Carbon in %	1.98	3.01	5.68	8.71	5.13	6.23 J	23.4	1.99
Total Solids in %	97.8	97.3	94.7	95.7	95.3	97.6	89.3	97.2
pH	6.09	6.19	6.52	6.37	5.41	5.54	5.16	5.27
Metals in mg/kg								
Aluminum	23500	16600	16100	14900	15000	21400	6940	18900
Antimony	0.2 UJ	0.2 UJ	0.2 UJ	0.6 J	0.8 J	0.3 J	17.2 J	0.2 J
Arsenic	12.3	10.6	9	20.7	21	22.4	28.6	20.2
Barium	230	443	255	484	413	192	876	276
Beryllium	0.7	0.4	0.5	0.6	0.5	0.7	0.6	0.5
Cadmium	2.2	2.5	2.4	13.3	6.9	6.3	15.8	5
Calcium	4010	5590	10900	7340	4640	3780	12100	4130
Chromium	31.9	19.5	23.2	21.5	14.9	31.4	8.6	25.9
Cobalt	10.8	7.9	6	6.7	6.4	8.7	4.1	8.1
Copper	32	18.7	22.6	24.9	24.1	32.5	52	25.1
Iron	27100	21900	17600	18000	15700	24000	9140	22300
Lead	83	94.7	113	500	374	572	1920	209
Magnesium	7150	5460	4420	4570	3290	6410	1960	5420
Manganese	880	1200	497	1330	1630	676	1460	726
Mercury	0.035	0.05	0.074	0.126	0.15	0.104	0.527	0.071
Nickel	31.1	19.2	18.6	17.9	14.4	22.8	7.8	20.4
Potassium	1760	1930	1440	2230	1260	1300	1200	2000
Selenium	0.5 U	0.5 U	0.7	0.5 U	0.5 U	0.5 U	2 U	0.5 U
Silver	0.2	0.2 U	0.2 U	0.3	0.4	0.3	2	0.3
Sodium	140	240	280	160	270	120 U	140 U	280
Thallium	0.2	0.2	0.2	0.6	0.5	0.5	1	0.3
Vanadium	41.2	31.3	30.7	26.2	24.8	47.3	11.4	33.7
Zinc	169	196	187	700	410	310	1150	268

Table D11 - Subarea SA-11 Soil Analytical Results

Sample ID	SA11-8C2	SA11-9C	SA11-8P-1	SA11-8P-2	SA11-8P-3	SA11-8P-4
Sampling Date	11/7/2012	11/8/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012
Sampling Depth in Inches	0 to 3 Field Variability Sample[a]	0 to 3	0 to 3	3 to 6	6 to 12	12 to 24
Total Org. Carbon in %	3.2	8.29	2.78	1.27	0.599	0.453
Total Solids in %	96	97.2	96.4	97.6	98.2	95
pH	5.41	5.9	5.62	5.68	5.95	5.98
Metals in mg/kg						
Aluminum	19000	22500	18600	21300	20700	17100
Antimony	0.9 J	0.9 J	0.4 J	0.2 UJ	0.2 UJ	0.2 UJ
Arsenic	37.3	35	26.2	16.9	6.4	6.8
Barium	523	420	423	258	159	117
Beryllium	0.5	1	0.5	0.6	0.6	0.5
Cadmium	14.7	16.9	6.8	0.58	0.2	0.2
Calcium	5680	8990	5450	3460	3680	3860
Chromium	19.8	31.2	18.6	20	21	24
Cobalt	7.8	12.2	8	8.2	8.6	9.2
Copper	41.9	43.5	22.1	23.3	31.6	33.1
Iron	21500	31000	20700	21900	23100	22800
Lead	810	715	236	19.2	8.4	7.8
Magnesium	4870	7580	4700	5060	5900	5900
Manganese	1570	2850	1340	797	411	335
Mercury	0.185	0.15	0.104	0.029	0.02	0.015
Nickel	20.7	38.8	19.3	23.3	21.9	21.8
Potassium	1870	2010	1610	1630	1890	2190
Selenium	0.5 U	0.6	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.6	0.5	0.4	0.2 U	0.2	0.2
Sodium	320	130	250	310	370	280
Thallium	0.6	0.7	0.3	0.2	0.2 U	0.2 U
Vanadium	28.8	31.1	31.4	35.1	41.2	45.3
Zinc	660	750	460	120	67	59

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA11-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

Table D12 - Subarea SA-12 Soil Analytical Results

Sample ID	SA12-1C	SA12-2C	SA12-3C	SA12-4C	SA12-6C	SA12-7C	SA12-7C2	SA12-8C
Sampling Date	11/7/2012	11/10/2012	11/10/2012	11/10/2012	11/10/2012	11/10/2012	11/10/2012	11/10/2012
Sampling Depth in Inches	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3 Field Variability Sample[a]	0 to 3
Total Org. Carbon in %	3.21	4.47	10.6	5.55	3.9	1.38	3.29	2.4 J
Total Solids in %	97.2	94.8	97	97	94.7	96.6	96.3	97.1
pH	6.06	5.08	5.89	6.75	6.42	6.13	6.25	5.61
Metals in mg/kg								
Aluminum	34600	20800	17000	16600	25100	25600	23600	19200
Antimony	0.2 J	0.2 UJ	0.4 J	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ
Arsenic	25.3	16.3	11	10	13.4	15.6	17.4	15.8
Barium	266	252	154	425	370	590	414	362
Beryllium	1.3	0.5	0.4	0.4	1.6	0.6	0.6	0.5
Cadmium	6.23	2.8	4.1	4	3.3	4.9	4.2	2.6
Calcium	6040	3250	10400	6910	5720	6770	5500	4530
Chromium	35	21.4	16.1	16	15.1	20.9	22.6	17.7
Cobalt	18.6	8.8	6.5	6.7	6.5	8.6	8.4	7.2
Copper	52.9	18.4	21	14.7	42.9	25.9	21.6	15.2
Iron	40800	22700	17900	18200	19700	25400	23800	21200
Lead	207	224	217	183	120	210	204	249
Magnesium	9370	4980	4600	3910	3280	6250	5540	4370
Manganese	1610	1470	655	966	1250	2380	1860	1370
Mercury	0.08	0.063	0.135	0.045	0.073	0.065	0.061	0.067
Nickel	76.4	20.4	14.3	17.9	16.5	24.4	23.8	18
Potassium	1920	1400	1100	1580	1330	2010	1470	1530
Selenium	0.5 U	0.5 U	0.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	1.2	0.2 U	0.3	0.2 U	0.2 U	0.3	0.2	0.2 U
Sodium	170	270	310	160	220	270	190	230
Thallium	0.4	0.3	0.2	0.2	0.2	0.3	0.3	0.2
Vanadium	44.3	33.6	25	23.4	23.7	31.4	31.4	26.1
Zinc	428	218	196	249	251	440	350	239

Table D12 - Subarea SA-12 Soil Analytical Results

Sample ID	SA12-9C	SA12-3P-1	SA12-3P-2	SA12-3P-3	SA12-3P-4
Sampling Date	11/10/2012	11/10/2012	11/10/2012	11/10/2012	11/10/2012
Sampling Depth in Inches	0 to 3	0 to 3	3 to 6	6 to 12	12 to 24
Total Org. Carbon in %	2.97	13.7	2.03	1	0.714
Total Solids in %	95.9	93.5	97.6	97.6	98.3
pH	6.24	5.45	5.73	6.67	7.48
Metals in mg/kg					
Aluminum	26200	12300	18800	23000	18800
Antimony	0.2 UJ	1.1 J	0.2 UJ	0.2 UJ	0.2 UJ
Arsenic	13.8	10.2	7.1	4.4	6.3
Barium	406	171	138	133	209
Beryllium	0.7	0.3	0.3	0.6	0.4
Cadmium	2	5.4	2.2	0.4	0.3
Calcium	4690	8050	6100	5520	57300
Chromium	22.6	14.1	18.7	21.8	25.6
Cobalt	10.3	6.3	7.6	9	9.3
Copper	19.8	18.6	13.9	18.5	28.9
Iron	26500	14900	20700	22700	27900
Lead	66.4	271	50.9	11	9
Magnesium	4640	3690	5390	5360	10400
Manganese	2750	914	479	229	396
Mercury	0.046	0.124	0.047	0.031	0.035
Nickel	35.5	12.6	15.1	18.3	24.5
Potassium	1620	1190	1160	1290	2010
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.2	0.3	0.2 U	0.2	0.2
Sodium	190	170	320	400	430
Thallium	0.2 U	0.3	0.2 U	0.2 U	0.2 U
Vanadium	28.5	20.6	27.9	30.8	36.6
Zinc	163	280	164	60	56

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA12-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

Table D13 - Subarea SA-13 Soil Analytical Results

Sample ID	SA13-1C		SA13-2C		SA13-3C		SA13-4C		SA13-5C		SA13-5C2		SA13-6C		SA13-7C	
Sampling Date	11/10/2012		11/10/2012		11/10/2012		11/10/2012		11/10/2012		11/10/2012		11/10/2012		11/7/2012	
Sampling Depth in Inches	0 to 3		0 to 3		0 to 3		0 to 3		0 to 3		0 to 3 Field Variability Sample[a]		0 to 3		0 to 3	
Total Org. Carbon in %	11.5		12.6		3.2		5.64		4.31		6.33		2.77		2.57	
Total Solids in %	96		92.5		95.8		95.7		95.4		95.5		95.3		97	
pH	6.18		6.68		5.77		5.95		6.34		6.19		5.73		5.96	
Metals in mg/kg																
Aluminum	21000		13900		17500		12700		22400		22200		28200		19400	
Antimony	0.2	UJ	0.3	UJ	0.3	J	0.2	UJ	0.5	J	0.5	J	0.4	J	0.5	J
Arsenic	7.7		5.9		12.8		5.3		17.3		18.4		22.4		21.7	
Barium	274		311		385		157		452		454		294		295	
Beryllium	0.8		0.5		0.5		0.4		0.5		0.5		0.6		0.5	
Cadmium	2.4		4.4		3.9		1.3		12.9		11.7		3.6		2.6	
Calcium	6490		24500		4510		10200		9820		9680		3050		2700	
Chromium	21.5		21.2		18.7		22		28		28		18		22	
Cobalt	8.5		7.1		6.9		9		11		11		7		9	
Copper	25.6		39		17.9		21.5		43.7		34.6		16.9		18.6	
Iron	23000		17200		19000		20900		24600		25800		22400		22000	
Lead	104		202		163		31.9		649		551		289		281	
Magnesium	5530		4800		3510		4770		6070		6610		3940		4330	
Manganese	851		1260		1480		317		1480		1370		2270		833	
Mercury	0.044		0.1		0.085		0.058		0.113		0.101		0.1		0.068	
Nickel	17.7		17.3		18.5		26.5		22.1		21.9		15.5		18.9	
Potassium	1230		1470		1300		1200		2380		2280		1250		1340	
Selenium	0.5	U	1.7		0.5	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
Silver	0.2	U	0.3		0.3		0.3		0.4		0.3		0.3		0.3	
Sodium	200		290		170		130	U	290		230		220		210	
Thallium	0.2		0.2		0.3		0.2	U	0.5		0.5		0.4		0.3	
Vanadium	37.7		27.2		23.3		30		39		38		32		35	
Zinc	172		305		280		160		660		600		271		217	

Table D13 - Subarea SA-13 Soil Analytical Results

Sample ID	SA13-8C	SA13-6P-1	SA13-6P-2	SA13-6P-3	SA13-6P-4
Sampling Date	11/10/2012	11/10/2012	11/10/2012	11/10/2012	11/10/2012
Sampling Depth in Inches	0 to 3	0 to 3	3 to 6	6 to 12	12 to 24
Total Org. Carbon in %	3.69	1.13	0.527	0.288	0.613
Total Solids in %	96.7	96.2	96.9	98.3	97.3
pH	5.29	5.69	5.51	5.47	5.48
Metals in mg/kg					
Aluminum	17300	28000	28600	23300	24800
Antimony	0.3 J	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ
Arsenic	16.4	9.5	4.9	4	6.2
Barium	272	233	244	259	205
Beryllium	0.5	0.7	0.8	0.6	0.7
Cadmium	2.8	0.9	0.3	0.2	0.6
Calcium	4280	1830	2180	2890	2390
Chromium	21.4	20	21	25	23
Cobalt	7.8	8	8	9	8
Copper	16.4	13.3	22.3	20.2	21.7
Iron	23100	22200	22800	24500	23100
Lead	168	38.6	12.5	10.8	21.2
Magnesium	4200	3930	4800	5840	4920
Manganese	1180	1100	291	330	361
Mercury	0.069	0.045	0.027	0.017	0.032
Nickel	19.7	18.1	19	20.5	19.8
Potassium	1350	1010	1180	1540	1210
Selenium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Silver	0.2 U	0.2	0.3	0.2	0.2
Sodium	170	170	240	200	200
Thallium	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Vanadium	34.6	34	37	45	39
Zinc	186	152	78	67	88

a - Secondary sample collected at station by rotating 45 degrees from the primary sampling points to assess short range concentration variability.
Sample identified as SA13-Field Duplicate in field notes and laboratory reports.
U = Not detected at the reporting limit indicated.
J = Estimated value.

APPENDIX D
DATA QUALITY REVIEW

A total of 170 soil samples (including four-point composites, field replicates, and discrete profiles) were collected between October 30 and November 10, 2012. The samples were submitted to Analytical Resources, Inc. (ARI), in Tukwila, Washington, for chemical analysis. The laboratory reported the results in 13 separate data packages with job numbers: VR30, VR31, VR32, VR33, VR34, VR35, VR36, VR37 VS18, VS19, VS20, VS21, VS22, and VS23.

All samples were analyzed for:

- EPA Target Analyte List (TAL) metals (silver, aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, lead, potassium, sodium, antimony, selenium, thallium, vanadium, zinc, and mercury), which were prepared and analyzed as follows:
  - Total mercury by EPA method 7471A
  - Total metals (Al, Ba, Ca, Fe, Mg, Mn, K, and Na) by EPA method 6010C
  - Total metals (Sb, As, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, and Zn) by EPA method 200.8
- Soil pH by EPA method 9045;
- Total organic carbon (TOC) following Plumb 1981; and
- Total solids (TS) by Standard Method 2540B.

The laboratory performed quality assurance/quality control (QA/QC) reviews on an ongoing basis. Hart Crowser reviewed the data to ensure they met data quality objectives for the project and recorded the results on laboratory quality control summary sheets. The following criteria were evaluated:

- Holding times;
- Reporting limits;
- Method blanks;
- Laboratory control sample (LCS) recoveries;
- Matrix spike/matrix spike duplicate (MS/MSD) recoveries;
- Laboratory duplicate relative percent differences (RPDs);
- Continuing calibration verifications (CCV);
- ICP interference check sample; and
- Post-digest spike recoveries (where applicable).

One sample from each subarea was incorrectly identified as a field duplicate. Field duplicate samples were not collected. Instead, these samples were secondary samples collected within 20 feet of the primary sample to assess spatial variability and, as such, RPD criteria are not applicable.

Samples used for laboratory quality control (matrix spike and laboratory duplicate analysis are summarized in the following table.

Laboratory Quality Control Sample	Laboratory Batch
SA1-1C	VR30
SA1-Field Duplicate	VR31
SA2-8C	VR32
SA3-7C	VR33
SA4-6C	VR34
SA6-4P-1 (0 to 3” depth)	VR35
SA7-4C	VR36
SA8-2P-3 (6 to 12” depth)	VR37
SA5-1C	VS18
SA9-3C	VS19
SA9-Field Duplicate	VS20
SA11-6C	VS21
SA12-3P-1	VS22
SA13-3C	VS23

The data were determined to be acceptable for use with minor qualification. The data review is summarized in the following pages and the complete laboratory reports are included on DVD at the end of the report.

Sample Receiving Discrepancies

Two sample numbers were listed incorrectly on the chain of custody (COC) for lab package VR30.

- The sample listed as SA1-3P-1 (3-inch to 6-inch depth) should be SA1-3P-2 (3-inch to 6-inch depth).
- The sample listed as SA1-3P-1 (6-inch to 12-inch depth) should be SA1-3P-3 (6-inch to 12-inch depth).

Although these errors appear on the COC, the sample numbers were written correctly on the jar labels and the laboratory logged the samples using the numbers on the labels. Therefore, the sample numbers are correct in the laboratory reports. Hart Crowser corrected the sample numbers on both the paper and electronic versions of the COC.

Total Mercury by EPA method 7471A

Holding times and reporting limits were acceptable. No method blank (MB) contamination was detected. The LCS recoveries were within method control limits. The laboratory duplicate RPD was within control limits or was not applicable when the sample and duplicate were non-detect or when the result was less than five times the RL.

Matrix Spike Recovery

MS recoveries were within method and QAPP control limits with the following exceptions.

- SA3-7C MS: The recovery for Hg fell below the control limits. The result for Hg in SA3-7C was qualified as estimated (J).

Continuing Calibration Verification

The CCVs were within method control limits with the following exception.

- CCV3 on 11/17/2012: The recovery failed low. The laboratory analyzed an additional CCV4 immediately, which was within control. Associated samples were reanalyzed following the passing CCV, and results were not qualified.

Total Metals by EPA method 6010A (includes Al, Ba, Ca, Fe, Mg, Mn, K, and Na)

Holding times and reporting limits were acceptable for all samples. All the LCS recoveries were within method control limits. The laboratory duplicate RPD was within control limits or was not applicable when the sample and duplicate were non-detect or when the result was less than five times the RL. The ICP interference check samples were within control limits.

Method Blank Analysis

Analytes were not detected in method blanks with the following exceptions.

- Method Blank 11/16/12: The MB had a detection for calcium above the RL. The results for calcium in the associated samples were greater than ten times the amount in the MB, and no results were qualified.

- Method Blank 11/15/12: The MB had a detection for manganese at the RL. The results for Mn in the associated samples were greater than ten times the amount in the MB, and no results were qualified.

Matrix Spike Recovery

All the MS/MSD recoveries were either within method control limits or not applicable when the source sample concentration was greater than four times the spiking amount, with the following exception.

- SA12-3P-1 (0 to 3 inches depth) MS: The recovery for Mn exceeded the control limits. The laboratory ran a post-digestion spike and recovery was within control limits. The failure likely occurred because the source sample concentration was higher than the spike amount. Results for this analyte are not qualified.

Continuing Calibration Verification and Continuing Calibration Blanks

The CCVs and CCBs were within method control limits with the following exceptions.

- CCV5 on 11/16/12: The recoveries for Ba, Mg, Na, and Fe exceeded the control limits. The laboratory analyzed an additional CCV6 following CCV5, which was in control. Samples analyzed prior to CCV5 (SA4-7C, SA4-8C, SA4-Field Duplicate, and SA4-6C) were reanalyzed later in the analytical sequence with passing CCVs and not qualified.

- CCV10 on 11/16/12: The recoveries for Al, Ba, Fe, Mg, Mn, K, and Na exceeded the control limits. The laboratory analyzed an additional CCV11 following CCV10, which was within control. As CCV11 was in control, the laboratory reported the associated samples, and results were not qualified.

- CCV15 on 11/16/12: The recoveries for Ca and Na fell below the control limits. The associated samples were reanalyzed on 11/19/12 with passing CCVs, and no results qualified.

- CCB5 on 11/15/12: There was a detection for Mn above the RL but below the CRDL.

- CCB9 on 11/15/12: There were detections for Al and Mn above the RL, but below the CRDL. There was a detection for Fe above the CRDL. The laboratory analyzed CCB10 immediately following CCB9, with all analytes below the RL. The associated samples MB, SA2-Field Duplicate, SA3-1C, SA3-2C, SA2-8C, Dup, MS, and LCS were analyzed prior to CCB9. The MB is ND for Al, Fe, Mn and not qualified. Results for Al, Fe, and Mn in samples SA2-8C, Dup, MS, SA2-Field Duplicate, SA3-1C, and SA3-2C were greater than ten times the amount in CCB9 and not qualified. Results for the LCS were within method control limits, and are not qualified. Samples SA2-8C, Dup, and MS were reanalyzed on 11/16/12, and results for Al, Fe, and Mn were reported from the reanalysis without qualification.

Total Metals by EPA method 200.8 (includes Sb, As, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, and Zn)

The holding times and reporting limits were acceptable for all samples. No method blank (MB) contamination was detected. All the LCS recoveries were within method control limits. Post digest spike recoveries were within method control limits.

Matrix Spike Recovery

All the MS/MSD recoveries were either within method control limits or not applicable because the source sample concentration was greater than four times the spiking amount, with the following exceptions.

- SA7-4C MS: The recovery for Zn fell below the control limits. The laboratory performed a post-digestion spike, which fell within the control limits. Results for Zn in SA7-4C were qualified as estimated (J).

- Antimony (Sb) matrix spikes: The MS/MSD recoveries failed low in all batches. The laboratory performed post-digestion spikes and recoveries were within control. Due to the poor MS recoveries, all the Sb results for this project are qualified as estimated (J).

Laboratory Duplicate Analysis

The laboratory duplicate RPD was within control limits or was not applicable when the sample and duplicate were less than five times the RL with the following exceptions.

- SA1-Field Duplicate: The RPD for Ni exceeded the laboratory control limits, but fell within the QAPP control limits. Sample results were not qualified.

- SA3-7C: The RPD for Ni exceeded the laboratory control limits, but fell within the QAPP control limits. Sample results were not qualified.

- SA7-4C: The RPD for Sb exceeded the laboratory control limits, but fell within the QAPP control limits. Sample results were not qualified.

- SA12-3P-1: The RPD for Sb exceeded the laboratory control limits, but fell within the QAPP control limits. Sample results were not qualified.

Continuing Calibration Verification

The CCVs were within method control limits with the following exceptions.

- CCV6, CCV7, and CV11 on 11/15/12: The recovery for Be failed high. The associated samples were reanalyzed for Be on 11/16/12 with passing CCVs, and no results were qualified.

- CCV7, CCV8, and CCV9 on 11/15/12: The recoveries for Ag failed low. The associated samples were reanalyzed for Ag on 11/19/12 with passing CCVs and no results were qualified.

- CCV6 on 11/16/12: The recovery for Co failed low. Co in the associated samples were reported from analyses on 11/15/12, 11/19/12, and 11/16/12 with passing CCVs, and no results were qualified.

- CCV4 on 11/21/12: The recovery for Ag failed low. The associated samples were reanalyzed for Ag on 11/23/12 and 11/26/12 with passing CCVs and results were not qualified.

- CCV10 on 11/23/12: The recoveries for Be and Se failed high. The associated samples were reanalyzed for Be and Se on 11/26/12 with passing CCVs and results were not qualified.

- CCV6 on 11/26/12: The recovery for Ag failed high. An additional CCV7 was analyzed shortly following, which passed. Silver was not reported from the associated samples analyzed prior to CCV6. The samples were reanalyzed for Ag on 11/28/12 with passing CCVs and results were not qualified.

Soil pH by EPA 9045

Holding times and reporting limits were acceptable. The LCS and laboratory duplicate were within control limits. Field duplicate RPDs were within QAPP control limits.

Total Organic Carbon (TOC) by Plumb 1981

Holding times and reporting limits were acceptable. The MB was ND. The standard reference results were within control limits. The laboratory control samples were within control limits.

Matrix Spike Recovery

The MS/MSD recoveries were within method control limits with the following exceptions.

- SA2-4C MS: The recovery for TOC slightly exceeded control limits. The results for TOC in sample SA2-4C are therefore qualified as estimated (J).

- SA12-8C MS: The recovery for TOC slightly exceeded control limits. The results for TOC in sample SA12-8C are therefore qualified as estimated (J).

Laboratory Duplicate Analysis

The RSD for laboratory replicates was within control limits except for the following.

- SA11-6C: The RSD is outside control limits due to sample inhomogeneity. The results for TOC in SA11-6C are therefore qualified as estimated (J).

Total Solids (TS) by SM 2540B

Holding times and reporting limits were acceptable. The MB was ND. The RSD for laboratory replicates was within control limits. Field duplicate RPDs were within QAPP control limits.

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APPENDIX E
STATISTICAL EVALUATION
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APPENDIX E
STATISTICAL EVALUATION

TABLES

FIGURES

APPENDIX E
STATISTICAL EVALUATION

E.1 Statistical Software

Statistical evaluation of data was performed using ProUCL 4.1 software.

E.2 Summary Statistics and Percentiles

Summary statistics for each of the 13 subareas were calculated on raw (untransformed) full datasets using ProUCL's summary statistics module. Percentiles were calculated using the full datasets with nondetects set equal to the reporting limit.

Surface soil metal concentration summary statistics and percentiles by individual subarea are presented in Tables E-1 and E-2, respectively.

Combined soil profile metal concentration summary statistics and percentiles for the 13 subareas are presented by depth interval in Tables E-3 and E-4, respectively.

E.3 Multivariate Analysis

Principal components analysis (PCA), one of many multivariate statistical methods available, was performed to determine if there are correlations among metals and other variables including soil type, underlying geology, elevation, slope, and aspect. PCA is a technique to combine correlated variables in a dataset and create a new, reduced set of variables (factors) that are linear combinations of the original variables. The total number of PCA factors derived is equal to the number of variables. The first PCA factor accounts for the largest percentage of data variability; the second PCA factor accounts for the second-most variability and so on. The first three PCA factors account for 93 percent of the observed variability in samples collected as part of this investigation. Increasing the number of factors evaluated or plotted has no impact on correlations among variables or statistical conclusions.

PCA correlation matrices and factor loading plots are used to evaluate correlations among variables. PCA correlation matrices quantitatively show the degree of correlation among variables. A correlation coefficient of 1.0 is a perfect correlation; a coefficient of 0.0 indicates no correlation among variables; and a coefficient of –1.0 demonstrates a negative correlation. Factor loading plots provide a visual indication of correlations among variables. Variables that plot close to one another in principal components (factor) space are strongly correlated while variables plotted further apart are less correlated. The PCA factor loadings and correlation matrix are presented in Appendix E on Tables E-5. and E-6, respectively. The strength or degree of correlation as defined by the correlation coefficients (r) is:

- r values greater than 0.90 – very strong;
- r values between 0.7 and 0.9 – strong;
- r values between 0.5 and 0.7 – moderate
- r values between 0.3 and 0.5 – weak and
- r values less than 0.3 – none

E.4 Surface Soil Concentration Ranges and Variability

The range and variability of pooled surface metal results by subarea are presented visually in box and whisker plots of pooled surface metal results by subarea on Figures E-1 through E-23 . The ProUCL software constructs box and whisker plots in the following manner:

- The bottom of the box corresponds to the 25th percentile concentration;
- The upper end of the box is the 75th percentile concentration;
- The line within the box is the median (50th percentile) concentration;
- The upper whisker is located at the data point that is the closest to, but not greater than, 1.5 times the Interquartile Range (75th percentile minus 25th percentile) added to the 75 percentile; and
- The lower whisker is located at the data point that is closest to but not greater than 1.5 times the Interquartile Range subtracted from the 25 percentile.
- For a normal distribution, the whiskers encompass 95 percent of the data and data points outside the whiskers may either be extreme tails of the distribution or potential data outliers. Whiskers have little significance for other data distributions.

Short-range metal concentration variability was assessed by collection of two nearby surface soil samples from each of the 13 subareas. After the primary four-point composite sample points were identified within a 20 foot radius, a second composite sample was collected by rotating the primary sample locations 45 degrees clockwise. The average relative percent difference (RPD) for the replicate metal analyses ranged from 3.2 to 42.6 percent. Results are summarized in Table E-7.

E.5 Soil Profile Data Distributions for Arsenic, Cadmium, Lead, Mercury, and Zinc

The 12- to 24-inch soil profile mean was calculated using the data distribution with the best fit correlation coefficient from ProUCL goodness of fit (GOF) calculations (Table E-8). Data distributions, arithmetic means, and geometric means for metals of concern are summarized in Table E-9.

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Table E-1 - Surface Soil Metal Summary Statistics by Subarea

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Al (sa-01)	9	0	0.00%	16500	26800	21944	21700	3505	2817	-0.0388	0.16
Al (sa-02)	9	0	0.00%	11200	23600	17589	16600	3981	3262	0.0368	0.226
Al (sa-03)	9	0	0.00%	11000	22100	17367	17200	3856	3855	-0.219	0.222
Al (sa-04)	9	0	0.00%	12900	18700	15333	14700	1839	1334	0.727	0.12
Al (sa-05)	8	0	0.00%	10700	31600	16013	14400	6691	3706	2.222	0.418
Al (sa-06)	9	0	0.00%	4590	17100	10962	9020	5291	6568	0.0481	0.483
Al (sa-07)	9	0	0.00%	4600	28400	13971	12400	7120	6316	0.978	0.51
Al (sa-08)	9	0	0.00%	7360	16000	10910	9990	3042	2076	0.771	0.279
Al (sa-09)	11	0	0.00%	15300	29400	20318	18700	4790	3706	1.131	0.236
Al (sa-10)	9	0	0.00%	17400	23700	19522	19000	1948	1631	1.28	0.1
Al (sa-11)	10	0	0.00%	6940	23500	17484	17750	4804	4151	-0.999	0.275
Al (sa-12)	9	0	0.00%	16600	34600	23189	23600	5615	4151	0.848	0.242
Al (sa-13)	9	0	0.00%	12700	28200	19400	19400	4743	4151	0.378	0.245
Sb (sa-01)	0	9	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sb (sa-02)	3	6	66.67%	0.2	0.4	0.3	0.3	0.1	0.148	2.602E-15	0.333
Sb (sa-03)	1	8	88.89%	0.6	0.6	0.6	0.6	N/A	0	N/A	N/A
Sb (sa-04)	5	4	44.44%	0.2	0.3	0.24	0.2	0.0548	0	0.609	0.228
Sb (sa-05)	6	2	25.00%	0.3	0.5	0.367	0.3	0.103	0	0.968	0.282
Sb (sa-06)	8	1	11.11%	0.2	1.5	0.5	0.35	0.417	0.148	2.482	0.835
Sb (sa-07)	9	0	0.00%	0.3	3.3	1.156	0.8	0.933	0.593	1.721	0.807
Sb (sa-08)	7	2	22.22%	0.2	2.6	0.943	0.7	0.8	0.445	1.799	0.848
Sb (sa-09)	7	4	36.36%	0.3	1.1	0.571	0.5	0.263	0.148	1.59	0.46
Sb (sa-10)	7	2	22.22%	0.2	1.7	0.786	0.5	0.587	0.445	0.91	0.747
Sb (sa-11)	7	3	30.00%	0.2	17.2	2.986	0.8	6.274	0.297	2.635	2.101
Sb (sa-12)	2	7	77.78%	0.2	0.4	0.3	0.3	0.141	0.148	N/A	0.471
Sb (sa-13)	6	3	33.33%	0.3	0.5	0.417	0.45	0.0983	0.0741	-0.456	0.236
As (sa-01)	9	0	0.00%	9.4	21.2	13	12.2	3.859	2.669	1.402	0.297
As (sa-02)	9	0	0.00%	7.4	22.7	14.59	16.2	4.799	3.41	-0.0921	0.329
As (sa-03)	9	0	0.00%	5.9	17.7	11.8	12.8	4.625	6.672	-0.0284	0.392
As (sa-04)	9	0	0.00%	9.1	20.2	14.3	14.3	3.411	3.558	0.318	0.239
As (sa-05)	8	0	0.00%	8.4	26.2	12.99	10.7	5.975	2.52	1.917	0.46
As (sa-06)	9	0	0.00%	5.7	36.3	15.87	14.8	9.661	7.858	1.318	0.609
As (sa-07)	9	0	0.00%	8.8	38.7	22.63	24.1	10.69	12.6	0.182	0.473
As (sa-08)	9	0	0.00%	7.6	45.1	21.89	17.3	12.68	8.302	0.906	0.579
As (sa-09)	11	0	0.00%	10.3	36	23.72	26.3	8.657	10.38	-0.233	0.365
As (sa-10)	9	0	0.00%	5.6	55.5	24.56	21.2	15.81	14.38	0.875	0.644
As (sa-11)	10	0	0.00%	9	37.3	21.71	20.85	9.689	12.08	0.336	0.446
As (sa-12)	9	0	0.00%	10	25.3	15.4	15.6	4.446	2.669	1.325	0.289
As (sa-13)	9	0	0.00%	5.3	22.4	14.21	16.4	6.594	7.858	-0.268	0.464
Ba (sa-01)	9	0	0.00%	226	1120	475.1	425	277	234.2	1.815	0.583
Ba (sa-02)	9	0	0.00%	90.4	744	319.5	308	182.9	124.5	1.623	0.572
Ba (sa-03)	9	0	0.00%	269	934	455.4	316	249.8	69.68	1.435	0.549

