Sampling and Analysis Plan/ Quality Assurance Project Plan Saddle Rock Park

Prepared for
City of Wenatchee

February 11, 2013
17917-00

HARTCROWSER

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1.0 INTRODUCTION

This combined Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) describes the recommended sampling locations, sample collection protocols, laboratory analytical methods, data evaluation procedures, and quality control criteria that will support the City of Wenatchee (City) in performing a Remedial Investigation/Feasibility Study (RI/FS) at the Saddle Rock Park (Site) in Chelan County, Washington.

1.1 Background

The Site is located on the outskirts of Wenatchee (Figure 1). The City purchased the 325-acre Site in 2011 from the Washington State Department of Natural Resources (DNR), which owned the Site for the previous 100 years. Under DNR ownership, the Site was used primarily as a community recreation area and, according to the Chelan-Douglas Land Trust (CDLT) web site, the City has been working since 1909 to acquire the land for preservation as a park or natural area. The City has also broadened the preservation goals for the Site to include wildlife habitat and open space as well as hiking and horseback riding.

There is a long documented history of prospecting/mining activity at the Site. An ongoing cultural resources survey of the Site by Reiss-Landreau Research (RLR) identified three mines within the Saddle Rock Park property boundary (Sunrise Mine, Squaw Saddle Mine, and Gold Knob Mine) and one mine (Cannon Mine) located south of the park entrance. In addition, RLR found records of mining claims located throughout the Site dating back to 1908. Although claims were on record, many of the claims may not have been substantially prospected or mined.

The Washington State Department of Ecology (Ecology) recently listed the Site (referred to as Gold Knob Prospects) in their ISIS database of confirmed or suspected contaminated sites and issued an early notice letter to the City. Ecology's action followed two independent evaluations of the Site: (1) a Phase I Environmental Site Assessment (ESA) conducted by Cascadia Technical Services in April 2011, and (2) an initial site investigation by Ecology in May 2011. Both investigations found arsenic concentrations in excess of the MTCA Method A unrestricted land use soil cleanup level of 20 mg/kg. These elevated arsenic levels appear to be related to historical gold and silver prospecting/mining activity evidenced by waste rock dumps and adits on the Site.

Saddle Rock is a popular destination for recreation and for educational field trips, so it is important to both the City and Ecology to identify public health risks at the Site.

1.2 Preliminary Site Characterization

In May 2011, Ecology performed X-ray fluorescence (XRF) screening at seven possible waste rock piles located across the Site. Arsenic concentrations were higher than the MTCA unrestricted soil cleanup level and reported background levels for the region. The city of Wenatchee provided us with the results of XRF data collected at the Site in May 2011 by Ecology Project Manager Jason Shira. A review of the data indicates that arsenic concentrations generally appear to be higher in the waste rock piles in the northwestern portion of the Site.

Ecology submitted five samples for laboratory analysis and results confirmed the elevated arsenic concentrations. In addition, results showed seven other metals (aluminum, antimony, barium, mercury, selenium, silver, and vanadium) were in the waste rock samples at concentrations in excess of the MTCA Method B direct contact cleanup levels or ecological indicator soil concentrations.

In November 2012 our field team visited the Site to measure the waste rock piles and collect data from potential areas of concern (AOCs). Ecology estimated the volume of possible waste rock is 4,300 cubic yards (cy). The data were used to identify soil sampling locations. A brief description of each waste rock pile AOC is provided below. Several areas are not included because, based on observations during the site visit, volumes were too small to estimate or material did not appear to be waste rock. Waste rock pile locations are shown on Figures 1, 2, and 3.

- **SR-1.** This AOC is about 300 feet northwest of the park entrance and the main hiking trail. Ecology estimated the dimensions of this waste rock pile as 20 feet by 20 feet and 3 feet deep, and a volume of 44 cubic yards (cy). Our field staff estimated a larger area with a calculated volume of about 130 cy. Ecology did not take XRF measurements at this location.

- **SR-2.** This AOC is located about 800 feet northwest of the park entrance. The primary prospecting/mining feature appears to be an adit. The entrance to the adit is filled with concrete. The waste rock pile at this location appears to be the largest at the Site; Ecology estimated the waste rock pile dimensions as 187 feet long, 57 feet wide, and 5 feet deep, with a volume of 1,974 cy. Our volume estimate was 2,600 cy or about 30 percent larger. Ecology's XRF measurements of arsenic concentrations ranged from less than 20 to 400 mg/kg.

- **SR-3.** This AOC is located about 1,600 feet northwest of the park entrance. Ecology's XRF measurements indicated high levels of arsenic in the waste rock. Ecology estimated the dimensions of the pile as 150 feet long, 42 feet wide, and 8 feet deep, with a calculated volume of 1,867 cy. During our site reconnaissance however, the field crew did not observe land disturbances indicating historical mining activity and waste rock. The field crew did not confirm measurements in this area.

- **SR-4.** This AOC is located in the northwest portion of the Site about 4,500 feet northwest of the park entrance. Ecology estimated the dimensions of the waste rock pile to be 35 feet long, 20 feet wide, and 10 feet deep, and a volume of 259 cy. Our volume estimate was 235 cy calculated using a radius of 15 feet and depth of 1 foot. Ecology's XRF measurements of arsenic concentrations ranged from less than 20 to 400 mg/kg.

- **SR-5.** This AOC is located about 3,400 feet northwest of the park entrance. Ecology estimated the dimensions of the waste rock pile to be 165 feet long, 6 feet wide, and 3 feet deep, with a volume of 110 cy. Our estimate was based on what appeared to be two waste rock piles with a total volume of 293 cy. Ecology's XRF measurements of arsenic concentrations ranged from 800 to 1,500 mg/kg.

- **SR-6.** This AOC is located about 2,600 feet west-northwest of the park entrance. Ecology estimated the dimensions of this pile as 20 feet by 20 feet and 2 feet deep, and calculated a volume of 30 cy. During the reconnaissance, our staff did not observe land disturbance typically associated with historical prospecting/mining activity. Given the small volume of material, the volume was not recalculated. Ecology's XRF measurement of arsenic concentrations ranged from less than 20 to 200 mg/kg.

- **SR-7.** This AOC is located about 1,000 feet northwest of the park entrance. The primary prospecting feature is a small shallow adit. Given the very small amount of excavation that appears to have been done, Ecology did not estimate dimensions or volume or collect XRF data here. We did not observe the presence of waste rock material adjacent to the adit.

- **SR-8.** This AOC is located about 1,200 feet northwest of the park entrance. Ecology named this AOC "SR Power Line," which we renamed SR-8 for the Remedial Investigation/Feasibility Study (RI/FS). Ecology estimated the dimensions of the waste rock pile to be 20 feet long, 5 feet wide, and 3 feet deep, and calculated a volume of 11 cy. We estimated the dimensions of

the waste rock pile to be 50 feet long, 40 feet wide, and 2.5 feet deep, with a volume of 93 cy. Ecology did not collect XRF data at this location.

2.0 PROJECT OBJECTIVES AND SUMMARY

The objective of the RI/FS will be to evaluate: (1) the environmental impacts from arsenic and other metals in waste rock piles identified on the Site, and (2) the potential for future releases of contaminants from the waste rock and adits to the Site environment. The investigation will focus on obtaining data needed to evaluate and implement a cost-effective cleanup action, if required.

