APPENDIX B
SEDIMENT CORE STUDY



UPPER COLUMBIA RIVER SEDIMENT ASSESSMENT SAMPLING AND QUALITY ASSURANCE PLAN

Submitted to
Gary Passmore
of the Confederated Tribes of the Colville Reservation
April 23, 2010

Submitted by

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Acronym List

bgs	below ground surface
CCT	Confederated Tribes of the Colville Reservation
cm	centimeters
cm/year	centimeters per year
COC	Chain of Custody
DQO	data quality objective
Ecology	Washington Department of Ecology
EI	Environment International, Ltd.
EPA	United States Environmental Protection Agency
ft	foot
FTWP	Field Task Work Plan
GPS	Global Positioning System
HSP	Health and Safety Plan
IDW	investigation-derived waste
MS	matrix spike
MSD	matrix spike duplicate
QA	quality assurance
QC	quality control
RM	river mile
RPD	relative percent difference
SOP	standard operating procedure
SQAP	Sampling and Quality Assurance Plan
Study	2010 UCR Sediment Assessment
TAL	Target Analyte List
TCM	Teck Cominco Metals, Limited
TOC	total organic carbon
Tribe	Confederated Tribes of the Colville Reservation
UCR	Upper Columbia River
USGS	United States Geological Survey
XRF	x-ray fluorescence

1. APPROVAL PAGE

Document Title: Sampling and Quality Assurance Plan (SQAP) for the Confederated Tribes of the ` Colville Reservation (CCT), Upper Columbia River (UCR) Sediment Assessment

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Preparation Date: April 22, 2010

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Suzanne Dolberg, P.E. *EI Project QA Officer*		
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2. PROJECT ORGANIZATION

This section provides a brief description of how the project is organized, including identification of the key project personnel and their responsibilities and a flow chart showing the chain of command.

Figure 2-1 is a project organization chart depicting the agencies and companies involved with this project and lines of authority. **Table 2-1** describes each participant's role in this project.

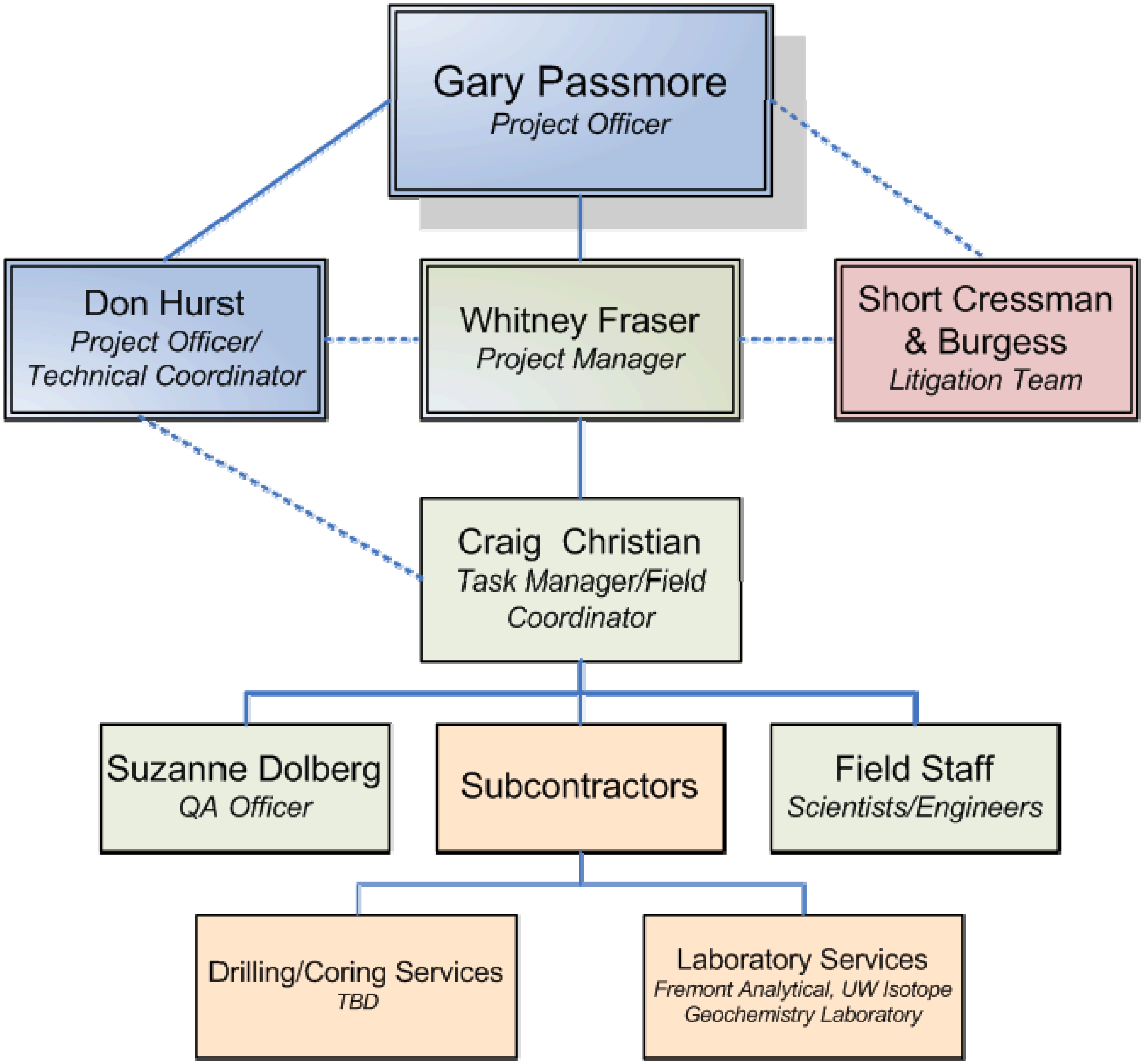
Table 2-1
Project Personnel Responsibilities

Name	**Title**	**Organizational Affiliation and Contact Info**	**Responsibilities**
Gary Passmore*	Project Officer	Confederated Tribes of the Colville Reservation *Phone*: 509.634.2426 *Email*: gary.passmore@colvilletribes.com	Oversees all project activities, approval of the SQAP and all project modifications.
Don Hurst*	Project Officer / Technical Coordinator	Confederated Tribes of the Colville Reservation *Phone*: 509.459.9220 *Email*: don.hurst@colvilletribes.com	Provides comment and oversight on the SQAP and all project modifications.
Whitney Fraser*	Project Manager	Environment International *Phone*: 206.525.3362 *Email*: Whitney.Fraser@eiltd.net	Provides overall contract and client management, resource assignments, and technical and project management.
Craig Christian*	Task Manager/ Field Coordinator	Environment International *Phone*: 206.525.3362 *Email*: Craig.Christian@eiltd.net	Day-to-day technical lead in charge of field work. Coordinates and conducts data collection. Participates in data interpretation and preparation of deliverables. Communicates and coordinates with subcontractors.
Suzanne Dolberg	QA Officer	Environment International *Phone*: 206.525.3362 *Email*: Suzanne.Dolberg@eiltd.net	Provides project quality assurance oversight.
Field Staff	Scientists/ Engineers	Environment International *Phone*: 206.525.3362	Conduct field activities with oversight from Project Manager/Task Manager. Oversee subcontractor field activities. Communicate and coordinate with the Project Manager.
Subcontractors	Drilling/ Coring Services	TBD	Operates the equipment needed to collect sediment core samples.

	Laboratory Services	Fremont Analytical	Analyzes samples for chemical constituents.
		UW Isotope Geochemistry Laboratory	
		Others as necessary	

* Distribution List for Final SQAP.

Figure 2-1: Project Organization Chart



3. SCOPE OF WORK

This section introduces the project (Section 3.1) and describes the purpose and objectives of conducting a Sediment Assessment along the Upper Columbia River (UCR) between the Canadian border and the Grand Coulee Dam for the Confederated Tribes of the Colville Reservation (CCT or Tribe; Section 3.2). A brief description of the project tasks required for accomplishing the project objectives is provided (Section 3.3) as is a schedule for completing the tasks (Section 3.4).

3.1 Introduction

Environment International, Ltd. (EI) is providing consulting expert support to the CCT's attorneys as part of litigation against Teck Cominco Metals Limited (TCM). CCT's attorneys have requested the preparation of this document.

EI has developed this Sampling and Quality Assurance Plan as part of the Comprehensive Field Task Work Plan (FTWP) required prior to conducting field work. The Comprehensive FTWP will consist of this document and a site-specific Health and Safety Plan (HSP). The SQAP was developed in accordance with US Environmental Protection Agency (EPA) and Washington Department of Ecology (Ecology) guidance documents. EI also utilized information from similar studies to determine appropriate sample collection methods and analyses. These studies include the United States Geological Survey (USGS) *Vertical Distribution of Trace-Element Concentrations and Occurrence of Metallurgical Slag Particles in Accumulated Bed Sediments of Lake Roosevelt, Washington* (Cox et al. 2005) and the Coeur d'Alene River Basin Natural Resource Damage Assessment Soil and Sediment Baseline study (Horowitz et al. 1995). Additional documents covering previous investigations within the UCR corridor were utilized for site-specific information.

3.2 Objectives

The objectives of this inquiry are to evaluate (1) the lead isotope ratios of depositional sediments and (2) the background metals concentrations in sediments, defined as those sediments deposited prior to the initiation of operations at the Teck Cominco Trail smelter in British Columbia.

In order to meet these objectives, EI will be collecting subsurface sediment samples from known sediment deposition areas within the original (pre-dam) river bed along the UCR corridor between Onion Creek at Northport, Washington, and the Canadian Border. Intact sediment core samples will be collected from 20 to 25 locations within this stretch of the UCR and submitted for total metals and lead isotope analyses to identify post-industrial and pre-industrial sediments at each location. The methodologies to be employed as part of this inquiry are further discussed in Section 5.3.

3.3 Purpose

The purpose of the SQAP is to describe the field sampling and data gathering methods to be used during the UCR Sediment Assessment. This document also includes information regarding the study objectives, background information and site conditions, sampling objectives, sampling locations and frequency, sampling procedures and equipment, task management responsibilities, and a schedule for completion of field investigations and reporting activities. Specifically, the SQAP describes detailed sampling and analytical standard operating procedures (SOPs); quality assurance/quality control (QA/QC) methods to ensure that the results of the work performed satisfy the data quality objectives (DQOs) dictated by the intended use of the data; project instructions; laboratory method detection limits; reporting limits; data assessment criteria; and data evaluation procedures.

EI has developed this SQAP to describe the samples that the CCT proposes to collect from depositional areas of sediment along the UCR corridor between River Mile 733 just south of Northport, Washington to the Canadian border. The primary objective of this sampling effort is to gather data to support an analysis of background metal concentrations in the UCR environment associated with a time period preceding the Trail Complex operations. The method by which the background concentrations and the depositional timeline will be determined is through collecting sediment core samples from depositional areas along the UCR. A challenge presented by this sampling effort will be to obtain cores deep enough to reach sediment unaffected by industry, particularly by contamination associated with Teck Cominco's smelter stacks, slag, and liquid effluent from Trail.

3.4 Project Tasks

Based on the Scope of Work developed by EI, the tasks associated with this project are as follows:

Task 1 – Site Visit and Scoping Meeting. Task 1 involves visiting the Site to understand the scope of the project, gain familiarity with the Site, identify optimal sample locations for meeting project objectives, and determine project limitations and potential hindrances to field activities. The initial site visit and scoping meeting was completed the week of October 26, 2009.

Task 2 – Sediment Assessment. Task 2 involves SQAP development and project management activities, as well as collecting sediment core samples from pre-selected locations along the UCR between River Mile 733, just south of Northport, Washington to the US-Canadian border. The subtasks associated with this task are described in detail in Section 5 of this SQAP.

Task 3 – Data Analysis and Validation. Task 3 includes submitting the samples collected by EI as part of Task 2 to analytical laboratories and reviewing the data to determine if they meet DQOs for this study. Data will be evaluated to determine pre-industrial concentrations of metals in sediment and to determine if slag-like material observed in sediment samples can be attributed to a particular source.

Task 4 – Reporting. A final project report will be completed after the analytical results have been received and validated. The final project report will include the following:

- Description of the Sediment Assessment activities;
- Tabulated analytical results of samples collected during the assessment;
- Deviations from the approved SQAP; and
- Recommendations for additional work, if any, and justifications based upon DQOs.

3.5 Project Schedule

Table 3-1 presents the proposed schedule for completing the tasks involved with the UCR Sediment Assessment. Field sampling is expected to take place in April 2010.

Table 3-1
UCR Sediment Assessment Schedule

Task	Proposed Start Date	Proposed Completion Date
Task 1 – Site Visit/Scoping Meeting	October 26, 2009	October 28, 2009
Task 2 – UCR Sediment Assessment		
Develop Draft SQAP	February 15, 2010	March 5, 2010
Review and Approval of SQAP	March 5, 2010	April 26, 2010
Finalize SQAP	April 26, 2010	April 26, 2010
Procure Subcontractors and Equipment	March 5, 2010	April 26, 2010
Mobilize to Site	April 26, 2010	April 27, 2010
All Field Work and Sampling	April 28, 2010	May 17, 2010
Task 3 – Data Analysis and Validation[1]		
Submit All Samples to Laboratory	April 29, 2010	May 18, 2010
Laboratory Analysis and Reporting	May 19, 2010	June 9, 2010
Data Validation	June 9, 2010	June 23, 2010
Data Analysis	June 16, 2010	July 9, 2010
Task 4 – Reporting		
Develop Draft Sediment Assessment Report	May 24, 2010	July 23, 2010
Review and Approval of Draft Report	July 23, 2010	August 6, 2010
Finalize Report	August 6, 2010	August 20, 2010

Table 3-1 Notes:
1. Assumes a 21-day turnaround time for most analyses. Other analyses may require longer turnaround times.

4. SITE CONDITIONS

This section establishes general site conditions affecting the types and locations of samples expected to be collected as part of this study. Section 4.1 describes the conditions known to exist along the UCR corridor. Site history is discussed in Section 4.2. Section 4.3 describes previous investigations that have been conducted on and near the areas of interest for this study. A preliminary conceptual site model is presented in Section 4.4.

4.1 Site Hydrology

The UCR Site is located in north central Washington and extends along the Columbia River from the border between the United States and Canada downstream to the Grand Coulee Dam. Immediately upstream of the Grand Coulee Dam the impounded Columbia River forms the Lake Roosevelt reservoir.

The Columbia River was free-flowing until 1933 when Rock Island Dam was constructed at USGS RM 483, followed by Bonneville Dam in 1937 at USGS RM 146, and then Grand Coulee Dam between USGS River Mile (RM) 596 and 597 in 1941. The main structure of the Grand Coulee dam was completed by December 31, 1941; it took less than a year for the reservoir to reach full pool elevation.

Lake Roosevelt's surface elevation, inflow, and outflow are systematically controlled by the U.S. Bureau of Reclamation in order to provide flood control, irrigation, recreation, fisheries, navigation, flow regulation, and power generation objectives. Grand Coulee Dam has historically been operated to maximize the storage capability of the reservoir for retention of flood waters during the spring runoff, to meet irrigation demand and downstream flow targets during the dry summer months, and to maintain the highest pool levels possible for maximum power generation at all other times of the year. Although reservoir elevations are systematically managed, the extent of the elevation fluctuations can be somewhat unpredictable due to varying annual runoff flows. The wide variation in runoff strongly influences the extent of reservoir elevation change, resulting in a range of pool elevations.

The full pool elevation maintained in Lake Roosevelt is 1,290 feet above mean sea level. During the annual operating cycle, water levels in the reservoir are typically drawn down between January and April to accommodate increased spring flows. At full pool, Lake Roosevelt extends at least 133 miles upriver from the dam to USGS RM 730, which is within 15 miles of the Canadian border, and is bordered by over 600 miles of publicly available shoreline. At the northern end of the UCR Site, the free-flowing reach of the UCR is generally undeveloped, bordered by the Colville National Forest to the west and Highway 25 to the east (EPA 2008).

This scope of this study is limited to the river corridor extending from USGS RM 733 just south of Northport, Washington, to USGS RM 745 at the US-Canadian border. The following is a description of the reach of the Columbia River that encompasses the focus of this study.

Reach 1: USGS RM 745 to USGS RM 730

Reach 1 begins at the US-Canadian border. The first three miles of river in Reach 1 are relatively shallow and narrow, retaining much of the river's historical hydraulic characteristics, and are expected to run free much of the time. Water depth at the Canadian border was reported to be approximately 14 feet and is consistent with soundings from the 1947–1949 surveys conducted by the U.S. Coast and Geodetic Survey. (EPA 2008)

The next 12 miles of river in Reach 1 – extending from USGS RM 742 to USGS RM 730 – are just upstream of the Lake Roosevelt reservoir and are influenced by the lake's pool level. As flow in the UCR varies and pool elevations change in response to dam operations, this section of the river transitions from a free-running riverine reach to a lacustrine (lake-like) reach. Reported water depths at the downstream end of this reach are 50 feet or more in the main channel. Several notable geomorphic features exist in this stretch of river. There is a large gravel bar at USGS RM 738 on the northern bank, across from Deadman's Eddy. Aerial photographs suggest that some minor depositional features exist at the downstream point of the bar. There are also well-defined erosional terraces marking various reservoir pool levels. This suggests that the gravel bar may be a relict feature pre-dating upstream flood-control operations and potentially pre-dating the construction of Grand Coulee Dam as well. At USGS RM 737, the channel thalweg makes several sharp turns between two islands: Steamboat Rock and Sand Point. Two minor tributaries enter the UCR at this point, Big Sheep Creek on the northern bank and Deep Creek on the southern bank. Although these tributaries are small, aerial photographs suggest that both tributaries exhibit deltaic features at their confluence with the UCR, suggesting that these creeks may be an important source of native watershed sediments to the UCR downstream of the U.S.-Canadian border. The mouths of both tributaries are well-protected by backwaters, and the mouth of Big Sheep Creek is protected further by the two islands. (EPA 2008)

Detailed characterizations of the riverbed between USGS RM 745 and USGS RM 730 are not available, although the information that does exist indicates that the bed consists of large (non-cohesive) particle types—gravel, cobbles, and boulders (EPA 2008).

4.2 Site History

The TCM facility is located on the Columbia River approximately 10 miles upstream from the US-Canadian border. Smelter operations have been underway in Trail since 1896. The original facilities were built in 1896 to smelt copper and gold ores from the Rossland Mines. A more modern competing facility was constructed in Northport, Washington, which subsequently prompted modernization activities to occur at the Trail facility in 1898. Modernizing the facility allowed for the extraction of lead in addition to copper and gold. Zinc production began in 1916. By 1925, the facility consisted of a complex of structures housing a lead plant, an electrolytic zinc plant, a foundry, a machine shop, and a copper-rod mill. Fertilizer plants were built at the Trail smelter in 1930, facilitating the production of both nitrogen- and phosphorus-based fertilizers. The facility constructed and operated a heavy water plant from 1944 to 1955. (EPA 2008)

By 1966, the TCM smelter was producing lead, zinc, cadmium, silver, gold, bismuth, antimony, indium, germanium, and arsenic. The TCM facility also produced sulfuric acid and liquid sulfur dioxide. Ammonia, ammonium sulfate, and phosphate fertilizers were produced at the plant until August 1994, at which time production of the phosphate-based fertilizer was terminated. (EPA 2008)

Major current operations at the facility include primary smelting of zinc and lead concentrates and secondary smelting for production of a variety of metal products (e.g., antimony, bismuth, cadmium, cobalt, copper, germanium, gold, indium, mercury, silver, and thallium), arsenic products, granular and crystallized ammonium sulfate fertilizers, sulfur, sulfuric acid, sulfur dioxide, and ferrous granules. (EPA 2008)

Known historic and current discharges and emissions from the TCM industrial complex at Trail that have relevance to the UCR Site include, but are not limited to:

- Discharges of granulated slag to the Columbia River;
- Liquid effluent discharges to the Columbia River;
- Atmospheric emissions (stack and fugitive);
- Potential discharges to the Columbia River via groundwater migration from under the smelter and from surface water runoff; and
- Accidental spills and releases to the Columbia River from Trail facility operations.

4.3 Previous Investigations

A number of environmental investigations have been performed in the UCR by numerous organizations for a variety of purposes; however, only three investigations have been performed that examined subsurface sediment concentrations from areas along the UCR between just south of Northport and the US-Canadian border. The following are descriptions of the three subsurface sediment studies that have been completed within the UCR.

4.3.1 Washington Department of Ecology Study (Johnson et al. 1989)

This study was conducted by researchers from Ecology and provides the first characterization of the distribution of metals in subsurface sediments in a portion of the UCR.

Sampling was conducted in September of 1986. A single core was collected at USGS RM 693 near French Rocks using a 5-centimeter (cm) gravity corer. The core was sectioned at 5-cm intervals. In addition to heavy metals concentrations, cesium-137 concentrations were measured in the core sample to assign a time horizon to each sample.

According to Johnson et al. (1989), the location of the single core collected during their survey coincided with the location of the maximum concentrations of lead, cadmium, and mercury in surface sediments identified by that time. The peak cesium-137 concentration in the core was in the 10–15 cm sediment horizon. The authors found that concentrations of all metals were elevated in the upper 30 cm of the sediment column, and concluded that metals contamination in this part of the UCR appeared to have begun prior to 1954. They also concluded that the level of contamination had apparently not changed appreciably since the 1950s.

4.3.2 USGS Sediment Investigation (Cox et al. 2005)

This study was conducted by researchers from USGS to evaluate the vertical distributions of metals in sediments throughout the UCR and to assess sediment accumulation rates.

Sampling was conducted in September 2002. Sediments were sampled at six stations from USGS RM 705 to USGS RM 624 and at one location in the Spokane River[1]. According to the authors, sites of continuously accumulating sediments were not found upstream from USGS RM 705, so no cores were collected in the uppermost portion of the UCR. The five cores in the downstream section of the UCR were collected near the original river channel where the accumulation of sediment was thought to be thickest and least likely to be disturbed by fluctuations in water level and river flow. The core at USGS RM 705 (the most upstream station) was located away from the historical river channel toward the left bank on a submerged terrace, because fine-grained sediments were not found in the channel. The core in the Spokane River was collected in the channel near the mouth. All cores were located in areas thought to be minimally affected by large landslides along the shoreline, which could potentially confound the vertical patterns of metals concentrations. Each core was collected using a 6.5-cm-diameter gravity corer. Core depths ranged from 38 to 164 cm and sectioning occurred in intervals of 2 to 5 cm, depending on the core. In addition to metals, concentrations of cesium-137 were measured in the core samples to assign a time horizon to each core.

Using the cesium-137 data to estimate the location of 1964 (the peak cesium-137 concentration related to atomic bomb testing) and 1954 (the first appearance of cesium-137 concentrations), Cox et al. estimated minimum sediment accumulation rates for each station that ranged from 0.8 centimeters per year (cm/year) at USGS RMs 624, 692, and 705 (i.e., in the upper and lower portions of the UCR) to 2.8 cm/year at USGS RM 668 in the middle portion of the UCR. The minimum sediment accumulation rate at USGS RM 643 in the middle portion of the UCR was 1.5 cm/yr, and the minimum rate in the Spokane Arm was 1.9 cm/yr. Based on this limited data set, sediment accumulation rates in the UCR are potentially greatest in the middle portion of the UCR, above the Spokane River and below the Colville River.

With respect to the vertical distributions of metals concentrations in the sediment cores collected in the UCR, Cox et al. concluded that concentrations generally varied greatly within each core profile (often over a range of 5- to 10-fold), and that concentrations typically were highest below the surface sediments in the lower half of each core profile, with generally decreasing concentrations from the 1964 horizon to the core surface. All of the cores from the UCR showed some evidence of disturbance from landslides in their deeper horizons, based on the concentration profiles of both metals and cesium-137. However, three cores (at USGS RMs 705, 692, and 624) showed no evidence of potential disturbance from landslides since the 1964 time horizon.

[1] Note that these locations are down-river from the locations proposed for EI's study.

4.3.3 2005 EPA Phase I Sediment Investigation

As part of the EPA's 2005 Phase I study, subsurface sediments were sampled in sediment cores collected from nine locations between EPA RM 708 and USGS RM 605[2]. Although three additional core samples were planned to be collected at several stations above EPA RM 708 (i.e., EPA RMs 723, 734, and 742), the sediments were found to be too coarse to allow coring. Cores were sampled from mid-channel and submerged side-bank locations to a maximum water depth of 200 feet. Cores were sampled to a maximum depth of 5 to 7 feet below ground surface, depending on the location. Sediment cores were collected using a 10-cm-diameter Vibracore with Lexan plastic core tubes. Each core was sectioned at 0.5-foot intervals in the top foot, and at 2-foot intervals in the deeper horizons. According to EPA, the core collected at USGS RM 622 may have been affected by landslides. Samples were submitted for grain size, metals, and organic compound analyses, but only grain-size and metals analyses are discussed here. (EPA 2008)

4.3.3.1 Grain Size

With respect to grain-size parameters, cores collected at EPA RMs 708 and 704 consisted almost exclusively of sand-sized particles throughout their lengths, because percent sand exceeded 93 percent in all sediment horizons. EPA visually characterized the sediments throughout these two cores as relatively uniform black sand, and suggested that the sampled areas represent primary depositional areas for sandy, granulated slag-enriched sediments. No visual observations of black sediments were found in any of the cores sampled downstream from Marcus Flats. Cores in downstream areas include greater percentages of fine-grained sediments. This is particularly true for cores collected in the middle portion of the UCR at EPA RM 692 and at USGS RMs 676 and 661, which contain relatively large proportions of fine-grained material in most sediment horizons. Concentrations of silt were particularly high in this portion of the UCR, exceeding 40 percent in all but one of the sediment horizons sampled in the three cores. Elevated concentrations of fine-grained sediment in the three cores collected from the lower portion of the UCR at USGS RMs 644, 637, and 605 were largely confined to the top 0.5 to 1 foot of the sediment column. (EPA 2008)

4.3.3.2 Metals

Vertical distributions of iron, zinc, and copper show the highest concentrations of these metals were found at EPA RMs 708 and 704. Concentrations in the cores from EPA RM 692 and USGS RM 676 were relatively similar to each other and significantly lower than the concentrations at EPA RM 704. Although iron concentrations in the core from USGS RM 661 were relatively uniform over the length of the core, zinc and copper concentrations tended to be higher in the upper 3 feet of the core relative to the concentrations found in underlying sediment horizons. At USGS RMs 644, 637, and 605 in the lower portion of the UCR, concentrations of all three metals were considerably higher in the top 0.5 to 1 foot of the cores, relative to concentrations in the underlying horizons. In general, concentrations of lead exhibited patterns similar to those found for iron, copper, and zinc. (EPA 2008)

[2] Note that these locations are down-river from the locations proposed for EI's study.

Vertical distributions of cadmium and mercury were relatively uniform throughout each core collected from the upper four stations. However, by contrast with iron, copper, and zinc, the highest concentrations of cadmium and mercury were generally found in the core from USGS RM 676 near Inchelium. Below USGS RM 676, concentrations of cadmium and mercury exhibited the same general patterns described above for iron, copper, and zinc. (EPA 2008)

Major findings of the 2005 EPA Phase I study with respect to grain size parameters and metals in subsurface sediments can be summarized as follows:

- With respect to grain-size parameters, cores collected at EPA RMs 708 and 704 in the vicinity of Marcus Flats consisted almost exclusively of sand-sized particles throughout their lengths, whereas cores in downstream areas included greater percentages of fine-grained sediments, particularly in the middle portion of the UCR.
- The highest concentrations of iron, copper, and zinc were found at EPA RMs 708 and 704.
- The highest concentrations of cadmium and mercury were found in the core from USGS RM 676 in the middle portion of the UCR.
- In the three cores collected from the lower portion of the UCR (between USGS RMs 644 and 605), concentrations of most metals were considerably higher in the top 0.5 to 1 foot of the cores, relative to concentrations in the underlying horizons.
- Sediments containing black sand-sized particles assumed to be granulated slag were found only in sediments at Marcus Flats and in upstream areas. (EPA 2008)

5. Sampling and Analysis Plan

The 2010 UCR Sediment Assessment (Study) is focusing on establishing natural background metal concentrations in the river sediments along the Upper Columbia River corridor between just south of Northport, Washington, and the US-Canadian border. This section describes the sampling and analysis activities that will be conducted during this assessment, including the types of samples, rationale for sample locations, and the proposed chemical analyses. This section also describes the tasks associated with the sediment assessment and the work that will be performed to complete the tasks.

Standard operating procedures that will be utilized for this project are listed in **Table 5-1**; all SOPs are provided as Appendix A. **Table 5-2** presents a summary of the sediment samples to be collected by EI as part of this investigation, including media to be sampled and the analyses to be performed on the samples. Field quality control samples that will be collected as part of this project as well as the sample analysis requirements, including analyses to be performed, required sample volumes, containers, preservation methods, and maximum holding times also are presented in Table 5-2. **Table 5-3** describes analytical sensitivity requirement for project samples.

5.1 Mobilization/Demobilization

The field investigation will begin with mobilization activities. Mobilization of staff and equipment will be required to prepare for the field effort and will continue throughout its duration to support the various subcontractor services and field tasks. Mobilization activities include:

- Procuring subcontractors;
- Orienting field personnel on proposed activities and health and safety protocols;
- Leasing and purchasing expendable and non-expendable items;
- Communicating and coordinating with Site owners and/or the CCT for Site access;
- Obtaining tribal permits to conduct sampling at sites within the Columbia River.
- Establishing a temporary field work area;
- Constructing and decommissioning a decontamination area(s);
- Assembling and transporting field equipment to and from the Site(s); and
- Coordinating and scheduling subcontractors.

Subcontractor procurement will include final evaluation and selection of subcontractors for coring/drilling, off-site analytical laboratory services. Investigation-derived waste (IDW) management services shall be performed by the CCT. IDW is discussed further in Section 5.8. All subcontractors will be required to adhere to the procedures presented in this SQAP. Subcontractors will also be required to comply with all state and local certification requirements. All employees and subcontractors[3] of EI who will participate in field activities at the Site are required to read the EI's *Site-Specific Health and Safety Plan (*HSP) and sign that they understand and will abide by its requirements. Field sampling will be

[3] Subcontractors that participate in field activities will be required to have their own health and safety plan and will be responsible for monitoring their own safety. However, if any of their activities conflict with EI's HSP, then the activities will need to be re-evaluated.

conducted mostly by EI employees; however, drilling subcontractors will be subcontracted and expected to perform field work limited to their areas of expertise.

A work boat provided by the CCT will serve as to transport EI and Subcontractor personnel to and from the barge, and will serve to transport core segments to a shore-based processing facility. An outdoor field station located on the drilling barge and including a work table will be used to cut and cap the cores for transport to shore. Core processing, including core logging, field inspection with a handheld x-ray flourescence (XRF) analyzer, sampling and preparation for storage will take place in a mobile processing station that will be located at the nearest accessible point on shore and include a table for processing and a tent in case of rain. A mutually agreeable location at each sampling site will be designated by the Field Team Leader and an EI or CCT representative for decontamination activities. An EI or CCT representative will determine an appropriate accumulation area for all drums containing IDW. The equipment and disposable items necessary to perform the various field activities will be ordered and stocked at EI's offices until the time they are needed in the field. Demobilization activities will coincide with the completion of the field effort and will consist of departure of the subcontractor barge, conducting a final inspection of each work site and assembling and transporting field equipment back to EI's offices.

5.2 Utility Clearance

Utility clearance is not necessary for this field event as drilling will be occurring in areas where utilities are not likely to be present.

5.3 Sediment Core Sampling

The CCT has tasked EI with evaluating pre-industrial background metal concentrations in the UCR sediments. In order to facilitate the design of this study, an understanding of the physical and chemical characteristics of the site is necessary. Based on historical operations and physical information regarding the site, a sediment study was developed for the UCR Site between USGS River Mile 733 near Northport, Washington to the Canadian border based on the following considerations:

- Smelting operations at the TCM facility began shortly after 1895 and resulted in contamination of river sediments through the discharge of slag and liquid wastes directly to the Columbia River.
- Prior to 1941, water flow in the UCR was relatively unobstructed.
- After 1941, the stretch of UCR between Kettle Falls and USGS RM 730 became part of the Lake Roosevelt Reservoir, which slowed sediment transport and allowed for higher deposition rates in this reach.

Because sediment data from previous investigations are not sufficient to establish in-river metal concentrations in sediment prior to the deposition of metals from industrial activities, nor are they sufficient to identify sources of metal contaminants from specific ore bodies, a sediment coring study is necessary to determine background (i.e. pre-industrial) concentrations of heavy metals and stable lead isotopes.

Sediment core samples will be collected and analyzed to determine if a significant difference in sediment metal concentrations exist between populations of discrete samples from the top and from the bottom of each sediment core. Target Analyte List (TAL) metals analysis will be performed in an attempt to identify post-industrial and pre-industrial sediments at each location. Additionally, sediment cores will be collected and analyzed for stable lead isotopes (Pb-204, Pb-206, Pb-207, and Pb-208). Stable lead isotope ratios will be used for comparison among discrete samples for background, post-industrial sediments, and known sources of ore used at the Teck Cominco smelter at Trail, British Colombia.

Background sediment information will be obtained by collecting sediment samples from in-water locations at discrete sampling depths from known depositional areas. A priori estimates of sediment deposition rates at each sediment core location will provide an estimate at which pre-industrial sediment is expected to be reached, if less than 15 feet below the surface of the river bottom, or mudline. Statistical methods will be used to determine if metal concentrations in the top and bottom sediment samples from each core are significantly different and the nature of this difference.

This project is focusing on four primary areas of concern within the UCR which are as follows: South of the Canadian Border; Black Sand Beach; Deadman's Eddy; and Northport/Onion Creek. Sediment coring will be conducted at 20 to 25 locations from known sediment deposition areas within the original (pre-dam) river bed along the UCR corridor between Onion Creek/Northport (USGS RM 733) and the Canadian Border (USGS RM 745). In addition to the 20 to 25 sample cores, duplicate cores shall be collected from areas where sediment conditions are favorable.

Proposed sediment core locations will be from the depositional areas, shown on **Figures 5-1 through 5-5**. Within each identified depositional area, coring locations have been chosen using a random point generator (See Appendix B for core location selection methodology). Proposed coring locations on Figures 5-1 through 5-5 represent more than three times the number of actual cores that will be taken. Additional sampling locations are included in each identified depositional area in order to allow for field flexibility in the case where cores are difficult to obtain from a specific location due to rock or other obstacles. The depositional areas represented by shading in the figures are based upon both direct observations made during on-river site visits and through historical photographs. After the initial core is extracted from each shaded area, a decision will be made whether to extract additional cores based upon the sediment properties and the slag content of the initial core. Factors such as the presence of cobbles or other impediments to an efficient core extraction will be considered as well.

Sediment cores will be installed using a dual-drive head core drill system capable of using both percussive vibratory drive and rotary drilling to optimize efforts at reaching a continuous 10 to 30-foot (ft) core. The drill will be able to collect cores using 4-inch outer diameter vibracore barrels in a 3.5-inch butyrate liner as well as utilizing a 2.5-inch outer diameter thin-walled acetate liner when the rotary drill is in operation. The drill rig will be mounted on and operated from a 32-foot, self-propelled, Chinook drilling barge. Once the drill rig is positioned, a continuous sediment core sample will be collected to a specified depth below the mudline as directed in the field. Core depth shall be based on an assessment of site conditions and the chemical composition of initial cores. Initial cores shall be completed as deep as technically possible below the mudline (below ground surface, or bgs) with a maximum depth of 30 feet. Accepted cores shall contain, at a minimum, 2/3 continuous sediment to targeted depth (i.e., for a 15-ft targeted depth core, a core shall not be accepted if less than 10 ft recovery, 20-ft targeted depth core shall contain a minimum 14-ft recovery). After initial cores have been examined, subsequent cores depth will be based upon the following Core Depth Decision Tree.

Core Depth Decision Tree

Core depths shall be determined as follows:

- Once the barge is in position at or near a coring location, the exact GPS coordinates shall be obtained and noted and depth to mudline measured.

- A core will first be attempted using the vibracore drill rig. If core can be completed to 30 feet or other depth specified in the field and is viable per the project definition, the core will be cut and capped. Cutting and capping the core involves: (1) decanting water off the top of the core, logging the amount of water recovered for the core, and capping the top and bottom of the core with core caps, secured with duct tape; and, (2) cutting through the butyrate liner and sediment with a saw, capping both open ends with core caps and duct tape. The vibracore head will then be moved without removing the anchor from the initial location to attempt a duplicate core. The vibracore head will move a sufficient distance such that the duplicate core will not be in sediment impacted by installing the initial core.

- If the vibracore head encounters resistance during the installation of the initial core, the following process shall be followed:

    - If resistance is encountered in the upper 5 ft of the core, the situation will be assessed to determine if the cause is an isolated barrier or if it is a larger problem. If the cause of resistance is determined to be an isolated barrier, the vibracore head will be moved without re-anchoring the barge to attempt another nearby core. If it is determined to be a larger barrier, the barge location will be changed before attempting another core.
    - If resistance is encountered between 5 and 15 ft. of the core, the situation will be assessed to determine if the cause is an isolated barrier or if it is a larger barrier. If it is determined to be an isolated barrier, coring will continue using the rotary drill technology. If it is determined to be a larger barrier, the core will be utilized if it is viable (note: to be a viable core for study purposes, the core must be at a minimum 15-ft continuous with 2/3 recovery), and the barge location will be changed before attempting another core.
    - If a viable core is collected at a location using the vibracore technology, a duplicate core will be collected.

- Once three or more unsuccessful cores are attempted in a study area, the viability of collecting additional cores in that particular depositional area will be determined. If no additional viable cores can be taken from a particular depositional area, the barge shall be moved to the next, downstream, depositional area for additional cores.

- A maximum number of viable cores to be collected will be determined from any given depositional area. The maximum number of cores for each depositional area shall be determined in the field and shall depend on the size of the area and the success of coring in other depositional areas. It is expected that 1 of every 3 locations on Figures 5-1 through 5-5 will be attempted; however, if that number may decrease if previous coring attempts have been very successful or increase if previous coring is unsuccessful. Field personnel shall look to meet the goal of obtaining 20 to 25 total cores for the entire study.

- Once the maximum number of cores is successfully collected from a depositional area, the barge shall be moved to the next, downstream, depositional area for additional cores. However, if the maximum number of cores are collected in the upstream locations, the number of targeted cores at downstream depositional areas may be decreased so that the most representative cores for the entire upper river area can be collected (i.e. cores shall be attempted in each of the depositional areas that have been identified as part of this study in order to provide the greatest areal coverage of the upper river).

- The study shall be completed once 20 to 25 viable cores (not including duplicate cores) are collected.

After the sediment core has been removed from the in-water environment, it will be cut into 3-5 foot lengths based upon visual observation of viable cutting points then capped to prevent sediment loss. Duplicate cores shall be cut into segments appropriate for long-term storage. All cores will be stored vertically at all times to minimize sediment movement inside the core. The core segments will be labeled indicating the sample number and the depth of the core segment below mudline. Cutting and capping will occur in a designated work table aboard the barge. The clean working surface will be covered in polyethylene sheeting, or it will have been washed off and completely free of sediment and debris prior to placing the sediment core on top of it. Field personnel handling the sediment core will be wearing a clean pair of nitrile gloves while working with the core.

After the sediment core has been cut, capped and labeled, it will be transported to a shore-based area for processing. At the shore-based processing area, field personnel will slice the core lengthwise using electric shears. The core liner will be folded back and the condition of the core will be documented through photographs with a digital camera with the time and date stamp option turned on.

After photographs of the sediment core have been taken, field personnel will visually assess the sediment core to identify areas of high slag concentrations and areas that may be representative of pre-industrial conditions and to document the type(s) of material seen. Core conditions will be documented, based on depth, in a log book and on the Sediment Coring Log Field Form attached in Appendix C. Field personnel shall document the geologic description of the materials within the sediment core and make note of any unusual materials observed. Particular attention will be paid to material that resembles slag, and its location within the sample core will be noted. The Unified Soil Classification System Identification and Munsell color will also be documented.

After visually assessing the sediment core, field personnel will utilize a XRF analyzer to screen for approximate metal concentrations, specifically lead, within the core sediments. The XRF will be calibrated in accordance with the manufacturer's instructions at the beginning of each work day and its calibration will be checked again at the end of the day to assess whether or not readings have drifted away from the original calibration standard and by what amount. Calibration will be documented in the site logbook on the form located in SOP EI-5204, Appendix A. XRF readings of the sediment core will be collected in accordance with the US-EPA Method 6200 and Field Portable XRF Guide, Appendix D. The XRF will be utilized to obtain order-of-magnitude concentrations of lead in the sediment core. Because the moisture in the sample interferes with the accuracy of XRF readings, EI does not anticipate using this equipment to obtain quantitative information, but rather to obtain qualitative information to help determine which samples will be submitted to a laboratory for chemical analysis.

Beginning at the top of the core (i.e. immediately below the mudline), the field crew will take XRF readings at 6-inch intervals and from other areas of interest within the sediment core. These other areas of interest may include slag-like material, unusual materials, the interface between visually different sediment materials, the top of the sediment core, and the very bottom of the core. All readings and their associated depth from the mudline will be documented in the site log book.

Based on visual observation and XRF results, the following areas for sampling will be identified and sampled: (1) areas of high slag concentration as determined through visual observation and XRF results; (2) areas of high metals concentration as determined by the XRF; (3) areas where the metals concentrations decrease indicating pre-industrial levels; (4) the top and bottom four inches of the core; and (5) other areas where anomalies are noted. Between four and eight samples, with an average of six samples, will be collected from each sediment core and placed in appropriate sample containers (discussed in **Table 5-2**), including a minimum of three samples from the pre-industrial area. The samples will be submitted to a pre-determined analytical laboratory for the following analysis:

- Visual classification of sediment including grain size, mineral composition, color, etc;
- TAL metals;
- Total Organic Carbon (TOC);
- Grain Size;
- Bulk Density;
- pH; and
- Lead stable isotopes (Pb-204, Pb-206, Pb-207, Pb-208).

The proposed chemical analyses to be performed on the sediment samples, preservation methods, holding times, and sample volumes are presented in **Table 5-2**. Analytical sensitivity and project criteria are provided in **Table 5-3**.

A clean, stainless steel spoon will be used to scoop the material from the sample liner into the sample jar(s). Care will be taken to minimize mixing while placing the sediment material into the jar(s). Field personnel will place sediment into the sample container beginning at the bottom of the sample section and moving up to the top of the section. Sample containers will be labeled, placed on ice inside a cooler, and shipped to the pre-determined laboratory according to SOP No. EI 4034 provided in Appendix A.

The remainder of the sediment core that has not been sampled will be prepared for long-term storage in the event that further analysis of the core is necessary. Un-sampled sediment will be placed into 16-oz. jars. Each of the jars labeled based upon sample location and depth bgs. Core samples for storage will be placed on ice and shipped according to SOP No. EI 4034. The preserved core samples will be stored by the CCT in a dedicated deep freeze unit.

When logging and labeling sediment samples, samples shall be identified using the following notation:

Field Code – Sample Core Number – Top Sample Interval Depth – Bottom Sample Interval Depth

For example, a sediment sample collected from the second core installed in the Onion Creek area from the depth interval of 44 inches bgs to 48 inches bgs would have the following sample identification number: OC-02-44-48. The field codes for the sampling locations proposed for this study are as follows.

Field Code	**Station Location**
SCB	South of the Canadian Border
BSB	Black Sand Beach
DE	Deadman's Eddy
OC	Onion Creek
CB	China Bend

5.3.1 Project Constraints

Collecting sediment core samples involves advancing drilling equipment through about 5 to 30 feet of water then into the river bed itself. Given the complex nature of collecting sediment core samples from a number of constraints may determine how this study is executed.

5.3.1.1 Physical Constraints

Practical constraints on sediment coring and data collection may include the following:

- Strong currents making collecting the core impossible;
- Reaching bedrock prior to reaching 15-foot depth of sediment core;
- Sample location consists primarily of cobbles and other materials that are difficult to drill;
- Physical properties of sediment make it difficult to collect continuous, un-disturbed core;

- Visual inspection of core indicating slag material throughout which indicates that a depth indicative of pre-industrial times has not been reached; and
- Visual inspection of the core indicates that a non-depositional area has been sampled. The presence of loamy material or tree roots and a lack of slag indicates that a non-depositional area has been sampled.

An alternate sediment core may be attempted if any of these physical constraints are encountered. The determination about whether to attempt an alternate core will be made in the field by the field team in consultation with technical staff from the CCT and EI. The same field team will also determine where alternate sediment cores will be attempted.

5.3.1.2 Temporal Constraints

During the annual operating cycle for the hydroelectric dams along the Columbia River, water levels in the Lake Roosevelt reservoir are typically drawn down between January and April to accommodate increased flows resulting from spring runoff, impacting flow conditions and river depths. As such, field work should be completed in March to meet the optimal flow and river level conditions that will help avoid encountering strong currents and water depths that are too shallow to accommodate the barge and boats needed to access the in-river sample locations.

Table 5-1
Field Standard Operating Procedures

Project Sampling SOP	SOP Number	Revised Date
Sediment Sampling	EI-1003	Rev 1, 1/22/2009
Chain-of-Custody and Sample Labeling	EI-1004	Rev 1, 1/12/2009
Quality Assurance/Quality Control Sample Collection	EI-1021	Rev 1, 1/22/2009
Field Equipment Decontamination	EI-1008	Rev 1, 1/12/2009
Environmental Sample Packaging and Shipping	EI-4034	Rev 0, 1/14/2009
Field Documentation and Forms	EI-4014	Rev 1, 1/12/2009
Investigation-Derived Waste Handling	EI-4033	Rev 0, 1/13/2009
Field Screening Equipment Calibration	EI-5204	Rev 0, 3/8/2010

TABLE 5-2. Sediment Sampling and Analysis Methods Requirements and UCR Site Sampling Summary

Specific Analysis Requested				TAL metals	TOC	Lead Stable Isotopes	Grain Size	pH	Bulk Density
Analytical Method				EPA 6020A, 7471A (Hg)	Plumb (1981)[1]	Harkins et al (2008)[2]	ASTM D422	EPA 9045D	ASTM D2937
Preservation Requirements				cool to 4 °C immediately after collection	cool to 4 °C immediately after collection	cool to 4 °C immediately after collection	None	cool to 4 °C immediately after collection	None
Sample Holding Time				6 months; 28 days (Hg)	14 days	NA	None		None
				Container/ Sample Volume, Notes					
Sample ID	**Depth**	**Rationale**	**Field Analyses/ Observations**	1x 8-oz wide-mouth glass jar[3]	1x 4-oz wide-mouth glass jar	1x2-oz wide-mouth glass jar	1x16-oz wide-mouth glass jar[4]	1x 4-oz wide-mouth glass jar[5]	1x16-oz wide-mouth glass jar[4]
Field Code-Core Number-Sample Depth	0 to 20 ft bgs	Characterize toxicity of and contamination in sediment.	Visual Characterization						
Field Sampling									
			total field samples	50	50	50	20	50	20
			total field duplicates	5	5	5	NA	NA	NA
			total field/rinsate blanks (1/day)	10	NA	NA	NA	NA	NA
			total trip blanks (VOC only)	NA	NA	NA	NA	NA	NA
			total temperature blanks (not analysis-specific)	NA	NA	NA	NA	NA	NA
			total laboratory QC dup/MS/MSD[6]	4	4	NA	NA	NA	NA
			Total Analyses	59	59	55	20	50	20

Table 5-2 Notes:

[1]Plumb, R. H. Jr., Procedures for Handling and Chemical Analysis of Sediment & Water Samples, May 1981, USACE Publication AD/A103788

[2] Harkins, S.A., Appold, M.S., Nelson, B.K., Brewer, A.M., and Groves, I.M., 2008, "Lead isotope constraints on the origin of non-sulfide zinc and sulfide zinc-lead deposits in the Flinders Ranges, South Australia": *Economic Geology*, v. 103, pp. 353-364.

[3]8-oz short, wide mouth, straight-sided glass jar, 70-mm neck finish; closure: polypropylene or phenolic cap, 70-400 size, 0.015-in. PTFE liner

[4] The same 16-oz, wide-mouth, straight-sided glass jar submitted for Grain Size analysis can be submitted for the Bulk Density sample.

[5] Uses the same 4-oz jar submitted for TOC analysis.

[6] Samples for laboratory QC will be designated in the field, one dup/MS/MSD per 20 samples

Table 5-2 Key:

ASTM	American Society for Testing & Materials	Hg	Mercury	MSD	Matrix Spike Duplicate	USACE	US Army Corps of Engineers
bgs	below ground surface	ID	Identification	oz	Ounce	VOC	Volatile organic compound
°C	Degree Celsius	in	inch	PTFE	Polytetrafluoroethylene		
EPA	Environmental Protection Agency	L	liter	QC	Quality control sample		
ft	Feet	mm	Millimeter	TAL	Target Analyte List		
g	gram	MS	Matrix Spike	TOC	Total organic carbon		

Table 5-3. Analytical Sensitivity and Project Criteria

Parameter	Method	Reporting Limit (RL)	MS Recovery Limits (%)	MS/MSD or Laboratory Duplicate RPD Limits (%)	Field Duplicate RPD Limits (%)
TAL metals	EPA Method 6010, 7471A (Hg)		75-125	≤ 20	≤ 50
TOC	Plumb (1981)[1]	0.02%	75-125	≤ 20	30
Stable Lead Isotopes	Harkins et al (2008)[2]	NA	NA	NA	NA
Grain Size	ASTM D422	NA	NA	NA	TBD
pH	EPA 150.1	NA	NA	TBD	TBD
Bulk Density	ASTM D2937	NA	NA	NA	TBD

Table 5-3 Notes:

[1]Plumb, R. H. Jr., Procedures for Handling and Chemical Analysis of Sediment & Water Samples, May 1981, USACE Publication AD/A103788

[2] Harkins, S.A., Appold, M.S., Nelson, B.K., Brewer, A.M., and Groves, I.M., 2008, "Lead isotope constraints on the origin of non-sulfide zinc and sulfide zinc-lead deposits in the Flinders Ranges, South Australia": *Economic Geology*, v. 103, pp. 353-364.

Table 5-3 Key:

ASTM	American Society for Testing & Materials	RL	Reporting Limit
EPA	Environmental Protection Agency	RPD	Relative Percent Difference
Hg	Mercury	TBD	To be determined by analytical laboratory
MS	Matrix Spike	USACE	US Army Corps of Engineers
MSD	Matrix Spike Duplicate		
NA	Not Applicable		

5.4 Data Assessment

5.4.1 Data Quality Objectives and Criteria for Data Measurement

DQOs are the quantitative and qualitative terms used to describe the quality and quantity of the data needed to meet the objectives of the project. DQOs are developed by considering the purpose of collecting the data and its intended use.

The objective of this site investigation is to collect sufficient data to determine sediment background concentrations of metals in the UCR by establishing a vertical profile of metals concentrations to delineate metals concentrations for each sediment core ranging from pre-industrial to current conditions. A secondary objective of this study is to determine, through stable lead isotope analysis, the source of slag identified in core samples.

The data obtained over the course of the project will be used to:

- Determine if a significant difference in sediment metals concentrations exists between populations of discrete samples from the top and from the bottom of each sediment core to identify pre-industrial, or background, sediments and those impacted by TCM industrial activities at each location;
- Assuming delineation of background and industrially-impacted sediments, compare background sediment concentrations among sediment cores to determine if background sediment concentrations are consistent; and
- Assuming delineation of background and industrially-impacted sediments, collect data on stable lead isotope ratios for comparison among discrete samples for background, post-industrial sediments, and known sources of ore used at the Teck Cominco's smelter in Trail, British Columbia.

The budget allocated for the sediment core study may limit the number of sediment cores. A minimum number of 20 cores will be collected to satisfy the data quality objectives.

Field conditions, including river current and ability to core through river bottom material, may exclude some locations for which sediment cores have been proposed. Flow rates in the UCR are lowest between January and April. Sediment cores shall be attempted during this time period to ensure maximum success of coring activities.

Core material may limit usability of sediment core data. Depositional areas were identified as part of the scoping study performed prior to this investigation. Visual inspection in the field may indicate non-depositional areas; e.g. presence of loamy material, tree roots in core material. These cores may be excluded from analysis by the field/technical team.

DQOs for measurement data (referred to here as data quality indicators) are precision, accuracy, representativeness, completeness, comparability, and measurement range. The overall QA objective for analytical data is to ensure that data of known, acceptable and legally defensible quality are generated.

To achieve this goal, data must be reviewed for 1) precision, 2) accuracy or bias, 3) representativeness, 4) comparability, and 5) completeness.

A summary of DQOs developed to meet the goals of the 2010 UCR Baseline Sediment Assessment study are presented in **Table 5-3**. Data validation to ensure QA/QC measures have been met is discussed in further detail in Section 5.4.1.6.

5.4.1.1 Precision

Precision measures the scatter in the data due to random error. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average values. Analytical precision is measured through matrix spike/matrix spike duplicate (MS/MSD) samples for organic analysis and through laboratory duplicate samples for inorganic analyses. Analytical precision is quantitatively expressed as the relative percent difference (RPD) between the MS/MSD or duplicates.

Field and analytical precision will be evaluated by the RPD between field duplicate samples and laboratory duplicate samples; laboratory accuracy and precision will be determined by the spike recoveries and the RPDs of the MS/MSD samples, respectively.

$$RPD = \frac{(R1 - R2)}{((R1 + R2)/2)} \times 100$$

R1 = Recovery for MS or initial analyte concentration
R2 = Recovery for MSD or duplicate sample concentration

Precision criteria for this study are analytical parameter-dependent, and are listed in Table 5-3.

5.4.1.2 Accuracy

Accuracy measures the closeness of the measured value to the true value. Analytical accuracy is assessed by "spiking" samples with known standards (surrogates or matrix spikes) and establishing the percent recovery. When a known amount of surrogate is added to a sample and its percent recovery is within laboratory established control limits, then the analyte values in the sample are considered accurate.

Accuracy will be evaluated by the use of percent recovery of the target analyte in spiked samples and surrogates in all samples and QC samples.

$$\% \text{ Recovery} = \frac{SQ - NQ}{S} \times 100$$

SQ = quantity of spike or surrogate found in sample
NQ = quantity found in native (unspiked) sample
S = quantity of spike or surrogate added to native sample

5.4.1.3 Representativeness

Representativeness is the degree to which data from the project accurately represent a particular characteristic of the environmental matrix that is being tested. Representativeness of samples is ensured by adherence to standard field sampling protocols and standard laboratory protocols.

The design of the sampling scheme and number of samples should ensure the representativeness of each matrix or product of the chemical processes being sampled.

5.4.1.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. The use of standard techniques for both sample collection and laboratory analysis should make data collected comparable to both internal and other data generated. Sample collection methods and other field methods are described in Section 5.0.

Comparability is the measurement of the confidence in comparing the results of this study/project with the results of a different study/project using the same matrix, sample location, sampling techniques and analytical methodologies.

5.4.1.5 Completeness

Completeness is defined as the ratio of acceptable (non-rejected) measurements obtained to the total number of measurements for an activity. The completeness objective for this project is 100 percent.

Completeness is the percentage of valid results obtained compared to the total number of samples taken for a parameter. Since sampling is by grabs and limited in number of samples, the number of valid results obtained from the analyses are expected to be equal or better than 90%. Percent completeness may be calculated using the following formula:

$$\% \text{ Completeness} = \frac{\#\text{ of valid results}}{\#\text{ of samples taken}} \times 100$$

The QA objectives outlined, above, will be evaluated in conjunction with the data validation process.

5.4.1.6 Data Review, Verification, and Validation

All of the data received from the laboratory will be subject to validation at a Level 2 review. The Level 2 review includes verifying the following:

- The laboratory utilized the specified extract, analysis, and cleanup methods.
- The sample holding time was not exceeded.
- Sample numbers and analyses match those requested on the chain-of-custody.
- Required reporting limits have been achieved.
- Surrogate compound analyses have been performed and have met QC criteria.
- Initial and continuing calibrations were run at the proper frequency and met acceptance criteria.
- Laboratory blanks are free of contaminants.

Data found to have significant deficiencies will be validated in accordance with EPA's functional guidelines for data validation (EPA 2004, 2005). Following this review, data qualifiers assigned by the laboratory may be amended.

5.4.1.7 Corrective Action

If procedures in the field or the lab are not performed to the project specifications and data quality objectives are not met, specific corrective actions will be determined that may include but are not limited to the following:

- Identifying the source of the violation
- Re-analyzing samples if holding time criteria permit
- Re-sampling and analyzing
- Evaluating and amending sampling and analytical procedures
- Accepting data and flagging it to indicate the level of uncertainty.

5.4.2 Data Evaluation

Comparison of measured concentrations with risk-based sediment criteria is not an objective of this study; however, analytical methods shall be selected to ensure that method detection limits are sufficiently low to quantify measured concentrations below CCT sediment cleanup levels and Ecology freshwater sediment quality standards.

5.5 Decontamination

Non-dedicated sampling equipment such as the drilling equipment, core samplers, and sampling scoops that will be utilized to collect sediment samples will require decontamination between sample locations. Decontamination procedures will be performed in accordance with SOP No. EI-1008 in Appendix A.

5.6 Location & Elevation Survey

All sediment sample locations will be surveyed for horizontal location using a handheld Global Positioning System (GPS) Unit. Field survey data presented by the GPS unit will clearly list the coordinates (and system) and relative elevation, as appropriate for all surveyed locations. The vertical position of each sample will be measured by combining information from the sampling vessel's depth finder and obtaining the water elevation at the time of sampling. The location and elevation survey will be used to develop maps and graphics of the Site.

5.7 Investigation-Derived Waste Handling

IDW generated during the field activities performed during this investigation include personal protective equipment and decontamination fluids. A small amount of contaminated sediment may be included with the IDW. All IDW will be handled in accordance with SOP No. EI-4033 in Appendix A. A representative of the CCT will be on site and will remove the IDW from the project site according to CCT regulations.

Most IDW is expected to consist of disposable sampling supplies (gloves, paper towels, etc.) that will be disposed of as uncontaminated solid waste. Decontamination fluids and sediment overburden generated during drilling activities will be collected in 55-gallon DOT-approved drums and provided to the CCT, who will dispose of the IDW according to existing state and federal guidelines.

5.8 Sample Handling and Custody

Samples collected during this study will be stored in coolers and kept under custody at all times. A Chain of Custody (COC) form will be completed in indelible ink for each shipping container used. Each sample will be included in the field data sheets and given individual numbers to match the bottles and the field data sheets. Prior to sealing the sample shipping container, one copy of the COC form and a copy of the field record sheet will be sealed in a re-sealable waterproof plastic bag. This plastic bag will be taped to the inside cover of the sample shipping container so that it is maintained with the samples being tracked. Ice chests will be sealed with reinforced tape for shipment. Until the field samples are relinquished to the laboratory, the samples will be kept in coolers with ice and cooled to approximately 4 °C. Each cooler will have an accompanying temperature blank.

5.9 Data Management & Documentation Procedures

Data generated as part of this project will be maintained in an organized manner in the field, at the analytical laboratory, and during reporting to minimize data interpretation errors and omissions.

5.9.1 Field Data Management and Documentation

Field data management and documentation including field log books and sample collection forms will be performed in accordance to SOP No. EI-4014. Chain-of-custody and sample labeling documentation procedures are detailed in SOP No. EI-1004. Both SOPs are included in Appendix A. The SOPs also include the relevant field forms. All field data management and documentation are subject to possible QA audit assessment.

5.9.2 Laboratory Data Management and Documentation

The laboratory will provide a "Level B" data package deliverable, which will include:

- Project narrative;
- Sample results sheets;
- Chain-of-custody and sample receipt documentation;
- Initial and continuing calibration summary sheets, if available and when appropriate to meet project-specific requirements;
- Instrument performance verification (Gas Chromatograph/Mass Spectrometer tunes, interference check samples, retention time shift checks), as appropriate for the specific method;
- Surrogate and internal standard data, as appropriate for the specific method; and
- Field and laboratory QC samples results including blank, matrix spike, laboratory control sample, and duplicate results.

Data packages will be provided for all samples analyzed and these will be maintained as a permanent record in the project file.

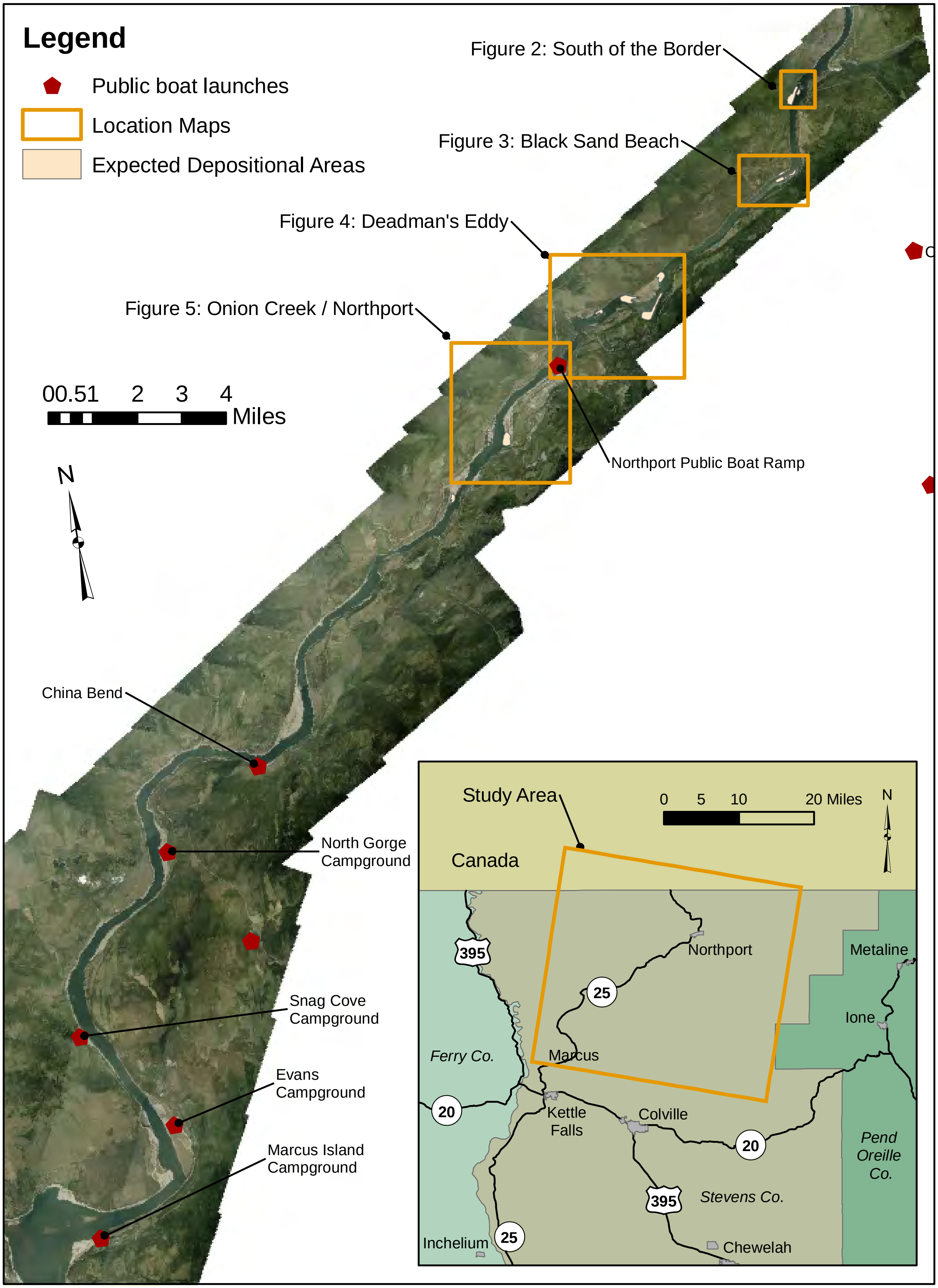
5.9.3 Reporting Data Management and Documentation

All laboratory data will be tabulated in an electronic format (typically Microsoft Excel or Microsoft Access) and any data qualifiers needed as a result of the data evaluation (Form R) will be included. To minimize potential for transcription errors, sample results will be electronically downloaded directly and verified against the hardcopy data packages. The data will be verified by comparing the electronic data printouts to the hardcopy laboratory data package results and the qualifications made in the data evaluation reports. This verification is performed to detect and correct errors, and to prevent the loss of data during data reduction, data reporting, and data entry into forms/reports/databases.

Electronic and database files will be maintained as a permanent record in the project file. Summary data tables and graphics generated from the electronic laboratory data will be included in the final assessment or investigation report.

The project file will be maintained for the life of the contract and provided upon request to the CCT. The project file will be archived in accordance with contract requirements.