Table E-1 - Surface Soil Metal Summary Statistics by Subarea

				Raw Statistics using Detected Observations							
Variable	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
Ba (sa-04)	9	0	0.00%	135	383	217.4	202	75.27	40.03	1.55	0.346
Ba (sa-05)	8	0	0.00%	130	773	269.4	198	209.2	49.67	2.541	0.777
Ba (sa-06)	9	0	0.00%	34.8	352	217.4	295	131.5	84.51	-0.426	0.605
Ba (sa-07)	9	0	0.00%	55	514	205.3	167	138.6	100.2	1.509	0.675
Ba (sa-08)	9	0	0.00%	75.7	427	186.2	161	108.1	62.27	1.491	0.581
Ba (sa-09)	11	0	0.00%	120	2590	589.1	375	688.3	275.8	2.903	1.168
Ba (sa-10)	9	0	0.00%	132	512	402.4	441	136.1	97.85	-1.316	0.338
Ba (sa-11)	10	0	0.00%	192	876	411.2	416.5	199.6	183.1	1.388	0.485
Ba (sa-12)	9	0	0.00%	154	590	359.9	370	125.1	81.54	0.157	0.348
Ba (sa-13)	9	0	0.00%	157	454	321.6	295	94.84	34.1	0.0136	0.295
Be (sa-01)	9	0	0.00%	0.7	1.2	0.856	0.8	0.174	0.148	1.07	0.203
Be (sa-02)	9	0	0.00%	0.4	0.9	0.6	0.5	0.166	0.148	0.846	0.276
Be (sa-03)	9	0	0.00%	0.4	0.9	0.611	0.5	0.203	0.148	0.617	0.332
Be (sa-04)	9	0	0.00%	0.5	0.7	0.544	0.5	0.0726	0	1.501	0.133
Be (sa-05)	8	0	0.00%	0.3	0.8	0.513	0.5	0.164	0.148	0.512	0.32
Be (sa-06)	9	0	0.00%	0.2	0.6	0.4	0.4	0.18	0.297	-1.86E-15	0.451
Be (sa-07)	9	0	0.00%	0.2	0.7	0.433	0.4	0.15	0.148	0.413	0.346
Be (sa-08)	9	0	0.00%	0.2	0.5	0.344	0.3	0.0882	0.148	0.214	0.256
Be (sa-09)	11	0	0.00%	0.5	1.5	0.691	0.6	0.277	0	2.968	0.401
Be (sa-10)	9	0	0.00%	0.5	1.2	0.7	0.7	0.212	0.148	1.818	0.303
Be (sa-11)	10	0	0.00%	0.4	1	0.6	0.55	0.17	0.0741	1.527	0.283
Be (sa-12)	9	0	0.00%	0.4	1.6	0.733	0.6	0.424	0.148	1.533	0.579
Be (sa-13)	9	0	0.00%	0.4	0.8	0.533	0.5	0.112	0	1.917	0.21
Cd (sa-01)	9	0	0.00%	0.9	3.3	1.678	1.6	0.748	0.741	1.259	0.446
Cd (sa-02)	9	0	0.00%	1.4	13.1	4.022	2.4	3.658	1.186	2.307	0.909
Cd (sa-03)	9	0	0.00%	0.6	11.1	4.344	3.6	3.5	3.262	0.949	0.806
Cd (sa-04)	9	0	0.00%	2.7	9.2	5.782	5.5	2.385	3.113	0.308	0.412
Cd (sa-05)	8	0	0.00%	2.9	9.5	6.288	6.25	2.269	2.669	-0.151	0.361
Cd (sa-06)	9	0	0.00%	1.1	10.6	6.508	8.4	3.743	2.076	-0.656	0.575
Cd (sa-07)	9	0	0.00%	4.77	17.2	9.141	8.1	4.196	3.706	1	0.459
Cd (sa-08)	9	0	0.00%	1.5	18.5	9.267	8.6	5.967	3.262	0.607	0.644
Cd (sa-09)	11	0	0.00%	4.26	24.2	11.2	10.5	5.833	5.634	0.965	0.521
Cd (sa-10)	9	0	0.00%	4.1	37.3	13.12	7.4	11.15	4.299	1.513	0.85
Cd (sa-11)	10	0	0.00%	2.2	16.9	8.6	6.6	5.942	6.375	0.321	0.691
Cd (sa-12)	9	0	0.00%	2	6.23	3.792	4	1.291	1.334	0.553	0.34
Cd (sa-13)	9	0	0.00%	1.3	12.9	5.067	3.6	4.211	1.483	1.439	0.831
Ca (sa-01)	9	0	0.00%	3110	10800	5691	5140	2278	859.9	1.539	0.4
Ca (sa-02)	9	0	0.00%	3370	7760	5019	5010	1379	1275	0.747	0.275
Ca (sa-03)	9	0	0.00%	2800	15200	6900	4970	4923	3024	1.164	0.714
Ca (sa-04)	9	0	0.00%	4420	7740	6030	5690	1204	1260	0.189	0.2
Ca (sa-05)	8	0	0.00%	4120	15300	8049	7130	3396	1171	1.555	0.422
Ca (sa-06)	9	0	0.00%	1310	5920	3574	4070	1710	1572	-0.212	0.479

Table E-1 - Surface Soil Metal Summary Statistics by Subarea

				Raw Statistics using Detected Observations							
Variable	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
Ca (sa-07)	9	0	0.00%	1630	7110	4072	3360	1922	2076	0.518	0.472
Ca (sa-08)	9	0	0.00%	2280	7020	3848	3540	1398	696.8	1.602	0.363
Ca (sa-09)	11	0	0.00%	3590	13200	8527	8250	3327	4552	0.116	0.39
Ca (sa-10)	9	0	0.00%	6330	21100	10493	9030	4556	2431	1.873	0.434
Ca (sa-11)	10	0	0.00%	3780	12100	6716	5635	3006	2468	0.856	0.448
Ca (sa-12)	9	0	0.00%	3250	10400	5979	5720	2017	1557	1.216	0.337
Ca (sa-13)	9	0	0.00%	2700	24500	8359	6490	6736	4937	1.975	0.806
Cr (sa-01)	9	0	0.00%	14.7	47.1	25.92	23.5	9.119	5.634	1.647	0.352
Cr (sa-02)	9	0	0.00%	15.3	48.6	24.98	20.6	11.03	7.858	1.302	0.442
Cr (sa-03)	9	0	0.00%	11.8	110	40.69	20.6	38.15	12.31	1.171	0.938
Cr (sa-04)	9	0	0.00%	13.5	53.8	27.7	27.5	11.1	4.448	1.69	0.401
Cr (sa-05)	8	0	0.00%	14	182	40.55	20.2	57.48	6.227	2.766	1.418
Cr (sa-06)	9	0	0.00%	7.6	40.3	17.78	17.3	10.99	12.45	1.117	0.618
Cr (sa-07)	9	0	0.00%	7	159	29.77	15.1	48.61	5.041	2.965	1.633
Cr (sa-08)	9	0	0.00%	9.1	17.1	13.31	12.2	2.867	3.41	0.101	0.215
Cr (sa-09)	11	0	0.00%	18.1	470	73.15	26.4	133.1	10.38	3.192	1.819
Cr (sa-10)	9	0	0.00%	11.2	34	20.46	20.6	6.739	8.302	0.813	0.329
Cr (sa-11)	10	0	0.00%	8.6	31.9	22.79	22.35	7.621	8.154	-0.437	0.334
Cr (sa-12)	9	0	0.00%	15.1	35	20.82	20.9	6.08	4.744	1.735	0.292
Cr (sa-13)	9	0	0.00%	18	28	22.31	21.5	3.523	0.741	0.876	0.158
Co (sa-01)	9	0	0.00%	6	12.3	8.989	9	1.919	1.483	0.224	0.213
Co (sa-02)	9	0	0.00%	5.3	17.6	8.422	6.9	3.676	2.372	2.328	0.436
Co (sa-03)	9	0	0.00%	4.6	23	9.911	6.4	7.393	2.224	1.376	0.746
Co (sa-04)	9	0	0.00%	6	9.7	8.567	8.9	1.181	0.89	-1.41	0.138
Co (sa-05)	8	0	0.00%	4.8	20	8.038	6.1	5.088	1.779	2.332	0.633
Co (sa-06)	9	0	0.00%	2.2	11.7	6.267	8	3.679	5.486	0.0388	0.587
Co (sa-07)	9	0	0.00%	2.1	22	6.633	5.5	5.914	1.334	2.702	0.892
Co (sa-08)	9	0	0.00%	3.5	8.3	5.144	4.9	1.592	1.927	0.966	0.31
Co (sa-09)	11	0	0.00%	6.2	24.2	10.7	8.6	4.977	2.076	2.324	0.465
Co (sa-10)	9	0	0.00%	2.9	21.5	10.74	10.6	4.906	2.372	1.018	0.457
Co (sa-11)	10	0	0.00%	4.1	12.2	7.87	7.85	2.341	1.927	0.455	0.297
Co (sa-12)	9	0	0.00%	6.5	18.6	9.067	8.4	3.798	2.52	2.389	0.419
Co (sa-13)	9	0	0.00%	6.9	11	8.589	8.5	1.589	2.076	0.623	0.185
Cu (sa-01)	9	0	0.00%	14.3	25	18.54	18.2	3.474	3.41	0.623	0.187
Cu (sa-02)	9	0	0.00%	11.9	34.3	19.93	17.6	7.683	4.151	1.062	0.385
Cu (sa-03)	9	0	0.00%	9.8	47	23.01	17.5	13.94	10.67	0.999	0.606
Cu (sa-04)	9	0	0.00%	17.6	36	25.16	25.2	4.915	2.52	1.104	0.195
Cu (sa-05)	8	0	0.00%	19.7	35.2	26.01	22.6	6.573	3.781	0.691	0.253
Cu (sa-06)	9	0	0.00%	6.4	33.9	20.54	20.1	10.51	12.75	-0.113	0.512
Cu (sa-07)	9	0	0.00%	12.7	62	30.77	30.1	15.31	16.75	1.02	0.498
Cu (sa-08)	9	0	0.00%	15	49.4	25.89	20.8	11.95	6.227	1.257	0.462
Cu (sa-09)	11	0	0.00%	23.4	50.1	32.33	30.9	7.666	7.561	1.225	0.237

Table E-1 - Surface Soil Metal Summary Statistics by Subarea

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Cu (sa-10)	9	0	0.00%	20.7	62.9	36.31	38.8	12.33	11.86	1.14	0.34
Cu (sa-11)	10	0	0.00%	18.7	52	31.73	28.55	10.83	7.709	0.764	0.341
Cu (sa-12)	9	0	0.00%	14.7	52.9	25.82	21	13.2	7.265	1.499	0.511
Cu (sa-13)	9	0	0.00%	16.4	43.7	26.02	21.5	10.44	6.82	0.798	0.401
Fe (sa-01)	9	0	0.00%	17200	40800	24056	22500	6635	1779	2.372	0.276
Fe (sa-02)	9	0	0.00%	18300	28700	21689	20900	3174	3262	1.422	0.146
Fe (sa-03)	9	0	0.00%	14200	39100	21967	18000	9408	4893	1.27	0.428
Fe (sa-04)	9	0	0.00%	15400	23900	21067	21800	2538	1631	-1.501	0.12
Fe (sa-05)	8	0	0.00%	13900	41500	19475	15750	9374	2743	2.335	0.481
Fe (sa-06)	9	0	0.00%	7980	27200	16062	16600	7654	11520	0.245	0.477
Fe (sa-07)	9	0	0.00%	7620	41200	17280	15700	9497	2372	2.348	0.55
Fe (sa-08)	9	0	0.00%	10600	17600	13744	13100	2926	3558	0.213	0.213
Fe (sa-09)	11	0	0.00%	14200	40400	24745	22900	7569	7709	0.789	0.306
Fe (sa-10)	9	0	0.00%	9150	33900	23172	23000	6748	3262	-0.705	0.291
Fe (sa-11)	10	0	0.00%	9140	31000	20824	21700	6128	5782	-0.27	0.294
Fe (sa-12)	9	0	0.00%	17900	40800	24022	22700	6976	4448	1.992	0.29
Fe (sa-13)	9	0	0.00%	17200	25800	22000	22400	2665	2224	-0.544	0.121
Pb (sa-01)	9	0	0.00%	37.6	158	78.28	72.5	34.16	18.38	1.676	0.436
Pb (sa-02)	9	0	0.00%	59.5	405	159.1	107	113.7	55.6	1.473	0.715
Pb (sa-03)	9	0	0.00%	31	509	214.9	174	173.5	162.9	0.735	0.808
Pb (sa-04)	9	0	0.00%	109	512	267.7	224	140.3	134.9	0.551	0.524
Pb (sa-05)	8	0	0.00%	118	389	277.3	319	100.2	69.68	-0.859	0.361
Pb (sa-06)	9	0	0.00%	60.3	619	354.1	401	219.3	318.8	-0.242	0.619
Pb (sa-07)	9	0	0.00%	268	1280	611.1	496	356.2	277.2	0.876	0.583
Pb (sa-08)	9	0	0.00%	62.5	1440	548.8	381	453.4	373.6	1.105	0.826
Pb (sa-09)	11	0	0.00%	165	1040	491.9	503	248.7	219.4	0.866	0.506
Pb (sa-10)	9	0	0.00%	162	1240	382.3	313	330.2	129	2.708	0.864
Pb (sa-11)	10	0	0.00%	83	1920	539.1	437	551.5	446.3	1.953	1.023
Pb (sa-12)	9	0	0.00%	66.4	249	186.7	207	57.42	25.2	-1.435	0.308
Pb (sa-13)	9	0	0.00%	31.9	649	271	202	204.3	129	1.037	0.754
Mg (sa-01)	9	0	0.00%	3670	8750	5532	5230	1515	1290	1.139	0.274
Mg (sa-02)	9	0	0.00%	3220	6570	4940	5000	1023	1067	-0.12	0.207
Mg (sa-03)	9	0	0.00%	2350	13800	6169	4260	4230	2357	1.059	0.686
Mg (sa-04)	9	0	0.00%	3280	7900	5446	5120	1472	800.6	0.636	0.27
Mg (sa-05)	8	0	0.00%	3330	24500	7026	4185	7209	889.5	2.617	1.026
Mg (sa-06)	9	0	0.00%	1800	6200	3524	3570	1719	2254	0.66	0.488
Mg (sa-07)	9	0	0.00%	1760	23400	5574	3340	6738	1171	2.907	1.209
Mg (sa-08)	9	0	0.00%	2180	4250	3192	2900	800.7	637.5	0.404	0.251
Mg (sa-09)	11	0	0.00%	2850	34900	9385	6040	9058	3084	2.656	0.965
Mg (sa-10)	9	0	0.00%	2510	6280	4844	5070	1266	1527	-0.542	0.261
Mg (sa-11)	10	0	0.00%	1960	7580	5113	5145	1707	1475	-0.34	0.334
Mg (sa-12)	9	0	0.00%	3280	9370	5216	4640	1781	1082	1.774	0.341

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Mg (sa-13)	9	0	0.00%	3510	6610	4862	4770	1023	1127	0.555	0.21
Mn (sa-01)	9	0	0.00%	914	2340	1426	1150	560.4	286.1	1.046	0.393
Mn (sa-02)	9	0	0.00%	399	2510	1145	1120	586.5	222.4	1.598	0.512
Mn (sa-03)	9	0	0.00%	622	2420	1271	1090	561.1	338	1.176	0.441
Mn (sa-04)	9	0	0.00%	574	1190	823.8	831	200	262.4	0.59	0.243
Mn (sa-05)	8	0	0.00%	427	1090	667.1	539.5	260.5	160.9	0.774	0.39
Mn (sa-06)	9	0	0.00%	162	2020	917.7	942	610.5	649.4	0.396	0.665
Mn (sa-07)	9	0	0.00%	254	1050	611	542	313.3	266.9	0.577	0.513
Mn (sa-08)	9	0	0.00%	304	918	637.8	619	207.7	262.4	-0.34	0.326
Mn (sa-09)	11	0	0.00%	334	2030	1182	1260	522.9	696.8	0.0133	0.442
Mn (sa-10)	9	0	0.00%	43.6	5490	2387	2340	1650	1883	0.502	0.691
Mn (sa-11)	10	0	0.00%	497	2850	1282	1265	679.7	556	1.32	0.53
Mn (sa-12)	9	0	0.00%	655	2750	1590	1470	660	578.2	0.537	0.415
Mn (sa-13)	9	0	0.00%	317	2270	1227	1260	543.6	326.2	0.304	0.443
Hg (sa-01)	9	0	0.00%	0.04	0.073	0.0501	0.048	0.0102	0.00593	1.643	0.203
Hg (sa-02)	9	0	0.00%	0.03	0.066	0.0453	0.041	0.0137	0.0119	0.557	0.303
Hg (sa-03)	9	0	0.00%	0.022	0.148	0.0636	0.036	0.0492	0.0208	0.927	0.774
Hg (sa-04)	9	0	0.00%	0.039	0.139	0.0739	0.073	0.0311	0.0326	1.201	0.42
Hg (sa-05)	8	0	0.00%	0.043	0.114	0.0733	0.0735	0.024	0.0267	0.387	0.328
Hg (sa-06)	9	0	0.00%	0.015	0.108	0.0702	0.082	0.0364	0.0311	-0.678	0.519
Hg (sa-07)	9	0	0.00%	0.055	0.278	0.126	0.099	0.0733	0.0519	1.243	0.58
Hg (sa-08)	9	0	0.00%	0.019	0.287	0.108	0.085	0.084	0.0771	1.271	0.775
Hg (sa-09)	11	0	0.00%	0.054	0.262	0.13	0.115	0.0648	0.0697	0.698	0.499
Hg (sa-10)	9	0	0.00%	0.06	0.232	0.108	0.094	0.0502	0.0252	2.18	0.463
Hg (sa-11)	10	0	0.00%	0.035	0.527	0.147	0.115	0.142	0.063	2.508	0.964
Hg (sa-12)	9	0	0.00%	0.045	0.135	0.0706	0.065	0.0267	0.0119	1.992	0.378
Hg (sa-13)	9	0	0.00%	0.044	0.113	0.082	0.085	0.0234	0.0237	-0.319	0.285
Ni (sa-01)	9	0	0.00%	13.1	33.6	23.03	23.4	5.653	4.596	0.165	0.245
Ni (sa-02)	9	0	0.00%	12.9	41.2	21.12	15.3	9.975	3.558	1.226	0.472
Ni (sa-03)	9	0	0.00%	11.4	95.3	35.16	19.4	31.66	11.12	1.174	0.9
Ni (sa-04)	9	0	0.00%	14.5	35.5	21.12	21.2	6.277	4.596	1.586	0.297
Ni (sa-05)	8	0	0.00%	10.8	44.9	18.85	14.5	11.61	5.486	1.942	0.616
Ni (sa-06)	9	0	0.00%	6.6	30.3	16.26	16.6	9.275	14.08	0.307	0.571
Ni (sa-07)	9	0	0.00%	5.9	83.8	20.33	14.3	24.02	4.151	2.891	1.181
Ni (sa-08)	9	0	0.00%	8.9	17.6	12.47	11.5	2.885	3.855	0.491	0.231
Ni (sa-09)	11	0	0.00%	20.7	178	41.71	26.9	45.52	8.895	3.232	1.091
Ni (sa-10)	9	0	0.00%	13.1	57.2	35.99	29.8	15.95	16.46	0.198	0.443
Ni (sa-11)	10	0	0.00%	7.8	38.8	21.17	19.8	8.555	3.632	0.821	0.404
Ni (sa-12)	9	0	0.00%	14.3	76.4	27.47	20.4	19.39	5.782	2.469	0.706
Ni (sa-13)	9	0	0.00%	15.5	26.5	19.79	18.9	3.283	2.372	0.989	0.166
K (sa-01)	9	0	0.00%	1090	1820	1378	1370	238.3	296.5	0.607	0.173
K (sa-02)	9	0	0.00%	1320	3380	2032	1900	649.7	415.1	1.284	0.32

Table E-1 - Surface Soil Metal Summary Statistics by Subarea

				Raw Statistics using Detected Observations							
Variable	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
K (sa-03)	9	0	0.00%	990	4730	2216	1640	1419	815.4	1.126	0.64
K (sa-04)	9	0	0.00%	1350	3520	2501	2760	645	459.6	-0.386	0.258
K (sa-05)	8	0	0.00%	1120	10400	3264	2460	2957	867.3	2.553	0.906
K (sa-06)	9	0	0.00%	600	2480	1416	1490	723.6	1112	0.239	0.511
K (sa-07)	9	0	0.00%	490	13900	2780	1370	4219	756.1	2.869	1.518
K (sa-08)	9	0	0.00%	610	1670	1170	1330	374.9	326.2	-0.387	0.32
K (sa-09)	11	0	0.00%	1150	17200	3620	1890	4660	563.4	2.966	1.287
K (sa-10)	9	0	0.00%	460	2120	1527	1600	470.6	326.2	-1.451	0.308
K (sa-11)	10	0	0.00%	1200	2230	1700	1815	368.7	422.5	-0.191	0.217
K (sa-12)	9	0	0.00%	1100	2010	1551	1530	281.6	192.7	0.292	0.182
K (sa-13)	9	0	0.00%	1200	2380	1533	1340	459.2	163.1	1.509	0.3
Se (sa-01)	0	9	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Se (sa-02)	0	9	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Se (sa-03)	0	9	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Se (sa-04)	0	9	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Se (sa-05)	0	8	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Se (sa-06)	0	9	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Se (sa-07)	1	8	88.89%	0.6	0.6	0.6	0.6	N/A	0	N/A	N/A
Se (sa-08)	0	9	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Se (sa-09)	1	10	90.91%	1	1	1	1	N/A	0	N/A	N/A
Se (sa-10)	3	6	66.67%	0.5	5.2	2.333	1.3	2.515	1.186	1.537	1.078
Se (sa-11)	2	8	80.00%	0.6	0.7	0.65	0.65	0.0707	0.0741	N/A	0.109
Se (sa-12)	1	8	88.89%	0.6	0.6	0.6	0.6	N/A	0	N/A	N/A
Se (sa-13)	1	8	88.89%	1.7	1.7	1.7	1.7	N/A	0	N/A	N/A
Ag (sa-01)	0	9	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ag (sa-02)	2	7	77.78%	0.2	0.2	0.2	0.2	0	0	N/A	0
Ag (sa-03)	3	6	66.67%	0.2	0.3	0.267	0.3	0.0577	0	-1.732	0.217
Ag (sa-04)	5	4	44.44%	0.2	0.4	0.28	0.3	0.0837	0.148	0.512	0.299
Ag (sa-05)	7	1	12.50%	0.2	0.4	0.3	0.3	0.0816	0.148	4.276E-15	0.272
Ag (sa-06)	6	3	33.33%	0.3	0.4	0.317	0.3	0.0408	0	2.449	0.129
Ag (sa-07)	9	0	0.00%	0.2	1	0.544	0.5	0.313	0.445	0.446	0.574
Ag (sa-08)	6	3	33.33%	0.3	1.2	0.567	0.5	0.339	0.222	1.635	0.598
Ag (sa-09)	11	0	0.00%	0.3	0.6	0.436	0.5	0.121	0.148	-0.0276	0.276
Ag (sa-10)	8	1	11.11%	0.2	0.6	0.338	0.3	0.13	0.148	1.14	0.386
Ag (sa-11)	8	2	20.00%	0.2	2	0.575	0.35	0.59	0.148	2.574	1.026
Ag (sa-12)	5	4	44.44%	0.2	1.2	0.44	0.3	0.428	0.148	2.16	0.972
Ag (sa-13)	7	2	22.22%	0.3	0.4	0.314	0.3	0.0378	0	2.646	0.12
Na (sa-01)	8	1	11.11%	100	200	155	160	38.54	37.06	-0.489	0.249
Na (sa-02)	8	1	11.11%	170	260	200	185	30.71	14.83	1.184	0.154
Na (sa-03)	7	2	22.22%	110	220	172.9	170	36.84	29.65	-0.485	0.213
Na (sa-04)	7	2	22.22%	130	160	150	150	11.55	14.83	-0.909	0.077
Na (sa-05)	8	0	0.00%	140	270	213.8	220	43.07	51.89	-0.399	0.202

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Na (sa-06)	5	4	44.44%	140	190	166	160	19.49	29.65	-0.081	0.117
Na (sa-07)	7	2	22.22%	130	320	184.3	160	64.25	29.65	1.96	0.349
Na (sa-08)	5	4	44.44%	120	270	166	140	61.07	29.65	1.762	0.368
Na (sa-09)	11	0	0.00%	150	340	232.7	210	69.15	88.95	0.284	0.297
Na (sa-10)	8	1	11.11%	150	250	197.5	200	32.84	29.65	0.101	0.166
Na (sa-11)	8	2	20.00%	130	320	227.5	255	73.44	66.72	-0.358	0.323
Na (sa-12)	9	0	0.00%	160	310	223.3	220	51.23	74.13	0.448	0.229
Na (sa-13)	8	1	11.11%	170	290	222.5	215	46.83	44.48	0.58	0.21
Tl (sa-01)	2	7	77.78%	0.2	0.3	0.25	0.25	0.0707	0.0741	N/A	0.283
Tl (sa-02)	5	4	44.44%	0.2	0.5	0.3	0.3	0.122	0.148	1.361	0.408
Tl (sa-03)	5	4	44.44%	0.2	0.6	0.36	0.3	0.182	0.148	0.567	0.505
Tl (sa-04)	8	1	11.11%	0.2	0.4	0.313	0.3	0.0835	0.148	-0.277	0.267
Tl (sa-05)	8	0	0.00%	0.2	0.5	0.338	0.35	0.106	0.0741	-0.0449	0.314
Tl (sa-06)	6	3	33.33%	0.3	0.4	0.367	0.4	0.0516	0	-0.968	0.141
Tl (sa-07)	9	0	0.00%	0.2	0.9	0.511	0.5	0.226	0.148	0.575	0.442
Tl (sa-08)	8	1	11.11%	0.2	1	0.488	0.35	0.3	0.148	1.136	0.615
Tl (sa-09)	11	0	0.00%	0.3	0.9	0.555	0.5	0.207	0.148	0.419	0.373
Tl (sa-10)	8	1	11.11%	0.3	1.2	0.488	0.4	0.295	0.0741	2.569	0.605
Tl (sa-11)	10	0	0.00%	0.2	1	0.48	0.5	0.262	0.297	0.644	0.545
Tl (sa-12)	8	1	11.11%	0.2	0.4	0.263	0.25	0.0744	0.0741	0.824	0.283
Tl (sa-13)	8	1	11.11%	0.2	0.5	0.325	0.3	0.128	0.148	0.475	0.394
V (sa-01)	9	0	0.00%	23	42.5	32.3	32.7	5.546	4.448	0.148	0.172
V (sa-02)	9	0	0.00%	17.5	34.6	27.32	27.7	5.361	3.558	-0.401	0.196
V (sa-03)	9	0	0.00%	17.5	39	25.02	19.5	8.986	2.965	0.768	0.359
V (sa-04)	9	0	0.00%	18.4	43.1	28.42	28.6	6.888	4.744	1.009	0.242
V (sa-05)	8	0	0.00%	20.5	73	30.93	22.5	18.27	2.965	2.217	0.591
V (sa-06)	9	0	0.00%	10.6	28.5	18.26	20.3	6.499	11.27	0.144	0.356
V (sa-07)	9	0	0.00%	9	75	25	19.1	19.26	4.893	2.685	0.771
V (sa-08)	9	0	0.00%	12.9	30.8	20.36	18.7	6.563	4.596	0.75	0.322
V (sa-09)	11	0	0.00%	17.3	73.5	33.17	26.7	18.05	8.599	1.647	0.544
V (sa-10)	9	0	0.00%	20.8	42.4	25.67	24.6	6.641	3.41	2.405	0.259
V (sa-11)	10	0	0.00%	11.4	47.3	30.65	30.9	9.583	5.56	-0.254	0.313
V (sa-12)	9	0	0.00%	23.4	44.3	29.71	28.5	6.58	5.189	1.44	0.221
V (sa-13)	9	0	0.00%	23.3	39	32.98	34.6	5.331	5.041	-0.704	0.162
Zn (sa-01)	9	0	0.00%	127	227	152.2	147	31.16	20.76	2.049	0.205
Zn (sa-02)	9	0	0.00%	105	520	258.8	210	148.2	65.23	1.159	0.573
Zn (sa-03)	9	0	0.00%	83	660	280.3	233	191.7	155.7	1.059	0.684
Zn (sa-04)	9	0	0.00%	186	430	290.6	281	91.32	131.9	0.148	0.314
Zn (sa-05)	8	0	0.00%	161	510	321.4	310	119	118.6	0.425	0.37
Zn (sa-06)	9	0	0.00%	70	540	331.7	420	183.7	74.13	-0.654	0.554
Zn (sa-07)	9	0	0.00%	188	1130	525.9	480	288.5	252	1.176	0.549
Zn (sa-08)	9	0	0.00%	112	1210	477.6	370	353.8	281.7	1.286	0.741

Table E-1 - Surface Soil Metal Summary Statistics by Subarea

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Zn (sa-09)	11	0	0.00%	280	850	526.4	490	190.6	192.7	0.466	0.362
Zn (sa-10)	9	0	0.00%	165	1330	549.1	400	375.6	222.4	1.217	0.684
Zn (sa-11)	10	0	0.00%	169	1150	480	360	324	269.8	0.997	0.675
Zn (sa-12)	9	0	0.00%	163	440	281.6	249	100.3	78.58	0.757	0.356
Zn (sa-13)	9	0	0.00%	160	660	316.8	271	185.1	126	1.339	0.584

Table E-2 - Surface Soil Metal Percentiles by Subarea

Variable	NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Al (sa-01)	9	16500	16500	17620	18575	21250	23450	24200	26620	26710	26782
Al (sa-02)	9	11200	11200	14000	14725	16250	20525	21200	21800	22700	23420
Al (sa-03)	9	11000	11000	13880	14625	16000	20150	20620	21920	22010	22082
Al (sa-04)	9	12900	12900	13620	13925	14700	16200	16740	17440	18070	18574
Al (sa-05)	8	10700	10700	11360	11800	14300	15500	16380	20480	26040	30488
Al (sa-06)	9	4590	4590	5070	5408	8760	16050	16240	16470	16785	17037
Al (sa-07)	9	4600	4600	7432	8730	11700	16375	18040	21020	24710	27662
Al (sa-08)	9	7360	7360	8344	8625	9555	12350	13400	15100	15550	15910
Al (sa-09)	11	15300	15330	15720	16050	18550	21050	21160	27950	29015	29323
Al (sa-10)	9	17400	17400	17800	17950	18850	20325	20640	21090	22395	23439
Al (sa-11)	10	6940	6940	14900	14950	16600	20200	21400	22500	23000	23400
Al (sa-12)	9	16600	16600	16920	17550	22200	25475	25720	27040	30820	33844
Al (sa-13)	9	12700	12700	13660	14750	18450	21900	22240	22980	25590	27678
Sb (sa-01)	9	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sb (sa-02)	9	0.2	0.2	0.2	0.2	0.2	0.2	0.22	0.31	0.355	0.391
Sb (sa-03)	9	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.24	0.42	0.564
Sb (sa-04)	9	0.2	0.2	0.2	0.2	0.2	0.2	0.22	0.3	0.3	0.3
Sb (sa-05)	8	0.2	0.2	0.2	0.2	0.3	0.3	0.38	0.5	0.5	0.5
Sb (sa-06)	9	0.2	0.2	0.2	0.225	0.3	0.475	0.5	0.6	1.05	1.41
Sb (sa-07)	9	0.3	0.3	0.38	0.45	0.75	1.4	1.54	1.86	2.58	3.156
Sb (sa-08)	9	0.2	0.2	0.2	0.2	0.5	0.85	0.96	1.34	1.97	2.474
Sb (sa-09)	11	0.2	0.2	0.2	0.2	0.35	0.5	0.5	0.68	0.88	1.056
Sb (sa-10)	9	0.2	0.2	0.2	0.2	0.4	0.725	0.94	1.52	1.61	1.682
Sb (sa-11)	10	0.2	0.2	0.2	0.2	0.3	0.85	0.9	0.9	9.05	15.57
Sb (sa-12)	9	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.22	0.31	0.382
Sb (sa-13)	9	0.2	0.2	0.2	0.225	0.3	0.475	0.5	0.5	0.5	0.5
As (sa-01)	9	9.4	9.4	9.72	9.95	11.45	13.5	14.42	17.33	19.27	20.81
As (sa-02)	9	7.4	7.4	8.04	9.2	15.05	16.65	16.98	18.2	20.45	22.25
As (sa-03)	9	5.9	5.9	6.38	6.85	10.75	14.95	15.62	17.34	17.52	17.66
As (sa-04)	9	9.1	9.1	11.26	11.83	13.4	15.83	16.44	18.04	19.12	19.98
As (sa-05)	8	8.4	8.4	8.58	8.7	10.4	12.1	14.06	18.84	22.52	25.46
As (sa-06)	9	5.7	5.7	6.66	7.55	13.85	15.58	17.6	26.67	31.49	35.34
As (sa-07)	9	8.8	8.8	9.76	11.4	20.35	28.35	30.7	35.82	37.26	38.41
As (sa-08)	9	7.6	7.6	10.88	11.75	17.15	26.5	30.4	38.35	41.73	44.43
As (sa-09)	11	10.3	10.64	13.78	14	24.15	29.1	30.2	33.03	34.52	35.7
As (sa-10)	9	5.6	5.6	10.32	11.6	18.8	30.35	32.58	40.92	48.21	54.04
As (sa-11)	10	9	9	10.6	11.45	20.7	25.5	28.6	35	36.15	37.07
As (sa-12)	9	10	10	10.8	11.6	14.7	16.18	16.52	18.19	21.75	24.59
As (sa-13)	9	5.3	5.3	5.78	6.35	14.6	18.13	19.06	21.77	22.09	22.34
Ba (sa-01)	9	226	226	254	262.5	412	471.8	522.6	710.5	915.3	1079
Ba (sa-02)	9	90.4	90.4	180.5	204.5	286	338.3	353.6	427.2	585.6	712.3
Ba (sa-03)	9	269	269	273.8	281.5	314.5	437	519	837.7	885.9	924.4
Ba (sa-04)	9	135	135	161.4	169.8	192	213	230	299.3	341.2	374.6
Ba (sa-05)	8	130	130	148	160	197	227	253.4	389	581	734.6
Ba (sa-06)	9	34.8	34.8	42.24	62.83	216.5	318	323.2	341.2	346.6	350.9
Ba (sa-07)	9	55	55	90.52	104.6	163	247.3	277.6	314.2	414.1	494
Ba (sa-08)	9	75.7	75.7	81.46	91.93	160	191.8	207.2	283.9	355.5	412.7
Ba (sa-09)	11	120	126.6	186.6	188.3	371.5	550.5	584.6	708.6	1562	2384
Ba (sa-10)	9	132	132	209.6	265.3	434	501	503	507.5	509.8	511.6
Ba (sa-11)	10	192	192	230	242.5	413	463.5	484	523	699.5	840.7
Ba (sa-12)	9	154	154	232.4	255.5	366	412	416.2	441.5	515.8	575.2
Ba (sa-13)	9	157	157	249	272.5	294.5	366.5	398.4	452.2	453.1	453.8
Be (sa-01)	9	0.7	0.7	0.7	0.7	0.8	0.95	1	1.02	1.11	1.182
Be (sa-02)	9	0.4	0.4	0.48	0.5	0.5	0.675	0.72	0.81	0.855	0.891
Be (sa-03)	9	0.4	0.4	0.4	0.425	0.5	0.75	0.82	0.9	0.9	0.9
Be (sa-04)	9	0.5	0.5	0.5	0.5	0.5	0.575	0.6	0.61	0.655	0.691
Be (sa-05)	8	0.3	0.3	0.36	0.4	0.4	0.6	0.6	0.64	0.72	0.784
Be (sa-06)	9	0.2	0.2	0.2	0.2	0.35	0.575	0.6	0.6	0.6	0.6