2.1 Sample Collection

Hart Crowser's activities will include:

- Collect discrete surface (from 0 to 12 inches) soil samples from waste rock piles.

- Collect 10-point composite samples off the toe of the waste rock piles to identify the extent of contamination. Three 20 foot wide areas (0 to 20 ft, 20 to 40 ft, and 40 to 60 ft from the toe of the waste rock piles) extending along the toe of the waste rock piles will be sampled to determine if down slope migration of waste rock has occurred and if the average concentrations exceed screening criteria.

- Determine natural background concentrations for Contaminants of Concern (COCs) in soil at the Site. Hart Crowser will collect twenty surface soil (from 0 to 6 inches) background samples from locations selected throughout the Site (Figures 1, 2, and 3). Initially, the data will be subdivided into two groups of ten samples each to evaluate whether different soil types and/or geology on the Site affect background concentrations. If there are no statistically significant differences between the two data sets, the data will be pooled to calculate overall background values for the Site. If statistically significant differences are identified we will discuss the difference with the City and Ecology.

  Another concern with establishing Site background is that historical research has identified a substantial number of historical mining claims throughout the Site Reiss-Landreau Research, 2013). Currently, we do not believe that there was substantial prospecting or mining on the claims. During sample collection, the areas will be reviewed for evidence of historical mining activity.

An initial screening will compare the COC concentrations at waste rock piles using:

- MTCA Method A unrestricted land use cleanup levels;
- MTCA Method B cleanup levels for soil ingestion;
- Criteria for ecological protection of plants, soil biota, and wildlife (Table 749-3 of the MTCA Cleanup Regulation); and
- Site-specific natural background.

The initial screening process will also evaluate whether the use of site-specific values is more appropriate at the Site.

Samples will be analyzed for aluminum, antimony, arsenic, barium, chromium, lead, mercury, selenium, silver, and vanadium, because these were the only metals that exceeded human health or ecological screening levels in the samples Ecology collected from the waste rock piles. Soil pH will be determined on selected samples. Samples will also be analyzed for iron and manganese to aid in determining if metal concentrations are elevated due to mining activities or if these concentrations reflect natural conditions. Selected samples with higher concentrations of metals will be extracted using the synthetic precipitation leaching procedure (SPLP) to determine if metals are mobile.

In addition, selected high-concentration samples may be analyzed using the toxicity characteristic leaching procedure (TCLP) to determine if, under RCRA, waste rock would be considered dangerous waste.

2.2 Adit Reconnaissance for Closure Alternatives

There are five apparent mine-related openings at waste rock piles SR-1, SR-2, SR-4, SR-7, and SR-8 (Figure 1). These mine features were reported to be former entries, exploratory holes, or adits related to mine workings. The adits are associated with active exploration or mining of minerals and may have elevated metal concentrations which pose a risk to human health. In addition, some of these mine features extend below the ground surface and may represent fall or entrapment hazards to people and animals. Alternatives to close these mine features will be developed to address these hazards as part of the cleanup action plan.

Additional site observations and measurements are needed to determine whether these adits represent physical hazards and exposure to elevated concentrations of metals. This additional site information is also needed to evaluate the feasibility of different mine entry closure alternatives.

Since there do not appear to be available mine maps that indicate which of these reported entries were connected to mine workings, it may be difficult to confirm the depth and extent of these entries and whether they are connected to deeper mine workings. Additional field information will be collected from the ground surface. We will not send staff below the ground surface to collect this field information. Entry below the surface requires confined space permitting and experience, which are costly and time consuming. If entry is necessary, we will discuss it with the City.

3.0 PROJECT TEAM AND RESPONSIBILITIES

Key staff members and their project functions shall be identified in the work schedule we submit to Ecology. The following staff members will conduct the site reconnaissance and collecting soil samples and environmental data:

- Steve Hughes, LG, LHG – Project Manager
- Andrew Kaparos, PE – Reconnaissance and field work
- Suzanne Faubl, MESM – Reconnaissance and field work

Additional staff may be involved with data validation and/or GIS support:

- Anne Conrad, MS - Chemist/Data Quality Review
- Phil Cordell, LG – Geologist/GIS Specialist

Reiss-Landreau Research will provide support for archeological and cultural resource issues if they arise.

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.

4.0 SAMPLE COLLECTION

Sample collection will be performed in a consistent manner by field personnel at all sampling locations to support data representativeness objectives. Field staff will visually assess each sample location and sketch the approximate size and relative location of excavation(s), waste rock pile(s) and other waste-like soil, and will record observations on field data forms (Appendix B).

4.1 Sample Locations

4.1.1 Waste Rock Piles

Five discrete surface soil samples will be collected at a depth of 0 to 12 inches from each waste rock pile with an estimated volume less than 1,000 cy (SR-1, SR-4, SR-5, SR-6, SR-7, and SR-8). Ten discrete surface soil samples will be collected at a depth of 0 to 12 inches from each waste rock pile with an estimated volume greater than 1,000 cy (SR-2 and SR-3).

In addition, three 10-point composite samples will be collected down slope of each waste rock pile. Defining composite sample areas for each waste rock pile will be accomplished by:

- Starting at one end of the toe of a waste rock pile measure a 20 foot down slope distance from the toe (the toe is defined as the visible down slope extent of waste rock). Flag the down slope location.

- Traverse 40 feet along the toe of the waste rock pile and repeat the 20 foot measurement and flag the location.

- Continue the traverse and down slope measurements until the other end of the waste rock pile is reached. The 20 foot wide area between the toe and the flags is the first area in which a composite sample will be collected (0 to 20 feet).

- To establish the remaining two sample collection areas repeat the down slope measurements from each of the 20-foot flags and define the 20 to 40 and 40 to 60 foot sample areas.

One composite surface soil sample will be collected from each of the three sampling areas. A composite soil sample will consist of 10 sub-samples collected from a depth of 0 to 6 inches randomly in a sample area. The results of sample analysis will be used to determine if down slope migration of waste rock has occurred and if the average concentrations exceed screening criteria.

In addition to composite sample collection, one discrete soil sample will be collected in each of the three composite sample areas at each waste rock pile. These samples will be logged and stored at the project laboratory under chain-of-custody. If during data analysis we find that results of discrete sample analysis will help evaluate the nature and extent of site contamination or potential site risks, we will discuss analysis of these samples with the City prior to proceeding with sample analysis.

4.1.2 Background Soil

Twenty background soil samples will be collected at the Site from a depth of 0 to 6 inches. Proposed sample locations are shown on Figures 1, 2, and 3.

As a rule, background samples will not be collected in:

- Disturbed areas (e.g., historical mining activity areas, landscaped or maintained areas, animal burrows, beneath power lines); and
- High-traffic areas (e.g., roads and hiking trails).

If a planned sampling location meets any of the exclusion criteria listed above, then staff will not collect a sample at that point; instead, they will identify an alternate sample location with similar geographical characteristics within the same general area. The alternate sample collection location will be located as close to the original location as feasible. Alternate locations will be scoped and selected in the field, as needed.

4.2 Field Sampling Methods

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 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 a 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.