Target Coring Locations — Figure 5-1: Site Map



Environment International Ltd [ces] Coordinate System: NAD 1983 UTM Zone 11N 22 April 2010

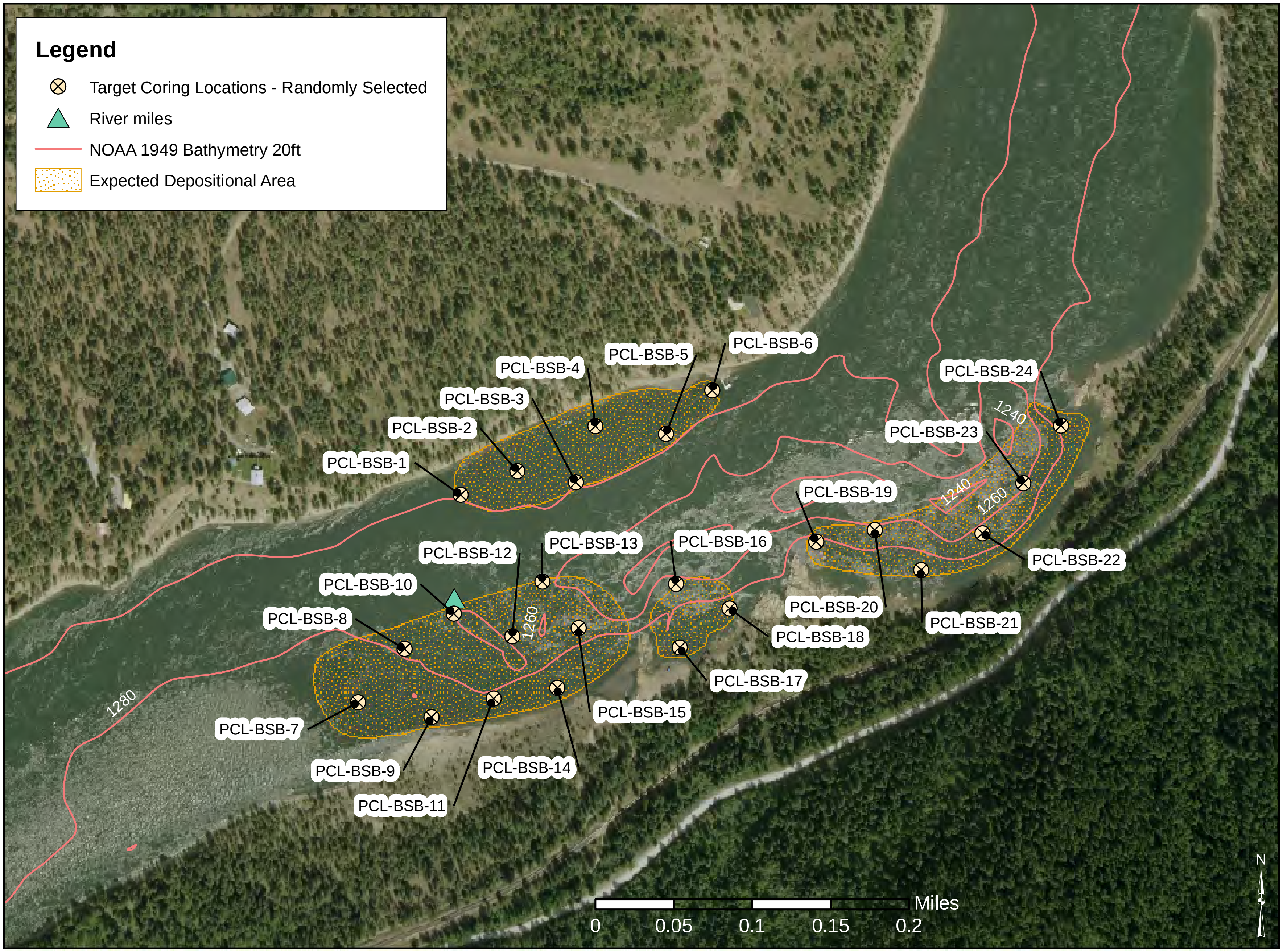
Target Coring Locations

Figure 5-2: South of the Border

Environment International Ltd [ces] Coordinate System: NAD 1983 UTM Zone 11N 22 April 2010

Target Coring Locations

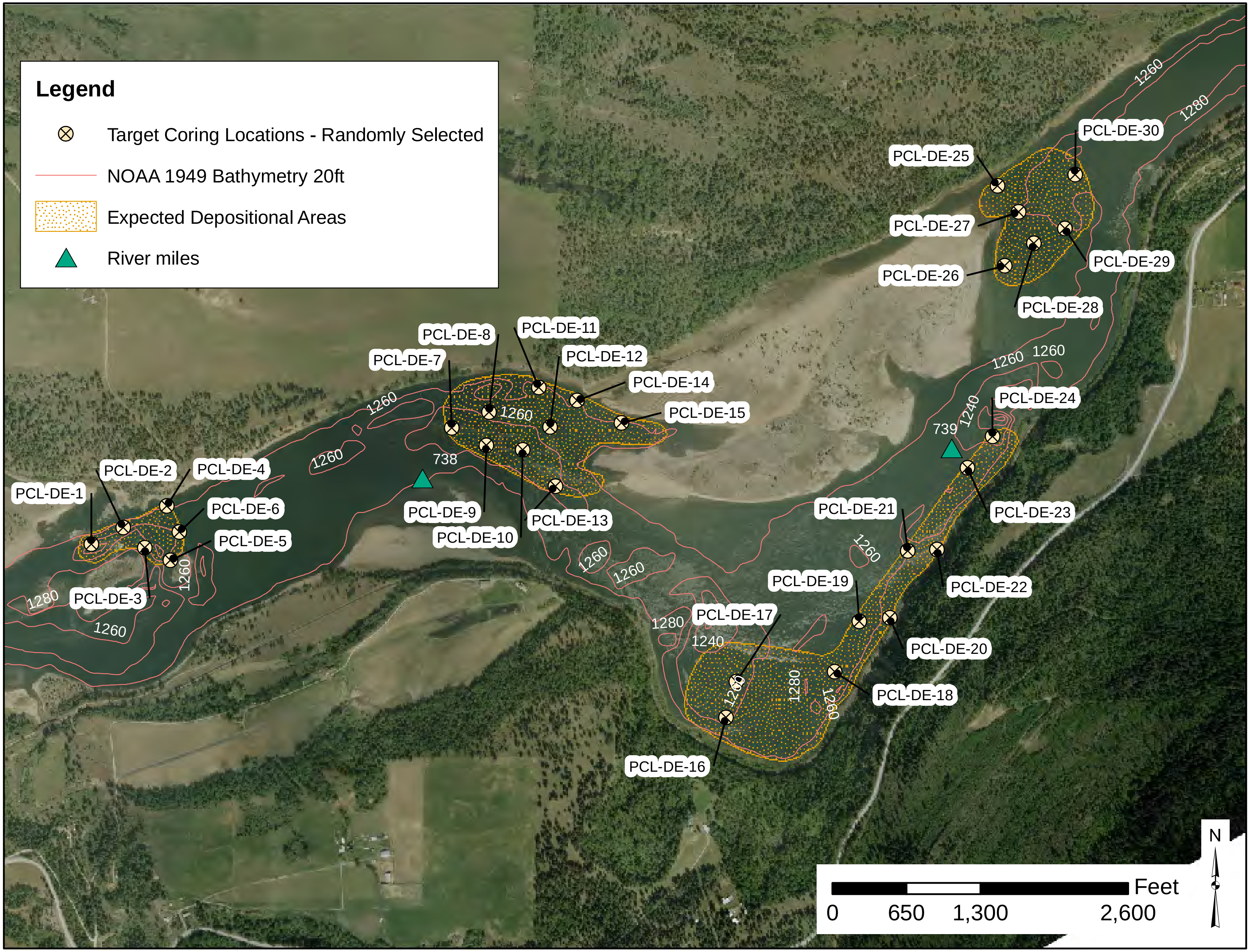
Figure 5-3: Black Sand Beach



Environment International Ltd [ces] Coordinate System: NAD 1983 UTM Zone 11N 22 April 2010

Target Coring Locations

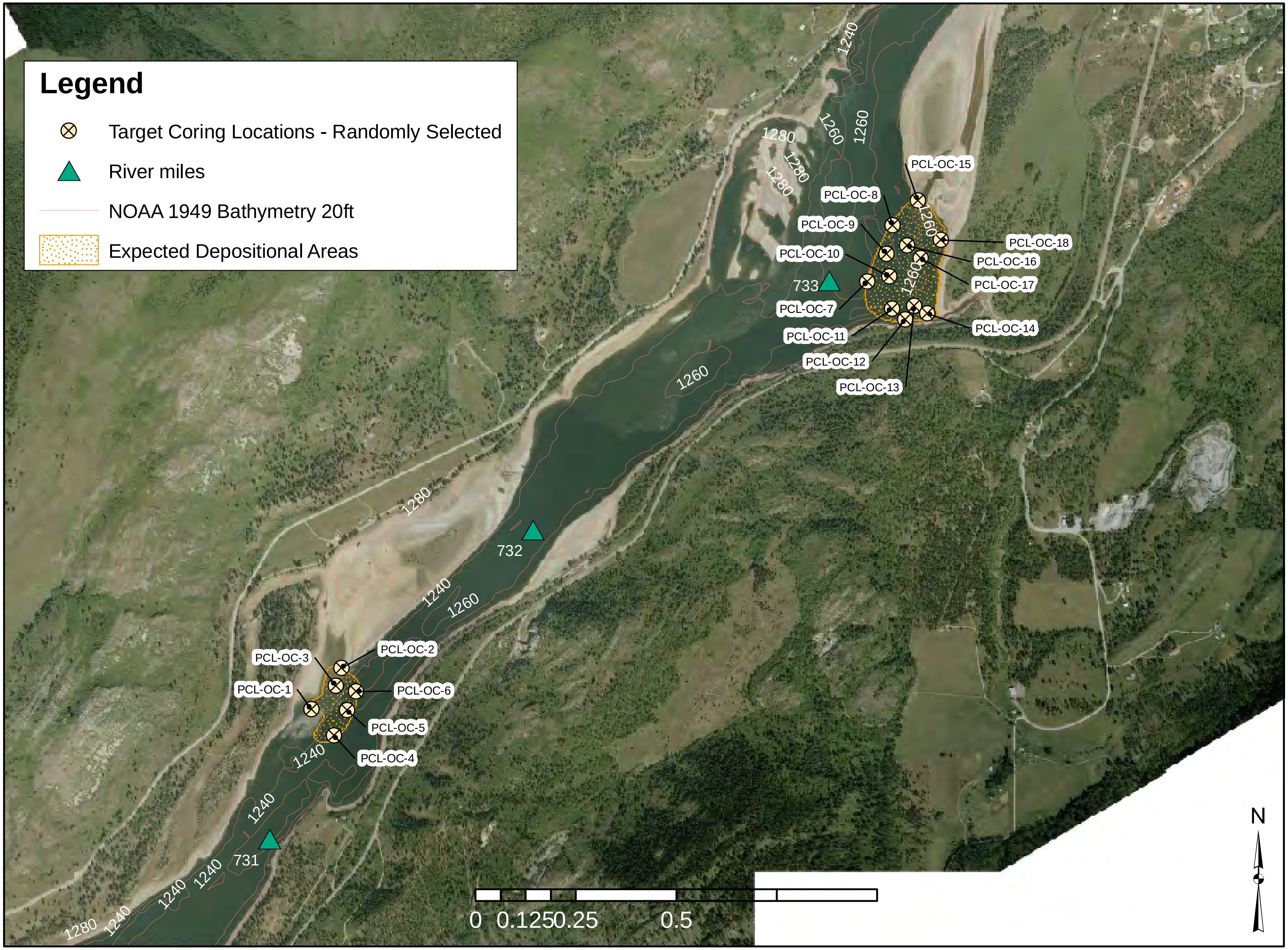
Figure 5-4: Deadman's Eddy



Environment International Ltd [ces]   Coordinate System: NAD 1983 UTM Zone 11N   22 April 2010

Target Coring Locations

Figure 5-5: Onion Creek / Northport



Environment International Ltd [ces] Coordinate System: NAD 1983 UTM Zone 11N 22 April 2010

6. REFERENCES

ASTM, 2001. Standard Test Methods for Laboratory Determinations of Soils. Methods D-4422, D-4318, D-2850, D-47678, D-2435b, D-2545, D-2937, D-854, and D-2216. *ASTM Book of Standards*. Vol. 04.08. American Society for Testing and Materials. Conshohocken, Pennsylvania.

Cox, Stephen E., Peter R. Bell, Stewart Lowther, and Peter C. VanMetre, 2005. *Vertical Distribution of Trace-Element Concentrations and Occurrence of Metallurgical Slag Particles in Accumulated Bed Sediments of Lake Roosevelt, Washington, September 2002*. United States Geological Survey Scientific Investigations Report 2004-5090, 70 p.

Harkins, S.A., Appold, M.S., Nelson, B.K., Brewer, A.M., and Groves, I.M., 2008, "Lead isotope constraints on the origin of nonsulfide zinc and sulfide zinc-lead deposits in the Flinders Ranges, South Australia": *Economic Geology*, v. 103, pp. 353-364.

Horowitz, A.J., K.A. Elrick, J.A. Robbins, and R.B. Cook. 1995. Effect of mining related activities on the sediment trace element geochemistry of Lake Coeur d'Alene, Idaho, USA, Part II – subsurface sediments: Hydrological Processes, v. 9, p. 35-54.

Johnson, A., B. Yake, and D. Norton. 1989. *An Assessment of Metals Contamination in Lake Roosevelt*. Segment No. 26-00-04. 84 pp. Washington State Department of Ecology. Olympia, WA.

MacDonald, D. D., C. G. Ingersoll, and T. A. Berger, 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. *Arch. Environ. Contam. Toxicol*. (39):20–31.

Plumb, R. H. Jr., Procedures for Handling and Chemical Analysis of Sediment & Water Samples, May 1981, USACE Publication AD/A103788

United States Environmental Protection Agency (EPA), December 2008, *Upper Columbia River Work Plan for the Remedial Investigation and Feasibility Study*, modified by the US Environmental Protection Agency, based on the Draft Work Plan Provided by Teck Cominco American Incorporated.

_____, 2009, *Regional Screening Level (RSL) Table Master April 2009*, U.S. Environmental Protection Agency. <http://www.epa.gov/region09/superfund/prg/pdf/composite_sl_table_run_APRIL2009.pdf >

_____, 2006, *National Recommended Water Quality Criteria (NRWQC)*, U.S. Environmental Protection Agency, Office of Water/Office of Science and Technology, Washington, D.C. 4 Nov. 2008. <http://www.epa.gov/waterscience/criteria/wqctable/>

_____, 2005, *Contract Laboratory Program National Functional Guidelines for Superfund Organic Data Methods Review*, EPA, Office of Solid Waste and Emergency Response, Document No. USEPA-540-R-04-009, Washington D.C.

_____, 2004, *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA, Office of Solid Waste and Emergency Response, Document No. EPA 540/R-04-004, Washington D.C.

_____, 2001. *Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual.* EPA 823-B-01-002. United States Environmental Protection Agency, Washington, D.C.

Washington State Department of Ecology (Ecology), 2003. *Development of Freshwater Sediment Quality Values for use in Washington State.* Phase II Report: Development and Recommendation of SQVs for Freshwater Sediments in Washington State. Publication Number 03-09-088. Washington State Department of Ecology, Olympia, Washington.

_____, 1997. *Creation and Analysis of Freshwater Sediment Quality Values in Washington State.* Publication No. 97-323a. Prepared for Washington State Department of Ecology, Sediment Management Unit, Olympia, Washington by J. Cubbage, B. Batts, and S. Breidenbach. July 1997.

_____, 1995a. *Sediment Sampling and Analysis Plan Appendix: Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards (Chapter 173-204 WAC)*. Washington State Department of Ecology. December 1995.

_____, 1995b. *Sediment Management Standards*. WAC Chapter 173-204. Washington Administrative Code. Washington State Department of Ecology. Amended December 1995.

_____, 1994. *Natural Background Soil Metals Concentrations in Washington State*. Toxics Cleanup Program. Washington State Department of Ecology. Publication No. 94-115.

_____, 1991. *Sediment Cleanup Standards User Manual*. First Edition. Washington State Department of Ecology, Sediment Management Unit. December 1991.



2010 Upper Columbia River Sediment Assessment
Sampling and Quality Assurance Plan

Appendix A
Standard Operating Procedures

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EI SOP No. 1003 – SEDIMENT COLLECTION AND SAMPLING

Written By:	**Approved By:**	**Date:**	**QA Concurrence**	**Date :**
Suzanne Dolberg	Craig Christian	3/3/2010		3/3/2010

This Standard Operating Procedure (SOP) contains 10 sections:

1. Purpose

The purpose of this SOP is to provide field personnel with a set of guidelines for collecting sediment and sediment samples. This SOP covers use of the most common sediment collection equipment and sediment sampling techniques. The sediment sampling techniques listed in this SOP are not intended to be all inclusive. Consult the site-specific Sampling and Quality Assurance Plan (SQAP) for specific sample collection requirements or techniques not directly covered in this SOP.

2. Application

The procedures outlined in this SOP can be used by field personnel for the collection of sediments consisting of soft fine-grained material, silts and clays, or sands and gravels, from streams, rivers, or standing water bodies.

3. References

American Society for Testing and Materials (ASTM). March, 2005. "Standard Practice for

Sampling Soils and Contaminated Media with Hand-Operated Bucket Augers". ASTM Standard D-6907-05. ASTM International, West Conshohocken, PA.

Simmons, Kevin. 2007. Sediment Sampling. U.S. Environmental Protection Agency Region 4, SESDPROC-200-R1. November.

EPA. SOP# 2016, Revision #0.0. Sediment Sampling. November 17, 1994.

4. Associated SOPs

EI-1002:	Surface Water Collection & Sampling
EI-1004:	Chain of Custody & Labeling
EI-4014:	Field Documentation
EI-4028:	Soil Sample Collection for Volatile Organics
EI-4033:	Investigation-Derived Waste Handling
EI-4034:	Environmental Sample Packing and Shipping

5. Equipment

The following equipment can be used in various field conditions for sediment collection:

- Documentation such as the field log book, field forms, and chain of custodies
- Copy of the Field Sampling Plan, Health and Safety Plan, and Quality Assurance Plan
- Site diagrams indicating sample locations
- PPE required per the HSP or SAP based on site hazards
- Nitrile Gloves
- Stainless steel mixing bowl
- Stainless steel spoon
- Stainless steel trowel
- Stainless steel hand auger
- Stainless steel ponar dredge
- Nylon rope
- Waterproof boots, hip or chest waders
- Position location equipment such as location buoys, flagging tape, wooden stakes, global positioning system (GPS)
- Decontamination equipment and supplies
- Sample bottles and containers and specified in the site-specific SAP
- Cooler and ice for samples
- Folding ruler with 0.01-ft increments

- Geologic characterization equipment: Munsell color chart, USCS
- Handheld photoionization detector (PID) or handheld X-Ray Fluorescence (XRF) spectrometer or both
- Digital Camera with Time/Date Stamp option turned on

6. Decontamination

All non-disposable equipment that comes in contact with sediment and surface water will be decontaminated prior to arrival on site, between sampling locations, and before leaving the site. Decontamination procedures will be followed in accordance with EI-1008.

7. Equipment Selection and Sampling Considerations

The type of equipment used for the collection of sediment is determined by the sampling objective such as surface versus subsurface samples and site restraints such as water depth and conveyance. The methods discussed for collecting sediment from a water body or other surface water conveyance are:

- Spoons or scoops
- Coring devices
- Ponar Dredge

Some considerations when collecting sediment samples are:

- Contaminants are more likely to concentrate in depositional areas of streams where the sediments are characterized by fine particle size and high organic matter content.

- If wading in a stream or river, sampling should proceed from downstream to upstream with the sample collected facing upstream.

- Most biological activity occurs within the top 10 centimeters of sediment. If collecting samples to assess ecological risk, sediment should be collected from the top 10 centimeters.

- Loose organic debris should be removed from the sample location prior to sampling.

- Any organic debris which is representative of the depositional environment will remain as part of the sample with the approximate percentage of organic material recorded.

- Any stones or gravel will be removed from the sample after a relative percentage of the stones or gravel has been recorded in the logbook.

- Take precautions to ensure that the sediment sample collected is representative of the water body or conveyance.

- If also collecting surface water samples, collect them prior to collecting the sediment sample. See SOP EI-1002 for surface water sampling procedures.

- Always use the buddy system and have a co-worker with you at all times.

- Always document in the site logbook how each sample is collected. Also document each sample location photographically.

8. Sediment Collection Procedures

8.1 Spoon or Scoop

Spoon or scoop sampling should be used in shallow (> 6-inches) onshore locations, low flow shallow streams, or areas where the conveyance is dry and the sediment is easily accessible.

When sampling multiple locations, begin sampling at the most downstream location and work upstream to the final sample location. If wading into a shallow stream or conveyance, wade in facing upstream ensuring minimal disturbance to the sediment.

A decontaminated stainless-steel spoon or scoop is inserted into the sediment and scooped up in an upstream direction. The sample is placed in its appropriate sample container or transferred to a mixing bowl for homogenization. Surface water should be decanted from the sample or homogenization container with care taken to ensure the fine sediment fraction is retained. Care should be taken to ensure that fine-grained particle size materials associated with the sediment being sampled are not lost in excess water drainage. **NOTE**: If the sample's pore water is also being analyzed, do not decant the surface water from the sediment sample.

When sampling for volatile organics analysis, the aliquots should be handled as little as possible to prevent the loss of volatiles.

Decontaminate the spoon or scoop prior to collecting the next sample. Decontamination shall be conducted in accordance with SOP-EI-1008.

Sediment sampling horizontal coordinates can be collected using a GPS or the locations can be located using a GPS.

8.2 Coring Devices

Sediment corers should be used in place of spoon or scoop sampling equipment when the water depth is greater than six inches or the rate of stream flow will cause disturbance or loss to fine-grained particle size materials associated with the substrate being sampled. The tube or bucket auger is driven into the sediment and used to extract a core and can be used at various water depths with the use of additional extensions and a T-handle.

Tube Auger

Bucket Auger

An acetate core liner can also be used by inserting into either the tube or bucket auger prior to sampling to extract an intact sediment core.

Again, when sampling multiple locations, begin sampling at the most downstream location and work upstream to the final sample location. If wading into a shallow stream or conveyance, wade in facing upstream ensuring minimal disturbance to the sediment.

The following procedures should be used to collect a sediment sample with either the tube or bucket auger:

1. Determine the sediment depth below water and attach the appropriate number of extensions along with the T-handle. Insert acetate liner if required.
2. Clear the area to be sampled of any debris without disturbing the sediment.
3. Insert the tube or bucket auger into the sediment at an angle 0° to 20° from vertical in order to minimize spillage of the sample from the sampling device upon retrieval.

4. Rotate the auger while applying pressure to cut a core of sediment.

5. Slowly withdraw the auger making sure the sediment core is intact. With the tube auger, make sure the slot is facing upward.

6. If field screening the samples for the presence of metals or VOCs, conduct the field screening prior transferring samples into the sample containers. Field screening shall be performed in accordance with the equipment manufacturer's instructions. If screening for VOCs, headspace screening will be performed in accordance with SOP EI-4019.

7. Transfer the sample into the appropriate sample container or mixing bowl for homogenization. If using an acetate liner, the liner can be capped at both ends and transported to the laboratory or the sediment can be removed from the acetate liner and homogenized and collected. If capping the acetate liner, simply remove the liner from the sampling device, cut off the acetate tube where headspace is present, and cap at both ends. Indicate on the outside of the acetate liner the appropriate orientation of the core. If sampling the sediment simply remove the acetate liner from the sampling device and using a razor or carpet knife, cut the liner lengthwise in two places allowing for the sediment to be exposed. The sediment can then be removed from the liner into a stainless steel mixing bowl for homogenization or transferred directly into the sampling containers. **NOTE**: Samples collected for volatile organic analysis must be collected prior to homogenization following the procedures outlined in SOP EI-4028.

8. Record in the field log book or sediment sampling field form (see attached), the length of the core and a description of the sediment using the USCS system and guidelines outlined in SOP EI-4014.

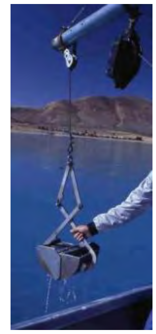
9. Decontaminate all the sampling equipment following the guidelines outlined is SOP-EI-1008.

10. If necessary, identify the location with a wooden stake, flagging tape, or marker buoy for future reference. Sediment sampling horizontal coordinates can be collected using a GPS or the locations can be located using a GPS.

8.3 Ponar Dredge

A ponar dredge is used to collect surface sediment at a sediment depth ranging from 0 to 4 inches by activating spring-loaded jaws which entrap the sediment. A ponar dredge can be used in deep water with the use of a winch or shallow waters as a handheld device.

Ponar Dredge



Ponar dredge using a winch

The collection of surface sediment is accomplished by lowering the ponar dredge to the surface of the sediment with the use of a rope or cable or an extended handle and activating the opened spring-loaded jaws to a closed position. The weight of the ponar dredge along with the spring loaded closing action allows for the collection of surface sediment. When used as a handheld device, the dredge can be placed on the sediment surface and activated.

Again, when sampling multiple locations, begin sampling at the most downstream location and work upstream to the final sample location. If wading into a shallow stream or conveyance, wade in facing upstream ensuring minimal disturbance to the sediment.

The following procedures should be followed to collect a surface sediment sample using a ponar dredge:

1. Attach a nylon rope or steel cable to the stainless steel ring fixed to the top of the ponar dredge.

2. Arrange the ponar dredge with the jaws in the open position and insert the spring-loaded pin into the hole in the trip bar.

3. Slowly lower the ponar dredge to approximately 2 inches above the sediment, making sure the rope or cable is taut at all times. Any slack may release the spring-loaded pin and close the ponar dredge before it has immersed into the sediment.

4. Drop the ponar dredge into the sediment and give the rope or cable some slack. This will release the spring-loaded pin which will activate the trip bars and close the ponar dredge. Pull up sharply on the rope or cable a few times to ensure the spring-loaded pin has released.

5. Pull the rope or cable taut and raise the dredge to the surface allowing any free liquid to decant from the screens on top of the dredge. Care should be taken to retain the fine sediment fraction during the decanting process.

6. Open the dredge over a stainless steel bowl and transfer the sediment from the dredge to the bowl.

7. If field screening the samples for the presence of metals or VOCs, conduct the field screening prior transferring samples into the sample containers. Field screening shall be performed in accordance with the equipment manufacturer's instructions. If screening for VOCs, headspace screening will be performed in accordance with SOP EI-4019.

8. Transfer a sample into the appropriate sample container or homogenize the sample and place into appropriate sample containers. Samples collected for volatile organic analysis must be collected prior to homogenization following the procedures outlined in SOP EI-4028.

9. Record in the field log book or sediment sampling field form (see attached), a description of the sediment using the USCS system and guidelines outlined in SOP EI-4014.

10. Decontaminate all the sampling equipment following the guidelines outlined is SOP-EI-1008.

11. If necessary, identify the location with a wooden stake, flagging tap, or marker buoy for future reference. Sediment sampling horizontal coordinates can be collected using a GPS or the locations can be located using a GPS.

9. Documentation

A Sediment Sampling Log must be completed for each sediment location sampled. See Attachment 1.

10. Measure of Proficiency

Field staff will demonstrate proficiency by successfully completing Sections 6 through 9 a minimum of three times under the direct supervision of a Senior Associate with appropriate field experience or their designee

Attachment 1: Sediment Sampling Log Sheet

Sediment Location	
Sediment Sample ID	
QC IDs (if applicable)	
Collection Method	
Sample Depth	
Sample Date/Time	
Sampler	
Photo Number	
Analyses	
Sediment Appearance	
Munsell Color	
Consistency	
Grain Size	
Debris Present (circle all that apply)	**Leaves Twigs Rocks Mussels Shells Trash Seaweed** **Other: ____**
Describe Debris	
Odor (if applicable)	
Sheen (if applicable)	

CHAIN-OF-CUSTODY AND SAMPLE LABELING

Written By:	Approved By:	Date:	QA Concurrence:	Date:
Suzanne Dolberg	Craig Christian	5/19/2009		

This Standard Operating Procedure (SOP) contains nine sections:

1. Purpose

The purpose of this SOP is to provide field personnel and other individuals involved in sample handling a set of procedures to ensure proper documentation of samples during transfer to maintain defensible chain-of-custody.

2. Application

This SOP is applicable to field programs involving sample collection and transfer of samples outside of field team personnel direct control (e.g., shipped from field to laboratory). On-site analysis programs generally do not require full chain-of-custody (COC) transfer procedures unless samples are not securely maintained under field team personnel control (e.g. overnight storage prior to analysis). If samples are not securely maintained under field team personnel control during an on-site analysis program, follow the custody procedures described in this SOP.

3. References

Consult the site-specific Sampling and Quality Assurance Plan (SQAP) for modifications that may be necessary to these procedures. Determine appropriate PPE for use in conjunction with this SOP based on the site-specific Health and Safety Plan (HASP).

4. Associated SOPs

EI-1008	Field Equipment Decontamination
EI-4014	Field Documentation and Forms
EI-4034	Environmental Sample Packaging and Shipping

5. Equipment

The following equipment should be brought with the field sampling team:

- Gloves (generally Nitrile but other materials may be acceptable based on SQAP or HASP requirements)
- PPE required per the HASP or SQAP based on site-specific hazards
- Chain-of-custody forms – see Attachment 1
- Chain-of-custody seals
- Sample labels
- Sample tags, as required
- Ball point pens
- Fine point permanent markers (e.g., Sharpies)
- Clear shipping tape
- Forms II Lite™ software
- Computer and Printer
- Blank labels for use in a printer.

6. Decontamination

Decontamination procedures will be followed in accordance EI-1008, if necessary (e.g., sample spillage).

7. Documentation Procedures

7.1 Chain-of-Custody

COC procedures provide a record of sample collection, transfer of samples, sample shipping, and receipt to ensure and document sample integrity.

Samples are in custody when:

1. in physical possession of field team member;
2. in view of a field team member, after being in physical possession; or
3. secured to prevent tampering after being in physical possession of a field team member in secure area restricted to authorized personnel only.

To maintain sample integrity, samples must be under documented control of field team personnel or secured from any possible tampering (i.e., locked or under COC seal).
Sample collection is documented in sample labels, tags and field books and field forms (see SOP No. EI-4014 for sample documentation procedures). COC forms document transfers of the samples and the responsibility for secure control of the sample integrity.

A written COC form must be initiated and thereafter maintained whenever samples must be transferred beyond control of the site-specific field team such as when samples are shipped to a laboratory. A COC form serves as legal evidence of possession of the samples and documents the conditions and integrity with which the samples were handled.

7.2 Initiating Chain-of-Custody Documentation

The COC form must be initiated with, or as soon as practicable after, sample collection and prior to any transfer of sample control beyond the site specific field team. For United States Environmental Protection Agency (EPA) projects where the samples are to be transferred to a Contract Laboratory Program (CLP) laboratory, the COC must be generated using EPA's Field Operations and Records Management System (FORMS) II Lite™ software prior to entering the field to sample. EPA projects may constitute the use of FORMS II Lite™ for tracking samples regardless of whether or not the samples will be submitted to a CLP laboratory.

For non-EPA projects, the COC form may be provided by the laboratory or a generic EI COC may be used in its place. See Attachment 1 for the generic EI COC form.

Once initiated, the COC form remains with the samples bearing the name of the person assuming responsibility for the samples. Since the COC form must accompany samples, the COC forms may be completed in conjunction with sample container packing to ensure that all samples contained in sample shipment containers (i.e., coolers) are contained on the same COC. When COC forms are completed during sample packing, sample collection notes such as date and time must be made during sample collection and maintained as part of the site record in bound logbooks or sample collection forms (see EI 4014 Field Documentation and Forms). COC forms do not replace documentation of sample collection but document the transfer of collected samples.

7.3 COC Information

The COC, in addition to establishing custody of samples, provides the laboratory or other recipient with information for proper sample handling and analysis. The COC should contain a minimum of the following general information:

- Project name;
- EI contact name, phone, email;
- Any special sample handling instructions (e.g., filter, short turnaround requests, or possible high hazard waste samples); and
- Shipping air bill or tracking number, as necessary

The COC must also contain the following specific information for each sample:

- Sample ID – refer to the site-specific SQAP for sample ID format;
- Date and time of collection;
- Sample matrix;
- Number and type of containers; and
- Analyses to perform.

An example COC form is included in Attachment 1.

7.4 Transfer of Custody

All sample transfers beyond the site-specific field team must be accompanied by a COC. Transfer of samples within the field team do not require a COC form (for example, transfer from sample collector to central area for COC preparation). When shipping the samples, the field team member responsible for packing the samples for shipment may indicate transfer by including the shipping company, date/time of shipment, and air bill or shipping number within a properly COC sealed shipping container (see section 7.5). If the samples are being picked up by a courier for immediate delivery, the courier must sign, date, and time the COC as an individual if the cooler is not COC sealed. When transferring possession of the samples, the individual receiving samples should sign, date, and time the COC when they receive the samples.

After signatures and dates of transfer are complete, the field team member responsible for packing the samples will make a copy of the COC. The original, signed copy will be placed in a waterproof plastic bag and taped to the inside top of the shipping container lid. The container will then be secured with nylon strapping tape and custody seals applied as described in Section 7.5.

The retained copy will immediately become part of the project file. The original will be returned to EI as part of the analytical data package. Other copies may be maintained by the laboratory.

7.5 Chain-of-Custody Seals

The COC seals are adhesive labels that are placed on the exterior sample container or shipping container in such a manner that the container cannot be opened without breaking the seals. The COC seal helps ensure that no sample tampering occurs during transit. COC seals are signed and dated by the field team member responsible for packing the samples. If seals are received broken at the laboratory, the laboratory will alert the EI contact within 24 hours of receipt of the container. The project manager will then follow the corrective action procedures designated in the site-specific SQAP. For additional security, COC seals will be used on shipping containers and may also be placed on each individual sampling container if required by the SQAP. See Figures 1 and 2 for an example COC seal and proper placement of seals on the cooler.

Figure 1: Custody Seal

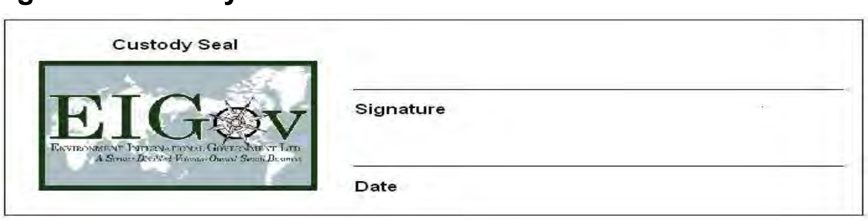
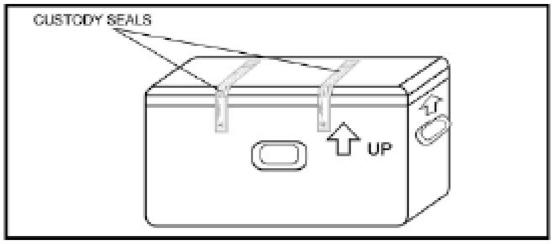


Figure 2: Custody Seal Placement



7.6 Sample Labels and Tags

A sample label (see Figure 3) will be placed on each sample container at or before the time of sample collection.

Figure 3: Sample Label

EPA projects where the samples are to be transferred to a Contract Laboratory Program (CLP) laboratory, the sample labels must be generated using EPA's FORMS II Lite™ software prior to entering the field to sample. Other EPA projects may constitute the use of FORMS II Lite™ for tracking samples regardless of whether or not the samples will be submitted to a CLP laboratory. If this is the case, FORMS II Lite™ should be utilized to generate sample labels prior to sampling.

For all other projects, sample labels can either be generated prior to sample collection or handwritten in the field. All sample labels should contain the information below. Labels may contain other optional information such as assigned laboratory, analyses and bottle type.

- Sample ID

- Sample location
- Preservation
- Samplers initials
- Date and time of collection
- Sample media

Hand-written labels completed prior to sample collection will contain all information except sampler initials, date, and time. It is the responsibility of the sampler to confirm that the information on the label is correct before collecting the sample. The sampler must initial and indicate the date and time of sample collection on pre-labeled containers. After providing the sample date, time and sampler initials, all labels should be additionally secured with clear tape to maintain legibility of the label.

Sometimes it may not be possible to apply a sample label directly to the sample container. An example of this is when pre-weighed VOA vials are used for collection of soil samples via EPA Method SW-846 5035A. Adding a label to the vial would add additional weight to the vial and skew sample results which requires proper determination of the weight of the soil added to the vial. In this case, a sample tag must be used. The sample label is applied to the sample tag and attached to the sample container with the tag string. The laboratory will be able to identify the sample and remove the tag temporarily to weigh the container. See Figure 4 for an example sample tag.

Figure 4: Sample Tag

8. Documentation

The COC form may be provided by the laboratory or a generic EI COC may be used in its place. See Attachment 1 for a generic EI COC form.

9. Measure of Proficiency

Field staff will demonstrate proficiency by successfully completing Sections 7 and 8 a minimum of two times under the direct supervision of a Project Manager, Field Team Leader, Senior Associate or designee with appropriate field experience.

FIELD EQUIPMENT DECONTAMINATION

Written By:	Approved By:	Date:	QA Concurrence:	Date:
Suzanne Dolberg	Craig Christian	5/15/2009		

This Standard Operating Procedure (SOP) contains nine sections:

1. Purpose

The purpose of this SOP is to provide field personnel with a description of the methods used for preventing cross-contamination and general guidelines for selecting the proper decontamination procedures which are dependent on equipment type, contaminants of concern, and contaminant concentrations.

2. Application

This SOP should be used by field personnel responsible for the decontamination of field equipment including soil/sediment sampling tools, groundwater/surface water sampling equipment, heavy equipment, and field measurement equipment for site contaminants including volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides/herbicides, polychlorinated biphenlys (PCBs), metals, and trace nitroaromatics.

3. References

Consult the site-specific Sampling and Analysis Plan (SAP) for modifications that may be necessary to these procedures and check with the site-specific Health and Safety Plan (HASP) to determine if additional personal protective equipment (PPE) is required.

4. Associated SOPs

EI-4033 Investigation Derived Waste Handling

5.0 Equipment

The actual equipment needed from the list below is dependent on the equipment and contaminant types.

- Nitrile gloves
- Any other PPE required per the HASP or SAP based on site hazards
- Polyethylene sheeting
- Utility knife
- Paper towels
- Plastic garbage bags
- Aluminum foil
- Plastic buckets and lids, 5-gallon
- Large plastic scrub brushes
- Bottle brushes or small wire brushes
- Squirt bottles
- Non-phosphate detergent (e.g., Liquinox)
- Approved potable water
- De-ionized or distilled water
- Reagent-grade nitric acid
- Pesticide-grade methanol or hexane or other, as specified by the SAP
- Pressurized sprayers or steam cleaners
- Drums or other suitable containers for holding waste decontamination fluids

6.0 Decontamination Summary

Removing or neutralizing contaminants from equipment minimizes sample cross-contamination and reduces the likelihood of transfer of contaminants to clean areas.

The first step in the decontamination process includes the removal of gross contamination using physical means. Physical decontamination procedures include scrubbing equipment with brushes or high pressure washing. Next, a soap and water wash followed by a rinse with approved water removes all visible particulate matter and oil or grease. Approved water may include store bought deionized or distilled water or potable water from a known source, as defined in the SAP. An acid rinse with 1% or 10% nitric acid may then be performed to remove trace inorganic contaminants followed by another rinse with approved water. Use 10% nitric acid for plastics and glass and 1% for metallic sampling equipment. If organic contaminants are a concern, an appropriate pesticide-grade solvent rinse is performed followed by another rinse with approved water. Common solvents used are methanol for VOCs and SVOCs or hexane for PCBs. Consult the SAP for the contaminants of concern on the site and the appropriate solvent for decontamination. The equipment is then allowed to air dry and a final rinse with approved water is performed. After decontamination is completed all liquid waste is considered investigation-derived waste and will be managed in accordance with EI4033.

The decontamination procedure described above may be summarized as follows:

1. Physical decontamination
2. Non-phosphate detergent wash
3. Approved water rinse
4. 1% or 10% Nitric acid
5. Approved water rinse
6. Solvent rinse
7. Rinse with approved water
8. Air dry
9. Rinse with approved water

If a particular contaminant fraction is not present or present at elevated concentrations based on site data, the procedure specified above may be modified for the site. For example, the nitric acid rinse may be eliminated if metals are not a concern, or the solvent rinse may be eliminated if organics are not of concern. If contaminant concentrations are very low Steps 4 through 7 may be eliminated completely resulting in the following five step procedure:

1. Physical decontamination
2. Non-phosphate detergent wash
3. Approved water rinse
4. Air dry
5. Rinse with approved water

7.0 Decontamination Procedures

7.1 Soil and Sediment Sampling Equipment

Soil and sediment sampling equipment may include items such as stainless steel bowls, trowels, scoops, and spoons. Equipment to be used during sampling will be decontaminated at a designated decontamination area. Decontaminated equipment will then be wrapped in aluminum foil with the shiny side facing out.

The following procedures will be followed for decontamination of soil and sediment field sampling equipment. If only organic contaminants are a concern Steps 7 and 8 below may be skipped; if only inorganic contaminants are a concern Steps 9 and 10 below may be skipped. For site locations with historical data indicating very low levels of contamination Steps 7 through 10 below may be eliminated.

1. Before commencing any decontamination activities, establish a decontamination area. The decontamination area will be set-up on a paved surface away from airborne sources of contamination, storm drains and other conduits whenever possible and the area covered with clean polyethylene sheeting. Alternatively, if paved areas are not available find a flat ground surface and cover with clean polyethylene sheeting. If the decontamination area must be set-up near storm drains or other conduits, the

decontamination area must be enclosed using containment berms.

2. Depending on the decontamination procedures for the particular contaminants of concern (see Section 6.0) set up enough plastic buckets on polyethylene sheeting to accommodate rinse water and solvents effectively creating decontamination “stations” for each step in the process moving from left to right. If particularly large pieces of sample equipment will need decontamination small children’s’ wading pools may be used in place of the buckets
3. Place the necessary decontamination tools, approved water, and solvents at each station. Solvents and acid rinses will be placed in appropriately labeled bottles. Don appropriate PPE as specified in the HASP.
4. Fill the initial “wash bucket” with approved water and non-phosphate detergent.
5. Submerge the sample equipment in the wash bucket and scrub all surfaces with a brush to remove all visible contamination. If equipment is heavily soiled, this procedure may need to be repeated using a fresh soap solution.
6. Rinse the equipment with approved water to remove all traces of soap, collecting the rinsate in a plastic bucket.
7. If inorganic contaminants are a concern, use a squirt bottle filled with nitric acid solution of the appropriate concentration (10% solution for plastic and glass or 1% solution or metallic equipment) to rinse the equipment, collecting the acid rinsate in a separate marked bucket. If inorganic contaminants are not a concern, skip to Step 9.
8. Rinse the equipment with approved water and collect the rinsate in a plastic bucket.
9. If organic contaminants are a concern, use a squirt bottle filled with an appropriate pesticide-grade solvent to rinse the equipment and collect the rinsate in a separate marked bucket. Never mix acid solution rinsates with solvent rinsate. If organic contaminants are not a concern, skip to Step 11.
10. Rinse the equipment with approved water and collect the rinsate in a plastic bucket.
11. Set the equipment out on clean polyethylene sheeting to air dry.
12. Perform a final rinse with approved water.
13. Wrap equipment in aluminum foil with the shiny side facing out.
14. Cover buckets with lids and manage in accordance with EI-4033.

7.2 Groundwater and Surface Water Sampling Equipment

Groundwater and surface water equipment may include items such as bailers, check values and tubing, submersible pumps, flow through cells, and bomb samplers,. Equipment used during sampling will be decontaminated at a designated decontamination area. Decontaminated equipment will then be placed in clean containers or enclosed in a clean plastic bag.

The following procedures will be followed for decontamination of groundwater and surface water field sampling equipment. If only organic contaminants are a concern Steps 5 and 6 below may be skipped; if only inorganic contaminants are a concern Steps 7 and 8 below may be skipped. For site locations with historical data indicating very low levels of contamination Steps 5 through 8 below may be eliminated.

1. Complete Steps 1 through 4 from Section 7.1
2. For bailers and other sample collection devices other than submersible pumps continue with Steps 5 through 12 from Section 7.1, placing fully decontaminated items in clean containers. If decontaminating a submersible pump, continue to Step 3 below.
3. For submersible pumps such as bladder pumps, remove the bladder assembly from the pump housing and submerge both portions in the wash bucket. Scrub the exterior housing with a stiff bristle brush. Manually compress and extend the bladder to pump the wash water thorough the assembly several times. For pumps that are not easily disassembled (such as electric submersible pumps), the pump may be setup in the same configuration as for sampling and a minimum of three pump assembly volumes pumped through.
4. Remove the pump parts from the wash bucket and submerge them in a bucket of clean approved water. Pour approved water over the pump housings. Submerge the bladder assembly and manually compress and extend the bladder to pump water through the assembly several times.
5. If inorganic contaminants are a concern, use a squirt bottle filled with 1% nitric acid and rinse the pump housing. Pour 1% nitric acid solution into the bladder and turn the bladder to rinse the entire interior of the bladder. Hold the pump intake over an acid solution waste bucket and carefully expel the solution by compressing the bladder. If the pump has only plastic parts a 10% nitric acid solution may be used.
6. Submerge the pump parts in a bucket of clean approved water. Pour approved water over the pump housing. Submerge the bladder assembly and manually compress and extend the bladder to pump water through the assembly several times.
7. If organic contaminants are a concern, use a squirt bottle filled with the appropriate pesticide-grade solvent to rinse the pump housing. Pour or squirt the appropriate solvent into the bladder and turn the bladder to rinse the entire interior of the bladder. Hold the pump intake over a solvent waste bucket and carefully expel the solution by compressing the bladder.
8. Submerge the pump parts in a bucket of clean approved water. Pour approved water over the pump housing. Submerge the bladder assembly and manually compress and extend the bladder to pump water through the assembly several times.
9. Set the equipment out on clean polyethylene sheeting to air dry.
10. Submerge the pump parts in a bucket of clean approved water. Pour approved water over the pump housing. Submerge the bladder assembly and manually compress and extend the bladder to pump water through the assembly several times.
11. Reassemble the pump and place in a clean container for transport to the next sample location.
12. Cover buckets with lids and manage in accordance with EI-4033.

7.3 Heavy Equipment Decontamination

Heavy equipment may include items such as drilling rigs and backhoes. All heavy equipment will be steam cleaned by the subcontractor before it is brought on site. The EI field team leader will inspect all heavy equipment for overall cleanliness and check for any leakage of petroleum, hydraulic, transmission fluids, or coolant. No equipment will be allowed on site until the source of the fluids has been identified, addressed, and the equipment properly cleaned.

Once on site, the actual drill rig or backhoe (deck and undercarriage) will not be steam cleaned between soil borings or test pits unless gross contamination is present. The subsurface drilling equipment including drill rods, augers, bits and tools will be decontaminated at a central decontamination area using the following procedures:

1. Remove gross contamination using a shovel or brush.
2. Transport the rig and tools to the decontamination area.
3. If the equipment is heavily soiled, use a brush with approved water and non-phosphate detergent to scrub the equipment. Steam clean drilling tools using approved water to rinse the soap solution off.
4. Steam clean all downhole drilling tools with approved water.
5. Allow equipment to air dry.
6. Mobilize to the next sample location in a manner that eliminates contact with contaminated media. In certain situations, it may be necessary to wrap tools in clean polyethylene sheeting for transport.
7. Containerize all fluids and manage in accordance with EI-4033.

7.4 Field Measurement Equipment

Water level indicators and downhole probes for measurement of water in wells and surface water bodies will be decontaminated between use by spraying with approved water and wiping with clean paper towels. If high levels of contaminants are present or the equipment comes into contact with non-aqueous phase liquid (NAPL), full decontamination procedures described in Section 7.2 should be followed.

8. Documentation

Decontamination procedures will be documented in the field log book according to EI4014. Documentation will include the procedures and liquids used in the decontamination process, and the disposition of the waste liquids.

9. Measure of Proficiency

Field staff will demonstrate proficiency by successfully completing the appropriate portions of Sections 7.0 and 8.0 a minimum of two times under the direct supervision of a Senior Associate with appropriate field experience or their designee.

QUALITY ASSURANCE/QUALITY CONTROL SAMPLE COLLECTION

Written By:	Approved By:	Date:	QA Concurrence:	Date:
Suzanne Dolberg	Craig Christian	5/15/2009		

This Standard Operating Procedure (SOP) contains seven sections:

1. Purpose
2. Application
3. References
4. Associated SOPs
5. QA/QC Sample Types
6. QA/QC Sample Collection Procedures
7. Measure of Proficiency

1. Purpose

The purpose of this SOP is to provide field personnel with procedures for collecting quality assurance (QA) and quality control (QC) samples in water and soil matrices.

2. Application

The procedures in this SOP are applicable to the collection of QA/QC samples in water and soil matrices. Specific instructions for collecting other types of QC samples or QC samples of other matrices (e.g., fish tissue) will be addressed in the site- or project-specific Sampling and Analysis Plan (SAP) or Quality Assurance Project Plan (QAPP).

3. References

Consult the site-specific SAP or QAPP for modifications that may be necessary to these procedures.

4. Associated SOPs

EI-1010 Surface Soil Sampling

EI-1011 Groundwater Sampling

EI-4002 Standard Penetration Tests and Split-Spoon Sampling

EI-4025 Direct Push Soil and Groundwater Sampling

5. QA/QC Sample Types

The goal of including QA/QC samples with any sampling or analytical event is to be able to identify, measure, quantify, and control the sources of error that may impact results. QA/QC samples must be taken, prepared, and analyzed in the same manner as the environmental samples.

QC samples such as blanks, field replicates, and matrix spikes verify performance of the field and/or laboratory process to provide reliable information about the environmental condition being evaluated. QA samples such as performance evaluation (PE) samples are generally used to establish intra-laboratory or method performance precision and bias not associated with specific conditions being evaluated. Several types of samples may be used for establishing QA/QC. Sample types and their definitions and purpose are outlined in Table 1.

Three commonly encountered terms in QA/QC sample discussions are accuracy, bias, and precision.

- *Accuracy* is the closeness or agreement between an observed value and an accepted reference value.
- *Bias* is the deviation of a measured value from a reference value or a known spiked amount, and is determined by calculating percent recovery.
- *Precision* is the closeness or agreement among individual measurements

Table 1
QA/QC Sample Types

QA/QC Type	Definition	Purpose
Field Duplicate	An independent sample collected as close as possible to the same location and time and using the same procedures as the field sample. Field duplicate pairs are considered equally representative of the sampled area.	To evaluate the overall precision of the field and laboratory procedures including innate non-homogeneity of the sample matrix.
Split Sample	A sample collected by dividing a sample after any mixing or homogenization into two aliquots for independent analysis (generally by an independent laboratory).	To evaluate the precision of the analytical results.
Matrix Spike (MS)	A sample collected as a split sample (divided into multiple aliquots following homogenization) which is spiked with target analytes at the laboratory before analysis.	To evaluate analytical accuracy and bias of methods in site specific matrices.
Matrix Spike Duplicate (MSD)	A sample collected in conjunction with an MS as a second split sample which is spiked with target analytes at the laboratory before analysis.	To evaluate precision of the analytical procedures
Performance Evaluation (PE) Sample	A sample of known or well established concentration of target analytes provided to the laboratory for analysis, without information as to the analytes identity or concentration. (Note double blind PE samples are PE samples that are not identified as PE samples to any involved in the sampling or analysis process).	To evaluate laboratory accuracy with regard to identification and quantitation of analytes.

Table 1
QA/QC Sample Types

QA/QC Type	Definition	Purpose
Field Blank*	An aqueous sample collected on-site during sampling activities by using analyte-free water to prepare the sample in the field including pouring the sample under ambient field conditions and preserving the sample.	To check for cross-contamination during sample collection, preservation, shipment, and at the laboratory.
Equipment Blank (or Rinsate Blank)	An aqueous sample collected by rinsing decontaminated, non-dedicated sample equipment with analyte-free water prior to collection of subsequent samples .	To evaluate bias from potential carryover of target analytes from contaminated well samples to subsequent samples and the effectiveness of field decontamination procedures.
Trip Blank	A sample of analyte-free water transported with empty sample containers to the field, stored with sample containers, and returned unopened to the laboratory with collected samples. Trip blanks are used only for analysis of volatile organic target analytes (VOCs or VPH, etc.)	To evaluate bias from potential contamination during bottle and/or sample transport and storage.
Other blanks (storage blanks, bottle blanks, filter blanks, etc.)	Analyte free water used to more specifically identify sources of contamination. Typically these would only be employed where previous blanks indicate a history of contamination.	To evaluate bias from potential field sources
Temperature Blank	A bottle or vial filled with water and shipped to the laboratory with the samples for receipt temperature verification.	To check that samples are received at cool temperatures generally 4± 2°C .

*** Note:** In addition to the specific definition of the term “field blank”, this phrase is also used to describe collectively all types of blanks designed to evaluate potential bias introduced outside the laboratory including but not limited to field blanks, rinsate blanks, storage blanks, filter blanks, bottle blanks and trip blanks.

6. QA/QC Sample Collection Procedures

6.1 Field Duplicates

An independent sample collected as close as possible to the same location and time, and using the same procedures as the field sample. Field duplicate pairs are considered equally representative of the sampled area.

6.1.1 Water Samples

To ensure that field duplicate samples are equally representative of the sampled area at a given time, samplers should alternate fill field duplicate sampling containers for the same analysis. For example, in using a Kemmerer sampler to collect surface water samples, the sampler volume is typically inadequate to collect sufficient water for all containers. Field duplicate containers should be alternately filled for a single analysis from the same grab volume, as opposed to collection of multiple analysis sample containers for one sample followed by a second grab for the field duplicate sample containers. The same rationale applies to low flow sampling where sample and field duplicate sample containers must be alternatingly filled for each analysis rather than collection of all analyses for the sample followed by collection of the field duplicate. Sample containers for volatile analyses should always be collected at once to complete filling and sealing with no delay to allow possible volatilization.

6.1.2 Solid Samples

To ensure that solid samples are equally representative of the sampled area, samplers should collect soil and sediment samples as close as possible to the same location. Soils should be independently collected and independently homogenized (in the case of non-volatile analyses) such that there is adequate soil volume for all analyses. Soil sample field duplicates must represent native heterogeneity of the area sampled. True field duplicates are not split from an homogenized sample volume. However, in some cases, split samples may be appropriate for the project where the objective is to measure analytical precision as opposed to overall precision of the sampling and analysis processes.

6.2 Split Samples

Split samples are intended to evaluate analytical precision by splitting of individual sample volumes for separate analysis. With solid samples, splits are collected after homogenization to remove variability due to field sampling and native matrix heterogeneity. Often, split samples are provided to separate laboratories for independent analysis. However, even when split samples are provided to separate laboratories, the results cannot be used to evaluate accuracy unless there are additional lines of evidence (e.g., data validation) to suggest reliability of one laboratory result over the second.

6.3 Matrix Spike/Matrix Spike Duplicates

MS/MSDs are collected as a split sample (i.e., divided sample volumes into multiple aliquots following solids homogenization) which is spiked with target analytes at the laboratory before analysis for the purpose of evaluating analytical variability. The key aspect of MS/MSDs is that the sample containers must be as close to identical as possible. Water samples must be collected by alternately filling sample containers to best achieve the comparable samples in the native samples and MS/MSDs. Soil sample volumes must be homogenized prior to division into sample containers for the native sample and MS/MSD.

6.4 Performance Evaluation Samples

PE samples contain known or well established concentrations of target analytes in samples provided to the laboratory without information as to the analytes identity or concentration. Submitting a PE sample to a laboratory does not require the collection of a sample in the field. Unless stated otherwise in the site-specific SAP or QAPP, PE samples will be single blind PE samples, purchased from a third party, and shipped along with or in advance of field samples with the preparation instructions. PE samples may be vials requiring dilution or matrix materials such as soil or sand. Single blind PE samples may be identifiable as PE samples. Double blind PE samples are not identifiable as PE samples and may be part of a larger QA program and shipped as an independent sample lot for pre-qualification of a laboratory. Single blind PE samples, especially those requiring dilution in analyte free water, must be shipped to include instructions on preparation. The PE samples will be assigned sample identifiers as described in the site specific SAP or QAPP and included on the chain-of-custody. Lot number and third party provider information will not be supplied to the laboratory if the information can be used to obtain actual analysis results or acceptable limits.

6.5 Field Blanks

Field blanks are aqueous samples collected on site during sampling activities by using analyte-free water to prepare the sample in the field, including pouring the sample under ambient field conditions and preserving the sample. Field blanks are generally collected when only dedicated equipment is used for sample collection.

1. Before going out into the field, determine the appropriate type of analyte-free water that is needed by consulting the site-specific SAP. Generally, distilled water is used for field blanks for organic analyses and de-ionized water is used for field blanks for inorganic analyses; however, the type and source of water that can be used may vary based on the contaminants of concern on the site and the detection limits of the analyses. HPLC-Grade or pesticide-grade water may be required.
2. Collect the field blank by transferring the analyte-free water into a set of individual samples containers at the sample location immediately following collection of the field sample.

6.6 Equipment Rinsate Blanks

An equipment rinsate blank is an aqueous sample that is collected by rinsing decontaminated non-dedicated sample equipment with analyte-free water and collecting the rinsate into appropriately preserved containers.

1. Before going out into the field, determine the appropriate type of analyte-free water that is needed by consulting the site-specific SAP. Generally, distilled water is used for field blanks for organic analyses and deionized water is used for field blanks for inorganic analyses; however, the type and source of water that can be used may vary based on the contaminants of concern on the site and the detection limits of the analyses. HPLC-Grade or pesticide-grade water may be required.
2. In the field, after collecting a sample, decontaminate the associated sample equipment using the decontamination procedures established in the site-specific SAP. The water used in the equipment decontamination process is frequently not the same analyte-free water used for collection of the rinsate blank sample.
3. Pour the analyte-free water over the sample equipment collecting the runoff into a set of individual sample containers immediately after decontamination is complete. If several pieces of equipment have been used to collect the sample (e.g., stainless steel bowl and tools), the water will be poured over the decontaminated tools into the decontaminated sample vessel and the water poured from the vessel into the appropriate sample containers.

6.7 Trip Blanks

A trip blank is a sample container that has been filled with analyte-free water at the laboratory, transported to the field with the empty sample containers, remains unopened during the sampling event, and is transported back to the laboratory with the samples for analysis. Trip blanks are used when samples are collected for volatile analyses only (VOCs or VPH, etc). Submitting a trip blank to a laboratory does not require the collection of a sample in the field. The trip blank will be given a sample identifier as described in the site-specific SAP and included on the chain-of-custody.

6.8 Temperature Blanks

A temperature blank is a small bottle or vial that is filled with analyte-free water and shipped to the laboratory with the samples. A temperature blank must be included in each cooler alongside samples whenever sample temperature must be controlled and documented. Submitting a temperature blank to a laboratory does not require the collection of sample in the field. Temperature blanks are marked only as “Temperature Blank”, and no sample identifiers are assigned nor is the sample included on the chain-of-custody.

7. Measure of Proficiency

Field staff will demonstrate proficiency by successfully completing Sections 6.0 and 7.0 a minimum of two times under the direct supervision of a Project Manager, Field Team Leader, Senior Associate or designee with appropriate field experience.

FIELD DOCUMENTATION AND FORMS

Written By:	Approved By:	Date:	QA Concurrence:	Date:
Suzanne Dolberg	Craig Christian	5/15/2009		

This Standard Operating Procedure (SOP) contains seven sections:

1. Purpose
2. Application
3. References
4. Associated SOPs
5. Equipment
6. Field Documentation Procedures
7. Measure of Proficiency

1. Purpose

The purpose of this SOP is to establish a consistent method and format for the use and control of documentation generated during daily field activities. Field notes and forms are intended to provide sufficient information that can be used to recreate the field activities without needing to rely on memory. Field notes are the formal and permanent documentation of field activities and are therefore vitally important to the quality assurance program.

2. Application

The procedures in this SOP will be used during all field activities unless otherwise stated in the Sampling and Analysis Plan (SAP). These activities may include, but are not limited to, sampling activities, well installation and development, site reconnaissance, hydrologic and geotechnical testing, remediation, waste handling, utility clearance, and sample location surveying. Note that some projects may require agency or contract specific forms for documentation.

3. References

Consult the site-specific SAP for modifications that may be necessary to these procedures and check with the site-specific Health and Safety Plan (HASP) to determine if additional personal protective equipment (PPE) is required.

4. Associated SOPs

ICF-1010 Surface Soil Sampling

ICF-1011 Groundwater Sampling

ICF-4000 Exploratory Pits and Trenches

ICF-4001 Exploratory Boring procedures

ICF-4002 Standard Penetration Tests and Split-Spoon Sampling

ICF-4008 Monitoring Well Installation

ICF-4010 Monitoring Well Development

ICF-4012 Monitoring Well Water Level Measurement

ICF-4025 Direct Push Soil and Groundwater Sampling

ICF-4033 Investigation Derived Waste Handling

ICF-5204 Field Screening Equipment Calibration

5. Equipment

- Log books –bound with consecutively numbered pages
- Black or blue ballpoint pens
- Black or blue fine tip permanent markers
- Field forms

6. Field Documentation Procedures

6.1 Site and Field Log Books

Site and field logbooks provide a daily handwritten account of all field activities. Logbooks will be permanently bound and have consecutively numbered pages. All entries will be made in blue or black ink and corrections will be crossed out using a single line and the individuals' initials and the date. Entries will be made in a legible handwriting. Each page of the logbook will be signed and dated by the person completing the log. No blank lines will be left between entries. Partially completed pages will have a slanted line drawn through the unused portion at the end of each day.

The cover of each logbook will include the facility name, the name of the subcontractor or agency completing the logbook, and the date the logbook was started. The site logbook will be a record of all site activities completed for each day of operation by the field team leader. The field logbook will be a record of field activities that are entered in real time by field personnel. Based on the number of separate field activities conducted, there may be several field logbooks but there will only be one site logbook.

6.1.1 Site Logbooks

The site logbook will be filled out by the field team leader and will contain the following information for each day on site at a minimum:

- List of all field logbooks created for the project
- Date
- Names, titles, and organizational affiliations of all project-related personnel and site visitors

- Weather conditions
- Activities conducted
- Any changes made to the established project procedures
- Problems encountered during the day and project impacts

6.1.2 Field Logbooks

The field logbook(s) will be filled out by field personnel and will contain the following information at a minimum:

- Date and time of each entry
- Names, titles, and organizational affiliations of all personnel performing the task
- Chronological description of field observations, significant conversations and events
- Level of safety protection
- Samples collected: including sample location, sample IDs, and any quality control samples collected including rinsate blank collection procedures and water used
- Equipment names and serial numbers, calibration and maintenance
- Sampling equipment decontamination
- Waste handling activities
- Problems encountered during the day and project impacts
- Deviations from approved procedures or work plans and the rationale for the change
- Photos taken along with the photo number and a description

6.2 Field Forms

Additional field forms may be required for each specific field activity. The use of field forms is described in the SOP for each specific activity. Field Forms for a variety of field activities are included in an attachment to this SOP:

- Soil Boring Log
- Sediment Coring Log
- Surface Soil Sampling Log
- Test Pit Excavation Profile
- Small Diameter Well Form
- Monitoring Well Construction Form (Stick Up)
- Monitoring Well Construction Form (Flush Mount)
- Monitoring Well Development Form
- Monitoring Well Water Level Form
- Groundwater Low Flow Sampling Sheet

- Monitoring Well Sampling Sheet (Volume-Based)
- Field Instrument Calibration Record
- Investigation Derived Waste Log
- Daily Drilling Report

7. Measure of Proficiency

Field staff will demonstrate proficiency by successfully completing Section 6.0 a minimum of two times under the direct supervision of, and acceptance by, a Senior Associate with appropriate field experience or their designee.

ENVIRONMENT INTERNATIONAL LTD.	Soil Boring Log	Date:
		Boring No.:
		Client:
		Project Name:
		Project No.:
Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
Depth to Water:	Drill Method:	
DB, WP, or MW?	Sampling Methods:	
Refusal?		
Geologist:	Lithologic Category:	

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	**GEOLOGIC DESCRIPTION** Unified Soil Class ID, color (Munsell No.), grain size, sorting, moisture, compaction, indication of contaminants, stratigraphic type, and general description **GROUNDWATER PARAMETERS (if applicable)** Dissolved oxygen, temperature, pH, conductivity, turbidity, ORP

Notes:

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Soil Boring Log

Environment International Ltd.

Date:	
Boring No.:	
Client:	
Project Name:	
Project No.:	

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	**GEOLOGIC DESCRIPTION** Unified Soil Class ID, color (Munsell No.), grain size, sorting, moisture, compaction, indication of contaminants, stratigraphic type, and general description **GROUNDWATER PARAMETERS (if applicable)** Dissolved oxygen, temperature, pH, conductivity, turbidity, ORP

Environment International Ltd.	**Sediment Coring Log**	**Date:**
		Core No.:
		Client:
		Project Name:
		Project No.:
Date:	**Contractor:**	**Location Diagram:**
Borehole Diameter:	**Drillers:**	
Boring Depth:	**Rig Type:**	
River Depth:	**Drill Method:**	
Refusal Depth?	**Sampling Methods:**	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	**GEOLOGIC DESCRIPTION** Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description

Notes:
Page 1 of ___

ENVIRONMENT INTERNATIONAL LTD.	Surface Soil Sampling Log	Date:
		Client:
		Project:
		Project No.:
Sampling Method		**Equipment Used**
Sampler(s)		**Decontamination**
Landscape	**Ecological Features**	**Location Diagram**
☐ Mowed Lawn	☐ Overhanging Vegetation	
☐ Meadow	☐ Algae/Aquatic Weeds	
☐ Woodland	☐ Amphibians/Fish	
☐ Secondary Forest	☐ Invertebrates	
☐ Flood Plain	☐ Physical/Chemical Stress	
☐ Floodplain Forest	☐ Other:	
☐ Industrial Property		
☐ Other:		

Sample Location	Sample ID	Sample Depth (in bgs)	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contamination, stratigraphic type, and general description

Notes/Comments:

Test Pit Excavation Profile

ENVIRONMENT INTERNATIONAL LTD.

Date	
Test Pit No.	
Client	
Project	
Project No.	

Start Date	Contractor	Location Diagram
End Date	Heavy Equipment ID	
Sampling Method	Geologist	
Trench Dimensions (LxWxD)	Field Screening Device	
Pit Orientation	Was Test Pit/Trench Photographed?	
Scale: _____ Square(s) = ______ Ft.		

Locate all stratigraphic layers and sample locations on the profile. Identify all codes used below. Profile should be as close to scale as possible.

Type and Number of Samples Collected

ENVIRONMENT INTERNATIONAL LTD.	Small Diameter Well Log	Date Boring No. Client Project Name Project No.
Date Started	Contractor	Location Diagram:
Date Completed	Drillers	
Casing Size	Hammer Weight	
Boring Depth (ft)	Drill Method:	
Depth to Water (ft)		
DB, WP, or MW?	Sampling Methods:	
Refusal?		
Geologist	Lithologic Category:	

Screen	Riser	Diameter	Material

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Discharge Water Description	Water Quality Parameters

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Small Diameter Well Log

Date:
Boring No.:
Client:
Project Name:
Project No.:

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Discharge Water Description	Water Quality Parameters

Page __ of __

Monitoring Well Construction Log (Stick Up)

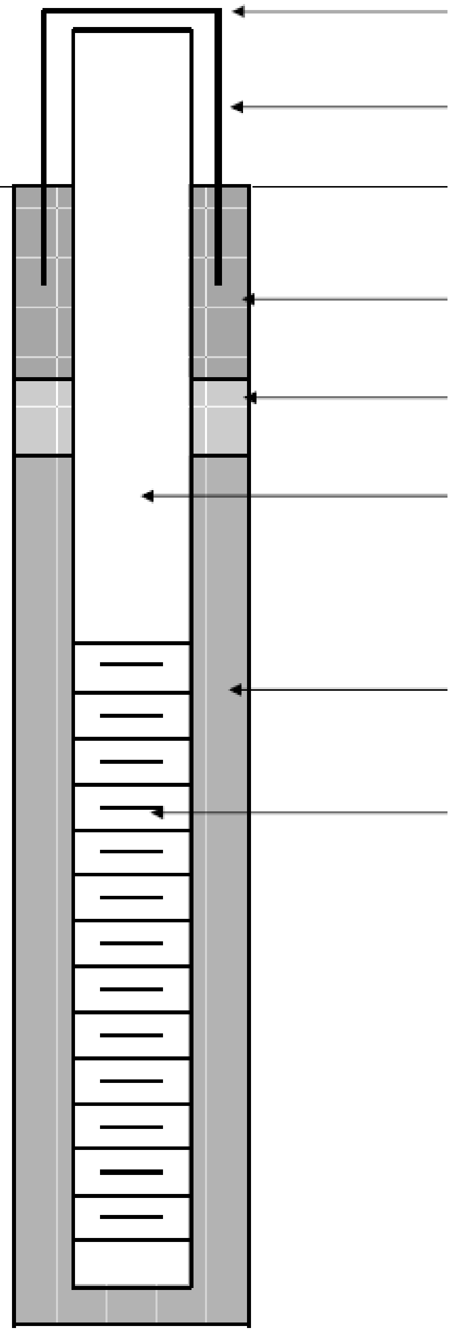
ENVIRONMENT INTERNATIONAL LTD.

	Monitoring Well Construction Log (Stick Up)	**Date**
		Well ID
		Client
		Project
		Project No.
Start Date	**Contractor**	**Location Diagram**
End Date	**Drillers**	
Boring Depth	**Geologist**	
Borehole Diameter	**Depth to Water (bgs)**	
Well Diameter		

Ground Surface Elevation ________

DEPTH (ft bgs)

Ground Surface ________



Bottom of Surface Casing ________

Top of Seal ________

Top of Sand Pack ________

Top of Screen ________

Bottom of Screen ________

Bottom of Well ________

Bottom of Boring ________

Well Cap Type

Steel Protective Surface Casing

Diameter:

Elevation Top of Casing:

Grout

Type

Annular Seal

Type

Riser Casing

Type

Elevation of Top of Riser

Diameter

Well Packing Material

Type

Screen

Type

Fluids Lost During Drilling and Well Construction (gallons)

Notes

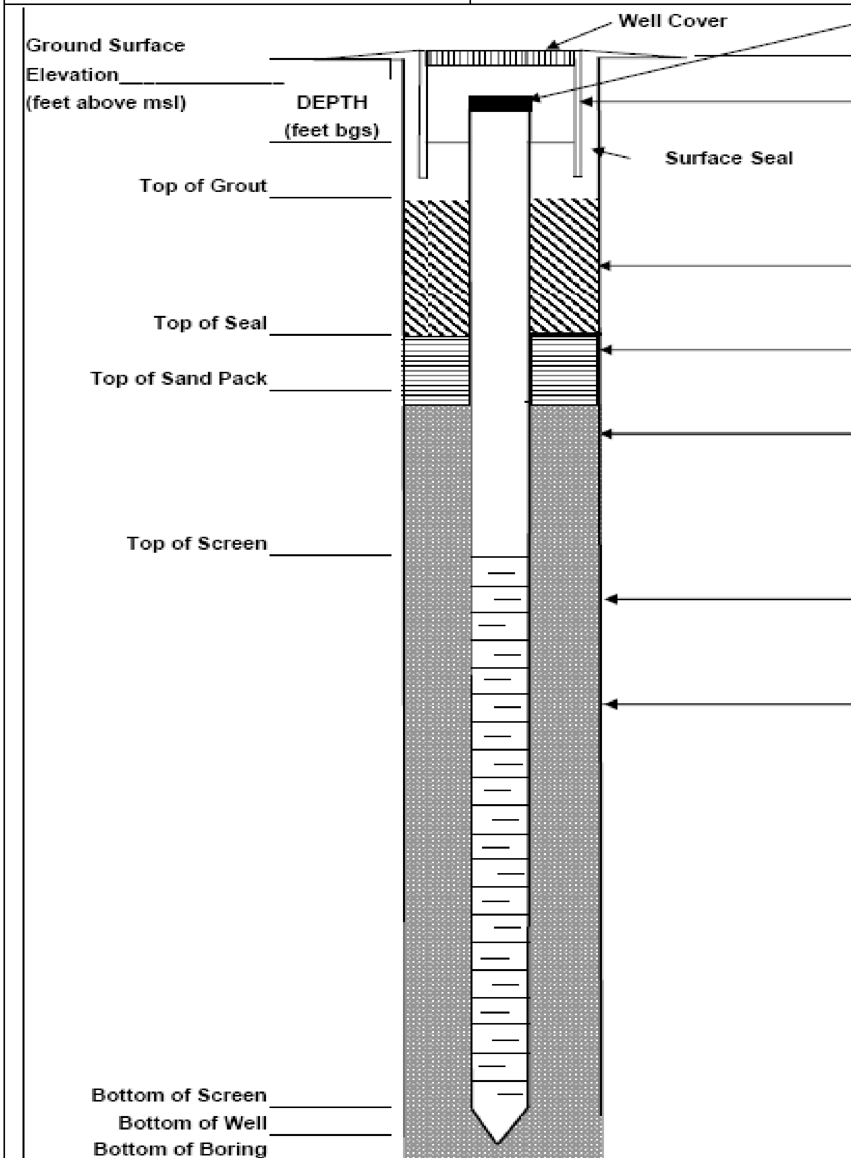
ENVIRONMENT INTERNATIONAL LTD.

Monitoring Well Construction Log (Flush Mount)

Date	
Well ID	
Client	
Project	
Project No.	

Start Date	Contractor
End Date	Drillers
Boring Depth	Geologist
Borehole Diameter	Depth to Water (bgs)
Well Diameter	

Location Diagram



Well Cap Type

Protective Surface Casing – Flush Mount

Diameter:

Elevation Top of Casing:

Grout

Type

Annular Seal

Type

Riser Casing

Type

Elevation of Top of Riser

Diameter

Well Packing Material

Type

Screen

Type

Elevation of Top of Screen:

Slot Width

Diameter

Fluids Lost During Drilling and Well Construction (gallons)

Notes

ENVIRONMENT INTERNATIONAL LTD.

Monitoring Well Development Log

Date	
Well ID	
Client	
Project	
Project No.	