Table E-2 - Surface Soil Metal Percentiles by Subarea

Variable	NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Be (sa-07)	9	0.2	0.2	0.28	0.325	0.4	0.475	0.52	0.61	0.655	0.691
Be (sa-08)	9	0.2	0.2	0.28	0.3	0.3	0.4	0.4	0.41	0.455	0.491
Be (sa-09)	11	0.5	0.51	0.6	0.6	0.6	0.6	0.6	0.78	1.115	1.423
Be (sa-10)	9	0.5	0.5	0.5	0.525	0.65	0.7	0.72	0.84	1.02	1.164
Be (sa-11)	10	0.4	0.4	0.5	0.5	0.5	0.65	0.7	0.7	0.85	0.97
Be (sa-12)	9	0.4	0.4	0.4	0.425	0.55	0.675	0.82	1.33	1.465	1.573
Be (sa-13)	9	0.4	0.4	0.48	0.5	0.5	0.5	0.52	0.62	0.71	0.782
Cd (sa-01)	9	0.9	0.9	0.98	1	1.55	1.925	2.02	2.22	2.76	3.192
Cd (sa-02)	9	1.4	1.4	1.8	1.925	2.25	4.475	4.96	5.99	9.545	12.39
Cd (sa-03)	9	0.6	0.6	1.24	1.45	2.95	6.1	6.98	8.04	9.57	10.79
Cd (sa-04)	9	2.7	2.7	3.26	3.45	5.47	7.1	7.88	9.02	9.11	9.182
Cd (sa-05)	8	2.9	2.9	3.38	3.7	5.9	7.5	7.94	8.78	9.14	9.428
Cd (sa-06)	9	1.1	1.1	1.42	1.75	7.785	8.825	9.08	9.88	10.24	10.53
Cd (sa-07)	9	4.77	4.77	5.434	5.65	7.45	10.58	11.66	14.23	15.72	16.9
Cd (sa-08)	9	1.5	1.5	2.7	3.875	7.7	10.43	12.32	18.41	18.46	18.49
Cd (sa-09)	11	4.26	4.324	5.22	6.1	10.15	13.68	13.84	15.79	19.69	23.3
Cd (sa-10)	9	4.1	4.1	4.42	4.975	7.4	17.1	20.28	23.71	30.51	35.94
Cd (sa-11)	10	2.2	2.2	2.4	2.45	6.3	14	14.7	15.8	16.35	16.79
Cd (sa-12)	9	2	2	2.48	2.65	3.65	4.175	4.34	5.033	5.632	6.11
Cd (sa-13)	9	1.3	1.3	2.18	2.45	3.2	4.275	5.86	11.82	12.36	12.79
Ca (sa-01)	9	3110	3110	3574	4013	5070	5610	6076	7830	9315	10503
Ca (sa-02)	9	3370	3370	3386	3580	4800	5605	5772	6122	6941	7596
Ca (sa-03)	9	2800	2800	2904	2945	4530	7535	9348	14930	15065	15173
Ca (sa-04)	9	4420	4420	4756	4875	5670	6905	7150	7497	7619	7716
Ca (sa-05)	8	4120	4120	5224	5960	7000	7540	8644	11300	13300	14900
Ca (sa-06)	9	1310	1310	1534	1625	3540	4798	4830	5047	5484	5833
Ca (sa-07)	9	1630	1630	1894	2298	3345	4885	5474	6768	6939	7076
Ca (sa-08)	9	2280	2280	2712	2883	3395	3960	4174	5049	6035	6823
Ca (sa-09)	11	3590	3712	4884	5088	7815	10700	11580	13070	13200	13200
Ca (sa-10)	9	6330	6330	7178	7455	8895	10395	11360	14710	17905	20461
Ca (sa-11)	10	3780	3780	4010	4070	5590	8165	8990	10900	11500	11980
Ca (sa-12)	9	3250	3250	4274	4570	5610	6588	6798	7259	8830	10086
Ca (sa-13)	9	2700	2700	2980	3358	5500	9785	9896	11630	18065	23213
Cr (sa-01)	9	14.7	14.7	18.54	20.08	23.2	27.15	27.8	31.53	39.32	45.54
Cr (sa-02)	9	15.3	15.3	15.78	16.03	18.95	29.9	30.58	33.39	41	47.08
Cr (sa-03)	9	11.8	11.8	12.2	12.88	20.45	51.65	68.4	95.6	102.8	108.6
Cr (sa-04)	9	13.5	13.5	19.26	21	26	28.68	29.22	32.83	43.32	51.7
Cr (sa-05)	8	14	14	14.9	15.5	19.3	22.2	26.84	63.44	122.7	170.1
Cr (sa-06)	9	7.6	7.6	8.16	8.45	13.25	20.45	22.04	29.05	34.68	39.18
Cr (sa-07)	9	7	7	9.64	10.55	13.8	17.6	18.18	32.55	95.77	146.4
Cr (sa-08)	9	9.1	9.1	10.3	10.88	12.05	15.48	16.02	16.92	17.01	17.08
Cr (sa-09)	11	18.1	18.23	20.36	23	26	36.1	41.82	84.49	260.5	428.1
Cr (sa-10)	9	11.2	11.2	14.16	14.93	20.5	21.05	22.2	26.98	30.49	33.3
Cr (sa-11)	10	8.6	8.6	14.9	17.2	21.5	28.55	31.2	31.4	31.65	31.85
Cr (sa-12)	9	15.1	15.1	15.82	16.03	19.3	22.3	22.6	23.84	29.42	33.88
Cr (sa-13)	9	18	18	18.56	19.33	21.45	22	23.2	28	28	28
Co (sa-01)	9	6	6	6.88	7.35	8.65	9.8	10.18	11.04	11.67	12.17
Co (sa-02)	9	5.3	5.3	6.18	6.4	6.85	8.5	8.68	10.22	13.91	16.86
Co (sa-03)	9	4.6	4.6	4.84	4.925	6	9.925	13.2	22.1	22.55	22.91
Co (sa-04)	9	6	6	7.28	7.775	8.65	9.3	9.36	9.61	9.655	9.691
Co (sa-05)	8	4.8	4.8	4.92	5	5.6	7.6	8.36	11.6	15.8	19.16
Co (sa-06)	9	2.2	2.2	2.44	2.525	5.45	8.75	8.98	9.54	10.62	11.48
Co (sa-07)	9	2.1	2.1	3.14	3.625	5.05	5.75	5.92	7.96	14.98	20.6
Co (sa-08)	9	3.5	3.5	3.58	3.675	4.6	6	6.32	6.59	7.445	8.129
Co (sa-09)	11	6.2	6.36	7.86	8.025	8.6	10.5	11.16	14.1	18.81	23.12
Co (sa-10)	9	2.9	2.9	7.46	8.7	9.8	11.73	12.16	13.31	17.41	20.68
Co (sa-11)	10	4.1	4.1	6	6.2	7.8	8.4	8.7	10.8	11.5	12.06
Co (sa-12)	9	6.5	6.5	6.5	6.55	7.8	8.75	9.1	11.13	14.87	17.85

Table E-2 - Surface Soil Metal Percentiles by Subarea

Variable	NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Co (sa-13)	9	6.9	6.9	6.98	7.025	8.15	9	9.4	11	11	11
Cu (sa-01)	9	14.3	14.3	14.86	15.25	17.45	20.28	20.72	21.94	23.47	24.69
Cu (sa-02)	9	11.9	11.9	11.98	12.95	17.55	20.18	22.4	30.79	32.55	33.95
Cu (sa-03)	9	9.8	9.8	10.2	11.18	16.1	26.95	31.68	43.94	45.47	46.69
Cu (sa-04)	9	17.6	17.6	21.2	22.45	24.45	25.75	26.14	27.99	32	35.2
Cu (sa-05)	8	19.7	19.7	20.12	20.4	22.4	30.9	32.54	35.04	35.12	35.18
Cu (sa-06)	9	6.4	6.4	7.28	8.5	19.1	27.73	29.26	33.18	33.54	33.83
Cu (sa-07)	9	12.7	12.7	17.5	18.73	26.05	35.98	38.62	45.35	53.68	60.34
Cu (sa-08)	9	15	15	16.28	16.9	19.7	28	31.48	41.84	45.62	48.64
Cu (sa-09)	11	23.4	23.53	24.92	25.53	30.7	34.33	37.02	38.36	43.67	48.81
Cu (sa-10)	9	20.7	20.7	25.34	26.63	34.8	39.18	39.72	43.91	53.41	61
Cu (sa-11)	10	18.7	18.7	22.6	23.35	25.1	37.2	41.9	43.5	47.75	51.15
Cu (sa-12)	9	14.7	14.7	15.1	16	20.4	24.83	29.3	43.9	48.4	52
Cu (sa-13)	9	16.4	16.4	16.8	17.15	20.05	32.35	35.48	39.47	41.59	43.28
Fe (sa-01)	9	17200	17200	20000	21000	22300	23450	23940	26490	33645	39369
Fe (sa-02)	9	18300	18300	18620	19000	20850	22600	23220	24200	26450	28250
Fe (sa-03)	9	14200	14200	14600	14800	17300	22575	25900	36580	37840	38848
Fe (sa-04)	9	15400	15400	18760	19650	21650	22525	22740	23000	23450	23810
Fe (sa-05)	8	13900	13900	13900	13900	15100	18400	20040	26300	33900	39980
Fe (sa-06)	9	7980	7980	8132	8335	13140	20700	21860	25490	26345	27029
Fe (sa-07)	9	7620	7620	10484	11925	15650	16175	16640	20320	30760	39112
Fe (sa-08)	9	10600	10600	10680	10825	12250	16375	16760	17060	17330	17546
Fe (sa-09)	11	14200	14500	17700	19075	22450	28150	28260	33160	36715	39663
Fe (sa-10)	9	9150	9150	18070	20500	22750	25000	25960	29490	31695	33459
Fe (sa-11)	10	9140	9140	15700	16650	21500	23150	24000	27100	29050	30610
Fe (sa-12)	9	17900	17900	18140	18575	21950	25000	25620	27930	34365	39513
Fe (sa-13)	9	17200	17200	18640	19475	22200	23075	23400	24720	25260	25692
Pb (sa-01)	9	37.6	37.6	48.48	54.13	69.4	84.1	85.8	96.26	127.1	151.8
Pb (sa-02)	9	59.5	59.5	67.5	73.75	106	202.3	232.8	263.7	334.4	390.9
Pb (sa-03)	9	31	31	57.48	66.53	139.5	310.8	364.4	437.9	473.5	501.9
Pb (sa-04)	9	109	109	128.2	133.5	218.5	364.3	388.4	409.4	460.7	501.7
Pb (sa-05)	8	118	118	130.6	139	301	340	341.6	353	371	385.4
Pb (sa-06)	9	60.3	60.3	79.66	93.88	380	492.8	541.6	616.3	617.7	618.7
Pb (sa-07)	9	268	268	300.8	310.3	426	838.8	911.6	968.6	1124	1249
Pb (sa-08)	9	62.5	62.5	115.7	173.8	372	665	803.6	1107	1274	1407
Pb (sa-09)	11	165	171.5	236	252.5	469.5	567	628.6	687	848.1	1002
Pb (sa-10)	9	162	162	192.4	205.5	279.5	329.5	344	484	862	1164
Pb (sa-11)	10	83	83	94.7	103.9	374	643.5	715	810	1365	1809
Pb (sa-12)	9	66.4	66.4	109.3	135.8	205.5	215.3	218.4	226.5	237.8	246.8
Pb (sa-13)	9	31.9	31.9	89.58	118.8	185	287	341.4	560.8	604.9	640.2
Mg (sa-01)	9	3670	3670	4206	4345	5130	6005	6174	6770	7760	8552
Mg (sa-02)	9	3220	3220	3924	4143	4735	5588	5640	5805	6188	6494
Mg (sa-03)	9	2350	2350	2606	2858	4040	7765	9424	12000	12900	13620
Mg (sa-04)	9	3280	3280	4152	4485	4975	5605	6044	7612	7756	7871
Mg (sa-05)	8	3330	3330	3516	3640	3690	4840	6048	11188	17844	23169
Mg (sa-06)	9	1800	1800	1944	1998	2830	3995	4422	6083	6142	6188
Mg (sa-07)	9	1760	1760	2392	2713	3320	4255	4448	6372	14886	21697
Mg (sa-08)	9	2180	2180	2412	2503	2850	3915	4154	4178	4214	4243
Mg (sa-09)	11	2850	2961	4248	5040	5910	8328	8498	14536	24065	32733
Mg (sa-10)	9	2510	2510	3614	3928	4715	5853	6104	6208	6244	6273
Mg (sa-11)	10	1960	1960	3290	3855	4870	5935	6410	7150	7365	7537
Mg (sa-12)	9	3280	3280	3784	4025	4620	5400	5682	6562	7966	9089
Mg (sa-13)	9	3510	3510	3854	4005	4550	5348	5638	6124	6367	6561
Mn (sa-01)	9	914	914	948.4	975.3	1135	1585	1800	2322	2331	2338
Mn (sa-02)	9	399	399	641.4	731	1105	1220	1246	1394	1952	2398
Mn (sa-03)	9	622	622	814	872	1037	1388	1506	1907	2164	2369
Mn (sa-04)	9	574	574	604.4	622.5	816	863	904	1055	1123	1177
Mn (sa-05)	8	427	427	431.8	435	539	851	895.8	988.4	1039	1080

Table E-2 - Surface Soil Metal Percentiles by Subarea

Variable	NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Mn (sa-06)	9	162	162	178	251.8	817	1245	1300	1444	1732	1962
Mn (sa-07)	9	254	254	340.4	362.5	468.5	839.5	954.4	1041	1046	1049
Mn (sa-08)	9	304	304	361.6	421.3	610	775.3	808	862.2	890.1	912.4
Mn (sa-09)	11	334	366	657.4	666.8	1205	1438	1652	1730	1865	1997
Mn (sa-10)	9	43.6	43.6	672.7	890	2265	2863	3058	3978	4734	5339
Mn (sa-11)	10	497	497	676	701	1200	1515	1570	1630	2240	2728
Mn (sa-12)	9	655	655	903.8	1037	1420	1798	1964	2417	2584	2717
Mn (sa-13)	9	317	317	729.8	837.5	1220	1453	1480	1559	1915	2199
Hg (sa-01)	9	0.04	0.04	0.0416	0.0425	0.047	0.0498	0.0518	0.0604	0.0667	0.0717
Hg (sa-02)	9	0.03	0.03	0.0324	0.033	0.0405	0.0558	0.0604	0.0624	0.0642	0.0656
Hg (sa-03)	9	0.022	0.022	0.0244	0.0255	0.0335	0.0923	0.11	0.128	0.138	0.146
Hg (sa-04)	9	0.039	0.039	0.047	0.0495	0.065	0.0788	0.0844	0.106	0.122	0.136
Hg (sa-05)	8	0.043	0.043	0.0472	0.05	0.068	0.088	0.0888	0.0948	0.104	0.112
Hg (sa-06)	9	0.015	0.015	0.0238	0.0268	0.081	0.0953	0.0974	0.104	0.106	0.108
Hg (sa-07)	9	0.055	0.055	0.0622	0.0668	0.095	0.156	0.174	0.201	0.239	0.27
Hg (sa-08)	9	0.019	0.019	0.0302	0.0385	0.0785	0.142	0.159	0.181	0.234	0.276
Hg (sa-09)	11	0.054	0.054	0.0568	0.0645	0.114	0.164	0.179	0.19	0.223	0.254
Hg (sa-10)	9	0.06	0.06	0.0736	0.0785	0.091	0.112	0.116	0.135	0.183	0.222
Hg (sa-11)	10	0.035	0.035	0.05	0.0605	0.104	0.15	0.15	0.185	0.356	0.493
Hg (sa-12)	9	0.045	0.045	0.0458	0.0498	0.064	0.0715	0.0744	0.0855	0.11	0.13
Hg (sa-13)	9	0.044	0.044	0.0552	0.0605	0.077	0.1	0.1	0.102	0.108	0.112
Ni (sa-01)	9	13.1	13.1	18.46	19.83	22.15	25.23	25.62	27.21	30.41	32.96
Ni (sa-02)	9	12.9	12.9	13.38	13.68	14.8	24.9	27.38	32.65	36.93	40.35
Ni (sa-03)	9	11.4	11.4	11.8	12.18	16.7	47.28	59.42	76.04	85.67	93.37
Ni (sa-04)	9	14.5	14.5	15.14	15.73	20.25	21.6	22.22	25.42	30.46	34.49
Ni (sa-05)	8	10.8	10.8	10.8	10.8	12.4	20.9	21.94	27.78	36.34	43.19
Ni (sa-06)	9	6.6	6.6	6.84	6.95	12.8	21.73	23.22	27.6	28.95	30.03
Ni (sa-07)	9	5.9	5.9	9.02	10.15	12.9	15.33	15.76	23.14	53.47	77.73
Ni (sa-08)	9	8.9	8.9	9.46	9.725	11.4	14.33	14.46	14.99	16.3	17.34
Ni (sa-09)	11	20.7	20.72	21.9	24.65	26.8	34	35.1	37.21	100.7	162.5
Ni (sa-10)	9	13.1	13.1	22.46	24.83	27.65	49.9	53.28	55.04	56.12	56.98
Ni (sa-11)	10	7.8	7.8	14.4	16.15	19.2	21.75	22.8	31.1	34.95	38.03
Ni (sa-12)	9	14.3	14.3	16.06	16.85	19.2	24.25	26.62	39.59	58	72.72
Ni (sa-13)	9	15.5	15.5	16.94	17.4	18.7	21.35	21.94	22.54	24.52	26.1
K (sa-01)	9	1090	1090	1154	1170	1295	1498	1514	1595	1708	1798
K (sa-02)	9	1320	1320	1520	1583	1765	2080	2218	2795	3088	3322
K (sa-03)	9	990	990	1070	1098	1545	2553	3102	4352	4541	4692
K (sa-04)	9	1350	1350	1814	1950	2605	2820	2838	2935	3228	3462
K (sa-05)	8	1120	1120	1462	1690	2360	2600	2888	4736	7568	9834
K (sa-06)	9	600	600	704	732.5	1140	1823	1920	2300	2390	2462
K (sa-07)	9	490	490	786	905	1265	2128	2382	3577	8738	12868
K (sa-08)	9	610	610	714	752.5	1220	1405	1424	1499	1585	1653
K (sa-09)	11	1150	1186	1514	1525	1875	2518	2798	5303	10804	15921
K (sa-10)	9	460	460	1196	1383	1515	1795	1844	1886	2003	2097
K (sa-11)	10	1200	1200	1260	1280	1760	1965	2000	2010	2120	2208
K (sa-12)	9	1100	1100	1284	1348	1500	1610	1680	1929	1970	2002
K (sa-13)	9	1200	1200	1224	1235	1320	1440	1632	2290	2335	2371
Se (sa-01)	9	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.51	0.555	0.591
Se (sa-02)	9	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Se (sa-03)	9	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Se (sa-04)	9	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Se (sa-05)	8	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.52	0.56	0.592
Se (sa-06)	9	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Se (sa-07)	9	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.51	0.555	0.591
Se (sa-08)	9	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.52	0.61	0.682
Se (sa-09)	11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.725	0.945
Se (sa-10)	9	0.5	0.5	0.5	0.5	0.5	0.5	0.66	1.69	3.445	4.849
Se (sa-11)	10	0.5	0.5	0.5	0.5	0.5	0.55	0.6	0.7	1.35	1.87

Table E-2 - Surface Soil Metal Percentiles by Subarea

Variable	NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Se (sa-12)	9	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.51	0.555	0.591
Se (sa-13)	9	0.5	0.5	0.5	0.5	0.5	0.5	0.74	1.73	1.865	1.973
Ag (sa-01)	9	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Ag (sa-02)	9	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Ag (sa-03)	9	0.2	0.2	0.2	0.2	0.2	0.2	0.22	0.3	0.3	0.3
Ag (sa-04)	9	0.2	0.2	0.2	0.2	0.2	0.275	0.3	0.31	0.355	0.391
Ag (sa-05)	8	0.2	0.2	0.2	0.2	0.3	0.3	0.34	0.4	0.4	0.4
Ag (sa-06)	9	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.31	0.355	0.391
Ag (sa-07)	9	0.2	0.2	0.2	0.225	0.45	0.8	0.9	0.91	0.955	0.991
Ag (sa-08)	9	0.2	0.2	0.2	0.2	0.3	0.55	0.6	0.66	0.93	1.146
Ag (sa-09)	11	0.3	0.3	0.3	0.3	0.45	0.5	0.5	0.59	0.6	0.6
Ag (sa-10)	9	0.2	0.2	0.2	0.2	0.3	0.375	0.4	0.42	0.51	0.582
Ag (sa-11)	10	0.2	0.2	0.2	0.2	0.3	0.45	0.5	0.6	1.3	1.86
Ag (sa-12)	9	0.2	0.2	0.2	0.2	0.2	0.275	0.3	0.39	0.795	1.119
Ag (sa-13)	9	0.2	0.2	0.2	0.225	0.3	0.3	0.3	0.31	0.355	0.391
Na (sa-01)	9	100	100	100	107.5	155	167.5	176	200	200	200
Na (sa-02)	9	120	120	160	172.5	180	212.5	220	224	242	256.4
Na (sa-03)	9	110	110	126	130	160	177.5	186	211	215.5	219.1
Na (sa-04)	9	130	130	130	130	145	157.5	160	160	160	160
Na (sa-05)	8	140	140	164	180	210	230	242	262	266	269.2
Na (sa-06)	9	120	120	120	120	130	160	164	181	185.5	189.1
Na (sa-07)	9	120	120	120	122.5	150	175	184	212	266	309.2
Na (sa-08)	9	120	120	120	122.5	130	137.5	146	180	225	261
Na (sa-09)	11	150	150	152	157.5	210	295	306	310	323.5	336.7
Na (sa-10)	9	130	130	146	152.5	195	200	206	232	241	248.2
Na (sa-11)	10	120	120	130	135	160	275	280	280	300	316
Na (sa-12)	9	160	160	168	175	205	260	270	274	292	306.4
Na (sa-13)	9	130	130	162	170	205	227.5	242	290	290	290
Tl (sa-01)	9	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.21	0.255	0.291
Tl (sa-02)	9	0.2	0.2	0.2	0.2	0.2	0.275	0.3	0.32	0.41	0.482
Tl (sa-03)	9	0.2	0.2	0.2	0.2	0.2	0.275	0.34	0.51	0.555	0.591
Tl (sa-04)	9	0.2	0.2	0.2	0.2	0.3	0.375	0.4	0.4	0.4	0.4
Tl (sa-05)	8	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.42	0.46	0.492
Tl (sa-06)	9	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4
Tl (sa-07)	9	0.2	0.2	0.28	0.325	0.45	0.575	0.64	0.81	0.855	0.891
Tl (sa-08)	9	0.2	0.2	0.2	0.225	0.3	0.475	0.58	0.91	0.955	0.991
Tl (sa-09)	11	0.3	0.3	0.32	0.375	0.5	0.65	0.76	0.8	0.845	0.889
Tl (sa-10)	9	0.2	0.2	0.28	0.3	0.4	0.4	0.42	0.57	0.885	1.137
Tl (sa-11)	10	0.2	0.2	0.2	0.2	0.5	0.6	0.6	0.7	0.85	0.97
Tl (sa-12)	9	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.31	0.355	0.391
Tl (sa-13)	9	0.2	0.2	0.2	0.2	0.25	0.375	0.42	0.5	0.5	0.5
V (sa-01)	9	23	23	26.84	27.93	32.5	34.4	34.82	36.38	39.44	41.89
V (sa-02)	9	17.5	17.5	21.58	23.28	26.7	29.73	30.84	33.88	34.24	34.53
V (sa-03)	9	17.5	17.5	17.5	17.7	19.1	32.18	35.2	36.3	37.65	38.73
V (sa-04)	9	18.4	18.4	22.08	23.6	27.5	29.2	30.1	33.92	38.51	42.18
V (sa-05)	8	20.5	20.5	20.5	20.5	22.1	26.5	32.14	47.08	60.04	70.41
V (sa-06)	9	10.6	10.6	11.4	11.8	16.5	22.58	22.82	23.82	26.16	28.03
V (sa-07)	9	9	9	15.16	16.9	18.9	22.85	23.12	28.74	51.87	70.37
V (sa-08)	9	12.9	12.9	15.06	15.6	17.2	23.55	25.94	29.81	30.31	30.7
V (sa-09)	11	17.3	17.46	19.3	20.4	26.4	30.95	35.02	59.36	67.12	72.22
V (sa-10)	9	20.8	20.8	21.28	21.43	23.45	25.68	25.9	28.27	35.34	40.99
V (sa-11)	10	11.4	11.4	24.8	25.5	30.7	32.5	33.7	41.2	44.25	46.69
V (sa-12)	9	23.4	23.4	23.64	24.03	27.3	31.4	31.84	34.67	39.49	43.34
V (sa-13)	9	23.3	23.3	26.42	27.9	33.3	37.03	37.76	38.1	38.55	38.91
Zn (sa-01)	9	127	127	130.2	131.5	140.5	150	154.2	176.6	201.8	222
Zn (sa-02)	9	105	105	125	142.5	199	253.5	301.2	493	506.5	517.3
Zn (sa-03)	9	83	83	119	131.8	188.5	360.5	406	489	574.5	642.9
Zn (sa-04)	9	186	186	186	187.5	275.5	357.5	372	385	407.5	425.5

Table E-2 - Surface Soil Metal Percentiles by Subarea

Variable	NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Zn (sa-05)	8	161	161	200.6	227	300	360	400	470	490	506
Zn (sa-06)	9	70	70	83.6	97.25	395	455	462	477	508.5	533.7
Zn (sa-07)	9	188	188	265.6	298.8	440	610	674	806	968	1098
Zn (sa-08)	9	112	112	141.6	186	350	522.5	620	895	1053	1179
Zn (sa-09)	11	280	283	320	347.5	465	615	692	774	811.5	842.3
Zn (sa-10)	9	165	165	233	254.3	385	737.5	814	880	1105	1285
Zn (sa-11)	10	169	169	187	191.5	310	680	700	750	950	1110
Zn (sa-12)	9	163	163	189.4	201.5	244	325.3	365.6	429.2	434.6	438.9
Zn (sa-13)	9	160	160	169.6	175.5	244	298.8	364	606	633	654.6

Table E-3 - Soil Profile Metal Summary Statistics by Depth Interval

Variable	Depth	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
Al (h1)	0 - 3"	13	0	0.00%	6450	29900	16151	15600	7061	4893	0.671	0.437
Al (h2)	3 - 6"	13	0	0.00%	6240	33500	18365	18800	7359	4151	0.454	0.401
Al (h3)	6 - 12"	13	0	0.00%	6710	34400	19255	20600	7087	6227	0.249	0.368
Al (h4)	12 - 24"	12	0	0.00%	6300	35400	17867	17050	7957	7265	0.842	0.445
Sb (h1)	0 - 3"	6	7	53.85%	0.4	5.1	1.7	1.1	1.779	1.038	1.841	1.046
Sb (h2)	3 - 6"	3	10	76.92%	0.4	0.7	0.567	0.6	0.153	0.148	-0.935	0.27
Sb (h3)	6 - 12"	1	12	92.31%	0.2	0.2	0.2	0.2	N/A	0	N/A	N/A
Sb (h4)	12 - 24"	0	12	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
As (h1)	0 - 3"	13	0	0.00%	6.8	26.2	13.92	11.1	6.062	3.113	0.968	0.436
As (h2)	3 - 6"	13	0	0.00%	4.7	28.2	11.04	9.6	6.459	5.486	1.686	0.585
As (h3)	6 - 12"	13	0	0.00%	1.3	16.1	6.308	5.5	3.936	3.41	1.227	0.624
As (h4)	12 - 24"	12	0	0.00%	1.3	10	5.05	5.35	2.687	2.669	0.196	0.532
Ba (h1)	0 - 3"	13	0	0.00%	48	445	239.4	216	122.9	103.8	0.471	0.513
Ba (h2)	3 - 6"	13	0	0.00%	44	376	214.9	236	101.3	133.4	0.0259	0.471
Ba (h3)	6 - 12"	13	0	0.00%	69.6	326	166.4	141	75.92	54.86	0.868	0.456
Ba (h4)	12 - 24"	12	0	0.00%	57.7	315	165.1	154.5	85.29	94.89	0.454	0.517
Be (h1)	0 - 3"	13	0	0.00%	0.2	1.1	0.531	0.5	0.263	0.297	0.909	0.495
Be (h2)	3 - 6"	13	0	0.00%	0.3	2.4	0.669	0.5	0.569	0.297	2.689	0.851
Be (h3)	6 - 12"	13	0	0.00%	0.3	2.1	0.692	0.6	0.468	0.148	2.604	0.676
Be (h4)	12 - 24"	12	0	0.00%	0.2	1.2	0.55	0.5	0.288	0.148	1.375	0.523
Cd (h1)	0 - 3"	13	0	0.00%	0.65	26.9	6.003	5.1	7.091	5.634	2.374	1.181
Cd (h2)	3 - 6"	13	0	0.00%	0.3	11.6	2.267	1.09	3.03	1.171	2.763	1.336
Cd (h3)	6 - 12"	13	0	0.00%	0.2	4.1	0.762	0.4	1.057	0.297	3.019	1.388
Cd (h4)	12 - 24"	12	0	0.00%	0.1	0.8	0.336	0.25	0.232	0.0741	1.173	0.692
Ca (h1)	0 - 3"	13	0	0.00%	1270	21800	5731	4140	5260	2461	2.671	0.918
Ca (h2)	3 - 6"	13	0	0.00%	1370	12700	4266	3650	3008	2016	2.038	0.705
Ca (h3)	6 - 12"	13	0	0.00%	1440	10900	3971	3530	2560	1972	1.883	0.645
Ca (h4)	12 - 24"	12	0	0.00%	1550	57300	7752	3680	15664	2120	3.416	2.021
Cr (h1)	0 - 3"	13	0	0.00%	7.4	28.3	17.75	18.6	6.455	6.672	-0.156	0.364
Cr (h2)	3 - 6"	13	0	0.00%	7.8	32.8	19.72	20	7.45	9.489	-0.102	0.378
Cr (h3)	6 - 12"	13	0	0.00%	7.8	28.9	20.76	21.8	7.459	8.599	-0.671	0.359
Cr (h4)	12 - 24"	12	0	0.00%	7.5	37.1	21.56	23.5	8.705	8.228	-0.0823	0.404
Co (h1)	0 - 3"	13	0	0.00%	2.3	19.9	7.523	6.5	4.464	3.113	1.809	0.593
Co (h2)	3 - 6"	13	0	0.00%	2.2	32.3	8.746	8	7.525	2.817	2.874	0.86
Co (h3)	6 - 12"	13	0	0.00%	2.3	24.5	8.385	8.6	5.471	1.927	2.232	0.652
Co (h4)	12 - 24"	12	0	0.00%	2.2	9.5	6.983	7.85	2.662	2.224	-0.714	0.381
Cu (h1)	0 - 3"	13	0	0.00%	8.2	69.7	23.25	22.1	15.47	5.634	2.442	0.665
Cu (h2)	3 - 6"	13	0	0.00%	9.6	70.4	22.26	22.3	15.85	10.23	2.584	0.712
Cu (h3)	6 - 12"	13	0	0.00%	6.5	64	22.97	22.5	14.72	13.49	1.865	0.641
Cu (h4)	12 - 24"	12	0	0.00%	5.8	35.3	21.18	22.75	10.55	16.16	-0.0426	0.498
Fe (h1)	0 - 3"	13	0	0.00%	8380	32600	18808	18700	7001	7413	0.253	0.372
Fe (h2)	3 - 6"	13	0	0.00%	8420	41600	21055	21900	8559	7858	0.861	0.407
Fe (h3)	6 - 12"	13	0	0.00%	8140	60200	23011	23100	12695	5486	2.177	0.552
Fe (h4)	12 - 24"	12	0	0.00%	8020	27900	20293	22950	7002	6968	-0.544	0.345
Pb (h1)	0 - 3"	13	0	0.00%	37.5	1620	325.2	224	439.4	259	2.451	1.351
Pb (h2)	3 - 6"	13	0	0.00%	12.5	552	105.1	28.4	150.6	23.57	2.5	1.433
Pb (h3)	6 - 12"	13	0	0.00%	5.2	248	36.57	13.8	64.8	10.38	3.367	1.772
Pb (h4)	12 - 24"	12	0	0.00%	4.95	26	13.18	9.15	7.703	5.374	0.656	0.584
Mg (h1)	0 - 3"	13	0	0.00%	1870	6680	4337	4700	1616	1616	-0.167	0.373
Mg (h2)	3 - 6"	13	0	0.00%	1840	10600	4943	5060	2274	1423	1.029	0.46
Mg (h3)	6 - 12"	13	0	0.00%	1940	13400	5403	5690	2887	770.9	1.687	0.534
Mg (h4)	12 - 24"	12	0	0.00%	1840	10400	5258	5370	2505	2772	0.501	0.476