Groundcover, if present, should be removed before sampling. Groundcover may consist of snow, grass, other vegetation, leaves, conifer needles, or rocks/pebbles.

Soil samples will be collected as follows:

1. Put on a clean pair of nitrile gloves.
2. Excavate soil to the target depth (0 to 12 inches for waste rock piles; 0 to 6 inches for toe of waste rock pile and background samples) with a clean

spade, spoon, bulb planter, or trowel. Use a ruler to accurately determine the depth.

3. Place soil into a stainless steel bowl.

4. 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.

5. Use a clean gloved hand to remove any large rocks or gravel from the bowl, taking care to retain soil particles adhered to debris to the extent practical.

6. Homogenize the soil in the bowl by mixing with a collection spoon. Then, draw an "X" in the soil with a spoon to separate it into quarters.

7. Fill a clean 8-ounce sample jar by removing one spoonful of soil from each quarter and placing the soil into the jar. Take care to ensure the soil placed in the jar is representative of the vertical distribution in the sample.

8. Wipe the rim of the full sample jar with a clean paper towel or Kimwipe. Screw the lid on tightly.

9. Label the sample jar with the date, time, and sample identification number, then place the jar in a ziplock bag and seal it. (Note: it is good practice to write the identification number on the jar lid and the ziplock bag as well).

10. Place the labeled sample jar into a cooler filled with ice as soon as feasible.

4.2.1 Waste Rock Piles

Five samples will be collected from each waste rock pile containing less than 1,000 cy and ten samples will be collected from waste rock piles containing greater than 1,000 cy. Staff will observe the following guidelines:

- Sample locations will be uniformly distributed across the waste rock pile.

- Soil samples will be collected with a clean shovel, hand auger, trowel, or stainless steel spoon from a depth of 0 to 12 inches.

4.2.2 Toe of Waste Rock Piles

Three composite soil samples will be collected down slope of the toe of the waste rock piles as described in Section 4.1.1. Staff will observe the following guidelines:

- Downslope soil samples will be collected beyond any visibly identifiable waste rock or erosion from the pile.
- Soil samples will be collected with a clean shovel, hand auger, trowel, or stainless steel spoon from a depth of 0 to 6 inches.

4.2.3 Background Soil Samples

Twenty soil samples will be collected from samples locations selected throughout the Site.

- Ensure that sample locations are outside of potential exclusion areas.
- Collect soil from a depth of 0 to 6 inches.

4.3 Equipment Decontamination Procedures

Field staff will use clean equipment to collect soil samples and will decontaminate all reusable field equipment (sampling spoons, mixing bowls, spade/shovel, split spoons, etc.) before reuse. Field staff will wear nitrile gloves or equivalent hand protection during the decontamination process. For areas where composite samples will be collected, equipment will be cleaned by dry brushing or wiping with paper towels between collection of samples comprising the composite, Equipment will be decontaminated in the following manner for discrete samples:

- Remove excess soil with paper towels or by dry brushing.
- Spray equipment with diluted Liquinox™ (or equivalent nonphosphate detergent) and scrub with the stiff-bristle brush until all evidence of soil/sediment or other material has been removed.
- Rinse equipment with potable water.
- Rinse equipment with deionized or distilled water.
- Place the equipment on a piece of plastic sheeting to air dry if necessary.

- Collect waste paper towels, used disposable gloves, and other refuse from decontamination in a plastic trash bag.

4.4 Disposal of Investigation-Derived Waste

4.4.1 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.

4.4.2 Decontamination Water Disposal

Decontamination water will be poured onto the ground at the Site.

4.5 Sample Containers and Labels

The analytical laboratory will provide pre-cleaned sample containers. All 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). Sample containers, preservatives, and holding times are summarized in Table 1.

4.6 Field Documentation

Field staff will take notes during all sampling and processing operations. The following will be included in the field documentation:

- Site name and location;
- Date and time of entry;
- Name of person(s) collecting and logging the samples;
- Weather conditions;
- Date, time, and identification of each sample, including number of jars and tests requested;
- Description of photographs;
- Details of sample collection, including GPS coordinates—actual sampling point locations will be recorded on a sketch map;

- Any deviation from the approved SAP; and
- General observations.

4.7 Sample Handling Procedures

4.7.1 Sample Preservation and Holding Times

Samples will be preserved according to the requirements of the analytical methods to be employed. Samples will be extracted and analyzed within the holding time for the analytical method to be employed. Sample containers, analysis methods, reporting and detection limits, preservatives, and holding times are summarized in Tables 1 and 2.

4.7.2 Chain of Custody Procedures

Field staff will use standard chain of custody (COC) forms to document the collection, custody, and transfer of samples from the collection to the analytical laboratory. A sample is considered to be "in custody" if it meets at least one of the following conditions:

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

The COC will include the sample number, date and time of sample collection, name of staff collecting samples, analysis requested, and the number of containers. Two copies of the custody form will be sealed in the cooler for delivery to the laboratory with the respective samples, and one copy of the form will be retained for the project files. Custody seals will be placed on each cooler or package of samples to prevent tampering.

4.7.3 Delivery of Samples to Analytical Laboratory

Filled sample containers will be packed on ice in coolers. The coolers will be transferred to Analytical Resources, Incorporated (ARI) in Tukwila, Washington. Handling procedures are as follows:

- Samples will be packaged and shipped according to 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;

- All coolers will be clearly labeled with name of project, time and date container was sealed, person sealing the cooler, and the Hart Crowser office name and address;

- Custody forms will be sealed in an envelope, then enclosed in a plastic bag and taped to the inside lid of the cooler;

- Custody seals will be affixed to each cooler, then signed and dated before the coolers are shipped or transferred;

- Samples will either be shipped by overnight courier or hand delivered to the laboratory by Hart Crowser personnel; and

- Appropriate staff or designated person(s) will sign the COC upon transfer of sample possession. When the cooler arrives at the laboratory, the sample-receiving custodian will break the custody seal and will compare the sample labels to the COC and record the temperature and condition of the samples.

5.0 LABORATORY 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) as summarized in Table 2. Laboratory methods, method reporting limits (MRL), and method detection limits (MDL) are presented in Table 2 along with the individual analytes requested for the different tests.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL

The quality of analytical data generated is assessed by the frequency and type of internal QC checks specific to the analytic test type. Hart Crowser will assess the quality of measurements reviewing results for method blanks, matrix spikes, laboratory control samples, surrogate compound recoveries, instrument calibrations, performance evaluation samples, interference checks, and other data, as specified for 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 at a minimum frequency of 5 percent or one per batch of 20 samples or fewer for each matrix;

- Matrix spike duplicate or laboratory duplicate to assess precision 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 the various analyses are summarized in Table 3.

6.1 Data Quality Indicators

All sample collection, field measurements, and laboratory analytical tests are designed to produce data of known and appropriate quality. Environmental laboratories use internal quality control checks to ensure the data they produce is of adequate quality. To ensure the data reported by the laboratory meets agreed-upon standards, Hart Crowser will assign an independent data quality reviewer to evaluate the internal quality control checks (including method blanks, matrix spikes, laboratory control samples, calibrations, performance evaluation samples, interference checks, etc.), for each data package.