Date Developed	**Total Depth**	**Location Diagram**
Depth to Water	**Developed By**	
Measuring Point	**Field Screening**	

LENGTH OF WATER COLUMN				
Well Depth (ft)	*-*	*Depth To Water (ft)*	*=*	*Water Column (ft)*
WELL VOLUME				
Water Column (ft)	*x*	*V_{well} (gal/ft)*	*=*	*Well Volume (gal)*
ANNULUS VOLUME				
Water Column (ft)	*x*	*$V_{annulus}$ (gal/ft)*	*=*	*Annulus Volume (gal)*
PURGE VOLUME				
(Well Volume +	*Annulus Volume +*	*Drilling Fluid Lost) x*	*Multiplier =*	*Purge Volume (gal)*

Well		**Annulus** 30% Porosity	
Diamtr	**V_{well}**	**Diamtr**	**$V_{annulus}$**
1.5 in	0.1 g/ft	4 in	0.29 g/ft
		6.5 in	0.46 g/ft
2 in	0.17 g/ft	7.25 in	0.59 g/ft
		7.75 in	0.69 g/ft
		8.25 in	0.79 g/ft
4 in	0.66 g/ft	8.25 in	0.64 g/ft
		10.25 in	1.06 g/ft
		12.25 in	1.63 g/ft
6 in	1.5 g/ft	12.25 in	1.41 g/ft

Time	**Total Volume Removed (gal)**	**pH**	**Temperature (^oC)**	**Conductivity**	**Turbidity (NTU)**	**Notes/Comments** *(Description of water, color, odor, etc)*

Post Development		
Depth to Sediment	**Before**	**After**
Type of Capacity of Pump		
Pumping Rate	**Recharge Time/Rate**	
Time to Develop	**Start Time**	**Finish Time**

Monitoring Well Sampling Sheet (Volume-Based)

Date	
Well ID	
Client	
Project	
Project No.	

Date Sampled	**Total Depth**	**Diameter**	**Location Diagram**
Depth to Water	**Sampled By**		
Equipment Used	**Field Screening Results**		

LENGTH OF WATER COLUMN				
Well Depth (ft)	-	*Depth To Water (ft)*	=	*Water Column (ft)*
WELL VOLUME				
Water Column (ft)	*x*	*V_{well} (gal/ft)*	=	*Well Volume (gal)*
ANNULUS VOLUME				
Water Column (ft)	*x*	*$V_{annulus}$ (gal/ft)*	=	*Annulus Volume (gal)*

PURGE VOLUME				
(Well Volume +	*Annulus Volume +*	*Drilling Fluid Lost) x*	*Multiplier =*	*Purge Volume (gal)*

Well	
Diamtr	**V_{well}**
1.5 in	0.1 g/ft
2 in	0.17 g/ft
4 in	0.66 g/ft
6 in	1.5 g/ft

Annulus 30% Porosity	
Diamtr	**$V_{annulus}$**
4 in	0.29 g/ft
6.5 in	0.46 g/ft
7.25 in	0.59 g/ft
7.75 in	0.69 g/ft
8.25 in	0.79 g/ft
8.25 in	0.64 g/ft
10.25 in	1.06 g/ft
12.25 in	1.63 g/ft
12.25 in	1.41 g/ft

Time	**Total Volume Removed (gal)**	**pH**	**Temperature (^oC)**	**Conductivity**	**Turbidity (NTU)**	**Notes/Comments** *(Description of water, color, odor, etc)*

Sample ID	**Time**	**Analysis**	**QC Type**	**#Bottles**	**Volume**	**Container**	**Preserve**	**Y/N**

Signature	**Date**	**No. of Bottles**	**Page of**

ENVIRONMENT INTERNATIONAL LTD.		Field Instrument Calibration Record			Date:	
					Client:	
					Project:	
					Project No.:	
MULTI-PARAMETER WATER QUALITY METER						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:					**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
pH			± 0.3			
Conductivity			± 10%			
ORP			± 10 mV			
DO			± 0.50 mg/L of saturation			
Zero DO*			< 1.0 mg/L			
Temperature*			± 2.0 °C			
Other*						
*If required						
TURBIDITY METER						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:					**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
Low Standard			± 0.3 NTU			
High Standard			± 10%			
PHOTOIONIZATION DETECTOR						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:		**Span Gas:**			**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
Background			< 2 ppm			
Span Gas			± 10%			
XRF ANALYZER						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:		**Metals:**			**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
OTHER:						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:					**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
NOTES:						
Calibrator's Signature (initial):					**Date/Time:**	
Calibrator's Signature (end of day):					**Date/Time:**	

ENVIRONMENT INTERNATIONAL LTD.	# Investigation-Derived Waste Log	Client: Project: Project No.: Date:

Drum No.	Waste Type	Drum Type	Drum Size (gal)	Drum Condition	Start Date	End Date	Approximate Volume
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E

Notes:

Signature:	**Date:**
Printed Name:	**Position:**

Environment International Ltd.	# Daily Drilling Report	Date Boring Nos. Client Project Name Project No.
Date:	**Boring Complete? Yes No**	**Well Complete? Yes No**
Contractor		**Hole Diameter**
Drill Method		**Casing Size**
Type of Rig		**Grout Method**
Geologist		**Boring Depth**
Development Method:		

Start Time	**End Time**
Start Depth	**End Depth**

Summary of Daily Events

Description of Materials Used		**Other Materials**
	Length of Riser (ft)	
	Length of Screen (ft)	
	Bentonite Powder (No. of Bags)	
	Bentonite Pellets (No. of Buckets)	
	Liquid Bentonite (No. of Gallons)	
	Portland Cement (No. of Bags)	
	Type of Casing	

Comments:

Signature	**Date**

INVESTIGATION-DERIVED WASTE HANDLING

Written By:	Approved By:	Date:	QA Concurrence:	Date:
Suzanne Dolberg	Craig Christian			

This Standard Operating Procedure (SOP) contains nine sections:

1. Purpose
2. Application
3. References
4. Associated SOPs
5. Equipment
6. Decontamination
7. IDW Procedures
8. Documentation
9. Measure of Proficiency

1. Purpose

The purpose of this SOP is to provide procedures to field personnel for handling investigation-derived waste (IDW) generated during site activities.

2. Application

All IDW must be handled and disposed of in accordance with all applicable federal, state, and local regulations. IDW that is determined to be non-hazardous may be able to be disposed of on site in accordance with the site-specific Sampling and Analysis Plan (SAP). All IDW should be handled as potentially hazardous until it can be documented otherwise. This SOP is intended to provide procedures for handling, labeling, storing, and documenting IDW that will be containerized for off-site disposal. This SOP does not cover waste characterization or actual disposal, which will be documented in the SAP.

Three basic types of waste may be generated during field work in the following forms:

- *Aqueous*: decontamination and drilling fluids, groundwater generated from well development and well purging, etc.
- *Solid*: drill cuttings, excess soil sample material, concrete, etc.
- *PPE/Disposable Equipment*: spent personal protective equipment (PPE), paper towels, sample tubing, filters, etc.

3. References

Consult the site-specific SAP for modifications that may be necessary to these procedures and check with the site-specific Health and Safety Plan (HASP) to determine if additional PPE is required.

USEPA, 1991. *Management of Investigation-Derived Wastes during Site Inspections*. EPA/540/G-91/009.

4. Associated SOPs

EI-1008 Field Equipment Decontamination

5. Equipment

- Nitrile gloves
- Steel-toed boots
- Any other PPE required per the HASP or SAP based on site hazards
- Handheld photoionization detector (PID)
- DOT-approved drums
- Drum lids, rings, gaskets, and fasteners/bolts (for soil and solids)
- Drum liners (for soil and solids)
- Socket wrench for drum ring bolts (usually 5/8 inch)
- Drum bung wrench
- Plastic 5-gallon buckets and lids
- Funnels, as needed
- Heavy-duty (10-mil) polyethylene sheeting, as needed
- Containment berms, as needed
- *Documentation*: Investigation Derived Waste Log (Attachment 1) and IDW labels (Attachment 2)

6. Decontamination

All non-disposable equipment that is used in the handling and management of IDW will be decontaminated prior to arrival on site, between sampling locations, and before leaving the site. Decontamination procedures will be followed in accordance with EI-1008.

7. IDW Procedures

1. Establish a secure drum storage area before commencing site activities. Drums should be stored on a paved surface away from storm drains and other conduits. Alternatively,

if paved areas are not available place drums on a flat surface covered with or heavy duty polyethylene sheeting. If IDW must be stored near storm drains or other conduits, the storage area must be enclosed using containment berms. Drums should be placed on pallets to facilitate transport and so they do not sink into or freeze to the ground.

2. Inspect drums to make sure they are in good condition and that all lids, rings, gaskets, fasteners/bolts, and liners are present.
3. All soil, aqueous, and solid waste (trash) will be drummed separately. Soil and solid waste will be drummed in open-top DOT-approved drums with drum liners. Aqueous waste will be drummed in close-top DOT approved drums with a bung.
4. All drums must be labeled with an IDW label from the moment any waste is placed in the drum. The label shall be placed on the side of the drum, not the top. Use a permanent marker to fill in the information on the label. The IDW label must contain the following items:
    - Site name
    - Point of contact and phone number
    - Waste sample locations
    - Type of waste
    - Potential contaminants
    - Accumulation start date
    - Drum ID (see Step 5)
5. The drum ID will be assigned based on the type of waste generated, the drum number, and the month and year generated:
    - e.g. AW-01-0408
        - Type of waste (AW = Aqueous Waste, SW = Soil Waste, TW = Trash Waste)
        - Drum number - number drums consecutively (01, 02, 03, 04, etc.)
        - Date (MMYY) – at start of generation (0408 for April 2008)
6. Record each drum on the Investigation-Derived Waste Log if multiple drums will be generated during the field program.
7. Drums that have been filled or partially filled drums that are not currently being used should be moved back to the secure drum storage area.
8. Store drums in rows no larger than 2 drums deep with labels facing outward for identification purposes. ***Never stack drums!***
9. Refer to the site-specific SAP for IDW sample analysis and disposal procedures.

8. Documentation

An Investigation-Derived Waste Log for each sampling program and Investigation-Derived Waste Labels for each drum of waste produced must be completed. See Attachments 1 and 2. Field notes should specify the number of drums and contents generated each day.

9. Measure of Proficiency

Field staff will demonstrate proficiency by successfully completing Sections 7.0 and 8.0 a minimum of two times under the direct supervision of a Senior Associate with appropriate field experience or their designee.

Attachment 1 Investigation Derived Waste Log

			Investigation-Derived Waste Log				**Client:** **Project:** **Project No.:** **Date:**
Drum No.	**Waste Type**	**Drum Type**	**Drum Size (gal)**	**Drum Condition**	**Start Date**	**End Date**	**Approximate Volume**
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 /	G / F / P			F / 75% / 50% / 25% / E

Notes:	
Signature:	**Date:**
Printed Name:	**Position:**

Attachment 2 Investigation Derived Waste Label

INVESTIGATION DERIVED WASTE

Site: ______________________________ Well #: ____________________

Contents: Purge Water Drill Cuttings Decon Water PPE Other__________

May Contain: VOCs SVOCs Metals UNK Other__________

Start Accum. Date: _____/_____/_____

Complete Date: _____/_____/_____ (% Full ____________)

Sample Name: ______________________________ Date ____/____/____

Comments: Drum #: ____________

C573127400

ENVIRONMENTAL SAMPLE PACKAGING AND SHIPPING

Written By:	Approved By:	Date:	QA Concurrence:	Date:
Suzanne Dolberg	Craig Christian	3/4/2010		

This Standard Operating Procedure (SOP) contains nine sections:

1. Purpose
2. Application
3. References
4. Associated SOPs
5. Equipment
6. Decontamination
7. Sample Packaging and Shipping Procedures
8. Documentation
9. Measure of Proficiency

1. Purpose

The purpose of this SOP is to provide field personnel with procedures for packaging and shipping environmental samples in a manner that will ensure the samples integrity.

2. Application

The procedures in this SOP will be followed when packing and/or shipping environmental samples for commercial or contract laboratory program routine analytical services laboratories. These procedures do not address international shipping, samples that exceed hazardous materials concentrations or volumes, samples meeting the definition of IATA Dangerous Goods, shipment of materials for disposal or any purposes except analysis, infectious substances such as untreated POTW wastewater or sludge, or shipping of samples on dry ice. The procedures described in this SOP are performed after environmental samples have been collected and placed in proper containers and correctly preserved according to the site- or project-specific Sampling and Analysis Plan (SAP) and in conformance with the site specific Health and Safety Plan (HASP).

3. References

Consult the site-specific SAP for modifications that may be necessary to these procedures and check with the site-specific HASP to determine if additional personal protective equipment (PPE) is required. Packaging and shipping of samples to Contract Laboratory Program (CLP) Routine Analytical Services (RAS) laboratories must comply with this procedure and requirements specified in the Contract Laboratory Program Guidance for Field Samplers, OSWER 9240.0-44, EPA 540-R-07-06, FINAL July 2007.

4. Associated SOPs

EI-1017 Chain-of-Custody and Sample Labeling

5. Equipment

- Gloves (generally Nitrile but other materials may be acceptable based on SAP or HASP requirements)
- PPE required per the HASP or SAP based on site specific hazards
- Chain-of-custody (COC) forms
- COC seals
- Coolers/Sample Shipment Containers
- Temperature blanks
- Large heavy duty plastic bags (e.g., trash bags)
- Plastic re-sealable bags in various sizes
- Ice (cubed or pelleted)
- Bubble wrap
- Strapping tape
- Clear shipping tape
- Paper towels
- Air bills, tags, cable ties
- Ball point pen
- Fine point permanent marker

6. Decontamination

In the event of sample spillage, decontamination procedures will be followed in accordance with EI-1008.

7. Sample Packaging and Shipping Procedures

Sample packaging and shipping requirements for laboratories contracted through the Contract Laboratory Program (CLP) for Routine Analytical Services (RAS) are specified by the contract requirements. If using a standard commercial laboratory please follow the packaging instructions in Section 7.1.1 below and the shipping instructions in Section 7.2.1. If using a CLP RAS laboratory, follow the instructions in Section 7.1.2 and 7.2.2.

Generally prior to packaging samples in coolers or other sample shipment containers for overnight shipment, all samples should be maintained at a cool temperature generally either refrigerated or in holding coolers. Samples maintained at ambient temperature retain enough heat to melt ice during shipping ensuring that samples will be received outside generally accepted temperature ranges. Samples may not require cooling prior to packaging during cold ambient weather but samplers must then ensure that samples are buffered from freezing temperatures that can cause expansion breakage of sample containers.

7.1 Sample Packaging

7.1.1 Sample Packaging – Commercial Laboratory

Environmental samples will be packaged in the following manner:

1. Choose a clean, sturdy cooler that is in good condition. Avoid using coolers that have molded handles if samples are to be shipped, as the air bill tag will need to be looped through the cooler handle.
2. Seal all drain holes inside and out with strapping tape to prevent leakage.
3. Check that all samples are tightly sealed and will not leak.
4. Check that the sample labels or tags have been properly filled out and match the COC. If water resistant labels have not been used apply clear shipping tape over the label.
5. Place wet ice into large re-sealable plastic bags. Do not use only the bags the ice was purchased in. Do not overfill the bags or fill bags with large solid chunks of ice. The samples will be less likely to break if the ice can move freely within the bag. <u>Note</u>: A five pound bag of ice can be emptied into a 2 or 2 ½ gallon re-sealable plastic bag with enough space to allow the ice to move freely.
6. Line the cooler with a large heavy duty plastic bag.
7. Place bagged ice on the cooler floor within the plastic bag creating a single layer.
8. Place at least two layers of bubble wrap over the layer of bagged ice.
9. Wrap glass or other fragile containers in bubble wrap. Glass VOA vials and other small breakable containers will also be placed in resealable plastic bags, one sample ID and analysis per bag.
10. Place containers in the cooler in an upright position. If large glass containers (e.g., 1L bottles or larger) are included in the shipment, extra bubble wrap should be placed in between the bottles for additional protection against breakage. Alternatively, bottles may be wrapped in an additional layer of bubble wrap in Step 9.
11. Place a temperature blank in the cooler alongside the samples.
12. Fill any empty space around the sides of the cooler with bubble wrap.
13. Place at least two layers of bubble wrap on top of the samples.
14. Place a single layer of bagged ice on top of the bubble wrap. If there is no room for a layer of ice at the top, the samples should be reconfigured in the cooler to allow bagged ice to be placed in the middle of the cooler amongst the sample containers.
15. Tie the large plastic bag closed, removing as much air as possible. If any empty space remains in the cooler fill with bubble wrap.
16. Complete the COC per ICF-1017.
17. Enclose the COC in a plastic re-sealable bag and tape the bag to the inside top of the

cooler and close the lid.

18. Wrap each end of the cooler with at least three layers of strapping tape. If the samples are being picked up by a courier do not seal the cooler. The courier will need to sign the COC upon receipt of samples. If shipping the samples proceed to the instructions in Section 7.2

7.1.2 Sample Packaging – CLP RAS Laboratories

Environmental samples for analysis under the CLP RAS program will be packaged in the following manner. Note that shipment of samples for CLP RAS analysis preserved with methanol according to SW 846 Method 5035A require specific dangerous goods shipping not covered by this SOP.

1. Choose a clean, sturdy cooler that is in good condition. Avoid using coolers that have molded handles if samples are to be shipped, as the air bill tag will need to be looped through the cooler handle.
2. Seal all drain holes inside and out with strapping tape to prevent leakage.
3. Fully chill all samples to 4 degrees C (+/- 2 degrees C).
4. Check that all samples are tightly sealed and will not leak and that COC seals have been affixed to each container such that the seal will break if the container is tampered with. Note: Pre-weighed sample vials for volatiles analysis should be placed in a plastic bag and the COC seal affixed over the bag seal. Never place COC seals or other labels directly on pre-weighed vials.
5. Check that the sample labels or tags have been properly filled out and match the COC and that the site name does not appear anywhere on sample documentation. If water resistant labels have not been used apply clear shipping tape over the label.
6. Seal all samples individually within clear plastic bags.
7. Double-bag wet ice into large re-sealable plastic bags. Do not overfill the bags or fill bags with large solid chunks of ice. The samples will be less likely to break if the ice can move freely within the bag. Note: A five pound bag of ice can be emptied into a 2 or 2 ½ gallon re-sealable plastic bag with enough space to allow the ice to move freely.
8. Line the cooler with clean, absorbent, non-combustible packing material (i.e., vermiculite).
9. Place a large heavy duty plastic bag in the cooler and atop the vermiculite.
10. Place bagged ice on the cooler floor within the plastic bag creating a single layer.
11. Place at least two layers of bubble wrap over the layer of bagged ice.
12. Wrap glass or other fragile containers in bubble wrap.
13. Place containers in the cooler in an upright position. If large glass containers (e.g., 1L bottles) are included in the shipment, extra bubble wrap should be placed in between the bottles for additional protection against breakage. Alternatively, bottles may be wrapped in an additional layer of bubble wrap in Step 9.
14. Place a temperature blank in the cooler alongside the samples.

15. Fill any empty space around the sides of the cooler with bubble wrap.
16. Place at least two layers of bubble wrap on top of the samples.
17. Place a single layer of double-bagged ice on top of the bubble wrap. If there is no room for a layer of ice at the top, the samples should be reconfigured in the cooler to allow bagged ice to be placed in the middle of the cooler amongst the sample containers.
18. Tie the large plastic bag closed, removing as much air as possible. If any empty space remains in the cooler fill with bubble wrap.
19. Complete the Tracking Report/Chain-of-Custody (TR/COC).
20. Enclose the TR/COC in a plastic re-sealable bag and tape the bag to the inside top of the cooler and close the lid.
21. Wrap each end of the cooler with at least three layers of strapping tape.

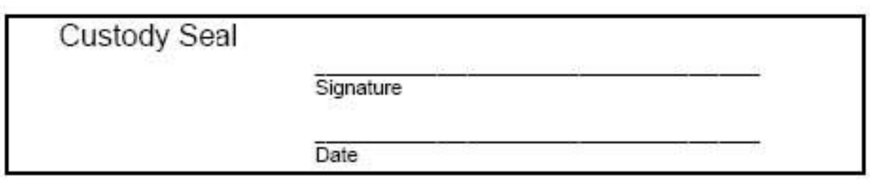
7.2 Sample Shipping

7.2.1 Sample Shipping – Commercial Laboratory

The following procedures will be followed when shipping environmental samples:

1. Sign and date two COC seals (Figure 1) and place them on opposite sides of the cooler opening in such a manner that the container cannot be opened without breaking the seals (See Figure 2).
2. Place a single layer of clear shipping tape over each seal.

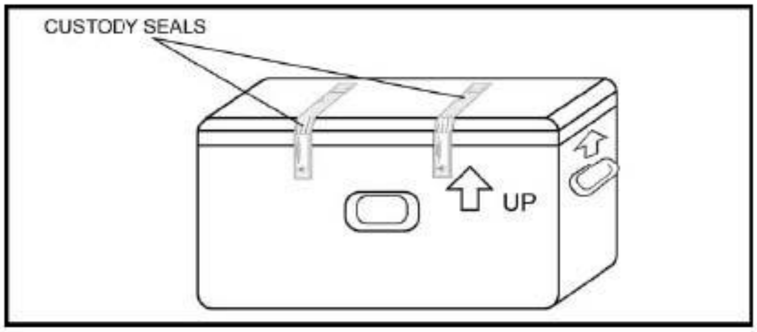
Figure 1 Chain-of-Custody Seal


Custody Seal

Signature

Date

Figure 2 Chain-of-Custody Seal Proper Placement



3. If shipping samples through a shipping firm (e.g., Federal Express) fill out an air bill (see example in Attachment 1). Note that depending on the shipper multiple shipping containers/coolers may be shipped under the same air bill by marking the coolers for example “1 of 3”. The air bill must include all of the following information:
   - ***Section 1***: Fill in the date, your name, and the ICF office address, phone number, and FedEx account number.
   - ***Section 2***: Enter the project number as the internal billing reference.
   - ***Section 3***: Fill in the laboratory address and phone number; use “Sample Receiving” as the recipient (don’t use a specific name).
   - ***Section 4***: Check “FedEx Priority Overnight” checkbox.
   - ***Section 5***: Check “Other” checkbox.
   - ***Section 6***: Check “No” checkbox for dangerous goods[1].
   - ***Section 6***: Check “Saturday Delivery” checkbox, if necessary.
   - ***Section 7***: Check “Sender” checkbox
4. Peel the adhesive backing off the air bill and place on a plastic FedEx tag
5. Loop the end of the tag through one of the handles of the cooler and use the adhesive strip to secure. Insert a cable tie through the hole in the tag and secure around the cooler handle
6. Bring to the nearest FedEx facility
7. Retain the top copy of the air bill for tracking and billing purposes
8. Contact the project chemist to coordinate receipt with the laboratory or contact the laboratory directly to inform them of sample shipment.

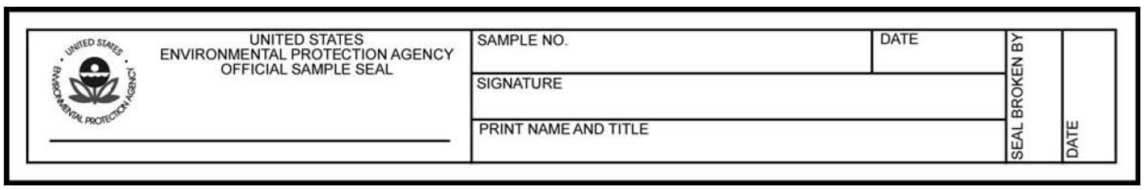
7.2.2 Sample Shipping – CLP RAS Laboratory

The following procedures will be followed when shipping environmental samples:

[1] Normally, samples are not considered dangerous goods. However, if you are submitting a sample consisting entirely of a hazardous material, then the sample must be shipped as hazardous materials. Shipping hazardous materials goes beyond what is specified in this SOP. Consult the H&S Coordinator for how to proceed in this situation.

1. Fill out 4 EPA COC seals (Figure 3). Make sure to both print and sign you name and include the date. Place one on each side of the cooler spanning the seal between the lid and bottom of the cooler in such a manner that the container cannot be opened without breaking the seals.
2. Place a single layer of clear shipping tape over each seal.

Figure 3 Chain-of-Custody Seal



3. Fill out a Federal Express air bill (see example in Attachment 1). Note that depending on the shipper multiple shipping containers/coolers may be shipped under the same air bill by marking the coolers for example “1 of 3”. If shipping via a different carrier or method consult the SAP for proper instructions. The FedEx air bill must include all of the following information:

   - ***Section 1***: Fill in the date, your name, and the ICF office address, phone number, and FedEx account number.
   - ***Section 2***: Enter the project number as the internal billing reference.
   - ***Section 3***: Fill in the laboratory address and phone number; use “Sample Receiving” as the recipient (don’t use a specific name).
   - ***Section 4***: Check “FedEx Priority Overnight” checkbox.
   - ***Section 5***: Check “Other” checkbox.
   - ***Section 6***: Check “No” checkbox for dangerous goods.
   - ***Section 6***: Check “Saturday Delivery” checkbox, if necessary.
   - ***Section 7***: Check “Sender” checkbox.

4. Peel the adhesive backing off the air bill and place on a plastic FedEx tag
5. Loop the end of the tag through one of the handles of the cooler and use the adhesive strip to secure. Insert a cable tie through the hole in the tag and secure around the cooler handle
6. Bring to the nearest FedEx facility
7. Retain the top copy of the air bill for tracking and billing purposes
8. Immediately contact the project chemist to coordinate with the CLP Regional RSCC or SMO designee. Never contact the CLP RAS laboratory directly. For each shipment by 8 AM the next day, the project chemist must provide the following information to the RSCC (or their designee) or to SMO:

- Contact name and phone number;
- SMO-assigned Case Number;
- Number, concentration, matrix and analysis of samples being shipped;
- Name of laboratory (or laboratories) to which the samples were shipped;
- Air bill number(s);
- Date of shipment;
- Case status (i.e., whether or not the Case is complete);
- Problems encountered, special comments, or any unanticipated issues;
- When to expect the next anticipated shipment; and
- An electronic export of the TR/COC Record

8. Documentation

If shipping samples, an air bill must be completed as described in Section 7.2. Procedures for filling out COC forms, COC seals, and sample labels and tags are included in ICF-1017.

9. Measure of Proficiency

Field personnel will demonstrate proficiency by successfully completing Sections 7.0 and 8.0 a minimum of two times under the direct supervision of a Project Manager, Field Team Leader, Senior Associate or designee with appropriate field experience.

Attachment 1 Example Completed Federal Express Air Bill

FedEx. Express US Airbill — FedEx Tracking Number 8614 3922 7522 — Form I.D. No. 0215 — SPH41 — Sender's Copy

fedex.com 1.800.GoFedEx 1.800.463.3339

1 From Please print and press hard.
Date 5/6/08 — Sender's FedEx Account Number 2520-
Sender's Name Wendy Luce — Phone (781) 676-4000
Company ICF INTERNATIONAL
Address 33 HAYDEN AVE STE 3 — Dept./Floor/Suite/Room
City LEXINGTON — State MA — ZIP 02421-7973

2 Your Internal Billing Reference 095220.0.088

3 To
Recipient's Name Sample Receiving — Phone (612) 607-1700
Company Pace Analytical Services
Recipient's Address 1700 Elm Street — We cannot deliver to P.O. boxes or P.O. ZIP codes. — Dept./Floor/Suite/Room
Address — To request a package be held at a specific FedEx location, print FedEx address here.
City Minneapolis — State MN — ZIP 55414

0354713003

Store your addresses at fedex.com
Simplify your shipping. Manage your account. Access all the tools you need.

4a Express Package Service — Packages up to 150 lbs.
- [X] FedEx Priority Overnight
- [ ] FedEx Standard Overnight
- [ ] FedEx First Overnight
- [ ] FedEx 2Day
- [ ] FedEx Express Saver

4b Express Freight Service — Packages over 150 lbs.
- [ ] FedEx 1Day Freight*
- [ ] FedEx 2Day Freight
- [ ] FedEx 3Day Freight

5 Packaging
- [ ] FedEx Envelope*
- [ ] FedEx Pak*
- [ ] FedEx Box
- [ ] FedEx Tube
- [X] Other

6 Special Handling
- [ ] SATURDAY Delivery
- [ ] HOLD Weekday at FedEx Location
- [ ] HOLD Saturday at FedEx Location

Does this shipment contain dangerous goods?
- [X] No
- [ ] Yes As per attached Shipper's Declaration
- [ ] Yes Shipper's Declaration not required
- [ ] Dry Ice
- [ ] Cargo Aircraft Only

7 Payment Bill to:
- [X] Sender
- [ ] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

Total Packages 1 — Total Weight — Total Declared Value $ .00

8 Residential Delivery Signature Options
- [ ] No Signature Required
- [ ] Direct Signature
- [ ] Indirect Signature

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PULL AND RETAIN THIS COPY BEFORE AFFIXING TO THE PACKAGE. NO POUCH NEEDED.

FIELD SCREENING EQUIPMENT CALIBRATION

Written By:	Approved By:	Date:	QA Concurrence:	Date:
Suzanne Dolberg	Craig Christian	3/4/2010		

This Standard Operating Procedure (SOP) contains nine sections:

1. Purpose
2. Application
3. References
4. Associated SOPs
5. Equipment
6. Decontamination
7. Calibration Procedures
8. Documentation
9. Measure of Proficiency

1. Purpose

The purpose of this SOP is to provide procedures to field personnel responsible for the calibration of field screening equipment. This SOP covers the most commonly used screening instruments and is not intended to be all-inclusive. Consult the manufacturer's operations manual or the site-specific Sampling and Analysis Plan (SAP) for equipment not covered by this SOP.

2. Application

This SOP is intended for use by field personnel operating any of the following field screening equipment:

- Photovac® 2020 or 2020PRO Plus Photoionization Detector (PID)
- MiniRAE® 2000 PID
- YSI® 6-Series Multi-parameter Probes [pH, temperature, conductivity, oxidation-reduction potential (ORP), and dissolved oxygen (DO)]
- LaMotte® 2020 or 2020e or 2020i Turbidity Meters
- Hand-held X-ray Fluorescence (XRF) analyzer

3. References

Consult the site-specific SAP for modifications that may be necessary to these procedures and check with the site-specific Health and Safety Plan (HASP) to determine if additional personal protective equipment (PPE) is required. Consult the appropriate Operators' Manuals for updated information regarding specific equipment.

4. Associated SOPs

EI-1008 Field Equipment Decontamination

EI-4014 Field Documentation and Forms

EI-5013 YSI® Water Quality Meter Operation and Routine Maintenance

EI-5202 Photoionization Detector Operation and Routine Maintenance (under review)

EI-5203 Turbidity Meter Operation and Routine Maintenance

5. Equipment

- Gloves (generally Nitrile but other materials may be acceptable based on SAP or HASP requirements)
- PPE required per the HASP or SAP based on site-specific hazards
- YSI® 6 Series Sonde with probes for required measurements
- YSI® handheld display and cord
- Ring stand and clamps
- Photoionization detector
- LaMotte® 2020/2020e/2020i
- Paper towels
- Lint-free disposable clothes
- Calibration solutions: pH 4, pH 10, conductivity, ORP, and zero DO, if required
- Plastic beakers (1 Liter)
- Small calibration vial
- Squirt bottle of deionized water
- Span gas and regulator (e.g., Isobutylene 100 ppm)
- Zero air cylinder, if required
- Tedlar® bag with connector tubing
- LaMotte® AMCO standards 1.0 and 10.0 NTU
- ***Documentation***: Field Instrument Calibration Record (Attachment 5) and field log book

6. Decontamination

All non-disposable equipment that comes in contact with contaminated media will be decontaminated prior to arrival on site, between sampling locations, and before leaving the site. Decontamination procedures will be followed in accordance EI-1008.

7. Calibration Procedures

Field instruments will be properly calibrated, charged, and in good working order. Performing daily calibrations and conducting calibration checks before and after use each day helps to ensure that instrument readings are accurate and can be used for the intended purpose.

All field instruments will be appropriately protected against inclement weather during operation and will be secured in a cool, dry place when not in use.

7.1 Photoionization Detectors

PIDs measure and display the total concentration of airborne vapors that can be ionized by the detector. The detector is sensitive, selective but non-specific and cannot distinguish between individual compounds. Only compounds with a ionization potential in electron volts less than the lamp energy are ionized and thereby detectable. The displayed reading reports the total concentration of all detectable VOCs in parts per million (ppm). Most PIDs are fitted with a 10.6 eV lamp while others can be fitted with either a 10.6 eV or an 11.7 eV lamp depending on the ionization potential of the site compounds of concern. The Photovac® 2020 and 2020PRO Plus discussed in Section 7.1.1 is limited to using only a 10.6 eV lamp. The MiniRAE® 2000 discussed in Section 7.1.2 can be outfitted with either a 10.6 or 11.7 eV lamp. It is extremely important to consult the site-specific SAP and HASP to make sure that the correct PID and lamp are used to detect site contaminants.

PIDs will be calibrated against ambient air and a standard reference gas of known concentration (span gas) at least twice each day. A calibration check will be conducted against both standards before use and at the end of each day. Calibration check results will be recorded on the Field Instrument Calibration Record. See Attachment 1 for photos of the MiniRAE® 2000.

7.1.1 Photovac® 2020 or 2020PRO Plus

1. Check to make sure that the PID and lamp are appropriate for detecting the site contaminants. If necessary, consult the SAP and HASP to determine appropriateness.
2. Make sure the regulator is turned all the way to the “off” position
3. Screw the regulator to the calibration gas cylinder
4. Open the valve on the Tedlar® bag, press to remove any air, and reclose the valve
5. Attach the Tedlar® bag inlet to the outlet of the regulator with the adaptor tubing
6. Slowly turn on the calibration gas regulator to slowly fill the Tedlar® bag with calibration gas
7. Close the calibration gas regulator, then close the Tedlar® bag valve and disconnect the bag from the regulator leaving the adaptor tubing on the Tedlar® bag inlet
8. Press the ***On/Off*** key on the PID instrument
9. Select ***Enter*** to access the menu
10. Select ***Set***
11. Select ***Cal***
12. Select ***Zero*** to zero the instrument. This process will take at least 60-90 seconds. Zeroing must be performed in a VOC-free environment. A cylinder of zero air may be used to fill a clean Tedlar® bag in order to zero the PID, if VOCs are present in ambient air.
13. Open the calibration gas Tedlar® bag and connect to the PID using the adapter tubing
14. Select ***Span***

15. At the prompt, enter the concentration of the calibration gas
16. Wait for the PID to complete the calibration (usually 1-2 minutes)
17. Remove the Tedlar® bag and close the valve
18. Approximately five minutes after the calibration is complete, sample ambient air (or zero air Tedlar® bag) and then the calibration gas Tedlar® bag again to ensure the PID has been calibrated correctly
19. Record the values for ambient air (or zero air Tedlar® bag) and the calibration gas on the Field Instrument Calibration Form
20. If either ambient air or the calibration gas standards does not meet accuracy goals below, the calibration should be redone.
21. Repeat Steps 18 and 19 at the end of the day. If accuracy goals are not met, the data should be considered estimated. If the value of the standards and the actual instrument reading vary by more than two times the accuracy goals the instrument should be re-calibrated more frequently to ensure worker safety.

Parameter	Post-Calibration Check Accuracy Goals
Ambient Air	<2 ppm
Span Gas	±10%

7.1.2 MiniRAE® 2000

1. Complete Steps 1-7 from Section 7.1.1.
2. Turn on the PID by depressing ***Mode*** for a full second
3. Wait for the PID to display a “Ready” message
4. If you are using isobutylene as your span gas skip to Step 9. If you are using a different span gas continue to Step 5
5. When prompted “Select Cal Memory?” press ***[Y/+]***. The display will read “Gas =” and “Mem # x?”
6. Press ***[N/-]*** to scroll through the memory numbers. Each memory number corresponds to a different span gas Cal Memory #0 = Isobutylene   Cal Memory #4 = Styrene Cal Memory #1 = Hexane Cal Memory #5 = Toluene Cal Memory #2 = Xylene Cal Memory #6 = Vinyl Chloride Cal Memory #3 = Benzene
7. Press ***[Y/+]*** to make a selection
8. Press ***[Y/+]*** when display will reads “Save?”
9. Press and hold down ***Mode*** and ***[N/-]*** simultaneously (about 3 seconds) to enter the programming menu
10. Menu choices will appear on the screen; use ***[N/-]*** to scroll through the menu and ***[Y/+]*** to choose menu items
11. Zeroing must be performed in a VOC-free environment. A cylinder of zero air may be

used to fill a clean Tedlar® bag in order to zero the PID, if VOCs are present in ambient air. If Zero air is to be used connect the Tedlar® bag to the instrument.

12. When prompted “Fresh Air Cal?” press ***[Y/+]***. The display will show “zero in progress” followed by a countdown timer
13. After about 15 seconds the display will show “update data…zeroed”
14. Press any key and wait about 20 seconds. The monitor will return back to the submenu
15. Open the Tedlar® bag and connect to the PID using the adapter tubing
16. Scroll through the prompts as necessary using ***[N/-]*** until “Span Cal?” is displayed
17. Press ***[Y/+]*** to start the calibration. <u>Do not press down on the Tedlar® bag</u>!
18. Wait approximately 30 seconds until the countdown timer reaches 0. The calibration is complete.
19. Close the valve and remove the Tedlar® bag.
20. Approximately five minutes after the calibration is complete, sample ambient air (or zero air Tedlar ® bag) and then the calibration gas again to ensure the PID has been calibrated correctly.
21. Record the values for ambient air and the standard on the Field Instrument Calibration Form.
22. If either ambient air or the span gas standards do not meet accuracy goals below, the calibration should be redone.
23. Repeat Steps 20 and 21 at the end of the day. If accuracy goals are not met, the data should be considered estimated. If the value of the standards and the actual instrument reading vary by more than two times the accuracy goals the instrument should be re-calibrated more frequently to ensure worker safety.

Parameter	Post-Calibration Check Accuracy Goals
Ambient Air	<2 ppm
Span Gas	±10%

7.2 Water Quality Instruments

Water quality instruments come in a variety of configurations. Some measure a single parameter; while others can be outfitted with several different probes depending on the water quality indicators of interest (see Attachment 2).

Water quality instruments will be calibrated using standards of known values at least at the start of each day. Calibration checks will be conducted against the same standards before use and at the end of each day. Calibration check results will be recorded on the Field Instrument Calibration Record.

7.2.1 YSI® 6-Series Sondes

The following procedures are written specifically for YSI® 6-series sondes (including models 600R, 600XL, 600XLM, 6820, 6920, and 6600) and the YSI® 650 display/data logger. The general procedures below are applicable to similar instruments. Consult the manufacturer's operations manual for specific procedures and any relevant updates.

Temperature probe calibration cannot be performed by the operator. Temperature probes should be verified for accuracy on an annual basis using a National Institute of Standards and Technology (NIST) traceable thermometer. If values vary by more than 0.15°C the instrument should not be used and the manufacturer should be contacted.

1. Press the green power button "ϴ"**.** Allow the unit to warm up for 10 minutes and the calibration solution temperature to stabilize. If the calibration solutions are extremely cold, pour aliquots of each solution sufficient for calibration into separate clean beakers to expedite this process. Make sure to cover all calibration solutions when not in use.
2. Select **Calibrate** from the main menu
3. Use the up and down arrows on the calibration menu and select **Conductivity** and then hit enter "↵"
4. Select **spCond** and press ↵ to calibrate specific conductivity
5. Enter the value of the conductivity solution in mS/cm^3 using the number pad and press ↵**.** Note: The concentration on the standard may be in uS/cm^3. To convert the standard concentration from uS/cm^3 to mS/cm^3 divide by 1000.
6. Gently rinse the probes with deionized water
7. Submerge the probes with the protective probe cover into a clean beaker with a sufficient amount standard to completely cover the sensor. See Attachment 2 for help with identifying the different sensors. Note: The conductivity sensor is located in the vent hole on the side of the conductivity/temperature probe. If the probe guard must be removed to sufficiently submerge the sensor, take extra care to avoid damaging the probes.
8. Wait for the specific conductivity measurement to stabilize and press ↵ to calibrate. If the display reads "Out of Range" do not accept the value! Instead, check for the source of the problem and retry Steps 6 and 7. The problem may be not sufficiently submerging the probe or entering the wrong value for the calibration solution.
9. Wait for the "Calibrated" message on the display.
10. Press the escape key "Esc" or ↵ as prompted to return to the calibration menu.
11. Select **pH** and hit ↵ to calibrate pH.
12. Select **2-point and** ↵ to perform a standard 2-point calibration. Per the SAP, a 3-point calibration may be required. In this case, select **3-point** and ↵.
13. When prompted enter the pH value using the number pad (e.g., 4.0 and ↵) and repeat

Steps 6 through 10 for each pH standard value.

14. On the calibration screen select **ORP** and ↵ to calibrate oxidation-reduction potential
15. When prompted enter the value of the ORP solution and ↵. Note: The value of the ORP standard varies with temperature. The value marked on the ORP solution is the value of the solution at 25°C. If the current temperature is not 25°C, use the table on the package insert to determine the proper temperature corrected standard value.
16. Repeat Steps 6 through 10
17. On the calibration screen select **Dissolved Oxygen** and ↵ to calibrate DO
18. Fill the calibration cup with the wet sponge and approximately 1/8" of de-ionized water.
19. Remove any water droplets from the DO probe membrane with a wipe using a gentle dabbing motion.
20. Place the probe ends into the calibration cup. Engage only 1 or 2 threads to ensure the probe is vented to air. Do not allow any of the probes to contact the water in the calibration cup!
21. Wait 10 minutes to allow the air in the calibration cup to become water saturated
22. Select **% DO** and ↵.
23. Enter the barometric pressure in mm Hg and ↵. Note: Barometric pressure readings from weather services are usually corrected to sea level and cannot be used until they are "uncorrected". If you need to determine the barometric pressure using weather service data and/or you need to convert a measurement to the proper units see the manufacturer's operations manual for instructions.
24. Wait for the DO measurement to stabilize and press ↵ to calibrate. Record the stabilized value on the Field Instrument Calibration Form. The calibration steps are complete. You must now verify the calibration.
25. Press Esc as needed to return to the main menu.
26. Gently rinse the probes with de-ionized water.
27. Select **Sonde Run** and ↵.
28. Select **Discrete Sample** and ↵.
29. Submerge the probes in the first calibration solution and wait for the reading to stabilize. Once stabilization has been reached record the value on the Field Instrument Calibration Form. Gently rinse the probes with deionized water.
30. Repeat Step 29 for each of the calibration solutions. If required in the SAP, an additional calibration check can be performed using a zero DO solution.
31. Prepare the instrument to check DO - repeat Steps 18 through 21 and record the saturation value.
32. Determine if the post-calibration values meet accuracy goals displayed below:
33. If all accuracy goals are met, you may proceed with sampling. If only one parameter does not meet the above accuracy goal and the check value varies by less than two

times the accuracy goal you may also proceed with sampling but the data for that parameter should be considered estimated. If more than one parameter does not meet the accuracy goal or if a single parameter varies from the accuracy goal my more than 2 times, the affected parameters must be recalibrated.

34. Repeat Steps 27 to 32 at the end of the day. If accuracy goals are not met, the data should be considered estimated. If the value of the standards and the actual instrument reading vary by more than two times the accuracy goals, the instrument should be re-calibrated more frequently.

Parameter	**Post-Calibration Check Accuracy Goals**
pH	± 0.3 units
Conductivity	± 10 %
Oxidation Reduction Potential	± 10 mV
Dissolved Oxygen	± 0.5 mg/L of the saturated value
	< 1.0 mg/L for zero DO sol'n if using

7.3 Turbidimeters

7.3.1 LaMotte® 2020/2020e/2020i Turbidimeter

1. Press **On** to turn the meter on (see Attachment 3)
2. Press the arrow keys (↓ and ↖) to highlight "Measure" and enter **OK**
3. Wipe the tube containing the 0 NTU standard with a lint-free cloth
4. Open the meter lid and insert the tube into the chamber making sure the standard vial is filled adequately to the index line (see Attachment 3)
5. Align the index notch on the vial with the index arrow on the meter and close the lid
6. Select "Scan Blank" and press **OK**
7. Remove the tube and repeat Steps 3 through 5 using the 10 NTU standard
8. Select "Scan Sample" and press **OK**
9. Observe the result. Press the down arrow (↖) and **OK** simultaneously to select "Calibrate"
10. Press ↓↖ to change the highlighted digit on the display to the value of the standard and press **OK** to accept a digit and move to the next digit.
11. Press **OK** to select "Set" after all digits are updated
12. The calibration is complete. Press the back arrow (→) to exit to the previous menu.
13. To verify the calibration use the ↓↖ keys and select "Measure"
14. Insert each standard in turn and select "Scan Sample" and press **OK**

15. Record the values for each of the two standards on the Field Instrument Calibration Record. Verify the values meet the below criteria.
16. If accuracy goals are not met, rerun the calibration.
17. At the end of the day repeat Steps 13 through 15. If accuracy goals are not met, the data should be considered estimated. If the value of the standards and the actual instrument reading vary by more than two times the accuracy goals the instrument should be re-calibrated more frequently.

Parameter	Post-Calibration Check Accuracy Goals
Turbidity – 0 NTU Standard	±0.3 NTU
Turbidity – 10 NTU Standard	±10%

7.4 Handheld XRF Analyzers

Handheld XRF analyzers are invaluable for measuring real-time concentrations of heavy metals in soils, sediment, and on solid surfaces. Handheld XRF analyzers can measure concentrations of the heavy metals typically of concern at sites suspected of having environmental contamination. The measurements that the handheld XRF provides also typically correlate well with fixed laboratory analysis, making the XRF analyzer a reliable field screening instrument. See Attachment 4 for a picture of what a typical XRF analyzer looks like.

If used in the field, XRF analyzers will be calibrated in accordance with the manufacturer's instructions provided in the operating manual. If applicable, calibration will be completed using standards of known values at least at the start of each day. Calibration checks will be conducted against the same standards before use and at the end of each day. Calibration check results will be recorded on the Field Instrument Calibration Record.

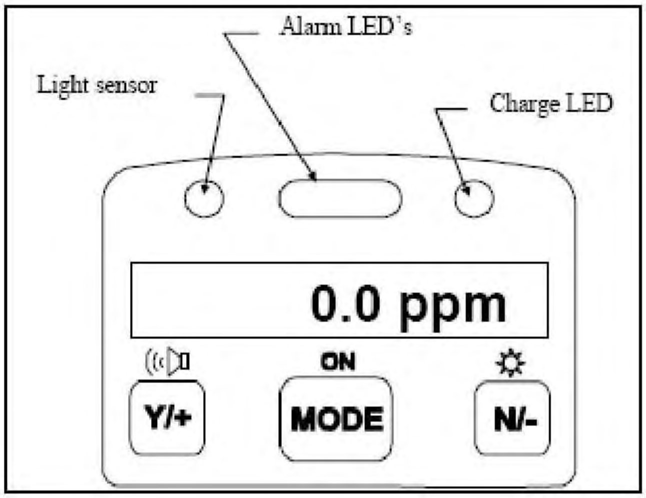
8. Documentation

A Field Instrument Calibration Record will be completed each day for each set of instruments. See Attachment 5.

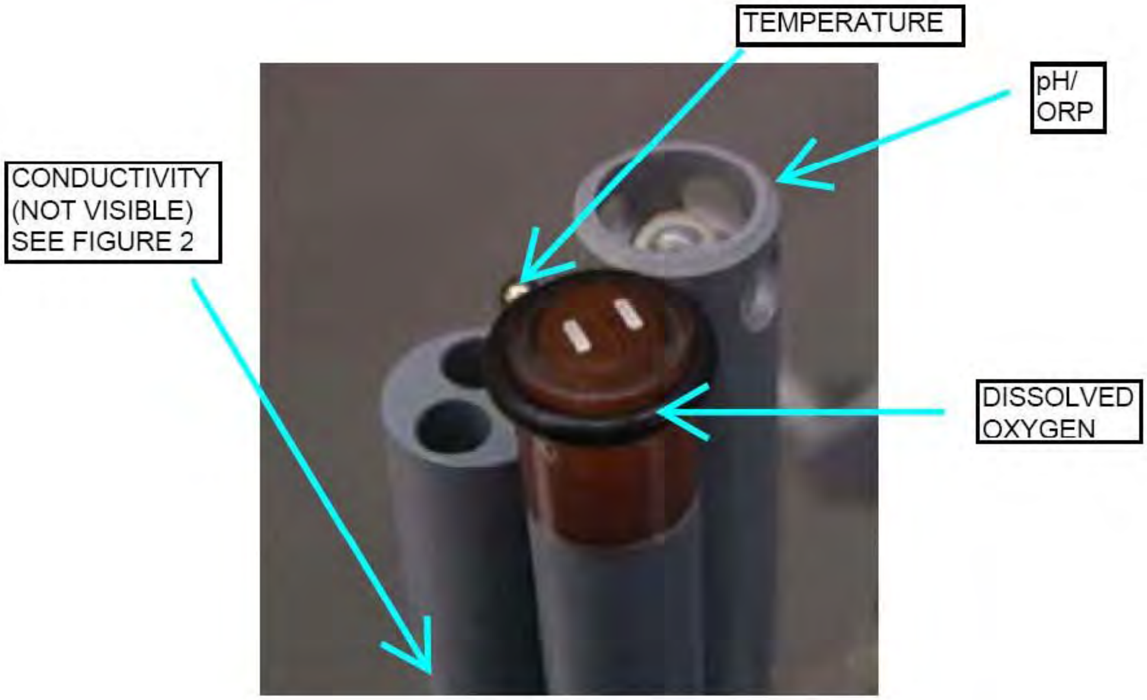
9. Measure of Proficiency

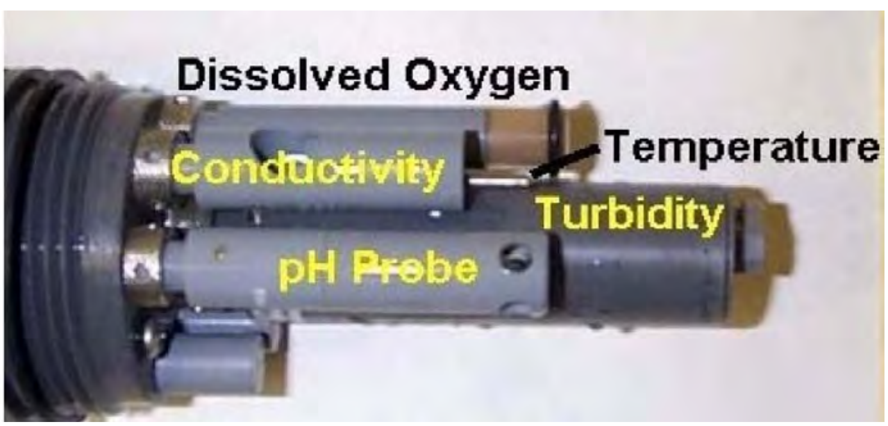
Field staff will demonstrate proficiency for calibrating a specific instrument by successfully completing the corresponding calibration procedure from Sections 7.0 and 8.0 a minimum of two times under the direct supervision of a Senior Associate with appropriate field experience or their designee.

Attachment 1: MiniRAE® 2000

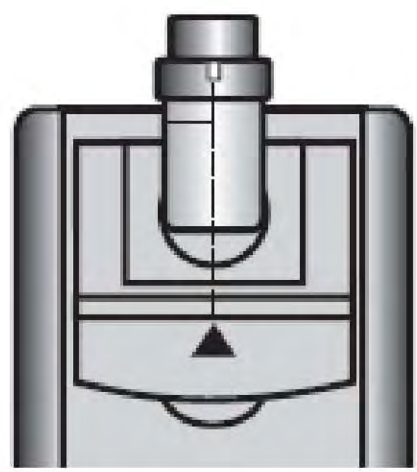


Attachment 2: YSI 6-Series Sonde Probes (top and side views)





Attachment 3: LaMotte 2020e Turbidity Meter



Attachment 4: Handheld XRF Analyzer

Attachment 5: Field Instrument Calibration Record

	Field Instrument Calibration Record				**Date:**	
					Client:	
					Project:	
					Project No.:	
MULTI-PARAMETER WATER QUALITY METER						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:					**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
pH			± 0.3			
Conductivity			± 10%			
ORP			± 10 mV			
DO			± 0.50 mg/L of saturation			
Zero DO*			< 1.0 mg/L			
Temperature*			± 2.0 ^{0} C			
Other*						
*If required						
TURBIDITY METER						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:					**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
Low Standard			± 0.3 NTU			
High Standard			± 10%			
PHOTOIONIZATION DETECTOR						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:		**Span Gas:**			**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
Background			< 2 ppm			
Span Gas			± 10%			
XRF ANALYZER						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:		**Metals:**			**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
OTHER:						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:					**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
NOTES:						
Calibrator's Signature (initial):					**Date/Time:**	
Calibrator's Signature (end of day):					**Date/Time:**	

XRF Quality Assurance/Instrument Performance Form

PAGE______OF______

JOB NO.

CALIBRATION CHECK

XRF Analyzer Calibration Check

If an XRF analyzer is used to obtain environmental sample results in the course of the Assessment, the instrument must be calibrated prior to use and as directed by the manufacturer. Calibration checks should be made at the beginning of each job, every four hours during continuous operation, at the end of every job, and each time the instrument is turned on. If specified by the manufacturer, the XRF analyzer should be calibrated if there is a significant change in temperature in work environments as soon as the temperature of the instrument has had an opportunity to adjust.

Zero reading: ____________ Acceptable Range: 0.0 +/-___________

Acceptable Control Range: _______________________

Reason for Check	Standard Used	XRF Reading	Accept or Reject	Corrective Action Number

Reason for Check

I.C. = Initial Calibration
Temp Calibration = Work Environment Temperature Change
4/Hour = Subsequent four hour check
T.O. = Resumed Assessment After Instrument was Turned Off
F.C. = Final Calibration

Corrective Action Number

1. Cleaned Instrument Face
2. Cleaned Zero Block/ Film
3. Manual Zero/ calibration
4. Consulted Manufacturer
5. Sent instrument to Manufacturer for service



2010 Upper Columbia River Sediment Assessment
Sampling and Quality Assurance Plan

Appendix B
Sediment Core Location Selection Methodology

Environment International Ltd.

Environment International Ltd.
5505 34th Avenue, NE – Seattle, WA – 98105
Ph: 206.525.3362 Fax:206.525.0869
www.eiltd.net; staff@eiltd.net

ENVIRONMENT INTERNATIONAL LTD.

Date: April 23, 2010

From: Sarah Halpert, Analyst, Environment International Ltd.

MEMO TO FILE

RE: UCR Litigation Coring Project – Generation of Random Core Sample Locations

Background

Environment International Ltd (EI) is performing a sediment study in the Upper Columbia River on behalf of the Confederated Colville Tribes (CCT) at the direction of their attorneys and in support of ongoing litigation. As part of this study, EI is generating random coring locations within selected depositional areas.

Goal

The objective of this process is to determine coring locations for the coring study using a random, unbiased methodology. In order to maximize use of the usefulness of these points in the field, three times as many sample location points as estimated were generated. For example, in an area where EI determined that up to 3 possible coring locations are required, 9 points would be randomly generated.

Methodology

Depositional areas were determined through field observation by EI and representatives of the Washington Department of Ecology and the CCT, and then further refined with the help of a coring subcontractor. These areas were mapped using ArcMap (GIS). Five figures were generated based upon geographical area and were labeled as such: South of the Border; Black Sand Beach; Deadman's Eddy; and Northport/Onion Creek.

Based on the size of each depositional area, EI estimated the number of potential coring locations that would be viable in each area. Using a GIS extension, Hawths Analysis Tools, random points were generated with the following parameters:

- For Black Sand Beach, a minimum of 60m between each randomized point was specified;
- For Onion Creek/Northport, a minimum of 60m between each randomized point was specified;
- For South of the Canadian Border, a minimum of 45m between each randomized point was specified;
- And for Deadman's Eddy, a minimum of 75 between each randomized point was specified.

The above minimum spacing distances were intended to create a variety of coring locations, such that the randomized locations were not clustered in any particular area. The measurements were adjusted relative to the size of the depositional areas.

Each point was labeled according to the labeling system indicated in the QAPP.

Conclusion

Attached are 5 figures that include the randomly generated sampling locations that are the result of the process described in this memo. Also attached is a Microsoft Excel spreadsheet with the GPS coordinates (latitude and longitude) for each of the coring locations, generated using ArcMap geometry associated with each coring location point.

Name	Latitude	Longitude
PCL-BSB-1	48.972482	-117.650624
PCL-BSB-2	48.972708	-117.649829
PCL-BSB-3	48.972606	-117.649010
PCL-BSB-4	48.973129	-117.648741
PCL-BSB-5	48.973062	-117.647756
PCL-BSB-6	48.973468	-117.647109
PCL-BSB-7	48.970562	-117.652032
PCL-BSB-8	48.971057	-117.651386
PCL-BSB-9	48.970428	-117.651006
PCL-BSB-10	48.971386	-117.650706
PCL-BSB-11	48.970607	-117.650135
PCL-BSB-12	48.971182	-117.649882
PCL-BSB-13	48.971687	-117.649466
PCL-BSB-14	48.970711	-117.649245
PCL-BSB-15	48.971263	-117.648950
PCL-BSB-16	48.971676	-117.647590
PCL-BSB-17	48.971090	-117.647532
PCL-BSB-18	48.971455	-117.646839
PCL-BSB-19	48.972077	-117.645636
PCL-BSB-20	48.972190	-117.644816
PCL-BSB-21	48.971827	-117.644160
PCL-BSB-22	48.972168	-117.643306
PCL-BSB-23	48.972636	-117.642737
PCL-BSB-24	48.973167	-117.642219
PCL-OC-1	48.885768	-117.837204
PCL-OC-2	48.887272	-117.835590
PCL-OC-3	48.886623	-117.835891
PCL-OC-4	48.884831	-117.835955
PCL-OC-5	48.885745	-117.835246
PCL-OC-6	48.886431	-117.834767
PCL-OC-7	48.901414	-117.807066
PCL-OC-8	48.903445	-117.805722
PCL-OC-9	48.902427	-117.806036
PCL-OC-10	48.901614	-117.805853
PCL-OC-11	48.900450	-117.805688
PCL-OC-12	48.900065	-117.804957
PCL-OC-13	48.900555	-117.804490
PCL-OC-14	48.900283	-117.803771
PCL-OC-15	48.904359	-117.804356
PCL-OC-16	48.902723	-117.804906
PCL-OC-17	48.902284	-117.804169
PCL-OC-18	48.902954	-117.803062
PCL-SCB-1	48.995389	-117.640332
PCL-SCB-2	48.994859	-117.639978
PCL-SCB-3	48.996266	-117.639705

Name	Latitude	Longitude
PCL-SCB-4	48.995827	-117.639180
PCL-SCB-5	48.995326	-117.638776
PCL-SCB-6	48.996822	-117.639644
PCL-SCB-7	48.996581	-117.639133
PCL-SCB-8	48.996825	-117.638626
PCL-SCB-9	48.997030	-117.638050
PCL-SCB-10	48.996108	-117.637500
PCL-SCB-11	48.996613	-117.637422
PCL-SCB-12	48.997721	-117.637855
PCL-SCB-13	48.998647	-117.636356
PCL-SCB-14	48.998995	-117.634852
PCL-SCB-15	49.000069	-117.634784
PCL-SCB-16	48.997904	-117.635202
PCL-SCB-17	48.997602	-117.634647
PCL-SCB-18	48.998282	-117.634393
PCL-SCB-19	48.997711	-117.633872
PCL-SCB-20	48.998250	-117.633501
PCL-SCB-21	48.998981	-117.633632
PCL-DE-1	48.937958	-117.750950
PCL-DE-2	48.938356	-117.749786
PCL-DE-3	48.937878	-117.748992
PCL-DE-4	48.938891	-117.748203
PCL-DE-5	48.937587	-117.748063
PCL-DE-6	48.938268	-117.747743
PCL-DE-7	48.940840	-117.737818
PCL-DE-8	48.941224	-117.736472
PCL-DE-9	48.940422	-117.736546
PCL-DE-10	48.940328	-117.735221
PCL-DE-11	48.941828	-117.734658
PCL-DE-12	48.940879	-117.734226
PCL-DE-13	48.939456	-117.734010
PCL-DE-14	48.941523	-117.733254
PCL-DE-15	48.940999	-117.731627
PCL-DE-16	48.933930	-117.727702
PCL-DE-17	48.934803	-117.727333
PCL-DE-18	48.935064	-117.723753
PCL-DE-19	48.936277	-117.722868
PCL-DE-20	48.936366	-117.721759
PCL-DE-21	48.937980	-117.721127
PCL-DE-22	48.938022	-117.720049
PCL-DE-23	48.939996	-117.718971
PCL-DE-24	48.940756	-117.718055
PCL-DE-25	48.946781	-117.717969
PCL-DE-26	48.944863	-117.717668
PCL-DE-27	48.946161	-117.717183

Name	Latitude	Longitude
PCL-DE-28	48.945411	-117.716609
PCL-DE-29	48.945776	-117.715493
PCL-DE-30	48.947072	-117.715130

ENVIRONMENT INTERNATIONAL LTD.

Date: April 23, 2010

From: Sarah Halpert, Analyst, Environment International Ltd.

MEMO TO FILE

RE: UCR Litigation Coring Project – Generation of Random Core Sample Locations

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Methodology

Depositional areas were determined through field observation by EI and representatives of the Washington Department of Ecology and the CCT, and then further refined with the help of a coring subcontractor. These areas were mapped using ArcMap (GIS). Five figures were generated based upon geographical area and were labeled as such: South of the Border; Black Sand Beach; Deadman's Eddy; and Northport/Onion Creek.