Table E-3 - Soil Profile Metal Summary Statistics by Depth Interval

Variable	Depth	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
Mn (h1)	0 - 3"	13	0	0.00%	190	5920	1146	799	1468	446.3	3.318	1.281
Mn (h2)	3 - 6"	13	0	0.00%	179	3590	777.8	479	876.2	278.7	3.176	1.127
Mn (h3)	6 - 12"	13	0	0.00%	121	2690	544	411	659.2	166	3.331	1.212
Mn (h4)	12 - 24"	12	0	0.00%	114	1450	418	375	343.2	98.59	2.813	0.821
Hg (h1)	0 - 3"	13	0	0.00%	0.019	0.241	0.0861	0.062	0.07	0.0608	1.161	0.813
Hg (h2)	3 - 6"	13	0	0.00%	0.017	0.144	0.0392	0.028	0.0331	0.0104	3.043	0.846
Hg (h3)	6 - 12"	12	1	7.69%	0.011	0.061	0.0248	0.021	0.0154	0.00964	1.615	0.623
Hg (h4)	12 - 24"	10	2	16.67%	0.009	0.058	0.0231	0.0165	0.0155	0.0111	1.363	0.672
Ni (h1)	0 - 3"	13	0	0.00%	7.2	44.8	19.01	15.8	10.77	6.672	1.244	0.567
Ni (h2)	3 - 6"	13	0	0.00%	7.1	78.2	22.43	18.4	18.21	9.192	2.693	0.812
Ni (h3)	6 - 12"	13	0	0.00%	7.5	75.6	23.22	20.5	17.41	11.86	2.52	0.75
Ni (h4)	12 - 24"	12	0	0.00%	7.3	36.7	19.64	19.25	8.936	10.01	0.38	0.455
K (h1)	0 - 3"	13	0	0.00%	490	2930	1424	1370	681.3	533.7	0.859	0.478
K (h2)	3 - 6"	13	0	0.00%	510	2850	1413	1360	632	548.6	0.735	0.447
K (h3)	6 - 12"	13	0	0.00%	510	2380	1406	1420	573.3	682	-0.138	0.408
K (h4)	12 - 24"	12	0	0.00%	560	3040	1612	1690	762.2	726.5	0.145	0.473
Se (h1)	0 - 3"	1	12	92.31%	1.3	1.3	1.3	1.3	N/A	0	N/A	N/A
Se (h2)	3 - 6"	1	12	92.31%	1.4	1.4	1.4	1.4	N/A	0	N/A	N/A
Se (h3)	6 - 12"	0	13	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Se (h4)	12 - 24"	0	12	100.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ag (h1)	0 - 3"	10	3	23.08%	0.2	1	0.39	0.25	0.269	0.0741	1.51	0.689
Ag (h2)	3 - 6"	4	9	69.23%	0.2	0.9	0.425	0.3	0.32	0.0741	1.866	0.753
Ag (h3)	6 - 12"	6	7	53.85%	0.2	1.4	0.45	0.25	0.472	0.0741	2.299	1.049
Ag (h4)	12 - 24"	6	6	50.00%	0.2	0.7	0.333	0.2	0.216	0	1.323	0.648
Tl (h1)	0 - 3"	8	5	38.46%	0.2	1	0.4	0.3	0.262	0.148	2.1	0.655
Tl (h2)	3 - 6"	5	8	61.54%	0.2	0.5	0.26	0.2	0.134	0	2.236	0.516
Tl (h3)	6 - 12"	1	12	92.31%	0.2	0.2	0.2	0.2	N/A	0	N/A	N/A
Tl (h4)	12 - 24"	1	11	91.67%	0.2	0.2	0.2	0.2	N/A	0	N/A	N/A
V (h1)	0 - 3"	13	0	0.00%	10.1	35.8	24.35	26.5	8.021	8.599	-0.36	0.329
V (h2)	3 - 6"	13	0	0.00%	11.5	39.2	26.63	27.8	8.392	10.82	-0.305	0.315
V (h3)	6 - 12"	13	0	0.00%	11.7	45	29.66	31.6	10.39	12.45	-0.35	0.35
V (h4)	12 - 24"	12	0	0.00%	11.2	45.3	29.62	31.25	10.26	10.38	-0.357	0.346
Zn (h1)	0 - 3"	13	0	0.00%	80	1230	326.8	200	311.8	137.9	2.28	0.954
Zn (h2)	3 - 6"	13	0	0.00%	61	720	173.5	128	169.2	37.06	3.244	0.975
Zn (h3)	6 - 12"	13	0	0.00%	40	410	101.5	67	97.03	37.06	3.072	0.956
Zn (h4)	12 - 24"	12	0	0.00%	24	166	65.83	57.5	39.02	33.36	1.63	0.593

Table E-4 - Soil Profile Metal Percentiles by Depth Interval

Variable	Depth	NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Al (h1)	0 - 3"	13	7128	7910	10458	12300	15600	18600	19680	26480	28760	29672
Al (h2)	3 - 6"	13	8736	10520	12200	14000	18800	21300	21480	27200	30560	32912
Al (h3)	6 - 12"	13	9584	11540	13220	15500	20600	23000	23180	25060	29060	33332
Al (h4)	12 - 24"	12	8335	10140	11700	12525	17050	20300	23600	26150	30395	34399
Sb (h1)	0 - 3"	13	0.2	0.2	0.2	0.2	0.2	1.1	1.1	1.9	3.3	4.74
Sb (h2)	3 - 6"	13	0.2	0.2	0.2	0.2	0.2	0.2	0.32	0.56	0.64	0.688
Sb (h3)	6 - 12"	13	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sb (h4)	12 - 24"	12	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
As (h1)	0 - 3"	13	8.12	9.1	9.58	9.7	11.1	18.2	19.34	22.5	24.34	25.83
As (h2)	3 - 6"	13	4.82	5.1	6.38	7.1	9.6	13.9	14.86	16.62	21.42	26.84
As (h3)	6 - 12"	13	1.72	2.24	3.52	4	5.5	8.2	8.98	9.66	12.26	15.33
As (h4)	12 - 24"	12	1.465	1.67	2.5	3.05	5.35	6.65	6.76	7.79	8.845	9.769
Ba (h1)	0 - 3"	13	87.6	120.4	151.2	159	216	301	362.8	419.2	431.8	442.4
Ba (h2)	3 - 6"	13	72.86	101.3	140.4	144	236	275	291.2	349.2	367	374.2
Ba (h3)	6 - 12"	13	74.88	83.52	114.8	131	141	193	232.6	263	288.8	318.6
Ba (h4)	12 - 24"	12	67.6	76.19	84.08	93.65	154.5	213.3	222.6	281.8	300.2	312
Be (h1)	0 - 3"	13	0.26	0.3	0.3	0.3	0.5	0.7	0.7	0.86	0.98	1.076
Be (h2)	3 - 6"	13	0.3	0.3	0.3	0.3	0.5	0.6	0.72	1.04	1.62	2.244
Be (h3)	6 - 12"	13	0.36	0.4	0.4	0.4	0.6	0.7	0.7	1.02	1.5	1.98
Be (h4)	12 - 24"	12	0.255	0.31	0.4	0.4	0.5	0.55	0.66	0.97	1.09	1.178
Cd (h1)	0 - 3"	13	0.8	0.94	1.14	1.2	5.1	6.8	8.06	10.26	17.12	24.94
Cd (h2)	3 - 6"	13	0.3	0.34	0.5	0.5	1.09	2.7	2.94	3.5	6.8	10.64
Cd (h3)	6 - 12"	13	0.2	0.2	0.2	0.2	0.4	0.8	0.86	1.14	2.36	3.752
Cd (h4)	12 - 24"	12	0.117	0.137	0.2	0.2	0.25	0.375	0.54	0.69	0.745	0.789
Ca (h1)	0 - 3"	13	1606	1960	2776	3220	4140	5870	7010	7994	13550	20150
Ca (h2)	3 - 6"	13	1694	1964	2224	2290	3650	4740	5556	6732	9214	12003
Ca (h3)	6 - 12"	13	1662	1874	2158	2200	3530	3760	4816	6600	8482	10416
Ca (h4)	12 - 24"	12	1682	1791	1862	2033	3680	4258	4450	5987	29168	51674
Cr (h1)	0 - 3"	13	7.52	8.6	13.2	14.1	18.6	23.1	23.7	24.58	26.14	27.87
Cr (h2)	3 - 6"	13	8.4	9.58	13.02	13.5	20	24.9	25.8	27.12	29.5	32.14
Cr (h3)	6 - 12"	13	8.16	9.54	14.18	14.3	21.8	26.4	27.12	28.56	28.84	28.89
Cr (h4)	12 - 24"	12	8.82	10.29	13.9	14.18	23.5	26.33	27.92	29.49	32.98	36.28
Co (h1)	0 - 3"	13	2.6	3.12	4.64	5	6.5	8.7	9.06	10.42	14.38	18.8
Co (h2)	3 - 6"	13	2.74	3.32	4.4	4.7	8	8.8	9.22	10.3	19.22	29.68
Co (h3)	6 - 12"	13	2.78	3.38	4.7	5	8.6	9	9.06	9.74	15.74	22.75
Co (h4)	12 - 24"	12	2.75	3.33	4.54	4.65	7.85	9.3	9.3	9.39	9.445	9.489
Cu (h1)	0 - 3"	13	9.28	10.24	12.04	13.3	22.1	25.4	25.7	28.14	45.1	64.78
Cu (h2)	3 - 6"	13	9.72	9.98	11.58	12.9	22.3	24.2	25.1	26.9	44.48	65.22
Cu (h3)	6 - 12"	13	8.6	10.08	10.96	11.8	22.5	25.3	29.08	32.16	44.98	60.2
Cu (h4)	12 - 24"	12	7.67	9.32	10.58	11.08	22.75	29.95	32.26	34.18	34.75	35.19
Fe (h1)	0 - 3"	13	8830	9784	13400	14900	18700	23700	24240	25480	28460	31772
Fe (h2)	3 - 6"	13	10028	11620	14500	15700	21900	25200	26040	27080	32960	39872
Fe (h3)	6 - 12"	13	9496	11280	15640	16900	23100	25500	25560	26560	40160	56192
Fe (h4)	12 - 24"	12	9604	11220	14140	14250	22950	26825	26880	27350	27625	27845
Pb (h1)	0 - 3"	13	38.16	39.7	46.18	49.3	224	271	460.6	651.8	1049	1506
Pb (h2)	3 - 6"	13	14.9	16.52	17.64	19.2	28.4	127	152.8	212.4	354.6	512.5
Pb (h3)	6 - 12"	13	6.82	8	8.64	9	13.8	31.3	33.22	45.06	127.8	224
Pb (h4)	12 - 24"	12	5.583	6.12	6.6	7.425	9.15	19.1	20.64	24.53	25.4	25.88
Mg (h1)	0 - 3"	13	1924	2128	2852	2930	4700	5670	5742	6302	6530	6650
Mg (h2)	3 - 6"	13	2182	2450	2806	3100	5060	5650	5872	6548	8248	10130
Mg (h3)	6 - 12"	13	2090	2304	3008	3380	5690	5990	6038	6454	9290	12578
Mg (h4)	12 - 24"	12	2099	2346	2798	3150	5370	6248	6836	7887	9069	10134
Mn (h1)	0 - 3"	13	319.6	413.8	458.6	479	799	1010	1064	1292	3172	5370

Table E-4 - Soil Profile Metal Percentiles by Depth Interval

Variable	Depth	NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Mn (h2)	3 - 6"	13	246.2	303.8	384.2	428	479	797	843.8	941.4	2011	3274
Mn (h3)	6 - 12"	13	154	186.6	257	299	411	512	520.4	560.4	1417	2435
Mn (h4)	12 - 24"	12	137.7	164.9	241.2	255.5	375	433.3	433.8	447.5	899.4	1340
Hg (h1)	0 - 3"	13	0.0202	0.0214	0.0262	0.031	0.062	0.124	0.128	0.182	0.213	0.235
Hg (h2)	3 - 6"	13	0.0182	0.0196	0.0232	0.025	0.028	0.039	0.0438	0.0502	0.0882	0.133
Hg (h3)	6 - 12"	13	0.0094	0.0112	0.012	0.012	0.02	0.023	0.0278	0.0454	0.0538	0.0596
Hg (h4)	12 - 24"	12	0.007	0.0072	0.009	0.009	0.0145	0.0298	0.0314	0.0347	0.0454	0.0555
Ni (h1)	0 - 3"	13	7.5	8.42	11.7	12.3	15.8	23.9	27.5	30.38	36.22	43.08
Ni (h2)	3 - 6"	13	8.36	9.64	11.72	12.2	18.4	23.5	26.2	30.16	49.7	72.5
Ni (h3)	6 - 12"	13	8.46	9.74	12.38	12.5	20.5	23.7	27.48	31.92	49.68	70.42
Ni (h4)	12 - 24"	12	7.795	8.57	12.08	12.58	19.25	24.95	25.94	30.08	33.29	36.02
K (h1)	0 - 3"	13	544	640	932	1010	1370	1650	1704	2276	2618	2868
K (h2)	3 - 6"	13	552	646	1002	1140	1360	1730	1802	2026	2382	2756
K (h3)	6 - 12"	13	522	594	894	960	1420	1870	1882	2002	2170	2338
K (h4)	12 - 24"	12	571	598	850	1098	1690	2055	2154	2271	2622	2956
Se (h1)	0 - 3"	13	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.82	1.204
Se (h2)	3 - 6"	13	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.86	1.292
Se (h3)	6 - 12"	13	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.1	1.82
Se (h4)	12 - 24"	12	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Ag (h1)	0 - 3"	13	0.2	0.2	0.2	0.2	0.2	0.4	0.52	0.6	0.76	0.952
Ag (h2)	3 - 6"	13	0.2	0.2	0.2	0.2	0.2	0.2	0.26	0.3	0.54	0.828
Ag (h3)	6 - 12"	13	0.2	0.2	0.2	0.2	0.2	0.2	0.26	0.38	0.8	1.28
Ag (h4)	12 - 24"	12	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.47	0.59	0.678
Tl (h1)	0 - 3"	13	0.2	0.2	0.2	0.2	0.2	0.3	0.36	0.48	0.7	0.94
Tl (h2)	3 - 6"	13	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.32	0.464
Tl (h3)	6 - 12"	13	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Tl (h4)	12 - 24"	12	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
V (h1)	0 - 3"	13	11.66	13.56	18.44	20.6	26.5	30	30.84	33.48	34.72	35.58
V (h2)	3 - 6"	13	14.5	16.62	18.22	19.9	27.8	30.9	33.42	36.62	37.88	38.94
V (h3)	6 - 12"	13	14.1	16.14	19.3	21.4	31.6	36.7	38.68	40.96	42.72	44.54
V (h4)	12 - 24"	12	14.67	17.73	20.22	21.38	31.25	36.83	37.32	38.85	41.84	44.61
Zn (h1)	0 - 3"	13	96.2	111.4	132.2	137	200	430	448	548	834	1151
Zn (h2)	3 - 6"	13	71.2	83	103.4	104	128	164	164.6	209	420	660
Zn (h3)	6 - 12"	13	41.2	42.4	48.8	56	67	111	113.4	119.8	236.6	375.3
Zn (h4)	12 - 24"	12	29.5	34.1	35.6	37.25	57.5	82	86.4	97	128.6	158.5

Table E-5 Principal Components Analysis Factor Loadings

Metal	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12	PC13	PC14	PC15	PC16	PC17	PC18	PC19	PC20	PC21	PC22	PC23
Al	0.217	-0.183	0.0092	-0.275	-0.0822	-0.385	0.141	0.00842	-0.105	-0.416	0.0584	0.177	0.0568	0.388	0.526	-0.00485	0.0821	-0.0433	0.0393	-0.0233	-0.0359	-0.0823	-0.0214
Sb	0.00651	0.268	-0.0806	0.182	0.356	-0.503	0.0412	0.161	0.275	0.364	-0.11	-0.0685	0.33	0.116	0.105	0.268	0.131	-0.126	-0.0413	-0.0631	-0.0353	0.1	0.0296
As	0.173	0.238	0.155	-0.197	-0.201	-0.013	0.26	-0.247	0.185	0.141	-0.689	0.0578	-0.232	-0.0155	0.0513	-0.0968	-0.168	-0.182	0.043	-0.088	0.0907	-0.0117	0.063
Ba	0.267	-0.0694	0.0133	0.142	0.274	-0.16	-0.447	-0.0936	-0.0498	-0.249	-0.17	-0.505	-0.329	0.069	-0.0592	0.00532	0.0989	-0.054	0.205	0.0543	0.227	-0.00653	0.143
Be	0.233	-0.125	0.00671	-0.245	0.27	-0.268	0.0819	-0.24	-0.582	0.156	-0.0413	0.143	0.228	-0.207	-0.346	0.021	-0.129	-0.0304	-0.0338	0.0691	0.0187	-0.169	0.0927
Cd	0.168	0.294	0.0599	-0.144	-0.132	0.311	-0.0941	0.0597	-0.198	0.103	-0.105	-0.239	0.367	0.162	0.209	0.265	-0.146	0.424	0.306	0.198	-0.0269	-0.012	0.0858
Ca	0.113	0.0305	-0.576	-0.196	-0.0393	0.0861	-0.407	0.172	-0.0457	0.199	-0.159	0.069	-0.0225	0.0253	0.112	-0.0983	-0.0757	-0.142	-0.12	-0.0119	0.0353	-0.257	-0.457
Cr	0.254	-0.143	-0.0725	0.355	0.0521	0.0675	-0.133	-0.155	-0.0585	-0.0261	-0.181	0.152	-0.117	-0.0413	0.1	0.139	-0.112	0.0541	-0.048	-0.042	-0.771	0.122	0.0268
Co	0.296	-0.11	-0.0855	-0.119	0.0717	0.211	0.203	0.0564	0.254	-0.0152	0.124	0.000905	0.128	-0.231	-0.0326	-0.0112	0.241	-0.44	0.458	0.392	-0.131	-0.0108	-0.0391
Cu	0.253	0.168	-0.208	-0.107	-0.118	-0.0194	0.244	-0.161	-0.18	0.329	0.323	-0.0929	-0.438	0.265	-0.109	0.124	0.247	0.0847	0.0152	-0.0542	-0.00607	0.347	-0.138
Fe	0.268	-0.162	-0.0866	-0.21	-0.00471	0.0431	0.262	0.116	0.298	-0.282	-0.121	-0.321	0.125	-0.0589	-0.334	0.235	0.11	0.277	-0.357	-0.157	-0.092	-0.127	-0.169
Pb	0.134	0.351	0.0501	0.0696	-0.0473	-0.0702	0.029	0.262	-0.175	-0.0414	-0.101	0.0154	-0.0904	-0.226	0.114	-0.36	0.452	0.169	-0.349	0.36	-0.104	-0.095	0.162
Mg	0.283	-0.153	-0.0599	0.252	-0.0392	0.0596	0.046	0.11	0.0535	-0.0388	-0.0142	0.204	-0.0159	0.0686	0.0228	0.218	-0.351	-0.0514	-0.353	0.476	0.388	0.284	0.0442
Mn	0.185	0.0523	0.227	-0.444	0.222	0.024	-0.354	0.0359	0.409	0.162	0.238	0.288	-0.171	0.122	-0.0984	-0.0631	-0.114	0.172	-0.0854	0.049	-0.113	-0.0642	0.278
Hg	0.109	0.333	-0.195	0.00672	0.0076	-0.259	-0.0142	0.176	0.0608	-0.356	0.0282	0.282	-0.0509	-0.35	-0.147	-0.0606	-0.201	0.273	0.355	-0.143	0.0699	0.3	-0.151
Ni	0.29	-0.111	-0.0779	0.0883	0.0967	0.154	-0.0363	-0.417	0.144	0.126	0.138	0.000473	0.217	-0.364	0.415	-0.178	0.141	0.182	-0.114	-0.303	0.269	0.104	0.043
K	0.259	-0.125	-0.0396	0.349	-0.079	0.0866	0.0159	0.0796	0.0511	0.0702	-0.129	0.264	0.232	0.464	-0.346	-0.376	0.188	0.15	0.198	-0.152	0.124	-0.104	0.0577
Se	-0.201	-0.0255	-0.664	-0.103	-0.00402	0.0602	0.122	-0.0424	0.0402	-0.0914	-0.0631	-0.00305	-0.0179	0.04	-0.0112	0.0251	-0.0113	0.0174	0.00554	-0.0154	-0.00904	-0.00114	0.685
Ag	0.0331	0.333	-0.123	0.259	0.0294	-0.121	0.185	-0.397	0.188	-0.0983	0.296	-0.114	-0.0469	0.103	-0.0183	-0.122	-0.305	0.0664	-0.0125	0.227	-0.0537	-0.511	-0.108
Na	0.0469	-0.1	0.00443	0.0176	-0.732	-0.385	-0.325	-0.171	0.132	0.106	0.0847	-0.034	0.142	-0.164	-0.152	0.147	0.118	-0.0233	0.0201	0.0978	-0.0238	-0.0333	0.118
Tl	0.193	0.297	0.0859	0.159	-0.0565	0.216	-0.0566	0.105	-0.126	-0.145	0.112	0.278	-0.105	-0.0709	-0.00927	0.495	0.172	-0.259	-0.0419	-0.332	0.154	-0.362	0.159
V	0.241	-0.211	0.0485	0.107	-0.134	-0.125	0.206	0.504	-0.0499	0.294	0.166	-0.249	-0.18	-0.172	0.151	-0.152	-0.357	0.0103	0.109	-0.222	-0.028	-0.208	0.187
Zn	0.183	0.317	0.0345	-0.0834	-0.103	0.0986	-0.112	0.0146	-0.0834	-0.19	0.182	-0.246	0.307	0.133	-0.112	-0.292	-0.225	-0.448	-0.241	-0.208	-0.142	0.307	0.106

Table E-6 - Principal Components Analysis Correlation Matrix

	ElevAvg	AspectAvg	Slope	SoilType	TOC	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Hg	Ni	K	Se	Ag	Na	Tl	V	Zn
ElevAvg	1	-0.0928	0.148	-0.185	-0.0454	0.468	-0.192	-0.183	0.303	0.474	-0.209	0.252	0.0726	0.283	-0.0486	0.36	-0.33	0.124	0.367	-0.18	0.222	0.00129	0.0	-0.69	0.1	-0.517	0.232	-0.207
AspectAvg	-0.0928	1	0.132	-0.0713	-0.181	0.153	-0.244	0.0922	0.145	0.0496	0.141	-0.0403	0.189	0.192	0.0961	0.176	0.0314	0.199	0.0435	-0.0781	0.242	0.168	0.0	-0.405	-0.136	-0.0844	0.136	0.093
Slope	0.148	0.132	1	-0.105	-0.0107	0.147	0.0692	0.0554	0.201	0.213	0.133	0.0739	0.208	0.335	0.154	0.336	0.0953	0.321	0.147	0.119	0.247	0.305	0.0	-0.2	-0.241	0.0743	0.308	0.124
SoilType	-0.185	-0.0713	-0.105	1	0.179	0.0016	0.0184	-0.0762	-0.002	-0.0394	-0.0575	0.067	0.0865	0.0446	0.101	0.0305	0.00066624	0.0855	-0.142	0.00783	0.00507	0.121	0.0	-0.138	-0.22	-0.0853	0.11	-0.0529
TOC	-0.0454	-0.181	-0.0107	0.179	1	-0.226	0.441	0.0895	0.0139	-0.00537	0.264	0.48	-0.0677	-0.0165	0.297	-0.147	0.369	-0.0785	0.0729	0.498	-0.0407	-0.117	0.0	0.122	-0.495	0.14	-0.191	0.237
Al	0.468	0.153	0.147	0.0016	-0.226	1	-0.302	0.188	0.483	0.761	-0.0302	0.177	0.406	0.673	0.357	0.797	-0.151	0.564	0.447	-0.0974	0.546	0.417	0.0	-0.415	0.333	-0.113	0.685	0.0121
Sb	-0.192	-0.244	0.0692	0.0184	0.441	-0.302	1	0.235	0.0852	-0.109	0.261	0.0918	-0.11	-0.211	0.246	-0.295	0.611	-0.171	-0.00426	0.703	-0.151	-0.111	0.0	0.729	-0.342	0.417	-0.278	0.392
As	-0.183	0.0922	0.0554	-0.0762	0.0895	0.188	0.235	1	0.0951	0.195	0.759	0.016	-0.0112	0.296	0.655	0.267	0.692	0.0751	0.472	0.557	0.199	0.0665	0.0	0.454	0.0486	0.655	0.0142	0.747
Ba	0.303	0.145	0.201	-0.002	0.0139	0.483	0.0852	0.0951	1	0.598	0.144	0.35	0.797	0.609	0.376	0.575	0.123	0.719	0.394	0.159	0.744	0.665	0.0	-0.0004348	0.0326	0.291	0.511	0.235
Be	0.474	0.0496	0.213	-0.0394	-0.00537	0.761	-0.109	0.195	0.598	1	0.075	0.272	0.464	0.679	0.466	0.715	-0.0634	0.515	0.486	0.00185	0.636	0.382	0.0	-0.267	-0.0355	-0.00974	0.512	0.0975
Cd	-0.209	0.141	0.133	-0.0575	0.264	-0.0302	0.261	0.759	0.144	0.075	1	0.3	-0.0007478	0.252	0.679	0.132	0.805	0.0537	0.449	0.668	0.18	0.0636	0.0	0.502	-0.0942	0.841	-0.0912	0.925
Ca	0.252	-0.0403	0.0739	0.067	0.48	0.177	0.0918	0.016	0.35	0.272	0.3	1	0.25	0.366	0.493	0.255	0.198	0.275	0.268	0.376	0.36	0.202	0.0	-0.00363	0.174	0.168	0.163	0.323
Cr	0.0726	0.189	0.208	0.0865	-0.0677	0.406	-0.11	-0.0112	0.797	0.464	-0.000748	0.25	1	0.655	0.336	0.562	-0.0134	0.93	0.0271	-0.0363	0.845	0.915	0.0	-0.0166	0.166	0.262	0.693	0.0362
Co	0.283	0.192	0.335	0.0446	-0.0165	0.673	-0.211	0.296	0.609	0.679	0.252	0.366	0.655	1	0.593	0.924	0.0593	0.793	0.497	0.0522	0.851	0.682	0.0	-0.168	0.0191	0.255	0.734	0.251
Cu	-0.0486	0.0961	0.154	0.101	0.297	0.357	0.246	0.655	0.376	0.466	0.679	0.493	0.336	0.593	1	0.478	0.644	0.426	0.377	0.609	0.534	0.395	0.0	0.498	0.0789	0.685	0.343	0.718
Fe	0.36	0.176	0.336	0.0305	-0.147	0.797	-0.295	0.267	0.575	0.715	0.132	0.255	0.562	0.924	0.478	1	-0.0561	0.745	0.506	-0.0591	0.741	0.607	0.0	-0.342	0.157	0.0749	0.787	0.141
Pb	-0.33	0.0314	0.0953	0.00067	0.369	-0.151	0.611	0.692	0.123	-0.0634	0.805	0.198	-0.0134	0.0593	0.644	-0.0561	1	0.00889	0.189	0.904	0.0182	0.0561	0.0	0.747	-0.16	0.879	-0.128	0.878
Mg	0.124	0.199	0.321	0.0855	-0.0785	0.564	-0.171	0.0751	0.719	0.515	0.0537	0.275	0.93	0.793	0.426	0.745	0.00889	1	0.117	-0.0169	0.833	0.94	0.0	-0.0846	0.208	0.274	0.852	0.08
Mn	0.367	0.0435	0.147	-0.142	0.0729	0.447	-0.00426	0.472	0.394	0.486	0.449	0.268	0.0271	0.497	0.377	0.506	0.189	0.117	1	0.221	0.332	0.00802	0.0	-0.124	-0.126	0.252	0.0947	0.435
Hg	-0.18	-0.0781	0.119	0.00783	0.498	-0.0974	0.703	0.557	0.159	0.00185	0.668	0.376	-0.0363	0.0522	0.609	-0.0591	0.904	-0.0169	0.221	1	0.0196	0.00156	0.0	0.788	-0.0815	0.778	-0.154	0.805
Ni	0.222	0.242	0.247	0.00507	-0.0407	0.546	-0.151	0.199	0.744	0.636	0.18	0.36	0.845	0.851	0.534	0.741	0.0182	0.833	0.332	0.0196	1	0.766	0.0	0.00329	0.0985	0.267	0.62	0.198
K	0.00129	0.168	0.305	0.121	-0.117	0.417	-0.111	0.0665	0.665	0.382	0.0636	0.202	0.915	0.682	0.395	0.607	0.0561	0.94	0.00802	0.00156	0.766	1	0.0	-0.0206	0.221	0.293	0.753	0.112
Se	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	0.0	0.0	0.0	0.0	0.0
Ag	-0.69	-0.405	-0.2	-0.138	0.122	-0.415	0.729	0.454	-0.00043	-0.267	0.502	-0.00363	-0.0166	-0.168	0.498	-0.342	0.747	-0.0846	-0.124	0.788	0.00329	-0.0206	0.0	1	-0.171	0.671	-0.369	0.672
Na	0.1	-0.136	-0.241	-0.22	-0.495	0.333	-0.342	0.0486	0.0326	-0.0355	-0.0942	0.174	0.166	0.0191	0.0789	0.157	-0.16	0.208	-0.126	-0.0815	0.0985	0.221	0.0	-0.171	1	-0.14	0.279	-0.0534
Tl	-0.517	-0.0844	0.0743	-0.0853	0.14	-0.113	0.417	0.655	0.291	-0.00974	0.841	0.168	0.262	0.255	0.685	0.0749	0.879	0.274	0.252	0.778	0.267	0.293	0.0	0.671	-0.14	1	-0.00724	0.889
V	0.232	0.136	0.308	0.11	-0.191	0.685	-0.278	0.0142	0.511	0.512	-0.0912	0.163	0.693	0.734	0.343	0.787	-0.128	0.852	0.0947	-0.154	0.62	0.753	0.0	-0.369	0.279	-0.00724	1	-0.0826
Zn	-0.207	0.093	0.124	-0.0529	0.237	0.0121	0.392	0.747	0.235	0.0975	0.925	0.323	0.0362	0.251	0.718	0.141	0.878	0.08	0.435	0.805	0.198	0.112	0.0	0.672	-0.0534	0.889	-0.0826	1

Black - correlation coefficient greater than 0.90; very strong correlation.
Blue - correlation coefficient between 0.7 and 0.9; strong correlation.
Green - correlation coefficient between 0.5 and 0.7; moderate correlation.
Gold - correlation coefficient between 0.3 and 0.5; weak correlation.
Red - correlation coefficient less than 0.3; no correlation.