Hart Crowser follows the procedures and quality control checks described in this section to verify that known and acceptable levels of accuracy and precision are maintained for each data package.

6.1.1 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 the matrix spike and matrix spike duplicate. The RPD will be calculated by:

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

Where,

D_1 = Sample value
D_2 = Duplicate sample value

Precision will be assessed by analysis of laboratory duplicates. Field variability will be assessed by analyzing numerous field samples rather than by comparing select samples to field duplicates.

6.1.2 Accuracy

Accuracy is the agreement between a measured value and its true or accepted value. It is not possible to determine absolute accuracy for environmental samples, so we use known standards and spiked samples to assess accuracy.

Laboratory accuracy will be assessed as the percent recovery of matrix spikes, matrix spike duplicates, surrogate spiked compounds (for organic analyses), and laboratory control samples. Accuracy will be defined as the percentage recoverable from the true value and is calculated by:

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

Where,

SSR = spiked sample result
SR = sample results (not applicable for surrogate recovery)
SA = amount of spike added

6.1.3 Representativeness

Representativeness expresses the degree to which the sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. The sampling program will be designed to ensure that: (a) sample locations are selected properly, (b) sufficient samples are collected to accurately reflect conditions at the site, and (c) 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.

6.1.4 Completeness

Completeness is the percentage of measurements that are judged to be valid. Completeness will be calculated separately for each analytical group (e.g., metals or PAHs). The analytical results must contain all quality control checks required to verify precision and accuracy to be considered complete. Data qualified as "estimated" during the validation process will be considered complete, but

results that are rejected during the validation review and samples for which no analytical results were obtained will be considered nonvalid. Completeness will be calculated for each analytical group 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 ongoing basis so that archived sample extracts can be reanalyzed, if required, without remobilization.

6.1.5 Comparability

Comparability is the degree to which data from separate data sets may be compared. For instance, sample data may be compared to data from background locations, to established criteria or guidance, or to data from earlier sampling events. There has been little consistency among historical studies used to estimate background chemical concentrations. For example, intervals defined as surface soil have varied often ranging from 1 inch to 6 or more inches in depth. In addition, analytical methods have not been consistent across studies.

Samples will be collected according to the same protocol at all sampling locations to ensure all data collected as part of this study are comparable to each other. Comparability is attained by careful adherence to standardized sampling and analytical procedures; rigorous documentation of sample locations (including depth, time, and date) is required. The use of standardized methods to collect and analyze samples, along with instruments calibrated against National Institute for Standards and Technology (NIST) and US EPA traceable standards will also ensure comparability, particularly for comparison of data collected from this study (within-study comparability).

Other data quality characteristics can affect comparability. Only when data are judged to be representative of the environmental conditions, and when precision and accuracy are known, can data sets be compared with confidence.

6.2 Data Quality Assurance Review

A project chemist at Hart Crowser will perform an independent data quality review of the analytical results. The data quality 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.

This data quality review 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. Raw data (instrument tuning, calibrations, instrument printouts, bench sheets, and laboratory worksheets) will be available for review if any problems or discrepancies are discovered.

Our data evaluation review will:

- Verify sample numbers and analyses match the chain of custody request;
- Verify adequate sample preservation and acceptable 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, surrogate compounds, 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.

The data reviewer will add qualifier flags to results that are outside the QC acceptance criteria. The qualifier flags are defined 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.

7.0 DATA ANALYSIS AND REPORTING

7.1 Evaluation of Chemistry Data

Analytical results will be compared to MTCA human health and ecological screening criteria, as well as natural background concentrations. Statistical comparisons of site and background concentrations will be performed with EPA's ProUCL software. Data set comparisons and hypothesis testing will be done according to ProUCL technical manual. The site specific background will be established as the 90th percentile concentration of background samples or four times the 50th percentile, whichever is lower, according to procedures specified in MTCA. Site concentrations and reasonable maximum exposure (RME) concentrations will be established at the upper 95 percent confidence level (UCL95) on the mean. Data distributions for each metal will be selected based on the highest (i.e., best fit) correlation.

Metal ratios (potential contaminant metals of concern to iron and manganese) may be compared to background samples to determine if elevated metal concentrations reflect contamination or natural mineralization.

7.2 Laboratory Reports

The laboratory will provide data packages containing complete documentation of analytical processes and all the raw data needed for independent data reduction and verification of analytical results. Each laboratory report will include:

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

- Copy of COC forms for all samples in the analytical batch.

- Tabulated 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 labeled.

- 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.
- Surrogate compound recoveries, when applicable, with percent recoveries.
- Laboratory control sample results, when applicable, with calculated percent recovery.
- Electronically formatted data deliverable (CD) results will be uploaded into Ecology's EIM data management system once results are validated.

8.0 HART CROWSER REPORTS

Hart Crowser will prepare an RI/FS report that includes the following information:

- Summary of data collected;
- Characterization of the nature and extent of site contamination;
- Comparison of site contaminant concentrations to human health and ecological screening levels;
- Description of contaminant fate and transport;
- Evaluation of cleanup action alternatives; and
- Recommended cleanup action.

The report will include maps that show the locations of the waste rock piles, sample collection points, contaminant concentrations, and relevant site features including hiking trails, power lines, and 4-wheel drive roads.

9.0 REFERENCES

EPA 1986. Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846, 3rd Update.

EPA 1992a. Specifications and Guidance for Contaminant-Free Sample Containers. OSWER Directive 92.0-05A.

EPA 2010. US EPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review. EPA-540-R-10-011, January 2010.

Reiss-Landreau Research 2013. DRAFT - An Archeological Review and Inventory of the Saddle Rock Park Development Project, Chelan County, Washington. Report 2012-263-28. W. Schroeder, L. Walton, C. Landreau et al, 2013.

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Table 1 - Sample Containers, Preservation, and Holding Times

Sample Type	Sample Preservation Technique	Maximum Holding Time
Total solids[1]	Cool, <6°C	14 days
Metals (except mercury)[1]	Cool, <6°C	6 months
Mercury[1]	Cool, <6°C	28 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 2 - 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)	
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
Chromium	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
Manganese	EPA 3050B	EPA 6020	0.5	0.025
Mercury	EPA 7471A	EPA 7471A	0.1	0.002
Selenium	EPA 3050B	EPA 6020	0.5	0.025
Silver	EPA 3050B	EPA 6020	0.2	0.01
Vanadium	EPA 3050B	EPA 6020	0.2	0.01

Notes:

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

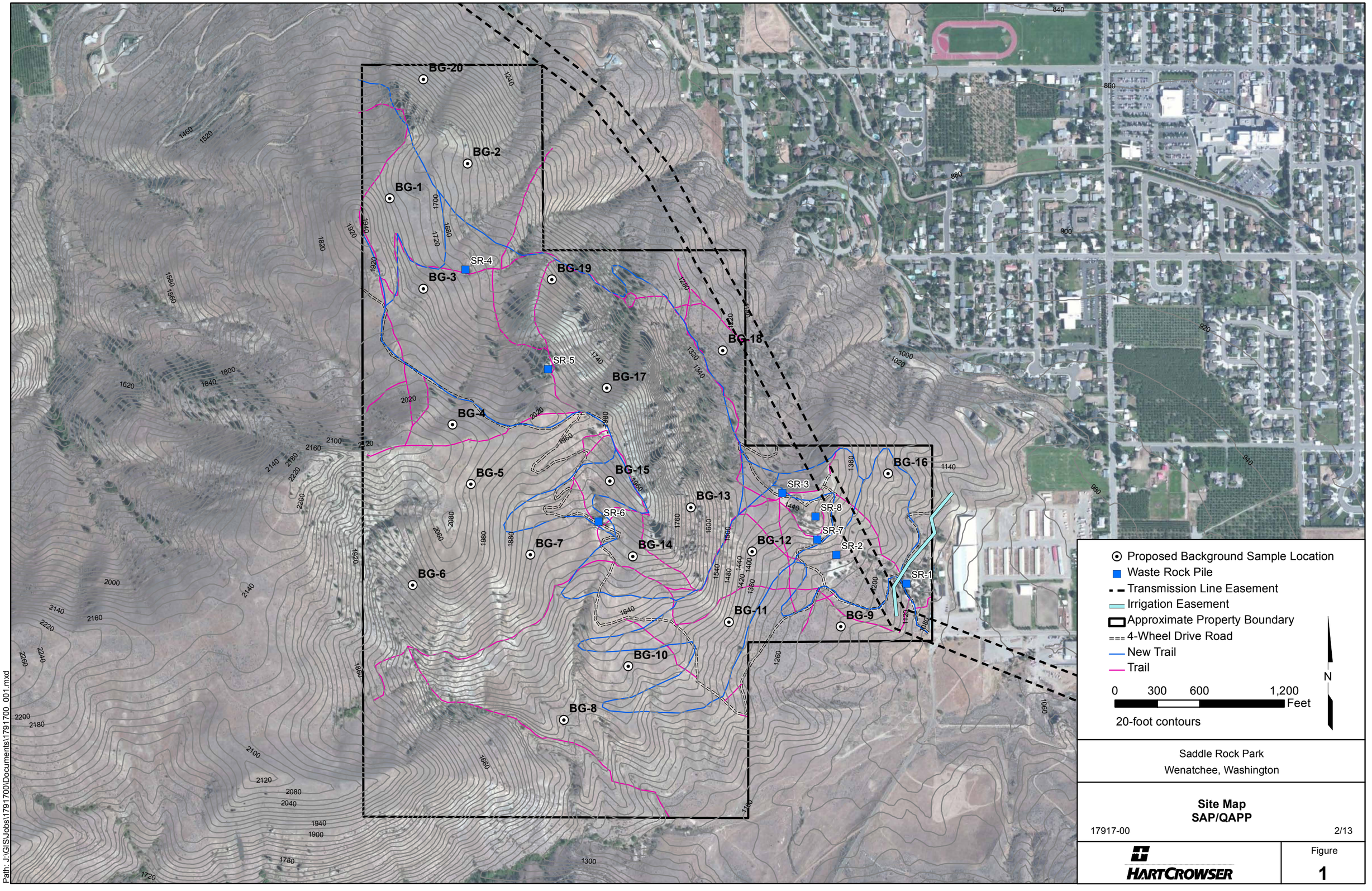
Table 3 - Quality Control Procedures for Metal Analysis

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 3 - Quality Control Procedures for Metal 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