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5505 34th Ave NE
Seattle, WA 98105
Tel: 206.525.3362 • Fax: 206.525.0869
www.eiltd.net

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PCL-BSB-6	48.973468	-117.647109
PCL-BSB-7	48.970562	-117.652032
PCL-BSB-8	48.971057	-117.651386
PCL-BSB-9	48.970428	-117.651006
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PCL-OC-3	48.886623	-117.835891
PCL-OC-4	48.884831	-117.835955
PCL-OC-5	48.885745	-117.835246
PCL-OC-6	48.886431	-117.834767
PCL-OC-7	48.901414	-117.807066
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PCL-OC-18	48.902954	-117.803062
PCL-SCB-1	48.995389	-117.640332
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PCL-SCB-3	48.996266	-117.639705

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PCL-SCB-7	48.996581	-117.639133
PCL-SCB-8	48.996825	-117.638626
PCL-SCB-9	48.997030	-117.638050
PCL-SCB-10	48.996108	-117.637500
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PCL-SCB-17	48.997602	-117.634647
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PCL-SCB-19	48.997711	-117.633872
PCL-SCB-20	48.998250	-117.633501
PCL-SCB-21	48.998981	-117.633632
PCL-DE-1	48.937958	-117.750950
PCL-DE-2	48.938356	-117.749786
PCL-DE-3	48.937878	-117.748992
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PCL-DE-10	48.940328	-117.735221
PCL-DE-11	48.941828	-117.734658
PCL-DE-12	48.940879	-117.734226
PCL-DE-13	48.939456	-117.734010
PCL-DE-14	48.941523	-117.733254
PCL-DE-15	48.940999	-117.731627
PCL-DE-16	48.933930	-117.727702
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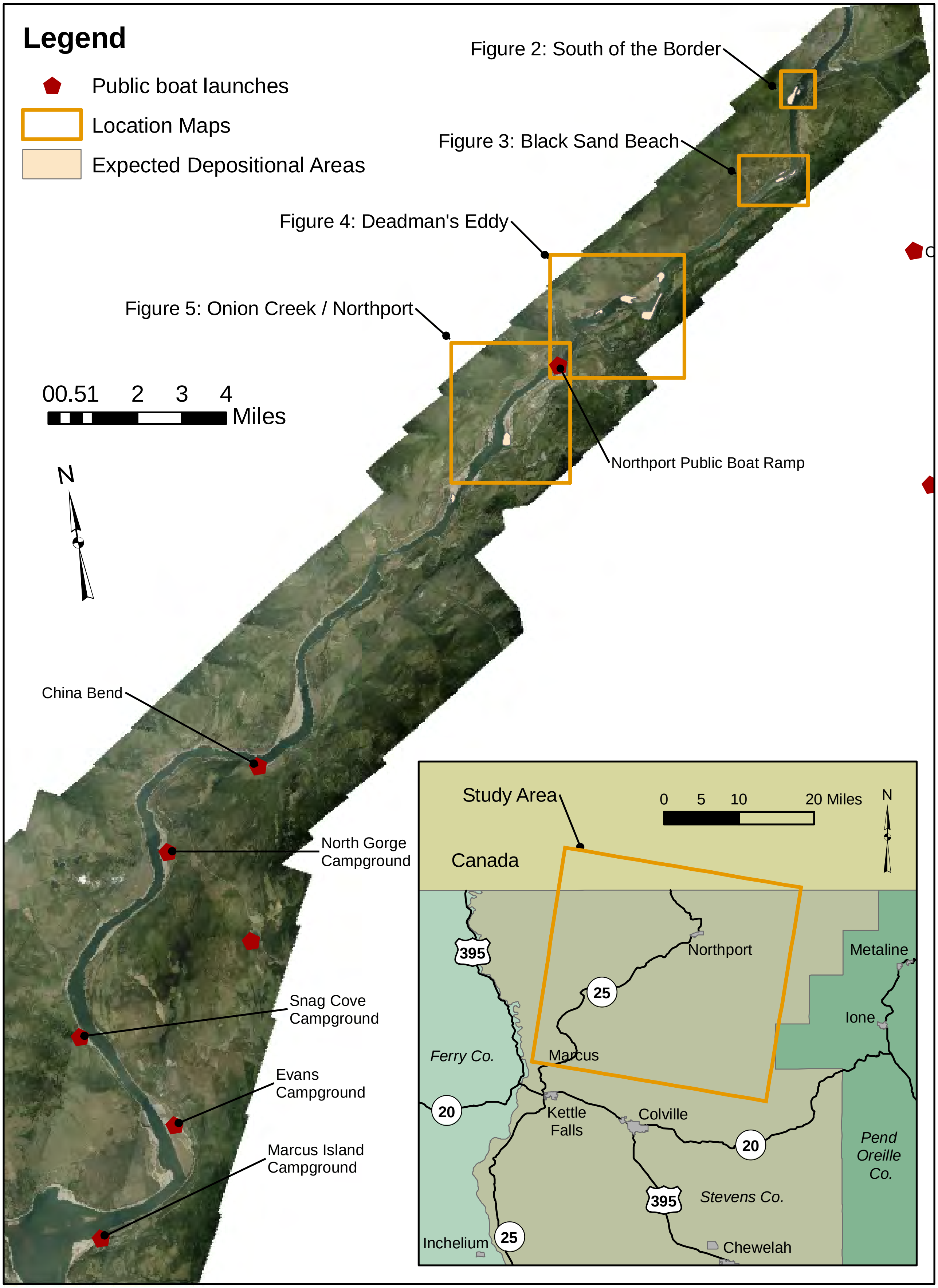
PCL-DE-21	48.937980	-117.721127
PCL-DE-22	48.938022	-117.720049
PCL-DE-23	48.939996	-117.718971
PCL-DE-24	48.940756	-117.718055
PCL-DE-25	48.946781	-117.717969
PCL-DE-26	48.944863	-117.717668
PCL-DE-27	48.946161	-117.717183

Name	Latitude	Longitude
PCL-DE-28	48.945411	-117.716609
PCL-DE-29	48.945776	-117.715493
PCL-DE-30	48.947072	-117.715130

Target Coring Locations — Figure 5-1: Site Map



Environment International Ltd [ces] Coordinate System: NAD 1983 UTM Zone 11N 22 April 2010

Target Coring Locations

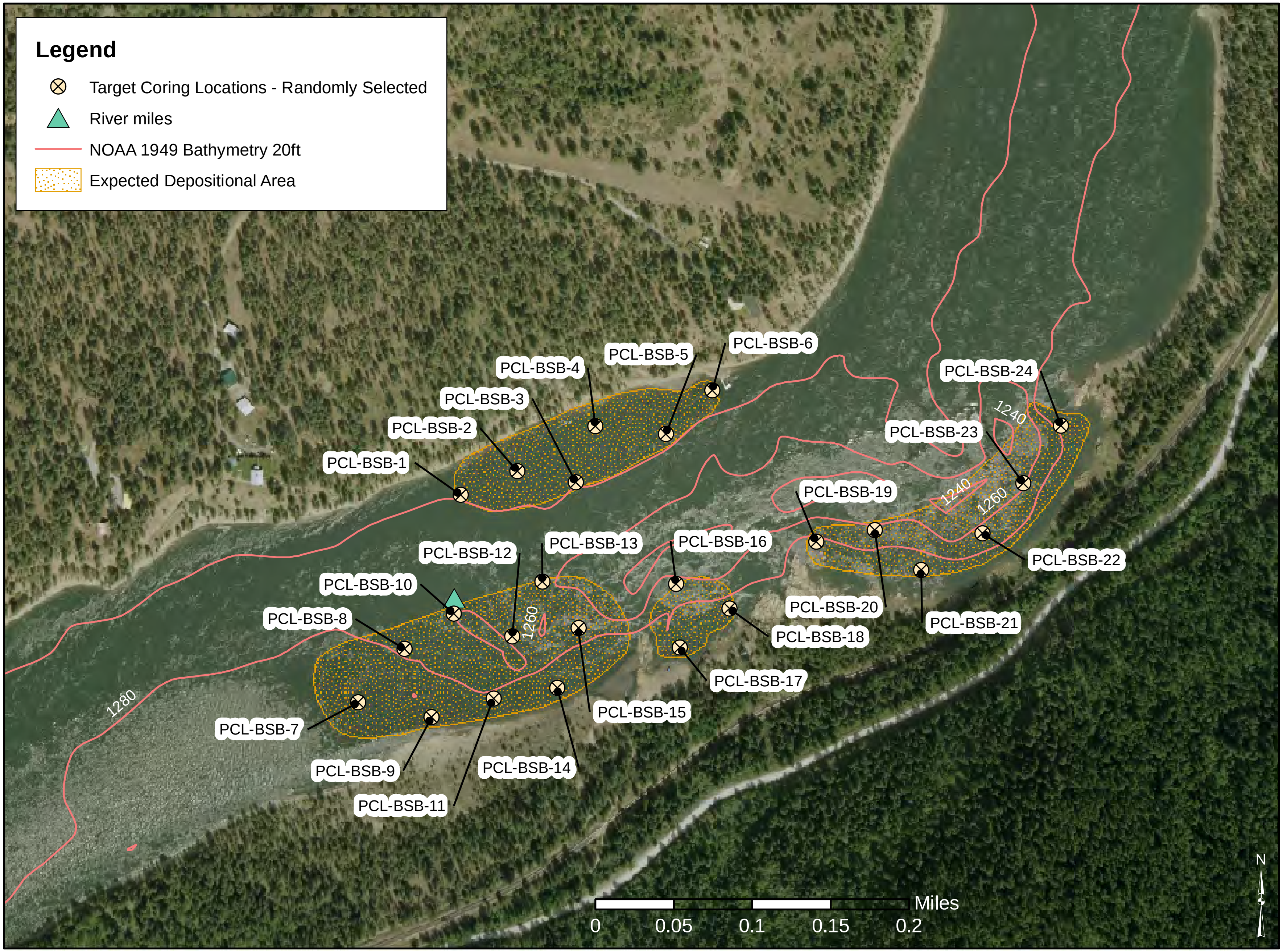
Figure 5-2: South of the Border

Environment International Ltd [ces] Coordinate System: NAD 1983 UTM Zone 11N 22 April 2010

PRIVELEGED AND CONFIDENTIAL ATTORNEY WORK PRODUCT

Target Coring Locations

Figure 5-3: Black Sand Beach

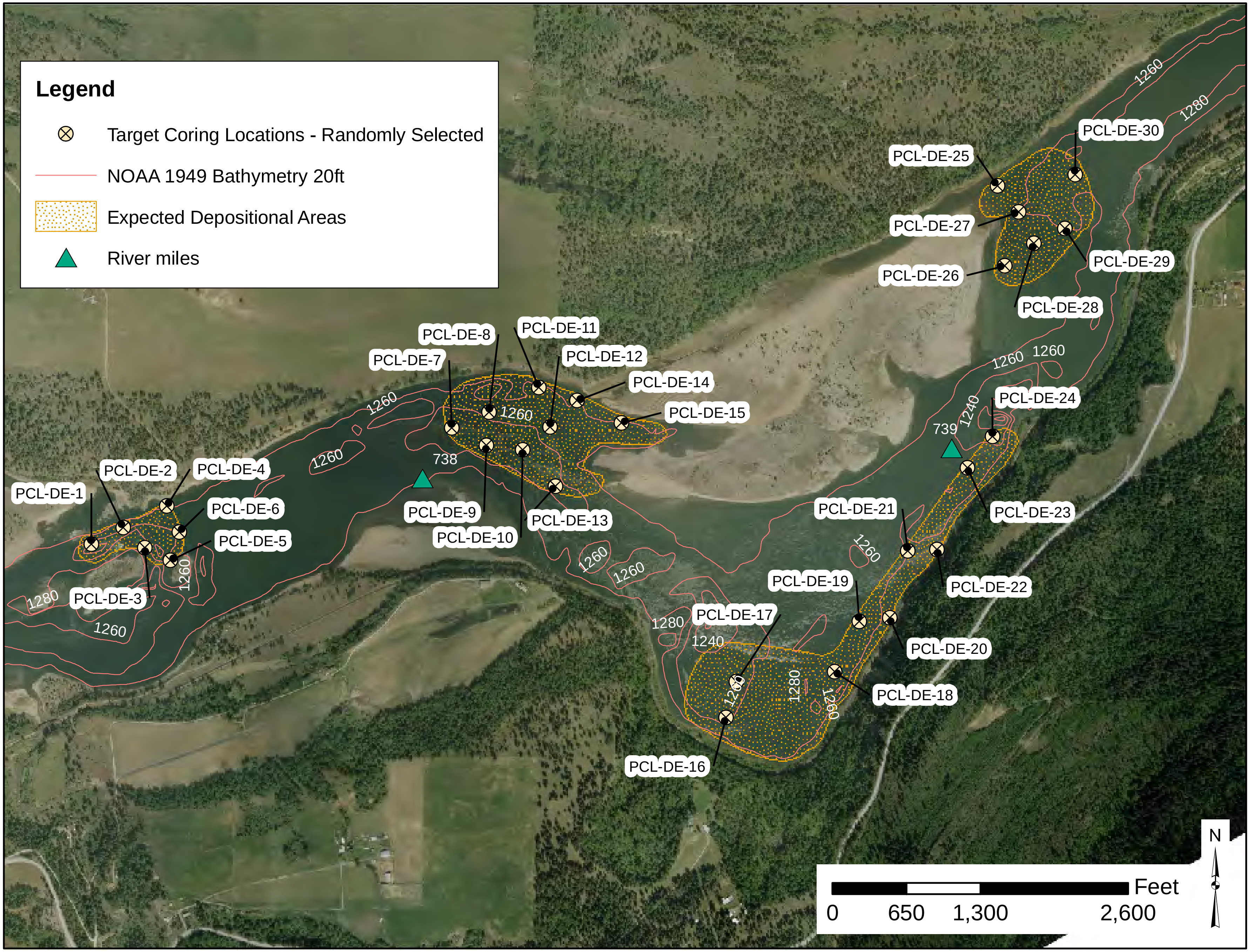


Environment International Ltd [ces] Coordinate System: NAD 1983 UTM Zone 11N 22 April 2010

PRIVELEGED AND CONFIDENTIAL ATTORNEY WORK PRODUCT

Target Coring Locations

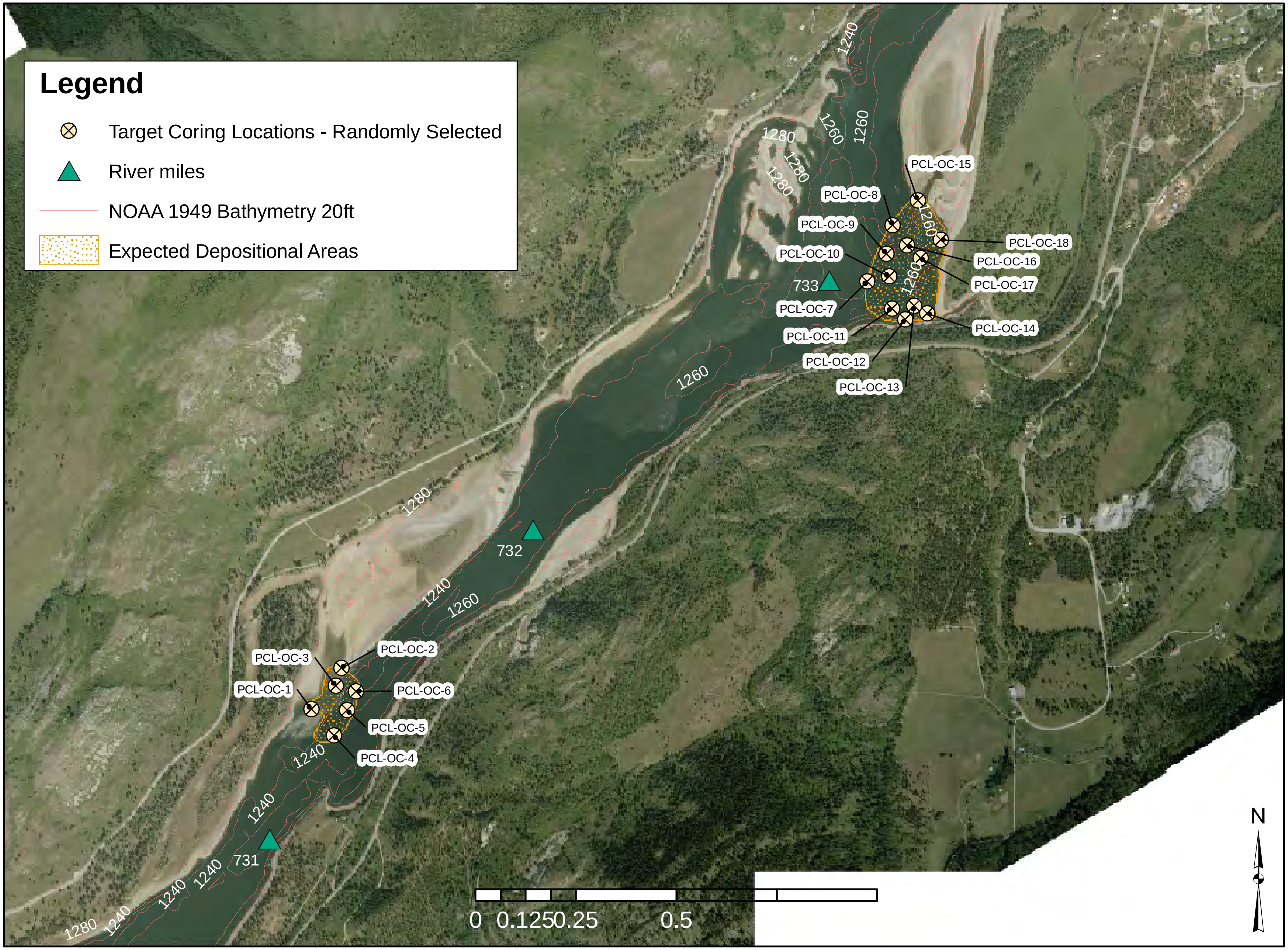
Figure 5-4: Deadman's Eddy



Environment International Ltd [ces] Coordinate System: NAD 1983 UTM Zone 11N 22 April 2010

Target Coring Locations

Figure 5-5: Onion Creek / Northport



Environment International Ltd [ces] Coordinate System: NAD 1983 UTM Zone 11N 22 April 2010



2010 Upper Columbia River Sediment Assessment
Sampling and Quality Assurance Plan

Appendix C
Field Forms

Environment International Ltd.
5505 34th Avenue, NE – Seattle, WA – 98105
Ph: 206.525.3362 Fax:206.525.0869
www.eiltd.net; staff@eiltd.net

Environment International Ltd.	Daily Drilling Report	**Date** **Boring Nos.** **Client** **Project Name** **Project No.**
Date:	**Boring Complete? Yes No**	**Well Complete? Yes No**
Contractor		**Hole Diameter**
Drill Method		**Casing Size**
Type of Rig		**Grout Method**
Geologist		**Boring Depth**
Development Method:		

Start Time	**End Time**
Start Depth	**End Depth**

Summary of Daily Events

Description of Materials Used		**Other Materials**
	Length of Riser (ft)	
	Length of Screen (ft)	
	Bentonite Powder (No. of Bags)	
	Bentonite Pellets (No. of Buckets)	
	Liquid Bentonite (No. of Gallons)	
	Portland Cement (No. of Bags)	
	Type of Casing	

Comments:

Signature	**Date**

Environment International Ltd.

Field Instrument Calibration Record

Date:	
Client:	
Project:	
Project No.:	

MULTI-PARAMETER WATER QUALITY METER						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:					**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
pH			± 0.3			
Conductivity			± 10%			
ORP			± 10 mV			
DO			± 0.50 mg/L of saturation			
Zero DO*			< 1.0 mg/L			
Temperature*			± 2.0 °C			
Other*						
*If required						
TURBIDITY METER						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:					**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
Low Standard			± 0.3 NTU			
High Standard			± 10%			
PHOTOIONIZATION DETECTOR						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:		**Span Gas:**			**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
Background			< 2 ppm			
Span Gas			± 10%			
XRF ANALYZER						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:		**Metals:**			**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
OTHER:						
Meter Type/Model:					**Unit ID No.:**	
Initial Check:					**End of Day Check:**	
Parameter	**Standard Value**	**Meter Value**	**Acceptance Criteria**	**Criteria Met? (Y/N)**	**Meter Value**	**Criteria Met? (Y/N)**
NOTES:						
Calibrator's Signature (initial):					**Date/Time:**	
Calibrator's Signature (end of day):					**Date/Time:**	

ENVIRONMENT INTERNATIONAL LTD.

Investigation-Derived Waste Log

Client:
Project:
Project No.:
Date:

Drum No.	Waste Type	Drum Type	Drum Size (gal)	Drum Condition	Start Date	End Date	Approximate Volume
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E
	AW / SW / PW	SS / PE	55 / __	G / F / P			F / 75% / 50% / 25% / E

Notes:

Signature: **Date:**

Printed Name: **Position:**

Sediment Coring Log

ENVIRONMENT INTERNATIONAL LTD.	**Sediment Coring Log**	**Date:**
		Core No.:
		Client:
		Project Name:
		Project No.:
Date:	**Contractor:**	**Location Diagram:**
Borehole Diameter:	**Drillers:**	
Boring Depth:	**Rig Type:**	
River Depth:	**Drill Method:**	
Refusal Depth?	**Sampling Methods:**	
Geologist:		

Scale in Feet	**Sample** Time, Sample ID, Type	**Recovery**	**Penetration**	**Field Screening Results**	**GEOLOGIC DESCRIPTION** Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description

Notes:
Page 1 of ___

XRF Quality Assurance/Instrument Performance Form

MISSOURI DEPARTMENT OF HEALTH AND SENIOR SERVICES
ENVIRONMENTAL PUBLIC HEALTH

PAGE______OF______

CALIBRATION CHECK

JOB NO.

XRF Analyzer Calibration Check

If an XRF analyzer is used to obtain environmental sample results in the course of the Assessment, the instrument must be calibrated prior to use and as directed by the manufacturer. Calibration checks should be made at the beginning of each job, every four hours during continuous operation, at the end of every job, and each time the instrument is turned on. If specified by the manufacturer, the XRF analyzer should be calibrated if there is a significant change in temperature in work environments as soon as the temperature of the instrument has had an opportunity to adjust.

Zero reading: ____________ Acceptable Range: 0.0 +/- ___________

Acceptable Control Range: _______________________

Reason for Check	Standard Used	XRF Reading	Accept or Reject	Corrective Action Number

Reason for Check

I.C. = Initial Calibration
Temp = Work Environment Temperature Change
4/Hour = Subsequent four hour check
T.O. = Resumed Assessment After Instrument was Turned Off
F.C. = Final Calibration

Corrective Action Number

1. Cleaned Instrument Face
2. Cleaned Zero Block/ Calibration Film
3. Manual Zero/ calibration
4. Consulted Manufacturer
5. Sent instrument to Manufacturer for service

2010 UPPER COLUMBIA RIVER SEDIMENT ASSESSMENT
SAMPLING AND QUALITY ASSURANCE PLAN

Appendix D
US EPA Method 6200
&
Field Portable XRF Guide

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US EPA Method 6200 and Field Portable X-RAY Fluorescence

This Guide is an overview on x-ray fluorescence (XRF) analysis of soils and sediments. Advances in digital electronics and semiconductor technology have made it possible to use portable XRF analyzers for field analysis of many sample types including soils and sediments. These notes will cover the following:

1. Introduction to XRF, basic theory of operation
2. EPA Method 6200 (rev. 2007)
3. Field use of XRF analyzers for soil
    a. In-situ testing
    b. Prepared sample (or ex-situ) testing
4. Basic quality assurance and sample preparation strategies

1. Introduction to XRF

Basic Atomic Structure

A model of an atom is shown in Figure 1. In this model, the atom consists of a nucleus occupied by protons and neutrons. Surrounding this nucleus are negatively charged particles called electrons. This is known as the Bohr model of the atom, because it assumes the electrons orbit around the nucleus of the atom in fixed orbits, much like the planets orbit the sun. While this model is not exactly correct, it is perfectly satisfactory to explain most of the principles encountered in x-ray fluorescence analysis. For an uncharged atom, the number of electrons equals the number of protons. For each element, the electrons are orbiting the nucleus at different energy levels.

These "orbits" or "shells" each contain a specific number of electrons. The shells closest to the nucleus get filled first and the shells get filled from the inner-most to the outer-most shell. Shells are named with the inner-most being the K-shell, then L-shell, etc., alphabetically named. The K-shell electrons can be thought of as having the lowest level of stored energy. The further out the electron shells are, the higher the energy level they have stored (the L-shell electrons have more stored energy than the K-shell electrons, the M shell electrons have more stored than the L shell, etc.).

Figure 1. Bohr atomic model with K, L & M shells.

How does EDXRF work?

Each of the elements present in a sample produces a unique set of characteristic x-rays that is a "fingerprint" for that specific element. Energy Dispersive XRF (EDXRF) analyzers determine the chemistry of a sample by measuring the spectrum of the characteristic x-rays emitted by the different elements in the sample when it is illuminated by x-rays. These x-rays are emitted either from a miniaturized x-ray tube, or from a small, sealed capsule of radioactive material.

A fluorescent x-ray is created when an x-ray of sufficient energy strikes an atom in the sample, dislodging an electron from one of the atom's inner orbital shells. The atom regains stability, filling the vacancy left in the inner orbital shell with an electron from one of the atom's higher energy orbital shells. The electron drops to the lower energy state by releasing a fluorescent x-ray, and the energy of this x-ray is equal to the specific difference in energy between two quantum states of the electron.

When a sample is measured using XRF, each element present in the sample emits its own unique fluorescent x-ray energy spectrum. By simultaneously measuring the fluorescent x-rays emitted by the different elements in the sample, handheld Thermo Scientific NITON XRF® analyzers rapidly determine those elements present in the sample and their relative concentrations – in other words, the elemental chemistry of the sample. For samples with known ranges of chemical composition, such as common grades of metal alloys, a Thermo Scientific NITON analyzer also identifies most sample types by name, typically in seconds.

Thirty or more elements may be analyzed simultaneously by measuring the characteristic fluorescence x-rays emitted by a sample. Our analyzers can quantify elements ranging from magnesium (element 12) through uranium (element 92), measuring x-ray energies from 1.25 keV up to 100 keV. These instruments also measure the elastic (Raleigh) and inelastic (Compton) scatter x-rays emitted by the sample during each measurement to determine, among other things, the approximate density and percentage of the light elements in the sample.

Light element analysis

It is important to note that, except with special hardware, light elements cannot be measured directly with handheld XRF analyzers, simply because x-rays with energies below 2 eV – including the characteristic x-rays of all elements lighter than sulfur (element 16) – are largely absorbed in air within a short distance. For this reason, light element XRF analysis is best performed either with a helium (He) gas purge or in a vacuum chamber in a laboratory environment. As the use of a vacuum with portable XRF is highly impractical (even minor punctures to the thin window used to seal the instrument from the environment will draw dust, debris and metal filings into the instrument), then an He purge unit is the most appropriate solution for light element analysis (Mg, Al, Si, P, S, Cl).

Sample Analysis Techniques

Handheld Thermo Scientific NITON XRF analyzers automatically compensate for many effects that would otherwise bias or distort sample analyses. These effects include:

- Geometric effects caused by the sample's shape, surface texture, thickness and density
- Spectral interferences
- Sample matrix effects including critical absorption of the characteristic x-rays of one element by other elements in the sample, and secondary and tertiary x-ray excitation of one or more elements by other elements in the sample.

By automatically adjusting for these effects, XRF analyzers are able to determine the chemistries of samples of widely different sample compositions, typically in seconds, without any requirement for instrument users to input empirical, sample-specific calibrations. In typical samples containing many elements, the elements may range in concentrations from high percent levels down to parts per million (ppm).

In sample matrices such as typical soil samples, metal and precious metal alloys, it is necessary to measure both lighter elements that emit lower energy x-rays (that are easily absorbed) as well as heavier elements that emit much higher energy x-rays (that penetrate comparatively long distances through the sample).

Figure 2. --- This shows the overall XRF process. High energy X-rays are directed at the sample and an atom ejects one of its low energy inner-shell electrons. That vacancy is immediately filled by a high-energy electron from an outer shell. The energy difference between the two is released in the form of lower-energy X-ray radiation, which enters the detector. The resultant electrical signal is sent through the digital signal processor and on to the CPU. Results are shown on the display and stored for downloading.

Compensation must be made for a variety of geometric effects. In these multi-element samples, it is also possible that one or more elements present act as critical absorbers. The effects of absorption, enhancement, and secondary fluorescence vary widely depending on the chemistry of the sample matrix, but in a sample with many elements in substantial concentrations, multiple absorptions, secondary and also tertiary x-ray fluorescence effects are typically present.

Our analyzers compensate for all of these effects in order to determine the actual concentration of elements in multi-element samples from the modified fluorescence x-ray spectrum that these samples produce in the XRF analyzer. To do this, we employ multiple methods to determine the true composition of these complex samples from their x-ray spectra.
These include:

- Fundamental Parameters (FP) analysis
- Compton Normalization (CN)
- Spectral matching (“fingerprint”) empirical calibrations
- User-definable empirical calibrations
- Various combinations of these techniques

Compton Normalization

These XRF techniques provide the best results for a wide range of environmental testing and related applications, particularly when it is necessary to measure sub-percent concentrations of heavy elements in samples composed mainly of light elements. In environmental testing projects, it is often highly desirable to be able to quickly measure low concentration levels of all of the Resource Conservation and Recovery Act (RCRA) heavy metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se,etc) on site and in real time. Using Compton Normalization, Thermo Scientific NITON XRF analyzers can measure concentrations of many heavy metals.

From the inside out, these instruments were designed to incorporate 80 MHz real-time digital signal processing, and dual state-of-the-art embedded processors for computation, data storage, communication and other functions. The very best in technology has been engineered into the Thermo Scientific NITON XL3t and XL3p Series Analyzers to provide users with high-performance today, scalability for tomorrow, and a robust foundation to develop future features and applications.

Turning the x-ray fluorescence into something useful

During testing, all the various metals within a soil sample are fluorescing. The XRF instrument must use this fluorescence to identify what elements are present and their concentrations in the sample. XRF analyzers use x-ray detectors, electronics, and on-board microprocessors to quantify various levels of elements in a sample. Remember, each element produces a fluorescence x-ray at a unique frequency (or energy). Detectors respond differently to different frequencies of x-rays. The electronics connected to the detector use this differing response to determine the frequency of every x-ray that enters the detector, and how many x-rays at each frequency strike the detector. By determining the frequency, the XRF device knows what element emitted the x-ray since elements all have unique x-ray emission frequencies. By determining the total number of x-rays at a particular frequency during a given amount of time, the device can determine the concentration of that particular element in the sample.

2. Regulatory Status - EPA Method 6200

An EPA Reference Method, incorporated into SW486 under RCRA, is available for field portable XRF analysis of soils and sediments: **Method 6200** ***"Field Portable XRF Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment."***

Features of this method:

- It is a field screening method for analysis of in-situ or bagged samples. Developers of the method cite field studies indicating that variability in contaminate concentrations over small distances greatly exceeds instrument measurement variability. Thus, the method is used to thoroughly characterize a site. A large number of screening-level measurements provide a better characterization than a small number of measurements produced by sample removal and analytical analysis.
- The method provides basic quality assurance methods, including calibration verification, determination of instrument precision, accuracy and limit of detection.
- The method recognizes the some XRF instruments do not require site-specific calibrations by the operator, that is, the factory calibration provides appropriate data quality.
- The method recommends that a minimum of 5% of all samples tested by XRF be confirmed by an outside laboratory using a total-digestion EPA analytical reference method.
- The method provides techniques for sample preparation (see section 11 of Method 6200). Refer to section 4 of this guide or the XRF User Manual for more details.

Applicable Analytes.

EPA Method 6200 (rev. 2007) is applicable to the in situ and intrusive analysis of the 26 analytes listed below for soil and sediment samples. Some common elements are not listed in this method because they are considered "light" elements that cannot be detected by field portable x-ray fluorescence (FPXRF). These light elements are: lithium, beryllium, sodium, magnesium, aluminum, silicon, and phosphorus. Most of the analytes listed below are of environmental concern, while a few others have interference effects or change the elemental composition of the matrix, affecting quantitation of the analytes of interest. Generally elements of atomic number 16 or greater can be detected and quantitated by FPXRF.

The following RCRA analytes have been determined by Method 6200:

ANALYTES	CAS Registry No
Antimony (Sb)	7440-36-0
Arsenic (As)	7440-38-0
Barium (Ba)	7440-39-3
Cadmium (Cd)	7440-43-9
Chromium (Cr)	7440-47-3
Cobalt (Co)	7440-48-4
Copper (Cu)	7440-50-8
Lead (Pb)	7439-92-1
Mercury (Hg)	7439-97-6
Nickel (Ni)	7440-02-0
Selenium (Se)	7782-49-2
Silver (Ag)	7440-22-4
Thallium (Tl)	7440-28-0
Tin (Sn)	7440-31-5
Vanadium (V)	7440-62-2
Zinc (Zn)	7440-66-6

The following non-RCRA elements have been determined by Method 6200:

ANALYTES	CAS Registry No
Calcium (Ca)	7440-70-2
Iron (Fe)	7439-89-6
Manganese (Mn)	7439-96-5
Molybdenum (Mo)	7439-93-7
Potassium (K)	7440-09-7
Rubidium (Rb)	7440-17-7
Strontium (Sr)	7440-24-6
Thorium (Th)	7440-29-1
Titanium (Ti)	7440-32-6
Zirconium (Zr)	7440-67-7

3. Field Use of XRF Analyzers for Soil & Sediment

Field portable XRF is generally used in three ways to test for metals in soil:
- In-situ soil testing
- Bagged soil sample testing
- Testing prepared soil samples

In general, in-situ and bagged sample testing are considered field screening methods. In-situ testing is still a very valuable technique because it is a very rapid testing method and screening methods can generate a great deal of data very quickly. Common usage and benefits of in-situ testing are provided on the next page, in *Advantages of Field Screening with XRF*.

For in situ analysis, remove any large or non-representative debris from the soil surface before analysis. This debris includes rocks, pebbles, leaves, vegetation, roots, and concrete. Also, the soil surface must be as smooth as possible so that the probe window will have good contact with the surface. This may require some leveling of the surface with a stainless-steel trowel.

To achieve analytical-grade data quality operators usually (but not always) must prepare the sample by sieving and perhaps grinding it. It is important to understand your data quality objectives (DQO) in order to determine the appropriate mix of field screening versus prepared sample testing. Illustrations of in-situ and prepared sample testing are shown in Figures 3 and 4.

Figure 3. In-situ testing of soil by placing XRF directly onto the ground. This type of testing is generally screening level data quality.

In-situ testing usually only provides screening level data quality. This is because analytical testing always requires a uniform, homogeneous sample matrix. A laboratory

Figure 4. Prepared sample testing ex situ using XRF. With proper sample homogenization, analytical grade testing data is usually achieved.

achieves this by digesting the sample into a hot acid before analysis. Testing directly on the ground does not ensure uniformity is met. Two methods often used to determine the data quality of in-situ testing, relative to well-prepared samples, are given in the section titled, *Basic Quality Assurance*.

Advantages of Field Screening with XRF

1. Focus sampling for laboratory analysis. Operators can profile a site with in-situ testing to determine a sampling plan. Sources of contamination can be located very quickly. Contamination boundaries can be established. Regions of low and high contamination can be delineated. Even main analytes of interest can be determined. Sample collection can then be concentrated in regions where contaminants are below or near clean-up levels. There is little need for off-site analysis of samples that the XRF reports as being above the clean-up levels. The cost reduction in off- site analysis easily justifies the investment for an the XRF analyzer.

2. Assure site meets clearance levels before contractors leave the site. By combining in-situ and prepared-sample XRF testing, you can eliminate failed clearance tests. Before samples are sent to the lab for final clearance, XRF operators can prepare and test the same samples on-site because XRF is non-destructive. Provided the XRF reports levels below clean-up standards, operators can be assured that the lab will concur. XRF operators should always use prepared samples for this analysis. This procedure virtually guarantees clearance criteria will be met. Benefits include:

- The contractors can leave the site earlier thus reducing costs.
- Pre-testing prepared samples with XRF ensures that the lab will report levels below clean-up criteria, which reduces cost since the contractor will not be called back to the site for additional clean-up.

3. Minimize volume of hazardous waste for treatment or disposal. Samples can be constantly evaluated on-site with field portable XRF to be sure only soils with contaminant levels in excess of clean-up levels are being treated or removed. Also, samples can be analyzed on-site to determine if waste will pass/fail TCLP testing. Soils that pass this procedure can be disposed at a non-hazardous waste landfill, generating enormous savings.

4. Basic Quality Assurance and Sample Preparation Strategies

This section is intended to provide basic quality assurance steps for XRF testing. This is mainly an overview. The Thermo Scientific NITON manual covers these topics in depth.

There are two important rules of thumb:

- Never report XRF results as being below clean-up levels based solely on in-situ XRF test results. Always perform some sample preparation to support these results. It is a good idea to confirm at least 5% of results via laboratory testing. In general in-situ XRF results will be lower than results from prepared samples, or from laboratory results. EPA Method 6200 recommends a minimum of 5% confirmatory analysis.

- Always evaluate the data quality of in-situ testing results using one of the methods described in detail below.

Quality assurance can be broken into three main areas:

- Proper verification of instrument operation
- Determining data quality of in-situ testing, and amount of sample preparation required to achieve analytical data quality.
- Proper sample preparation and testing for comparison to reference laboratory analysis.

Instrument verification. Quality assurance here constitutes testing of known standards to verify calibration; testing of blank standards to determine limits of detection and to check for sample cross-contamination or instrument contamination. EPA Method 6200 provides a detailed procedure.

Determining data quality of in-situ testing. For operators relying extensively on in-situ testing, it is extremely important to determine the data quality of this testing at a given site. XRF operators generally follow one of two procedures to determine data quality of in-situ testing:

- Direct comparison of in-situ test results to laboratory results to determine correlation curve
- For subset of samples, perform stepwise sample preparation to determine the effect of sample preparation on XRF testing results, and compare XRF test of fully prepared sample to laboratory analysis of the same sample

Method (1) for determining data quality of in-situ test results:

Direct comparison of in-situ testing to laboratory testing. Operators will pick a number of testing locations and take several in-situ XRF measurements in that location. Or a sample can be collected and bagged, with several XRF tests performed directly into the bag. A sample is then collected from the testing region and sent to a laboratory for homogenization and analysis, or the bagged sample is sent. The average result from this series of XRF tests is plotted against the laboratory result. A correlation curve is determined, and this curve is used to "correct" future in-situ testing results from the site in question. The correlation curve developed from this analysis incorporates bias in the XRF result due to the lack of sample preparation. In this way, the bias from in-situ testing is removed, on average, from the in-situ test results.

As an example, in-situ testing data for zinc in soil is shown in Figure 5. A direct comparison of the in-situ XRF results to the laboratory results reveals a consistent bias in the XRF data. Based on the least squares fit shown in the graph, the laboratory result is on average about 35% greater than the XRF result. This bias exists because the soil was not prepared before XRF testing, and particles like small pebbles in the soil surface "shielded" the zinc x-rays from reaching the detector. However, the comparison reveals a well-behaved correspondence between XRF and laboratory results. For this site, operators relied on extensive in-situ XRF analysis, but used the correction factor of 1.35 to correct in-situ results. This is a good example of using a direct comparison between initial in-situ XRF data and laboratory analysis to then gather a large amount of in-situ XRF data for off-line correction.

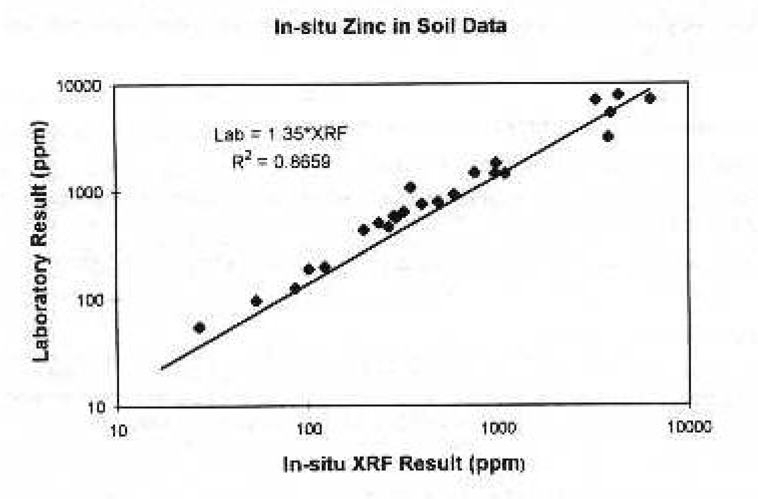


Figure 5. Comparison of in-situ XRF results for zinc in soil to laboratory results.

Method (2) for determining data quality of in-situ test results:

Stepwise sample preparation to determine data quality of in-situ testing. The purpose of this protocol is to determine the amount of sample preparation required to get quantitative, as opposed to screening level, data quality. The basic strategy is to perform increasingly rigorous levels of sample preparation, followed by XRF analysis each time, until the XRF result stops changing. This protocol is not intended for every sample, but rather for a small percentage of samples considered representative of the site. If the operator can demonstrate that quantitative data is achieved with little or no sample preparation, then the site characterization will be completed much more quickly but correctly.

For example, an operator may be able to demonstrate that the XRF result changes considerably when samples are passed through a 2 mm sieve, but that XRF results do NOT change appreciably upon finer sieving. In this case the operator can conclude that good XRF data is achievable with only 2 mm sieving. Sieving only to this level requires far less time than a more robust sample preparation. A protocol to determine the appropriate level of sample preparation is the following:

1. Delineate a region of soil approximately 10 cm x 10 cm.
2. Perform several in-situ tests in this area, or collect the top (approximately) 25 mm of soil from this region, bag the soil, test through the bag. In either case, average the results.

3. If you did not bag the in-situ test sample, collect the top (approximately) quarter-inch of soil from this region and sieve through the 2 mm sieve. Otherwise, sieve the bagged sample used for the in-situ test. Thoroughly mix the sieved sample, and place some of the sieved material into an XRF cup, and perform a test of this sample.

4. If the results of this prepared sample differ less than 20% with the average in situ result, this indicates the soil in this region is reasonably homogeneous. The data quality in this case is probably at the semi-quantitative level, rather than just screening data.

5. If the results differ by more than 20%, this indicates the soil is not very homogeneous, and there are serious particle size effects affecting your in-situ measurements.

6. In this case, sieve the sample through the 250 μm sieve. Mix this sample and place a sub-sample into an XRF cup for testing. If this result differs from the previous by less than 20% then this indicates that at a minimum the 2mm sieving is necessary to achieve higher data quality.

7. If this result differs by more than 20% from the sample sieved through 2 mm, and then particle size effects are still affecting the XRF result. In this case samples should be sieved through 125 μm to assure data quality at the quantitative level. In our experience, sieving through 125 μm is always adequate to ensure a quantitative data quality level.

Comparison of prepared XRF samples to laboratory analysis. As shown in Figure 6, comparison of XRF analysis of prepared soil samples generally yields very good agreement with laboratory analysis, provided proper sample preparation and handling is performed. The data shown is from a Thermo Scientific NITON 700 Series XRF analyzer used within the EPA's lead laboratory accreditation program (ELPAT). In this program participant laboratories (including field operators) receive quarterly samples for analysis. Results are reported and compared to reference laboratory results as a means for laboratories to gauge their measurement accuracy.

The data shown below are several rounds of analysis where Thermo Scientific NITON XRF operators participated in this program, to demonstrate that field portable XRF can routinely meet EPA lead laboratory accreditation requirements for prepared samples. It is important to note that samples sent to participant laboratories are homogenized and ground to 125 μm particle sizes or less.

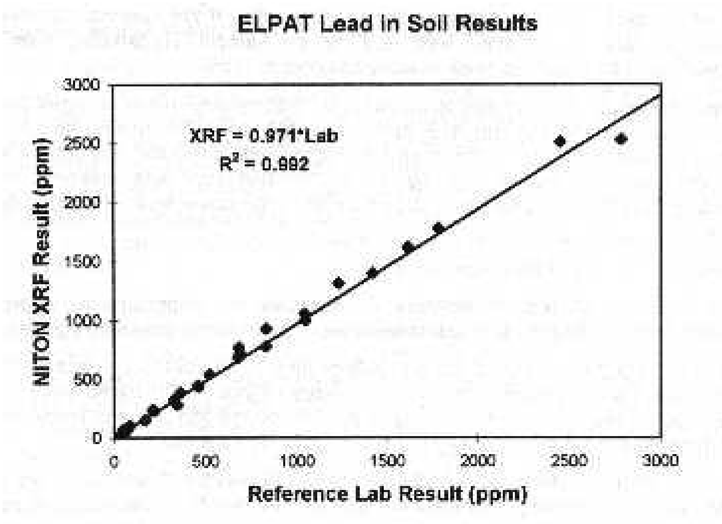


Figure 6. Comparison of XRF results to laboratory results for prepared soil samples.

Some XRF operators compare prepared XRF analysis to laboratory analysis to demonstrate the accuracy of XRF analysis. This is most often done to satisfy regulatory or client demands for defensible data. Please note this is different from the previous comparison of in-situ results to lab results. In that case it is expected that the results will differ, and the goal is to determine an overall correction factor. For prepared samples, the operator is attempting to make a direct comparison of the absolute XRF result to the laboratory result to show no further corrections to the data are required.

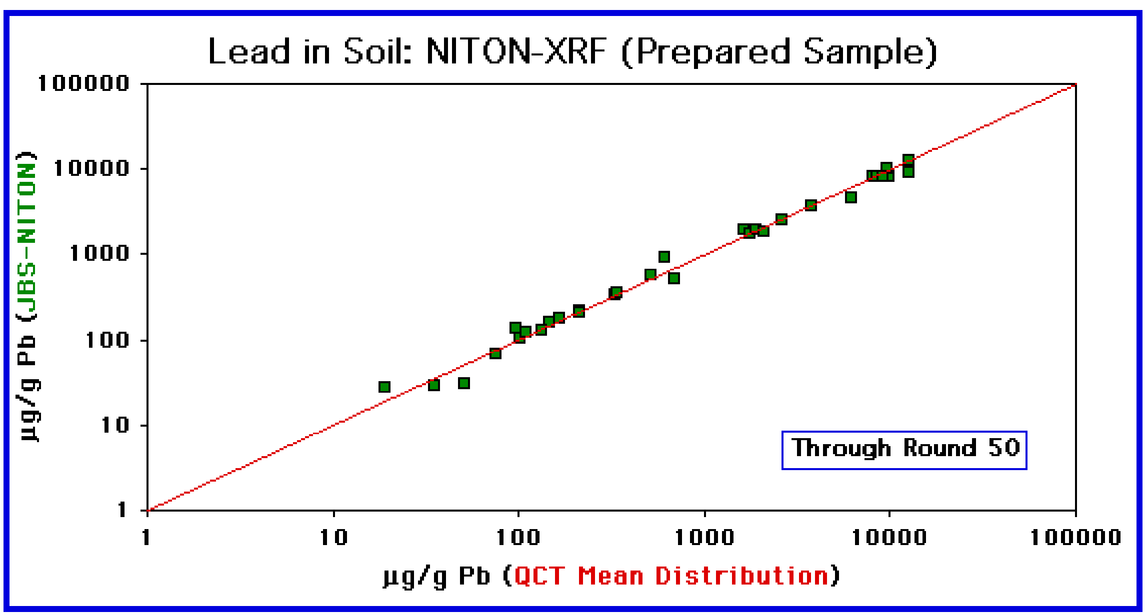


Figure 7 Comparison of XRF results to laboratory results for prepared samples (r2=0.997)

US EPA Method 6200 and Field Portable X-RAY Fluorescence

Data (fig. 7&8) are result of Quality Control Technology (QCT Australia) for Soils, Dusts and Sediments program, using samples collected from a range of "real life" environmental sources, which are then homogenized and tested.

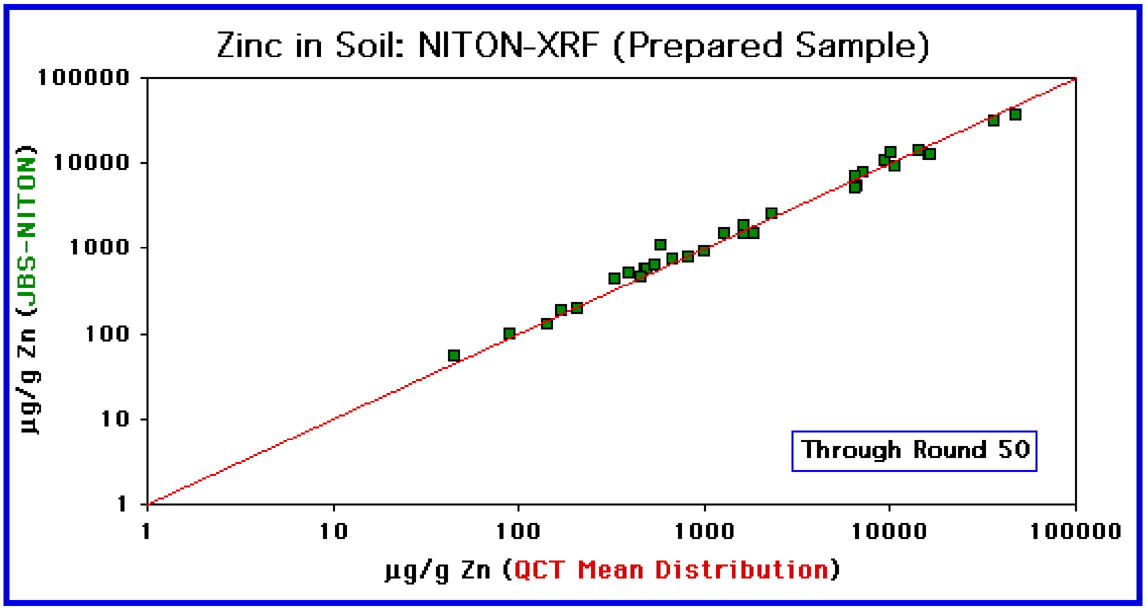


Figure 8. Comparison of XRF results to laboratory results for prepared samples (r2=0.994)

Sample preparation protocol

When comparing XRF results to laboratory performance always use thoroughly prepared samples before XRF testing. One possible sample preparation protocol is described in Figure 9. This protocol guarantees that the test results are being compared properly. Without such a preparation protocol there is no way to ensure that the samples being compared are identical. Use of this protocol for prepared-sample XRF analysis generally provides analytical-level data quality. (See also section 11 of Method 6200)

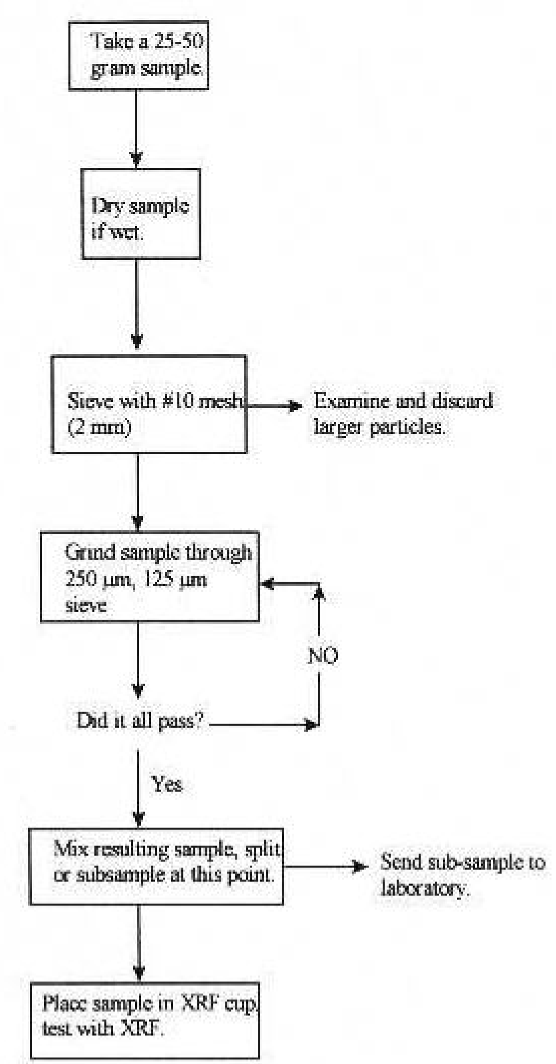
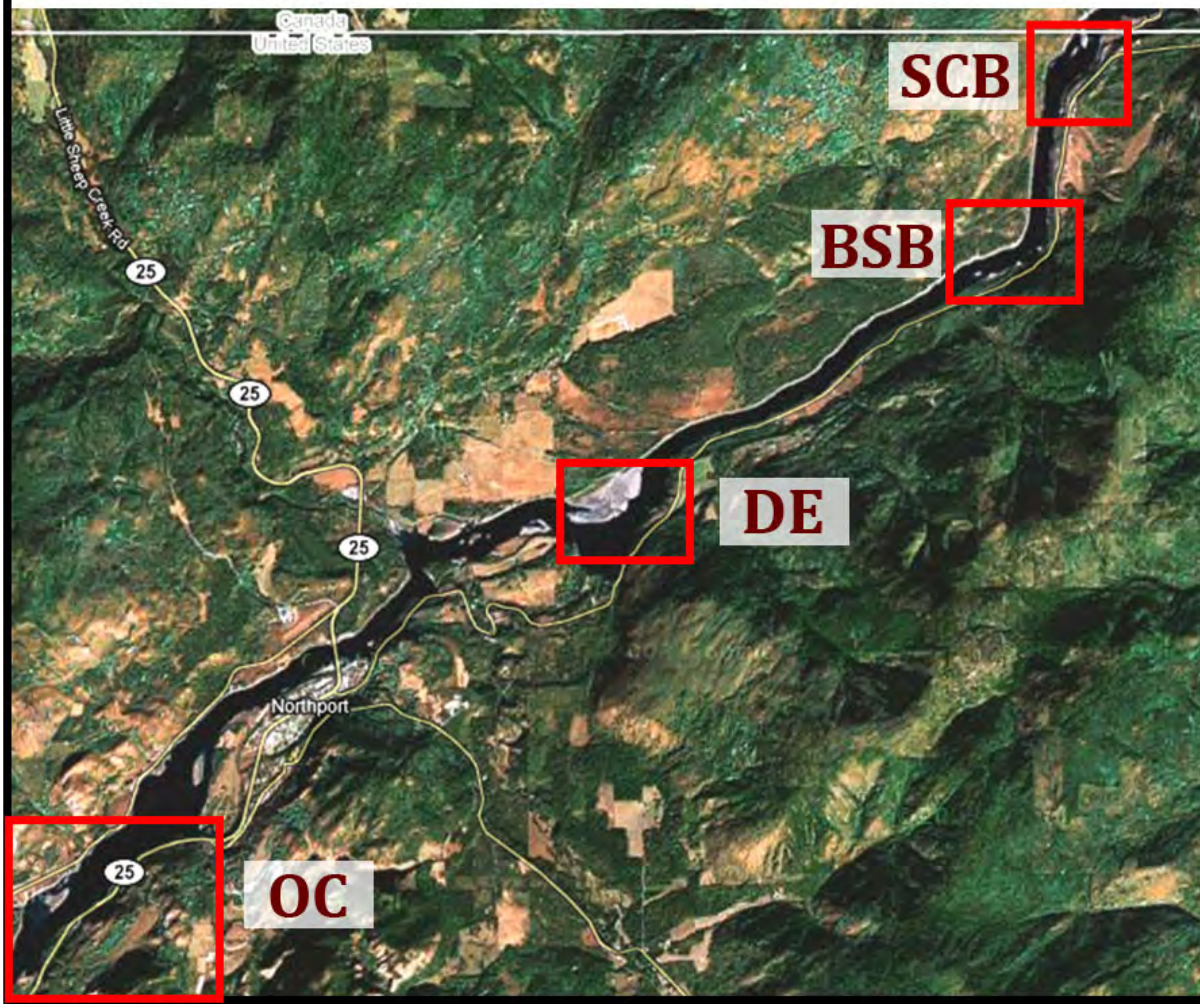


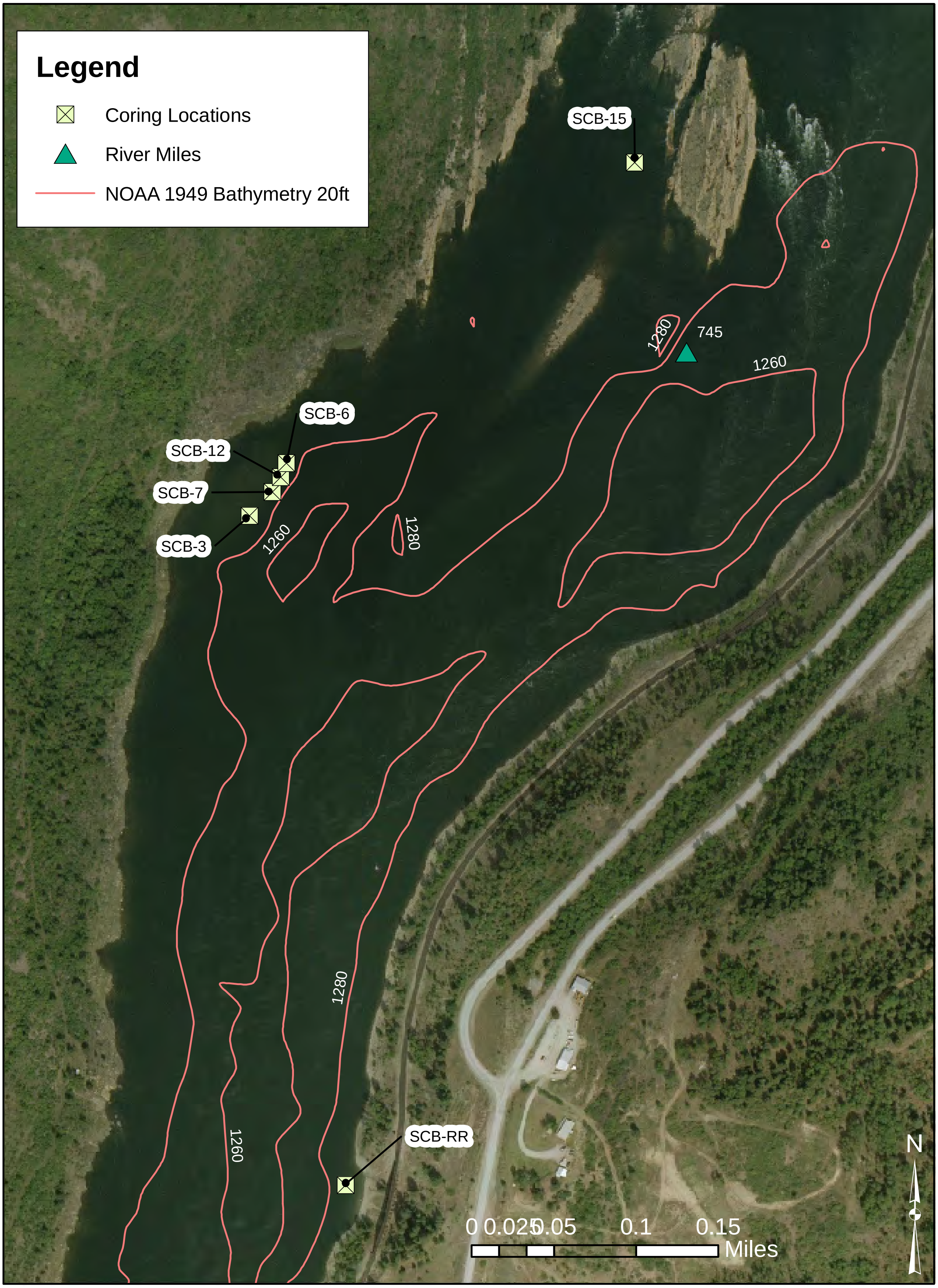
Figure 9. Detailed soil preparation procedures.

Study Area


Canada
United States
Little Sheep Creek Rd
25
SCB
BSB
DE
Northport
OC

Coring Locations

Figure 5-2: South of the Canadian Border



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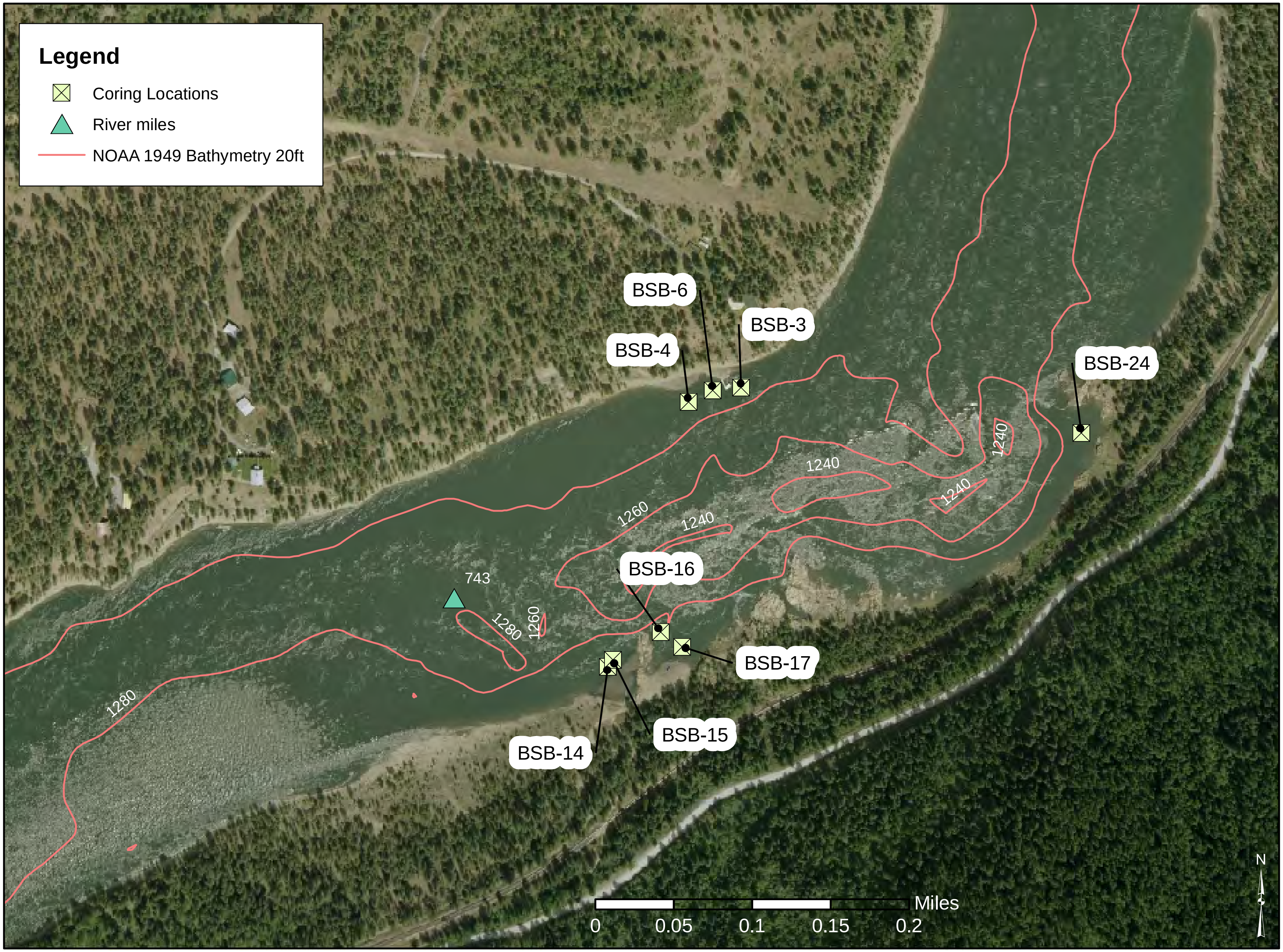
Coring Locations

Figure 5-3: Black Sand Beach



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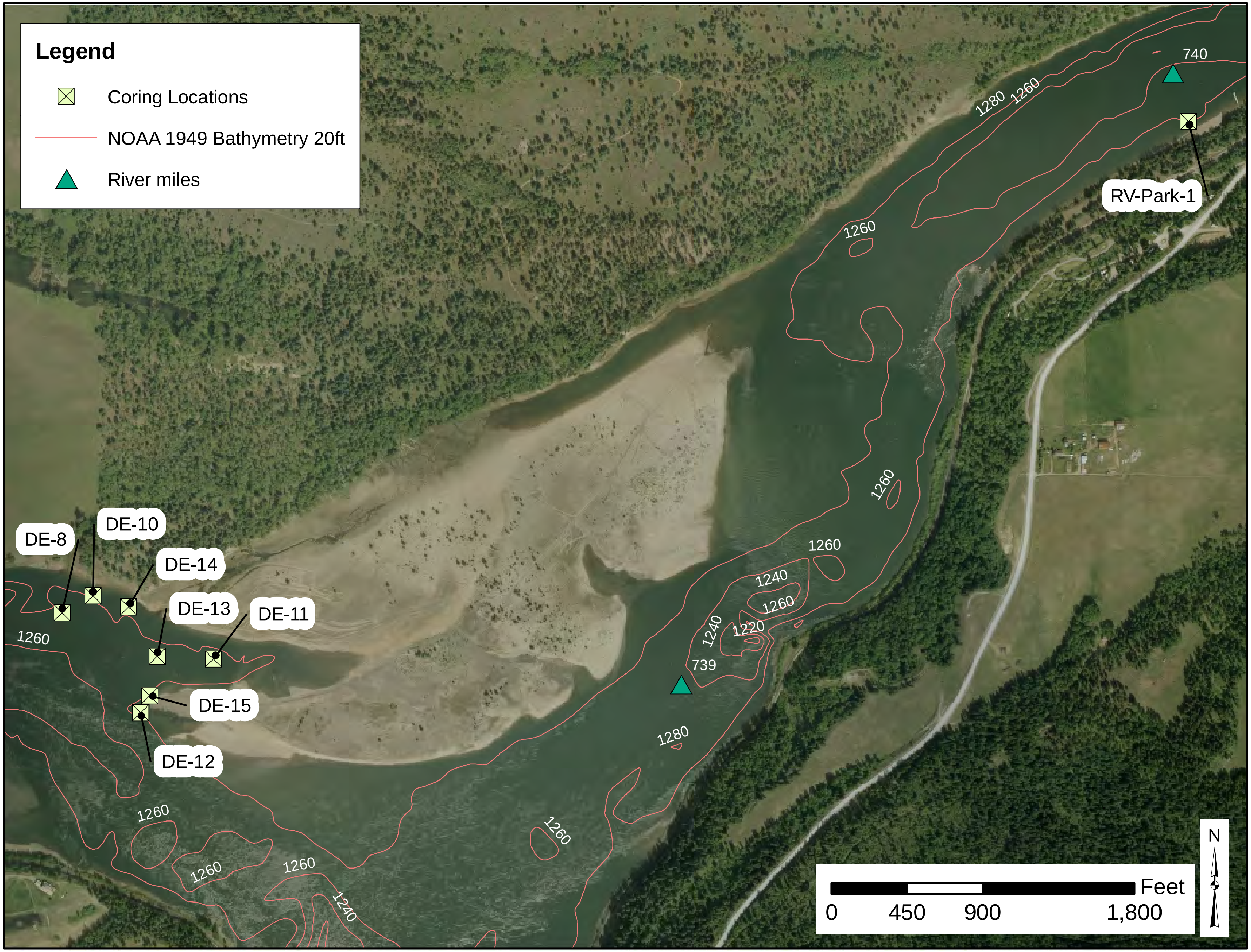
Coring Locations

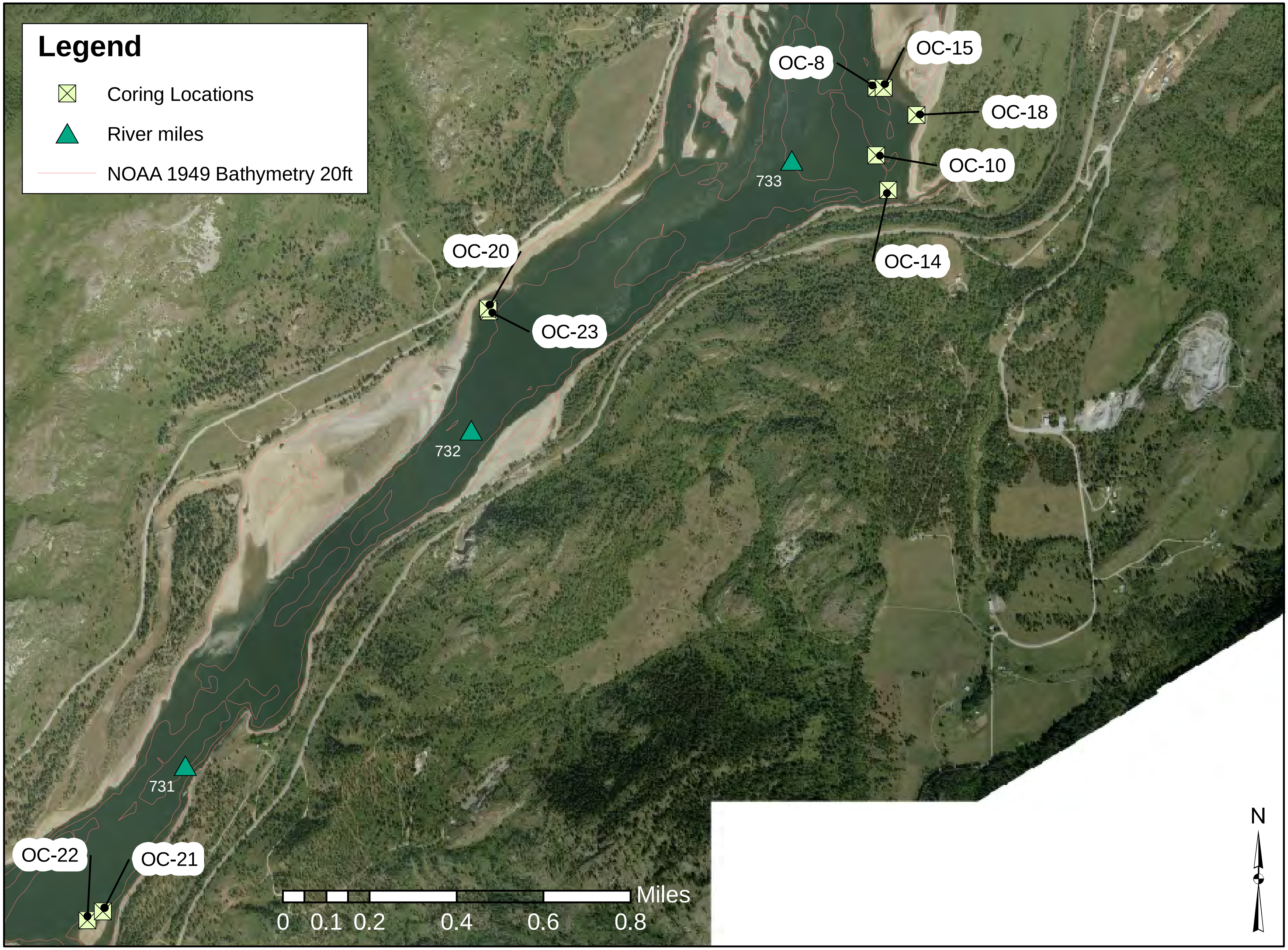
Figure 5-4: Deadman's Eddy



Environment International Ltd [ces] Coordinate System: NAD 1983 UTM Zone 11N 18 May 2010

Coring Locations

Figure 5-5: Onion Creek / Northport



Environment International Ltd [ces] Coordinate System: NAD 1983 UTM Zone 11N 18 May 2010

Drilling Log

Core Station	Time	Latitude	Longitude	Water Depth	Water Elevation	Penetration (ft)*	Mud Line Elevation	Core Penetration Elevation	Recovery (ft)	Percent Recovery	Comments
30-Apr											
DE-15A	13:10	48.56.4117	117.43.9609	2.3	1300.35	4.5	1298.1	1293.6	2.7	60%	DE 15 at large sand bar. Began coring at Deadman's Eddy due to TEG inability to navigate the rapid. Water was moving very quickly. Should be able to navigate with less weight.
DE-14A	14:00	48.56.4985	117.43.9936	1.2	1300.37	5.0	1299.2	1294.2	3.0	60%	Will re-core. Did not meet resistance with 6' core sampler.
DE-13A	14:37	48.56.4505	117.43.9507	4.0	1300.38	3.0	1296.4	1293.4	2.2	73%	Core not sampled due to limited recovery in core sampler.
DE-12A	15:14	48.56.3951	117.43.9740	2.2	1300.38	5.5	1298.2	1292.7	3.8	69%	Will re-core. Did not meet resistance with 6' core sampler.
DE-11A	15:49	48.56.4485	117.43.8669	3.4	1300.39	3.0	1297.0	1294.0	1.7	57%	Likely hit a rock and drove it shallow depth affecting recovery. Core sampler driven full 6.0'. Will re-sample this location - no samples to be taken from this core.
1-May											
DE-12A (6-12)	11:50	48.56.3951	117.43.9740	2.0	1299.82	5.5	1297.8	1292.3	1.5		Drilled to 10.0' before hard refusal. Redrilled to 6.0' and used 2.5" OD sampler - started sampler at 6.0' BML, drove to refusal.
DE-11A(2)	10:13	48.56.4990	117.43.8668	2.2	1298.84	3.5	1296.6	1293.1	2.0	57%	Hit rock at 4.0'. Attempted to drill beyond the cobble. Drilled for 2.0' but could not get beyond cobble/hard rock bottom.
DE-14B	14:56	48.56.4983	117.43.9931	1.3	1300.86	5.0	1299.6	1294.6	3.2	64%	Hit hard refusal at 5.5'. Same as previous day. Report that bottom sediments with low readings on XRF.
2-May											
DE-10A	9:36	48.56.5089	117.44.0463	1.6	1299.24	4.5	1297.6	1293.1	2.7	60%	W. Side of river on S. side of Deadman's Eddy beach. Previous core immediately upstream of this location had different bottom sediments. Hit hard rock bottom at about 5.0'.
DE-10B	10:15	48.56.5089	117.44.0463	1.6	1299.24	4.5	1297.6	1293.1	2.9	64%	Hit rock at same elevation as in 10A.
DE-8A	10:54	48.56.4920	117.44.0925	2.9	1299.41	5.0	1296.5	1291.5	3.9	78%	Deep Bar of sediment on upstream side of old pipe outfall. Appears to be a very large sand bar. Able to drive the 6.0' sampler all the way in
DE-8B	11:25	48.56.4920	117.44.0925	2.9	1299.41	6.5	1296.5	1290.0	4.9	75%	Long butyrate sample. Both 8A and 8B appear to be all slag.
DE-8C (0-9.5)	12:46	48.56.4920	117.44.0925	2.9	1299.68	9.0	1296.8	1287.8	6.2	69%	Attempt with the 12.0' sampler - encountered more dense sand at about 9.0 feet, but did not meet complete resistance.
DE-8C (10-17)**	13:18	48.56.4920	117.44.0925	2.9	1299.68	6.6	1296.8	1290.2	2.5		Drilled to 10.0' and used the 2.5' sampler. Drove sampler all the way to 17.0'. Limited recovery, but still did not reach a hard bottom. Core catcher had a lot of organic debris - likely hit an old tree.
DE-8C (17-20)**	14:05	48.56.4920	117.44.0925	2.9	1299.77	6.6	1296.9	1290.3	1.0		Drilled to 17.0' and used the 2.5' sampler. Drove the sampler to 20.0' where we met very solid resistance. Recovery very limited - may have been pushing a rock into the sand, thus limiting recovery. Sand throughout appears to look like slag. Could be that bar was created by berm for pipeline and deposition area created after industrialization of the river.
3-May											60MPH Winds. Weather Day. Dangerous to be on the river.
4-May											
BSB-17A	11:17	48.58.2660	117.38.8500	2.6	1299.44	4.5	1296.8	1292.3	4.1	91%	Barge abbutting BSB. Sand until hit hard bottom. Appears to be all slag.
BSB-17B	11:48	48.58.2660	117.38.8500	2.6	1299.27	4.0	1296.7	1292.7	3.7	93%	Met resistance at the same location as in 17A.
BSB-16A	13:17	48.58.2742	117.38.8682	4.4	1299.25	2.3	1294.9	1292.6	2.2	96%	Core taken off the beach just upstream of rock outcrop. Met very hard resistance at bottom indicative of solid rock. All slag. Attempted to anchor further out into river, but could not afix anchor - bottom was ll rock, no sediment. Decision to avoid deeper water unless clear indication of deposition.
BSB-15A	14:50	48.58.2584	117.38.9082	2.5	1299.49	3.3	1297.0	1293.7	2.3	70%	Near shore of BSB on downstream side of rock outcrop. Core met cobble almost immediately and penetrated only with difficulty. No indication that cobble layer would end within the top 2-3 feet, only became more dense.
BSB-14A*	15:30	48.58.2546	117.38.9123	2.6	1299.49	1.5	1296.9	1295.4	1.4	93%	Moved 40-50 feet downstream of BSB-15A. Met cobble right away and unable to get a good core. Beach appears to get more densly packed with cobble as move downstream.
5-May											
BSB-6 Archive2	8:30	48.58.4082	117.38.8262	1.9	1299.22	5.5	1297.3	1291.8	3.5	64%	On W. side of river near beach/ private dock. Met little resistance with 6.0' corer. Plan to archive this core (log & jar) and sample core from longer core samper. Bottom of core is white sand that appears to be very different and contain little slag.
BSB-6A	9:30	48.58.4082	117.38.8262	1.9	1299.95	9.5	1298.1	1288.6	5.8	61%	Drove 12.0' corer in approximately 10.0 feet -the last 2 feet with a lot of resistance. Found black sand overlaying clean white sand with a small cobble layer in between.
BSB-6B	10:41	48.58.4082	117.38.8262	1.8	1300.63	8.3	1298.8	1290.5	6.2	75%	Drove 12.0' corer approximately 8.8' in. Core has clear deliniation between dark sand above white bottom sand.