Table E-7: Surface Soil Field Variability Sample Metal Concentration Relative Percent Differences

Sample	TOC	pH	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu
SA1-3C	39.3%	3.6%	14.5%	0.0%	21.8%	0.2%	0.0%	10.5%	3.2%	2.2%	8.3%	5.2%
SA2-4C	4.7%	1.0%	12.1%	66.7%	18.9%	15.4%	0.0%	68.5%	0.6%	8.4%	7.5%	28.2%
SA3-6C	77.0%	13.0%	11.5%	0.0%	2.3%	12.2%	11.8%	48.0%	2.0%	15.7%	4.4%	7.5%
SA4-6C	17.9%	0.5%	13.0%	40.0%	10.0%	2.4%	18.2%	19.0%	11.9%	21.8%	5.8%	6.1%
SA5-4C	15.2%	0.7%	1.7%	50.0%	17.8%	13.1%	0.0%	12.8%	14.8%	31.8%	7.4%	3.5%
SA6-2C	7.8%	5.2%	5.0%	28.6%	5.3%	1.3%	18.2%	21.5%	16.3%	17.4%	10.7%	8.5%
SA7-5C	27.5%	5.9%	14.3%	130.0%	35.1%	4.9%	18.2%	10.5%	0.9%	28.8%	29.7%	31.4%
SA8-3C	37.2%	1.9%	4.4%	0.0%	44.1%	9.1%	40.0%	66.7%	14.2%	1.2%	1.6%	7.0%
SA9-10C	33.3%	1.3%	14.3%	40.0%	32.7%	1.6%	0.0%	44.2%	13.2%	3.1%	1.2%	5.4%
SA10-3C	46.9%	1.0%	4.9%	46.2%	7.4%	14.9%	0.0%	11.4%	20.0%	0.7%	13.2%	6.4%
SA11-8C	46.6%	2.6%	0.5%	127.3%	59.5%	61.8%	0.0%	98.5%	31.6%	26.7%	3.8%	50.1%
SA12-7C	81.8%	1.9%	8.1%	0.0%	10.9%	35.1%	0.0%	15.4%	20.7%	7.8%	2.4%	18.1%
SA13-5C	38.0%	2.4%	0.9%	0.0%	6.2%	0.4%	0.0%	9.8%	1.4%	0.0%	0.0%	23.2%
Average RPD	**36.4%**	**3.2%**	**8.1%**	**40.7%**	**20.9%**	**13.3%**	**8.2%**	**33.6%**	**11.6%**	**12.7%**	**7.4%**	**15.4%**

Table E-7: Surface Soil Field Variability Sample Metal Concentration Relative Percent Differences

Fe	Pb	Mg	Mn	Hg	Ni	K	Se	Ag	Na	Tl	V	Zn
4.9%	20.5%	5.1%	7.3%	4.1%	4.2%	8.4%	0.0%	0.0%	6.1%	0.0%	2.3%	1.5%
6.2%	61.0%	4.1%	2.4%	58.1%	4.5%	15.9%	0.0%	0.0%	0.0%	40.0%	17.3%	33.3%
7.4%	37.6%	15.6%	26.7%	16.1%	25.3%	9.3%	0.0%	0.0%	0.0%	18.2%	8.0%	33.6%
11.5%	28.1%	15.8%	26.0%	30.7%	13.2%	19.7%	0.0%	28.6%	13.3%	0.0%	9.9%	12.3%
1.4%	31.6%	0.8%	9.1%	37.6%	13.8%	8.1%	0.0%	40.0%	25.0%	0.0%	7.5%	18.2%
5.9%	11.1%	1.5%	19.0%	2.5%	8.9%	1.7%	0.0%	0.0%	5.4%	28.6%	13.8%	4.7%
3.1%	87.2%	3.1%	34.4%	63.9%	25.7%	10.9%	0.0%	57.1%	10.5%	40.0%	21.1%	2.1%
1.8%	69.5%	1.9%	21.2%	53.8%	2.1%	4.4%	0.0%	0.0%	15.4%	0.0%	3.6%	28.4%
7.5%	50.6%	4.4%	2.6%	18.4%	0.7%	21.1%	0.0%	0.0%	38.5%	28.6%	8.6%	34.7%
3.2%	19.8%	3.8%	20.3%	44.2%	4.3%	11.2%	0.0%	0.0%	5.1%	0.0%	2.8%	2.4%
3.7%	118.0%	10.7%	73.5%	89.1%	1.5%	6.7%	0.0%	66.7%	13.3%	66.7%	15.7%	84.5%
6.5%	2.9%	12.0%	24.5%	6.3%	2.5%	31.0%	0.0%	40.0%	34.8%	0.0%	0.0%	22.8%
4.8%	16.3%	8.5%	7.7%	11.2%	0.9%	4.3%	0.0%	28.6%	23.1%	0.0%	2.6%	9.5%
5.2%	**42.6%**	**6.7%**	**21.1%**	**33.5%**	**8.3%**	**11.7%**	**0.0%**	**20.1%**	**14.7%**	**17.1%**	**8.7%**	**22.2%**

Table E-8 - Soil Profile (12- to 24-Inch) Data Distribution Goodness of Fit Statistics

User Selected Options

From File	L:\1780036-UCR Sampling\Statistics\Profile Data ProUCL Input.wst
Full Precision	OFF
Confidence Coefficient	0.95

Arsenic Soil Profile Horizon 4 (12 to 24")

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	12	0	0.00%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Full: no NDs)	12	1.3	10	5.05	5.35	2.687

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log CV
Statistics (Full: no NDs)	3.163	2.428	1.597	1.453	0.65	0.447

Normal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.983	0.983	0.983	0.983

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Full: no NDs)	0.957	0.859	Data Appear Normal
Lilliefors (Full: no NDs)	0.166	0.256	Data Appear Normal

Gamma Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.969	0.969	0.969	0.969

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Full: no NDs)	0.348	0.738	
Kolmogorov-Smirnov (Full: no NDs)	0.213	0.247	Data Appear Gamma Distributed

Lognormal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.965	0.965	0.965	0.965

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Full: no NDs)	0.922	0.859	Data Appear Lognormal
Lilliefors (Full: no NDs)	0.216	0.256	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

Table E-8 - Soil Profile (12- to 24-Inch) Data Distribution Goodness of Fit Statistics

Cadmium Soil Profile Horizon 4 (12 to 24")

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	12	0	0.00%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Full: no NDs)	12	0.1	0.8	0.336	0.25	0.232

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log CV
Statistics (Full: no NDs)	2.666	2.055	0.126	-1.29	0.649	-0.503

Normal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.905	0.905	0.905	0.905

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Full: no NDs)	0.813	0.859	Data Not Normal
Lilliefors (Full: no NDs)	0.311	0.256	Data Not Normal

Gamma Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.958	0.958	0.958	0.958

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Full: no NDs)	0.657	0.74	
Kolmogorov-Smirnov (Full: no NDs)	0.239	0.248	Data Appear Gamma Distributed

Lognormal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.965	0.965	0.965	0.965

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Full: no NDs)	0.925	0.859	Data Appear Lognormal
Lilliefors (Full: no NDs)	0.197	0.256	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

Table E-8 - Soil Profile (12- to 24-Inch) Data Distribution Goodness of Fit Statistics

Lead Soil Profile Horizon 4 (12 to 24")

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	12	0	0.00%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Full: no NDs)	12	4.95	26	13.18	9.15	7.703

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log CV
Statistics (Full: no NDs)	3.319	2.544	3.971	2.42	0.588	0.243

Normal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.938	0.938	0.938	0.938

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Full: no NDs)	0.859	0.859	Data Appear Normal
Lilliefors (Full: no NDs)	0.276	0.256	Data Not Normal

Gamma Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.959	0.959	0.959	0.959

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Full: no NDs)	0.597	0.738	
Kolmogorov-Smirnov (Full: no NDs)	0.243	0.247	Data Appear Gamma Distributed

Lognormal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.964	0.964	0.964	0.964

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Full: no NDs)	0.908	0.859	Data Appear Lognormal
Lilliefors (Full: no NDs)	0.21	0.256	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

Table E-8 - Soil Profile (12- to 24-Inch) Data Distribution Goodness of Fit Statistics

Mercury Soil Profile Horizon 4 (12 to 24")

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	10	2	16.67%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	2	0.007	0.007	0.007	0.007	0
Statistics (Detects Only)	10	0.009	0.058	0.0231	0.0165	0.0155
Statistics (All: NDs treated as DL value)	12	0.007	0.058	0.0204	0.0145	0.0154
Statistics (All: NDs treated as DL/2 value)	12	0.0035	0.058	0.0198	0.0145	0.016
Statistics (Normal ROS Estimated Data)	12	-0.0171	0.058	0.0171	0.0145	0.0199
Statistics (Gamma ROS Estimated Data)	12	0.0001079	0.058	0.0197	0.0145	0.0161
Statistics (Lognormal ROS Estimated Data)	12	0.00353	0.058	0.02	0.0145	0.0158

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log CV
Statistics (Detects Only)	2.884	2.219	0.00801	-3.951	0.628	-0.159
Statistics (NDs = DL)	2.344	1.814	0.00871	-4.12	0.691	-0.168
Statistics (NDs = DL/2)	1.737	1.358	0.0114	-4.235	0.873	-0.206
Statistics (Gamma ROS Estimates)	1.029	0.828	0.0192	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	-4.205	0.824	-0.196

Normal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.92	0.908	0.931	0.975

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.849	0.842	Data Appear Normal
Lilliefors (Detects Only)	0.229	0.28	Data Appear Normal
Shapiro-Wilks (NDs = DL)	0.827	0.859	Data Not Normal
Lilliefors (NDs = DL)	0.229	0.256	Data Appear Normal
Shapiro-Wilks (NDs = DL/2)	0.871	0.859	Data Appear Normal
Lilliefors (NDs = DL/2)	0.212	0.256	Data Appear Normal
Shapiro-Wilks (Normal ROS Estimates)	0.962	0.859	Data Appear Normal
Lilliefors (Normal ROS Estimates)	0.176	0.256	Data Appear Normal

Gamma Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.981	0.981	0.99	0.986

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.385	0.733	
Kolmogorov-Smirnov (Detects Only)	0.185	0.269	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	0.448	0.741	

Table E-8 - Soil Profile (12- to 24-Inch) Data Distribution Goodness of Fit Statistics

Kolmogorov-Smirnov (NDs = DL)	0.172	0.248	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL/2)	0.239	0.744	
Kolmogorov-Smirnov (NDs = DL/2)	0.12	0.249	Data Appear Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	0.47	0.756	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.194	0.252	Data Appear Gamma Distributed

Lognormal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.975	0.974	0.98	0.991

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.936	0.842	Data Appear Lognormal
Lilliefors (Detects Only)	0.154	0.28	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.935	0.859	Data Appear Lognormal
Lilliefors (NDs = DL)	0.137	0.256	Data Appear Lognormal
Shapiro-Wilks (NDs = DL/2)	0.952	0.859	Data Appear Lognormal
Lilliefors (NDs = DL/2)	0.126	0.256	Data Appear Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.978	0.859	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.123	0.256	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

Zinc Soil Profile Horizon 4 (12 to 24")

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	12	0	0.00%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Full: no NDs)	12	24	166	65.83	57.5	39.02

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log CV
Statistics (Full: no NDs)	3.763	2.878	17.49	4.048	0.54	0.133

Normal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.919	0.919	0.919	0.919

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Full: no NDs)	0.858	0.859	Data Not Normal
Lilliefors (Full: no NDs)	0.175	0.256	Data Appear Normal

Table E-8 - Soil Profile (12- to 24-Inch) Data Distribution Goodness of Fit Statistics

Gamma Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.977	0.977	0.977	0.977

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Full: no NDs)	0.232	0.737	
Kolmogorov-Smirnov (Full: no NDs)	0.121	0.247	Data Appear Gamma Distributed

Lognormal Distribution Test Results

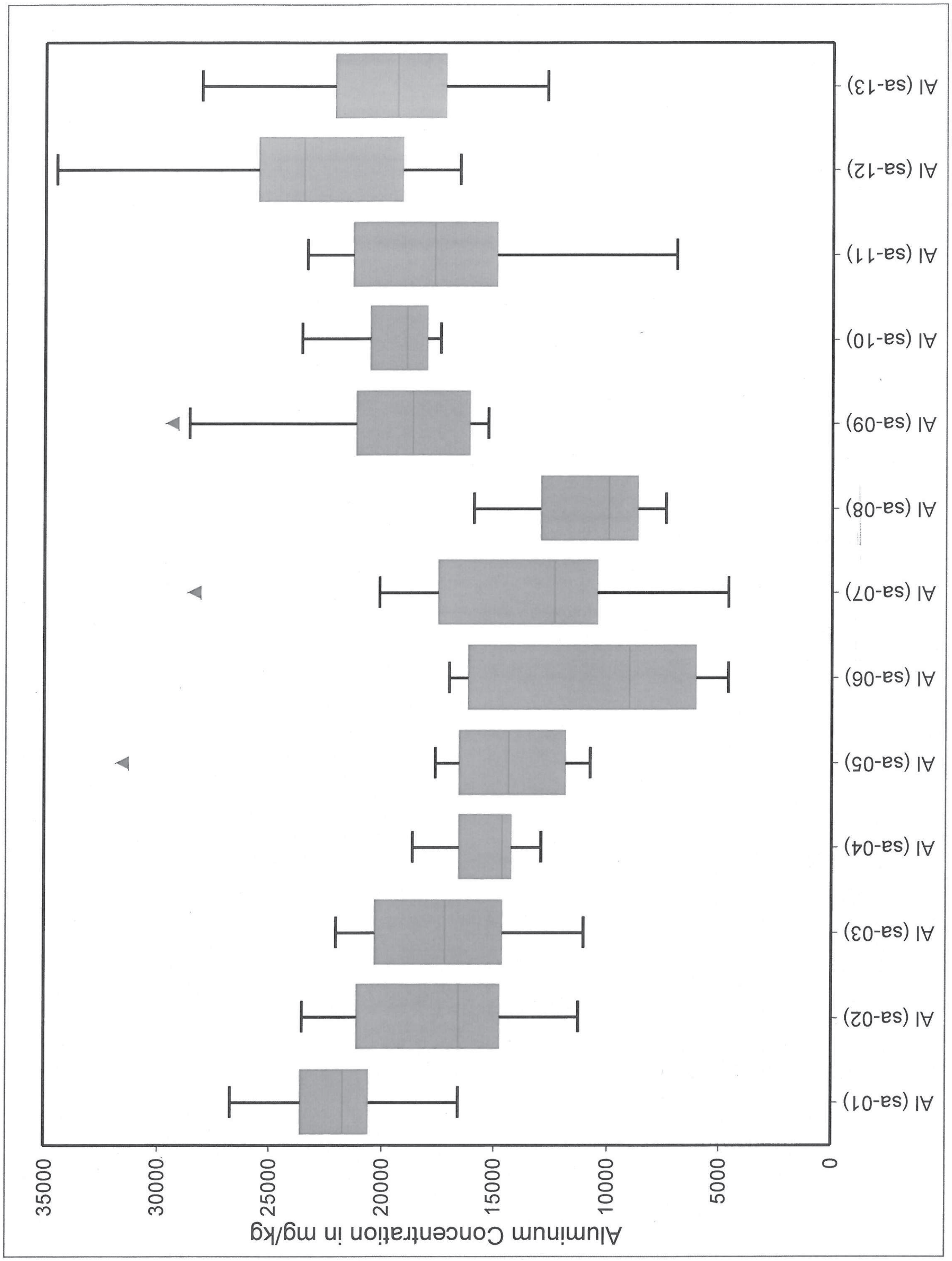
	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.99	0.99	0.99	0.99

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Full: no NDs)	0.983	0.859	Data Appear Lognormal
Lilliefors (Full: no NDs)	0.11	0.256	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

Table E-9 - Pooled 12- to 24-Inch Soil Profile Data Distributions and Means for Smelter Related Metals

Metal	12- to 24-inch Soil Profile Distribution	Arithmetic Mean	Geometric Mean
Arsenic	normal	5.05	4.28
Cadmium	lognormal	0.336	0.275
Lead	lognormal	13.2	11.2
Mercury	lognormal	0.020	0.016
Zinc	lognormal	65.8	57.3



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

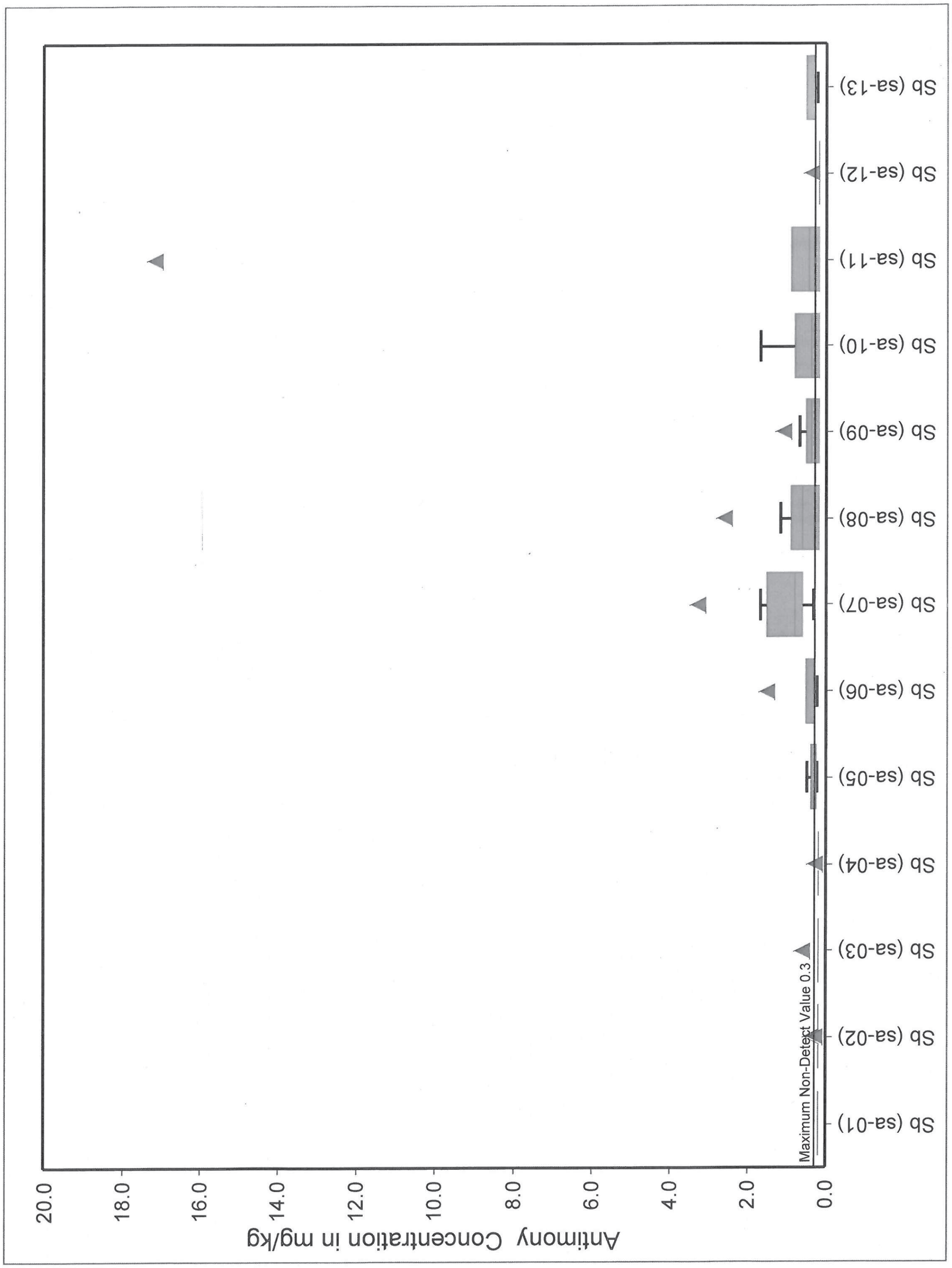
Surface Soil Aluminum Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-1

EAL 04/08/13 1780036-AH.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

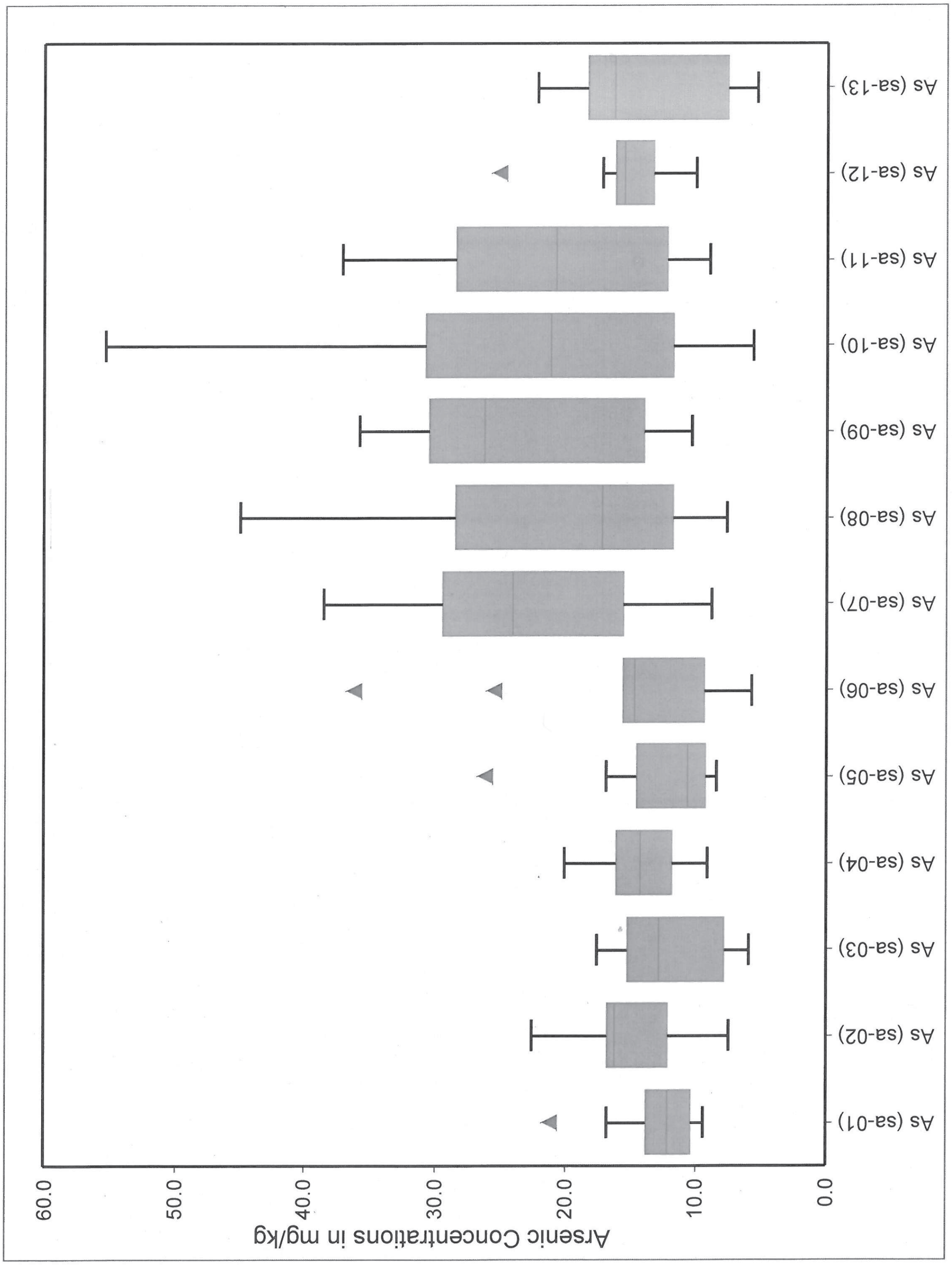
Surface Soil Antimony Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-2

EAL 04/08/13 1780036-AI.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

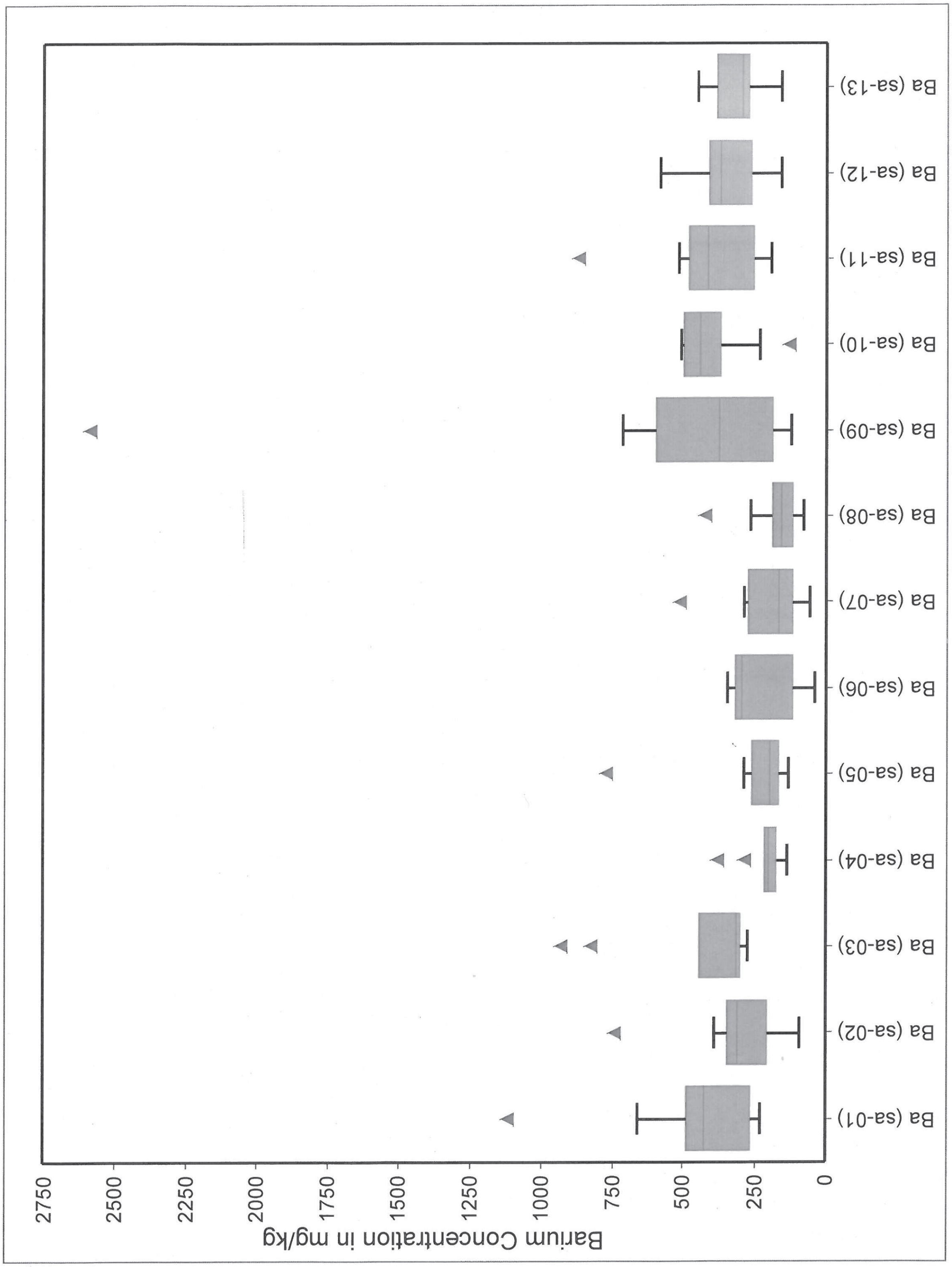
Surface Soil Arsenic Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-3

EAL 04/08/13 1780036-AJ.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

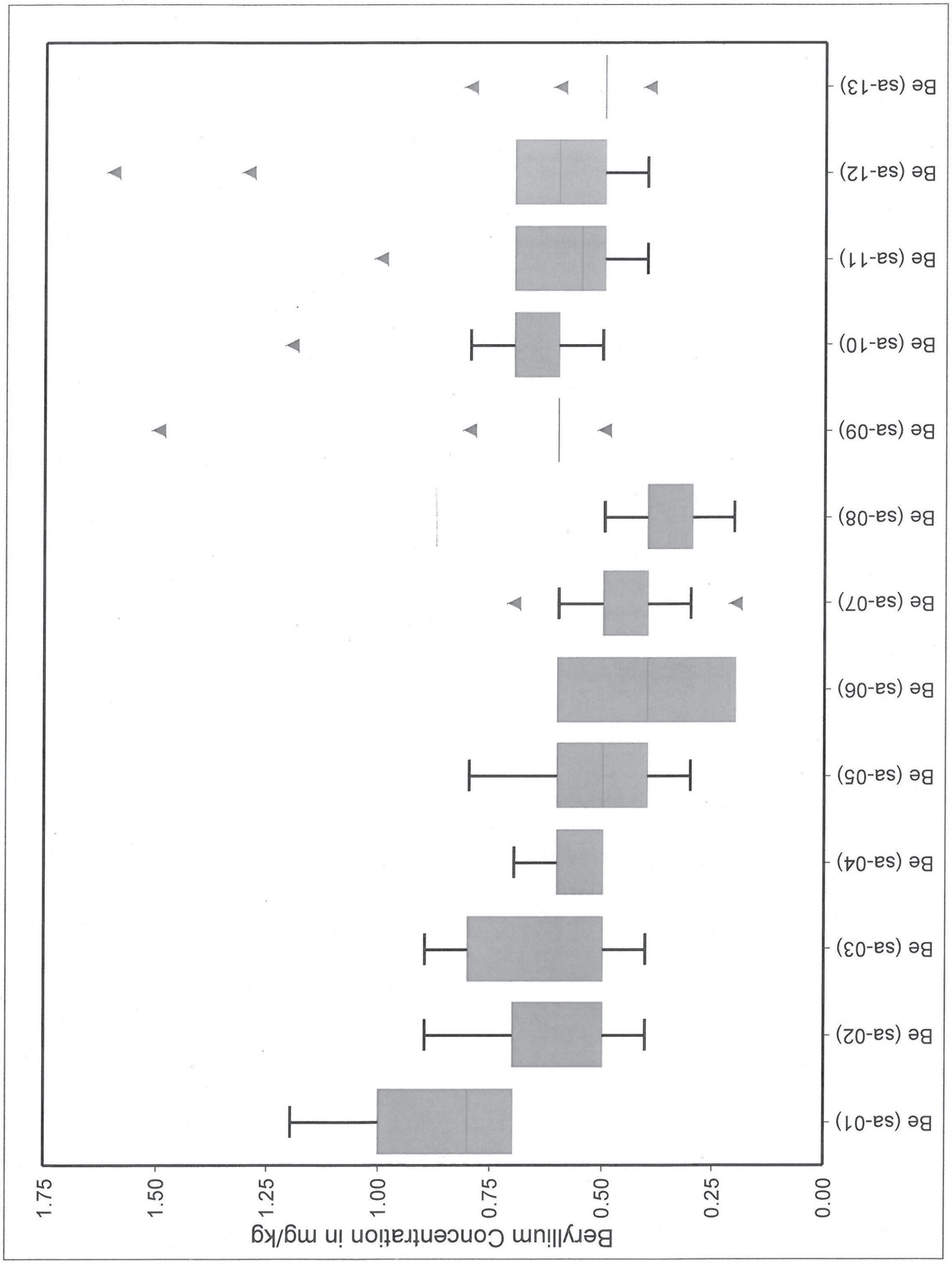
Surface Soil Barium Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-4

EAL 04/08/13 1780036-AK.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Surface Soil Beryllium Box and Whisker Plot by Subarea

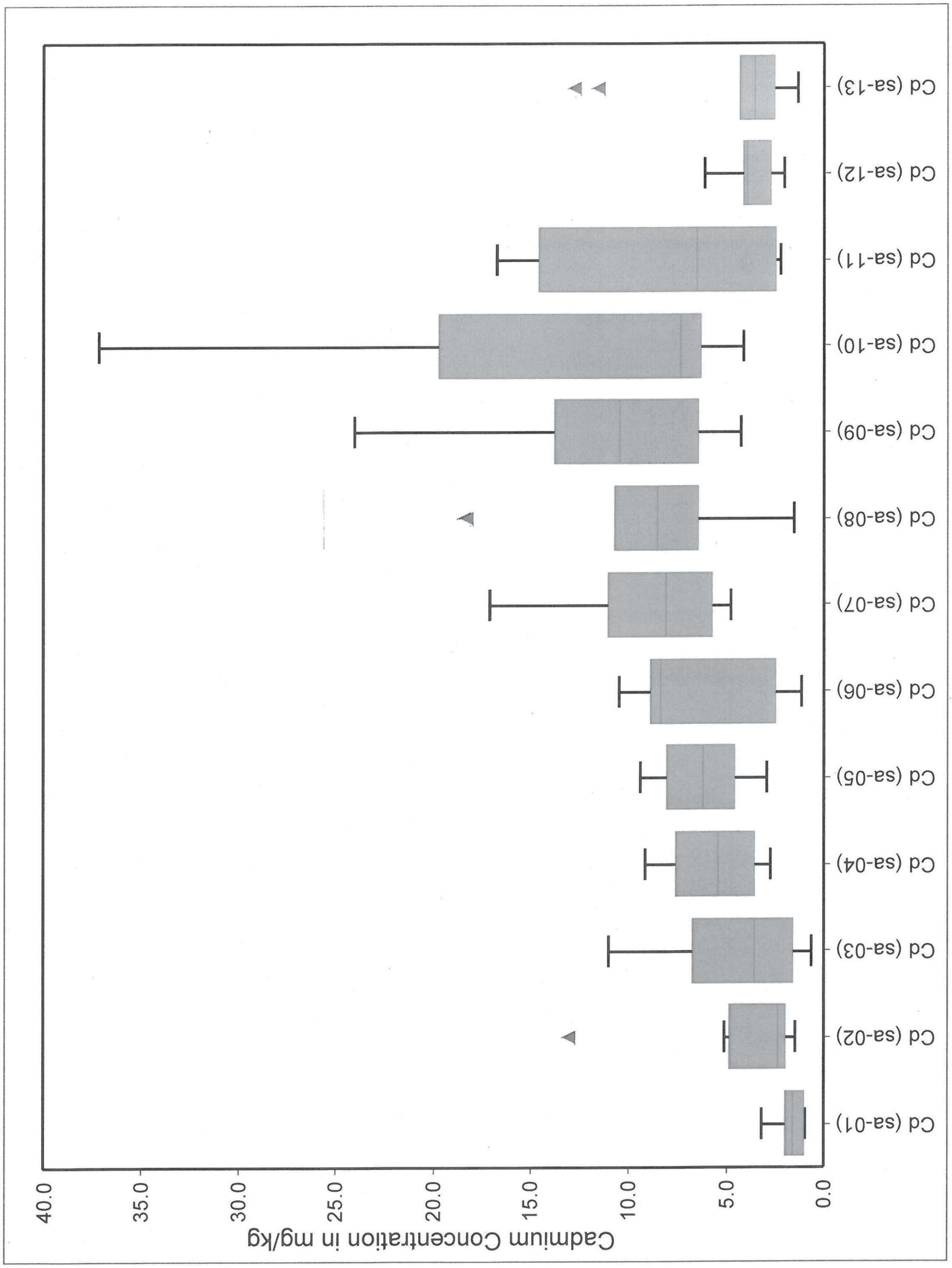
17800-36 4/13

HARTCROWSER

Figure

E-5

EAL 04/08/13 1780036-AL.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

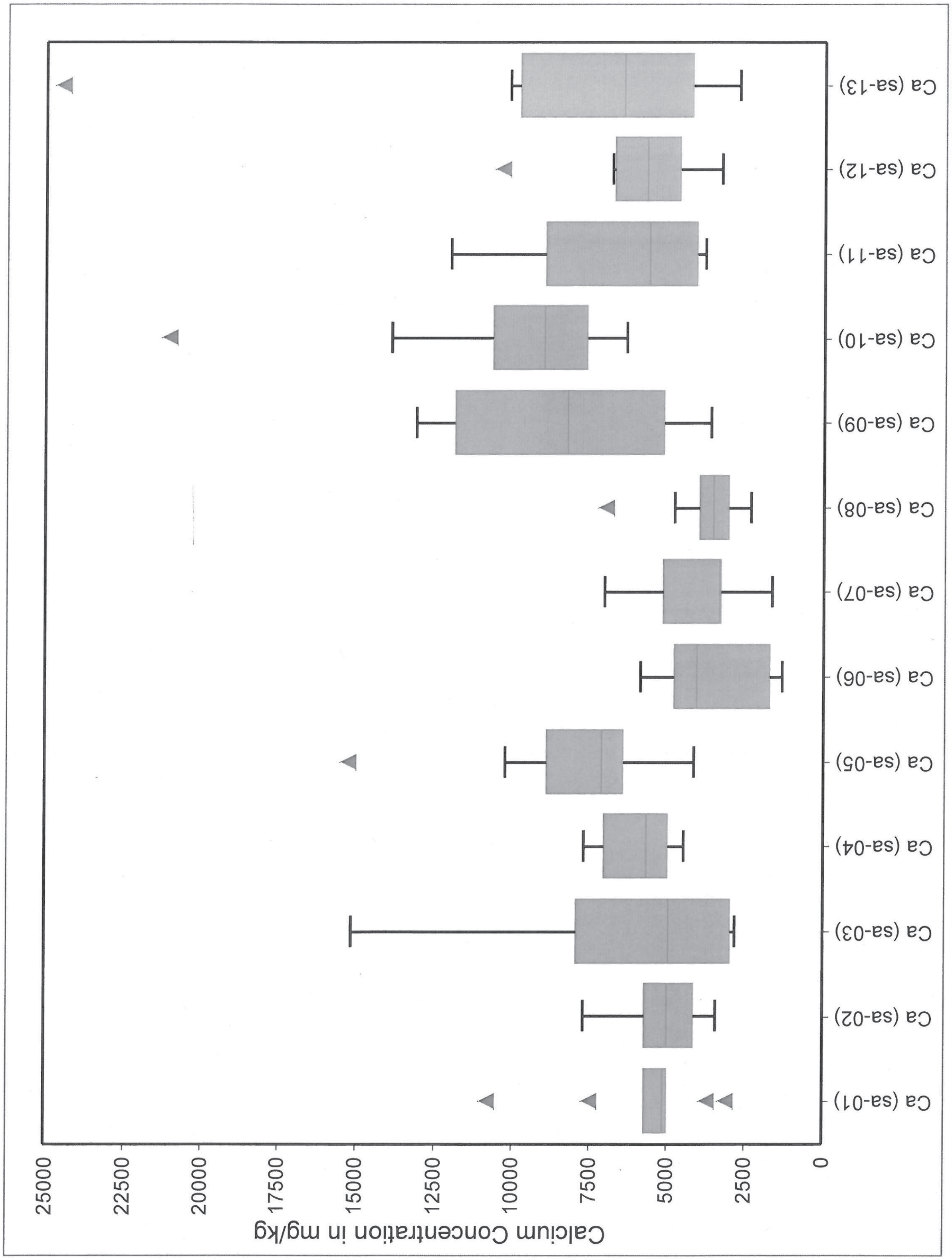
Surface Soil Cadmium Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-6