Saddle Rock Park
Wenatchee, Washington

Site Map
SAP/QAPP

17917-00 2/13

HARTCROWSER

Figure
1

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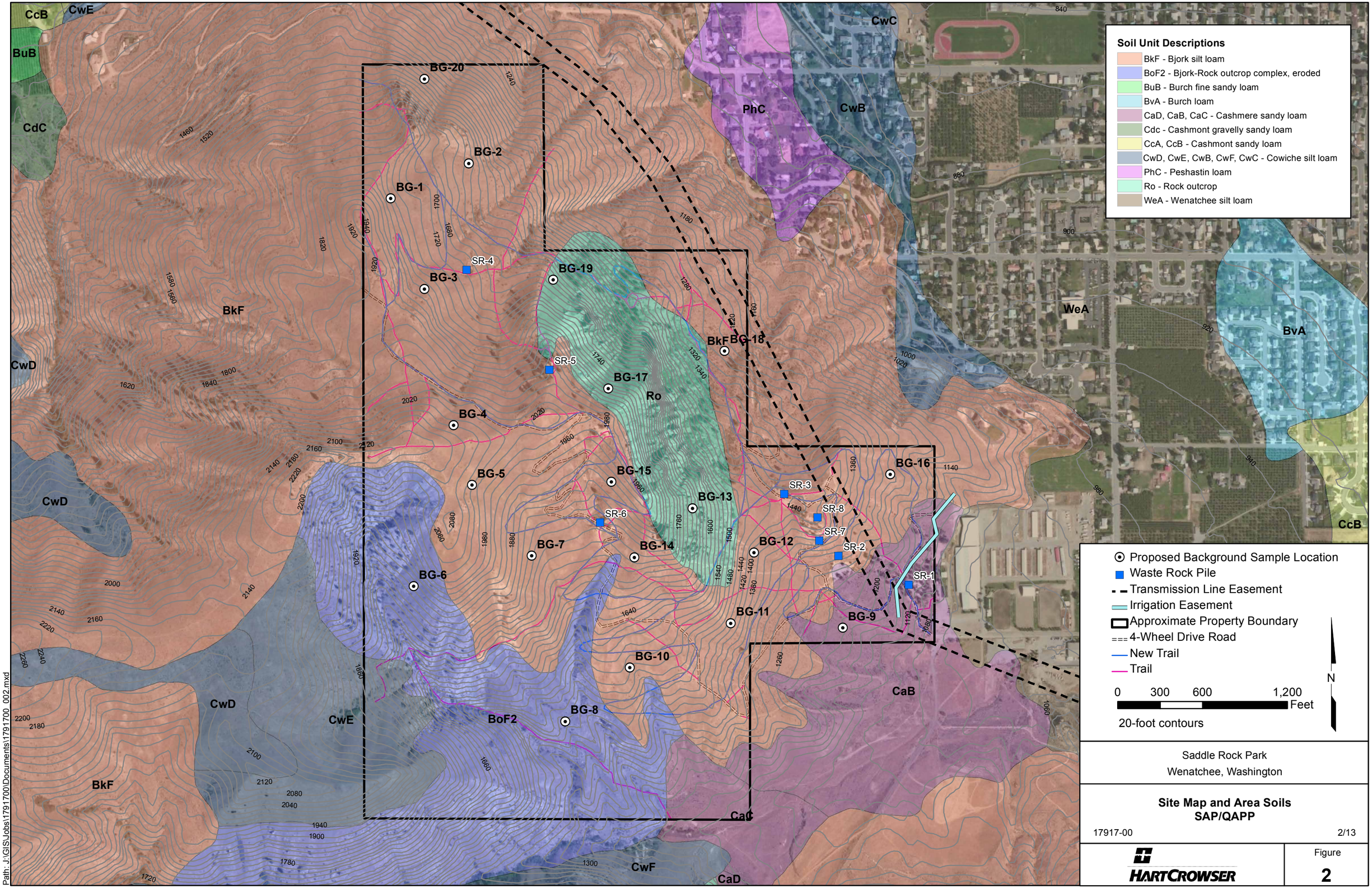
Soil Unit Descriptions
BkF - Bjork silt loam
BoF2 - Bjork-Rock outcrop complex, eroded
BuB - Burch fine sandy loam
BvA - Burch loam
CaD, CaB, CaC - Cashmere sandy loam
Cdc - Cashmont gravelly sandy loam
CcA, CcB - Cashmont sandy loam
CwD, CwE, CwB, CwF, CwC - Cowiche silt loam
PhC - Peshastin loam
Ro - Rock outcrop
WeA - Wenatchee silt loam
BG-20
BG-2
BG-1
BG-3
BG-19
BG-18
BG-17
BG-4
BG-5
BG-15
BG-13
BG-16
BG-7
BG-14
BG-12
BG-6
BG-11
BG-9
BG-10
BG-8
SR-4
SR-5
SR-6
SR-3
SR-8
SR-7
SR-2
SR-1
Proposed Background Sample Location
Waste Rock Pile
Transmission Line Easement
Irrigation Easement
Approximate Property Boundary
4-Wheel Drive Road
New Trail
Trail
0 300 600 1,200 Feet
20-foot contours
N
Saddle Rock Park
Wenatchee, Washington
Site Map and Area Soils
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HARTCROWSER
Figure
2
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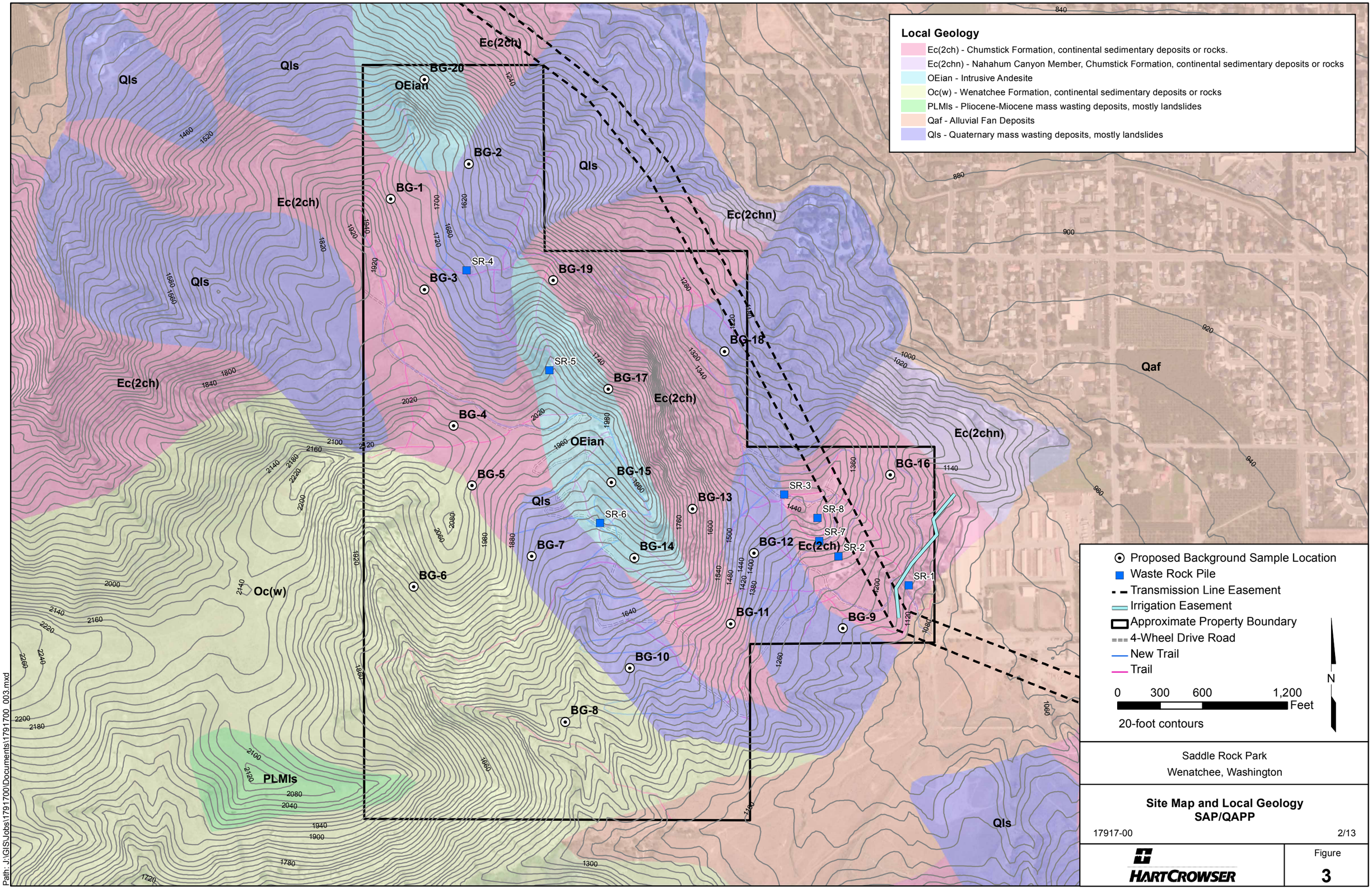

Saddle Rock Park
Wenatchee, Washington

Site Map and Local Geology
SAP/QAPP

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HARTCROWSER

Figure 3

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APPENDIX A
HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN
SADDLE ROCK PARK INTEGRATED PLANNING PROJECT
WASHINGTON STATE
DATE PREPARED: December 28, 2012

EMERGENCY CONTINGENCY INFORMATION

SITE LOCATION	Southern Chelan County, west of the City of Wenatchee
NEAREST HOSPITALS	**Central Washington Hospital** 1201 South Miller Street, Wenatchee, WA (509) 662-1511 The route to the hospital is depicted on Figure 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 (David Erickson) (509) 888-3280 National Response Center..... ....(800) 424-8802 Washington Emergency Management. ..... (800) 258-5990 Ecology Central Regional Office ..... (509) 575-2490 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

0 1000 2000
Scale in Feet

N

Saddle Rock Integrated Planning Project
Wenatchee, Washington

Route to Hospital Map

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HARTCROWSER

Figure
A-1
Page
2

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SITE HEALTH AND SAFETY PLAN SUMMARY

LOCATION: Wenatchee, Washington State.

PROPOSED DATES OF ACTIVITIES: Spring 2013.

TYPE OF FACILITY: Wenatchee Foothills Trails - Recreation.

LAND USE OF AREA SURROUNDING FACILITY: Grasslands with sparse evergreens and primarily undeveloped land with recreational walking and horse trails. Seven areas with identified historical mine waste rock piles and three adits.

POTENTIAL SITE CONTAMINANTS: Arsenic and vanadium.

ROUTES OF ENTRY: Only foot access to the property.

OTHER SPECIFIC SAFETY HAZARDS: 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, 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 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 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 5 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: Andrew Kaparos

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:

- Collecting soil samples; and
- Sketching or photographing and characterizing mine features.

The expected duration of this project is five days in spring 2013.