Drilling Log

Core Station	Time	Latitude	Longitude	Water Depth	Water Elevation	Penetration (ft)*	Mud Line Elevation	Core Penetration Elevation	Recovery (ft)	Percent Recovery	Comments
BSB-4A	12:06	48.58.4017	117.38.8463	1.9	1300.79	7.1	1298.9	1291.8	4.8	67%	Downstream of BSB-6 along same beach. Cobble bar more obvious off shore from this location. Hit hard cobble bar at 7.1'.
BSB-4B	13:19	48.58.4017	117.38.8463	1.9	1300.9	3.7	1299.0	1295.3	3.6	97%	Moving only a couple feet over, could not penetrate below 3.7' despite moving beyond 7' in the original location. Hit hard cobbles.
BSB-5A	15:14	48.58.4005	117.38.8377	3.8	1300.99	4.5	1297.2	1292.7	4.0	89%	Tried to get a core closer to middle of river on small sand bar near the dock. Dock owner James Knight stated that he has encountered white sand in that area when installing his dock. Hit hard cobble layer after 4.5'.
											Conversation with James Knight: Indicated that the beach used to look like black sand beach, but that sand had eroded a lot in the past 10 years - likely 8-10 feet of sand had disappeared. Last 2-3 years, has seen more white sand as he moves his boat on and off the river.
6-May											
BSB-3 Archive	8:14	48.58.4098	117.38.8022	3.7	1298.55	6.0	1294.9	1288.9	3.5	58%	6.0' core sampler driven to full depth without meeting resistance. Archived this core and changed to 12.0' sampler
BSB-3A	8:42	48.58.4098	117.38.8022	3.7	1298.63	8.0	1294.9	1286.9	3.9	49%	Hit hard cobble bottom at 8.0'. Looks like slag throughout
BSB-24A	9:30	48.58.3864	117.38.5161	2.5	1298.63	2.0	1296.1	1294.1	1.8	90%	Core near small creek outfall - large sand bar in narrow crook in rocks. Sand lighter in color than in other locations. Hit hard rock after only 2.0' core.
SCB-6A	11:13	48.59.8176	117.38.3308	2.8	1299.34	6.5	1296.5	1290.0	4.2	65%	Coring along N. end of large sand bar on W. Side of river. Dark sand - looks slaggy throughout, but lighter in color than the BSB area. Hit cobbles at bottom.
SCB-6B	12:07	48.59.8176	117.38.3308	2.8	1300.15	5.5	1297.4	1291.9	3.8	68%	Not able to drive core barrel as far - hit hard rock at 5.5'. Based on the locations of the cores, it appears that sand bar may be sitting on bedrock shelf.
SCB-3A	13:49	48.59.7897	117.38.3603	1.8	1299.79	3.5	1298.0	1294.5	3.2	91%	Towards S. end of sand bar. Hit hard rock at 3.5'. Same slag-filled material as SCB-6
SCB-3B	14:15	48.59.7897	117.38.3603	1.8	1299.79	5.5	1298.0	1292.5	4.5	82%	Able to drive core to 5.5'. Cobble bar is inconsistent along this bar
7-May											
SCB-7Archive	8:58	48.59.8025	117.38.3420	2.0	1299.62	6.0	1297.6	1291.6	4.4	73%	Moved to middle of sand bar. Drove 6.0' core sampler all the way in without resistance. Will archive this core and try again in same location with 12.0' core sampler.
SCB-7A	8:58	48.59.8025	117.38.3420	2.0	1299.62	9.0	1297.6	1288.6	6.7	74%	Hit hard rock at 9.5'. Last 1.5' appears to be a very light colored sand.
SCB-7B	10:16	48.59.8025	117.38.3420	2.3	1300.05	6.0	1297.8	1291.8	4.2	70%	Only drove to 6.5'. Lighter sand also appeared at very bottom of this core.
SCB-12A	12:03	48.59.8102	117.38.3354	2.2	1300.6	6.0	1298.4	1292.4	4.4	73%	Core just offshore of sand bar between SCB-6 and 7. Drove 6.0' core sampler all the way in. Core appears to be dark and filled with slag throughout.
SCB-12Archive	12:30	48.59.8102	117.38.3354	2.2	1300.6	6.6	1298.4	1291.8	4.2	64%	Additional attempt at SCB-12 with 12.0' core sampler. Hit hard bottom at 7.1'. Material dark throughout.
SCB-15	13:28	48.59.9782	117.38.0534	8.1	1300.76	3.5	1292.7	1289.2	1.8	51%	Attempted a core in north end of rock bay in slow moving water where there appears to be a sandy bottom. Hit hard rock at 4.0'.
SCB-RR	14:02	48.59.4366	117.38.2784	2.6	1300.86	2.2	1298.3	1296.1	2.0	91%	Not a part of the study area, but had time at end of day while barge moving back downstream to attempt a core. RR area is beach below a 100+ foot railroad trestle that is 150-yards upland. The area is very sandy. Large cobble are on both sides of the beach. Could only drive the core sampler 2.0' before encountering large cobble.
8-May											
BSB 6 Conf	10:17	48.56.4062	117.38.8326	2.7	1298.59	5.0	1295.9	1290.9	3.9	78%	Attempt for confirmation sample at BSB 6 where found clean sand previously. Could not penetrate to same depths as previously - hit cobble bottom. Did find trace of white sand with small cobble at bottom of the core. Plugged the core sampler with cobbles in an attempt to get below the cobbles.
RV Park 1A	11:36	48.56.9827	117.42.4280	2.8	1298.58	3.0	1295.8	1292.8	2.2	73%	Not part of initial sample area b/c discussions with Ecology that beach may not be 100% natural. After discussions with many locals, determined that beach is likely natural - reported to have been there for a very long time. Hit cobble bottom very quickly. Some slag in sample. Large core plug appears to include a lot of organic debris. Sediments appear more silty than previous samples.

Drilling Log

Core Station	Time	Latitude	Longitude	Water Depth	Water Elevation	Penetration (ft)*	Mud Line Elevation	Core Penetration Elevation	Recovery (ft)	Percent Recovery	Comments
											Before moving back downstream, attempted to find additional areas at DE to core. Wanted to attempt to push into cobbles as a test to see how that coring technique affects the core recovery percentage. As we moved downstream, the water was dropping quickly, and bargte had a very difficult time navigatin garound DE - the area S. of DE was in less than 2-ft of water. Barge was in danger of being grounded. Took a long time to get out of the DE area.
9-May											
OC-15 Archive	8:47	48.54.2325	117.48.2744	2.0	1297.2	5.5	1295.2	1289.7	4.1	75%	Drove 6.0' core sampler to full depth. Location is near S. facing sandy beach in a large bay protected by a cobble bar.
OC-15A	9:25	48.54.2325	117.48.2744	2.0	1297.2	7.0	1295.2	1288.2	5.2	74%	Hit gravel at 7.5'. Could not drive sampler further.
OC-15B	11:00	48.54.2325	117.48.2744	2.0	1298.03	7.4	1296.0	1288.6	5.2	70%	Hit gravel at 7.4' - same horizon as in the A sample.
OC-8	12:58	48.54.2321	117.48.2958	5.7	1298.11	0.0	1292.4	1292.4	0.0		Could not penetrate dense gravelly rock overlaying cobble. Obvious from shoreline that much cobble present. Only 1.0' ft sediment.
OC-18 Archive	13:30	48.54.1789	117.48.1742	1.5	1298.11	5.5	1296.6	1291.1	4.4	80%	Drove 6.0' core sampler to full depth. Sand bar sticking into river. River level dropping quickly - had to move back off beach to prevent grounding barge.
OC-18A	14:44	48.54.1789	117.48.1742	1.4	1296.77	6.9	1295.4	1288.5	5.1	74%	Sampler plugged with gravel at bottom. Hit gravel at about 7.5'. Gravel likely overlaying cobble - based on visual observation and inability to maneuver sample through gravel.
OC-18B	15:45	48.54.1789	117.48.1742	1.4	1296.32	7.5	1294.9	1287.4	5.3	71%	Sampler plugged with gravel at bottom at same horizon as in 18A
10-May											
OC-10A	8:54	48.54.0974	117.48.2938	2.7	1296.96	7.5	1294.3	1286.8	4.6	61%	Sandy shelf in middle of bay. Very soft overburden - much turbidity when anchors hit bottom - sand is mixed with an organic layer.Hit very solid bottom at 8.0'.
OC-10B	9:21	48.54.0974	117.48.2938	3.3	1296.96	7.5	1293.7	1286.2	5.4	72%	Hit hard bottom at 8.0'. Catcher hammered on hard, immovable rock.
OC-14A	10:30	48.54.0288	117.48.2562	2.1	1297.46	7.5	1295.4	1287.9	6.6	88%	On large sand bar near small (likely seasonal) creek outfall. Sedimentis very soft silt sand mix. Sediments very wet in the core. Core sampler bound up at 8.0' - hi some rock, could not penetrate further, but no "hard bottom"
OC-14B	11:31	48.54.0288	117.48.2562	2.1	1298.14	7.8	1296.0	1288.2	5.7	73%	Core sample mixed due to problems removing Butyrate from core liner. Core can be used for bulk sample, but cannot log core - too much mixing in the butyrate. Appeared to be uniform sediment - mostly sand/silty slag.
OC-14 Deep	14:24	48.54.0288	117.48.2562	1.8	1297.48		1295.7	1295.7			Sample from 8.0' BML to 10.6' BML. Retrieved 1.3' in core and additional 0.3' plug in core catcher. Hard rock encountered with drill at 10.0'
11-May											
OC-15 Deep	8:51	48.54.2408	117.48.2824	3.7	1298.27		1294.6	1294.6			Hard rock encountered with drill at 11.0'. Used core from 9.0' to 11.0'. Found "slag balls" in drill corer. Removed 0.8' of sample from 2.5" sampler.
OC-20Archive	10:18	48.53.7838	117.49.4647	1.6	1298.77	2.4	1297.2	1294.8	1.5	63%	The remaining downstream areas were unreachable because of the low river leve - all were out of the water. Had to scout additional areas where coring possible. This location on a small sand/silty beach. Encountered gravel after 2.4 - drove sampler an additional 0.5'. Want to see % recovery difference when perator attempts to drive sampler through gravel. Core catcher plugged with sand & gravel - this plug was shown to contain very few metals with XRF field screen.
OC-20 A	11:09	48.53.7838	117.49.4647	1.6	1299.17	1.8	1297.6	1295.8	1.7	94%	Used this location to test theory that attempting to push into gravel affects recovery percentage. Did not push sampler once gravel encountered. Recovery of 1.7' identical on both cores, but recovery % better on this core since only drove sampler 2.3' and stopped rather than attempt to push through rock.
OC-21A	12:49	48.52.5715	117.50.6093	2.5	1300.07	5.5	1297.6	1292.1	4.3	78%	Sandy beach just upstream of Onion Creek on E.side of river. Did not meet hard resistance with core sampler. Core appeared to be consistent filled with slag.
OC-21B	13:15	48.52.5715	117.50.6093	2.5	1300.07	5.6	1297.6	1292.0	4.8	86%	Core stopped by dense sand layer - no hard resistance - at same location as OC-21A.
OC-22A	13:50	48.52.5532	117.50.6559	2.1	1300.11	3.2	1298.0	1294.8	2.5	78%	Further downstream on same sand bar as OC-21. Hit cobble barrier at 3.7' and could go no further.
OC-22B	14:35	48.52.5532	117.50.6559	2.1	1300.15	4.5	1298.1	1293.6	3.8	84%	Hit cobble barrier at 5.0'
12-May											
OC-21 Deep 1 (9.3'- 10.0')	9:28	48.52.5735	117.50.6097	1.9	1298.2		1296.3	1296.3			River dropped fairly significantly overnight. Original OC-21 is now on the beach. Got as close as possible (~12') to original location. Drilled to 9.3 ' before encountering hard rock. Attempted sample, but almost no recovery at this depth.

Drilling Log

Core Station	Time	Latitude	Longitude	Water Depth	Water Elevation	Penetration (ft)*	Mud Line Elevation	Core Penetration Elevation	Recovery (ft)	Percent Recovery	Comments
OC-21 Deep 2 (7.0'-9.0')	10:36	48.52.5735	117.50.6097	1.9	1298.6		1296.7	1296.7			Re-drilled location to 7.0' and took sample with 2.5" sampler. Pushed to 9.0' and encountered hard rock.
OC-23 Archive	12:30	48.53.7781	117.49.4605	2.2	1298.65	1.4	1296.5	1295.1	1.2	86%	Attempted to re-core the same beach as OC-20. Discovered that XRF revealed low metals levels in sediment that was mixed with gravel in the core. Because of low water level, were not able to access same area of beach as previous day.
OC-23A	12:45	48.53.7781	117.49.4605	2.2	1298.59	1.5	1296.4	1294.9	1.2	80%	Attempted second core to capture as much sediment muixed with gravel as possible. Gravel layer was very consistent about 1-2' below mudline.
OC-23B	13:00	48.53.7781	117.49.4605	2.2	1298.59	1.5	1296.4	1294.9	1.4	93%	Gravel bed encountered in same location. Hard rock/cobble underneath gravel.

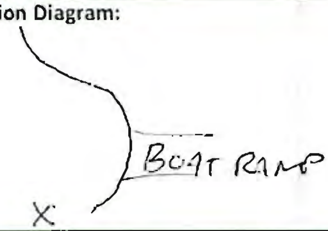
* Penetration corrected for core cutter depth
Core cutter for 4.0" D = 0.5'
Core Cutter for 2.5" D = 0.4'

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	
Core No.:	TEST CORE 4/30
Client:	
Project Name:	
Project No.:	

Date: 4/30	Contractor:	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 2'	Rig Type:	
River Depth: 2'	Drill Method: VIBRACORE	
Refusal Depth?	Sampling Methods:	
Geologist: MB		



Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 209 ZN 265	MED SAND W/ SILT BLACK 2.5Y 2.5/1 SILT W/ FINE SAND BLACK 10YR 2/1 LAYERED & SOME ROOTS ~~HARBBEDDED~~ W/ BROWN 10YR 2/2 FINE SAND W/ SILT
1'				Pb 156 ZN 3744	7" MED/COARSE SAND W/ SILT & SOME COBBLES QUARTZ, DARK FINE GRAINS 10YR 2/1

Notes:

①

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	4/30
Core No.:	DE 14A (#2)
Client:	
Project Name:	
Project No.:	

Date:	4/30	Contractor:	
Borehole Diameter:	4"	Drillers:	
Boring Depth:	0-5.5'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?	5.5'	Sampling Methods:	
Geologist:	MB		

Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	SAMPLE 0-0.75			Pb 231 ZN 2071	DK BROWN MED. SAND & SLAG QUARTZ, SLAG, SOME ROOTS, FIBERS, LEAVES 7.5YR 3/3
6"				Pb 157 ZN 5149	← XRF SAMPLE NAME = 0.5-1
	SAMPLE 0.75-1			Pb 175 ZN 802	RED OXIDIZED ZONE @ CONTACT LAYERED GRAY & REDDISH — FINE SAND W/SILT FINE SAND W/SILT QUARTZ, SLAG 2.5Y 3/1 7.5YR 3/3
12"				Pb 47 ZN 104	~~SAND / COBBLES / GRAVEL~~ GRAVELLY SAND W/ COBBLES ≤2" ROUNDED TO SUBROUNDED QUARTZ, FINE BLACK GRAINS SPAR 10YR 5/3 FINES DOWN ↓
18"	SAMPLE 1.4-2			<22.1 Pb <31.7 ZN	~~MED~~ FINE SAND W/ SOME COARSE SAND & TRACE GRAVEL QUARTZ, MICA, SPAR 10YR 5/3
	SAMPLE 2-3			<16 Pb 35 ZN	↓

Notes:

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ENVIRONMENT INTERNATIONAL LTD.	Sediment Coring Log	Date: 4/30
		Core No.: DE 14A
		Client:
		Project Name:
		Project No.:

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb < 16.4 Zn 27	AS ABOVE 36" END OF CORE

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	4/30
Core No.:	DE 15A (#1)
Client:	
Project Name:	
Project No.:	

Date: 4/30	Contractor: TEG	Location Diagram:	
Borehole Diameter: 4"	Drillers:		
Boring Depth: 0-5.5'	Rig Type:		
River Depth:	Drill Method:		
Refusal Depth? ~~20~~ 5'	Sampling Methods:		
Geologist: MB			

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	SAMPLE: 0-1'			Pb 115 Zn 6580 Pb 152 Zn 6561	~~COARSE SAND & SLAG~~ SLAG & COARSE SAND ~60% 40% QUARTZ, SPAR, FINE GRAINED SLAG 10YR 2/1
1				Pb 114 Zn 7228	
	BROKEN SOCK @ 1.5'			Pb 97 Zn 6261	
2	RESUME @ 1.9'			1.5/1.9 Pb 203 Zn 8065	
3	SAMPLE: 1.9-2.7			Pb 173 Zn 4877	
4					

Notes: CORE IN 2 PIECES: TOP - 1.8', 1.9' - 2.7' DOWNWARD.
TOP HALF CLEAN, BOTTOM HALF BROKEN SOCK

1

ENVIRONMENT INTERNATIONAL LTD.

3.8' RECOVERY

Sediment Coring Log

Date:	9/30
Core No.:	DE 12A
Client:	
Project Name:	
Project No.:	

Date:		Contractor:	
Borehole Diameter:	4"	Drillers:	
Boring Depth:	6.0'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?	6.0'	Sampling Methods:	
Geologist:			

Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	SAMPLE 0-1			Pb 185 Zn 6310	MEDIUM SAND (~40%) & FINE SLAG (~60%) SUBANGULAR ANGULAR 2.5Y 6/3
				Pb 118 Zn 3983	
1				Pb 73 Zn 1679	MORE SLAG - ~75%
	SAMPLE + DUPLICATE + MS/MSD 16→33			Pb 72 Zn 4835	
2	SAMPLE ID: 1.3-2.7			Pb 121 Zn 7149	

Notes:

(2)

ENVIRONMENT INTERNATIONAL LTD.	**Sediment Coring Log**	Date: 4/30 Core No.: DE 12A Client: Project Name: Project No.:
Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 160	
				Zn 5708	— — —33" FINER, MORE SLAG – ~ 80%
3'					
				Pb 235	
				Zn 9103	
3.5'					

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/1
Core No.:	PE 11A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 3.5'	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth? 3.5'	Sampling Methods:	
1.1' RECOVERY		
Geologist: MB		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 96 Zn 543	BLACK SILT W/ GREEN SHOOTS & SOME FINE SAND
6				Pb 106 Zn 660	BLACK SILT W/ SOME FINE SAND GLEY 2 2.5/10G
12				Pb 206 Zn 1466	
18				Pb 186 Zn 679	GRAY FINE SAND WITH SILT GLEY 1 4/5GY
					THIN LAYER BLACK FINE SAND WITH SILT & PLANT FIBERS @ 22"
24				Pb 264 Zn 4999	24½" BROWN SILTY SAND 7.5YR 4/4
END OF CORE					V DARK BROWN COARSE SAND W/ SOME SILT 7.5YR 2.5/3

Notes: CORE WATERY W/ LITTLE RECOVERY (1.1') - LEFT OVERNIGHT ON 4/30 TO XRF IN MORNING. NO SAMPLES TAKEN.

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/1
Core No.:	DE 13A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth? 3.5'	Sampling Methods:	
1.7' RECOVERY		
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 126 Zn 1516	SANDY SILT W/ GREEN PLANT MATTER GLEY 1 3/10Y --- 3" DK GREENISH GRAY SILTY FINE SAND SOME PLANT FIBER
6				Pb 144 Zn 1149	GLEY 1 3/5GY
12					
18				Pb 410 Zn 4765	BROWN COARSE SAND & COBBLES TO 2.5" 10YR 3/3
24					END CORE

Notes: CORE ON 4/30 WAS WATERY W/ LITTLE RECOVERY (1.7')
LEFT OVERNIGHT 2' OF SEDIMENT IN CORE ON 5/1

NO SAMPLES TAKEN

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/1
Core No.:	DE 11A-2
Client:	
Project Name:	
Project No.:	
Location Diagram:	

Date:	5/1	Contractor:	
Borehole Diameter:	4"	Drillers:	
Boring Depth:	4'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?		Sampling Methods:	
	2' of Recovery		
Geologist:	MB		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-1.3			Pb 86 Zn 534	BLACK SANDY SILT WITH TRACE FIBERS 2.5Y 2.5/1
6					
12					
18				Pb 202 Zn 2980	DIFFUSE CONTACT MED, SILTY SAND (~60%) & SLAG (~40%) 2.5Y 3/2 V. DK GRAYISH BROWN
24	2-2.5			Pb 282 Zn 1371	GRAY FINE SAND, TR. SILT GLEY 1 ~~2~~ 2.5/N W/LAYER OF BLACK + SOME FIBERS
30					

Notes: CORE ARRIVED W/ LOTS OF LIQUID & ~~[illegible]~~ ~6" EMPTY SPACE BTWN TOP OF CORE MATERIAL & MARKED MUDLINE

V. SOFT OVERLYING MATERIAL

(2)

ENVIRONMENT INTERNATIONAL LTD.	Sediment Coring Log	Date: 5/1 Core No.: DELLA #2 Client: Project Name: Project No.:
Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
30				Pb 140 Zn 2960	COARSE SAND w/ SLAG GRAVEL COBBLY COBBLES TO 4" ROUNDED SAND SUBROUNDED/SUBANGULAR ~50% SLAG IN SAND
36					36" BOTTOM OF CORE

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/1
Core No.:	DC 12A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth: 6' - 12'	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	SAMPLE ENTIRE RECOVERED INTERVAL			Pb 291 Zn 5268	MEDIUM SAND (80%) + SLAG (20%) QUARTZ, FELDSPAR, TR. MICAS SAND ~ 10Y 6/2
6				Pb 223 Zn 5741	
12				Pb 257 Zn 3270	
18					18" END OF CORE

Notes: 1.5' RECOVERY LIKELY A COMPOSITE OF 6-12' INTERVAL

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/2
Core No.:	DE 10A
Client:	
Project Name:	
Project No.:	

Date: 5/2	Contractor: TEG	Location Diagram:	
Borehole Diameter: 4"	Drillers:		
Boring Depth: 0-5.5'	Rig Type:		
River Depth: 1.6'	Drill Method:		
Refusal Depth? 5.5'	Sampling Methods:		
Geologist: MB			

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-1 STORAGE 1 6807+ 1/23202 12:05			Pb 149 Zn 1238 Pb 152 Zn 1220	~~COARSE~~ COBBLY, SAND w/ GRAVEL 10YR 4/3 BROWN; COBBLES TO 3", ROUNDED; SAND POORLY SORTED 70% FINE SAND, 40% COARSE QUARTZ, ~~ROUNDED TO~~ SUBROUNDED 1% SLAG. COBBLES FINE DOWNWARDS
	12:00 1-2' DE 10A-1-2			Pb 128 Zn 1015 Pb 160 Zn 1441	
±1' CONTACT ZONE NOT RECOVERED	2.1-2.5 12:10 NO GS			Pb 257 Zn 2570	COBBLY MEDIUM SAND w/ GRAVEL SUBANGULAR FELDSPAR, QUARTZ, SOME MICA COBBLES TO 1.25", ROUNDED 2.5Y 3/2 V DK GRAYISH BROWN. 30" END OF CORE

Notes: CORE DRILLED 9:30 AM. 1.6' WATER, 5.5' PENETRATION, 2.7' RECOVERY

ENVIRONMENT INTERNATIONAL LTD.	Sediment Coring Log	Date: 5/2
		Core No.: DE 8A
		Client:
		Project Name:
		Project No.:

Date: 5/2	Contractor: TEG	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 0 – 6'	Rig Type:	
River Depth: 2.5'	Drill Method:	
Refusal Depth? N/A	Sampling Methods:	
4' RECOVERY		
Geologist:		

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 152 Zn 340	DK BROWN MEDIUM SAND WITH CHARCOAL, MOSS ~ 75% SLAG MICA, QUARTZ 2.5Y 3/2 V. DK. GRAYISH BROWN
				Pb 112 Zn 1846	
				Pb 227 Zn 4652	GREENISH BLACK ~~FINE~~ SILTY FINE SAND GLEY 1 2.5/5GY 70% SLAG QUARTZ SOME TWIGS, PINE NEEDLES, LEAVES
				Pb 177 Zn 2849	
24				Pb 174 Zn 2366	
30					

Notes: DECANTED ~1" WATER

DE 8C IS FROM ~2' AWAY – 8A WILL BE ARCHIVED

(2)

ENVIRONMENT INTERNATIONAL LTD.	# Sediment Coring Log	Date: 5/2
		Core No.: DE 8A
		Client:
		Project Name:
		Project No.:

Date:	Contractor: TEG	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 172 Zn 2232	31": 1/2" THICK LENS OF SILT W/ FINE SAND, TRACE SLAG GLEY 1 3/5GY
36				Pb 124 Zn 3272	
42					43" END OF CORE

Notes:

Page 1 of ___

(1)

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/2
Core No.:	"THE REAL" DE BB
Client:	
Project Name:	
Project No.:	

Date: 5/2	Contractor: TEG	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 0-6.5'	Rig Type:	
River Depth: 2.7'	Drill Method:	
Refusal Depth?	Sampling Methods:	
4.9' RECOVERY		
Geologist: WB		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	ARCHIVE SAMPLE. DEBB 0-.75			Pb 199 ZN 4365	BROWN MEDIUM SAND & SLAG (50%)
12	ARCHIVE SAMPLE .75-1.75				BLACK FINE-MED SAND + SLAG (~65%) GLEY 1 2.5/5GY W/ TRACE VEG FIBERS
24	ARCHIVE SAMPLE 1.75-2.75				

Notes:

CORE LEAKED SOME WATER FROM BOTTOM WHEN CUT OPEN

SOME SMEAR WAS INCLUDED IN SAMPLE JARS.

(2)

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date: 5/2
Core No.: DE 8B
Client:
Project Name:
Project No.:

Date: 5/2
Borehole Diameter:
Boring Depth:
River Depth:
Refusal Depth?
Geologist:

Contractor: TEG
Drillers:
Rig Type:
Drill Method:
Sampling Methods:

Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	ARCHIVE SAMPLE 1.75-2.75				~32" - PIECE OF 4-PLY PLASTIC
36	ARCHIVE SAMPLE 2.75-3.75				SAME AS ABOVE
42					
48	ARCHIVE SAMPLE 3.75-4.5				
54					54" END OF CORE

Notes:

PHOTOS &
NB: XRF READINGS ~~[illegible]~~ ALL NAMED DE 8B

①

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/2
Core No.:	DE 8C
Client:	
Project Name:	
Project No.:	

Date:		Contractor: TEG	Location Diagram:
Borehole Diameter: 4"		Drillers:	
Boring Depth: 0 - 9.5'		Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?		Sampling Methods:	
6.2' Recovery			
Geologist: MB			

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	3:00 0-.75 DE8C-1			Pb 167 Zn 2240	MEDIUM SAND, 70% SLAG QUARTZ, SPAR DK. YELLOWISH BROWN 10YR 3/4
				Pb 215 Zn 3304	
					80% SLAG w/ FINE TO MEDIUM SAND & SILT. QUARTZ MICA. GLEY 1 2.5/5GY
12				Pb 199 239 Zn 4297	← ~~THE~~ READING NAME IS 2ND (ATTEMPT?) OF .5-1
	1.25-2.75 SAMPLE			Pb 225 Zn 3757	
24				Pb 131 Zn 4198	
30					30": 1" LENS OF VEG FIBER, BLACK SILT

Notes: ~~ARCHIVE CORE~~ NO ~~SAMPLES~~ TAKEN

②

ENVIRONMENT INTERNATIONAL LTD.	**Sediment Coring Log**	Date: 5/2
		Core No.: DE8B
		Client:
		Project Name:
		Project No.:

Date:	Contractor: TEG	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 0-9.5'	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 114 Zn 2520	
36				Pb 132 Zn 2713	-SILT LENS @ 35" ~1/3" THICK
				Pb 169 Zn 2814	80% SLAG W/ FINE/MEDIUM SAND QUARTZ, MICA GLEY 1 7.5/5GY
48				Pb 132 Zn 240	~~-SILT LENS @ 44" ~1/2" THICK~~
	4.25-5 SAMPLE			Pb 141 Zn 2097	FINE/ MEDIUM SAND WITH SILT GLEY 1 4/5GY ~60% SLAG
60					

Notes: PHOTOS & XRF READINGS FOR THIS CORE ARE LABELED 08B

③

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/2
Core No.:	DC 8
Client:	
Project Name:	
Project No.:	

Date:		Contractor: TEG	Location Diagram:
Borehole Diameter:	4"	Drillers:	
Boring Depth:	0-9.5'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?		Sampling Methods:	
Geologist:			

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
66				Pb 133	- SILT LENS @ 61" ~1/2" THICK GLEY 1 3/10Y W/ FINE SAND, TR. SLAG
				Zn 2711	MED - FINE SAND WITH SILT
66					7% SLAG GLEY 1 2.5/5GY
				Pb 106	MICA, QUARTZ
				Zn 3291	
					— 71" END OF CORE
72					

Notes:

①

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/2
Core No.:	DEBC
Client:	
Project Name:	
Project No.:	

Date:		Contractor:	TEG
Borehole Diameter:	2½"	Drillers:	
Boring Depth:	10'–17'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?		Sampling Methods:	
2.5' RECOVERY			
Geologist:			

Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-24" SAMPLED DE18C-10.0-17.0 NO GC				V. DK GREENISH GRAY FINE SAND AND SILT MICAS, QUARTZ, ~10% SLAG GLEY 1 3/5GY
12					
24	24-27" 2 OZ JAR FOR STORAGE DE18C-17.0				MED-FINE SAND & 30% SLAG GLEY 1 3/10GY
					27" END OF CORE

Notes:
DECANTED ~2" WATER FROM TOP
CORE HAS MEDIUM SAND & SLAG SMEAR ZONE
STORED, RATHER THAN SAMPLING, BOTTOM 3" → LOTS OF SMEAR

①

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/4
Core No.:	BSB17A
Client:	
Project Name:	
Project No.:	

Date:	5/4	Contractor:	TEG
Borehole Diameter:	4"	Drillers:	
Boring Depth:	5'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?	NA	Sampling Methods:	
Geologist:	MB		

Location Diagram:

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION: Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	STORAGE			Pb 163 ZN8530	SLAG + (85%) MEDIUM SAND w/ SOME FINE SAND QUARTZ, TR MICAS SUBANGULAR ~ 10YR 6/3 DISCOUNTING SLAG
	.75 -1.3 SAMPLE			Pb 171 ZN 9115	9" — — — — FINES @ CONTACT MEDIUM-FINE SAND & SLAG (~30%) w/ SILT QUARTZ, MICA
12				Pb 58 Zn 1183	2.5Y 4/3
	STORAGE			Pb 122 ZN 5345	— — 17" - 23" TRANSITIONAL ZONE
24	2-3 SAMPLE			Pb 336 Zn 9214	SLAG (~90%) WITH MED-COARSE SAND SUBANGULAR 2.5Y 2.5/1

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date: 5/11	
Core No.: BSB 17A	
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
30				Pb 132 Zn 8885	AS ABOVE
36				Pb 153 Zn 6416	MEDIUM SAND & SLAG (~70%) SUBROUNDED - SUBANGULAR QTZ, MICA 2.5Y 3/3
42	3.7-3.75 STORAGE 3.75-4 STORAGE			Pb 302 Zn 12.8K	1" THICK SILTY LAYER 42.5-43.5 SILT W/FINE SAND, ~5% SLAG GLEY 1 4/5GY
48					MEDIUM SAND & SLAG, ANGULAR-SUBANGULAR QTZ, SPAR 48" END OF CORE

Notes:

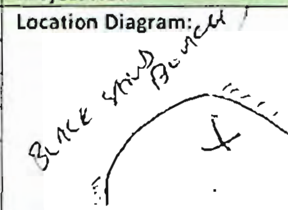
Sediment Coring Log

ENVIRONMENT INTERNATIONAL LTD.

Date:	5/4
Core No.:	BSB 16A
Client:	
Project Name:	
Project No.:	

Date:		Contractor:	
Borehole Diameter:	4"	Drillers:	
Boring Depth:	0-2.8'	Rig Type:	
River Depth:	4.4'	Drill Method:	
Refusal Depth?	2.8'	Sampling Methods:	
Geologist:	MB		

Location Diagram:



Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 357 Zn 3757	MEDIUM-FINE SAND WITH SILT ~50% SLAG QTZ. ~ ~~10~~ 2.5Y 5/3 DISCONTINUOUS SILT -- -- 3" 10YR 3/3 MEDIUM-FINE SAND ~60% SLAG -6.5": 1/4" THICK FINER SAND/SILT
				Pb 145 Zn 6025	SAME AS ABOVE -- -- 9" MEDIUM-FINE SAND & SLAG (85%) 10YR 2/1
12				Pb 213 Zn 11.7K	
	1.5-2.2 SAMPLE GS + SILT UNDERFILLED			Pb 158 Zn 13.5K	-- -- 20" 90% SLAG w/ MEDIUM SUBROUNDED-SUBANGULAR SAND GLEY 1 2.5/10GY
24				Pb 220 Zn 14.0K	26" END OF CORE

Notes:

ENVIRONMENT INTERNATIONAL LTD.

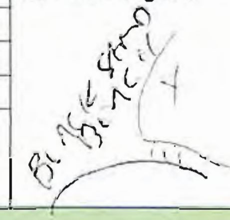
Sediment Coring Log

Date: 5/4
Core No.: BSB15A
Client:
Project Name:
Project No.:

Date:	5/4
Borehole Diameter:	4"
Boring Depth:	0–3.0'
River Depth:	
Refusal Depth?	3.8'
Geologist:	MB

Contractor:
Drillers:
Rig Type:
Drill Method:
Sampling Methods:

Location Diagram:



Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	SAMPLE 0-1			Pb 197 Zn 5721	SLAG & MED. SAND (60%) QTZ SUBANGULAR 10Y 5/2 (DISCOUNTING FOR SLAG)
				Pb 218 Zn 7762	70% SLAG & MED. SAND W/ TR. SILT MICA, QTZ, SPAR 2.5Y 4/2
12	SAMPLE 1-2			Pb 246 Zn 13.2K	COARSE SAND & GRAVEL W/ ROUNDED COBBLES TO 1½" SAND IS 90% SLAG + SUBANGULAR QTZ SAND: 7.5YR 6/3 -SLAG FINES DOWN
				Pb 424 Zn 15.8K	
24					24" END OF CORE

Notes:

Page 1 of ___

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	7/4
Core No.:	BSB 14A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 0–2.0'	Rig Type:	
River Depth: 2.6'	Drill Method:	
Refusal Depth? 2.0'	Sampling Methods:	
1.4' RECOVERY		
Geologist:		

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0–.75 STORAGE			Pb 129 Zn 8175	MEDIUM SAND & SLAG (80%) SUBANGULAR QTZ 2.5Y 3/1
6				Pb 136 Zn 6576	
12	.75–1.4 STORAGE			Pb 157 Zn 6924	MEDIUM SAND & SLAG (2.5Y 4/3 QTZ, MICA SUBROUNDED – SUBANGULAR GRAVEL & SAND 4 COBBLES TO 3" IN CATCHER
					16" END OF CORE

Notes:

(1)

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/5
Core No.:	SSB 6A
Client:	
Project Name:	
Project No.:	

Date:		Contractor: TEG	Location Diagram:
Borehole Diameter:		Drillers:	
Boring Depth:	10'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?	NA	Sampling Methods:	
Geologist:	MB		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	SAMPLE 0-1			Pb 109 Zn 3377	SLAG + MEDIUM SAND, SUBROUNDED - SUBANGULAR (70%) 2.5Y 3/1
6				Pb 123 Zn 3431	
12	STORE 1-1.5			Pb 196 Zn 5457	
18	SAMPLE 1.5-2.5			Pb<18.9 Zn<32.0	COARSE SAND & FINE GRAVEL AT CONTACT SAME AS BELOW
24				Zn 34 Pb<18.5	
30					CONTINUOUS SILTY CLAY, 30" - 32" w/ SOME FINE GRAVEL + 1" COBBLE

Notes:

Page 1 of ___

2

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	8/5
Core No.:	BSB 6A
Client:	
Project Name:	
Project No.:	

Date:		Contractor:	Location Diagram:
Borehole Diameter:	4"	Drillers:	
Boring Depth:	0-10'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?		Sampling Methods:	
Geologist:	MB		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	SAMPLE 2.5-3.5			Pb<17.2 Zn<23.4	CORSE SAND w/ TR. FINE SAND QTZ, MICA, BLACK PLATY GRAINS SUBROUNDED - SUBANGULAR 10YR 6/4
36				Pb<23.2 Zn<36.5	
42	STORE 3.5-4			Pb<17.1 Zn 31	SANDY FINE GRAVEL w/ ~~[illegible]~~ COBBLES GRAVEL MOSTLY PLATY DK GRAINS, SOME QTZ
48	SAMPLE 4-5			Pb<18.4 Zn<30.9	CORSE SAND w/ SOME FINE SAND & TR. GRAVEL SUBROUNDED 2.5Y 6/4 MICA, QTZ, DK PLATY GRAINS
				Zn 31 Pb 44.9	
60					

Notes:

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ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	3/5
Core No.:	BSB6A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
60	STORE 5-5.2			Pb < 23.0 Zn < 35.2	COARSE SUBROUNDED SAND & COBBLES TO 1 1/2"
					SAME AS ABOVE
					62" END OF CORE
66					

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/5
Core No.:	BSB 4A
Client:	
Project Name:	
Project No.:	
Location Diagram:	

Date:	5/5	Contractor:	TEG
Borehole Diameter:	4"	Drillers:	
Boring Depth:	0-7.1'	Rig Type:	
River Depth:	1.9'	Drill Method:	
Refusal Depth?		Sampling Methods:	
Geologist:	MB		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 200 Zn 8216	SLAG + MEDIUM SAND (90%) ~ MICA, QTZ
				Pb 101 Zn 5691	
12	.9-1.4 SAMPLE 8OZ SPLIT AND GS			Pb 161 Zn 1401	— 11 10YR 4/3 FINE-MED SAND W/ SLAG (~40%) — 14": BROWN ~~SILT~~ SILTY SAND 1/4" THICK -7.5YR 3/3 MED-FINE SAND + SLAG (~50%) QTZ, MICA 10YR 4/3 — 17 } CLEANS UPWARD
	1.5-2.5 SAMPLE +MS/MSD			Pb 203 Zn 9889	SLAG + MED. SAND (65%) SUBANGULAR - ANGULAR w/ THIN LAYERS OF COARSER, CLEANER SAND LIGHTER BAND: 2.5Y 4/3
24				Pb 194 Zn 9381	

Notes: BLED ~5" OF WATER FROM TOP OF CORE BEFORE CUTTING OPEN.

(2)

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/5
Core No.:	BSB 4A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
30	2.5-3.2 SAMPLE			Pb 551 Zn 8340	SLAG SAND AS ABOVE
36	3.2-3.5 SAMPLE			Pb 1244 Zn 13.5K	—39.5" COARSE SAND w/ TRACE FINE SAND & SILT SUBANGULAR - ROUNDED QTZ, SPAR, DK PLATY GRAINS, SERPENTINE? 2.5Y 6/2 39.5-43" ALSO w/ SOME FINE GRAVEL, COBBLES TO 3"
48	3.5-4.5 SAMPLE			Pb <18.5 Zn <27.3	
					54" END OF CORE
60					

Notes:

ENVIRONMENT INTERNATIONAL LTD.	**Sediment Coring Log**	Date: 5/5 Core No.: BSB 5A Client: Project Name: Project No.:
Date: 5/5 Borehole Diameter: 4" Boring Depth: 3.7' River Depth: Refusal Depth? Geologist: MB	Contractor: Drillers: Rig Type: Drill Method: Sampling Methods:	Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 73 Zn 2021	SLAG + MEDIUM SAND (65%) SUBANGULAR 2.5Y 2.5/1
				Pb 353 Zn 7434	
	SAMPLE .75-1.5			Pb 227 Zn 12.6K	SLAG (85%) & MED-COARSE SAND, SUBANGULAR
				Pb 141 Zn 985	SLAG + MEDIUM SAND SUBANGULAR 2.5Y 5/3 (DISCOL WITH SLAG)
2.1				Pb 91 Zn 2490	½" THICK BROWN FINE SANDY SILT 10YR 3/3 @ 2.2' FINES DOWN
3.0					

Notes: BLED ~4" OF WATER FROM CORE, LOST SOME FINES FROM TOP

②

ENVIRONMENT INTERNATIONAL LTD.	Sediment Coring Log	Date: 5/3 Core No.: RSB 5A Client: Project Name: Project No.:
Date: Borehole Diameter: Boring Depth: River Depth: Refusal Depth? Geologist:	Contractor: Drillers: Rig Type: Drill Method: Sampling Methods:	Location Diagram:

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 96 Zn 6345	65% SLAG & MED-FINE SAND 10YR 5/4 (DISCOLORED SLAG) COARSENS DOWN
36	SAMPLE 3-3.5			Pb 359 Zn 15.3k	~~[illegible]~~ GRADUAL CONTACT ONE ·2" SLAG IN MEDIUM SAND 95% SUBANGULAR-SUBROUNDED
42					42" END OF CORE

Notes:

Page 1 of __

(1)

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/6
Core No.:	BSB 3A
Client:	
Project Name:	
Project No.:	

Date:		Contractor:	
Borehole Diameter:	4"	Drillers:	
Boring Depth:	8'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?	8.1	Sampling Methods:	
Geologist:	MS		

Location Diagram:

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-.5 STORAGE			Pb 124 ZN 5961	
	.5-2 SAMPLE + FIELD DUP			Pb 153 ZN 7081	MED-COARSE SAND & SLAG (70%) SUBANGULAR-SUBROUNDED QTZ, TR. FINES 2.5Y 6/2. (DISCOLORED SLAG)
12				Pb 116 ZN 6031	
				Pb 113 ZN 6399	
24	2-2.3 STORAGE			Pb 140 ZN 5827	
	SAMPLE 2.3-3.1				BROWN MED/COARSE SAND & SLAG (50%) 10YR 3/3 SUBROUNDED

Notes:

②

Sediment Coring Log

ENVIRONMENT INTERNATIONAL LTD.

Date:	5/6
Core No.:	BSB 3A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
30	SAMPLE 23-3.1			Pb 63 Zn 5828	AS ABOVE
30				Pb 98 Zn 5215	MED. SAND & SLAG (70%) SUBROUNDED 10YR 6/3 DISCOLORING SLAG
42					V COARSE SAND, FINE GRAVEL, & COBBLES TO 1" IN BOTTOM INCH 43" END OF CORE

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/6
Core No.:	BSB 24A
Client:	
Project Name:	
Project No.:	

Date:	5/6	Contractor:	
Borehole Diameter:	4"	Drillers:	
Boring Depth:	2'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?	2'	Sampling Methods:	
Geologist:	MB		

Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 115 Zn 969	BROWN
6				Pb 119 Zn 1202	LAYERED BLACK, BROWN, & GRAY SANDY SILTS W/ SOME FIBERS
12				Pb 171 Zn 3900	LAYERED BROWN BROWN-GRAY, BLACK, & GRAY FINE SAND W/ SILT TR. FIBERS
	1.2-1.5 SAMPLE NO GS				DK. BROWN MED-FINE SAND & SLAG (30%) 10YR 3/3
18				Pb 574 Zn 2593	GRAY SILT @ CONTACT SANDY SILT W/ SLAG (20%) 7.5YR 4/6
					20" END OF CORE

Notes:

(1)

ENVIRONMENT INTERNATIONAL LTD.	Sediment Coring Log	Date: 5/6
		Core No.: BSB 3 ARCHIVE
		Client:
		Project Name:
		Project No.:

Date:	Contractor:	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 0-6.0'	Rig Type:	
River Depth: 3.7'	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist: MB		

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 241 Zn 4152	SOME LEAVES & TWIGS IN TOP 4" BROWN MED SAND & SLAG (50%) SUBANGULAR - SUBROUNDED QTZ, MICA 10YR 4/4 (DISCONTIN SLAG)
				Pb 119 Zn 6083	FINES & GETS MORE REDDISH BROWN DOWN
12				Pb 118 Zn 4745	
				Pb 102 Zn 6223	20.5" MED SAND & SLAG (~60%) SAND: 2.5Y 7/1
24				Pb 75 Zn 5053	10YR 4/4 MED SAND & SLAG (60%) SUBROUNDED
					10YR 3/4 MED SAND & SLAG ([illegible]%)

Notes:

②

ENVIRONMENT INTERNATIONAL LTD.	# Sediment Coring Log	Date: 8/6
		Core No.: BSB 3 ARCHIVE
		Client:
		Project Name:
		Project No.:

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
70				Pb 114 Zn 8729	
30				Pb 119 Zn 6307	
42					42" END OF CORE

Notes:

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ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/6
Core No.:	SCB-6A
Client:	
Project Name:	
Project No.:	

Date: 5/6	Contractor: TEG	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 0-6.5'	Rig Type: GEOPROBE	
River Depth: 2.8'	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist: NB		

Scale in ~~Feet~~ INCH	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
0	0-.5 STORAGE			Pb 73 Zn 2268	SILTY FINE SAND W/ SLAG (20%) 10YR 3/3
	.5-1.5 SAMPLE			Pb 85 Zn 1730	MED. SAND & SLAG (40%) W/ TR. SILT 10YR 4/3
12				Pb 156 Zn 3136	MED-COARSE SAND & SLAG (35%) 2.5Y 6/2 (DISCONTINUOUS SLAG
	1.5-2.8 STORAGE			Pb 130 Zn 2441	
24				Pb 246 Zn 3040	
30					

Notes:

(2)

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/6
Core No.:	~~SSB~~ SCB 6A
Client:	
Project Name:	
Project No.:	

Date:		Contractor:	
Borehole Diameter:	4"	Drillers:	
Boring Depth:		Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?		Sampling Methods:	
Geologist:			

Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
30				Pb 376	SILTY DK BROWN FINE SAND W SLAG (35%) 2.5Y 3/3
				ZN 1577	32 — DK GRAY SILT W/ FINE SAND & SLAG (<50% OF VISIBLE GRAINS) GLEY 1 2.5/5GY — 34
	2.8-3.3 SAMPLE				
36				Pb 376 ZN 3774	MED-FINE SAND & SLAG (40%) MICA, QTZ 2.5Y 4/3
	3.3-3.7 STORAGE				
42				Pb 275 ZN 3259	41 — GLEY 1 2.5/5GY DK GREY SILT W/ FINE SAND & SLAG AS ABOVE — 43
	3.7-4.2 SAMPLE				MED-FINE SAND & SLAG (40%) SUBROUNDED - SUBANGULAR QTZ, SPAR
48				Pb 372 ZN 4804	2.5Y 5/4
					54" END OF CORE
54					

Notes: SAMPLES INTERVALS ARE BTWN GRAY SILT BANDS

(F)

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/6
Core No.:	SCB 3A
Client:	
Project Name:	
Project No.:	

Date: 5/6	Contractor:	Location Diagram:	
Borehole Diameter: 4"	Drillers:		
Boring Depth: 0-3.5'	Rig Type:		
River Depth:	Drill Method:		
Refusal Depth? RESISTANCE @ 2.5'	Sampling Methods:		
8			
Geologist:			

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-1.3 STORAGE			Pb 151 Zn 1635	SILTY FINE-MED SAND w/ TR. TWIGS / FIBERS 20% SLAG 2.5Y 3/2
				Pb 127 Zn 2112	
12				Pb 183 Zn 3647	SILTY MED. SAND w/ TR. FIBERS ~20% SLAG SUBANGULAR - SUBROUNDED 10YR 3/3
	1.3-2.1 SAMPLE				FINE - MED. SAND & SLAG (~65%) 2.5Y 6/3 DISCERNABLE SLAG
				Pb 217 Zn 3053	18.5": THIN BAND REDDISH MATERIAL MED SAND & SLAG AS ABOVE
24	~~2.1-2.2~~ 2.1-2.5 STORAGE			Pb 198 Zn 2446	SILT W/ FINE SAND 2.5Y 4/3 LAYERED W/ SILTY SAND & SLAG (20%) 10YR 3/3
30					

Notes: TOP 10" OF SOIL V. SOUPY - DRAINED SURF. WATER AFTER OPENING

(2)

ENVIRONMENT INTERNATIONAL LTD.	**Sediment Coring Log**	Date: 5/6 Core No.: SCB 3A Client: Project Name: Project No.:
Date:	Contractor:	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
30	2.5-3.2 SAMPLE			Pb 315 Zn 4681	MED ~~&~~ FINE SAND & SLAG (50%) SUBANGULAR - SUBROUNDED 10YR 5/3 (DISCOLORING SLAG)
36				Pb 221 Zn 2930	
					38" END OF CORE

Notes:

(1)

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/7
Core No.:	SCB 7A
Client:	
Project Name:	
Project No.:	

Date:		Contractor: TEG	Location Diagram:
Borehole Diameter:	4"	Drillers:	
Boring Depth:	0-9.5'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?	NA	Sampling Methods:	
Geologist:	MB		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-1 STORAGE			Pb 138 Zn 2099	MEDIUM SAND & SLAG (30%) MICA, QTZ 2.5Y 4/3
				Pb 99 Zn 1678	
12	1.0-2.3 MS/MSD + FIELD DUPLICATE			Pb 152 Zn 3339	
				Pb 157 Zn 3765	
24				Pb 250 Zn 3409	
30	2.3-2.7 STORAGE				MED SAND & SLAG (30%) 2.5Y 5/4

Notes:

2

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/7
Core No.:	SCB 7A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
30				Pb 756 Zn 4654	AS ABOVE
36	2.7-3.6 SAMPLE				REDDISH SILT LAYER 1" THICK SILT w/ TR. FINE SAND 10 YR 3/3
				Pb 643 Zn 3076	MED. SAND & SLAG (50%) SUBANGULAR 2.5Y 6/3 (DISCOLORING SLAG)
42	3.6-4.4 SAMPLE			Pb 607 Zn 2089	FINE-MED SAND & SLAG (60%) QTZ, MICA
48				Pb 371 Zn 1079	2.5Y 6/2 (DISCOLORING SLAG)
54	4.4-5.0 SAMPLE				FINE-MED SAND w/ SILT 2.5Y 5/2 ~4% SLAG
				Pb 363 Zn 722	SANDY SILT 2.5Y 4/3
60					MED SAND SUBANGULAR-SUBROUND 2.5Y 4/4 QTZ, MICA, SPAR

Notes:

③

ENVIRONMENT INTERNATIONAL LTD.	Sediment Coring Log	Date: 5/7 SCB 7A Core No.: Client: Project Name: Project No.:
Date: Borehole Diameter: Boring Depth: River Depth: Refusal Depth? Geologist:	Contractor: Drillers: Rig Type: Drill Method: Sampling Methods:	Location Diagram:

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
60	5.0-5.6 SAMPLE			Pb 100 Zn 221	As above MED SAND TR. SLAG 2.5Y 7/2 SUBANGULAR
	5.6-6.3 SAMPLE			Pb<21.9 Zn 65	SILTY MED-FINE SAND 5Y 6/2 QTZ, MICA, 10% SLAG/SLAGLIKE MICA BITS
72				Pb 28 Zn 44	
					76" END OF CORE

Notes:

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ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/7/10
Core No.:	SCB12 A
Client:	
Project Name:	
Project No.:	

Date: 5/7/10	Contractor: TEG	Location Diagram:	
Borehole Diameter: 4"	Drillers:		
Boring Depth:	Rig Type:		
River Depth: 1.8'	Drill Method:		
Refusal Depth? 6.5	Sampling Methods:		
	4.4' Recovery		
Geologist: GSP			

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-0.5 storage			Pb 99 ZN 1567	
6	0.5-1.5 sample			Pb 75 ZN 1495	fin-med SAND w/ silt and slag (20-30%) 2.5Y 2.5/1 1" thick silt layer v. dark gray at ~12" 2.5Y 3/1 (XRF = Pb 341, ZN 636)
12				Pb 59 ZN 722	becoming coarse at ~19" 2.5Y 3/2 slag = ~~40~~ 30-%
18	1.5-3.1 storage			Pb 218 ZN 4345	
24				Pb 167 ZN 3834	
30					

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date: 5/7/10
Core No.: SCB 12A
Client:
Project Name:
Project No.:

Date:	Contractor:
Borehole Diameter:	Drillers:
Boring Depth:	Rig Type:
River Depth:	Drill Method:
Refusal Depth?	Sampling Methods:
Geologist: GSP	

Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb = 108 Zn 2657	As above, homogeneous med-coarse sand w/ 30-40% slag
36				Pb 261 Zn 2326	
42	3.1 - 4.1 Sample			Pb 331 Zn 2701	
48				Pb 1263 Zn 9261	
52					50' end of core

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/8/10 logging
Core No.:	SCB 15 Archive
Client:	
Project Name:	
Project No.:	

Date: 5/7/10 core 1:10 PM	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth: 8.1'	Drill Method:	
Refusal Depth?	Sampling Methods: Recovery 1.6' ~19"	
Geologist: GSP		

Scale in Feet (inches)	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 166 Zn 4797	fine-med SAND, little med gravel (Y 2.5/1 black uniform subrounded (~20% neg?) mafic minerals
6	Sleeve 0-1.6			Pb 125 Zn 4483	organic material (leaves, roots) starting at 0.8' (9-11") w/ coarse gravel well rounded, black
12				Pb 170 Zn 9884	As above
18					
19					19" end of core

Notes:

Page 1 of ___

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/8/10 1:25 p logged
Core No.:	SCD-RR archive
Client:	
Project Name:	
Project No.:	

Date: 5/7 cored	Contractor:	Location Diagram:	
Borehole Diameter:	Drillers:		
Boring Depth: 2.2'	Rig Type:		
River Depth: 2.6'	Drill Method:		
Refusal Depth?	Sampling Methods: Driven 2.2 Recovery 2.0' (22")		
Geologist: esf			

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-1.9 Sludge			Pb 116 ZN 1253	Fine-med SAND, some silt and slag (10%) little gravel 10YR 3/2 v. dark grayish brown
6				Pb 143 ZN 1201	at 11-12" reddish stained layer
12				Pb 225 ZN 1825	
18				Pb 185 ZN 1251	
24					22" end of core

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/8/10
Core No.:	BSB 6A ~~[illegible]~~ Cont.
Client:	
Project Name:	
Project No.:	

Date: 5/8/10	Contractor: TEG	Location Diagram:	
Borehole Diameter:	Drillers:		
Boring Depth: 5.5'	Rig Type:		
River Depth: 2.7'	Drill Method:		
Refusal Depth?	Sampling Methods:		
	Recovery 3.7' 45"		
Geologist: GP			

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-0.5 Sample			Pb 322 ZN 8544	med-coarse SAND w/ mafic minerals, sub-rounded and slag (20-30%), uniform sand 10YR 2/1 black
6				Pb 105 ZN 7251	
12	0.5-1.5 Sample			Pb 214 ZN 7186	As above
18	1.5-2.4 Sample			Pb 119 ZN 9321	
24				Pb 312 ZN 12.2K	
30					

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/8/10
Core No.:	BSB 6 A~~[illegible]~~ Conf
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist: GP		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 198 Zn 5262	
36	2.4 - 3.4 sample			Pb 219 Zn 8826	at 41" gradational contact w/ med coarse SAND w/ gravel (fine - coarse) trace silt (slate quartz mica bits) (Beach sand) multicolored rounded (~10-20% slag) 2.5 Y4/2
42	sample 3.4 - 3.7			Pb 108 Zn 5017	
					eob 45"

Notes:

Sample 3.4-3.7' only TAL metals jar filled (not completely)
split jar filled 1/4 full

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date: 5/8/10 3:30
Core No.: ~~[illegible]~~ RV Park / Archive
Client:
Project Name:
Project No.:

Date:
Borehole Diameter:
Boring Depth: 7.5
River Depth: 2.8'
Refusal Depth?

Geologist: EP

Contractor: TEG
Drillers:
Rig Type:
Drill Method:
Sampling Methods:
Recovery 2.2
~ 27"

Location Diagram:
Not in study area - for RV Park Beach sand characterization only

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 133 ZN 1493	Fine SAND and SILT 10YR 2/1 black organic material (wood, roots)
6	0-2.2 None			Pb 262 Zn 4383	
12				Pb 232 ZN 3713	
18				Pb 244 ZN 2778	
24				Pb 169 ZN 2071	color change Gradational contact at 26" 10YR 3/2 v dark grayish brn to 10YR 3/3 dk brn; EOB 27"

Notes:
Material in catcher = 10YR 3/3 dk brn
Fine sand + silt, organic material
Sample from catcher = RV Park / Archive catcher

Page 1 of __

(1)

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/5
Core No.:	BSB 6 ARCHIVE 2
Client:	
Project Name:	
Project No.:	

Date: 5/4	Contractor:	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 0-6'	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth? NA	Sampling Methods:	
Geologist: MB		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 122 ZN 3343	SLAG & MED. SAND (75%) SUBROUNDED 2.5Y 4/2
				Pb 154 ZN 4247	~~GRAVEL~~ TRACE COBBLES TO 1¼" — @ 7.5"
02				Pb 168 ZN 5910	GRAVEL & COBBLES TO 1" AT CONTACT
				Pb<15.9 ZN 51	COARSE SAND w/ TRACE FINES. SUBROUNDED 10YR 6/3 QTZ, MICA, ROUND BLACK GRAINS
				Pb 19 ZN <26.2	

Notes:

2

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/5
Core No.:	BSB 6 ARCH 2
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
30				Pb<17.8 Zn 29	COARSENS DOWN ↓
36				Pb < 21.7 Zn 39	~~[illegible]~~ COARSE SAND & FINE ROUNDED - SUBROUNDED GRAVEL W/ TRACE FINE SAND
					40" END OF CORE

Notes:

(1)

ENVIRONMENT INTERNATIONAL LTD.	# Sediment Coring Log	Date: 5/9/10 Core No.: OC-18A Client: Project Name: Project No.:

Date:	Contractor:	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 7.5	Rig Type:	
River Depth: 1.4	Drill Method:	
Refusal Depth?	Sampling Methods: Recovery 5.1 ~ 60"	
Geologist: EP		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-0.5 Storage			Pb 285 Zn 3843	Fine - coarse SAND 10YR/2/2 v. dk brown + 20% - 30% slag
6	0.5 - 2.0 Sample			Pb 198 Zn 2832	
12				Pb 165 Zn 3060	
18				Pb 200 Zn 2746	Color change at 24" dk brn → black
24	2.0 - 2.6 Storage ~~Sample~~			Pb 192 Zn 1646	SILT w/ fine sand, some organic material (roots)
30					

Notes:

Page 1 of ___

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/29/10
Core No.:	OC-18A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist: GP		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	2.6- 3.3 Storage			Pb 119 ZN 3078	change to red - coarse SAND + slag
36				Pb 100 ZN 1129	
	3.3- 3.5 Sample TAL/Pb split				2" thick gray fine-sand and silt layer core top
42	3.5- 4.1 Storage			Pb 226 ZN 4477	fine - coarse black sand and SLAG (60-70%)
48				Pb 188 ZN 1985	3" Black organic layer w/ roots, no color change from above/below
54	4.1- 5.1 sample			Pb 219 ZN 1270	fine-medium ~~coarse~~ SAND w/ silt; becoming lighter gray, siltier, more fine sand
60					

Notes:

EOB 60'

(1)

ENVIRONMENT INTERNATIONAL LTD.	**Sediment Coring Log**	Date: 5/9/15 5:15 PM Core No.: OC-18 Archive Client: Project Name: Project No.:
Date: Borehole Diameter: 4" Boring Depth: 6.0' River Depth: 1.5' Refusal Depth? Geologist: GP	Contractor: TEG Drillers: Rig Type: Drill Method: Sampling Methods: Recovery 4.4' ≈ 52'	Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0 – 0.5 storage			Pb 109 Zn 1606	roots in silty wash 0-0.5' Fine to coarse SAND 10YR 2/2 v. dk brn +20% slag
6	:05 – 1.3 storage			Pb 248 Zn 4149	Grading to ~~silty sand~~ at 16" Sand, SILT w/ thin silt layering throughout
12	storage			Pb 242 Zn 2263	
18	1.5 2.0 storage			Pb 323 Zn 2619	Color change at 24" dk. brn → black
24	2.0-3.0 storage			Pb 215 Zn 4526	SILT w/ fine Sand (grading to fine-med, then med-coarse SAND at 3.0') SILT layers 1/2" thick at 26" and 35" ~~med coarse SAND and Slag (60% 70%)~~
30					

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/9/10
Core No.:	OC-18 Archive
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist: GP		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 138 Zn 2001	SILT layer (½")
36	3.0' 4.4 storage			Pb 382 Zn 7086	med-coarse sand + slag (Black) 60-70% uniform
42				Pb 206 Zn 5308	
48				Pb 147 Zn 1913	becoming siltier at 48"
					EOB ~ 52"
54				~~Pb~~ ~~Zn~~	
60					

Notes:

1

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/10/10
Core No.:	OC-10A
Client:	
Project Name:	
Project No.:	

Date:		Contractor:	
Borehole Diameter:	4"	Drillers:	
Boring Depth:	7.5'	Rig Type:	
River Depth:	27'	Drill Method:	
Refusal Depth?		Sampling Methods:	Recovery 4.6' ~54"
Geologist:	GSP		

Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-0.4 storage			Pb 316 Zn 4557	Med-coarse SAND and slag (30%) ~40
6	0.4-1.3 sample (excluding silt layer)			Pb 153 Zn 2418 (in finer sand layer)	sand fining into silt layer
12				Pb 577 Zn 7415	3.5Y3/1 1st silt layer 13-14" w/ organics (roots)
					Increasing SLAG, faint color layering in sand layers, ~~increasing~~ banding, dark black color finer sand/slag layers alternating with coarse sand layers
18	1.3-2.3 sample			Pb 323 Zn 10.2K	
24				Pb 225 Zn 7934	
30					

Notes:

(2)

ENVIRONMENT INTERNATIONAL LTD.	Sediment Coring Log	Date: 5/10/10 Core No.: OC-10A Client: Project Name: Project No.:
Date: Borehole Diameter: Boring Depth: River Depth: Refusal Depth? Geologist:	Contractor: Drillers: Rig Type: Drill Method: Sampling Methods:	Location Diagram:

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION: Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	2.3-3.0 Sample			Pb 623 Zn 11.1K	@ 34" less slag (lighter color, increasing → brn), more fine sand 10YR 2/2
36				Pb 362 ~~482~~ Zn 5361	sand coarsening at 39"
42				Pb 507 Zn 6354	
48	sample 3.0-4.6			Pb 234 Zn 3297	SILT layer at 50-51' as before sand fining to end of core
54					eob 54"

Notes:

(1)

ENVIRONMENT INTERNATIONAL LTD.	# Sediment Coring Log	Date: 5/10/10 Core No.: OC 14A Client: Project Name: Project No.:
Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	- Drillers note v. soft sediments lots of retained H_2O in core sleeve
Boring Depth: 7.5'	Rig Type:	
River Depth: 2.1'	Drill Method:	- offshore depositional environment deeper water than previous core
Refusal Depth?	Sampling Methods: recovery 6.6 ~77"	
Geologist: GSP		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-0.5 storage			Pb 91 ZN 493	v. wet + soft sludge consistency SILT, black
6	0.5-1.5 sample			Pb 223 ZN 1115	SILT and fine sand little slag (20%?) organics (tiny roots) 10YR 2/1
12				Pb 204 ZN 1149	
18	1.5-3.3 storage			Pb 381 ZN 1799	As above
24				Pb 319 ZN 1139	
30					

Notes:

- organic odor when obtaining core on boat

②

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/10/10
Core No.:	OC 14 A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist: ESP		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 153 Zn 672	
36				Pb 95 Zn 804	Organic v. slk black layer (roots, sticks, leaves) organic odor (decomposing) SILT (as before) and fine sand
42	3.3-4.3 Sample			Pb 195 Zn 2434	med-course SAND + slag (~60%) v. dark black (SILT) as before alternating with darker gray-black fine sand layers (1-1.5" thick) (2.5Y3/1 v. dk gray) 2.5Y 2.5/1
48				Pb 163 Zn 1185	
54	4.3-5.5 Storage			Pb 686 Zn 1868	
60					

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/10/10
Core No.:	OC 14A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 270 Zn 1385	As above
66				Pb 835 Zn 1713	Fine sand and SILT
72	Sample 5.5-6.6			Pb 174 Zn 2067	Fine sand, Black +silt no visible slag fragments
				Pb 217 Zn 1621	eob ~77" ← material in catcher is silt w/ fine sand dk brn
				Pb 436 Zn 2094	Also have OC 14 B in catcher fine sand w/silt (the rest of the core is in bottle) dk brn

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/10/10
Core No.:	OC 14 Deep
Client:	
Project Name:	
Project No.:	

Date:		Contractor:	
Borehole Diameter:	2 1/2"	Drillers:	
Boring Depth:	8-10.6'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?		Sampling Methods:	1.3' recovery
Geologist:	GSP		

Location Diagram:

Grab sample Deep
+ 0.3' in catcher
(8-10.6')

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
					Grab sample 8-10.6
feet 8	8-10.6 sample			Pb 163 Zn 1060	Fine sand and SILT
9					
10					
10.6					

Notes:

Page 1 of ___

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/11/10 930Am
Core No.:	OC15 Deep + Dril Auger Sample
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram: Grab sample # DEEP + material from auger at 11.0' (11.0') (9-11' sample) (off grid location)
Borehole Diameter:	Drillers:	
Boring Depth: 9.0'	Rig Type:	
River Depth: 3.3'	Drill Method:	
Refusal Depth?	Sampling Methods: Recovery 0.8' ≈ 10"	
Geologist: GSP		

depth (ft) inches ~~feet~~

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
9.0 0				~~Pb 8351~~ ~~Zn 29.6k~~ ↓ ~~one "ball"~~	XRF Pb 145 Zn 3072 / Pb 148 Zn 3274 — Fine-med SAND and slag (40-50%) (~~50%-60%~~) some subrounded mafic x-tals 10YR 2/1
9.4 5	9-9.8 sample (filled Pb, TAL and split only)				
9.8 10					
	Storage of slag balls				OC 15 Deep Drill Auger (at 11.0') Storage sample Slag "balls" 7-8 in number 1-2" diameter 90-95% slag x-tals little coarse sand (quartz x-tals) Black, glossy, slag all the way through XRF (one ball) Pb = 8351 Zn = 29.6K XRF (two ball) Pb = 7270 Zn = 26.8K

Notes:

ENVIRONMENT INTERNATIONAL LTD.	# Sediment Coring Log	Date: 5/11/10 10:40 Core No.: OC-20 Archive + Catcher Client: Project Name: Project No.:
Date:	Contractor:	Location Diagram:
Borehole Diameter: 4"	Drillers:	~~off~~ (off-grid location)
Boring Depth: 2.9'	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
	1.5 + catcher	
Geologist: GSP	recovery ~17"	

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 199 Zn 1442	SILT and fine sand w/ slag ↑ 10YR 2/2 v. dark brn (20%) fresh organic material - (green shoots, roots)
6	storage 0 - 12			Pb 191 Zn 1588	- - becoming sandier
12	~~storage~~ 1.2 + 1.4 + catcher			Pb 359 Zn 3025	Fine sand w/ slag (~30%) Gravel ~~Cobbles~~ seq. at 14" rounded to angular up to 2" diameter, (fine - coarse gravel)
18					EOB 17"
					Material in catcher is SILT and fine SAND w/ gravel (fine → coarse) v. wet
					XRF = Pb < 19 Zn 66

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date: 5/11/10
Core No.: SC20A
Client:
Project Name:
Project No.:

Date:	Contractor:	Location Diagram: (off grid location)
Borehole Diameter: 4"	Drillers:	
Boring Depth: 2.3	Rig Type:	
River Depth: 1.7'	Drill Method:	
Refusal Depth?	Sampling Methods: Recovery 1.7' ≈ 20"	
Geologist: GSP		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-0.5 Storage			Pb 52 Zn 366	SILT and fine sand, v. wet "sludgy", some slag fresh organics (roots, fibers, grass) (20% slag) 7.5YR 2.5/2 v. dr brn
6	Sample 0.5-1.7			Pb 226 Zn 590	becoming sandier at 9" Fine sand ~~and~~ little SILT, (20% slag)
12				Pb 246 Zn 1792	
18				Pb 277 Zn 2057	
20					eob 20"

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/11/10 1230 (obtain core)
Core No.:	OC 21A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram: off grid location
Borehole Diameter:	Drillers:	
Boring Depth: 6.6'	Rig Type:	
River Depth: 2.5'	Drill Method:	
Refusal Depth?	Sampling Methods: Recovery 4.3' ~50"	
Geologist: GSP		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-1 sample			Pb 210 Zn 2667	Fine-med SAND, little silt, slag (~30%) uniform sand w/ occasional grey silt layers 10YR 3/2 v. dk. grayish brn
6				Pb 234 Zn 2915	
12				Pb 246 Zn 2287	As above
18	1-2.7 ~~waste~~ sample + DUP + MS/MSD			Pb 234 Zn 2057	As above
24	discard strange jar			Pb 220 Zn 1873	
30					

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/11/10
Core No.:	OC-21A
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist: GSP		

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 219 Zn 1682	Fine silt layers intermingle w/ SAND at regular intervals of 1/4 - 1/2"
36				Pb 197 Zn 1481	SILT layer 10YR 4/1 dk gray @ 41-42"
42	Sample 2.7 - 4.3			Pb 244 Zn 2567	10YR 3/2 v. dk grayish brn Fine Sand some silt some SLAG (30%)
48				Pb 199 Zn 1675	
					eob at 50"

Notes:

ENVIRONMENT INTERNATIONAL LTD.	**Sediment Coring Log**	Date: 5/11/10 230pm Core No.: BC-22A Client: Project Name: Project No.:
Date: 5/11/10 Borehole Diameter: Boring Depth: 3.7 River Depth: 2.1' Refusal Depth? Geologist: GSP	Contractor: TSG Drillers: Rig Type: Drill Method: Sampling Methods: 2.5' Recovery	Location Diagram: (off and location)

Scale in Feet	Sample: Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-1.5			Pb 235 ZN 2652	Fine-med SAND little slag (20-30%) 10YR 3/2 v dark grayish brown
6	1.5			Pb 169 ZN 1835	(Top of core (12") very disturbed, features are slumped due to mixing in transit - no sample taken from top of core)
12	sample			Pb 281 ZN 3110	uniform sand to end of core
18				Pb 210 ZN 2076	
24	sample 1.5- 2.5			Pb 195 ZN 2193	eob at 30"
30					

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/12/10 1030
Core No.:	OC-21 Rep 2
Client:	
Project Name:	
Project No.:	

Date:		Contractor:	
Borehole Diameter:		Drillers:	
Boring Depth:		Rig Type:	
River Depth:	1.9	Drill Method:	
Refusal Depth?	9-11	Sampling Methods:	Kevlar 1.1 x 13'
Geologist:	GSP		

Location Diagram:

off grid location

9'. depth inches

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	Sample 0-1.1			Pb 377 Zn 2669	Fine-med SAND and slag (20-30%) v. wet. Sample pretty homogenized due to water content 10YR 2/2 v. dk brn.
9.5 6	(filled only TAL, Pb + split jars)			Pb 392 Zn 2216	
10 12				Pb 354 Zn 2051	EOB ~ 13'

Notes:

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Sediment Coring Log

ENVIRONMENT INTERNATIONAL LTD.