EAL 04/08/13 1780036-AN.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

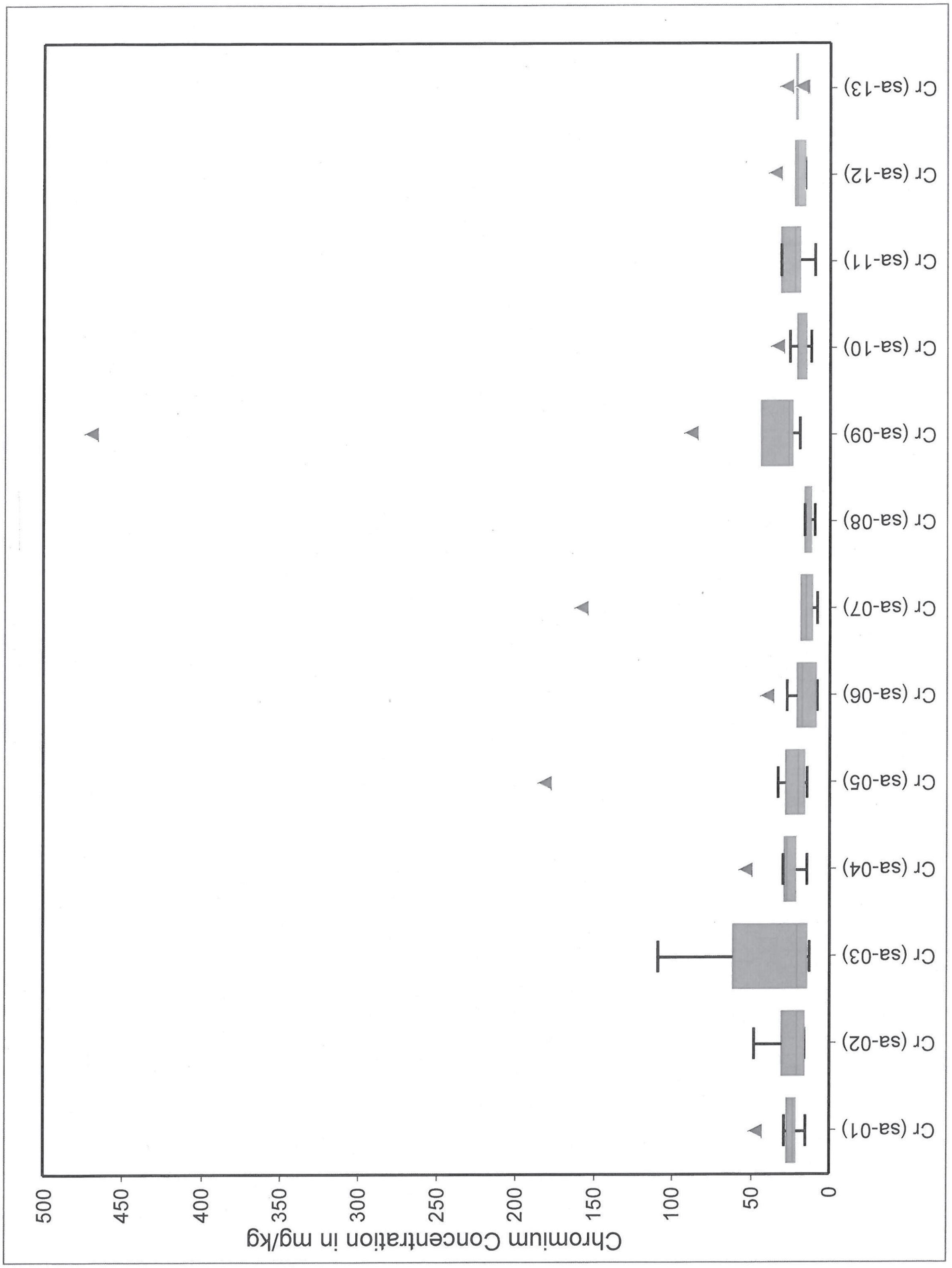
Surface Soil Calcium Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-7

EAL 04/08/13 1780036-AO.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

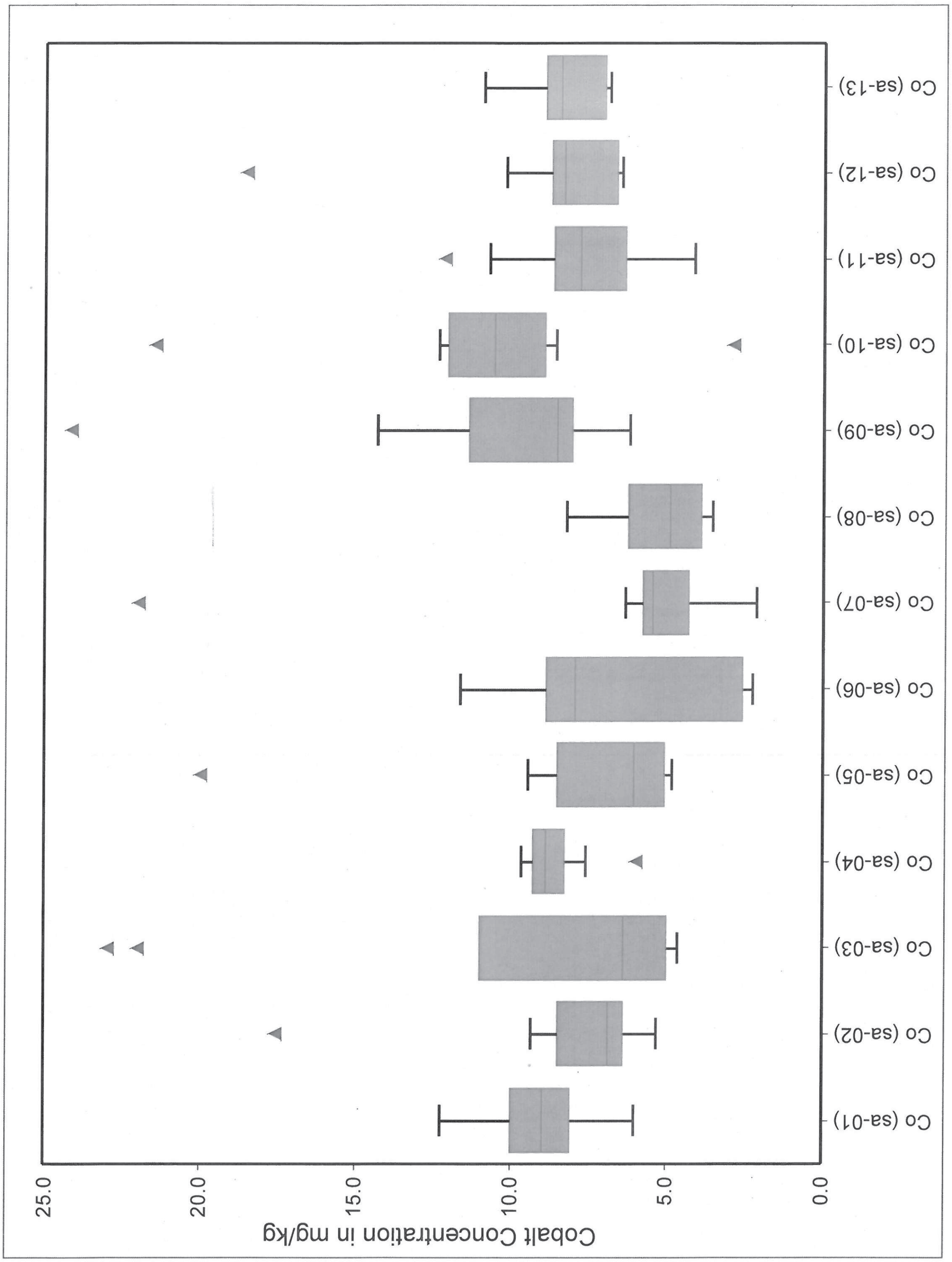
Surface Soil Chromium Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-8

EAL 04/08/13 1780036-AP.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

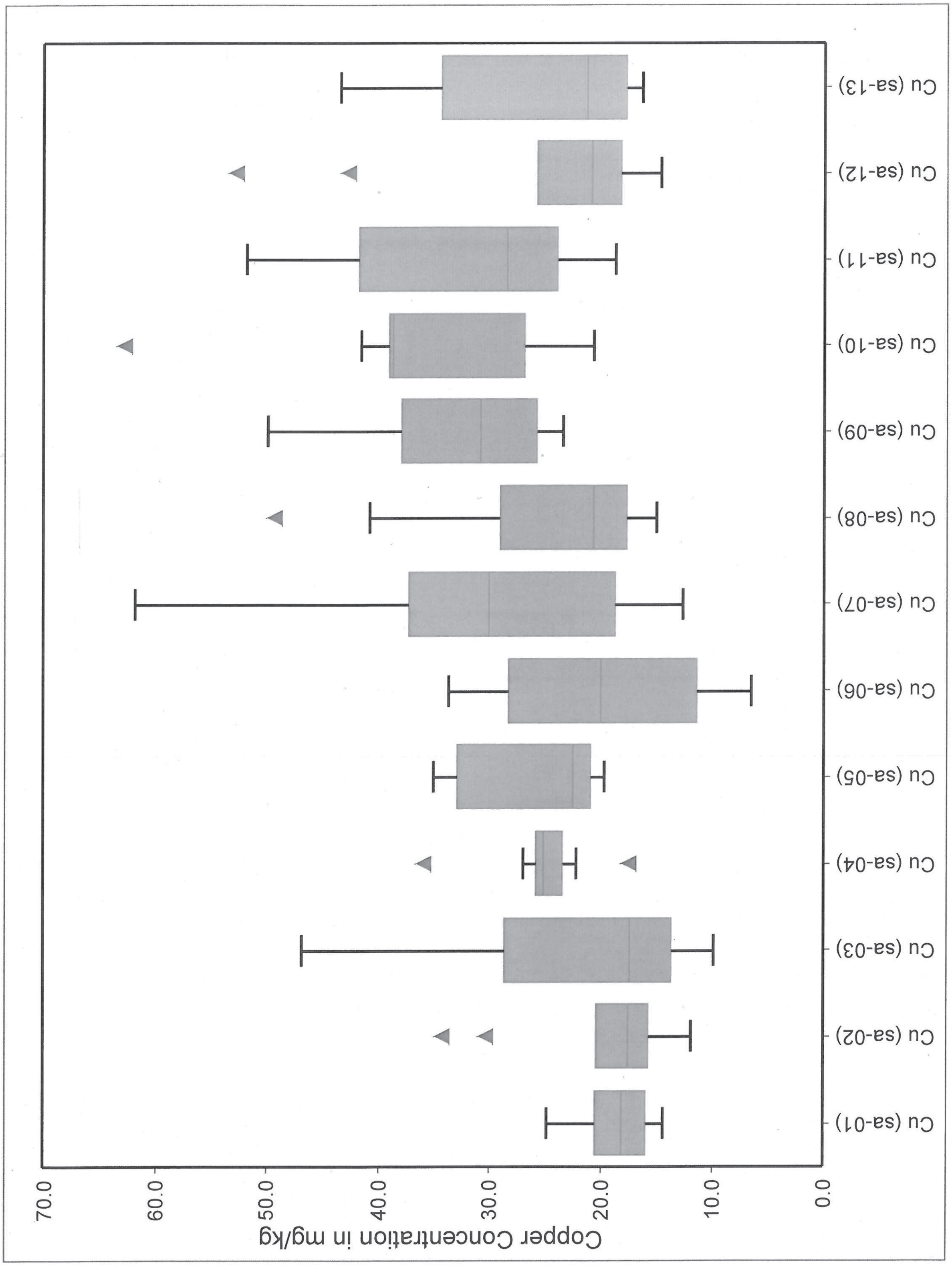
Surface Soil Cobalt Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-9

EAL 04/08/13 1780036-AQ.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

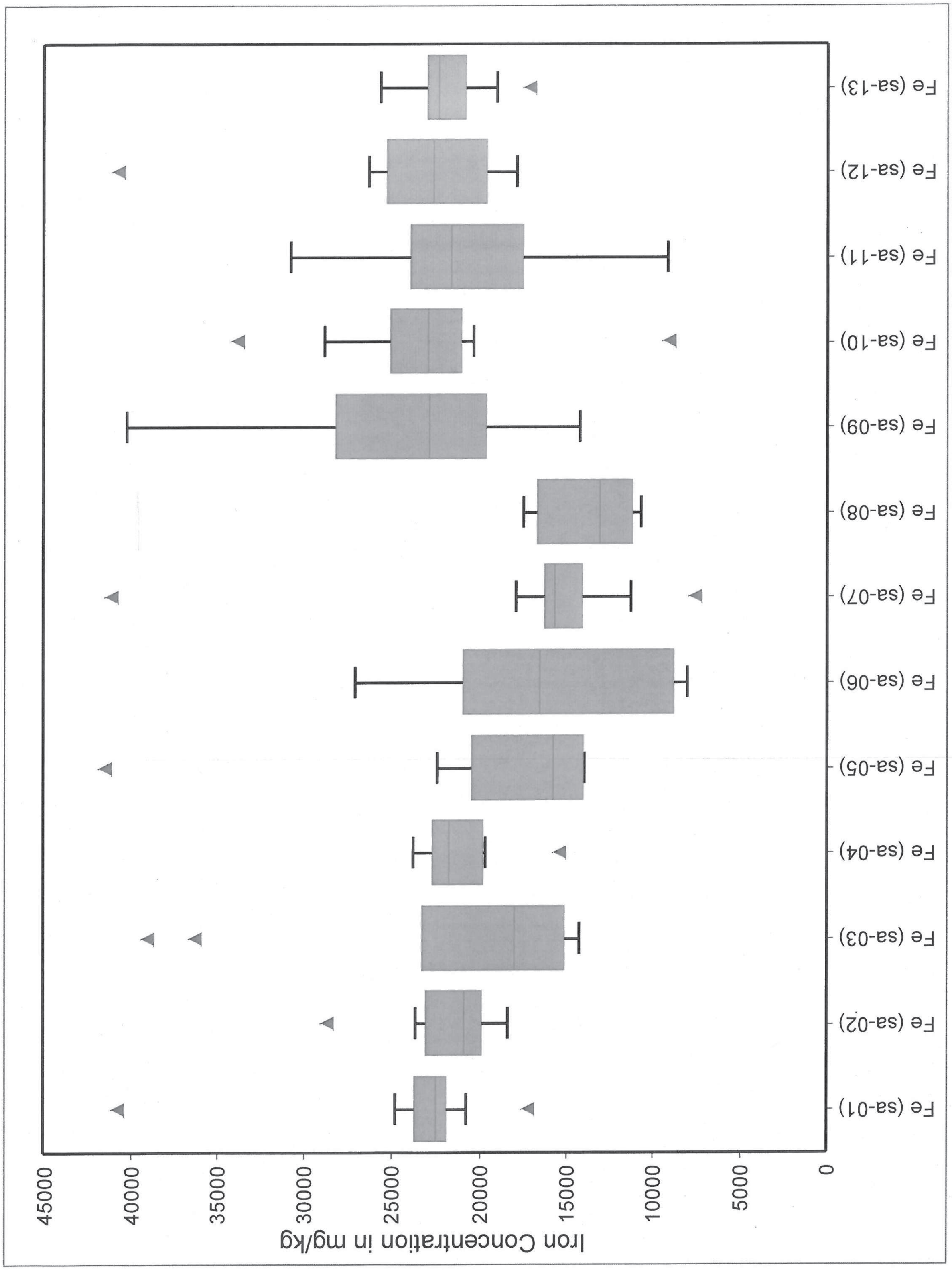
Surface Soil Copper Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-10

EAL 04/08/13 1780036-AR.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

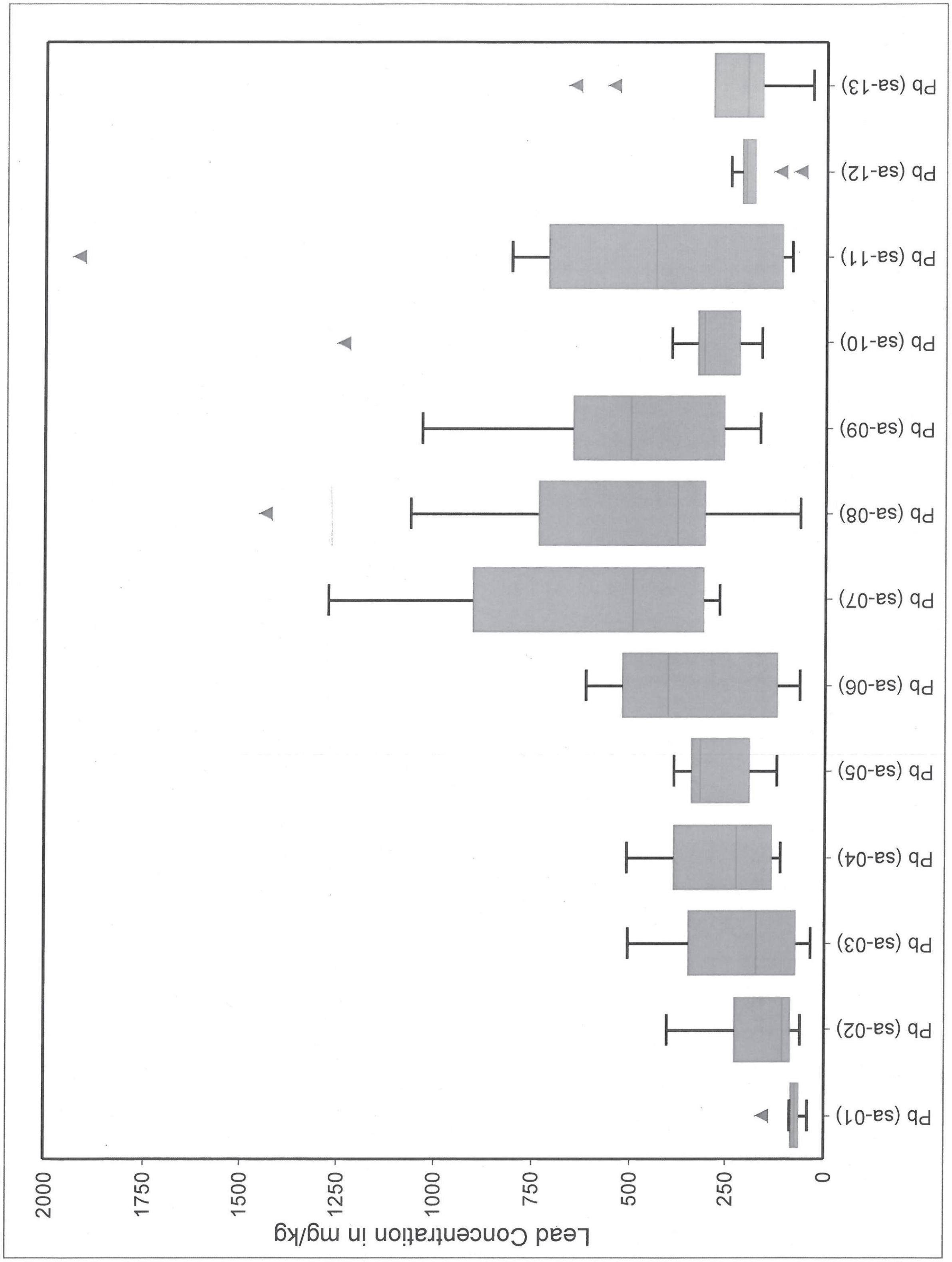
Surface Soil Iron Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-11

EAL 04/08/13 1780036-AS.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

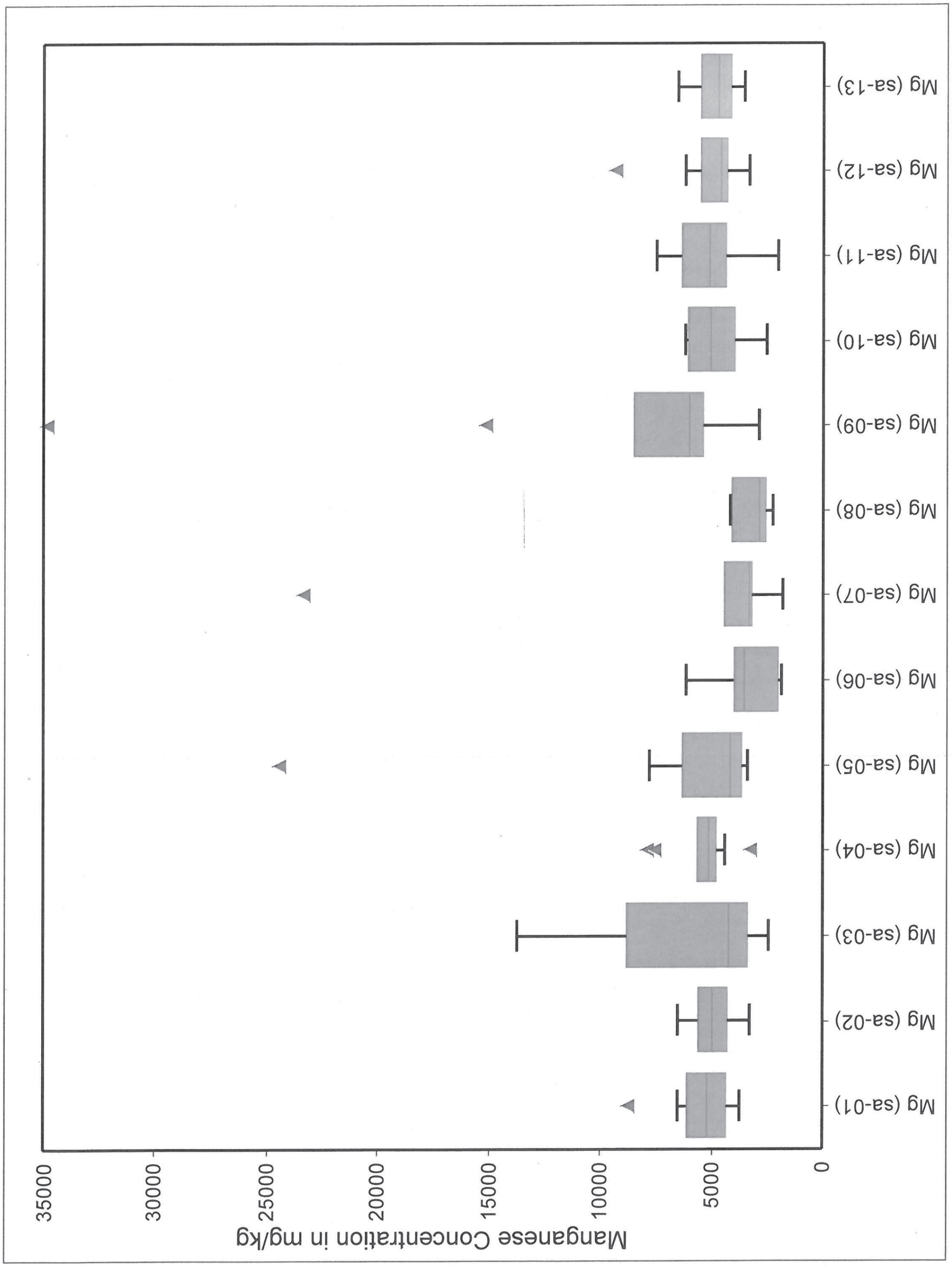
Surface Soil Lead Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-12

EAL 04/08/13 1780036-AT.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

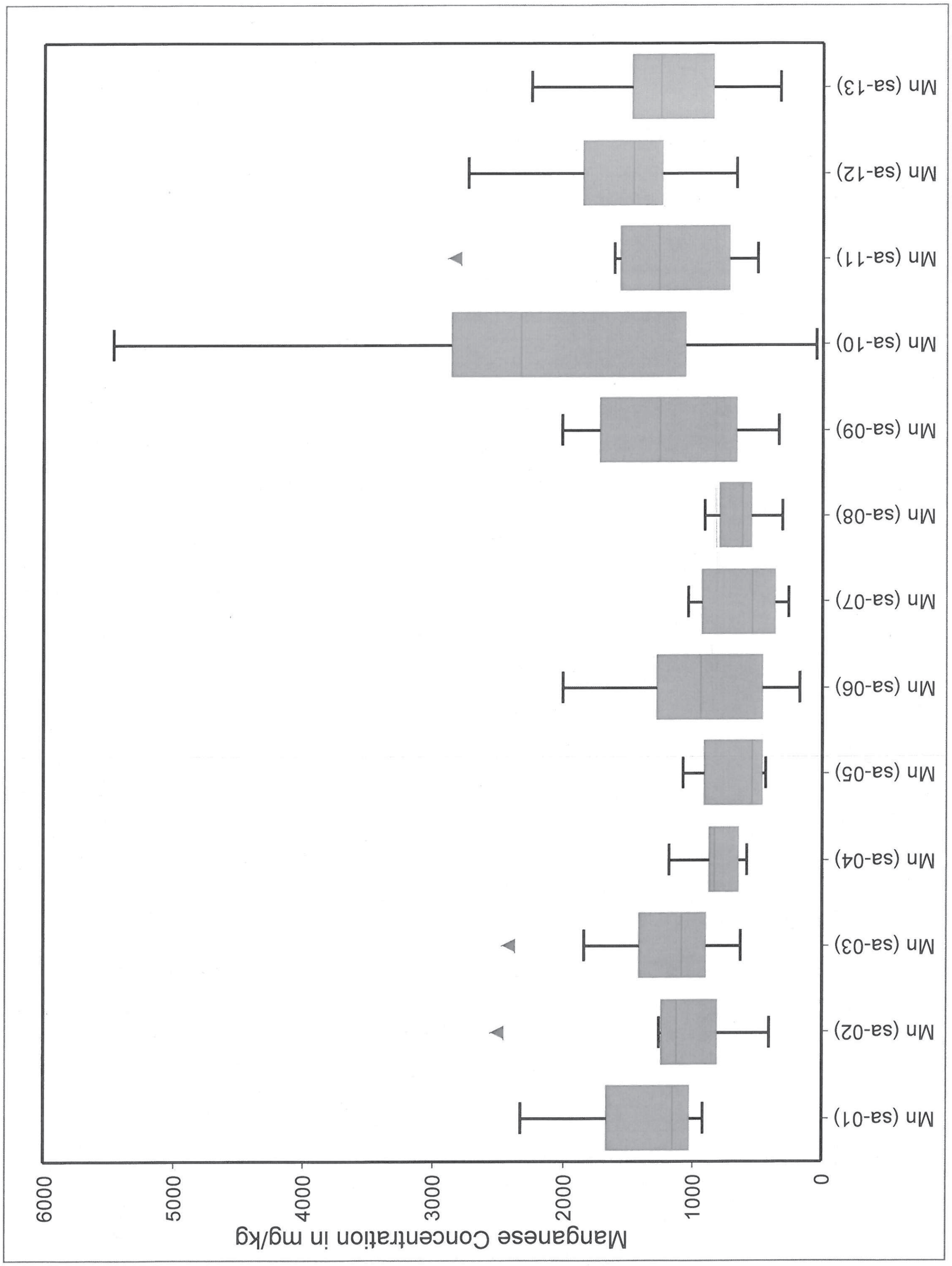
Surface Soil Magnesium Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-13

EAL 04/08/13 1780036-AU.cdr



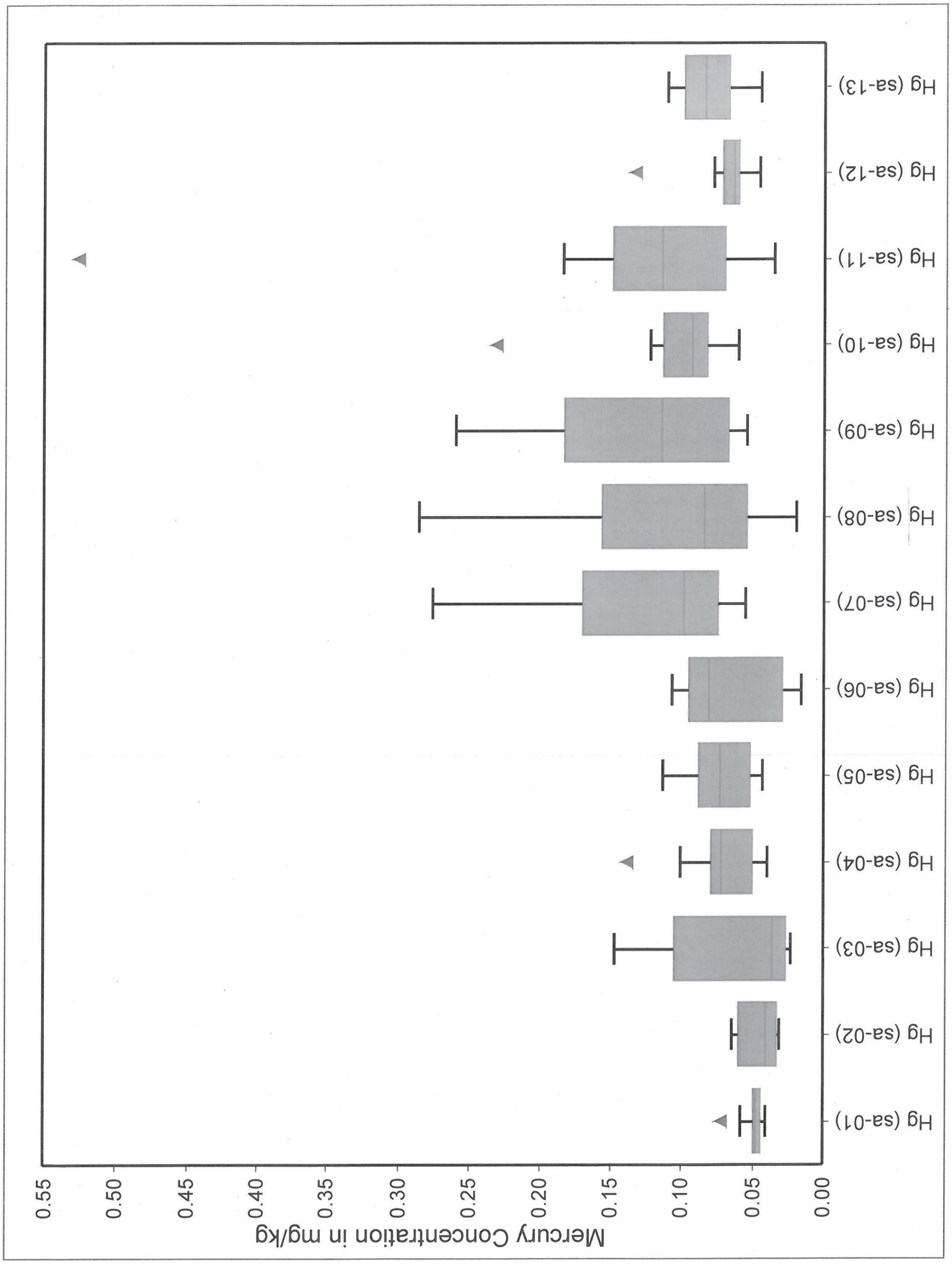
Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Surface Soil Manganese Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-14