1.5 Site Description

Saddle Rock Park is located on the southwestern edge of the City of Wenatchee, within Section 16, Township 22 North, Range 20 East W.M. The Site encompasses 325.12 acres and its dimensions are about 1 mile (from north to south) on the west boundary and 0.75-mile on an interior east-west line.

The Site can be accessed from two parking areas (trailheads). The Saddle Rock/Dry Gulch Preserve parking area/trailhead is located on the east boundary of the Site; and the Jacobson Trailhead (located northeast of the northeast corner of the Site) provides access up a switchback trail/road to the northwest corner of the Site.

Topography is steep, with elevations varying from the high point elevation of 1,982 feet near the northeast center at the Saddle Rock summit, to the lowest elevation of about 1,160 feet at Dry Gulch in the southeast corner. Approximately half of the Site consists of steep (about 45 to 65 percent) southerly facing slopes, and the balance east- and northeast-facing aspects. Several sheer cliff faces are located within the east center of the Site at Saddle Rock and the north boundary at Old Butte, with the summit divide near the west center of the Site.

Improvements include minor amounts of partial barbed-wire fencing in poor repair on the east and south boundaries. Unimproved roads (jeep, 4WD, and track equipment access), built with a few bulldozer passes in native soils across the Site in a southeast to northwest direction, are now used as the main public trail system. The trails exhibit erosional features such as rilling, fill bank washouts, subsidence (cracks and slumps) and wear/migration patterns, from wheel tracks, pedestrians, and horses.

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 following metals may be present at this site: arsenic and vanadium.

Health hazards of arsenic are discussed below. This information covers potential toxic effects that might occur if relatively significant acute and/or chronic exposure were to happen. This information does not mean that such effects will occur from the planned site activities. In general, the chemicals that may be encountered at this site are not expected to be present at concentrations that could produce significant exposures. The types of planned work activities and use of protective measures will limit potential exposures at this site.

These standards are presented using the following abbreviations:

PEL Permissible exposure limit.

TWA Time-weighted average exposure limit for any 8-hour work shift.

STEL Short-term exposure limit expressed as a 15-minute time-weighted average and not to be exceeded at any time during a work day.

Metals

Exposure to metals may occur via inhalation or accidental ingestion of metal containing dust. Certain metals may be absorbed through the skin. Metals have been shown to exhibit a wide range of adverse acute and chronic health effects in humans and animals. The PELs for metals vary by element. If metals are discovered on site, activities should be tailored to protect against exposure to the specific metals and levels encountered.

Arsenic

Arsenic is toxic by inhalation and ingestion of dusts and fumes. Trivalent arsenic compounds are the most toxic to humans and may have significant corrosive effects on the skin, eyes, and mucous membranes. Skin sensitization and contact dermatitis may result from exposure to arsenic trioxide or pentoxide. Trivalent arsenic interacts with a number of sulfhydryl proteins and enzymes and alters their normal biological function. Ingestion of arsenic can cause fever, anorexia, cardiac abnormalities, and neurological damage. Liver injury can accompany chronic exposure. Skin and inhalation exposure to arsenic has been associated with cancer in humans, particularly among workers in the arsenical-pesticide industry or copper smelters.

The EPA currently classifies arsenic as a Class A, or confirmed, human carcinogen. Arsine is a highly toxic gaseous arsenical and causes nausea, vomiting, and hemolysis. The current PEL-TWA for organic and inorganic forms of arsenic is 0.01 mg/m^3.

Vanadium

Vanadium is found in nature only in a chemically combined form. Vanadium exposure can occur by inhalation and ingestion. The most stable and common vanadium compound is vanadium pentoxide, which is used as a catalyst in manufacturing sulfuric acid. Breathing air with vanadium pentoxide can result in coughing which can last a number of days after exposure. Oral consumption can result in nausea and stomach cramps. Vanadium is a possible carcinogen. The current PEL-TWA for vanadium pentoxide as respirable dust is 0.05 mg/m^3.

2.2 Potential Exposure Routes

Inhalation

Exposure via this route is unlikely at this site. No volatile chemicals are known to exist at the sites. Inhalation of dusts contaminated with metals or asbestos could occur. However, control measures specified in this plan will minimize the possibility for inhalation of site contaminants.

Skin Contact

Exposure via this route could occur if contaminated soil or water contacts the skin or clothing. Dust generated during soil movement may also settle on exposed skin and clothing of site workers. Protective clothing and decontamination activities specified in this plan will minimize the potential for skin contact with the contaminants.

Ingestion

Exposure via this route could occur if individuals eat, drink, or perform other hand-to-mouth contact in metals-impacted soils or waters on the site. Decontamination procedures established in this plan will minimize the inadvertent ingestion of contaminants.

2.3 Air Monitoring and Action Levels

Air monitoring will not be conducted since airborne concentrations of contaminants of concern are not expected to approach action levels in worker airspace. Air monitoring for dust generation will be performed initially using visual observations. If dusty conditions are observed and workers must remain in the area, engineering controls will be utilized (e.g. standing upwind from dust source; applying water for dust suppression). If conditions change, additional protective measures may be required.

2.4 Fire and Explosion Hazard

No vehicles will be used on the Site.

2.5 Heat and Cold Stress

Cold stress, or hypothermia, can result from abnormal cooling of 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 are reminded to have work boots, a safety vest, and other appropriate safety equipment when working at a job site.

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.

Rabies

Foxes and coyotes are the primary carriers of rabies. Avoid any fox or coyote 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.

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 area near 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 medical attention immediately.
- 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

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.

Hart Crowser employees are required to comply with all federal, state, and local regulations regarding the use of cellular devices while driving. If a cellular device must be used during vehicle operation, a hands-free device must be used. Under no circumstances is text messaging or any use of a keyboard allowed while operating a vehicle.

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.

Confined Spaces

Hart Crowser personnel will not enter any confined space such as mine shafts or adits.

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.

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.

2.7 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 3.

Table 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.
Sample collection	Splashes, skin contact, inhalation	Level D or C PPE

[a]Protection levels are defined in Table 4.
[b]Protection levels may require upgrade based on site monitoring or other information.

In addition, special task requirements include the following:

Soil Sampling

All soil sampling activities will be conducted under the assumption that the media is contaminated and appropriate PPE will be required.

3.0 PERSONAL PROTECTIVE EQUIPMENT

Table 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 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/ Work Gloves	Respirator	
									Half-Face	Full-Face
None Anticipated	Level D(a)	b	c	X			X			
Minor Skin Contact Possible	Level D(a)	X	c	X			X			
Skin Contamination Possible:	Level C(c)									
Inorganics		X	c	X			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.

3.2 Level C Activities

Workers performing site activities where skin contact with free product or contaminated materials is likely will wear chemical-resistant gloves (nitrile, neoprene, or other appropriate outer gloves, surgical inner gloves) and polyethylene-coated Tyvek® or other chemical-resistant suits or rain gear. Make sure the protective clothing and gloves are suitable for the types of chemicals that may be encountered on site. Use face shields or goggles as necessary to avoid splashes in the eyes or face.

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;
- 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

Fieldwork being performed as part of this project consists primarily of low-impact sampling activities that will not result in migration of contaminants or increased exposure to human health or the environment. Therefore, establishment of formal exclusion, contaminant reduction, and support zones is not necessary for this field investigation.