Date:	5/12/10
Core No.:	OC 23A + catcher
Client:	
Project Name:	
Project No.:	

Date:		Contractor:	
Borehole Diameter:	2.5"	Drillers:	
Boring Depth:		Rig Type:	
River Depth:	2.3	Drill Method:	
Refusal Depth?	1.5	Sampling Methods:	Recovery 1.2 ~15"
Geologist:	GSP		

Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	~~0-0.8 sample~~			Pb 98 ZN 723	Fine-med SAND some silt ~~10YR~~ 2.5Y 3/2 v. dark grayish brn with slag (30%) v. wet top 6" some organic material (fresh grass, roots)
6	0.0-1.2 sample + DUP			Pb 185 ZN 1255	As above w/ gravel (~1")
12				Pb = 280 Zn 1586	
					eob 15"
					Catcher OC23A material as above w/ gravel Pb 333 ZN 1550 Storage Sample

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/12/10
Core No.:	OC 23 Archive + catcher
Client:	
Project Name:	
Project No.:	

Date:		Contractor:	
Borehole Diameter:	2.5	Drillers:	
Boring Depth:	1.4	Rig Type:	
River Depth:	2.2	Drill Method:	
Refusal Depth?		Sampling Methods:	Eckman 1.0
Geologist:	GSP		

Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
6	0–1.0 Storage			Pb 113 Zn 833	F V. wet, silty sludge w/ organic material Fine-med SAND and SILT 2.5Y 3/2
12				Pb 163 Zn 1258	As above
					eob @ 12"
					Catcher OC 23 Archive Pb 253 Zn 1544 Share sample
					As above Fine-med sand w/silt

Notes:

1

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/9/10
Core No.:	OC-15 Archive
Client:	
Project Name:	
Project No.:	

Date: 5/9/10	Contractor:	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 6.0'	Rig Type:	
River Depth: 2.0'	Drill Method:	
Refusal Depth?	Sampling Methods: 4.1' recovery ~51"	
Geologist: SP		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	0-.4 Storage			Pb 313 ZN 3531	Fine-coarse SAND ~~red~~ brown with varves (black, reddish stained ((curved) (30% slag?) core top ← some stranded mafic minerals 10YR2/2 v. dark brn
6	.6-1.5 ~~Stor~~ Storage			Pb 242 ZN 3790	
12				Pb 428 ZN 4471	
18	1.5-2.4 Storage			Pb 382 ZN 6443	Fine-coarse SAND darker ~~brown~~ color + slag 2.5Y 2.5/1 black
24				Pb 347 ZN 6235	color transition to gray-black 5Y 2.5/1
30					

Notes:

2

Sediment Coring Log

ENVIRONMENT INTERNATIONAL LTD.

Date:	5/5/10
Core No.:	OC-15 Archive
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist: GP		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	2.4-3.6			Pb 209 Zn 2650	Fine-med SAND + slag dark grey; silt layer at 35" 1/2-1" thick 2.5Y 4/1 dk grey
36	storage			Pb 208 Zn 3301	2" thick Organics layer black (roots, wood, leaves) slight organic odor; Fine sand black + slag, and silt
42	3.6-4.1			Pb 827 Zn 8497	Coarse SAND becoming finer at end of core and slag (50-60%)
48	storage			Pb 142 Zn 2708	Finer sand
					EOB ~51"

Notes:

(1)

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/7
Core No.:	SCB 12 Arc(?) ave
Client:	
Project Name:	
Project No.:	

Date:	Contractor: TEG	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 0-3.5	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth? 0-7.1 (rocks)	Sampling Methods: Recovery 82'	
Geologist: GSB		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb 703 ZN 1417	Fine-med SAND + slag 2.5Y 3/2 w/silt (20-30%) ~~at~~
6	0-1.3 Storage			Pb 99 ZN 1197	As above but more med-coarse sand ~3/4" SILT layer at ~11" 2.5Y 3/1 grayish
12				Pb 72 ZN 930	~1/4" silty layer at 16" 2.5Y 3/2
18				Pb 288 ZN 6048	med-coarse SAND + slag (30%), some silt 5Y 2.5/2
24				Pb 105 ZN 2085	
30					

Notes:

②

ENVIRONMENT INTERNATIONAL LTD.	# Sediment Coring Log	Date: 5/7
		Core No.: SCB 42 Archive
		Client:
		Project Name:
		Project No.:

Date:	Contractor: TEG	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist: GSP		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
	1.3'-3.5'			Pb 405 ZN 3508	As above, homogeneous med-coarse SAND+slag
36	~~Sample~~ storage			Pb 873 ZN 5293	
42					42" end of core

Notes:

(2)

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/7
Core No.:	SCB 7 AR CHIR
Client:	
Project Name:	
Project No.:	

Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist:		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
30	2.6-3.1 STORAGE			Pb 291 Zn 3256	AS ABOVE -- 37" MED SAND & SLAG (40%) SUBANGULAR QTZ, MICA
36	3.1-4.0 STORAGE			Pb 261 Zn 2769	2.5Y 6/2 (DISCOUNTING SLAG) ← 38" THIN REDDISH SILT LAYER W/ FINE SAND 10YR 3/3 MED SAND & SLAG (45%) SUBANGULAR QTZ, TR. MICA 2.5Y 6/3 (DISCOUNTING SLAG)
42				Pb 650 Zn 4425	— 42.5" THIN REDDISH BAND SAND & SLAG AS ABOVE
48	4.0-4.3 STORAGE			Pb 474 Zn 2780	2.5Y 7/2 (DISCOUNTING SLAG) —— 48 MED SAND & SLAG (40%) 51" END OF CORE

Notes:

(1)

ENVIRONMENT INTERNATIONAL LTD.	Sediment Coring Log	Date: 5/7 Core No.: SCB 7 ARCHIVE Client: Project Name: Project No.:
Date:	Contractor:	Location Diagram:
Borehole Diameter: 4"	Drillers:	
Boring Depth: 0-6.5'	Rig Type:	
River Depth: 2.0'	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist: MB		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
0	0-.5 STORAGE			Pb 117 Zn 2319	SILTY MED-FINE SAND & SLAG (40%) 10YR 3/4
	.5-1.6 STORAGE			Pb 103 Zn 1343	
12				Pb 97 1143	
18	1-6-2.6 STORAGE			Pb 175 Zn 2936	-- 2.1' MEDIUM SAND & SLAG (35%) SUBROUNDED - SUBANGULAR
24				Pb 167 Zn 2961	2.5Y 6/2 (DISCONTINUOUS SLAG)
30					

Notes:

ENVIRONMENT INTERNATIONAL LTD.

Sediment Coring Log

Date:	5/9/10 11:30
Core No.:	OC-15A
Client:	
Project Name:	
Project No.:	

Date:	5/9/10	Contractor:	TEG
Borehole Diameter:	4"	Drillers:	
Boring Depth:	7.5'	Rig Type:	
River Depth:		Drill Method:	
Refusal Depth?		Sampling Methods:	Recovery 5.2 ~62"
Geologist:	GSP		

Location Diagram:

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
0–6				Pb 332 Zn 3412	Fine-med SAND w/ silt w/ Slag (30-40%) 10YR 2/2 v. dark brown some rounded mafic minerals Becoming darker colored gradually, approaching black organic layer
6–12	0.5-1.5 sample			Pb 404 Zn 4872	at ~9" 1/2" black curved layer varve? - organics - ~~v. dark black~~ (roots, needles)
12–18				Pb 804 Zn 2336	
18–24				Pb 468 Zn 7619	fine-med SAND w/ silt & slag (as above)
24–30	1.5-2.8 storage			Pb ~~247~~ 260 ~~275~~ Zn ~~3149~~ ~~3419~~ 3245	

Notes:

ENVIRONMENT INTERNATIONAL LTD.	Sediment Coring Log	Date: 5/9/10 Core No.: OC-15 A Client: Project Name: Project No.:
Date:	Contractor:	Location Diagram:
Borehole Diameter:	Drillers:	
Boring Depth:	Rig Type:	
River Depth:	Drill Method:	
Refusal Depth?	Sampling Methods:	
Geologist: GSl		

Scale in Feet	Sample Time, Sample ID, Type	Recovery	Penetration	Field Screening Results	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell No.), grain size, sorting, compaction, visible minerals or slag, indication of contaminants, and general description
				Pb ~~166~~ 247 ~~800~~ Zn ~~1866~~ ~~3245~~ 3149	~32-33" Organic black material layer (roots) v. dk. black
36	2.8-4.2 sample			Pb 166 Zn 1866	Coarsening sand and slag, little silt (~40% slag)
42				Pb 177 Zn 2094	Fine sand zone
48				Pb 388 Zn 9639	Coarser sand + slag (~30% slag) ~40 ~53-54" Silt layer dk gray 1/4-1/2" thick 2.5Y 4/1
54	4.2-5.2 sample			Pb 212 Zn 3195	Fine-med sand + slag
60	Notes:			Pb 198 Zn 4550	
62					eob 62"

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
1	4/30/10

Core #:

DE 15A 5-23in

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
2	4/30/10

Core #:

DE 15A 23-38in

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
3	4/30/10

Core #:

DE 14A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
4	4/30/10

Core #:

DE 14A 00-14in

Notes:

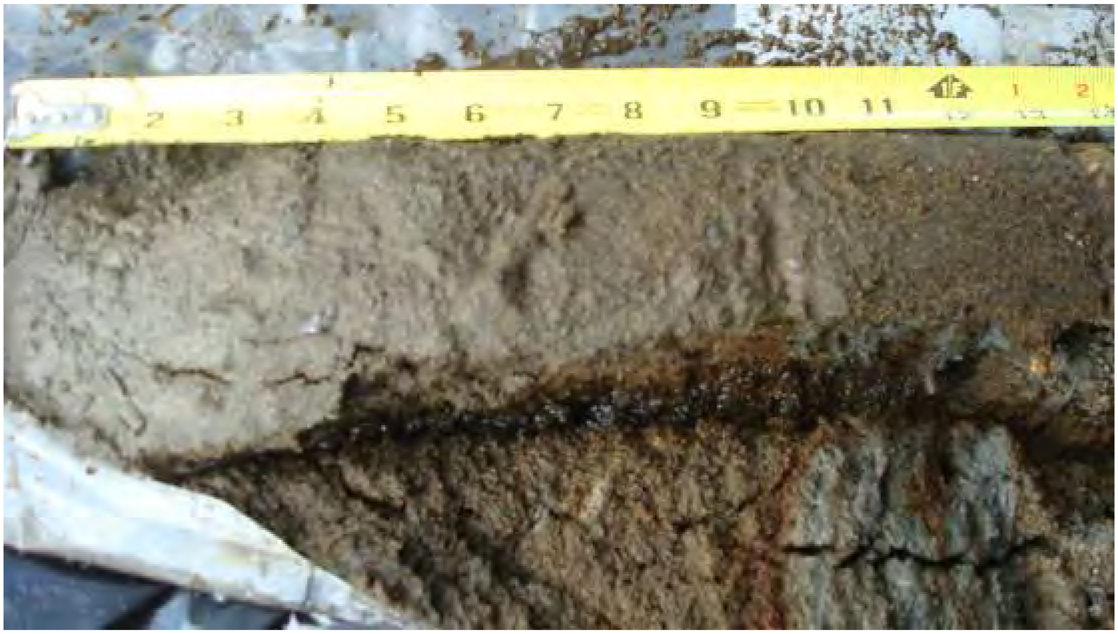


Photo No.	Date:
5	4/30/10

Core #:

DE14A 09-21in

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
6	4/30/10

Core #:

DE 14A 18-28in

Notes:

Photo No.	Date:
7	4/30/10

Core #:

DE 14A 16-29in

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
8	4/30/10

Core #:

DE 14A 16-37in

Notes:

Photo No.	Date:
9	4/30/10

Core #:

DE 13A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 10

Date: 4/30/10

Core #:

DE 11A

Notes:

MARIA – SHOULD THIS BE 12???

Photo No. 11

Date: 4/30/10

Core #:

DE 11A / DE 13A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 12 | **Date:** 4/30/10

Core #:

DE 11A

Notes:

Photo No. 13 | **Date:** 5/1/10

Core #:

DE 11A2

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. **14** | **Date:** 5/1/10

Core #:

DE 11A2

Notes:

Photo No. **15** | **Date:** 5/1/10

Core #:

DE 12A 6'-12'

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
16	5/1/10

Core #:

DE 12A 6'-12'

Notes:

Photo No.	Date:
17	5/2/10

Core #:

DE 10A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
18	5/2/10

Core #:

DE 10A

Notes:

Photo No.	Date:
19	5/2/10

Core #:

DE 8A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 20

Date: 5/2/10

Core #:

DE 8A

Notes:

Photo No. 21

Date: 5/2/10

Core #:

DE 8A 00-24in

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
22	5/2/10

Core #:

DE 8A 24-44in

Notes:

Photo No.	Date:
23	5/2/10

Core #:

DE 8C

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
24	5/2/10

Core #:

DE 8C

Notes:

Photo No.	Date:
25	5/2/10

Core #:

DE 8C

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
26	5/2/10

Core #:

DE 8B

Notes:

Photo No.	Date:
27	5/2/10

Core #:

DE 8B

Notes:

EI Ltd.		**PHOTOGRAPHIC LOG**
Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. 28	**Date:** 5/2/10
Core #: DE 8B	
Notes:	

Photo No. 29	**Date:** 5/2/10
Core #: DE 8B	
Notes:	

EI Ltd.		**PHOTOGRAPHIC LOG**
Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. 30	**Date:**
Core #: DE 8B 00-36in	
Notes:	

Photo No. 31	**Date:** 5/2/10
Core #: DE 8B 24-54in	
Notes:	

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
32	5/2/10

Core #:

DE 8C

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
33	5/2/10

Core #:

DE 8C 10'-17'

Notes:

Photo No.	Date:
34	

Core #:

DE 8C 10'-17' Core Catcher

Notes:

EI Ltd. **PHOTOGRAPHIC LOG**

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
35	5/2/10

Core #:

DE 8C 17'-24'

Notes:

Photo No.	Date:
36	5/2/10

Core #:

DE 8C 17'-24'

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 37

Date: 5/4/10

Core #:

BSB 17A

Notes:

Photo No. 38

Date: 5/4/10

Core #:

BSB 17A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
39	5/4/10

Core #:

BSB 17A

Notes:

Photo No.	Date:
40	5/4/10

Core #:

BSB 16A

Notes:

EI Ltd.		**PHOTOGRAPHIC LOG**
Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. 41	**Date:** 5/4/10
Core #: BSB 16A	
Notes:	

Photo No. 42	**Date:** 5/4/10
Core #: BSB 15A	
Notes:	

EI Ltd.		**PHOTOGRAPHIC LOG**
Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. 43	**Date:** 5/4/10
Core #: BSB 15A	
Notes:	

Photo No. 44	**Date:** 5/4/10
Core #: BSB 14A	
Notes:	

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
45	5/4/10

Core #:

BSB 14A

Notes:

Photo No.	Date:
46	5/5/10

Core #:

BSB 6Archive 2

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
47	5/5/10

Core #:

BSB 6Archive 2

Notes:

Photo No.	Date:
48	5/5/10

Core #:

BSB 6A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
49	5/5/10

Core #:

BSB 6A

Notes:

Photo No.	Date:
50	5/5/10

Core #:

BSB 6A (1/4)

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 51 | **Date:** 5/5/10

Core #:

BSB 6A (2/4)

Notes:

Photo No. 52 | **Date:** 5/5/10

Core #:

BSB 6A (34)

Notes:

EI Ltd. **PHOTOGRAPHIC LOG**

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
53	5/5/10

Core #:

BSB 6A (4/4)

Notes:

Light sand @ bottom of core

Photo No.	Date:
54	5/5/10

Core #:

BSB 4A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
55	5/5/10

Core #:

BSB 4A

Notes:

Photo No.	Date:
56	5/5/10

Core #:

BSB 4A (1/3)

Notes:

Note light sand @ very bottom

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
57	5/5/10

Core #:

BSB 4A (2/3)

Notes:

Photo No.	Date:
58	5/5/10

Core #:

BSB 4A (3/3)

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
59	5/5/10

Core #:

BSB 5A

Notes:

Photo No.	Date:
60	5/5/10

Core #:

BSB 5A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
61	5/5/10

Core #:

BSB 5A

Notes:

Photo No.	Date:
62	5/5/10

Core #:

BSB 5A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
63	5/6/10

Core #:

BSB 3A

Notes:

Photo No.	Date:
64	5/6/10

Core #:

BSB 3A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
65	5/6/10

Core #:

BSB 3A

Notes:

Photo No.	Date:
66	5/6/10

Core #:

BSB 3A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 67

Date: 5/6/10

Core #:

BSB 3Archive

Notes:

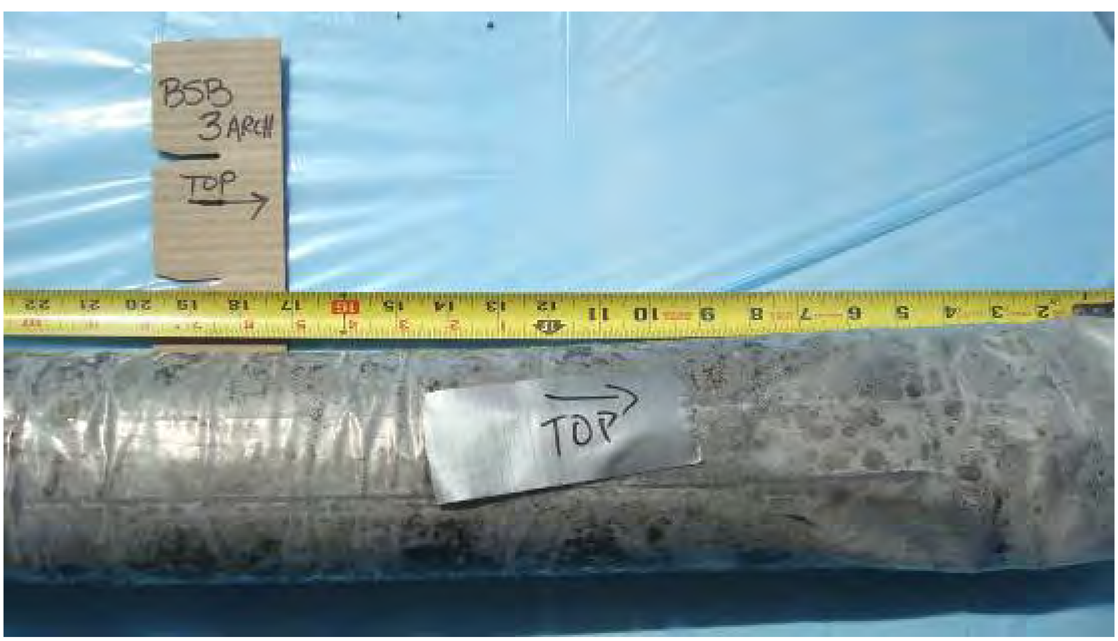
Photo No. 68

Date: 5/6/10

Core #:

BSB 3Archive

Notes:



EI Ltd.

PHOTOGRAPHIC LOG

Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. 69	**Date:** 5/6/10

Core #:

BSB 3Archive

Notes:

Photo No. 70	**Date:** 5/6/10

Core #:

BSB 3Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
71	5/6/10

Core #:

BSB 3Archive

Notes:

Photo No.	Date:
72	5/6/10

Core #:

BSB 3Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 73 **Date:** 5/4/10

Core #:

BSB 3Archive

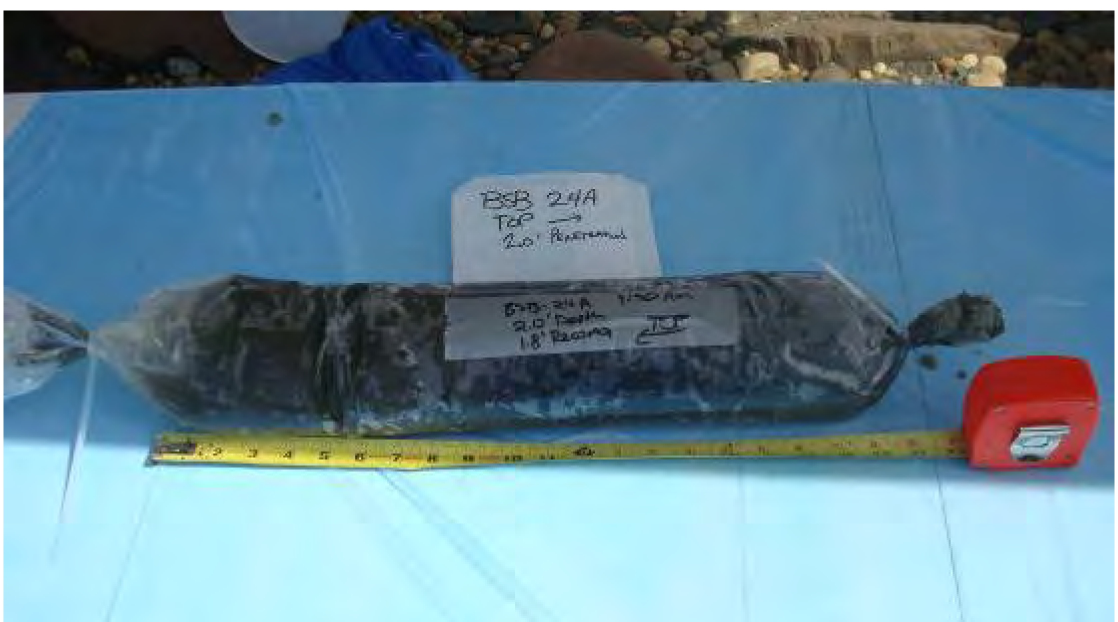
Notes:

Photo No. 74 **Date:** 5/6/10

Core #:

BSB 24A

Notes:



EI Ltd.

PHOTOGRAPHIC LOG

Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. 75	**Date:** 5/6/10

Core #:

BSB 24A

Notes:

Photo No. 76	**Date:** 5/6/10

Core #:

BSB 24A

Notes:

EI Ltd. **PHOTOGRAPHIC LOG**

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
77	5/6/10

Core #:

BSB 24A

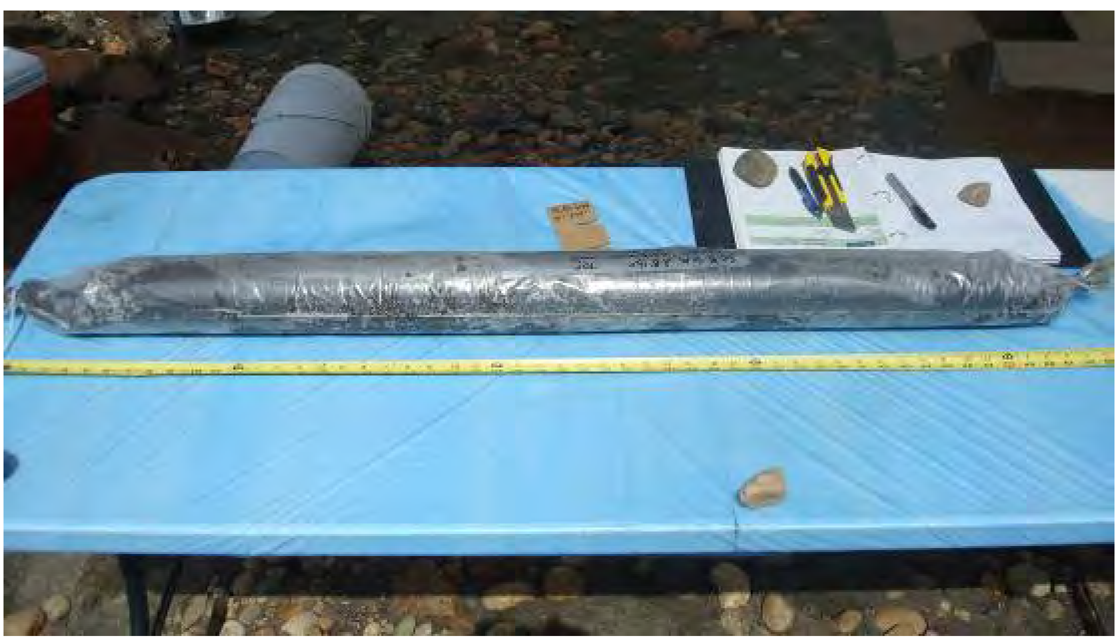
Notes:

Photo No.	Date:
78	5/6/10

Core #:

SCB 6A

Notes:



EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
79	5/6/10

Core #:

SCB 6A

Notes:

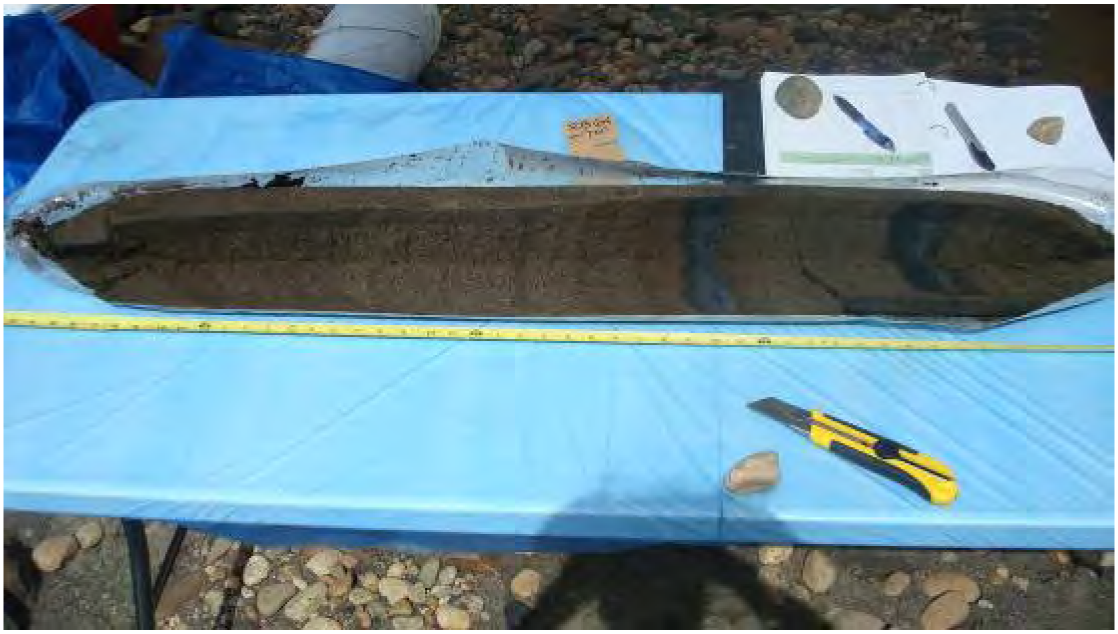


Photo No.	Date:
80	5/6/10

Core #:

SCB 6A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
81	5/6/10

Core #:

SCB 6A

Notes:

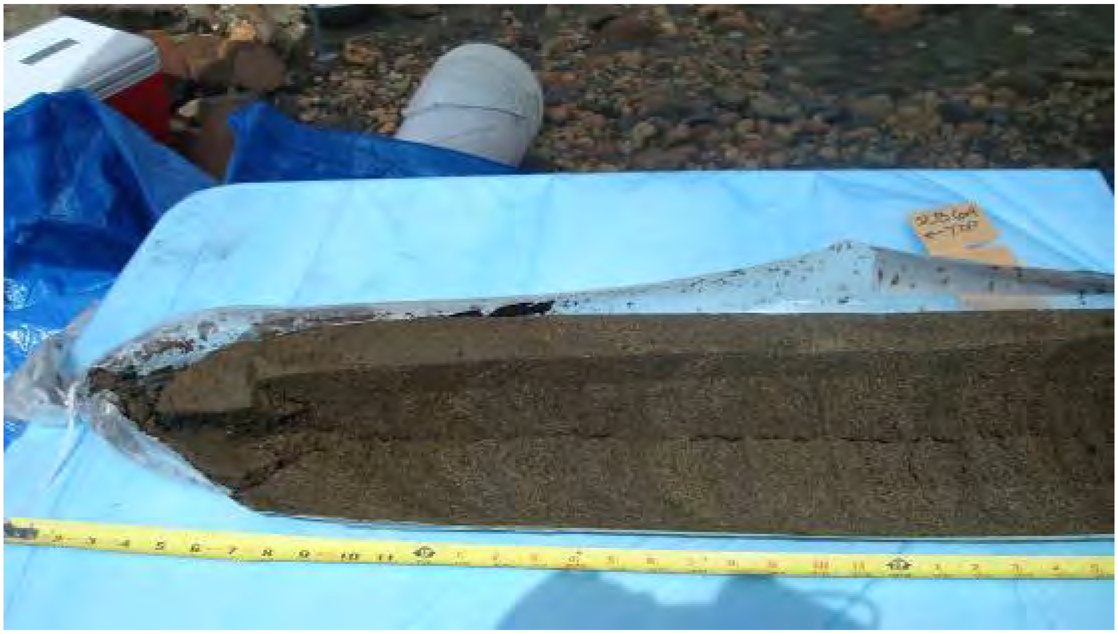


Photo No.	Date:
82	5/6/10

Core #:

SCB 3A

Notes:

EI Ltd.		**PHOTOGRAPHIC LOG**
Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. 83	**Date:** 5/6/10

Core #:

SCB 3A

Notes:

Photo No. 84	**Date:** 5/7/10

Core #:

SCB 7A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
85	5/7/10

Core #:

SCB 7A

Notes:

Photo No.	Date:
86	5/7/10

Core #:

SCB 7A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. **87**

Date: 5/7/10

Core #: SCB 7A

Notes: Light sand @ bottom of core

Photo No. **88**

Date: 5/7/10

Core #: SCB 7A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 89

Date: 5/7/10

Core #:

SCB 7A

Notes:

Light sand @ bottom of core

Photo No. 90

Date: 5/7/10

Core #:

SCB 7A

Notes:

Light sand @ bottom of core

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. **91**

Date: 5/7/10

Core #:

SCB 7 Archive

Notes:

Photo No. **92**

Date: 5/7/10

Core #:

SCB 7 Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 93 **Date:** 5/7/10

Core #: SCB 12 Archive

Notes:

Photo No. 94 **Date:** 5/7/10

Core #: SCB 12 Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
95	5/7/10

Core #:

SCB 12 Archive

Notes:

Photo No.	Date:
96	5/7/10

Core #:

SCB 12 Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
97	5/7/10

Core #:

SCB 12A

Notes:

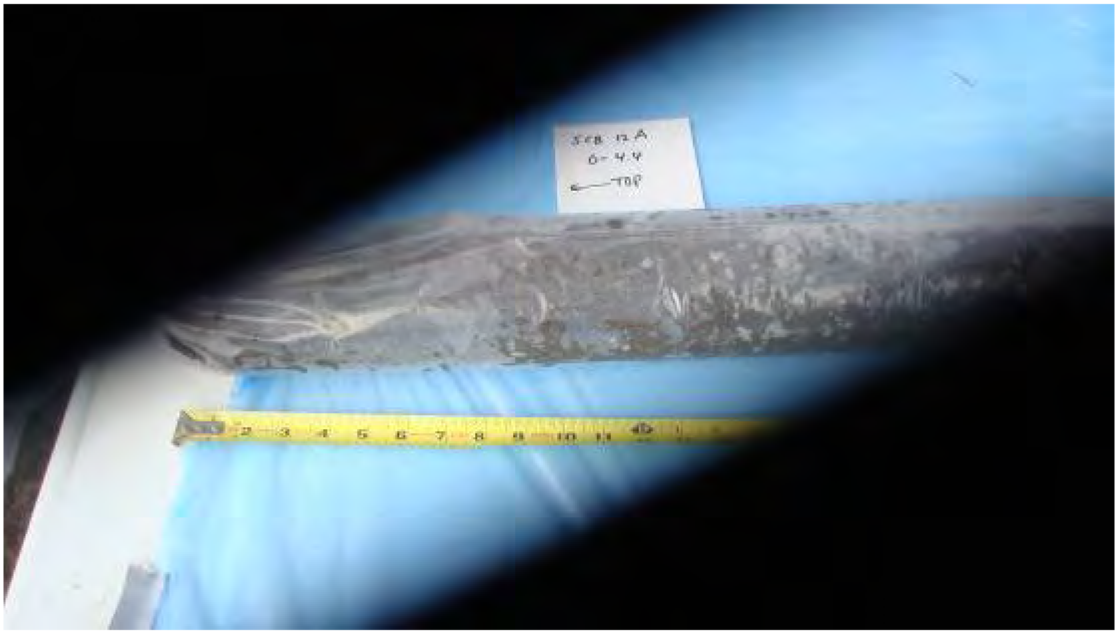


Photo No.	Date:
98	5/7/10

Core #:

SCB 12A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
99	5/7/10

Core #:

SCB 12A

Notes:

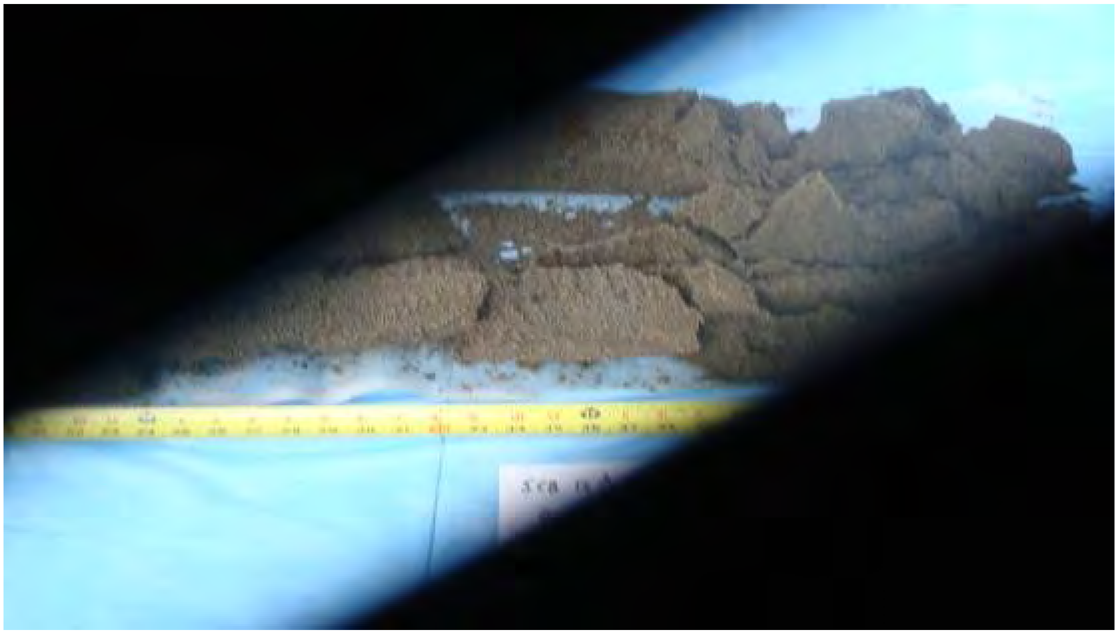
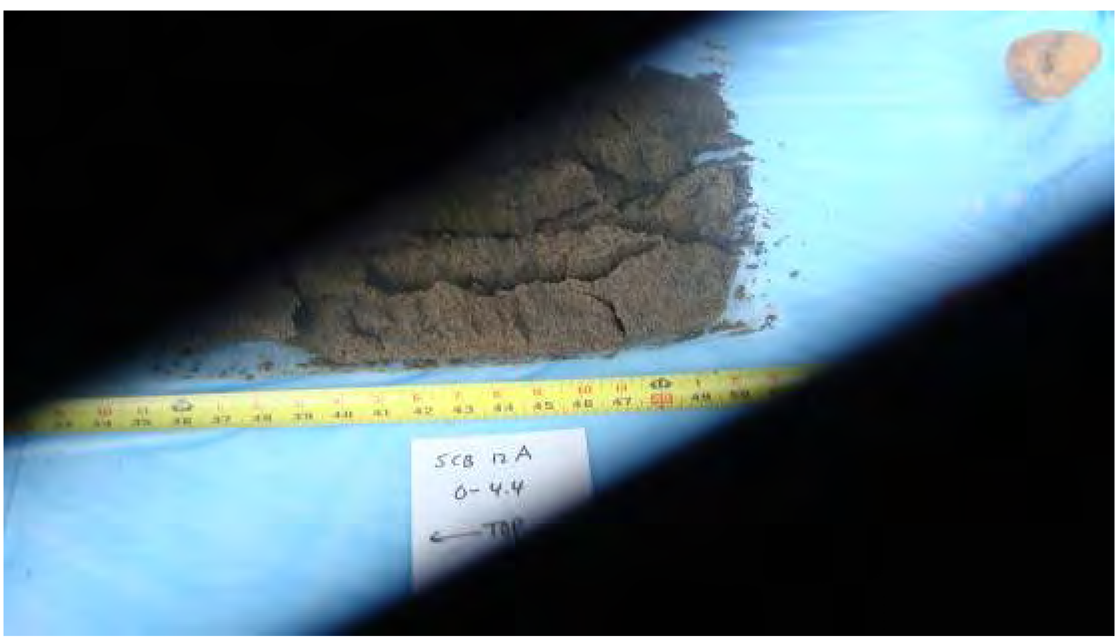


Photo No.	Date:
100	5/7/10

Core #:

SCB 12A

Notes:



EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 101

Date: 5/7/10

Core #:

SCB 15A

Notes:

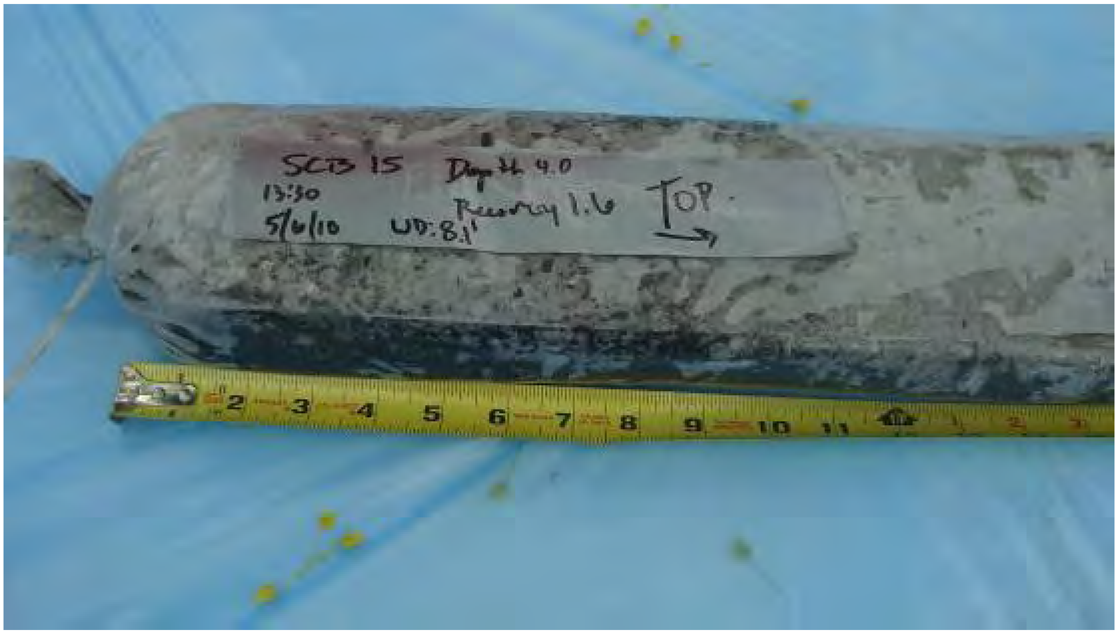


Photo No. 102

Date: 5/7/10

Core #:

SCB 15A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
103	5/7/10

Core #:

SCB RR Archive

Notes:

Photo No.	Date:
104	5/7/10

Core #:

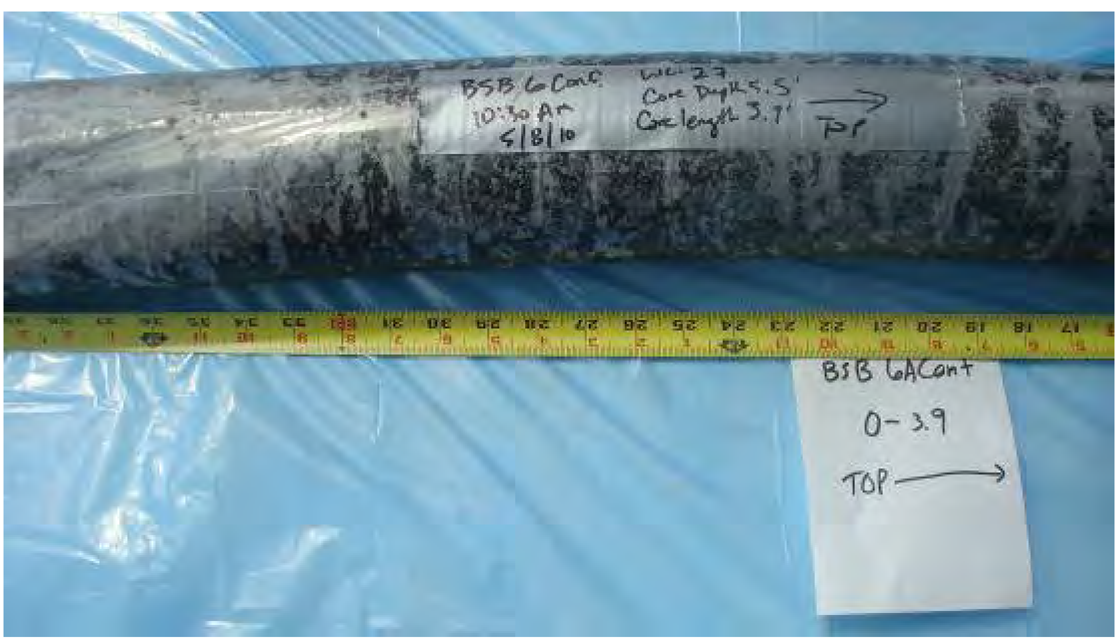
SCB RR Archive

Notes:

EI Ltd.		**PHOTOGRAPHIC LOG**
Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. 105	**Date:** 5/8/10
Core #: BSB 6A Conf	
Notes:	

Photo No. 106	**Date:** 5/8/10
Core #: BSB 6A Conf	
Notes:	



EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
107	5/8/10

Core #:

BSB 6A Conf

Notes:

Photo No.	Date:
108	5/8/10

Core #:

BSB 6A Conf

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
109	5/8/10

Core #:

BSB 6A Conf

Notes:

Photo No.	Date:
110	5/8/10

Core #:

BSB 6A Conf

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
111	5/8/10

Core #:

BSB 6A Conf

Notes:

Photo No.	Date:
112	5/8/10

Core #:

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
113	5/8/10

Core #:

RVPark 1A Archive

Notes:

Photo No.	Date:
114	5/8/10

Core #:

RVPark 1A Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
115	5/8/10

Core #:

RVPark 1A Archive

Notes:

Photo No.	Date:
116	5/8/10

Core #:

RVPark 1A Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
117	5/9/10

Core #:

OC 15A

Notes:

Photo No.	Date:
118	5/9/10

Core #:

OC 15A

Notes:

EI Ltd.		**PHOTOGRAPHIC LOG**
Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. 119	**Date:** 5/9/10

Core #:

OC 15A

Notes:

Photo No. 120	**Date:** 5/9/10

Core #:

OC 15A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
121	5/9/10

Core #:

OC 15A

Notes:

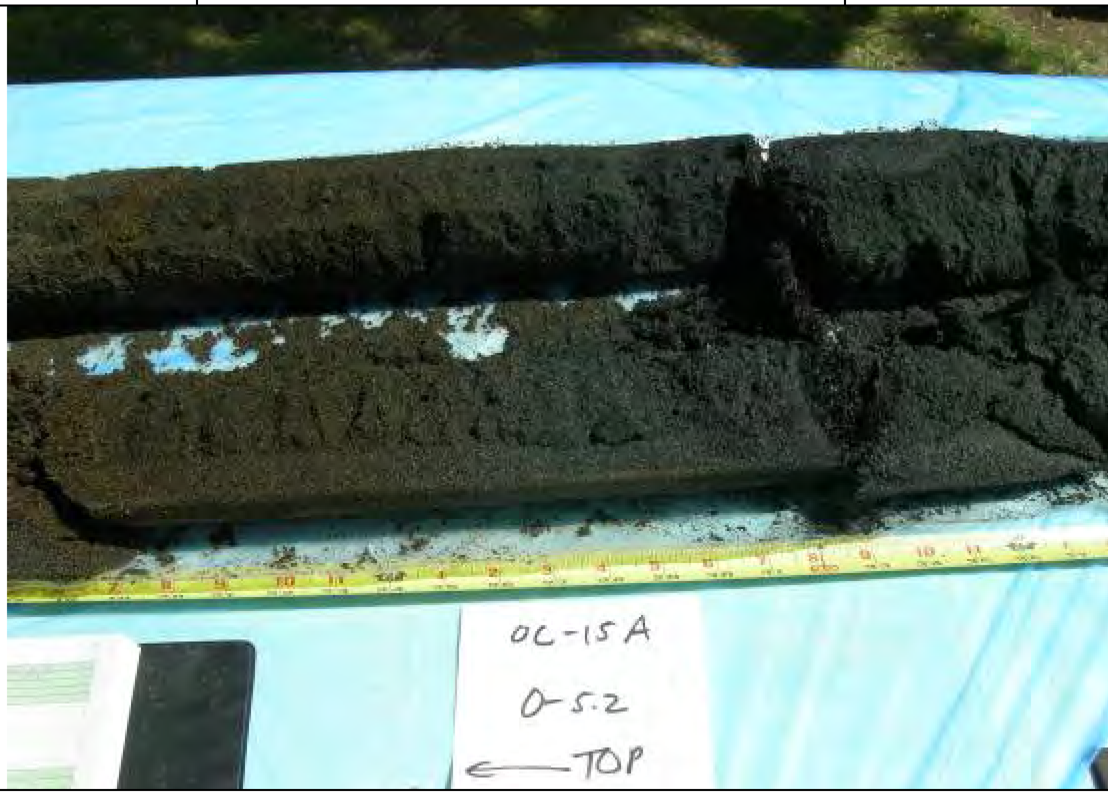


Photo No.	Date:
122	5/9/10

Core #:

OC 15A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
123	5/9/10

Core #:

OC 15Archive

Notes:

Photo No.	Date:
124	5/9/10

Core #:

OC 15Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
125	5/9/10

Core #:

OC 15Archive

Notes:

Photo No.	Date:
126	5/9/10

Core #:

OC 15Archive

Notes:

EI Ltd.		**PHOTOGRAPHIC LOG**
Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. 127	**Date:** 5/9/10

Core #:

OC 15Archive

Notes:

Photo No. 128	**Date:** 5/9/10

Core #:

OC 15Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 129

Date: 5/9/10

Core #:

OC 15Archive

Notes:

Photo No. 130

Date: 5/9/10

Core #:

OC 15Archive Sediment Plug from Core Catcher

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 131

Date: 5/9/10

Core #: OC 18A

Notes:

Photo No. 132

Date: 5/9/10

Core #: OC 18A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
133	5/9/10

Core #:

OC 18A

Notes:

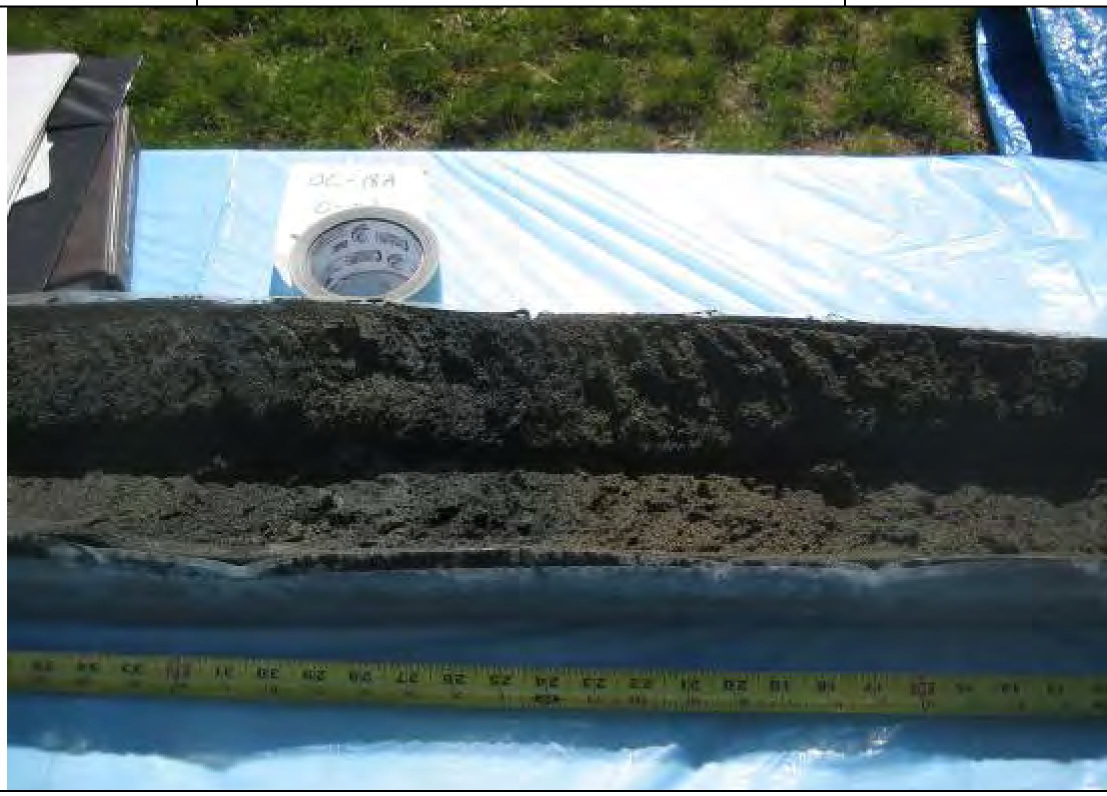
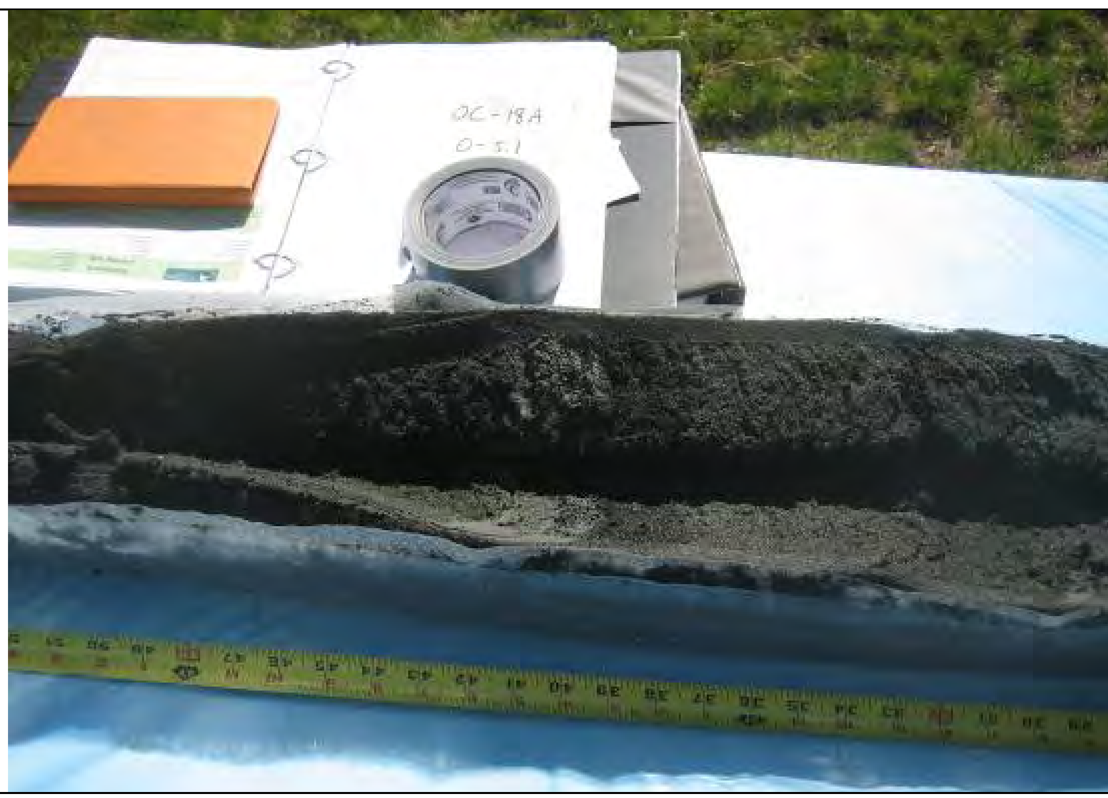


Photo No.	Date:
134	5/9/10

Core #:

OC 18A

Notes:



EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
135	5/9/10

Core #:

OC 18A

Notes:

Photo No.	Date:
136	5/9/10

Core #:

OC 18A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
137	5/9/10

Core #:

OC 18A

Notes:

Photo No.	Date:
139	5/9/10

Core #:

OC 18Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
139	5/9/10

Core #:

OC 18Archive

Notes:

Photo No.	Date:
140	5/9/10

Core #:

OC 18Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
141	5/9/10

Core #:

OC 18Archive

Notes:

Photo No.	Date:
142	5/9/10

Core #:

OC 18Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. **143**

Date: 5/10/10

Core #:

OC 10A

Notes:

Photo No. **144**

Date: 5/10/10

Core #:

OC 10A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
145	5/10/10

Core #:

OC 10A

Notes:

Photo No.	Date:
146	5/10/10

Core #:

OC 10A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
147	5/10/10

Core #:

OC 10A

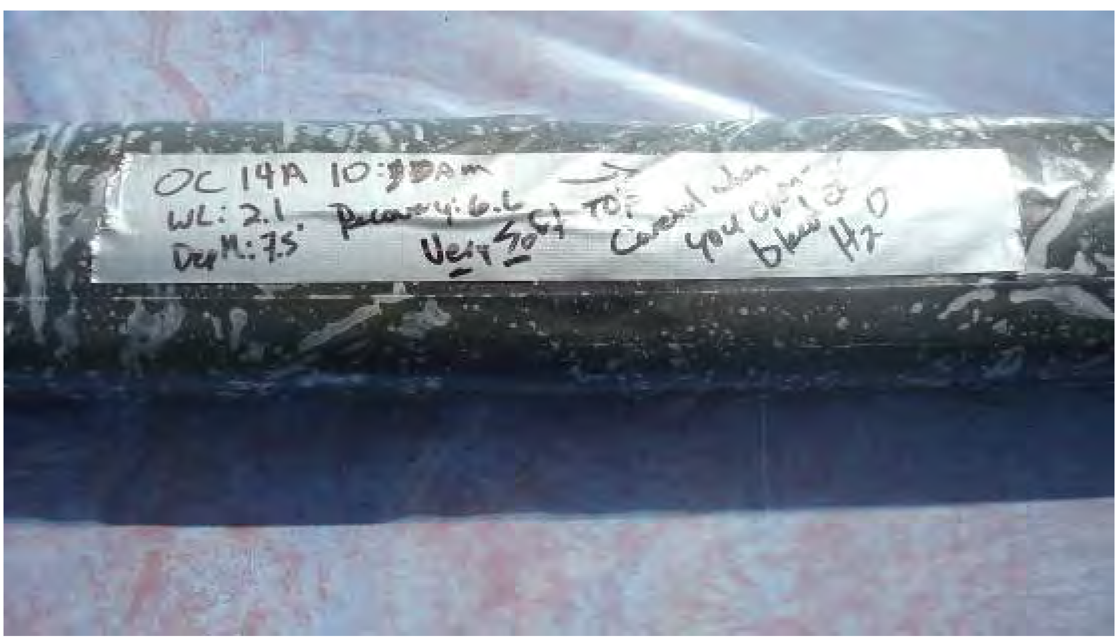
Notes:

Photo No.	Date:
148	5/10/10

Core #:

OC 14A

Notes:



EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
149	5/10/10

Core #:

OC 14A

Notes:

Photo No.	Date:
150	5/10/10

Core #:

OC 14A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
151	5/10/10

Core #:

OC 14A

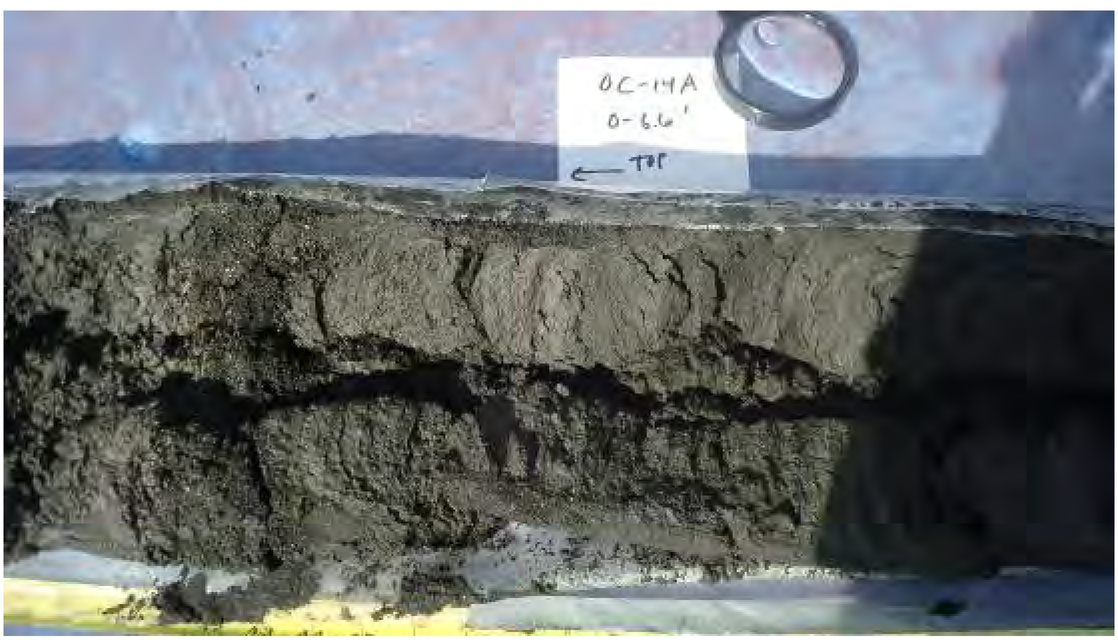
Notes:

Photo No.	Date:
152	5/10/10

Core #:

OC 14A

Notes:



EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
153	5/10/10

Core #:

OC 14A

Notes:

Photo No.	Date:
154	5/10/10

Core #:

OC 14A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
155	5/10/10

Core #:

OC 14A

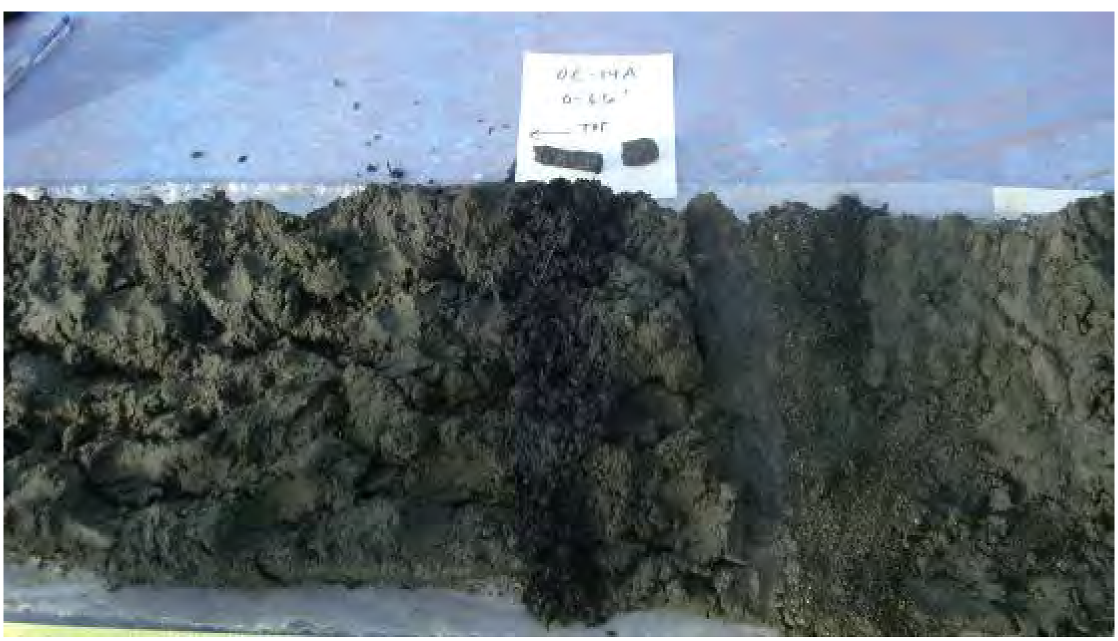
Notes:

Photo No.	Date:
156	5/10/10

Core #:

OC 14A

Notes:



EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 157

Date: 5/10/10

Core #:

OC 14 Deep

Notes:

Photo No. 158

Date: 5/10/10

Core #:

OC 14 A & B Core Catcher Sediment

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 159

Date: 5/10/10

Core #:

OC 14 Deep Catcher

Notes:

Photo No. 160

Date: 5/10/10

Core #:

OC 14 Deep & Catcher

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
161	5/11/10

Core #:

OC 15 Deep – Drill Auger

Notes:

"Slag Balls" found in drill auger – only time during study where captured sediment in drill auger.

Photo No.	Date:
162	5/11/10

Core #:

OC 15 Deep – Drill Auger

Notes:

"Slag Balls" found in drill auger – only time during study where captured sediment in drill auger.

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
163	5/11/10

Core #:

OC 20 Archive
Core Catcher Sediments

Notes:

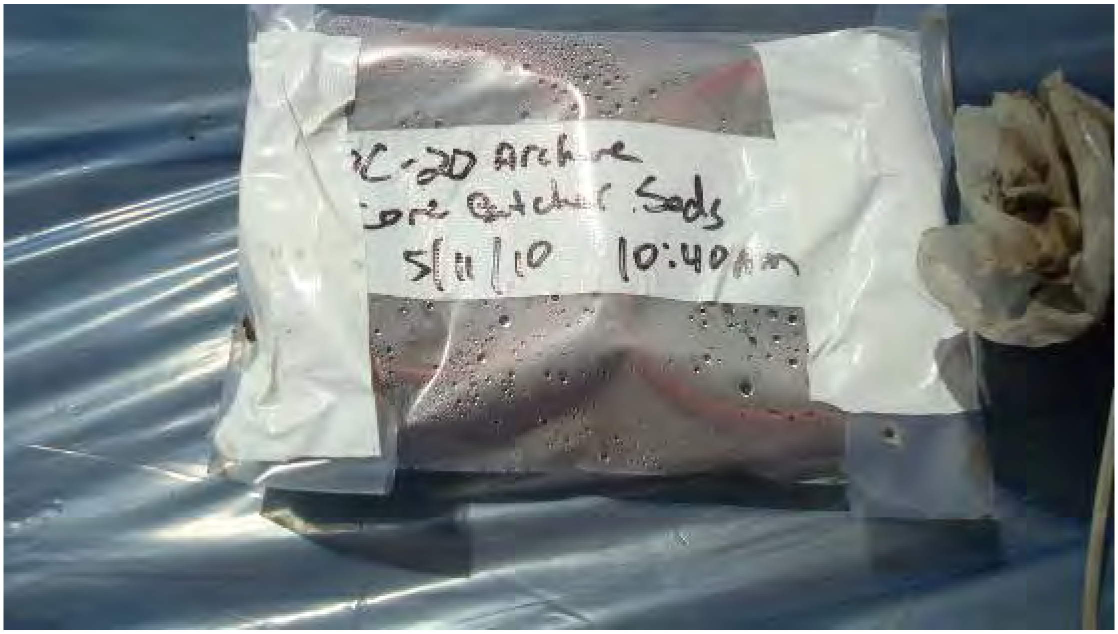
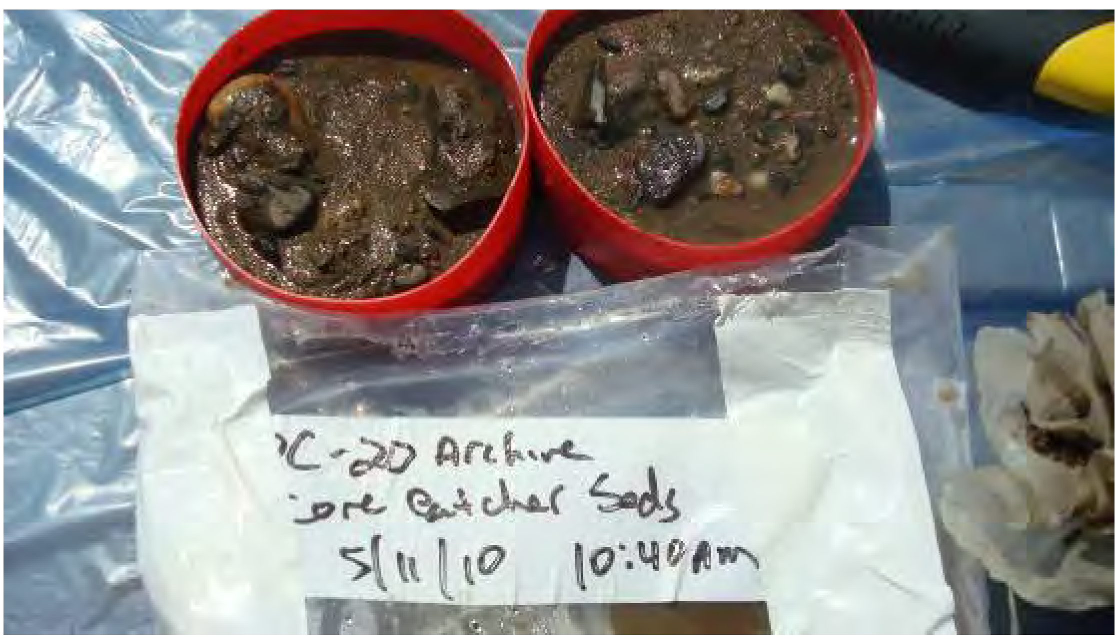


Photo No.	Date:
164	5/11/10

Core #:

OC 20 Archive
Core Catcher Sediments

Notes:



EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 165

Date: 5/11/10

Core #:

OC 20 Archive

Notes:

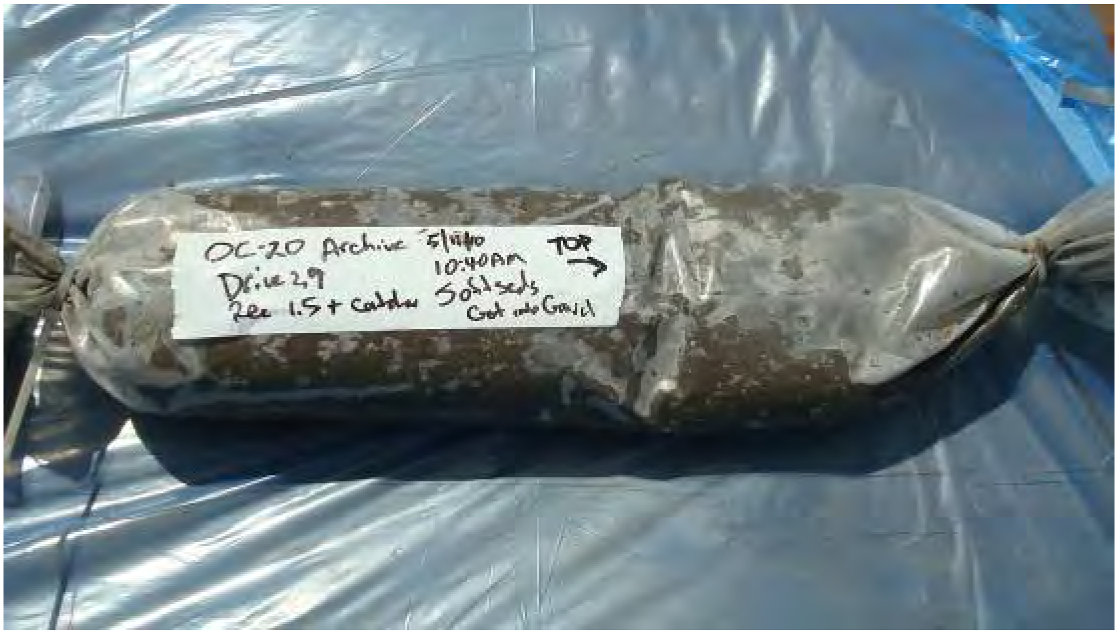


Photo No. 166

Date: 5/11/10

Core #:

OC 20 Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 167

Date: 5/11/10

Core #:

OC 20A

Notes:

Photo No. 168

Date: 5/11/10

Core #:

OC 20A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
169	5/11/10

Core #:

OC 21A

Notes:

Photo No.	Date:
170	5/11/10

Core #:

OC 21A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
171	5/11/10

Core #:

OC 21A

Notes:

Photo No.	Date:
172	5/11/10

Core #:

OC 21A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
173	5/11/10

Core #:

OC 21A

Notes:

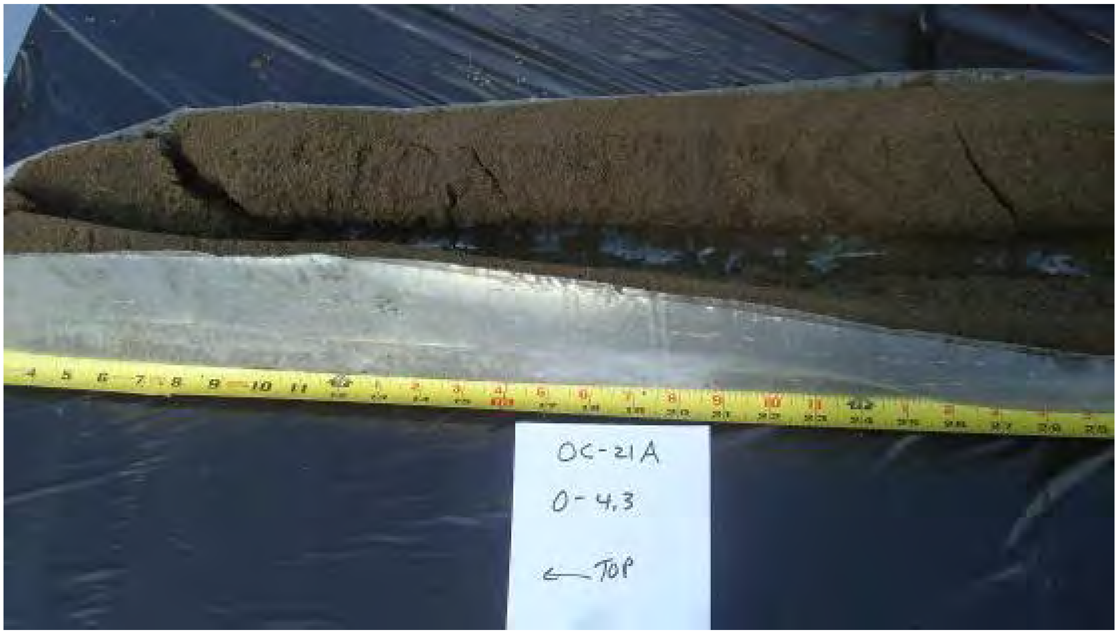


Photo No.	Date:
174	5/11/10

Core #:

OC 21A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
175	5/11/10

Core #:

OC 21A

Notes:

Photo No.	Date:
176	5/11/10

Core #:

OC 21A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. **177**

Date: 5/11/10

Core #:

OC 22A

Notes:

Photo No. **178**

Date: 5/11/10

Core #:

OC 22A

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 179 | **Date:** 5/11/10

Core #:

OC 22A

Notes:

Photo No. 170 | **Date:** 5/11/10

Core #:

OC 22A

Notes:

EI Ltd.	**PHOTOGRAPHIC LOG**	
Client Name: CCT	**Site Location:** Upper Columbia River Cores	**Project:** UCR Coring Study

Photo No. 181	**Date:** 5/11/10
Core #: OC 22A	
Notes:	

Photo No. 182	**Date:** 5/12/10
Core #: OC 21 Deep 2	
Notes:	

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
183	5/12/10

Core #:

OC 21 Deep 2

Notes:

Photo No.	Date:
184	5/12/10

Core #:

OC 21 Deep 2

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No. 185 **Date:** 5/12/10

Core #: OC 23 Archive

Notes:

Photo No. 186 **Date:** 5/12/10

Core #: OC 23 Archive

Notes:

EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
187	5/12/10

Core #:

OC 23 A

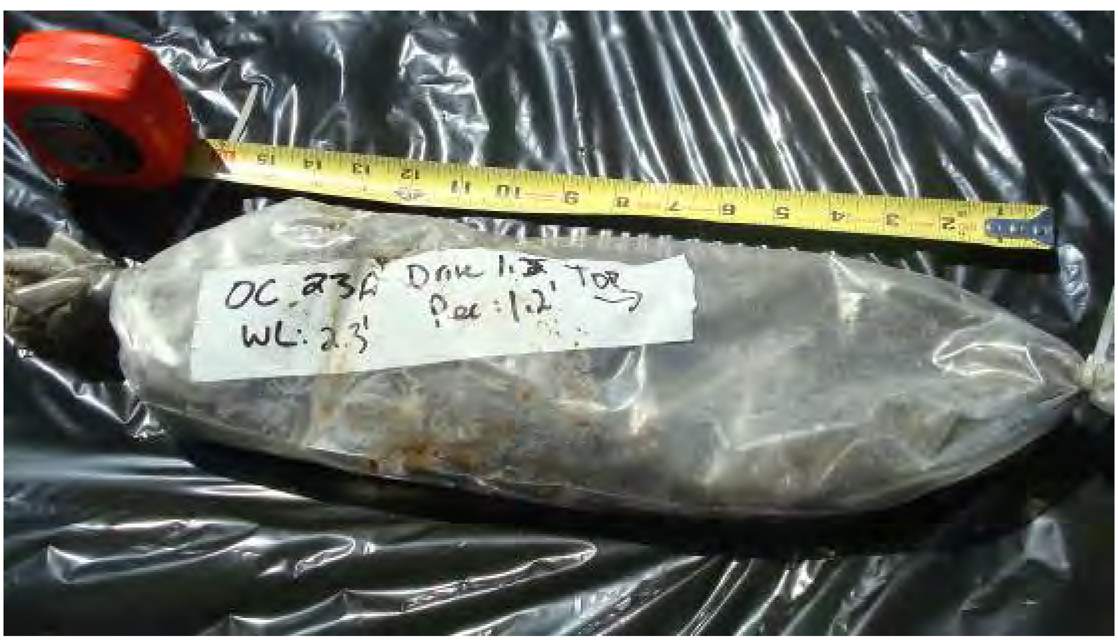
Notes:

Photo No.	Date:
188	5/12/10

Core #:

OC 23 A

Notes:



EI Ltd.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project:
CCT	Upper Columbia River Cores	UCR Coring Study

Photo No.	Date:
189	5/12/10

Core #:

OC 23 A

Notes:

Photo No.	Date:
190	5/12/10

Core #:

OC 23 A

Notes:

2930 Westlake Ave N Suite 100
Seattle, WA 98109
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Environment International
Attn: Jennifer Arthur
5505 34th Ave. NE
Seattle, WA 98105

RE: UCR Sediment Coring
Fremont Project No: CHM100504-1
EI Project No: EI#2

May 18th, 2010

Jennifer:

Enclosed are the analytical results for the **UCR Sediment Coring** soil and water samples to Fremont Analytical on Tuesday May 4th, 2010.