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

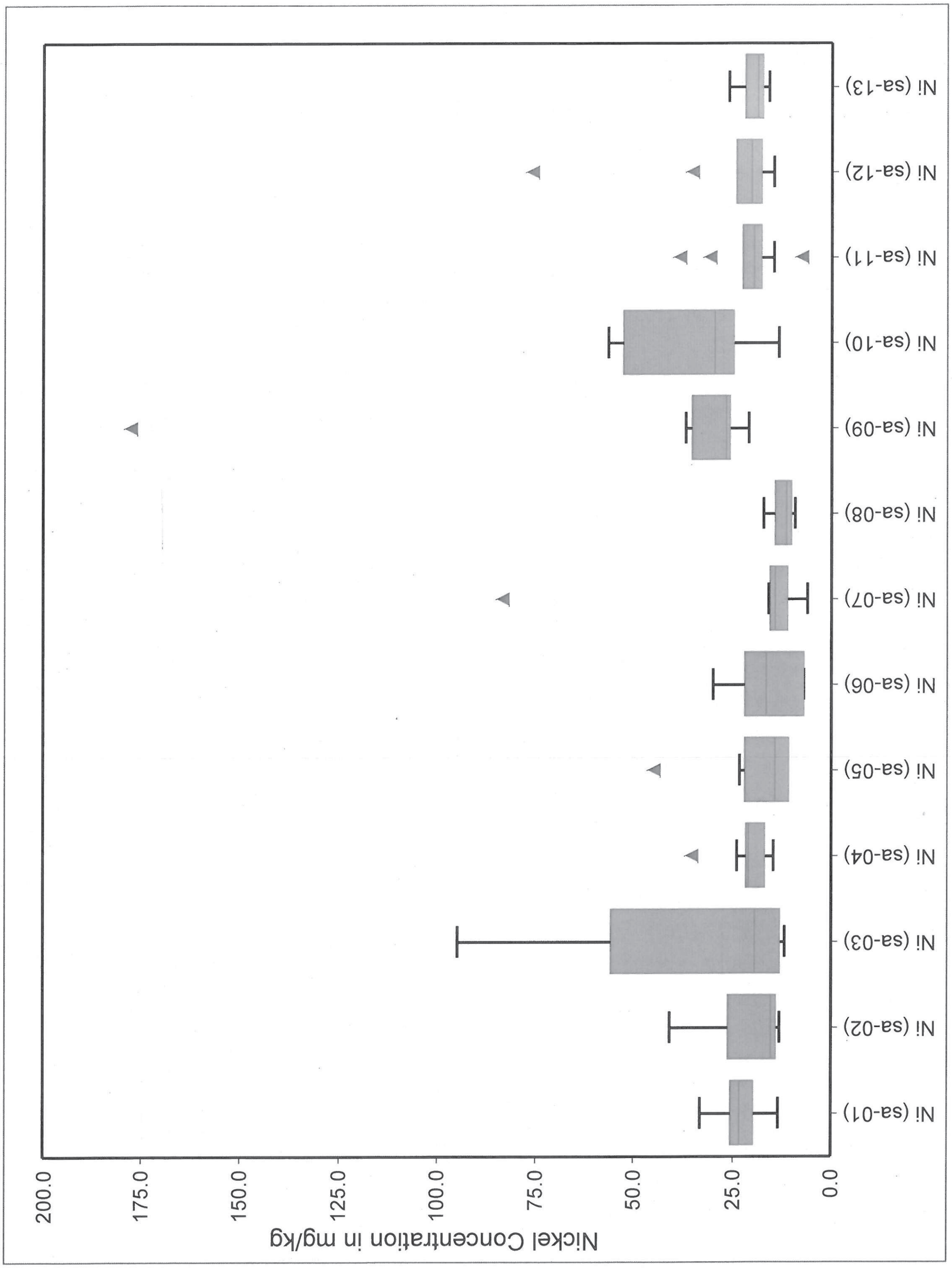
Surface Soil Mercury Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-15

EAL 04/08/13 1780036-AW.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

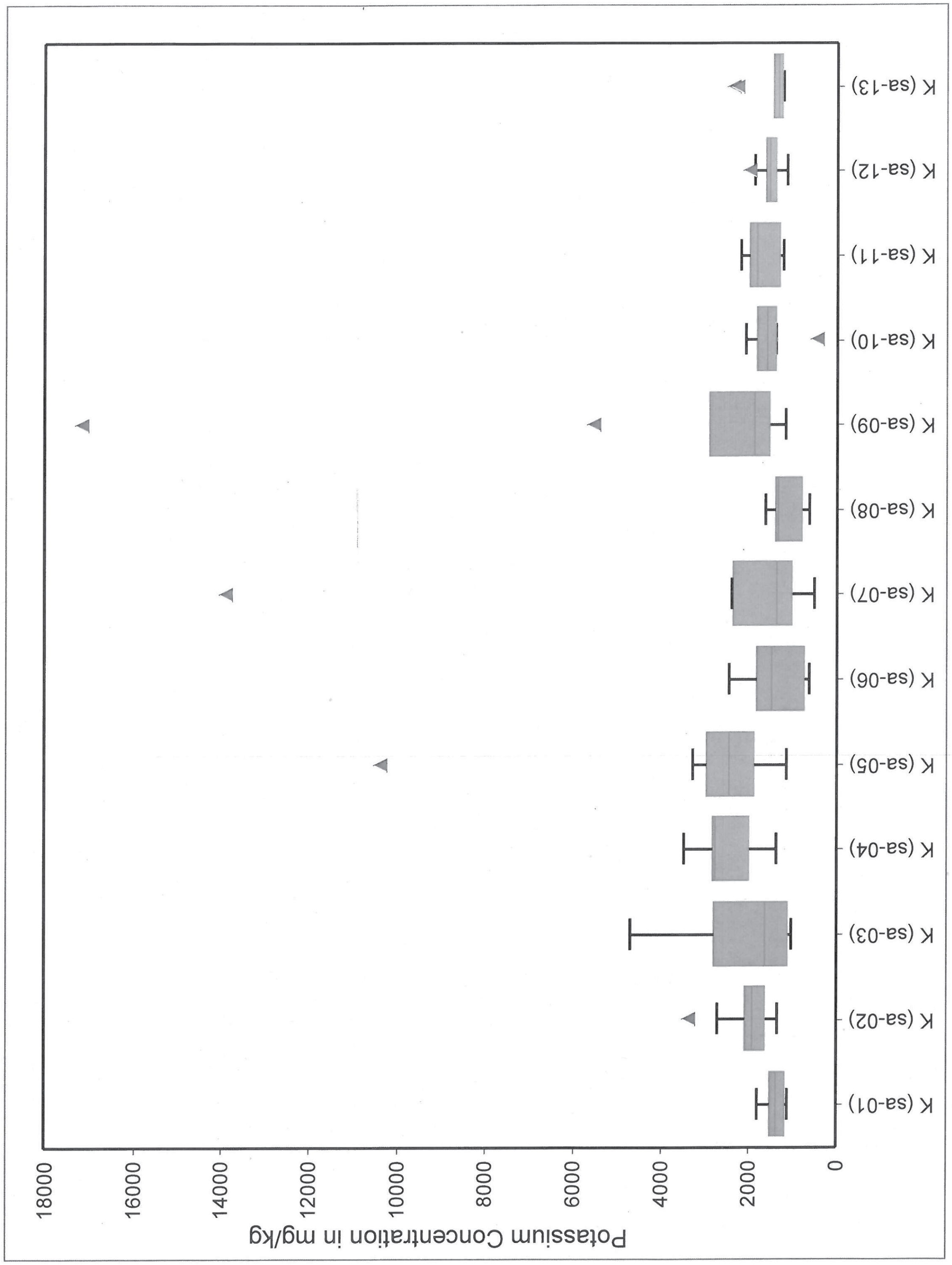
Surface Soil Nickel Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure **E-16**

EAL 04/08/13 1780036-AX.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

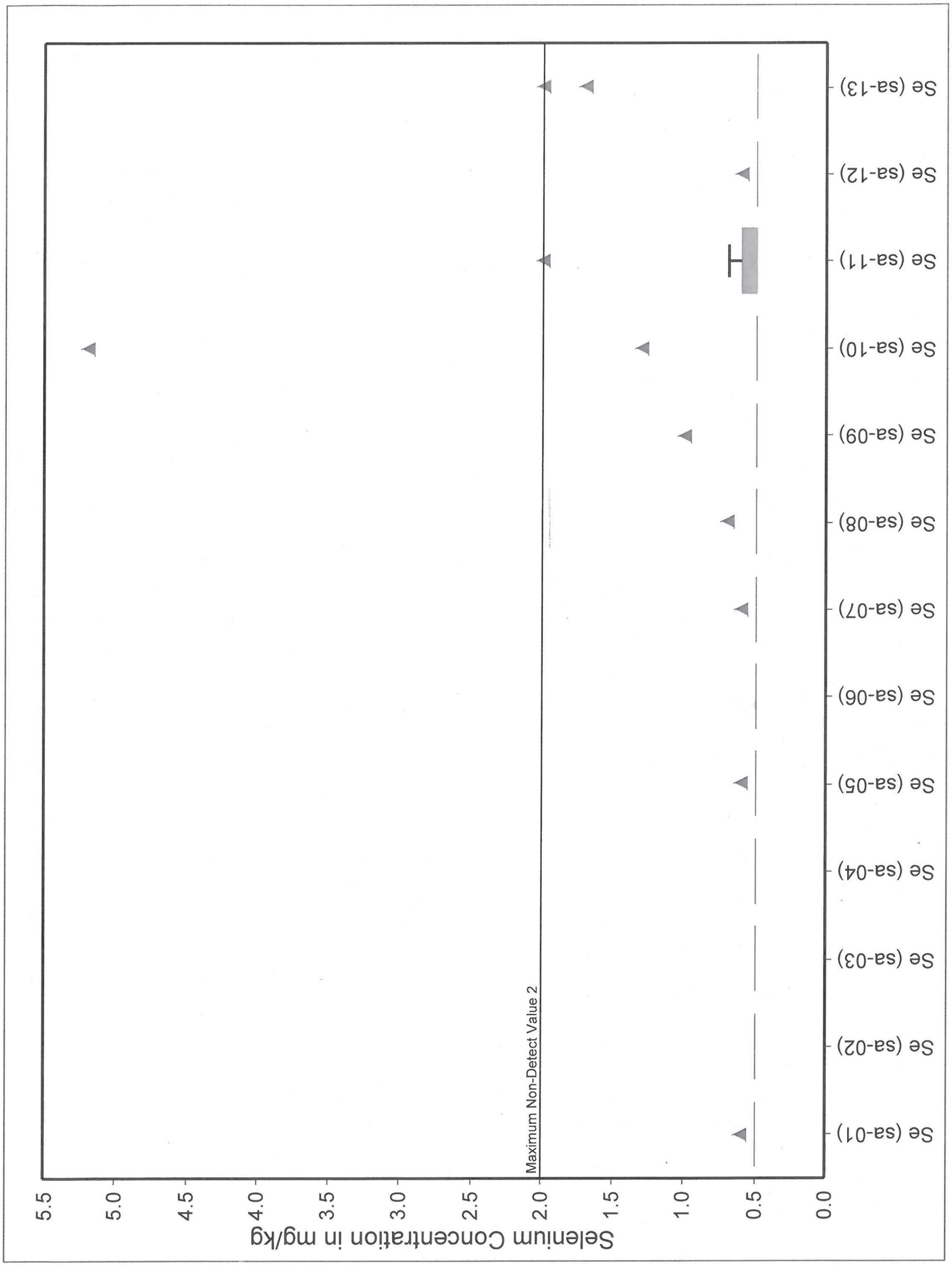
Surface Soil Potassium Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-17

EAL 04/08/13 1780036-AY.cdr



EAL 04/08/13 1780036-AZ.cdr

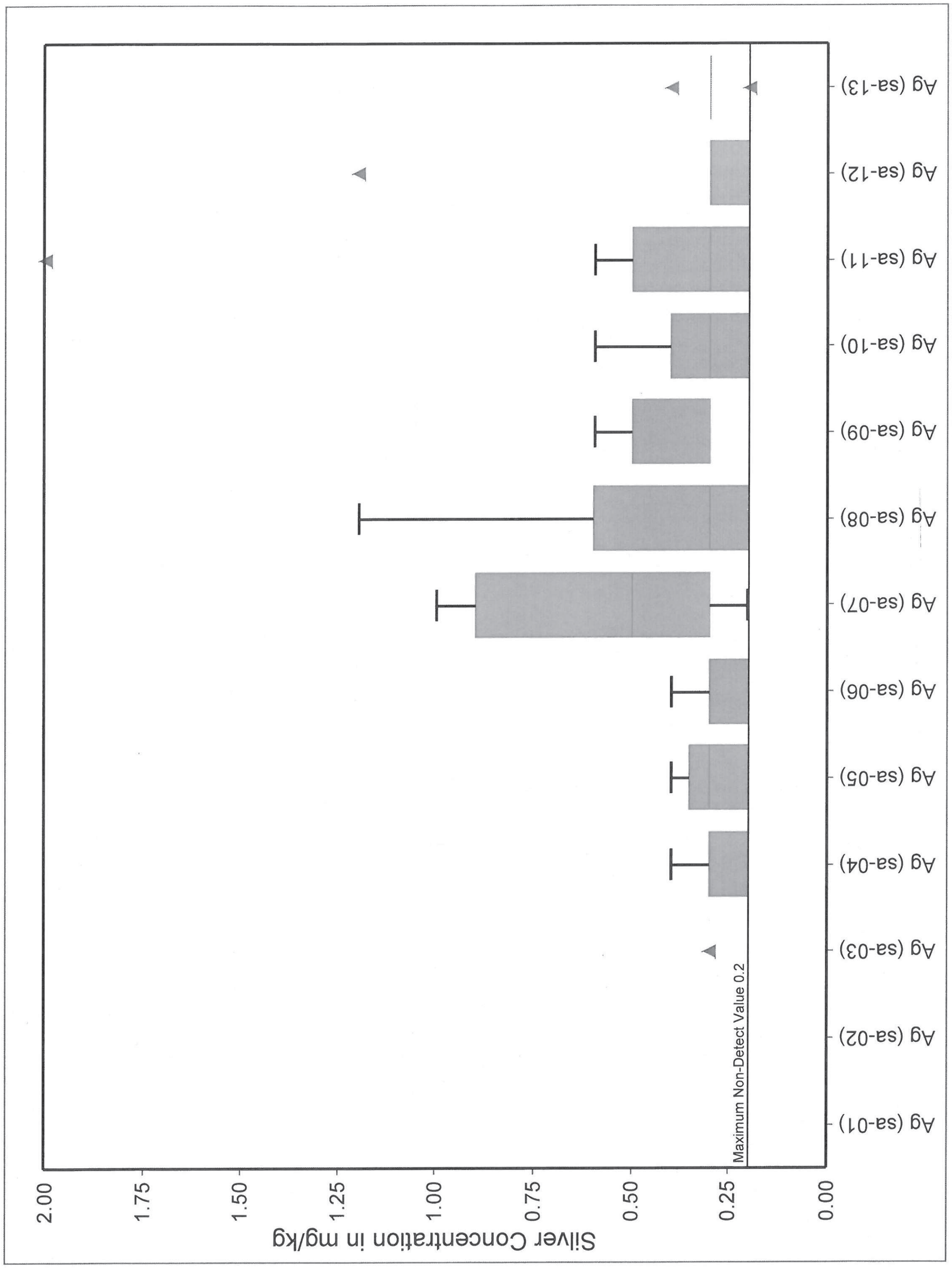
Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Surface Soil Selenium Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-18



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

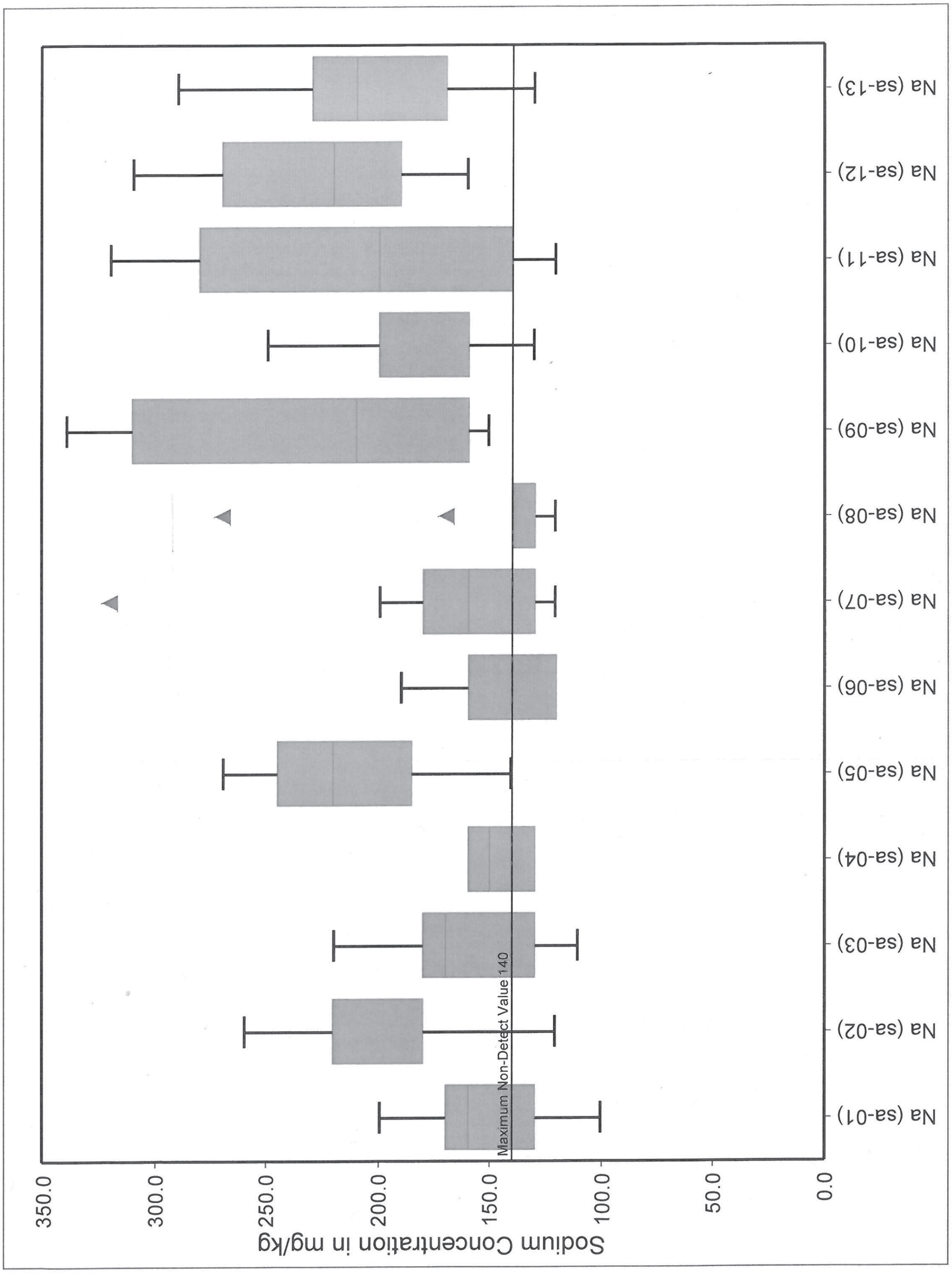
Surface Soil Silver Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-19

EAL 04/08/13 1780036-BA.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

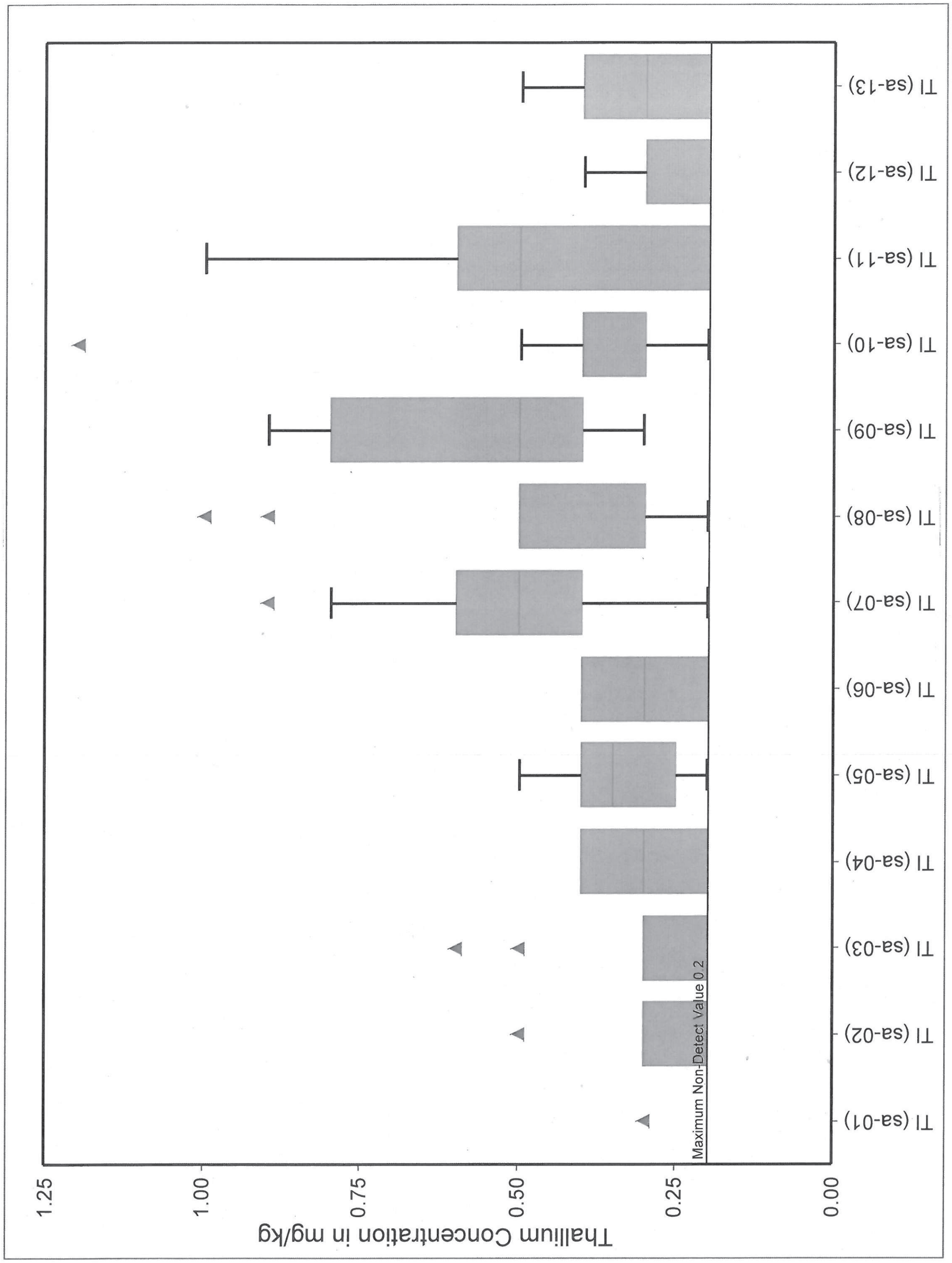
Surface Soil Sodium Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-20

EAL 04/08/13 1780036-BB.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

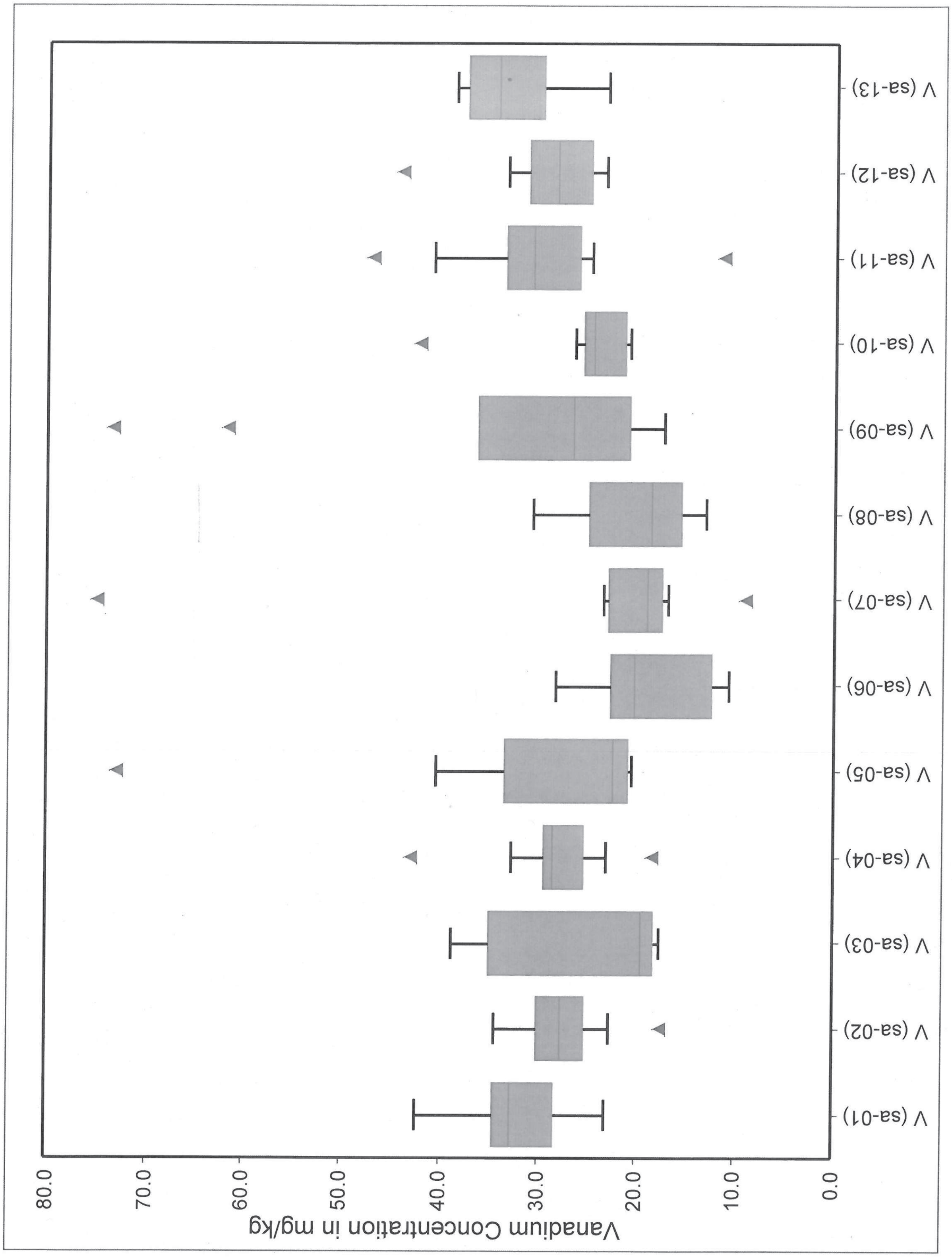
Surface Soil Thallium Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-21

EAL 04/08/13 1780036-BC.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

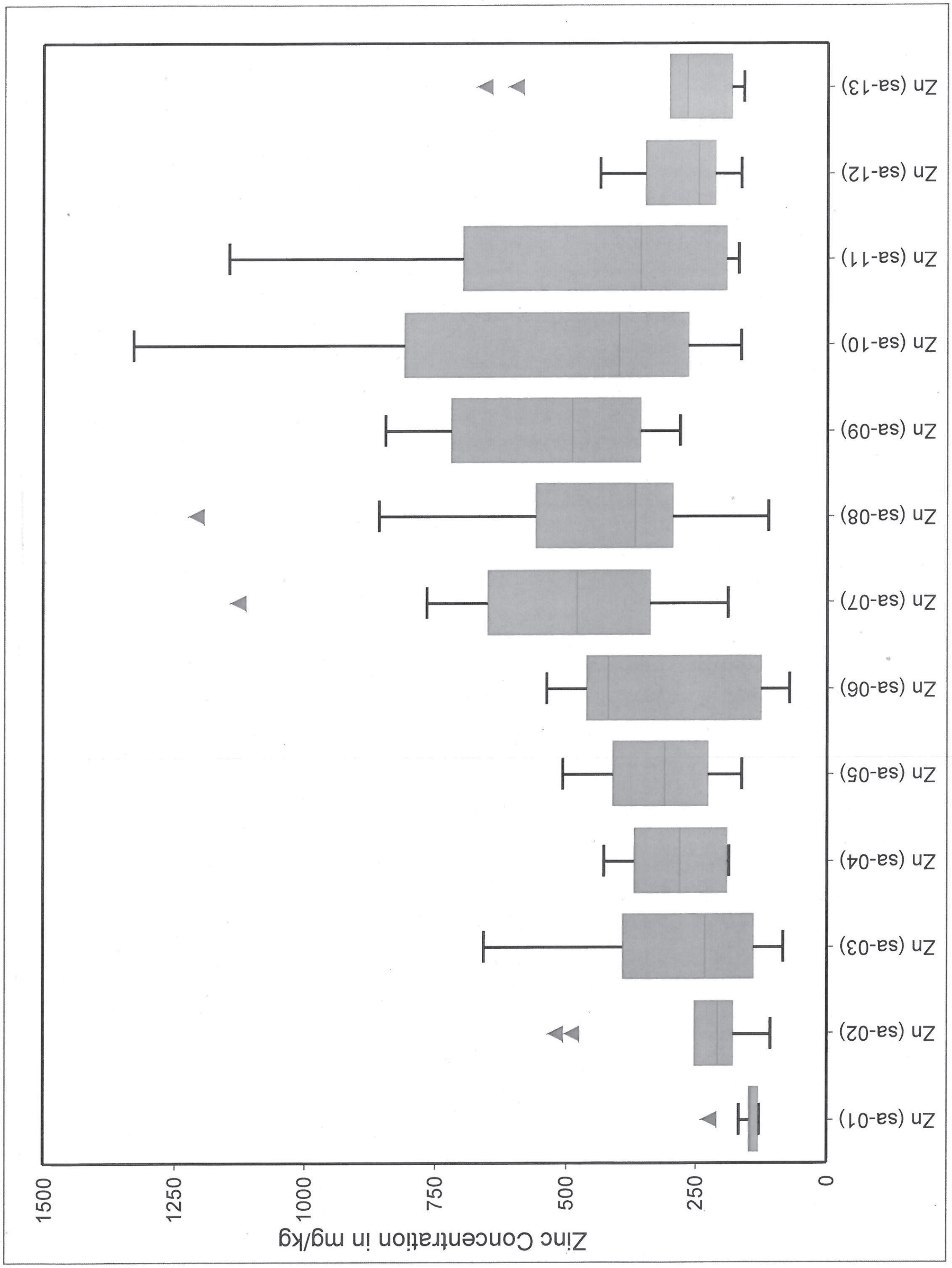
Surface Soil Vanadium Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-22

EAL 04/08/13 1780036-BD.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

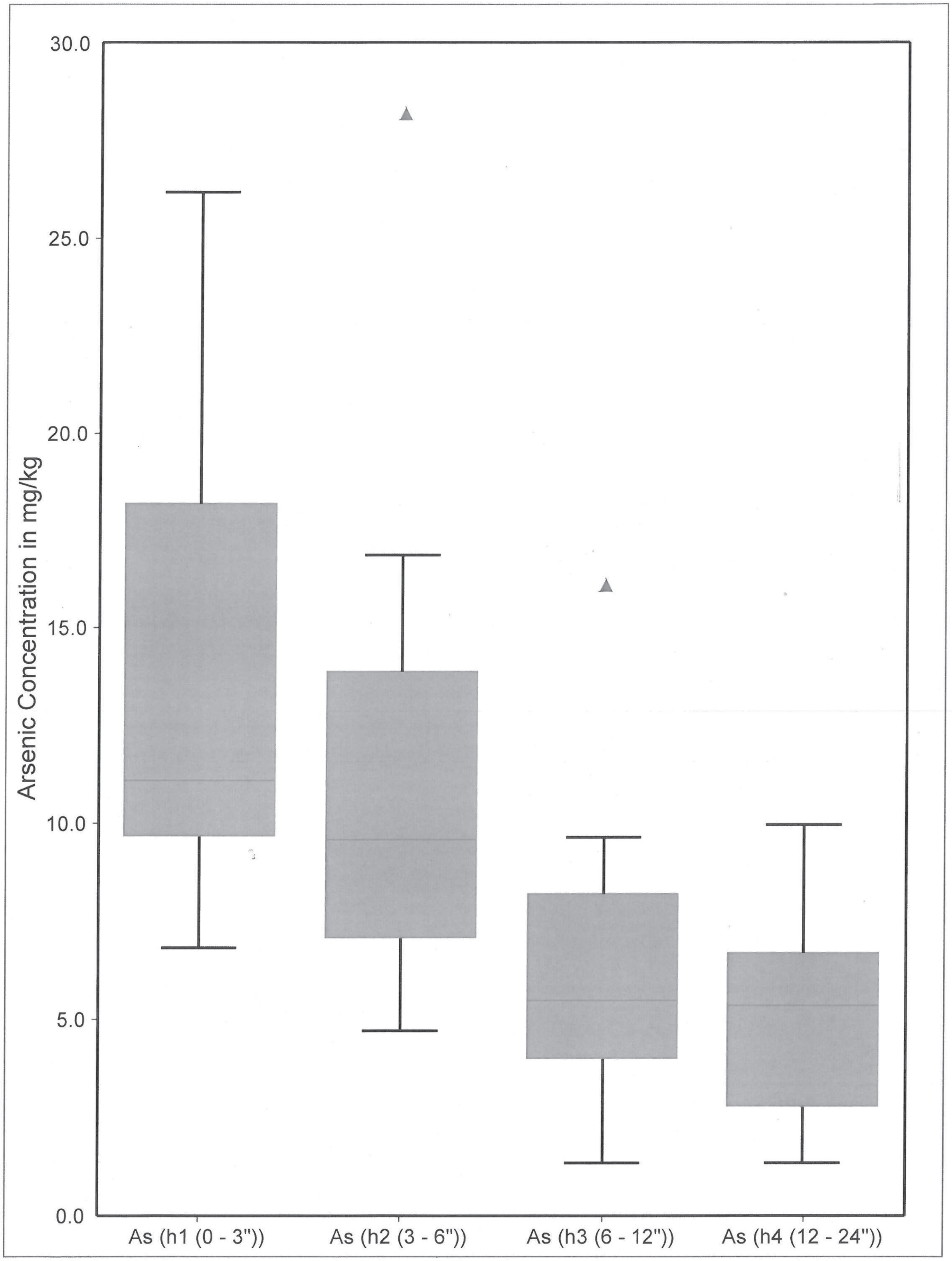
Surface Soil Zinc Box and Whisker Plot by Subarea