6.0 MINIMIZING CONTAMINATION

To minimize contaminant migration and exposure to surrounding areas, the amount of equipment and number of personnel allowed in contaminated areas should be minimized. In addition, the amounts of soil collected should not exceed what is needed for laboratory analysis and record samples. Avoid kneeling on contaminated ground whenever possible. Do not stir up unnecessary dust, or perform any practice that increases the probability of hand-to-mouth transfer of contaminated materials. Use plastic drop cloths and equipment covers where appropriate. Eating, drinking, chewing gum, smoking, and using smokeless tobacco are forbidden while in potentially contaminated areas.

7.0 DECONTAMINATION

Personnel decontamination is not necessary for staff working at this site. All non-disposable equipment will be decontaminated prior to leaving site. Soil and water sampling instruments should be cleaned with detergent solutions or placed in plastic trash bags for decontamination after demobilization.

8.0 DISPOSAL OF CONTAMINATED MATERIALS

All disposable sampling equipment and materials will be placed inside of 10 mil polyethylene bags or other appropriate containers and removed from the site with the personnel. Dispose of in local municipal waste disposal facility.

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 very small 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 4), which will be kept on site during work activities and recorded in the project files.

Job No._____
Date_____
S M T W Th F S
Arrival Time:_____
Departure Time:_____

Field Health & Safety Report

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

Saddle Rock Integrated Planning Project
Wenatchee, Washington

Field Health & Safety Report

17917-00

12/12

HARTCROWSER

Figure A-2

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Table 4 - Record of Health and Safety Communication*

PROJECT NAME: Saddle Rock Integrated Planning Project Sit Reconnaissance				**PROJECT NUMBER:** 17917-00	
SITE CONTAMINANTS: arsenic and vanadium					
PPE REQUIREMENTS (check all that apply):					
x	**Safety glasses**	x	**Gloves (specify)**	Work gloves, nitrile	
x	**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\1791700\SAP-QAPP-HASP\Saddle Rock HASP.doc

APPENDIX B
FIELD FORMS

Surface Soil Sample Collection Form

Sample No. _____ Collected by _____

Job _____ Date _____

Job No. _____ Latitude _____

Location _____ Longitude _____

Composite Sample ☐ Yes ☐ No

Photograph ☐

Sample Description (moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES)

_____

_____

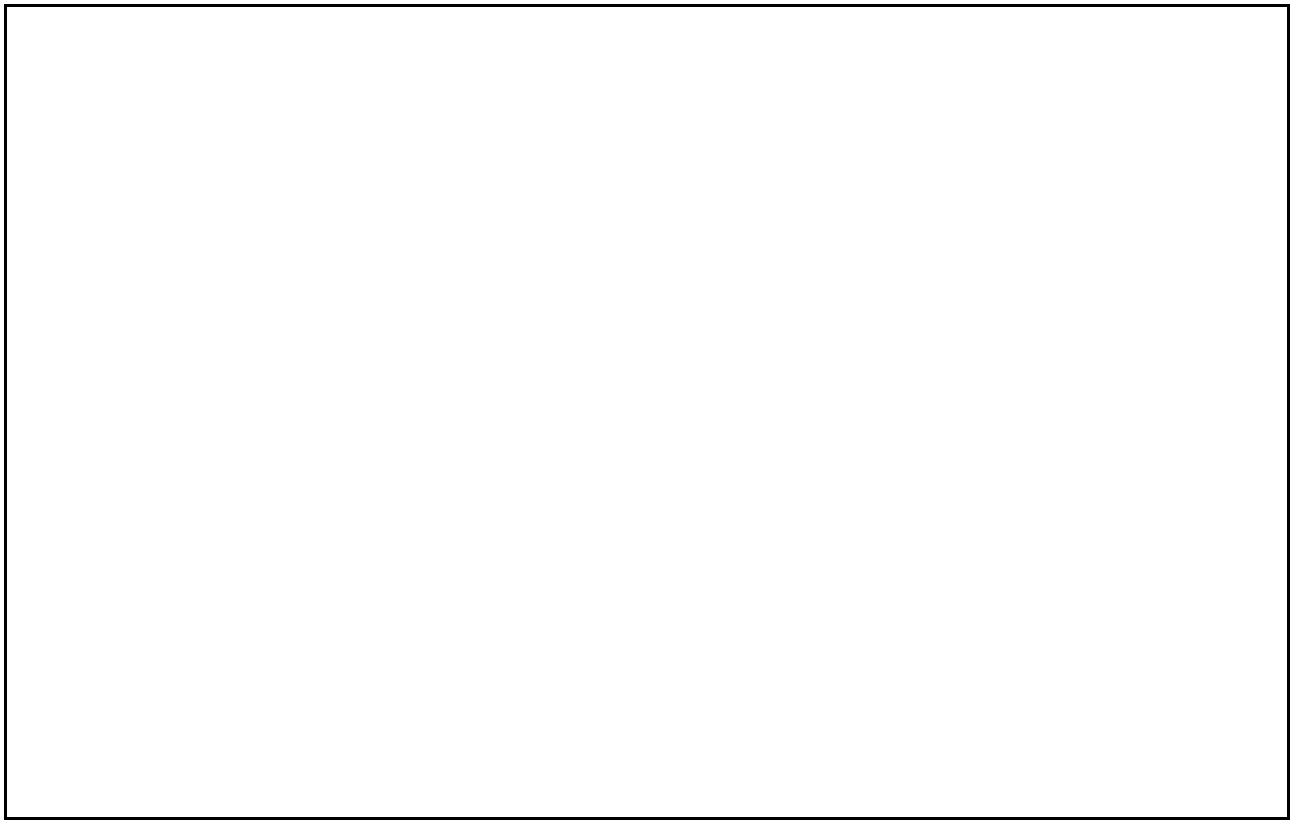
_____

Remarks _____

_____

_____

Sample Location



Hart Crowser

J:\Docs\Forms\Field & Lab\Surface Soil Sample Collection Form.xls

Sample Custody Record

Samples Shipped to: _____

HARTCROWSER

Hart Crowser, Inc.
1700 Westlake Avenue North, Suite 200
Seattle, Washington 98109-6212
***Office:** 206.324.9530 • **Fax** 206.328.5581 • **Cell:** 206.954.8676*

JOB _____ LAB NUMBER _____

PROJECT NAME _____

HART CROWSER CONTACT _____

_____

SAMPLED BY:

REQUESTED ANALYSIS

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	TIME	SIGNATURE	TIME
PRINT NAME		PRINT NAME	
COMPANY		COMPANY	
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	TIME	SIGNATURE	TIME
PRINT NAME		PRINT NAME	
COMPANY		COMPANY	

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____ for Other Contract Requirements

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS:
☐YES ☐NO ☐N/A
GOOD CONDITION
☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND
☐COURIER ☐OVERNIGHT

TURNAROUND TIME:

☐ 24 HOURS ☐ 1 WEEK
☐48 HOURS ☐STANDARD
☐72 HOURS OTHER _____

White and Yellow Copies to Lab Pink to Project Manager Lab to Return White Copy to Hart Crowser Gold to Sample Custodian