Sample Receipt:
The samples were received in good condition - in the proper containers, properly sealed, labeled and within holding time. The samples were received in 7 – 16oz soils jars, 9 – 80z soil jars, 16 – 4oz soil jars and 2 – 250mL HDPE bottles. The samples were received in coolers with wet ice, with cooler temperatures of 4.6°C and 3.6°C respectively, which is within the laboratory recommended cooler temperature range (<4°C - 10°C). The samples were stored in a refrigeration unit at the USEPA-recommended temperature of 4°C ± 2°C.

Sample Receipt Notations:

- DE12A-6-12: 16oz jar for "Grain Size" was 1/2 full. Laboratory will use remaining sample from 8oz jar. Issue resolved.
- 2 Rinsate bottles were submitted with different dates/times. Only one bottle was listed on Chain of Custody. Both samples were analyzed/reported.

Sample Analysis:
Examination of these samples was conducted for the presence of the following:

- ***Total Metals (TAL) by EPA Method 6020***
- ***Total Organic Carbon by EPA Method 9060A***
- ***Grain Size by ASTM D422***
- ***Bulk Density by ASTM D-2937***

These applications were performed under Washington State Department of Ecology accreditation parameters. All appropriate Quality Assurance / Quality Control method parameters have been applied.

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RE: UCR Sediment Coring
Fremont Project No: CHM100504-1
EI Project No: EI#2

Laboratory Notations (Soil):

SW6020

- The *Laboratory Control Sample (LCS)* was within range for all analytes.
- Matrix interferences were present in most samples:
  - Soil Matrix (Sample ID: DE#12A-1.5-3.5): The *relative percent difference (RPD%)* between the sample and sample duplicate exceeded recommended control limits (30%) for *Antimony (Sb)* and *Arsenic (As)*. All other analyte *RPD%* values were within range.
  - (Sample ID: DE#12A-1.5-3.5): There were no *Matrix Spike (MS)* or *Post Digestion Spike (PDS)* recoveries *Calcium (Ca)*, *Iron (Fe)* and *Zinc (Zn)*, due to high concentrations of the analyte in the sample.
  - (Sample ID: DE#12A-1.5-3.5): Interferences prevented the determination of the *MS*, *MS Duplicate (MSD)* and *PDS* recoveries for *Vanadium (V)*.
  - (Sample ID: DE#12A-1.5-3.5): The *MS* and *PDS* recoveries for *Copper (Cu)* were outside of the laboratory control limits. The *MSD* was within range.

SW9060A

- The *MSD* (Sample ID: *DE#912A-1.5-3.5*) was outside of the laboratory recommended control limits. The MS and LCS were within range (Note: Method 9060A does not require Matrix Spike samples).

Laboratory Notations (Water):

SW6020

- Water Matrix (Sample ID: Rinsate Blank 4/30/10): The *relative percent difference (RPD%)* between the sample and sample duplicate exceeded recommended control limits (30%) for *Lead (Pb)*. All other analyte *RPD%* values were within range.

Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical!

Sincerely,

Michael Dee
Sr. Chemist / Principal

mikedee@fremontanalytical.com

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

EPA 6020 (mg/kg)	MRL	Method Blank	LCS	DE#12A-1.5-3.5	Duplicate DE#12A-1.5-3.5	RPD %	DE#912A-1.5-3.5
Date Extracted		5/4/10	5/4/10	5/4/10	5/4/10		5/4/10
Date Analyzed		5/4/10	5/4/10	5/4/10	5/4/10		5/4/10
Matrix				Soil	Soil		Soil
Aluminum (Al)	5.5	nd	109%	**13,800**	**14,100**	3%	**12,000**
Antimony (Sb)	0.20	nd	92%	**1.88**	**3.99**	72%	**2.15**
Arsenic (As)	0.10	nd	80%	**7.35**	**5.12**	36%	**4.43**
Barium (Ba)	0.50	nd	83%	**299**	**326**	9%	**248**
Beryllium (Be)	0.20	nd	92%	**0.791**	**0.822**	4%	**0.694**
Cadmium (Cd)	0.05	nd	82%	**2.02**	**2.10**	4%	**1.97**
Calcium (Ca)	10	**10.4**	109%	**39,100**	**38,100**	2%	**33,000**
Chromium (Cr)	0.20	nd	82%	**51.3**	**52.7**	3%	**40.7**
Cobalt (Co)	0.20	nd	83%	**14.1**	**14.6**	3%	**12.0**
Copper (Cu)	0.10	nd	79%	**783**	**820**	5%	**669**
Iron (Fe)	20	nd	108%	**129,000**	**132,000**	2%	**106,000**
Lead (Pb)	0.50	nd	83%	**274**	**275**	0.3%	**260**
Magnesium (Mg)	10	nd	108%	**4080**	**4090**	0.4%	**3360**
Manganese (Mn)	0.20	nd	131%	**5930**	**5870**	1%	**5240**
Mercury (Hg)	0.05	nd	95%	**0.333**	**0.299**	11%	**0.361**
Nickel (Ni)	0.10	nd	79%	**5.38**	**5.35**	1%	**4.13**
Potassium (K)	50	nd	123%	**6370**	**5740**	10%	**5790**
Selenium (Se)	0.50	nd	79%	nd	nd		nd
Silver (Ag)	0.10	nd	81%	**0.696**	**0.801**	14%	**0.338**
Sodium (Na)*	10	nd	113%	**895**	**845**	6%	**437**
Thallium (Tl)	0.20	nd	85%	**4.03**	**4.09**	2%	**2.34**
Vanadium (V)	0.10	nd	71%	nd	nd		nd
Zinc (Zn)	0.40	nd	80%	**13,800**	**13,800**	0.1%	**7200**

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"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

EPA 6020 (mg/kg)	MRL	DE#12A-6-12	DE#11A2-0-1.3	DE#11A2-2-2.5	DE#10A-1-2
Date Extracted		5/4/10	5/4/10	5/4/10	5/4/10
Date Analyzed		5/4/10	5/4/10	5/4/10	5/4/10
Matrix		Soil	Soil	Soil	Soil
Aluminum (Al)	5.5	**11,500**	**5320**	**3080**	**3620**
Antimony (Sb)	0.20	**1.81**	**3.49**	**1.80**	**0.518**
Arsenic (As)	0.10	**8.52**	**6.09**	**4.34**	**6.53**
Barium (Ba)	0.50	**337**	**223**	**173**	**40.2**
Beryllium (Be)	0.20	**0.606**	**0.506**	**0.205**	**0.169** ***J***
Cadmium (Cd)	0.05	**3.12**	**4.76**	**5.15**	**0.416**
Calcium (Ca)	10	**39,100**	**30,200**	**41,000**	**3950**
Chromium (Cr)	0.20	**20.7**	**16.8**	**10.9**	**7.63**
Cobalt (Co)	0.20	**10.8**	**6.18**	**3.82**	**3.42**
Copper (Cu)	0.10	**522**	**143**	**126**	**63.1**
Iron (Fe)	20	**88,000**	**3610**	**19,600**	**13,200**
Lead (Pb)	0.50	**476**	**38.9**	**218**	**228**
Magnesium (Mg)	10	**7224**	**2260**	**23,400**	**2440**
Manganese (Mn)	0.20	**4616**	**135**	**383**	**469**
Mercury (Hg)	0.05	**0.292**	**0.072**	**0.153**	**0.096**
Nickel (Ni)	0.10	**4.13**	**1.90**	**3.02**	**5.51**
Potassium (K)	50	**5670**	**655**	**1550**	**1510**
Selenium (Se)	0.50	nd	nd	nd	nd
Silver (Ag)	0.10	**0.389**	**0.130**	**0.242**	**0.233**
Sodium (Na)*	10	**445**	**61**	**214**	**174**
Thallium (Tl)	0.20	**4.16**	**0.580**	**1.5**	**3.04**
Vanadium (V)	0.10	nd	nd	nd	nd
Zinc (Zn)	0.40	**6510**	**300**	**892**	**1690**

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"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
- Fe, Na, Al, K, Ca = 50%
- Other = 30%

Acceptable Spike Recovery Limits
- Fe, Na, Al, K, Ca = 50% - 150%
- Other = 65% - 135%

Spike Concentration:
- As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
- Fe, Na, Al, K, Ca = 2700 µg/L
- Pb = 50 µg/L
- Se, Hg = 10 µg/L
- Cd, Ag, Sb = 5 µg/L
- Tl = 2.5 µg/L
- Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

EPA 6020 (mg/kg)	MRL	DE#10A-2.1-2.5	DE#8C-0-.75	DE#8C-1.25-2.25
Date Extracted		5/4/10	5/4/10	5/4/10
Date Analyzed		5/4/10	5/4/10	5/4/10
Matrix		Soil	Soil	Soil
Aluminum (Al)	5.5	**4490**	**9870**	**9500**
Antimony (Sb)	0.20	**1.02**	**5.88**	**7.18**
Arsenic (As)	0.10	**8.43**	**13.2**	**15.8**
Barium (Ba)	0.50	**54.5**	**629**	**627**
Beryllium (Be)	0.20	**0.180 *J***	**0.694**	**0.683**
Cadmium (Cd)	0.05	**0.514**	**1.99**	**3.26**
Calcium (Ca)	10	**5200**	**31,500**	**32,900**
Chromium (Cr)	0.20	**12.0**	**59.8**	**55.2**
Cobalt (Co)	0.20	**5.17**	**26.1**	**18.5**
Copper (Cu)	0.10	**101**	**873**	**982**
Iron (Fe)	20	**17,900**	**83,600**	**83,300**
Lead (Pb)	0.50	**312**	**200**	**309**
Magnesium (Mg)	10	**2800**	**5150**	**4850**
Manganese (Mn)	0.20	**709**	**3480**	**3470**
Mercury (Hg)	0.05	**0.099**	**0.314**	**0.788**
Nickel (Ni)	0.10	**7.00**	**10.0**	**13.5**
Potassium (K)	50	**1640**	**5180**	**5600**
Selenium (Se)	0.50	nd	nd	nd
Silver (Ag)	0.10	**0.298**	**1.82**	**1.51**
Sodium (Na)*	10	**206**	**921**	**798**
Thallium (Tl)	0.20	**4.07**	**2.76**	**4.40**
Vanadium (V)	0.10	nd	nd	nd
Zinc (Zn)	0.40	**2460**	**7360**	**7380**

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"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

		MS	MSD		PDS
EPA 6020 (mg/kg)	**MRL**	**DE#12A-1.5-3.5**	**DE#12A-1.5-3.5**	**RPD %**	**DE#12A-1.5-3.5**
Date Extracted		5/4/10	5/4/10		5/4/10
Date Analyzed		5/4/10	5/4/10		5/4/10
Matrix		Soil	Soil		Soil
Aluminum (Al)	5.5	69%	87%	22%	105%
Antimony (Sb)	0.20	87%	66%	27%	123%
Arsenic (As)	0.10	84%	84%	0.1%	80%
Barium (Ba)	0.50	78%	70%	11%	91%
Beryllium (Be)	0.20	85%	85%	0.1%	91%
Cadmium (Cd)	0.05	91%	91%	1%	106%
Calcium (Ca)	10	-	13%		45%
Chromium (Cr)	0.20	84%	85%	2%	89%
Cobalt (Co)	0.20	87%	86%	0%	87%
Copper (Cu)	0.10	52%	66%	23%	51%
Iron (Fe)	20	-	-		-
Lead (Pb)	0.50	125%	95%	27%	112%
Magnesium (Mg)	10	79%	83%	4%	93%
Manganese (Mn)	0.20	-	-		-
Mercury (Hg)	0.05	108%	108%	1%	101%
Nickel (Ni)	0.10	85%	85%	0.2%	79%
Potassium (K)	50	89%	134%	40%	139%
Selenium (Se)	0.50	69%	72%	4%	63%
Silver (Ag)	0.10	70%	73%	4%	73%
Sodium (Na)*	10	91%	93%	1%	105%
Thallium (Tl)	0.20	110%	103%	6%	121%
Vanadium (V)	0.10	*int*	*int*		44%
Zinc (Zn)	0.40	-	-		-

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"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

EPA 6020 (µg/L)	MRL	Method Blank	LCS	Rinsate Blank 4/30/10	Duplicate Rinsate Blank 4/30/10	RPD %	Rinsate Blank 5/1/2010
Date Extracted		5/4/10	5/4/10	5/4/10	5/4/10		5/4/10
Date Analyzed		5/4/10	5/4/10	5/4/10	5/4/10		5/4/10
Matrix				Water	Water		Water
Aluminum (Al)	55	nd	123%	nd	nd		**72.5**
Antimony (Sb)	0.2	nd	106%	**0.950**	**0.850**	11%	nd
Arsenic (As)	1.0	nd	94%	nd	nd		**1.05**
Barium (Ba)	0.3	nd	96%	**4.00**	**3.85**	4%	**8.10**
Beryllium (Be)	0.2	nd	117%	**25.3**	**25.2**	1%	**1.25**
Cadmium (Cd)	0.2	nd	95%	nd	nd		nd
Calcium (Ca)	100	nd	123%	**1950**	**1850**	5%	**15,000**
Chromium (Cr)	0.6	nd	97%	**0.850**	**1.05**	21%	**1.25**
Cobalt (Co)	0.3	nd	99%	nd	nd		**0.550**
Copper (Cu)	0.4	nd	96%	**1.25**	**1.05**	17%	**1.75**
Iron (Fe)	100	nd	133%	nd	nd		nd
Lead (Pb)	0.2	nd	96%	**0.65**	**0.45**	36%	**1.65**
Magnesium (Mg)	100	nd	114%	**108**	**100**	7%	**282.9**
Manganese (Mn)	2.0	nd	96%	**5.30**	**4.35**	20%	**4.55**
Mercury (Hg)	0.3	nd	123%	nd	nd		**0.650**
Nickel (Ni)	0.5	nd	95%	nd	nd		nd
Potassium (K)	500	nd	121%	nd	nd		nd
Selenium (Se)	1.0	nd	89%	nd	nd		nd
Silver (Ag)	0.2	nd	96%	nd	nd		nd
Sodium (Na)	100	nd	121%	**3030**	**2860**	6%	**1040**
Thallium (Tl)	0.20	nd	97%	**0.200**	**0.200**	0%	**0.250**
Vanadium (V)	0.50	nd	95%	nd	nd		**0.55**
Zinc (Zn)	1.5	nd	93%	**7.10**	**6.85**	4%	**33.5**

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"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
- Fe, Na, Al, K, Ca = 50%
- Other = 30%

Acceptable Spike Recovery Limits
- Fe, Na, Al, K, Ca = 50% - 150%
- Other = 65% - 135%

Spike Concentration:
- As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
- Fe, Na, Al, K, Ca = 1250 µg/L
- Pb = 50 µg/L
- Se, Hg = 10 µg/L
- Cd, Ag, Sb, Be = 5 µg/L
- Tl = 2.5 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

EPA 6020 (µg/L)	MS Rinsate Blank 4/30/10	MSD Rinsate Blank 4/30/10	RPD %
Date Extracted	5/4/10	5/4/10	
Date Analyzed	5/4/10	5/4/10	
Matrix	Water	Water	
Aluminum (Al)	91%	92%	1%
Antimony (Sb)	107%	108%	1%
Arsenic (As)	95%	95%	1%
Barium (Ba)	95%	96%	1%
Beryllium (Be)	96%	113%	16%
Cadmium (Cd)	94%	95%	1%
Calcium (Ca)	92%	101%	10%
Chromium (Cr)	95%	95%	0.3%
Cobalt (Co)	98%	97%	0.3%
Copper (Cu)	94%	93%	1%
Iron (Fe)	97%	98%	1%
Lead (Pb)	93%	95%	2%
Magnesium (Mg)	91%	93%	2%
Manganese (Mn)	109%	109%	0.4%
Mercury (Hg)	123%	130%	5%
Nickel (Ni)	93%	93%	1%
Potassium (K)	105%	94%	11%
Selenium (Se)	89%	92%	3%
Silver (Ag)	94%	94%	1%
Sodium (Na)	87%	104%	17%
Thallium (Tl)	94%	95%	0.4%
Vanadium (V)	91%	91%	0.2%
Zinc (Zn)	94%	93%	1%

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"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 1250 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb, Be = 5 µg/L
Tl = 2.5 µg/L

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**Method Blank**	**LCS**
Date Analyzed		5/11/10	5/11/10
Matrix			
Total Organic Carbon	0.1	nd	89%

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"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS, ICV, CCV = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**DE#12A-1.5-3.5**	Duplicate **DE#912A-1.5-3.5**	**RPD %**	**DE#912A-1.5-3.5**
Date Analyzed		5/11/10	5/12/10		5/12/10
Matrix		Soil	Soil		Soil
Total Organic Carbon	0.1	**0.101**	**0.103**	15%	**0.119**

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Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS, ICV, CCV = 40% Carbon

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Seattle, WA 98109

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email: info@fremontanalytical.com

Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**DE#12A-6-12**	**DE#11A2-0-1.3**	**DE#10A-1-2**	**DE#10A-2.1-2.5**
Date Analyzed		5/12/10	5/12/10	5/12/10	5/12/10
Matrix		Soil	Soil	Soil	Soil
Total Organic Carbon	0.1	**0.994**	**4.79**	**0.267**	**0.189**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS, ICV, CCV = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**DE#8C-0-.75**	**DE#8C-1.25-2.25**
Date Analyzed		5/12/10	5/12/10
Matrix		Soil	Soil
Total Organic Carbon	0.1	**0.337**	**0.439**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS, ICV, CCV = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

		MS	MSD	
EPA 9060A	**MRL**	**DE#912A-1.5-3.5**	**DE#912A-1.5-3.5**	**RPD**
(Percent Organic Carbon by Weight)				**%**
Date Analyzed		5/12/10	5/12/10	
Matrix		Soil	Soil	
Total Organic Carbon	0.1	125%	143%	14%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS, ICV, CCV = 40% Carbon

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

Percent Finer (Passing) Than the Indicated Size

UOM = percent

Sieve Size	3/4"	1/2"	3/8"	#4	#20	#40	#60	#100	#200	#325	#450
particle size (microns)	19000	12500	9500	4750	850	425	250	150	75	45	34
DE#12A-1.5-3.5	100.00	100.00	100.00	100.00	99.66	38.97	9.80	1.61			
DE#912A-1.5-3.5	100.00	100.00	100.00	100.00	99.63	30.35	6.93	1.16			
DE#12A-6-12	100.00	100.00	100.00	100.00	98.07	29.54	3.11	1.52			
DE#11A2-0-1.3	100.00	100.00	100.00	100.00	96.79	89.80	81.77	41.89	12.17	3.45	2.59
DE#10A-1-2	82.35	76.38	68.10	56.28	31.93	13.61	6.63	3.02			
DE#8C-0-.75	100.00	100.00	100.00	100.00	99.94	84.13	14.88	1.98			
DE#8C-1.25-2.25	100.00	100.00	100.00	100.00	99.64	88.66	45.00	8.18			

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

Percent Retained in Each Size Fraction

UOM =Percent

Sieve Size (microns)	>19000	19000-12500	12500-9500	9500-4750	4750-850	850-425	425-250	250-150	150-75	75-45	45-34	<34
DE#12A-1.5-3.5	0.00	0.00	0.00	0.00	0.34	60.69	29.17	8.19				
DE#912A-1.5-3.5	0.00	0.00	0.00	0.00	0.37	69.28	23.42	5.77				
DE#12A-6-12	0.00	0.00	0.00	0.00	1.93	68.53	26.43	1.59				
DE#11A2-0-1.3	0.00	0.00	0.00	0.00	3.21	6.99	8.03	39.88	29.73	8.72	0.86	0.31
DE#10A-1-2	17.65	5.97	8.28	11.82	24.34	18.32	6.98	3.62				
DE#8C-0-.75	0.00	0.00	0.00	0.00	0.06	15.81	69.25	12.89				
DE#8C-1.25-2.25	0.00	0.00	0.00	0.00	0.36	10.98	43.67	36.82				

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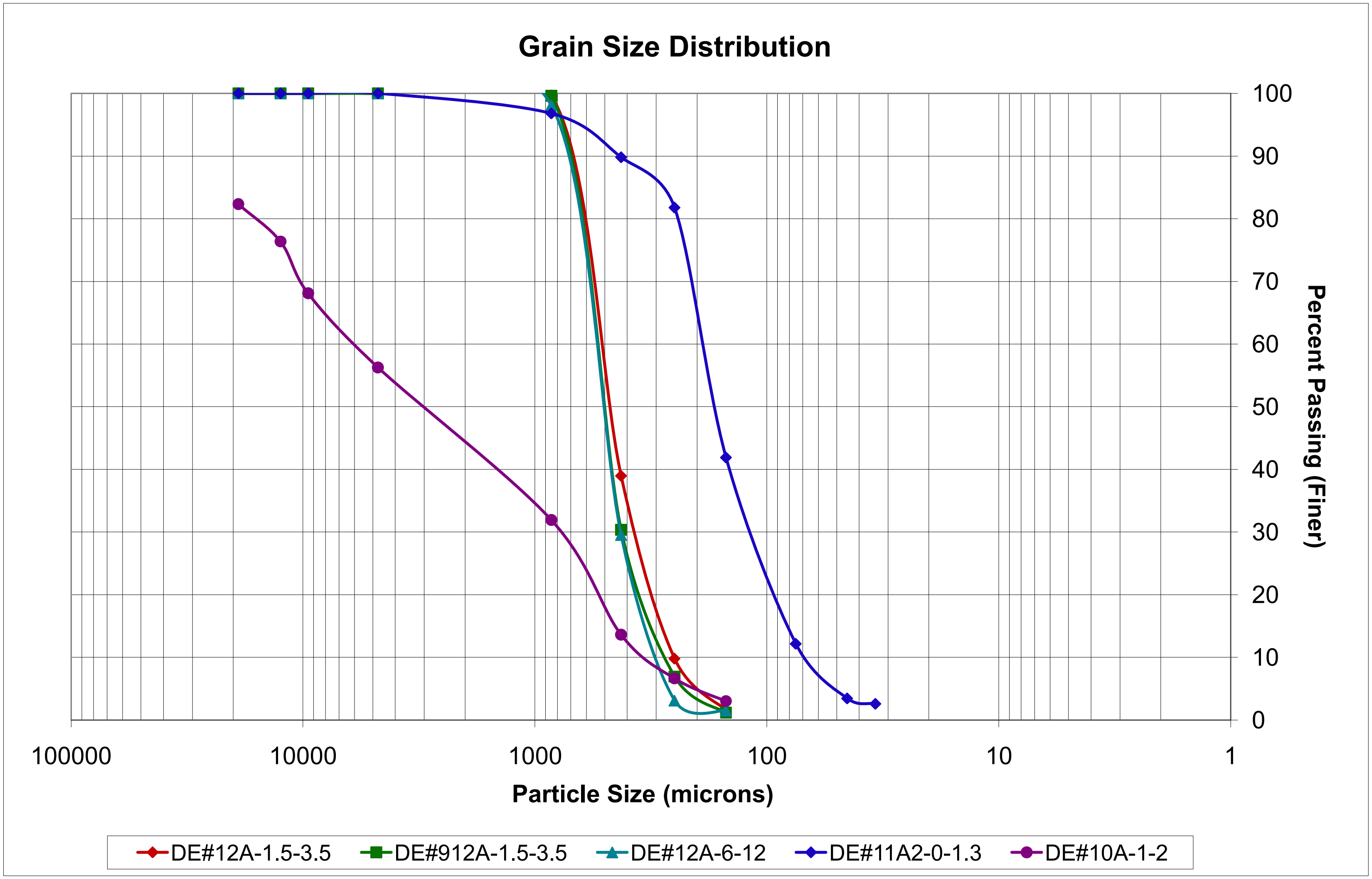
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1



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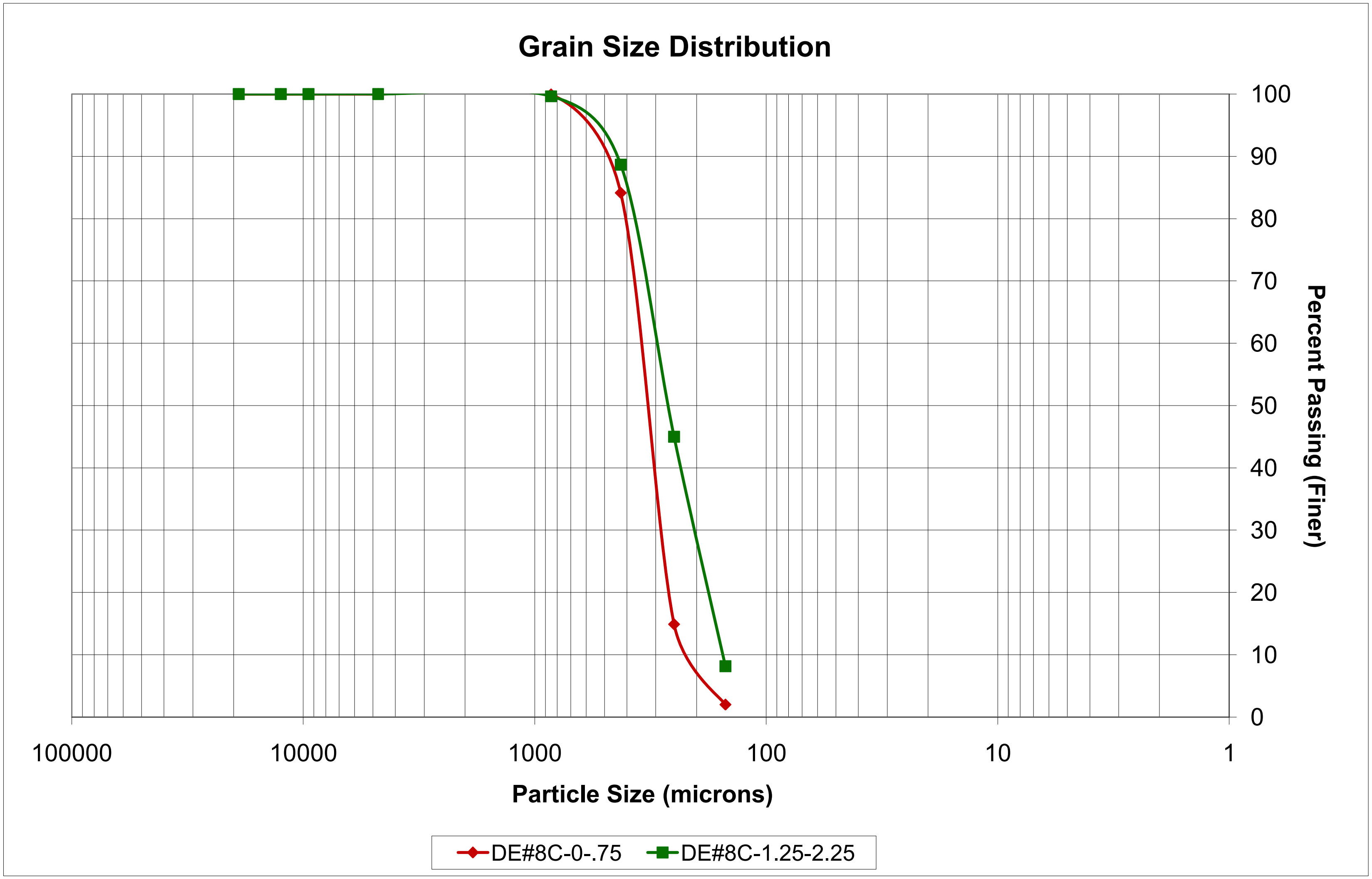
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1



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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

ASTM D-2937 (g/cm3)	DE#12A-1.5-3.5	DE#912A-1.5-3.5	DE#12A-6-12	DE#11A2-0-1.3
Matrix	Soil	Soil	Soil	Soil
Bulk Density	**1.11**	**1.14**	**1.39**	**0.49**

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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-1

ASTM D-2937 (g/cm3)	DE#10A-1-2	DE#8C-0-.75	DE#8C-1.25-2.25
Matrix	Soil	Soil	Soil
Bulk Density	**1.35**	**0.99**	**1.06**

EI#2

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested:
ARI Client Company: ENVIRONMENT INTERNATIONAL	Phone: 206 525 3362
Client Contact: JENNIFER ARTHUR	
Client Project Name: UCR SEDIMENT CORING	
Client Project #:	Samplers: MARIA BRUNA
Page: 1 of 2	
Date: 5/2/10	Ice Present? Yes
No. of Coolers: 1	Cooler Temps:

Sample ID	Date	Time	Matrix	No. Containers	TAL 8oz METALS	TOC 4oz	GRAIN 16oz SIZE	BULK 16oz DENSITY					Notes/Comments
DE#12A-1.5-3.5	4/30	6:55	Soil	2		X	X	X					
DE#912A-1.5-3.5	4/30	7:00	Soil	3	X	X	X	X					
DE#12A-1.5-3.5 MS/MSD	4/30	6:55	Soil	1		X							
DE#12A-6-12	5/1	1:15	Soil	3	X	X	X	X					
DE#11A2-0-1.3	5/1	2:15	Soil	3	X	X	X	X					
DE#11A2-2-2.5	5/1	2:25	Soil	1	X								
Rinsate Blank	5/1	3:00	DI Water	1	X								
DE#10A-1-2	5/2	12:15	Sediment	3	X	X	X	X					
DE#10A-2.1-2.5	5/2	12:10	Sediment	2	X	X							
DE#8C-0-.75	5/2	3:00	Sediment	3	X	X	X	X					

Comments/Special Instructions	Relinquished by:	Received by:	Relinquished by:	Received by:
	(Signature) Jason Inman	(Signature) Michelle Clement	(Signature)	(Signature)
	Printed Name: Jason Inman	Printed Name:	Printed Name:	Printed Name:
	Company: EI	Company: Fremont	Company:	Company:
	Date & Time: 5/2/10 4:15 pm	Date & Time: 5/4/10 12:00 pm	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

EI#2,2

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested:	Page: 2	of 2
ARI Client Company: ENVIRONMENT INTERNATIONAL	Phone: 206 525-3362	Date: 5/2/10	Ice Present? Yes
Client Contact: JENNIFER ARTHUR		No. of Coolers: 1	Cooler Temps:
Client Project Name: UCR SEDIMENT CORING			
Client Project #:	Samplers: MARIA BRUNA		

Sample ID	Date	Time	Matrix	No. Containers	TAL 8oz METALS	TOC 4oz	GRAIN 16oz SIZE	BULK 16oz DENSITY					Notes/Comments
DE#8C-125-2.25	5/2/10	3:05	Sediment	3	X	X	X	X					

Analysis Requested

Comments/Special Instructions	Relinquished by:	Received by:	Relinquished by:	Received by:
	(Signature) [signature]	(Signature) [signature]	(Signature)	(Signature)
	Printed Name: Jason Inman	Printed Name:	Printed Name:	Printed Name:
	Company: EI	Company: Fremont	Company:	Company:
	Date & Time: 5/2/10 4:15 pm	Date & Time: 5/4/10 12:00 pm	Date & Time:	Date & Time:

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Fremont Analytical

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Environment International
Attn: Jennifer Arthur
5505 34th Ave. NE
Seattle, WA 98105

RE: UCR Sediment Coring
Fremont Project No: CHM100504-2
EI Project No: EI#1

May 18th, 2010

Jennifer:

Enclosed are the analytical results for the **UCR Sediment Coring** soil samples to Fremont Analytical on Tuesday May 4th, 2010.

Sample Receipt:
The samples were received in good condition - in the proper containers, properly sealed, labeled and within holding time. The samples were received in 6 – 16oz soils jars, 12 – 8oz soil jars and 9 – 4oz soil jars. The samples were received in a cooler with wet ice, with a cooler temperature of 3.6°C, which is within the laboratory recommended cooler temperature range (<4°C - 10°C). The samples were stored in a refrigeration unit at the USEPA-recommended temperature of 4°C ± 2°C.

Sample Receipt Notations:

- DE12A-0-1: 16oz jar for "Grain Size" was not present with the delivery. Analyst used remaining sample from other containers.

Sample Analysis:
Examination of these samples was conducted for the presence of the following:

- ***Total Metals (TAL) by EPA Method 6020***
- ***Total Organic Carbon by EPA Method 9060A***
- ***Grain Size by ASTM D422***
- ***Bulk Density by ASTM D-2937***

These applications were performed under Washington State Department of Ecology accreditation parameters. All appropriate Quality Assurance / Quality Control method parameters have been applied.

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RE: UCR Sediment Coring
Fremont Project No: CHM100504-2
EI Project No: EI#1

Laboratory Notations:

SW6020

- The *Laboratory Control Sample (LCS)* was within range for all analytes.
- Matrix interferences were present in most samples:
  - Soil Matrix (Sample ID: DE#15A-0-1): The *relative percent difference (RPD%)* between the sample and sample duplicate exceeded recommended control limits (30%) for *Antimony (Sb)* and *Mercury (Hg)*. All other analyte *RPD%* values were within range.
  - (Sample ID: DE#15A-0-1): There were no *Matrix Spike (MS)* or *Post Digestion Spike (PDS)* recoveries *Manganese (Mn), Iron (Fe)*, *Potassium (K) and Zinc (Zn)*, due to high concentrations of the analyte in the sample.
  - (Sample ID: DE#15A-0-1): Interferences prevented the determination of the *MS*, *MS Duplicate (MSD)* and *PDS* recoveries for *Vanadium (V)*.
  - (Sample ID: DE#15A-0-1): The *MSD* recovery for *Calcium (Ca)* was outside of the laboratory control limits. The *MS and PDS* spike recoveries were within range.
  - (Sample ID: DE#15A-0-1): The RPD% between the *MS* and *MSD* exceeded recommended control limits (30%) *Copper (Cu)*. All spike recoveries were within range.
  - (Sample ID: DE#15A-0-1): The *MS and MSD* recoveries for *Lead (Pb)* were outside of the laboratory control limits. The *PDS* spike recovery was within range.
  - (Sample ID: DE#15A-0-1): The *MS and MSD* recoveries for *Mercury (Hg)* were outside of the laboratory control limits. The *PDS* spike recovery was within range.

SW9060A

- The *MSD* (Sample ID: *Batch 100504-1-2*) was outside of the laboratory recommended control limits. The MS and LCS were within range (Note: Method 9060A does not require Matrix Spike samples).

Please contact the laboratory if you should have any questions about the results,

Thank you for using Fremont Analytical!

Sincerely,

Michael Dee
Sr. Chemist / Principal

mikedee@fremontanalytical.com

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2

EPA 6020 (mg/kg)	MRL	Method Blank	LCS	DE#15A-0-1	Duplicate DE#15A-0-1	RPD %	DE#15A-1.9-2.7
Date Extracted		5/4/10	5/4/10	5/4/10	5/4/10		5/4/10
Date Analyzed		5/4/10	5/4/10	5/4/10	5/4/10		5/4/10
Matrix				Soil	Soil		Soil
Aluminum (Al)	5.5	nd	106%	**13,400**	**14,100**	6%	**15,200**
Antimony (Sb)	0.20	nd	94%	**3.71**	**2.62**	35%	**2.60**
Arsenic (As)	0.10	nd	81%	**7.02**	**6.02**	15%	**6.74**
Barium (Ba)	0.50	nd	84%	**487**	**407**	18%	**398**
Beryllium (Be)	0.20	nd	93%	**0.791**	**0.823**	4%	**0.910**
Cadmium (Cd)	0.05	nd	82%	**1.60**	**1.59**	0.1%	**2.04**
Calcium (Ca)	10	nd	108%	**36,000**	**35,900**	0.1%	**38,400**
Chromium (Cr)	0.20	nd	81%	**50.7**	**46.9**	8%	**51.2**
Cobalt (Co)	0.20	nd	83%	**22.2**	**18.8**	17%	**13.6**
Copper (Cu)	0.10	nd	79%	**748**	**666**	12%	**734**
Iron (Fe)	20	nd	105%	**112,000**	**114,000**	2%	**129,000**
Lead (Pb)	0.50	nd	83%	**256**	**227**	12%	**353**
Magnesium (Mg)	10	nd	103%	**5320**	**5400**	1%	**4750**
Manganese (Mn)	0.20	nd	131%	**4870**	**5080**	4%	**5880**
Mercury (Hg)	0.05	nd	120%	**0.791**	**0.358**	75%	**0.340**
Nickel (Ni)	0.10	nd	79%	**7.46**	**8.61**	14%	**5.98**
Potassium (K)	50	nd	123%	**34,100**	**36,900**	8%	**39,900**
Selenium (Se)	0.50	nd	78%	nd	nd		nd
Silver (Ag)	0.10	nd	82%	**1.22**	**0.994**	20%	**0.465**
Sodium (Na)*	10	nd	110%	**1030**	**990**	4%	**528**
Thallium (Tl)	0.20	nd	86%	**3.33**	**2.97**	12%	**2.77**
Vanadium (V)	0.10	nd	71%	nd	nd		nd
Zinc (Zn)	0.40	nd	80%	**10,600**	**10,900**	3%	**8610**

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"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2

EPA 6020 (mg/kg)	MRL	DE#14A-0-.75	DE#14A-.75-1	DE#14A-1.4-2	DE#14A-2-3	DE#12A-0-1
Date Extracted		5/4/10	5/4/10	5/4/10	5/4/10	5/4/10
Date Analyzed		5/4/10	5/4/10	5/4/10	5/4/10	5/4/10
Matrix		Soil	Soil	Soil	Soil	Soil
Aluminum (Al)	5.5	**8970**	**6600**	**3900**	**3920**	**12,900**
Antimony (Sb)	0.20	**3.26**	**2.64**	**0.0818**	**0.0249**	**8.73**
Arsenic (As)	0.10	**6.45**	**7.54**	**2.44**	**1.95**	**11.2**
Barium (Ba)	0.50	**292**	**213**	**43.2**	**43.4**	**794**
Beryllium (Be)	0.20	**0.523**	**0.485**	nd	**0.201**	**0.889**
Cadmium (Cd)	0.05	**2.89**	**6.79**	**0.242**	**0.207**	**1.71**
Calcium (Ca)	10	**24,500**	**37,300**	**3870**	**3770**	**39,900**
Chromium (Cr)	0.20	**27.2**	**19.4**	**9.09**	**8.81**	**81.8**
Cobalt (Co)	0.20	**8.60**	**6.14**	**3.44**	**2.91**	**40.6**
Copper (Cu)	0.10	**325**	**160**	**19.1**	**11.7**	**1110**
Iron (Fe)	20	**62,200**	**20,900**	**9470**	**8010**	**112,000**
Lead (Pb)	0.50	**241**	**151**	**13.3**	**9.32**	**222**
Magnesium (Mg)	10	**7230**	**10,100**	**3550**	**3490**	**5180**
Manganese (Mn)	0.20	**2540**	**693**	**154**	**234**	**5300**
Mercury (Hg)	0.05	**0.316**	**0.650**	nd	nd	**0.324**
Nickel (Ni)	0.10	**7.42**	**6.01**	**4.21**	**7.17**	**10.6**
Potassium (K)	50	**21,500**	**12,900**	**4030**	**6300**	**41,200**
Selenium (Se)	0.50	nd	nd	nd	nd	nd
Silver (Ag)	0.10	**0.581**	**0.563**	**0.0325**	**0.0481**	**2.39**
Sodium (Na)*	10	**281**	**282**	**89.0**	**151**	**1320**
Thallium (Tl)	0.20	**1.83**	**2.13**	nd	nd	**3.00**
Vanadium (V)	0.10	nd	nd	nd	nd	nd
Zinc (Zn)	0.40	**2910**	**1560**	**37.5**	**38.9**	**10,900**

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"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Seattle, WA 98109

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email: info@fremontanalytical.com

Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2

EPA 6020 (mg/kg)	MRL	DE#8C-4.25-5	DE#8C-17.0-24.0	DE#8C-17.0C	DE#8C-10-17
Date Extracted		5/4/10	5/4/10	5/4/10	5/4/10
Date Analyzed		5/4/10	5/4/10	5/4/10	5/4/10
Matrix		Soil	Soil	Soil	Soil
Aluminum (Al)	5.5	**8740**	**8570**	**5670**	**6560**
Antimony (Sb)	0.20	**8.18**	**3.72**	**3.95**	**3.17**
Arsenic (As)	0.10	**7.34**	**14.6**	**6.90**	**7.49**
Barium (Ba)	0.50	**423**	**150**	**124**	**176**
Beryllium (Be)	0.20	**0.532**	**0.459**	**0.520**	**0.432**
Cadmium (Cd)	0.05	**3.13**	**5.99**	**11.6**	**9.19**
Calcium (Ca)	10	**27,000**	**40,600**	**45,100**	**62,400**
Chromium (Cr)	0.20	**44.2**	**13.9**	**12.4**	**14.4**
Cobalt (Co)	0.20	**10.5**	**11.9**	**4.92**	**5.90**
Copper (Cu)	0.10	**469**	**360**	**187**	**192**
Iron (Fe)	20	**68,100**	**53,900**	**31,000**	**34,100**
Lead (Pb)	0.50	**171**	**925**	**428**	**361**
Magnesium (Mg)	10	**6080**	**12,400**	**16,900**	**22,300**
Manganese (Mn)	0.20	**2490**	**2240**	**1270**	**1500**
Mercury (Hg)	0.05	**0.498**	**0.460**	**0.958**	**0.987**
Nickel (Ni)	0.10	**8.98**	**7.28**	**8.13**	**9.03**
Potassium (K)	50	**25,900**	**33,600**	**27,100**	**34,800**
Selenium (Se)	0.50	nd	nd	nd	nd
Silver (Ag)	0.10	**0.529**	**0.814**	**0.459**	**0.403**
Sodium (Na)*	10	**508**	**881**	**477**	**623**
Thallium (Tl)	0.20	**2.46**	**11.9**	**5.77**	**4.91**
Vanadium (V)	0.10	nd	nd	nd	nd
Zinc (Zn)	0.40	**5250**	**9630**	**4270**	**4460**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2

EPA 6020 (mg/kg)	MRL	MS DE#15A-0-1	MSD DE#15A-0-1	RPD %	PDS DE#15A-0-1
Date Extracted		5/4/10	5/4/10		5/4/10
Date Analyzed		5/4/10	5/4/10		5/4/10
Matrix		Soil	Soil		Soil
Aluminum (Al)	5.5	84%	113%	29%	61%
Antimony (Sb)	0.20	86%	88%	3%	76%
Arsenic (As)	0.10	82%	82%	0.2%	72%
Barium (Ba)	0.50	100%	128%	24%	105%
Beryllium (Be)	0.20	84%	84%	0.5%	66%
Cadmium (Cd)	0.05	92%	95%	3%	89%
Calcium (Ca)	10	78%	171%	75%	112%
Chromium (Cr)	0.20	84%	90%	6%	88%
Cobalt (Co)	0.20	85%	86%	2%	81%
Copper (Cu)	0.10	77%	113%	39%	103%
Iron (Fe)	20	-	-		-
Lead (Pb)	0.50	143%	163%	13%	100%
Magnesium (Mg)	10	89%	99%	10%	107%
Manganese (Mn)	0.20	-	-		-
Mercury (Hg)	0.05	160%	167%	5%	118%
Nickel (Ni)	0.10	80%	80%	1%	66%
Potassium (K)	50	-	-		-
Selenium (Se)	0.50	67%	68%	2%	4%
Silver (Ag)	0.10	78%	74%	5%	60%
Sodium (Na)*	10	95%	96%	1%	116%
Thallium (Tl)	0.20	104%	112%	7%	123%
Vanadium (V)	0.10	*int*	*int*		45%
Zinc (Zn)	0.40	75%	-		-

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"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**Method Blank**	**LCS**	**DE#15A-0-1**	**DE#15A-1.9-2.7**	**DE#14A-0-.75**
Date Analyzed		5/11/10	5/11/10	5/11/10	5/11/10	5/12/10
Matrix				Soil	Soil	Soil
Total Organic Carbon	0.1	nd	89%	**0.326**	**0.101**	**0.825**

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"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS, ICV, CCV = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**DE#14A-1.4-2**	**DE#14A-2-3**	**DE#12A-0-1**	**DE#8C-4.25-5**	**DE#8C-10-17**
Date Analyzed		5/12/10	5/11/10	5/12/10	5/12/10	<date>
Matrix		Soil	Soil	Soil	Soil	Soil
Total Organic Carbon	0.1	**0.263**	**0.246**	**0.230**	**0.549**	**3.21**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS, ICV, CCV = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2

		QA Sample	QA Duplicate		MS	MSD	
EPA 9060A	**MRL**	*Batch*	*Batch*	**RPD**	*Batch*	*Batch*	**RPD**
(Percent Organic Carbon by Weight)		*100504-1-2*	*100504-1-2*	**%**	*100504-1-2*	*100504-1-2*	**%**
Date Analyzed		5/12/10	5/12/10		5/12/10	5/12/10	
Matrix		Soil	Soil		Soil	Soil	
Total Organic Carbon	0.1	**0.119**	**0.103**	15%	125%	143%	14%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS, ICV, CCV = 40% Carbon

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2

Percent Finer (Passing) Than the Indicated Size

UOM = Percent

Sieve Size	3/4"	1/2"	3/8"	#4	#20	#40	#60	#100	#200	#325	#450
particle size (microns)	19000	12500	9500	4750	850	425	250	150	75	45	34
DE#15A-0-1	100.00	100.00	100.00	99.74	99.42	52.40	11.86	2.41			
DE#15A-1.9-2.7	100.00	100.00	100.00	100.00	99.74	46.01	7.41	1.47			
DE#14A-0-.75	100.00	100.00	100.00	100.00	99.21	83.42	20.91	7.22			
DE#14A-1.4-2	100.00	98.54	97.03	92.58	87.24	78.61	32.85	7.78			
DE#14A-2-3	100.00	100.00	99.36	97.73	95.62	86.40	36.55	11.08			
DE#12A-0-1	100.00	100.00	100.00	100.00	99.34	28.07	1.77	0.29			
DE#8C-4.25-5	100.00	100.00	100.00	99.98	99.95	80.16	22.25	1.55			

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2

Percent Retained in Each Size Fraction

UOM = Percent

Sieve Size (microns)	>19000	19000-12500	12500-9500	9500-4750	4750-850	850-425	425-250	250-150	150-75	75-45	45-34	<34
DE#15A-0-1	0.00	0.00	0.00	0.26	0.32	47.02	40.54	9.45				
DE#15A-1.9-2.7	0.00	0.00	0.00	0.00	0.26	53.73	38.59	5.94				
DE#14A-0-.75	0.00	0.00	0.00	0.00	0.79	15.79	62.51	13.69				
DE#14A-1.4-2	0.00	1.46	1.51	4.45	5.35	8.62	45.76	25.07				
DE#14A-2-3	0.00	0.00	0.64	1.63	2.11	9.22	49.85	25.47				
DE#12A-0-1	0.00	0.00	0.00	0.00	0.66	71.27	26.30	1.49				
DE#8C-4.25-5	0.00	0.00	0.00	0.02	0.03	19.80	57.91	20.69				

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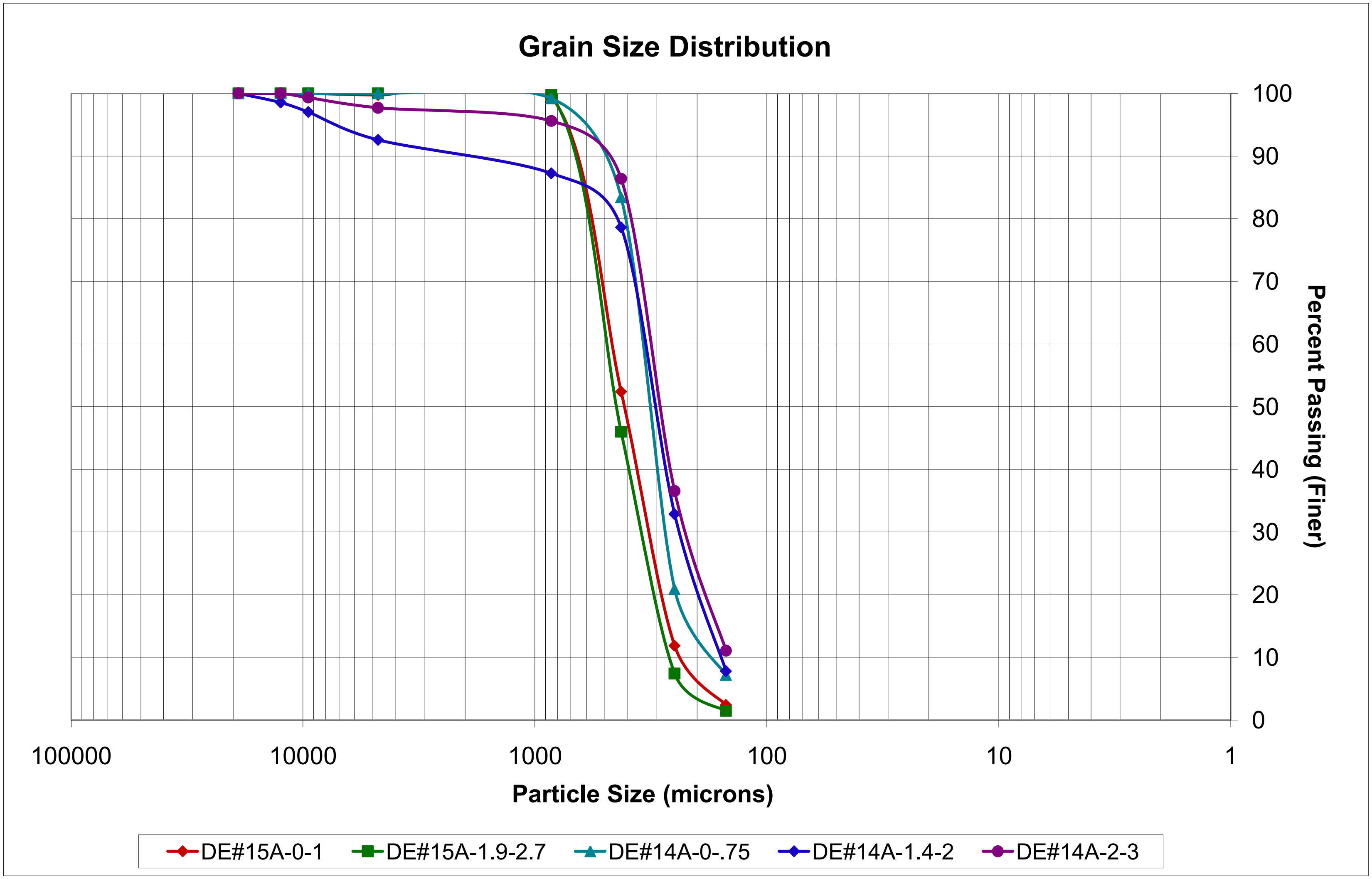
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2



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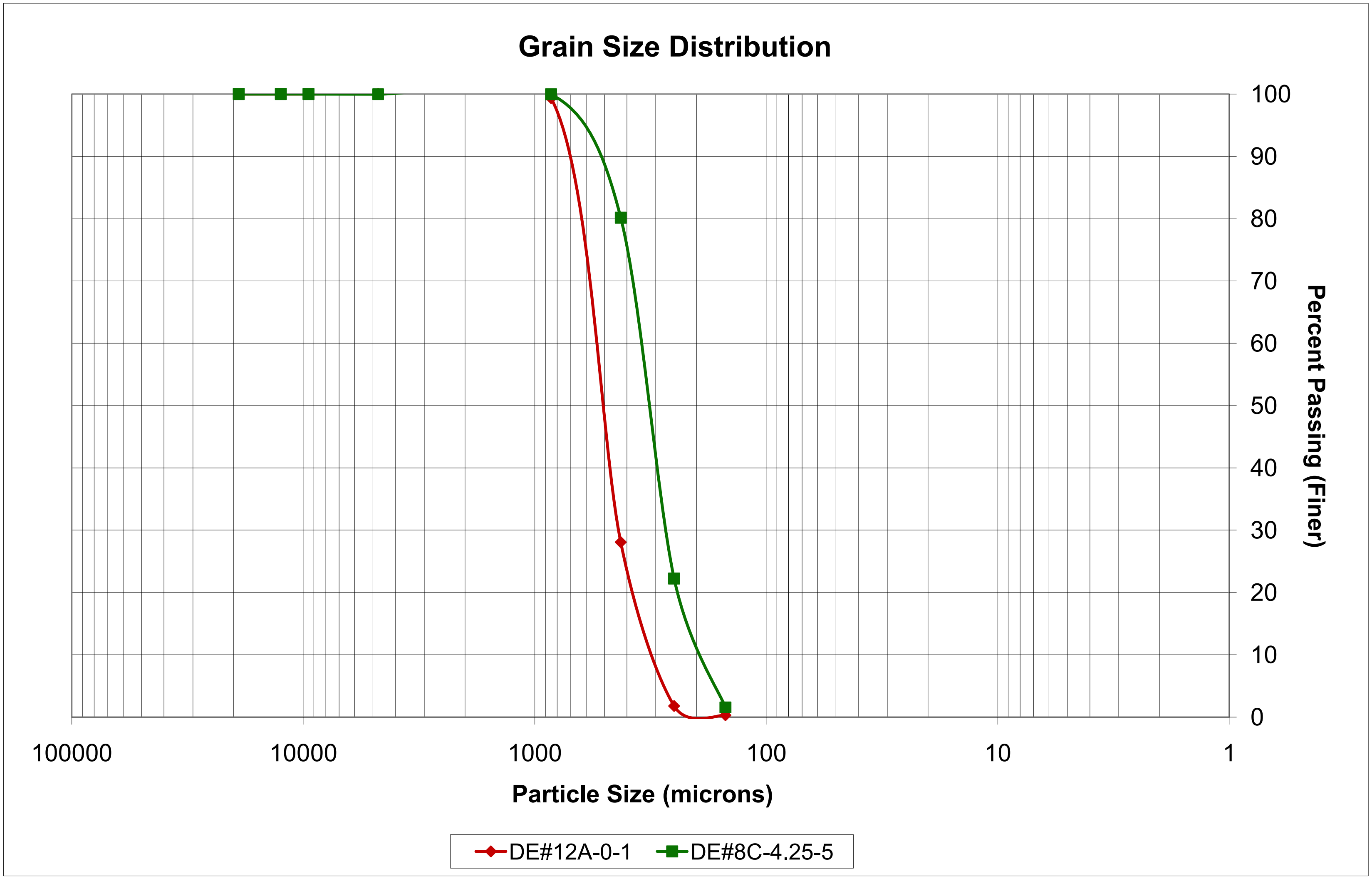
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2



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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2

ASTM D-2937 (g/cm3)	DE#15A-0-1	DE#15A-1.9-2.7	DE#14A-0-.75	DE#14A-1.4-2
Matrix	Soil	Soil	Soil	Soil
Bulk Density	**1.20**	**1.41**	**1.12**	**1.09**

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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100504-2

ASTM D-2937 (g/cm3)	DE#14A-2-3	DE#12A-0-1	DE#8C-4.25-5
Matrix	Soil	Soil	Soil
Bulk Density	**1.13**	**1.04**	**1.14**

EI 1

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested:
ARI Client Company: ENVIRONMENT INTERNATIONAL	Phone: 206 525 3362
Client Contact: JENNIFER ARNOLD	
Client Project Name: UCR SEDIMENT CORING	
Client Project #:	Samplers: MARIA BRAUN
Page: 1 of 2	
Date: 5/2/10	Ice Present?
No. of Coolers:	Cooler Temps:

Sample ID	Date	Time	Matrix	No. Containers	TAL 8oz METALS	TOC 4oz	GRAIN 16oz SIZE	BULK 16oz DENSITY					Notes/Comments
DE#15A-0-1	4/30/10	4:45	Sed	3	X	X	X	X					
DE#15A-1.9-2.7	4/30/10	4:45	Sed	3	X	X	X	X					
DE#14A-0-.75	4/30/10	5:30	Sed	3	X	X	X	X					
DE#14A-.75-1	4/30/10	5:35	Sed	1	X								
DE#14A-1.4-2	4/30/10	5:45	Sed	3	X	X	X	X					
DE#14A-2-3	4/30/10	5:50	Sed	3	X	X	X	X					
DE#12A-0-1	4/30/10	6:45	Sed	3	X	X	X	X					
~~DE#12A-1.5-3.5~~	~~4/30/10~~	~~6:55~~	~~Sed~~		~~X~~		~~X~~	~~X~~					
DE#12A-1.5-3.5 MS/MSD	4/30/10	6:55	Sed		X								
~~DE#12A-1.5-3.5~~	~~4/30/10~~	~~7:00~~	~~Sed~~				~~X~~	~~X~~					

Comments/Special Instructions	Relinquished by:	Received by:	Relinquished by:	Received by:
	(Signature) [signature]	(Signature) Michelle Clements	(Signature)	(Signature)
	Printed Name: Jason Inman	Printed Name: Michelle Clements	Printed Name:	Printed Name:
	Company: EI	Company: Fremont	Company:	Company:
	Date & Time: 5/2/10 6:50	Date & Time: 5/4/10 12:00	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

EI1

Chain of Custody Record

Fremont Analytical

2930 Westlake Ave. N. Suite 100
Seattle, WA 98103
Tel: 206-352-3790
Fax: 206-352-7178

Date: 5/2/10

Laboratory Project No (internal):

Page: 2 of: 2

Client: ENVIRONMENT INTERNATIONAL
Address: 5505 34th AVE NE
City, State, Zip: SEATTLE WA 98105
Tel: 206 525 3362

Project Name: UCR SEDIMENT CORING
Location:
Collected by: MARIA BRUMAN

Reports To (PM):
Fax:
Email:
Project No:

	Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx/Dx Ext.	SEMI VOL 8270C	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals*	Total (T) | Dissolved (D)	Anions (IC)**	TOC	GRAIN SIZE	BULK DENSITY		Comments/Depth
1	DE#12A-1.5-3.5	6:55	Sediment	8oz	4/30												1						
2	DE#8C-4.25-5	5:00	Sediment	various 8oz	5/2												X		X	X	X		
3	DE#8C-17.0-24.0	6:15pm	Sediment	VOA/8oz/4oz	5/2												X						
4	DE#8C-17.0C	6:25	Sediment	8oz	5/2												X						
5	DE#8C-10-17	6:05	Sediment	8oz/4oz	5/2												X		X				
6																							
7																							
8																							
9																							
10																							

***Metals Analysis (Circle):** MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

****Anions (Circle):** Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Relinquished	Date/Time	Received	Date/Time
x Jason Ionner	5/2/10 7:00pm	x Michelle Clements	5/4/10 12:00
x		x	

Sample Receipt:	
Good?	
Cooler Temperature:	
Seals Intact?:	
Total Number of Containers:	

Special Remarks:

TAT --> 24HR 48HR Standard

Distribution: White - Lab, Yellow - File, Pink - Originator

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T: (206) 352-3790
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Environment International
Attn: Jennifer Arthur
5505 34th Ave. NE
Seattle, WA 98105

RE: UCR Sediment Coring
Fremont Project No: CHM100507-1
EI Project No: EI#4

May 21st, 2010

Jennifer:

Enclosed are the analytical results for the ***UCR Sediment Coring*** soil and water samples to Fremont Analytical on Friday May 7th, 2010.

Sample Receipt:
The samples were received in good condition - in the proper containers, properly sealed, labeled and within holding time. The samples were received in 5 – 16oz soils jars, 7 – 8oz soil jars, 7 – 4oz soil jars and 1 – 250mL HDPE bottles. The samples were received in a cooler with wet ice, with a cooler temperature of 5.3°C, which is within the laboratory recommended cooler temperature range (<4°C - 10°C). The samples were stored in a refrigeration unit at the USEPA-recommended temperature of 4°C ± 2°C.

Sample Receipt Notations:
- Broken Container = *BSB4A-2.5-3.2*. The sample was contained in a zip lock bag. There was no impact to the analysis.
- Sample *BSB5A-0.75-1.5*: Sample ID not listed on 16oz container. The laboratory matched up sample time to determine the sample ID.

Sample Analysis:
Examination of these samples was conducted for the presence of the following:

- ***Total Metals (TAL) by EPA Method 6020***
- ***Total Organic Carbon by EPA Method 9060A***
- ***Grain Size by ASTM D422***
- ***Bulk Density by ASTM D-2937***

These applications were performed under Washington State Department of Ecology accreditation parameters. All appropriate Quality Assurance / Quality Control method parameters have been applied.

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RE: UCR Sediment Coring
Fremont Project No: CHM100507-1
EI Project No: EI#4

Laboratory Notations (SW6020):

- The *Laboratory Control Sample (LCS)* was within range for all analytes.
- Dilution was required. Adjusted reporting limits are noted.
- High matrix interferences were present:
  - Sample ID: BSB4A-1.5-2.5: The *relative percent difference (RPD%)* between the sample and sample duplicate exceeded recommended control limits (30%) for *Antimony (Sb), Arsenic (As)* and *Mercury (Hg)*. All other analyte *RPD%* values were within range.
  - Sample ID: BSB4A1.5-2.5: The *Matrix Spike (MS) and MS Duplicate (MSD)* for the analytes showed poor recoveries due to high concentrations of the analytes and due to the sample matrix. *A Post Digestion Spike (PDS)* was included. Poor *PDS* recoveries were obtained for *Calcium (Ca)*, *Manganese (Mn)*, and *Vanadium (V)*.

Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical!