17800-36 4/13

HARTCROWSER

Figure
E-23

EAL 04/08/13 1780036-BE.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Arsenic Soil Profile Box and Whisker Plot by Depth Interval

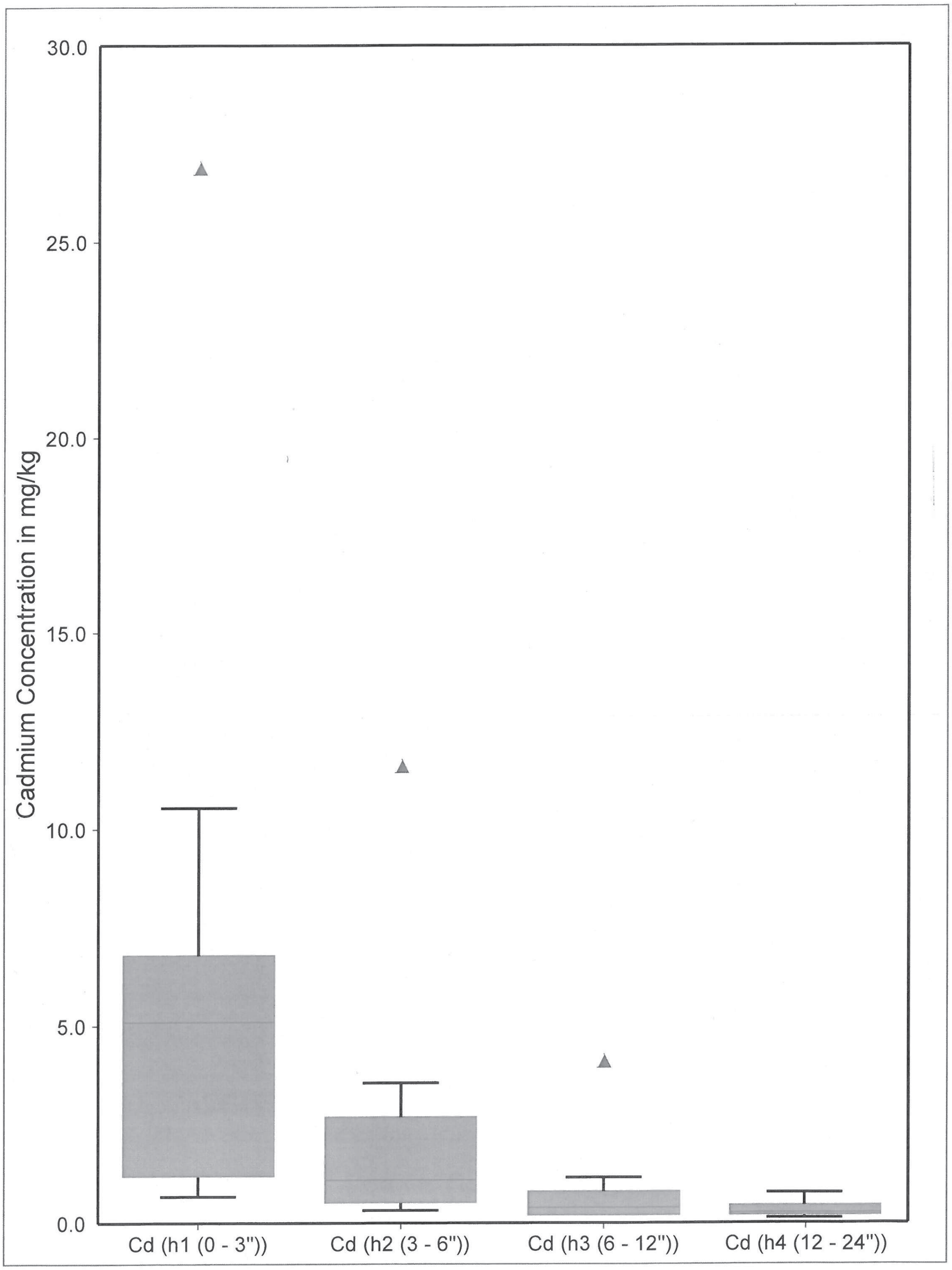
17800-36 4/13

HARTCROWSER

Figure

E-24

EAL 04/08/13 1780036-BF.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

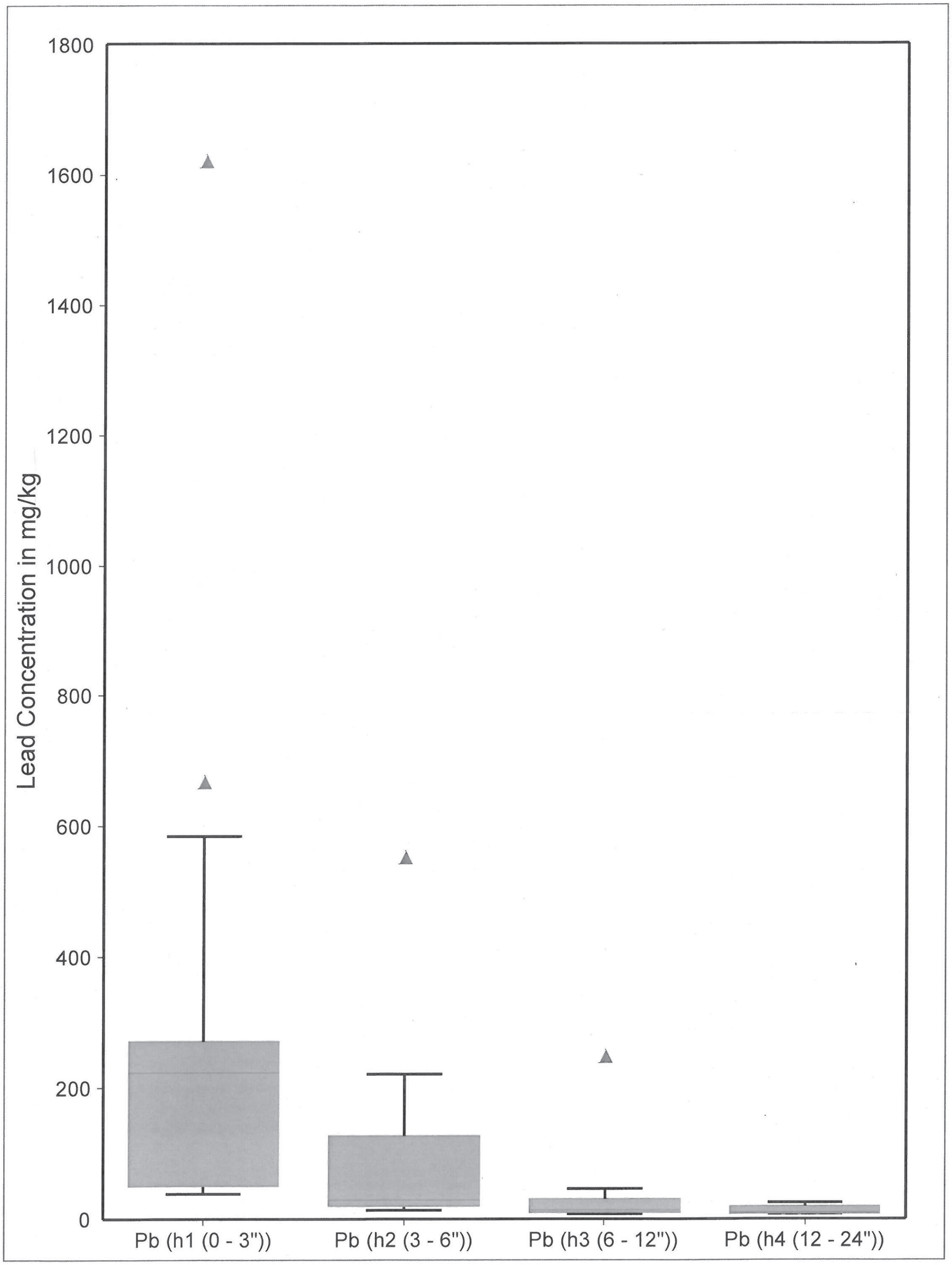
Cadmium Soil Profile Box and Whisker Plot by Depth Interval

17800-36 4/13

HARTCROWSER

Figure
E-25

EAL 04/08/13 1780036-BG.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Lead Soil Profile Box and Whisker Plot by Depth Interval

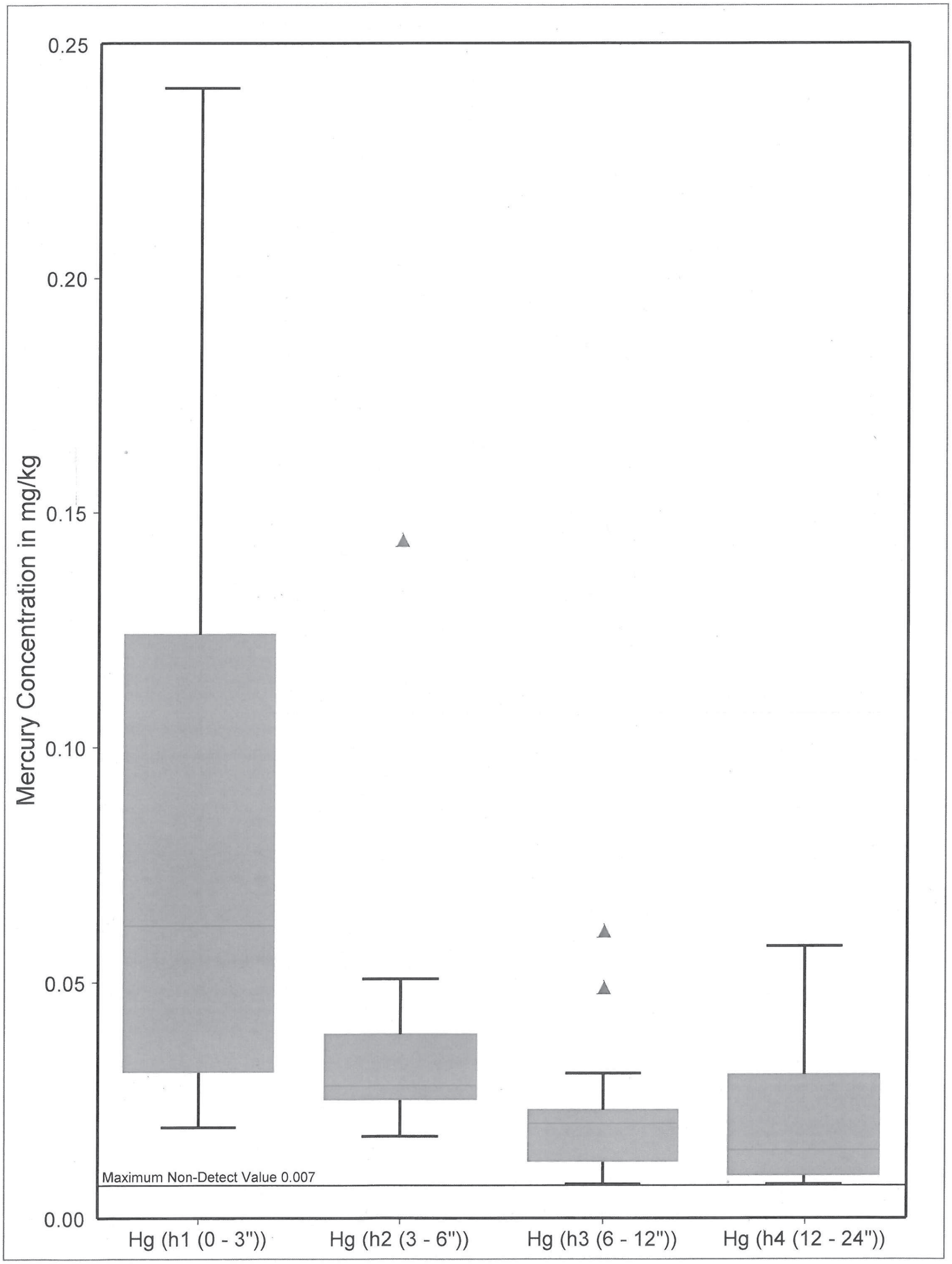
17800-36 4/13

HARTCROWSER

Figure

E-26

EAL 04/08/13 1780036-BH.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

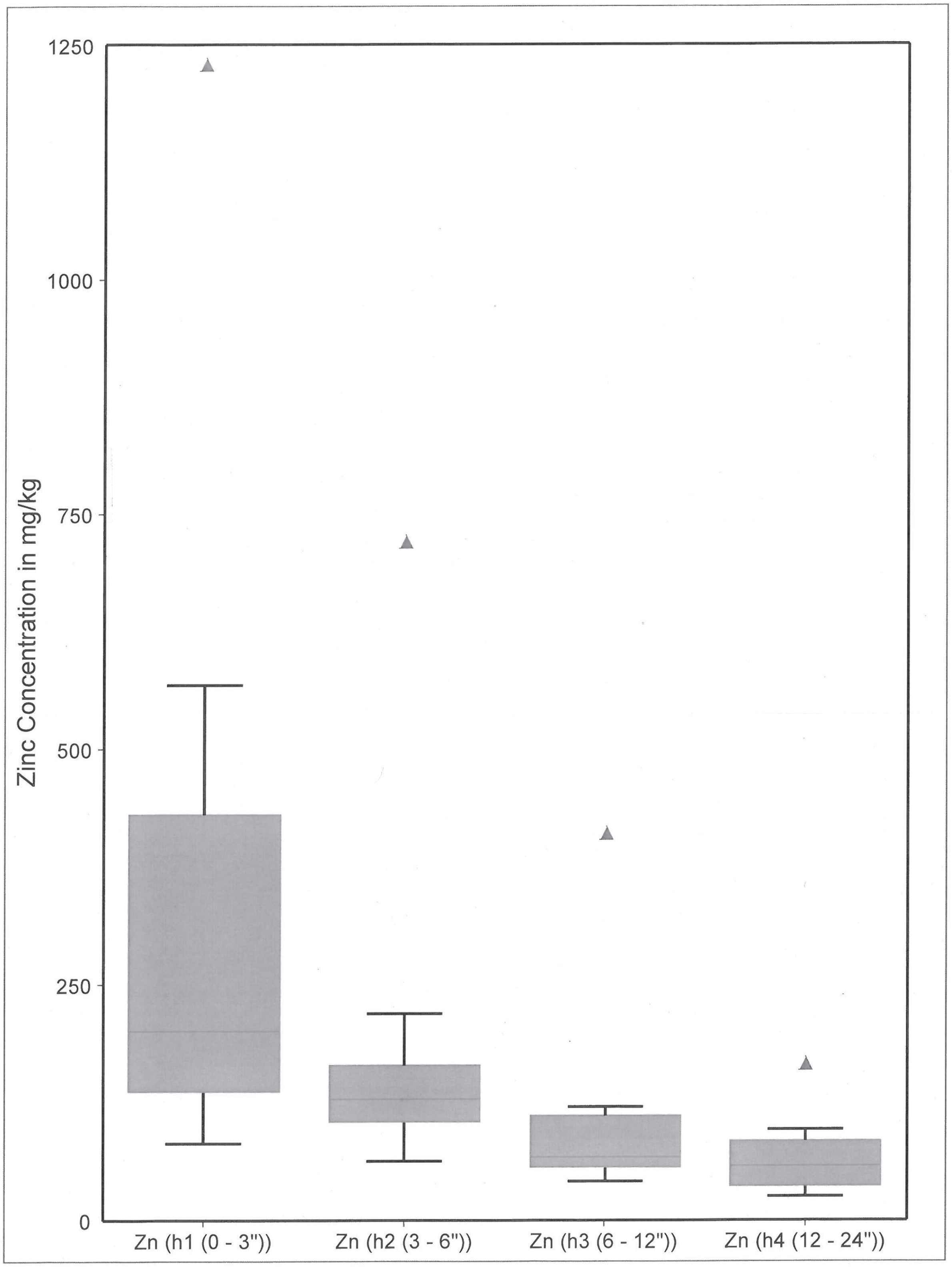
Mercury Soil Profile Box and Whisker Plot by Depth Interval

17800-36 4/13

HARTCROWSER

Figure
E-27

EAL 04/08/13 1780036-BI.cdr



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

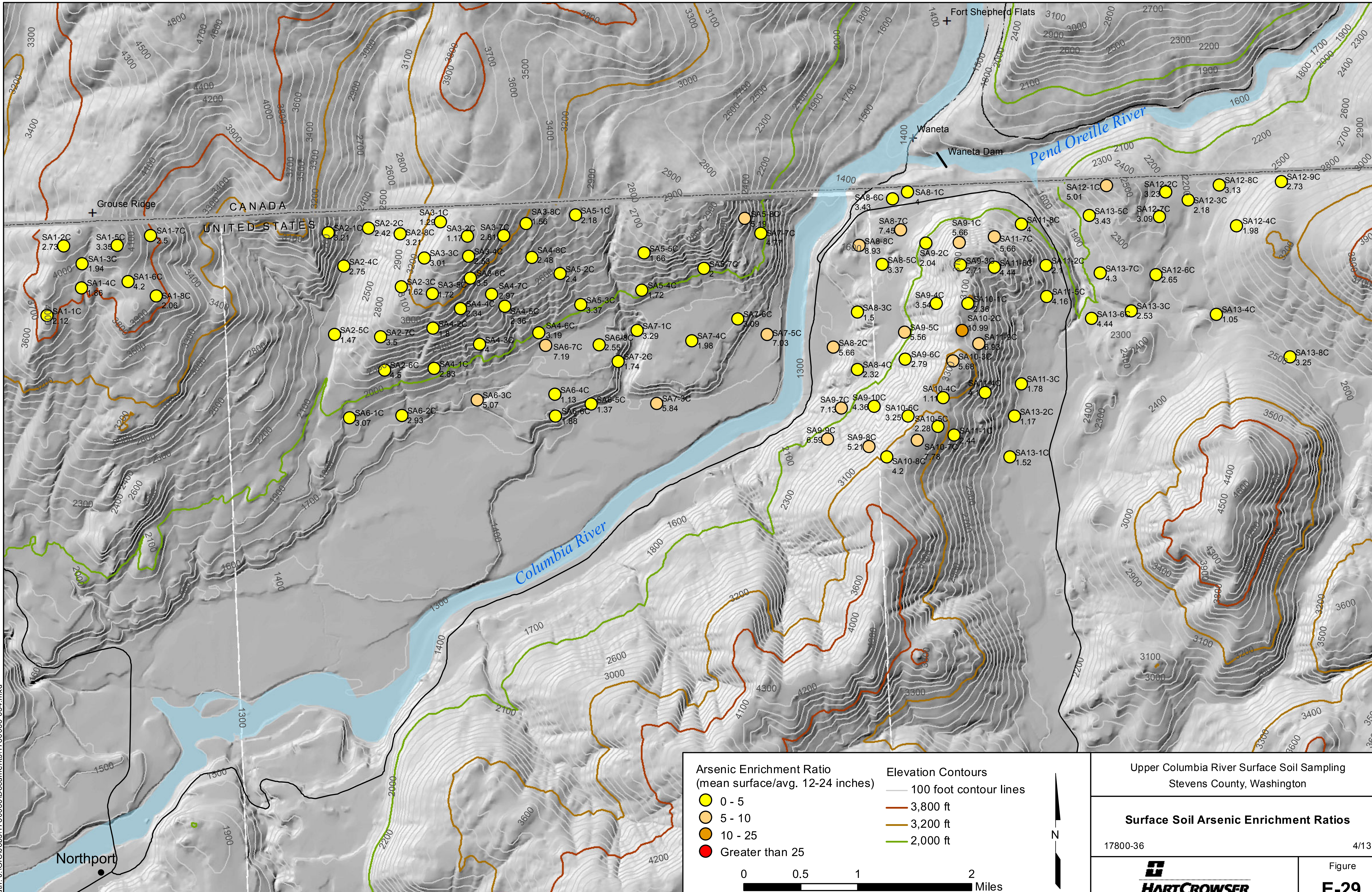
Zinc Soil Profile Box and Whisker Plot by Depth Interval

17800-36 4/13

HARTCROWSER

Figure
E-28

EAL 04/08/13 1780036-BJ.cdr



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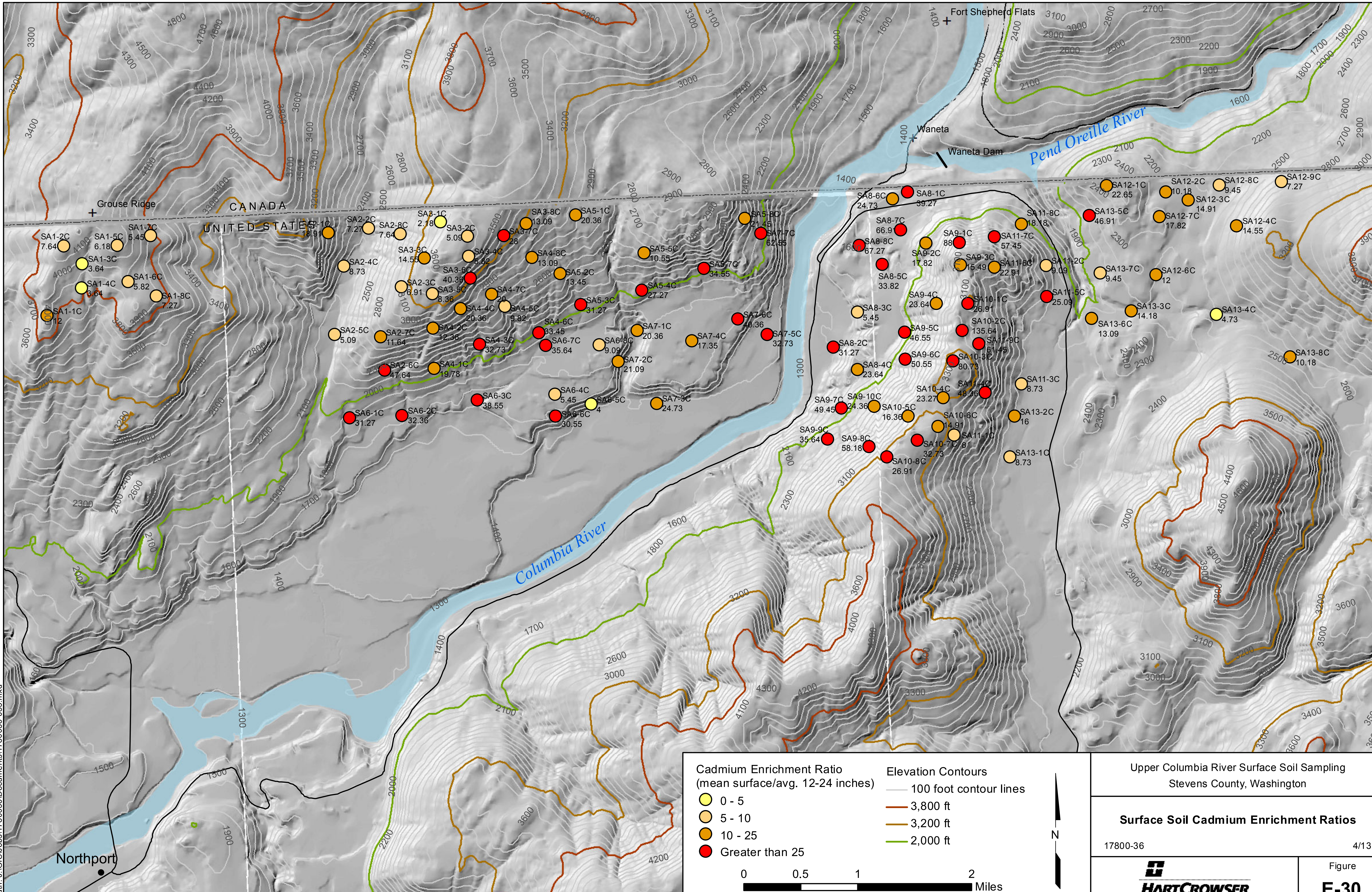


Upper Columbia River Surface Soil Sampling
Stevens County, Washington

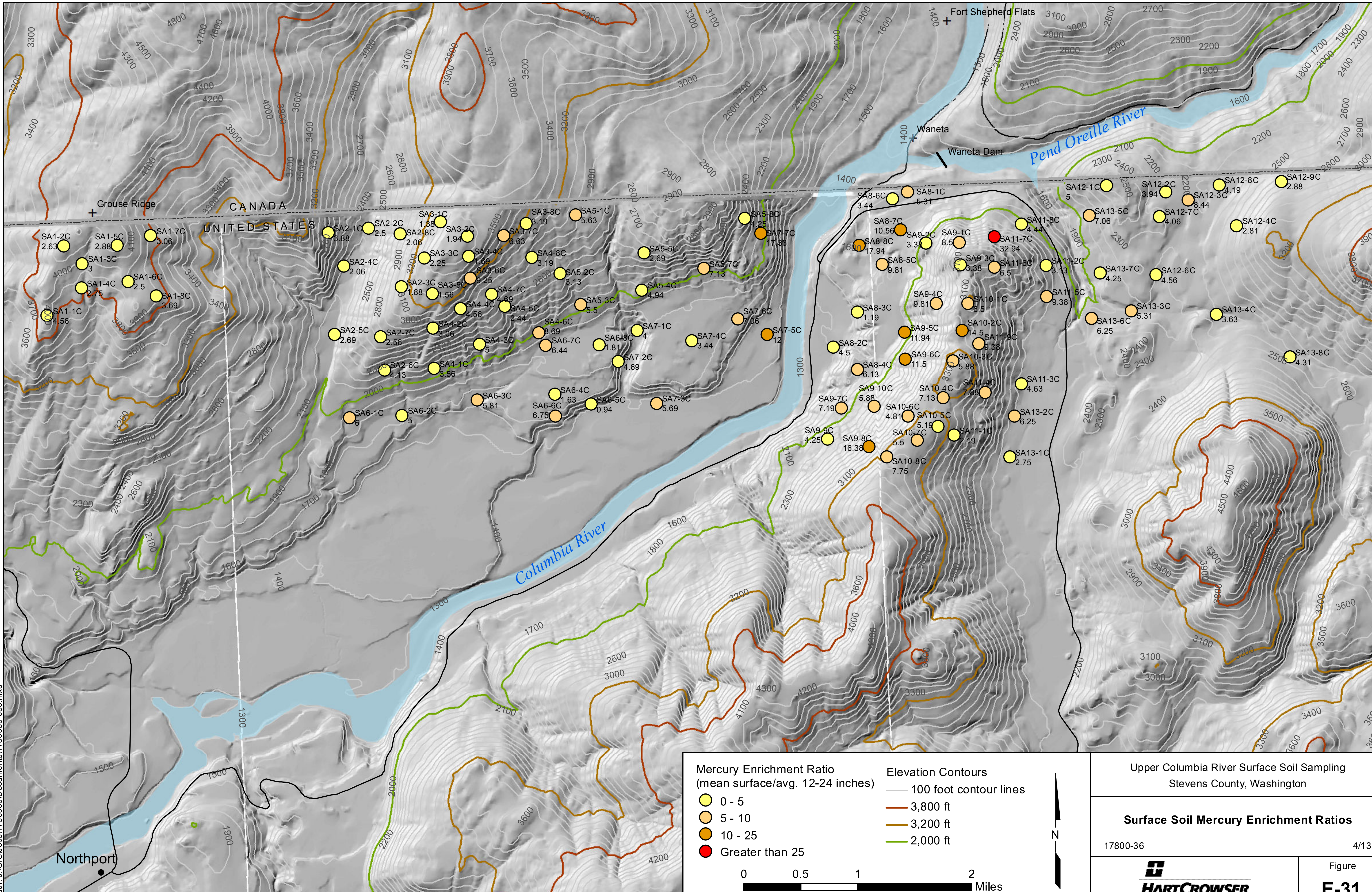
Surface Soil Cadmium Enrichment Ratios

17800-36 4/13

HARTCROWSER

Figure
E-30

Path: J:\GIS\Jobs\17800036\Documents\17800036-055.mxd



Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Surface Soil Mercury Enrichment Ratios

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HARTCROWSER

Figure
E-31

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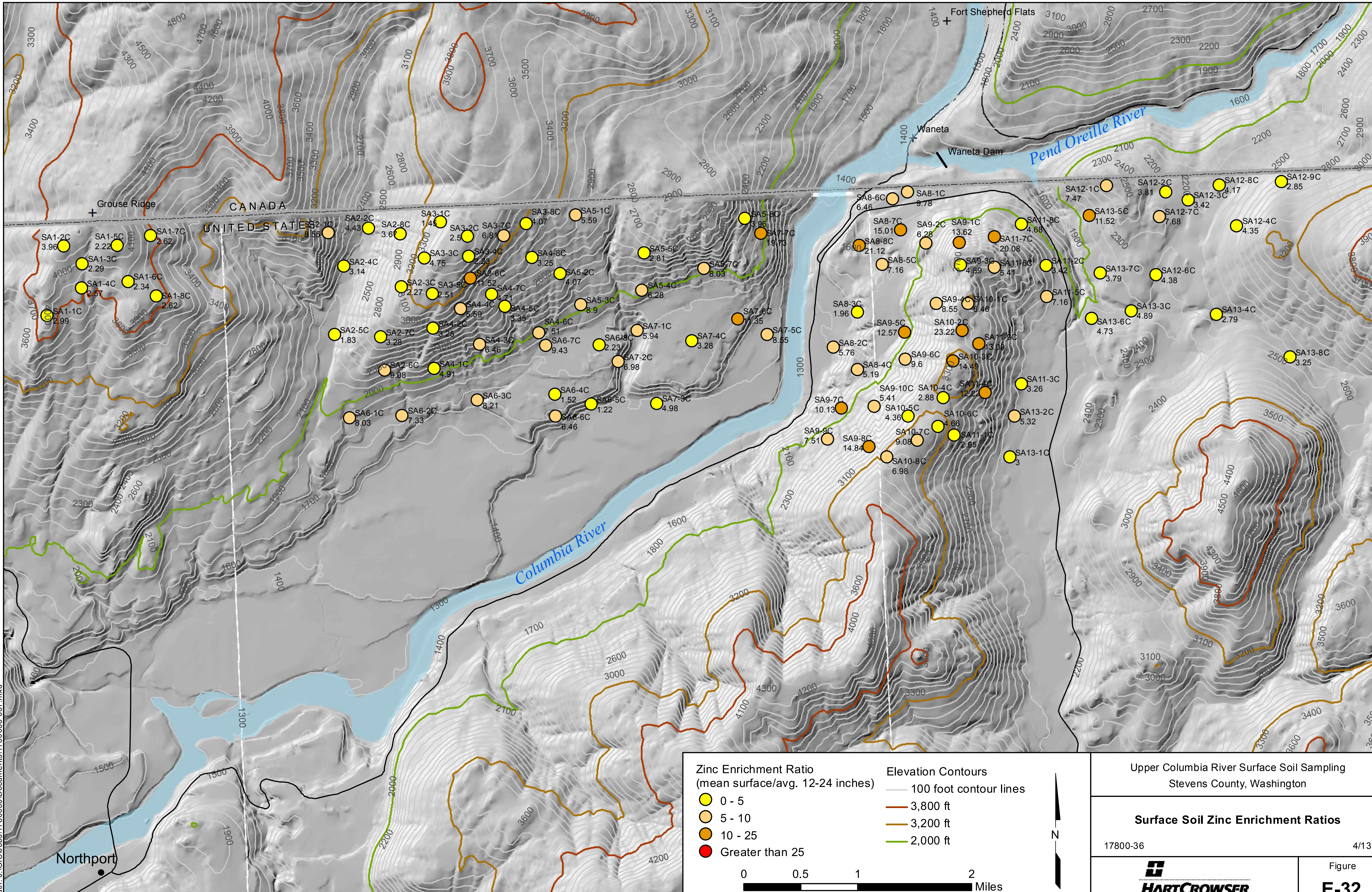

Upper Columbia River Surface Soil Sampling
Stevens County, Washington

Surface Soil Zinc Enrichment Ratios

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Figure
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Path: J:\GIS\Jobs\1780036\Documents\1780036-057.mxd