

2.7 Equipment Decontamination

All sampling equipment was decontaminated using a soap and tap water rinse prior to collecting each sample. Gross contamination was removed from any hand tools used to prepare the test pit sidewalls.

2.8 Field Documentation

All significant observations, measurements, relevant data and results were clearly documented in the field logbook in indelible ink according to the methods and procedures specified in CFRSSI SOP-G-4. This included the following:

- Lithologic logs of the test pits indicating material types (i.e., sand, silt), color, and other observations (i.e. presence of roots, wood, or debris) (The lithologic logs were recorded on separate log sheets and not in the field logbook);
- Presence of visually discernable impacted material;
- Results of XRF field screening;
- Depths from the ground surface to all soil horizons and total depth of the boring;
- Sample location descriptions and designations;
- Photographs of selected sample locations to aid data recording and documentation efforts; and,
- Abnormal occurrences and other relevant observations.

The lithologic logs, photographs, and field logs are included in Appendices B, C and D.

2.9 Laboratory Analysis

Samples were analyzed for parameters as presented in Table 2-1. Table 2-1 shows the parameters and the respective method of analysis. The samples were submitted to Energy Laboratory in Helena, Montana for analysis of saturated paste pH, arsenic, cadmium, copper, lead and zinc, the contaminants of concern (COC).

Table 2-1. Parameters for Laboratory Analysis Clark Fork River Operable Unit.

Parameter	Test	Method
Total Metals (As, Cu, Cd, Pb, Zn)	ICP-AES	EPA Contract Laboratory Program Statement of Work, Multi-Media, Multi Concentration, Inorganic Analytical Service for Superfund (ILM05.4)
pH	Saturated Paste Extract	USAD Handbook 60, Methods 2, 3a, CFRSSI SOP SS-09 modified ¹

¹ CFRSSI SOP-09 will be modified: pH will be determined using a minimum of 16-hour equilibration time and vacuum extraction of the saturated paste extract, rather than a 1:1 soil:water dilution.

2.10 Sample Handling

Upon completion of sampling activities at each location, the collected samples were packaged for shipping. For all samples analyzed, the sampler labeled the sample with an indelible marker, recorded the sample designation on a field XRF log sheet. The samples were later recorded on a chain-of-custody form as specified in CFRSSI SOP G-7. Sample labels clearly presented the sample designation,

not negatively impact the project quality objectives. Cross contamination blank sample analyses are presented in Appendix G.

3.3.3 Field Duplicate Samples

Field duplicate samples were collected at a rate of one duplicate per 20 natural samples in the field. A total of 144 duplicate samples were collected on the total sample set of 2,837 natural samples which exceeds the requirement of 142 duplicates. The proper number of duplicate samples were collected in the field but only selected samples were sent to the laboratory for analysis, not always coinciding with the interval the duplicate sample was collected. In order to offset the number of duplicate samples, natural samples were split and analyzed by the laboratory. Duplicate samples were compared to COC results for their corresponding natural samples and the relative percent difference (RPD) was calculated when both values exceeded five-times the PQL, or absolute value difference (AVD) was calculated when one or both values were less than or equal to the five-times PQL. This analysis was performed in a Microsoft Excel spreadsheet and the results of the analysis are presented in Appendix G. If the RPD was greater than 35 percent or the AVD was greater than the PQL, the duplicate sample value was flagged in the color red in Appendix G. Table 3-1 presents the number and percentage of the duplicate samples that exceeded either the Relative Percent Difference (RPD) or Absolute Difference between Duplicates (AVD) for each constituent.

Table 3-1 Results of Duplicate Sample Comparisons

Constituent	Number of Exceedances	Percent Exceedance(1)
Arsenic	45	31.25%
Cadmium	43	29.86%
Copper	28	19.44%
Lead	65	45.14%
Zinc	39	27.08%
Saturated pH	0	0.00%

Note: (1) Percent based on 144 duplicate samples

The relatively large percentage of exceedances is not unusual for soil sampling although it is probably more severe than in some soil sampling investigations for two reasons:

1. The materials in the floodplain are very heterogeneous consisting of tailings, natural soils and mixed soils/tailings. Although duplicate samples were taken at the same depth as the natural samples, their slightly different positions could produce significantly different metals concentrations due to heterogeneity of the materials.
2. The duplicate comparison results indicate that there is some uncertainty associated with the concentrations of a particular constituent at a given sample depth. The remaining question is how much this uncertainty affected the determination of the extent of contamination. To ascertain this effect, the values of each duplicate sample and its corresponding natural sample were compared to the pass-fail criteria. This information is also presented in Appendix G. We then compared how many disagree (one passed and one failed). This analysis showed that 91 percent of the duplicate-natural sample pairs agree suggesting that the uncertainty in the actual constituents' concentrations had relatively little effect on our ability to determine the extent of contamination.