Sincerely,

Michael Dee
Sr. Chemist / Principal

mikedee@fremontanalytical.com

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

EPA 6020 (mg/kg)	MRL	RL	Method Blank	LCS	BSB4A-3.5-4.5	BSB4A-2.5-3.2
Date Extracted			5/10/10	5/10/10	5/10/10	5/10/10
Date Analyzed			5/10/10	5/10/10	5/10/10	5/10/10
Matrix					Soil	Soil
Aluminum (Al)	5.5	11	nd	119%	**4020**	**20,900**
Antimony (Sb)	0.20	0.40	nd	108%	nd	**2.24**
Arsenic (As)	0.10	0.20	nd	90%	**1.80**	**20.4**
Barium (Ba)	0.50	1.0	nd	94%	**44.0**	**506**
Beryllium (Be)	0.20	0.40	nd	108%	**0.391**	**1.01**
Cadmium (Cd)	0.05	0.10	nd	92%	**0.245**	**3.04**
Calcium (Ca)	10	20	nd	120%	**8580**	**72,600**
Chromium (Cr)	0.20	0.40	nd	85%	**7.04**	**33.7**
Cobalt (Co)	0.20	0.40	nd	85%	**2.52**	**17.5**
Copper (Cu)	0.10	0.20	nd	84%	**13.0**	**1320**
Iron (Fe)	20	40	nd	119%	**9250**	**216,000**
Lead (Pb)	0.50	1.0	nd	91%	**15.3**	**1650**
Magnesium (Mg)	10	20	nd	119%	**6260**	**6530**
Manganese (Mn)	0.20	0.40	nd	117%	**410**	**6550**
Mercury (Hg)	0.05	0.10	nd	103%	nd	**0.369**
Nickel (Ni)	0.10	0.20	nd	90%	**7.37**	**6.81**
Potassium (K)	50	100	nd	119%	**1960**	**8560**
Selenium (Se)	0.50	1.0	nd	93%	nd	nd
Silver (Ag)	0.10	0.20	nd	91%	nd	**1.24**
Sodium (Na)*	10	20	nd	121%	**219**	**1440**
Thallium (Tl)	0.20	0.40	nd	91%	**0.251 *J***	**7.57**
Vanadium (V)	0.10	0.20	nd	73%	nd	nd
Zinc (Zn)	0.40	0.80	nd	87%	**151**	**31,300**

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"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%
Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%
Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

EPA 6020 (mg/kg)	MRL	RL	BSB4A-1.5-2.5	Duplicate BSB4A-1.5-2.5	RPD %	BSB4A-0.9-1.4
Date Extracted			5/10/10	5/10/10		5/10/10
Date Analyzed			5/10/10	5/10/10		5/10/10
Matrix			Soil	Soil		Soil
Aluminum (Al)	5.5	11	**20,400**	**18,600**	10%	**13,100**
Antimony (Sb)	0.20	0.40	**3.81**	**1.89**	67%	**0.799**
Arsenic (As)	0.10	0.20	**11.0**	**7.80**	34%	**4.01**
Barium (Ba)	0.50	1.0	**643**	**583**	10%	**360**
Beryllium (Be)	0.20	0.40	**1.10**	**0.898**	20%	**0.616**
Cadmium (Cd)	0.05	0.10	**2.17**	**1.89**	14%	**2.28**
Calcium (Ca)	10	20	**78,900**	**70,100**	12%	**44,100**
Chromium (Cr)	0.20	0.40	**56.3**	**47.8**	16%	**23.4**
Cobalt (Co)	0.20	0.40	**14.3**	**12.3**	15%	**9.34**
Copper (Cu)	0.10	0.20	**1400**	**1230**	13%	**445**
Iron (Fe)	20	40	**220,000**	**193,000**	19%	**120,000**
Lead (Pb)	0.50	1.0	**805**	**699**	14%	**198**
Magnesium (Mg)	10	20	**4500**	**4500**	13%	**5710**
Manganese (Mn)	0.20	0.40	**6960**	**5970**	15%	**3300**
Mercury (Hg)	0.05	0.10	**0.494**	**0.272**	58%	**0.463**
Nickel (Ni)	0.10	0.20	**5.98**	**4.93**	19%	**7.11**
Potassium (K)	50	100	**5500**	**5040**	9%	**5940**
Selenium (Se)	0.50	1.0	nd	nd		nd
Silver (Ag)	0.10	0.20	**1.06**	**1.00**	6%	**0.707**
Sodium (Na)*	10	20	**1150**	**1090**	5%	**776**
Thallium (Tl)	0.20	0.40	**3.91**	**3.46**	12%	**1.25**
Vanadium (V)	0.10	0.20	nd	nd		nd
Zinc (Zn)	0.40	0.80	**27,700**	**24,000**	14%	**10,900**

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"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

EPA 6020 (mg/kg)	MRL	RL	BSB5A-3.0-3.5	BSB5A-0.75-1.5
Date Extracted			5/10/10	5/10/10
Date Analyzed			5/10/10	5/10/10
Matrix			Soil	Soil
Aluminum (Al)	5.5	11	**14,400**	**20,100**
Antimony (Sb)	0.20	0.40	**1.22**	**4.20**
Arsenic (As)	0.10	0.20	**3.93**	**10.9**
Barium (Ba)	0.50	1.0	**389**	**996**
Beryllium (Be)	0.20	0.40	**0.758**	**1.24**
Cadmium (Cd)	0.05	0.10	**1.13**	**1.42**
Calcium (Ca)	10	20	**53,600**	**81,700**
Chromium (Cr)	0.20	0.40	**23.4**	**62.3**
Cobalt (Co)	0.20	0.40	**10.50**	**32.2**
Copper (Cu)	0.10	0.20	**886**	**1870**
Iron (Fe)	20	40	**124,000**	**201,000**
Lead (Pb)	0.50	1.0	**322**	**356**
Magnesium (Mg)	10	20	**3850**	**5570**
Manganese (Mn)	0.20	0.40	**4320**	**6160**
Mercury (Hg)	0.05	0.10	**0.183**	**0.265**
Nickel (Ni)	0.10	0.20	**3.92**	**9.30**
Potassium (K)	50	100	**6620**	**8410**
Selenium (Se)	0.50	1.0	nd	nd
Silver (Ag)	0.10	0.20	**0.913**	**2.58**
Sodium (Na)*	10	20	**1010**	**1780**
Thallium (Tl)	0.20	0.40	**1.70**	**1.90**
Vanadium (V)	0.10	0.20	nd	nd
Zinc (Zn)	0.40	0.80	**16,600**	**22,600**

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"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

			MS	MSD		PDS
EPA 6020 (mg/kg)	**MRL**	**RL**	**BSB4A1.5-2.5**	**BSB4A1.5-2.5**	**RPD %**	**BSB4A-3.5-4.5**
Date Extracted			5/10/10	5/10/10		5/10/10
Date Analyzed			5/10/10	5/10/10		5/14/10
Matrix			Soil	Soil		Soil
Aluminum (Al)	5.5	11	64%	-		107%
Antimony (Sb)	0.20	0.40	-	-		109%
Arsenic (As)	0.10	0.20	67%	69%	2%	93%
Barium (Ba)	0.50	1.0	153%	-		101%
Beryllium (Be)	0.20	0.40	95%	86%	9%	85%
Cadmium (Cd)	0.05	0.10	122%	95%	25%	99%
Calcium (Ca)	10	20	66%	-		187%
Chromium (Cr)	0.20	0.40	62%	50%	21%	87%
Cobalt (Co)	0.20	0.40	65%	63%	4%	87%
Copper (Cu)	0.10	0.20	37%	-		94%
Iron (Fe)	20	40	-	-		122%
Lead (Pb)	0.50	1.0	-	74%		98%
Magnesium (Mg)	10	20	9%	-		112%
Manganese (Mn)	0.20	0.40	-	-		-
Mercury (Hg)	0.05	0.10	74%	71%	4%	101%
Nickel (Ni)	0.10	0.20	75%	73%	2%	94%
Potassium (K)	50	100	34%	31%	10%	119%
Selenium (Se)	0.50	1.0	64%	80%	22%	81%
Silver (Ag)	0.10	0.20	56%	55%	3%	99%
Sodium (Na)*	10	20	30%	26%	13%	103%
Thallium (Tl)	0.20	0.40	100%	81%	20%	92%
Vanadium (V)	0.10	0.20	108%	174%	47%	20%
Zinc (Zn)	0.40	0.80	-	-		78%

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"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

EPA 6020 (µg/L)	MRL	Method Blank	LCS	Rinsate Blank 5/5/2010	QA Sample Batch 100511-4-11	QA Duplicate Batch 100511-4-11	RPD %
Date Extracted		5/12/10	5/12/10	5/12/10	5/12/10	5/12/10	
Date Analyzed		5/12/10	5/12/10	5/12/10	5/12/10	5/12/10	
Matrix				Water		Water	
Aluminum (Al)	55	nd	97%	nd	nd	nd	
Antimony (Sb)	0.20	nd	113%	nd	**0.440**	**0.440**	0%
Arsenic (As)	1.0	nd	93%	nd	nd	nd	
Barium (Ba)	0.30	nd	100%	**1.34**	**14.5**	**13.6**	6%
Beryllium (Be)	0.20	nd	110%	nd	nd	nd	
Cadmium (Cd)	0.20	nd	97%	nd	nd	nd	
Calcium (Ca)	100	**147**	91%	**2730**	**1330**	**1820**	31%
Chromium (Cr)	0.60	nd	90%	nd	**0.440**	**0.400**	10%
Cobalt (Co)	0.30	**0.72**	74%	nd	nd	nd	
Copper (Cu)	0.40	nd	92%	**0.980**	**4.64**	**4.24**	9%
Iron (Fe)	100	nd	98%	nd	**515**	**489**	5%
Lead (Pb)	0.20	nd	93%	nd	**7.70**	**7.46**	3%
Magnesium (Mg)	100	nd	95%	nd	**219**	**301**	32%
Manganese (Mn)	2.0	nd	78%	**2.22**	**14**	**15**	6%
Mercury (Hg)	0.30	nd	99%	nd	nd	nd	
Nickel (Ni)	0.50	nd	95%	**0.740**	**1.28**	**0.180 *J***	-
Potassium (K)	500	nd	94%	**819**	nd	nd	
Selenium (Se)	1.0	nd	83%	nd	nd	nd	
Silver (Ag)	0.20	nd	95%	nd	nd	nd	
Sodium (Na)	100	nd	82%	**405**	nd	nd	
Thallium (Tl)	0.20	nd	91%	nd	nd	nd	
Vanadium (V)	0.50	nd	96%	nd	nd	nd	
Zinc (Zn)	1.5	nd	89%	**28.0**	**50.5**	**47.3**	7%

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"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 1250 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb, Be = 5 µg/L
Tl = 2.5 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

EPA 6020 (µg/L)	MRL	MS *Batch 100506-5-1*	MSD *Batch 100506-5-1*	RPD %
Date Extracted		5/12/10	5/12/10	
Date Analyzed		5/12/10	5/12/10	
Matrix		Water	Water	
Aluminum (Al)	55	96%	95%	1%
Antimony (Sb)	0.20	113%	114%	1%
Arsenic (As)	1.0	94%	95%	2%
Barium (Ba)	0.30	98%	100%	2%
Beryllium (Be)	0.20	118%	122%	3%
Cadmium (Cd)	0.20	97%	98%	0.2%
Calcium (Ca)	100	101%	108%	6%
Chromium (Cr)	0.60	70%	70%	0.4%
Cobalt (Co)	0.30	70%	70%	0%
Copper (Cu)	0.40	88%	89%	1%
Iron (Fe)	100	91%	90%	1%
Lead (Pb)	0.20	91%	92%	1%
Magnesium (Mg)	100	103%	96%	7%
Manganese (Mn)	2.0	93%	112%	19%
Mercury (Hg)	0.30	99%	106%	7%
Nickel (Ni)	0.50	101%	104%	2%
Potassium (K)	500	124%	119%	4%
Selenium (Se)	1.0	84%	89%	5%
Silver (Ag)	0.20	83%	83%	0%
Sodium (Na)	100	107%	99%	8%
Thallium (Tl)	0.20	89%	90%	0.9%
Vanadium (V)	0.50	90%	89%	1%
Zinc (Zn)	1.5	84%	86%	2%

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"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%
Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%
Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 1250 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb, Be = 5 µg/L
Tl = 2.5 µg/L

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**Method Blank**	**LCS**	**BSB4A-3.5-4.5**	**BSB4A-2.5-3.2**
Date Analyzed		5/19/10	5/19/10	5/19/10	5/19/10
Matrix				Soil	Soil
Total Organic Carbon	0.5	nd	89%	**0.444 *J***	**0.144 *J***

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"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**BSB4A-1.5-2.5**	**BSB4A-0.9-1.4**	**BSB5A-3.0-3.5**	**BSB5A-0.75-1.5**
Date Analyzed		5/19/10	5/19/10	5/19/10	5/19/10
Matrix		Soil	Soil	Soil	Soil
Total Organic Carbon	0.5	nd	**0.285 *J***	nd	nd

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"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

		QA Sample	QA Duplicate	MS	MSD	
EPA 9060A	**MRL**	*Batch*	*Batch*	*Batch*	*Batch*	**RPD**
(Percent Organic Carbon by Weight)		*100507-7-10*	*100507-7-10*	*100507-7-10*	*100507-7-10*	**%**
Date Analyzed		5/19/10	5/19/10	5/19/10	5/19/10	
Matrix		Soil	Soil	Soil	Soil	
Total Organic Carbon	0.5	nd	nd	112%	94%	17%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS = 40% Carbon

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

Percent Finer (Passing) Than the Indicated Size

UOM = Percent

Sieve Size	3/4"	1/2"	3/8"	#4	#20	#40	#60	#100	#200	#325	#450
particle size (microns)	19000	12500	9500	4750	850	425	250	150	75	45	34
BSB-4A-3.5-4.5	81.21	80.45	80.45	79.74	25.50	4.29	2.42	1.91			
BSB-4A-2.5-3.2	100.00	100.00	100.00	99.93	97.01	22.88	2.10	0.95			
BSB-4A-1.5-2.5	100.00	100.00	100.00	100.00	98.39	18.29	2.01	0.97			
BSB-5A-3.0-3.5	100.00	100.00	100.00	100.00	98.17	14.74	2.37	0.70			
BSB-5A-0.75-1.5	100.00	100.00	100.00	100.00	90.00	10.95	1.84	0.73			

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

Percent Retained in Each Size Fraction

UOM = Percent

Sieve Size (microns)	>19000	19000-12500	12500-9500	9500-4750	4750-850	850-425	425-250	250-150	150-75	75-45	45-34	<34
BSB-4A-3.5-4.5	18.79	0.76	0.00	0.72	54.24	21.21	1.87	0.51				
BSB-4A-2.5-3.2	0.00	0.00	0.00	0.07	2.92	74.13	20.78	1.15				
BSB-4A-1.5-2.5	0.00	0.00	0.00	0.00	1.61	80.10	16.28	1.04				
BSB-5A-3.0-3.5	0.00	0.00	0.00	0.00	1.83	83.42	12.38	1.67				
BSB-5A-0.75-1.5	0.00	0.00	0.00	0.00	10.00	79.04	9.12	1.10				

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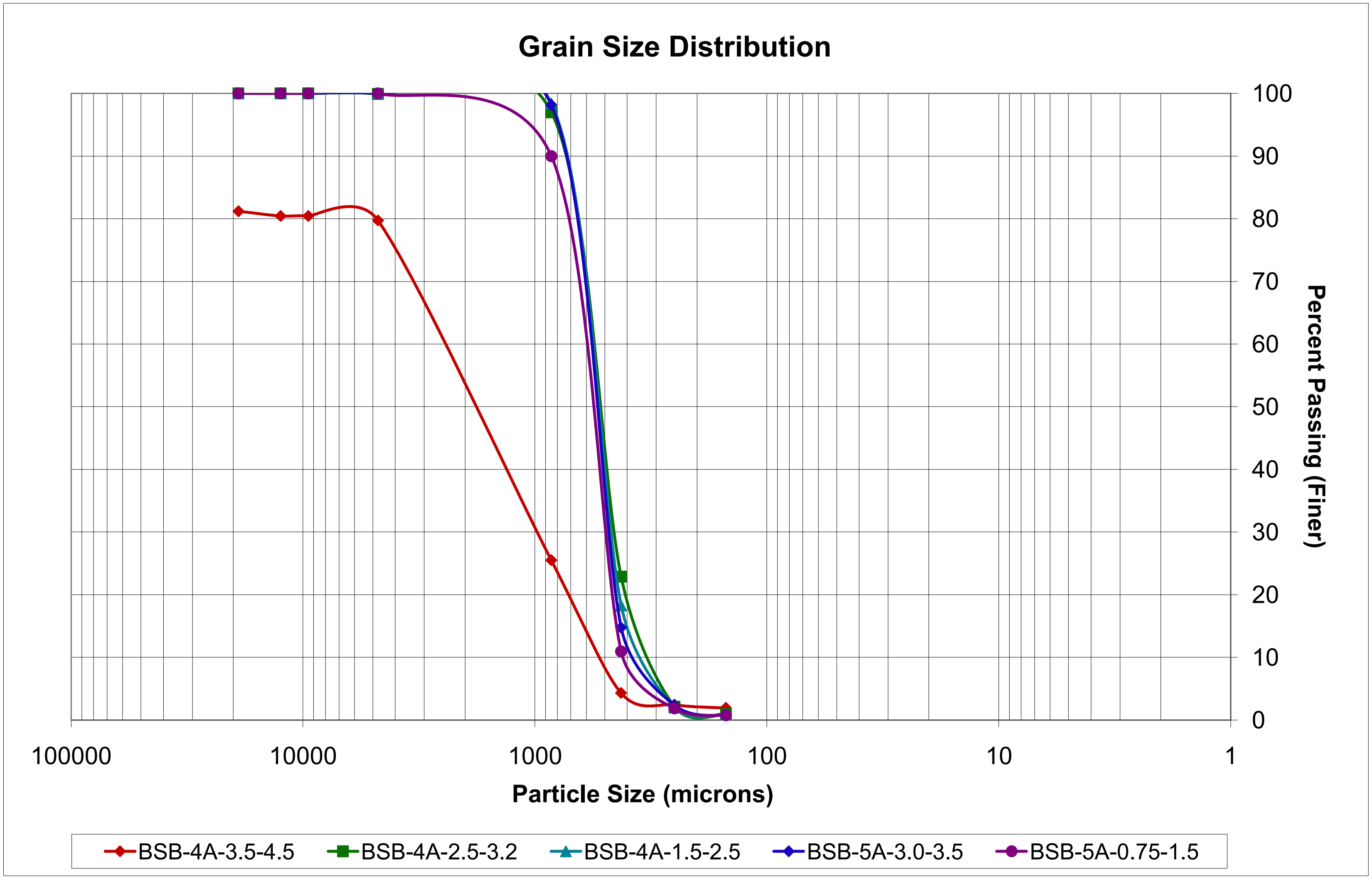
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1



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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-1

ASTM D-2937 (g/cm3)	BSB4A-3.5-4.5	BSB4A-2.5-3.2	BSB4A-1.5-2.5	BSB5A-3.0-3.5	BSB5A-0.75-1.5
Matrix	Soil	Soil	Soil	Soil	Soil
Bulk Density	**1.29**	**1.29**	**1.32**	**1.36**	**1.30**

EI #4

Chain of Custody Record

Fremont
Analytical

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Laboratory Project No (internal): CHM100507-1

Date: ______ Page: ______ of: ______

Client: ENVIRONMENT INTERNATIONAL
Address: 5505 34TH AVE NE
City, State, Zip: SEATTLE WA 98105
Tel: 206 525 3362

Project Name: UCR SEDIMENT CORING
Location:
Collected by: MARIA BRUMM

Reports To (PM):
Fax:
Email:
Project No:

	Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx/Dx Ext.	SEMI VOL 8270C	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals* 8oz	Total (T) / Dissolved (D)	Anions (IC)**	TOC 4oz	GRAIN SIZE → 16oz	BULK DENSITY		Comments/Depth
1	BSB4A-3.5-4.5	1:00	sed	various	5/5/10												X		X	X			3 bottles
2	BSB4A-2.5-3.2	1:05		various	5/5/10												X		X	X			3 bottles
3	BSB4A-1.5-2.5	1:15		various	5/5/10												X		X	X			3 bottles
4	BSB4A-.9-1.4	1:20		various	5/5/10												X		X				2 bottles
5	BSB4A-1.5-2.5 MS/MSD	1:15		various	5/5/10												X		X				2 bottles MS/MSD
6	Rinsate blank	2:55	DI water	250 ml	5/5/10												X						Rinsate Blank
7	BSB5A-3-3.5	4:15		various	5/5/10												X		X	X			3 bottles
8	BSB5A-.75-1.5	4:20		various	5/5/10												X		X	X			3 bottles
9																							
10																							

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL Individual: Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

x [signature]	5/7/10 1332	x	
Relinquished	Date/Time	Received	Date/Time
x [signature]	5.7.10 1332	x	
Relinquished	Date/Time	Received	Date/Time

Sample Receipt:	
Good?	Y
Cooler Temperature: Cooler	5.3°C
Seals Intact?:	Y
Total Number of Containers:	

Special Remarks:

TAT --> 24HR 48HR Standard

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Environment International
Attn: Jennifer Arthur
5505 34th Ave. NE
Seattle, WA 98105

RE: UCR Sediment Coring
Fremont Project No: CHM100507-7
EI Project No: EI#3

May 21st, 2010

Jennifer:

Enclosed are the analytical results for the ***UCR Sediment Coring*** soil and water samples to Fremont Analytical on Friday May 7th, 2010.

Sample Receipt:
The samples were received in good condition - in the proper containers, properly sealed, labeled and within holding time. The samples were received in 8 – 16oz soils jars, 11 – 8oz soil jars, 10 – 4oz soil jars and 2 – 250mL HDPE bottles. The samples were received in a cooler with wet ice, with a cooler temperature of 5.3°C, which is within the laboratory recommended cooler temperature range (<4°C - 10°C). The samples were stored in a refrigeration unit at the USEPA-recommended temperature of 4°C ± 2°C.

Sample Receipt Notations:

- Broken Containers = *BSB16A – 1.5-2.2 (8oz) and BSB6A-2.5-3.2 (8oz)*. The samples were contained in a zip lock bags. There was no impact to the analyses.
- Sample *BSB16A-1.5-2.25*: 16oz sample container was missing. Grain Size analysis was not conducted.

Sample Analysis:
Examination of these samples was conducted for the presence of the following:

- ***Total Metals (TAL) by EPA Method 6020***
- ***Total Organic Carbon by EPA Method 9060A***
- ***Grain Size by ASTM D422***
- ***Bulk Density by ASTM D-2937***

These applications were performed under Washington State Department of Ecology accreditation parameters. All appropriate Quality Assurance / Quality Control method parameters have been applied.

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RE: UCR Sediment Coring
Fremont Project No: CHM100507-7
EI Project No: EI#3

Laboratory Notations (SW6020):

- The *Laboratory Control Sample (LCS)* was within range for all analytes.
- Dilution was required. Adjusted reporting limits are noted.
- High matrix interferences were present:
  - Sample ID: BSB17A-2.0-3.0: The *relative percent difference (RPD%)* between the sample and sample duplicate exceeded recommended control limits (30%) for *Antimony (Sb).* All other analyte *RPD%* values were within range.
  - Sample ID: BSB17A-2.0-3.0: The *Matrix Spike (MS) and MS Duplicate (MSD)* for the analytes showed poor recoveries due to high concentrations of the analytes and due to the sample matrix. *A Post Digestion Spike (PDS)* was included. Poor *PDS* recoveries were obtained for *Iron (Fe)*, *Manganese (Mn)*, and *Vanadium (V)*.

Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical!

Sincerely,

Michael Dee
Sr. Chemist / Principal

mikedee@fremontanalytical.com

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

EPA 6020 (mg/kg)	MRL	RL	Method Blank	LCS	BSB17A-0.75-1.3
Date Extracted			5/10/10	5/10/10	5/10/10
Date Analyzed			5/10/10	5/10/10	5/10/10
Matrix					Soil
Aluminum (Al)	5.5	11	nd	119%	**10,000**
Antimony (Sb)	0.20	0.40	nd	108%	**1.91**
Arsenic (As)	0.10	0.20	nd	90%	**4.43**
Barium (Ba)	0.50	1.0	nd	94%	**506**
Beryllium (Be)	0.20	0.40	nd	108%	**0.407**
Cadmium (Cd)	0.05	0.10	nd	92%	**1.64**
Calcium (Ca)	10	20	nd	120%	**43,400**
Chromium (Cr)	0.20	0.40	nd	85%	**35.5**
Cobalt (Co)	0.20	0.40	nd	85%	**9.08**
Copper (Cu)	0.10	0.20	nd	84%	**566**
Iron (Fe)	20	40	nd	119%	**103,000**
Lead (Pb)	0.50	1.0	nd	91%	**130**
Magnesium (Mg)	10	20	nd	119%	**6480**
Manganese (Mn)	0.20	0.40	nd	117%	**2280**
Mercury (Hg)	0.05	0.10	nd	103%	**0.264**
Nickel (Ni)	0.10	0.20	nd	90%	**8.60**
Potassium (K)	50	100	nd	119%	**3540**
Selenium (Se)	0.50	1.0	nd	93%	nd
Silver (Ag)	0.10	0.20	nd	91%	**0.579**
Sodium (Na)*	10	20	nd	121%	**464**
Thallium (Tl)	0.20	0.40	nd	91%	**0.957**
Vanadium (V)	0.10	0.20	nd	73%	nd
Zinc (Zn)	0.40	0.80	nd	87%	**7860**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"RL" Indicates Adjusted Reporting Limit (dilution)
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

EPA 6020 (mg/kg)	MRL	RL	BSB17A-2.0-3.0	Duplicate BSB17A-2.0-3.0	RPD %	BSB17A-3.75-4.0
Date Extracted			5/10/10	5/10/10		5/10/10
Date Analyzed			5/10/10	5/10/10		5/10/10
Matrix			Soil	Soil		Soil
Aluminum (Al)	5.5	11	**16,900**	**17,700**	5%	**20,200**
Antimony (Sb)	0.20	0.40	**1.52**	**0.983**	43%	**1.29**
Arsenic (As)	0.10	0.20	**4.21**	**3.52**	18%	**3.04**
Barium (Ba)	0.50	1.0	**472**	**505**	7%	**398**
Beryllium (Be)	0.20	0.40	**0.739**	**0.836**	12%	**1.20**
Cadmium (Cd)	0.05	0.10	**1.04**	**1.10**	6%	**2.12**
Calcium (Ca)	10	20	**64,200**	**66,700**	4%	**73,400**
Chromium (Cr)	0.20	0.40	**35.0**	**39.1**	11%	**34.6**
Cobalt (Co)	0.20	0.40	**13.0**	**14.3**	9%	**14.9**
Copper (Cu)	0.10	0.20	**991**	**989**	0%	**1460**
Iron (Fe)	20	40	**16,900**	**185,000**	9%	**196,000**
Lead (Pb)	0.50	1.0	**188**	**161**	16%	**299**
Magnesium (Mg)	10	20	**4650**	**4970**	7%	**5900**
Manganese (Mn)	0.20	0.40	**4660**	**4970**	6%	**6710**
Mercury (Hg)	0.05	0.10	**0.259**	**0.235**	10%	**0.347**
Nickel (Ni)	0.10	0.20	**6.06**	**6.74**	11%	**5.93**
Potassium (K)	50	100	**5890**	**6230**	5%	**7890**
Selenium (Se)	0.50	1.0	nd	nd		nd
Silver (Ag)	0.10	0.20	**0.872**	**0.84**	4%	**1.03**
Sodium (Na)*	10	20	**994**	**1020**	2%	**1440**
Thallium (Tl)	0.20	0.40	**1.26**	**1.11**	13%	**1.67**
Vanadium (V)	0.10	0.20	nd	nd		nd
Zinc (Zn)	0.40	0.80	**15,500**	**15,900**	3%	**24,100**

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"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

EPA 6020 (mg/kg)	MRL	RL	BSB16A-1.5-2.2	BSB16A-0.25-0.75	BSB15A-0-1	BSB15A-1-2
Date Extracted			5/10/10	5/10/10	5/10/10	5/10/10
Date Analyzed			5/10/10	5/10/10	5/10/10	5/10/10
Matrix			Soil	Soil	Soil	Soil
Aluminum (Al)	5.5	11	**22,800**	**6870**	**1060**	**21,200**
Antimony (Sb)	0.20	0.40	**3.24**	**1.93**	**0.254 *J***	**1.99**
Arsenic (As)	0.10	0.20	**5.98**	**2.71**	**0.544**	**5.10**
Barium (Ba)	0.50	1.0	**821**	**436**	**62.7**	**643**
Beryllium (Be)	0.20	0.40	**1.07**	**0.346**	nd	**1.03**
Cadmium (Cd)	0.05	0.10	**1.44**	**0.777**	nd	**1.23**
Calcium (Ca)	10	20	**96,700**	**38,000**	**4900**	**80,900**
Chromium (Cr)	0.20	0.40	**70.2**	**23.4**	**4.02**	**60.7**
Cobalt (Co)	0.20	0.40	**19.1**	**6.74**	**1.34**	**16.1**
Copper (Cu)	0.10	0.20	**1630**	**544**	**104**	**1310**
Iron (Fe)	20	40	**245,000**	**77,000**	**11700**	**223,000**
Lead (Pb)	0.50	1.0	**249**	**110**	**14.0**	**253**
Magnesium (Mg)	10	20	**6830**	**2630**	**393**	**6250**
Manganese (Mn)	0.20	0.40	**6480**	**1920**	**304**	**5840**
Mercury (Hg)	0.05	0.10	**0.207**	**0.176**	nd	**0.244**
Nickel (Ni)	0.10	0.20	**10.1**	**3.55**	**0.623**	**7.99**
Potassium (K)	50	100	**8180**	**3330**	**439**	**8320**
Selenium (Se)	0.50	1.0	nd	nd	nd	nd
Silver (Ag)	0.10	0.20	**0.611**	**0.660**	**0.127 *J***	**0.710**
Sodium (Na)*	10	20	**1160**	**398**	**71.5**	**1240**
Thallium (Tl)	0.20	0.40	**1.57**	**0.736**	nd	**1.57**
Vanadium (V)	0.10	0.20	nd	nd	nd	nd
Zinc (Zn)	0.40	0.80	**23,100**	**7720**	**1080**	**19,800**

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"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

EPA 6020 (mg/kg)	MRL	RL	BSB6A-0-1	BSB6A-1.5-2.5	BSB6A-2.5-3.5	BSB6A-4.0-5.0
Date Extracted			5/10/10	5/10/10	5/10/10	5/10/10
Date Analyzed			5/10/10	5/10/10	5/10/10	5/10/10
Matrix			Soil	Soil	Soil	Soil
Aluminum (Al)	5.5	11	**17,300**	**5540**	**4390**	**5150**
Antimony (Sb)	0.20	0.40	**3.07**	**0.206 *J***	nd	nd
Arsenic (As)	0.10	0.20	**11.9**	**2.50**	**1.85**	**1.98**
Barium (Ba)	0.50	1.0	**616**	**54.4**	**51.4**	**58.0**
Beryllium (Be)	0.20	0.40	**0.919**	**0.718**	**0.415**	**0.481**
Cadmium (Cd)	0.05	0.10	**2.23**	**0.303**	**0.230**	**0.273**
Calcium (Ca)	10	20	**63,600**	**6420**	**9080**	**8410**
Chromium (Cr)	0.20	0.40	**48.9**	**9.21**	**12.7**	**9.16**
Cobalt (Co)	0.20	0.40	**13.6**	**3.57**	**2.69**	**3.10**
Copper (Cu)	0.10	0.20	**1170**	**13.5**	**8.68**	**13.6**
Iron (Fe)	20	40	**181,000**	**12,300**	**9280**	**10,400**
Lead (Pb)	0.50	1.0	**610**	**11.7**	**4.68**	**8.56**
Magnesium (Mg)	10	20	**5180**	**5740**	**6800**	**7600**
Manganese (Mn)	0.20	0.40	**5210**	**546**	**390**	**450**
Mercury (Hg)	0.05	0.10	**0.359**	nd	nd	nd
Nickel (Ni)	0.10	0.20	**8.41**	**10.7**	**8.66**	**10.6**
Potassium (K)	50	100	**6530**	**1970**	**1910**	**2090**
Selenium (Se)	0.50	1.0	nd	**0.141**	nd	nd
Silver (Ag)	0.10	0.20	**1.20**	nd	nd	nd
Sodium (Na)*	10	20	**981**	**258**	**231**	**261**
Thallium (Tl)	0.20	0.40	**3.20**	**0.208 *J***	nd	nd
Vanadium (V)	0.10	0.20	nd	nd	nd	nd
Zinc (Zn)	0.40	0.80	**21,400**	**95.7**	**58.9**	**116**

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"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

			MS	MSD		PDS
EPA 6020 (mg/kg)	**MRL**	**RL**	**BSB17A-2.0-3.0**	**BSB17A-2.0-3.0**	**RPD %**	**BSB6A-1.5-2.5**
Date Extracted			5/10/10	5/10/10		5/10/10
Date Analyzed			5/10/10	5/10/10		5/14/10
Matrix			Soil	Soil		Soil
Aluminum (Al)	5.5	11	97%	140%	37%	126%
Antimony (Sb)	0.20	0.40	10%	7%	26%	113%
Arsenic (As)	0.10	0.20	64%	63%	2%	97%
Barium (Ba)	0.50	1.0	132%	176%	29%	107%
Beryllium (Be)	0.20	0.40	43%	36%	17%	88%
Cadmium (Cd)	0.05	0.10	99%	100%	1%	105%
Calcium (Ca)	10	20	-	-		194%
Chromium (Cr)	0.20	0.40	70%	71%	1%	91%
Cobalt (Co)	0.20	0.40	68%	66%	2%	91%
Copper (Cu)	0.10	0.20	-	-		98%
Iron (Fe)	20	40	-	-		163%
Lead (Pb)	0.50	1.0	-	58%		103%
Magnesium (Mg)	10	20	40%	56%	34%	130%
Manganese (Mn)	0.20	0.40	-	-		-
Mercury (Hg)	0.05	0.10	126%	133%	5%	101%
Nickel (Ni)	0.10	0.20	75%	74%	1%	98%
Potassium (K)	50	100	51%	87%	52%	121%
Selenium (Se)	0.50	1.0	37%	42%	12%	84%
Silver (Ag)	0.10	0.20	58%	61%	4%	104%
Sodium (Na)*	10	20	32%	33%	4%	108%
Thallium (Tl)	0.20	0.40	82%	77%	6%	98%
Vanadium (V)	0.10	0.20	48%	7%	148%	26%
Zinc (Zn)	0.40	0.80	-	-		82%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"RL" Indicates Adjusted Reporting Limit (dilution)
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

EPA 6020 (µg/L)	MRL	Method Blank	LCS	Rinsate Blank 5/2/2010	Rinsate Blank 5/4/2010
Date Extracted		5/12/10	5/12/10	5/12/10	5/12/10
Date Analyzed		5/12/10	5/12/10	5/12/10	5/12/10
Matrix				Water	Water
Aluminum (Al)	55	nd	97%	nd	**136**
Antimony (Sb)	0.20	nd	113%	nd	**0.960**
Arsenic (As)	1.0	nd	93%	nd	nd
Barium (Ba)	0.30	nd	100%	**2.32**	**20.2**
Beryllium (Be)	0.20	nd	110%	nd	nd
Cadmium (Cd)	0.20	nd	97%	nd	nd
Calcium (Ca)	100	**147**	91%	**2610**	**2810**
Chromium (Cr)	0.60	nd	90%	nd	nd
Cobalt (Co)	0.30	**0.72**	74%	nd	**0.88**
Copper (Cu)	0.40	nd	92%	**1.10**	**16.9**
Iron (Fe)	100	nd	98%	nd	**1590**
Lead (Pb)	0.20	nd	93%	**0.240**	**1.58**
Magnesium (Mg)	100	nd	95%	nd	nd
Manganese (Mn)	2.0	nd	78%	**3.20**	**39**
Mercury (Hg)	0.30	nd	99%	nd	nd
Nickel (Ni)	0.50	nd	95%	**0.720**	**0.500**
Potassium (K)	500	nd	94%	nd	nd
Selenium (Se)	1.0	nd	83%	nd	nd
Silver (Ag)	0.20	nd	95%	nd	nd
Sodium (Na)	100	nd	82%	**267**	**586**
Thallium (Tl)	0.20	nd	91%	nd	nd
Vanadium (V)	0.50	nd	96%	nd	nd
Zinc (Zn)	1.5	nd	89%	**36.6**	**153**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 1250 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb, Be = 5 µg/L
Tl = 2.5 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

EPA 6020 (µg/L)	**MRL**	QA Sample *Batch 100511-4-11*	QA Duplicate *Batch 100511-4-11*	**RPD %**	MS *Batch 100506-5-1*	MSD *Batch 100506-5-1*	**RPD %**
Date Extracted		5/12/10	5/12/10		5/12/10	5/12/10	
Date Analyzed		5/12/10	5/12/10		5/12/10	5/12/10	
Matrix			Water		Water	Water	
Aluminum (Al)	55	nd	nd		96%	95%	1%
Antimony (Sb)	0.20	**0.440**	**0.440**	0%	113%	114%	1%
Arsenic (As)	1.0	nd	nd		94%	95%	2%
Barium (Ba)	0.30	**14.5**	**13.6**	6%	98%	100%	2%
Beryllium (Be)	0.20	nd	nd		118%	122%	3%
Cadmium (Cd)	0.20	nd	nd		97%	98%	0.2%
Calcium (Ca)	100	**1330**	**1820**	31%	101%	108%	6%
Chromium (Cr)	0.60	**0.440**	**0.400**	10%	70%	70%	0.4%
Cobalt (Co)	0.30	nd	nd		70%	70%	0%
Copper (Cu)	0.40	**4.64**	**4.24**	9%	88%	89%	1%
Iron (Fe)	100	**515**	**489**	5%	91%	90%	1%
Lead (Pb)	0.20	**7.70**	**7.46**	3%	91%	92%	1%
Magnesium (Mg)	100	**219**	**301**	32%	103%	96%	7%
Manganese (Mn)	2.0	**14**	**15**	6%	93%	112%	19%
Mercury (Hg)	0.30	nd	nd		99%	106%	7%
Nickel (Ni)	0.50	**1.28**	**0.180 *J***	-	101%	104%	2%
Potassium (K)	500	nd	nd		124%	119%	4%
Selenium (Se)	1.0	nd	nd		84%	89%	5%
Silver (Ag)	0.20	nd	nd		83%	83%	0%
Sodium (Na)	100	nd	nd		107%	99%	8%
Thallium (Tl)	0.20	nd	nd		89%	90%	0.9%
Vanadium (V)	0.50	nd	nd		90%	89%	1%
Zinc (Zn)	1.5	**50.5**	**47.3**	7%	84%	86%	2%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%, Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 1250 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb, Be = 5 µg/L
Tl = 2.5 µg/L

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

EPA 9060A ***(Percent Organic Carbon by Weight)***	**MRL**	**Method Blank**	**LCS**	**BSB17A-0.75-1.3**	**BSB17A-2.0-3.0**
Date Analyzed		5/19/10	5/19/10	5/19/10	5/19/10
Matrix				Soil	Soil
Total Organic Carbon	0.5	nd	89%	**0.313 *J***	**0.124 *J***

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**BSB16A-1.5-2.2**	**BSB16A-0.25-0.75**	**BSB15A-0-1**	**BSB15A-1-2**
Date Analyzed		5/19/10	5/19/10	5/19/10	5/19/10
Matrix		Soil	Soil	Soil	Soil
Total Organic Carbon	0.5	**0.122 *J***	**0.185 *J***	**0.133 *J***	nd

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**BSB6A-0-1**	Duplicate **BSB6A-0-1**	**BSB6A-1.5-2.5**	**BSB6A-2.5-3.5**	**BSB6A-4.0-5.0**
Date Analyzed		5/19/10	5/19/10	5/19/10	5/19/10	5/19/10
Matrix		Soil	Soil	Soil	Soil	Soil
Total Organic Carbon	0.5	nd	nd	**0.146 *J***	**0.398 *J***	**0.265 *J***

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

		MS	MSD	
EPA 9060A	**MRL**	**BSB6A-0-1**	**BSB6A-0-1**	**RPD**
(Percent Organic Carbon by Weight)				**%**
Date Analyzed		5/19/10	5/19/10	
Matrix		Soil	Soil	
Total Organic Carbon	0.5	112%	94%	17%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits: 65% to 135%
LCS = 40% Carbon

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

Percent Finer (Passing) Than the Indicated Size

UOM = Percent

Sieve Size	3/4"	1/2"	3/8"	#4	#20	#40	#60	#100	#200	#325	#450
particle size (microns)	19000	12500	9500	4750	850	425	250	150	75	45	34
BSB-17A-0.75-1.3	100.00	100.00	100.00	100.00	99.82	75.41	29.79	7.90			
BSB-17A-2.0-3.0	100.00	100.00	100.00	100.00	95.92	23.21	3.64	1.51			
BSB-15A-0-1	100.00	100.00	100.00	100.00	99.82	34.87	7.39	1.55			
BSB-15A-1-2	77.59	55.25	51.54	46.52	43.11	8.07	1.79	1.00			
BSB-6A-0-1	100.00	100.00	100.00	99.68	99.42	41.49	5.41	1.30			
BSB-6A-1.5-2.5	100.00	96.25	95.85	94.64	45.56	4.68	2.11	1.59			
BSB-6A-2.5-3.5	100.00	96.37	95.72	92.42	32.37	4.73	2.12	1.76			
BSB-6A-4-5	79.55	73.05	71.80	70.42	43.30	7.66	3.74	2.69			

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

Percent Retained in Each Size Fraction

UOM = Percent

Sieve Size (microns)	>19000	19000-12500	12500-9500	9500-4750	4750-850	850-425	425-250	250-150	150-75	75-45	45-34	<34
BSB-17A-0.75-1.3	0.00	0.00	0.00	0.00	0.18	24.41	45.62	21.88				
BSB-17A-2.0-3.0	0.00	0.00	0.00	0.00	4.08	72.71	19.57	2.13				
BSB-15A-0-1	0.00	0.00	0.00	0.00	0.18	64.95	27.48	5.84				
BSB-15A-1-2	22.41	22.33	3.71	5.03	3.41	35.04	6.28	0.79				
BSB-6A-0-1	0.00	0.00	0.00	0.32	0.26	57.93	36.08	4.12				
BSB-6A-1.5-2.5	0.00	3.75	0.39	1.22	49.07	40.89	2.56	0.52				
BSB-6A-2.5-3.5	0.00	3.63	0.65	3.30	60.05	27.64	2.61	0.35				
BSB-6A-4-5	20.45	6.49	1.25	1.37	27.13	35.64	3.92	1.05				

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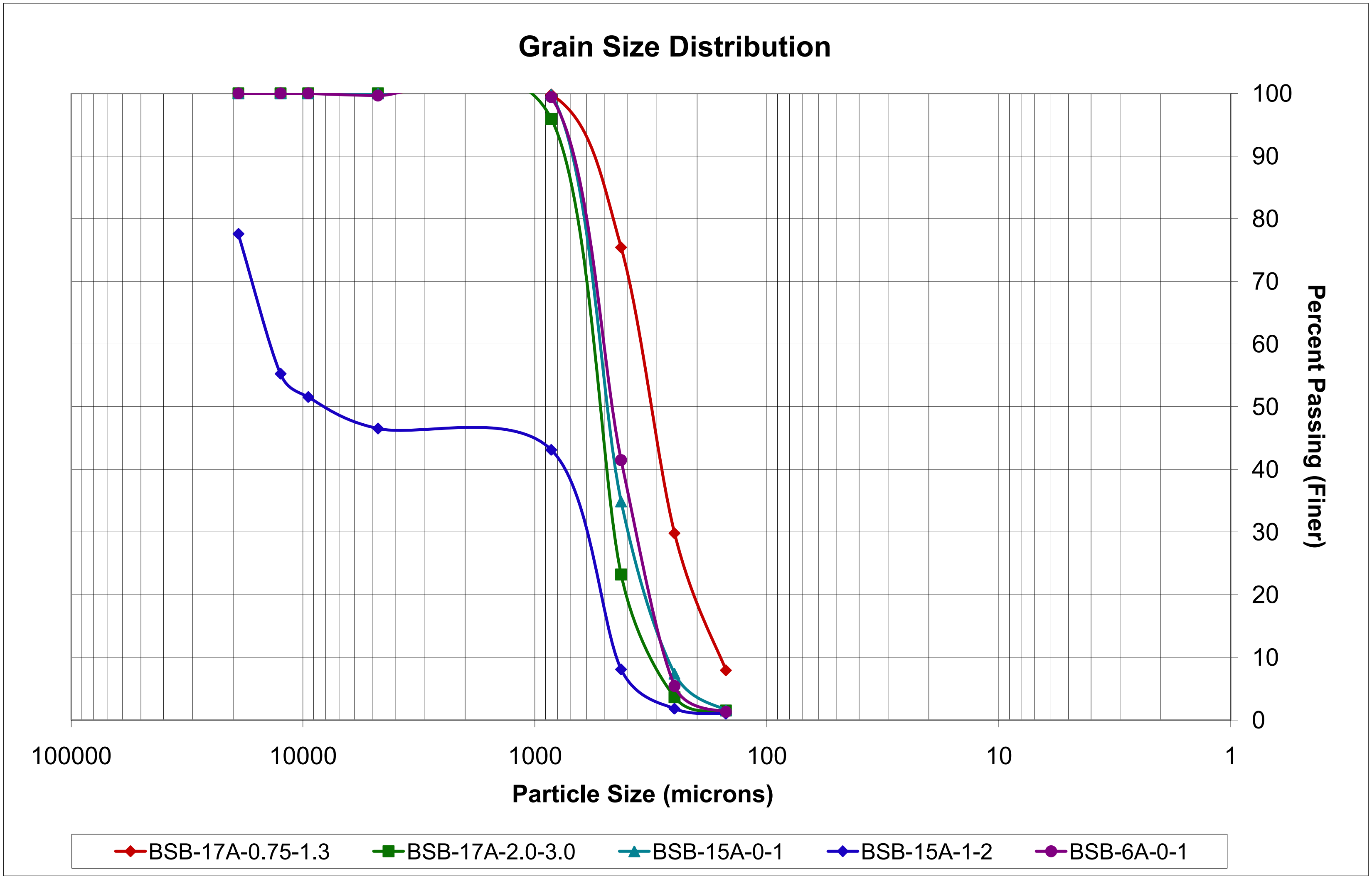
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7



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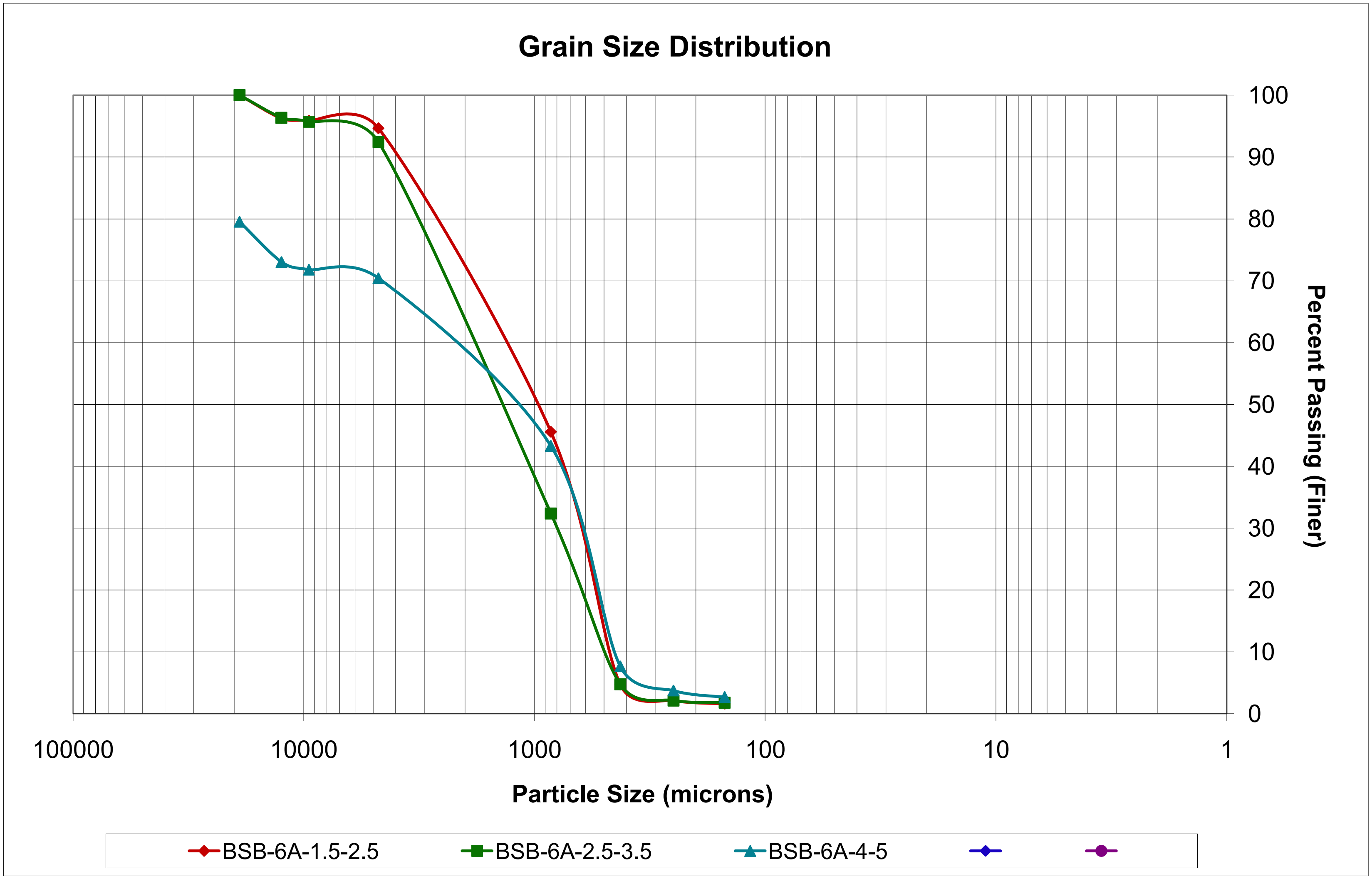
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7



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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

ASTM D-2937 (g/cm3)	BSB17A-0.75-1.3	BSB17A-2.0-3.0	BSB16A-1.5-2.2	BSB15A-0-1
Matrix	Soil	Soil	Soil	Soil
Bulk Density	**1.20**	**1.16**	**1.32**	**1.23**

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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100507-7

ASTM D-2937 (g/cm3)	BSB15A-1-2	BSB6A-0-1	BSB6A-1.5-2.5	BSB6A-2.5-3.5	BSB6A-4.0-5.0
Matrix	Soil	Soil	Soil	Soil	Soil
Bulk Density	**1.42**	**1.25**	**1.24**	**1.28**	**1.32**

EI #3

Fremont Analytical

Chain of Custody Record

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Date:

Laboratory Project No (internal): CHM100507-8

Page: of:

Client: ~~EET~~ ENVIRONMENT INTERNATIONAL

Address: 5505 34TH AVE NE

City, State, Zip: SEATTLE WA 98105

Tel: 206 525 3362

Project Name: UCR SEDIMENT CORING

Location:

Collected by: MARIA BRUM

Reports To (PM):

Fax:

Email:

Project No:

	Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx Ext.	SEMI VOL 8270C	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals* Total(TT) Dissolved(D) 8oz	Anions (IC)**	TOC 4oz	Grainsize 16oz	and Bulk density	Comments/Depth
1	BSB17A-.75-1.3	12:00pm	SED	various	5/4/10											X		X	X		3 bottles
2	Rinsate Blank	4:20	DI water	250ml plastic	5/4/10											|					
3	BSB17A-2-3	12:15pm	Sed	various	5/4/10											X		X	X		3 bottles
4	BSB17A-3.75-4	12:10	Sed	8oz	5/4/10											X					1 bottle
5	BSB16A-1.5-2.2	2:20	Sed	various	5/4/10											X		X	X		3 bottles
6	BSB16A-.25-.75	2:25	Sed	various	5/4/10											X		X			2 bottles
7	BSB15A-0-1	3:45	Sed	various	5/4/10											X		X	X		3 bottles
8	BSB15A-1-2	3:40	Sed	various	5/4/10											X		X	X		3 bottles
9	Rinsate Blank	4:15	DI water	250ml plastic	5/4/10											X					
10	BSB6A-0-1	10:45	Sed	various	5/5/10											X		X	X		3 bottles

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Floride Nitrate+Nitrite

5/7/10 13:31

Relinquished	Date/Time	Received	Date/Time
x	5.7.10 1334		
Relinquished	Date/Time	Received	Date/Time
x		x	

Sample Receipt:	
Good?	Y
Temperature: cooler	5.8°C
Seals Intact?:	Y
Total Number of Containers:	

Special Remarks

TAT --> 24HR 48HR Standard

Distribution: White - Lab, Yellow - File, Pink - Originator

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EI #3,2

Chain of Custody Record

Fremont Analytical
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Laboratory Project No (internal): CHM100507-7

Date: ______ Page: ______ of: ______

Client: ENVIRONMENT INTERNATIONAL
Address: 5505 34th AVE NE
City, State, Zip: SEATTLE WA 98105
Tel: 206 525 3362

Project Name: LCR SEDIMENT CORING
Location:
Collected by: MARIA BRUHM

Reports To (PM): Fax: Email: Project No:

	Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx Ext.	SEMI VOL 8270C	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals* 8oz Total (T) | Dissolved (D)	Anions (IC)**	TOC 4oz	Grain Size 16oz	Bulk Density	Comments/Depth
1	BSB6A-1.5-2.5	10:55	SEDIMENT	VARIOUS	5/5/10											X		X	X	X	3 bottles
2	BSB6A-2.5-3.5	11:00		VARIOUS	5/5/10											X		X	X	X	3 bottles
3	BSB6A-4-5	11:10		VARIOUS	5/5/10											X		X	X	X	3 bottles
4	~~BSB4A-BSB5A~~																				
5																					
6																					
7																					
8																					
9																					
10																					

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Floride Nitrate+Nitrite

Relinquished	Date/Time	Received	Date/Time:	Sample Receipt:		Special Remarks
x [signature]	5/7/10 1534	x		Good?	Y	
				Temperature:	5.3°C	
Relinquished	Date/Time	Received	Date/Time:	Seals Intact?:	Y	
x		x [signature]	5 7 10 1534	Total Number of Containers:		TAT --> 24HR 48HR Standard

Distribution: White - Lab, Yellow - File, Pink - Originator

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Environment International
Attn: Jennifer Arthur
5505 34th Ave. NE
Seattle, WA 98105

RE: UCR Sediment Coring
Fremont Project No: CHM100511-3

May 26th, 2010

Jennifer:

Enclosed are the analytical results for the ***UCR Sediment Coring*** soil and water samples to Fremont Analytical on Tuesday May 11th, 2010.

Sample Receipt:
The samples were received in good condition - in the proper containers, properly sealed, labeled and within holding time. The samples were received in 7 – 16oz soils jars, 7 – 8oz soil jars, 8 – 4oz soil jars and 1 – 250mL HDPE bottles. The samples were received in a cooler with wet ice, with a cooler temperature of 2.8°C, which is within the laboratory recommended cooler temperature range (<4°C - 10°C). The samples were stored in a refrigeration unit at the USEPA-recommended temperature of 4°C ± 2°C.

Sample Analysis:
Examination of these samples was conducted for the presence of the following:

- ***Total Metals (TAL) by EPA Method 6020***
- ***Total Organic Carbon by EPA Method 9060A***
- ***Grain Size by ASTM D422***
- ***Bulk Density by ASTM D-2937***

These applications were performed under Washington State Department of Ecology accreditation parameters. All appropriate Quality Assurance / Quality Control method parameters have been applied.

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RE: UCR Sediment Coring
Fremont Project No: CHM100511-3

Laboratory Notations (SW6020):

- The *Laboratory Control Sample (LCS)* was within range for all analytes.
- High matrix interferences were present:
  - Sample ID: *Batch 100511-4-3*: The *relative percent difference (RPD%)* between the sample and sample duplicate exceeded recommended control limits (30%) for *Mercury (Hg).* All other analyte Sample/Sample Duplicate *RPD%* values were within range.
  - Sample ID: *Batch 100511-4-3*: The *Matrix Spike (MS) and MS Duplicate (MSD)* for the analytes showed poor recoveries due to high concentrations of the analytes and due to the sample matrix. *Post Digestion Spikes (PDS)* were included. Poor *PDS* recoveries were obtained for *Calcium (CA)*, *Iron (Fe)*, *Manganese (Mn)*, Potassium (K),*Vanadium (V)* and *Zinc (Zn)*.

Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical!

Sincerely,

Michael Dee
Sr. Chemist / Principal

mikedee@fremontanalytical.com

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (mg/kg)	MRL	Method Blank	LCS	BSB3A-0.5-2	BSB3A-2.3-3.1	BSB903A-.5-2.0
Date Extracted		5/18/10	5/18/10	5/18/10	5/18/10	5/18/10
Date Analyzed		5/18/10	5/19/10	5/19/10	5/19/10	5/19/10
Matrix				Soil	Soil	Soil
Aluminum (Al)	5.5	nd	120%	**14,800**	**14,100**	**15,000**
Antimony (Sb)	0.20	nd	114%	**8.25**	**5.06**	**14.0**
Arsenic (As)	0.10	nd	88%	**7.06**	**4.91**	**7.48**
Barium (Ba)	0.50	nd	98%	**619**	**472**	**710**
Beryllium (Be)	0.20	nd	110%	**0.926**	**0.801**	**0.957**
Cadmium (Cd)	0.05	nd	94%	**1.30**	**1.10**	**1.19**
Calcium (Ca)	10	nd	121%	**52,300**	**49,500**	**54,000**
Chromium (Cr)	0.20	nd	101%	**70.7**	**62.4**	**75.9**
Cobalt (Co)	0.20	nd	95%	**21.7**	**14.7**	**23.2**
Copper (Cu)	0.10	nd	97%	**952**	**747**	**889**
Iron (Fe)	20	nd	112%	**154,000**	**145,000**	**158,000**
Lead (Pb)	0.50	nd	97%	**202**	**166**	**185**
Magnesium (Mg)	10	nd	125%	**4520**	**4510**	**4660**
Manganese (Mn)	0.20	nd	116%	**5,870**	**5,240**	**5620**
Mercury (Hg)	0.05	nd	92%	**0.310**	**0.178**	**0.235**
Nickel (Ni)	0.10	nd	95%	**8.39**	**8.03**	**9.44**
Potassium (K)	50	nd	95%	**5540**	**5020**	**6250**
Selenium (Se)	0.50	nd	80%	nd	**0.714**	nd
Silver (Ag)	0.10	nd	98%	**1.10**	**0.561**	**1.35**
Sodium (Na)*	10	**14.7**	122%	**926**	**710**	**924**
Thallium (Tl)	0.20	nd	96%	**1.56**	**1.31**	**1.44**
Vanadium (V)	0.10	nd	97%	nd	nd	nd
Zinc (Zn)	0.40	**1.04**	91%	**13,800**	**12,200**	**13,500**

"nd" Indicates no detection at the listed reporting limits
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"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be =10 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (mg/kg)	MRL	BSB24A-1.2-1.5	SCB6A-0.5-1.5	SCB6A-2.8-3.4	SCB6A-3.6-4.3
Date Extracted		5/18/10	5/18/10	5/18/10	5/18/10
Date Analyzed		5/19/10	5/19/10	5/19/10	5/19/10
Matrix		Soil	Soil	Soil	Soil
Aluminum (Al)	5.5	**7390**	**6790**	**8530**	**8110**
Antimony (Sb)	0.20	**25.1**	**3.54**	**5.98**	**4.48**
Arsenic (As)	0.10	**12.9**	**3.89**	**11.6**	**8.92**
Barium (Ba)	0.50	**606**	**226**	**573**	**357**
Beryllium (Be)	0.20	**0.507**	**0.432**	**0.553**	**0.514**
Cadmium (Cd)	0.05	**4.23**	**1.17**	**4.73**	**1.92**
Calcium (Ca)	10	**43,000**	**20,900**	**34,800**	**23,700**
Chromium (Cr)	0.20	**48.9**	**21.0**	**18.0**	**16.4**
Cobalt (Co)	0.20	**17.5**	**6.62**	**8.75**	**8.40**
Copper (Cu)	0.10	**763**	**292**	**417**	**365**
Iron (Fe)	20	**64,600**	**61,200**	**70,800**	**66,800**
Lead (Pb)	0.50	**263**	**158**	**799**	**536**
Magnesium (Mg)	10	**6560**	**2620**	**6590**	**3030**
Manganese (Mn)	0.20	**2220**	**2270**	**2720**	**2630**
Mercury (Hg)	0.05	**0.481**	**0.295**	**6.42**	**0.381**
Nickel (Ni)	0.10	**11.70**	**5.24**	**7.28**	**5.27**
Potassium (K)	50	**3550**	**2500**	**3440**	**3160**
Selenium (Se)	0.50	nd	**0.639**	nd	nd
Silver (Ag)	0.10	**2.84**	**0.646**	**1.06**	**0.764**
Sodium (Na)*	10	**364**	**312**	**441**	**427**
Thallium (Tl)	0.20	**2.40**	**1.29**	**5.60**	**3.70**
Vanadium (V)	0.10	nd	nd	nd	nd
Zinc (Zn)	0.40	**5350**	**5830**	**9410**	**6870**

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"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be =10 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (mg/kg)	MRL	SCB3A-1.3-2.1	SCB3A-2.5-3.2	QA Sample Batch 100511-4-3	QA Duplicate Batch 100511-4-3	RPD %
Date Extracted		5/18/10	5/18/10	5/18/10	5/18/10	
Date Analyzed		5/19/10	5/19/10	5/18/10	5/18/10	
Matrix		Soil	Soil	Soil	Soil	
Aluminum (Al)	5.5	**8960**	**7030**	**9410**	**9370**	0.4%
Antimony (Sb)	0.20	**5.61**	**3.28**	**6.16**	**5.97**	3%
Arsenic (As)	0.10	**6.12**	**9.03**	**6.54**	**5.66**	15%
Barium (Ba)	0.50	**407**	**139**	**417**	**408**	2%
Beryllium (Be)	0.20	**0.574**	**0.439**	**0.574**	**0.580**	1%
Cadmium (Cd)	0.05	**3.18**	**2.28**	**2.03**	**1.80**	12%
Calcium (Ca)	10	**31,600**	**13,900**	**29,700**	**29,100**	2%
Chromium (Cr)	0.20	**28.4**	**14.0**	**36.3**	**34.2**	6%
Cobalt (Co)	0.20	**8.23**	**12.6**	**8.50**	**8.70**	2%
Copper (Cu)	0.10	**412**	**335**	**410**	**410**	0.05%
Iron (Fe)	20	**82,900**	**66,000**	**86,700**	**86,100**	1%
Lead (Pb)	0.50	**338**	**519**	**262**	**227**	14%
Magnesium (Mg)	10	**4050**	**2830**	**3520**	**3270**	7%
Manganese (Mn)	0.20	**3360**	**2380**	**3620**	**3620**	0.1%
Mercury (Hg)	0.05	**0.502**	**0.286**	**1.58**	**1.02**	44%
Nickel (Ni)	0.10	**5.54**	**5.08**	**6.99**	**6.38**	9%
Potassium (K)	50	**3180**	**2680**	**4040**	**3930**	3%
Selenium (Se)	0.50	**0.525**	**0.528**	nd	nd	
Silver (Ag)	0.10	**0.779**	**0.628**	**0.676**	**0.719**	6%
Sodium (Na)*	10	**411**	**341**	**505**	**496**	2%
Thallium (Tl)	0.20	**2.50**	**3.48**	**2.32**	**2.02**	14%
Vanadium (V)	0.10	nd	nd	nd	nd	
Zinc (Zn)	0.40	**8940**	**8280**	**8930**	**8460**	5%

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Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be =10 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

		MS	MSD		PDS	PDS
EPA 6020 (mg/kg)	**MRL**	*Batch 100511-4-3*	*Batch 100511-4-3*	**RPD %**	*Batch 100511-4-2*	*Batch 100511-4-8*
Date Extracted		5/18/10	5/18/10		5/18/10	5/18/10
Date Analyzed		5/18/10	5/18/10		5/21/10	5/21/10
Matrix		Soil	Soil		Soil	Soil
Aluminum (Al)	5.5	17%	-		90%	99%
Antimony (Sb)	0.20	8%	17%	73%	122%	122%
Arsenic (As)	0.10	65%	67%	3%	128%	129%
Barium (Ba)	0.50	76%	59%	25%	115%	116%
Beryllium (Be)	0.20	93%	110%	17%	109%	91%
Cadmium (Cd)	0.05	78%	76%	3%	122%	119%
Calcium (Ca)	10	-	-		53%	-
Chromium (Cr)	0.20	70%	68%	3%	115%	115%
Cobalt (Co)	0.20	66%	68%	3%	125%	122%
Copper (Cu)	0.10	55%	43%	24%	126%	136%
Iron (Fe)	20	-	-		-	-
Lead (Pb)	0.50	21%	-		88%	-
Magnesium (Mg)	10	13%	29%	79%	98%	99%
Manganese (Mn)	0.20	26%	-		-	-
Mercury (Hg)	0.05	115%	108%	6%	92%	88%
Nickel (Ni)	0.10	65%	66%	1%	124%	122%
Potassium (K)	50	40%	70%	54%	44%	15%
Selenium (Se)	0.50	61%	60%	3%	104%	108%
Silver (Ag)	0.10	65%	63%	3%	124%	123%
Sodium (Na)*	10	15%	41%	90%	96%	92%
Thallium (Tl)	0.20	64%	52%	19%	116%	105%
Vanadium (V)	0.10	-	-		11%	20%
Zinc (Zn)	0.40	-	-		61%	9%

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Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be =10 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (µg/L)	**MRL**	**Method Blank**	**LCS**	**Rinsate Blank 5/6/2010**	QA Sample *Batch 100511-4-11*	QA Duplicate *Batch 100511-4-11*	**RPD %**
Date Extracted		5/12/10	5/12/10	5/12/10	5/12/10	5/12/10	
Date Analyzed		5/12/10	5/12/10	5/12/10	5/12/10	5/12/10	
Matrix				Water	Water	Water	
Aluminum (Al)	55	nd	97%	nd	nd	nd	
Antimony (Sb)	0.2	nd	113%	nd	**0.440**	**0.440**	0%
Arsenic (As)	1.0	nd	93%	nd	nd	nd	
Barium (Ba)	0.3	nd	100%	**1.02**	**14.5**	**13.6**	6%
Beryllium (Be)	0.2	nd	110%	nd	nd	nd	
Cadmium (Cd)	0.2	nd	97%	nd	nd	nd	
Calcium (Ca)	100	**147**	91%	**2128**	**1330**	**1820**	31%
Chromium (Cr)	0.6	nd	87%	nd	**0.440**	**0.400**	10%
Cobalt (Co)	0.3	**0.72**	74%	nd	nd	nd	
Copper (Cu)	0.4	nd	92%	**0.600**	**4.64**	**4.24**	9%
Iron (Fe)	100	nd	98%	nd	**515**	**489**	5%
Lead (Pb)	0.2	nd	93%	**0.480**	**7.70**	**7.46**	3%
Magnesium (Mg)	100	nd	95%	nd	**219**	**301**	32%
Manganese (Mn)	2.0	nd	78%	**2.44**	**13.8**	**14.7**	6%
Mercury (Hg)	0.3	nd	99%	nd	nd	nd	
Nickel (Ni)	0.5	nd	95%	**0.880**	**1.28**	**0.180 *J***	-
Potassium (K)	500	nd	94%	**672**	nd	nd	
Selenium (Se)	1.0	nd	83%	nd	nd	nd	
Silver (Ag)	0.2	nd	95%	nd	nd	nd	
Sodium (Na)	100	nd	82%	**142**	nd	nd	
Thallium (Tl)	0.20	nd	91%	nd	nd	nd	
Vanadium (V)	0.50	nd	96%	nd	nd	nd	
Zinc (Zn)	1.5	nd	89%	**24.8**	**50.5**	**47.3**	7%

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Acceptable RPD Limits:
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Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 1250 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb, Be = 5 µg/L
Tl = 2.5 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (µg/L)	**MRL**	MS *Batch* *100506-5-1*	MSD *Batch* *100506-5-1*	**RPD** **%**
Date Extracted		5/12/10	5/12/10	
Date Analyzed		5/12/10	5/12/10	
Matrix		Water	Water	
Aluminum (Al)	55	96%	95%	1%
Antimony (Sb)	0.2	113%	114%	1%
Arsenic (As)	1.0	94%	95%	2%
Barium (Ba)	0.3	98%	100%	2%
Beryllium (Be)	0.2	118%	122%	3%
Cadmium (Cd)	0.2	97%	98%	0.2%
Calcium (Ca)	100	101%	108%	6%
Chromium (Cr)	0.6	70%	70%	0.4%
Cobalt (Co)	0.3	70%	70%	0%
Copper (Cu)	0.4	88%	89%	1%
Iron (Fe)	100	91%	90%	1%
Lead (Pb)	0.2	91%	92%	1%
Magnesium (Mg)	100	103%	96%	7%
Manganese (Mn)	2.0	93%	112%	19%
Mercury (Hg)	0.3	99%	106%	7%
Nickel (Ni)	0.5	101%	104%	2%
Potassium (K)	500	124%	119%	4%
Selenium (Se)	1.0	84%	89%	5%
Silver (Ag)	0.2	83%	83%	0%
Sodium (Na)	100	107%	99%	8%
Thallium (Tl)	0.20	89%	90%	0.9%
Vanadium (V)	0.50	90%	89%	1%
Zinc (Zn)	1.5	84%	86%	2%

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Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 1250 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb, Be = 5 µg/L
Tl = 2.5 µg/L

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**Method Blank**	**LCS**	**BSB3A-0.5-2**	**BSB3A-2.3-3.1**	**BSB903A-.5-2.0**
Date Analyzed		5/17/10	5/17/10	5/18/10	5/18/10	5/18/10
Matrix				Soil	Soil	Soil
Total Organic Carbon	0.5	nd	99%	nd	nd	**0.165 *J***

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"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
LCS = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**SCB6A-0.5-1.5**	**SCB6A-2.8-3.4**	**SCB6A3.6-4.3**	**SCB3A-1.3-2.1**
Date Analyzed		5/18/10	5/18/10	5/17/10	5/18/10
Matrix		Soil	Soil	Soil	Soil
Total Organic Carbon	0.5	**0.111 *J***	**0.264 *J***	nd	**0.230 *J***

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Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
LCS = 40% Carbon

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

			QA Sample	QA Duplicate	MS	MSD	
EPA 9060A	**MRL**	**SCB3A-2.5-3.2**	*Batch*	*Batch*	*Batch*	*Batch*	**RPD**
(Percent Organic Carbon by Weight)			*100511-4-6*	*100511-4-6*	*100511-4-6*	*100511-4-6*	**%**
Date Analyzed		5/17/10	5/18/10	5/18/10	5/18/10	5/18/10	
Matrix		Soil	Soil	Soil	Soil	Soil	
Total Organic Carbon	0.5	nd	nd	nd	114%	109%	5%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
LCS = 40% Carbon

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

Percent Finer (Passing) Than the Indicated Size

UOM = Percent

Sieve Size	3/4"	1/2"	3/8"	#4	#20	#40	#60	#100	#200	#325	#450
Particle Size (microns)	19000	12500	9500	4750	850	425	250	150	75	45	34
BSB-3A-.5-2	100.00	100.00	100.00	100.00	99.71	26.05	2.44	0.65			
BSB-3A-2.3-3.1	100.00	100.00	100.00	100.00	99.43	30.13	3.69	1.23			
SCB-6A-.5-1.5	100.00	100.00	100.00	100.00	100.00	87.82	25.08	5.76			
SCB-6A-2.8-3.4	100.00	100.00	100.00	100.00	99.98	91.96	46.87	14.33	5.07	4.16	4.03
SCB-6A-3.6-4.3	100.00	100.00	100.00	100.00	100.00	86.39	33.57	11.69			
SCB-3A-1.3-2.1	100.00	100.00	100.00	100.00	99.92	84.73	29.91	8.37			
SCB-3A-2.5-3.2	100.00	100.00	100.00	99.95	99.87	85.31	33.19	9.00			

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

Percent Retained in Each Size Fraction

UOM = Percent

Sieve Size (microns)	>19000	19000-12500	12500-9500	9500-4750	4750-850	850-425	425-250	250-150	150-75	75-45	45-34	<34
BSB-3A-.5-2	0.00	0.00	0.00	0.00	0.29	73.65	23.61	1.79				
BSB-3A-2.3-3.1	0.00	0.00	0.00	0.00	0.57	69.30	26.44	2.46				
SCB-6A-.5-1.5	0.00	0.00	0.00	0.00	0.00	12.18	62.75	19.32				
SCB-6A-2.8-3.4	0.00	0.00	0.00	0.00	0.02	8.02	45.09	32.54	9.26	0.91	0.13	0.16
SCB-6A-3.6-4.3	0.00	0.00	0.00	0.00	0.00	13.61	52.82	21.88				
SCB-3A-1.3-2.1	0.00	0.00	0.00	0.00	0.08	15.19	54.82	21.55				
SCB-3A-2.5-3.2	0.00	0.00	0.00	0.05	0.09	14.55	52.12	24.19				

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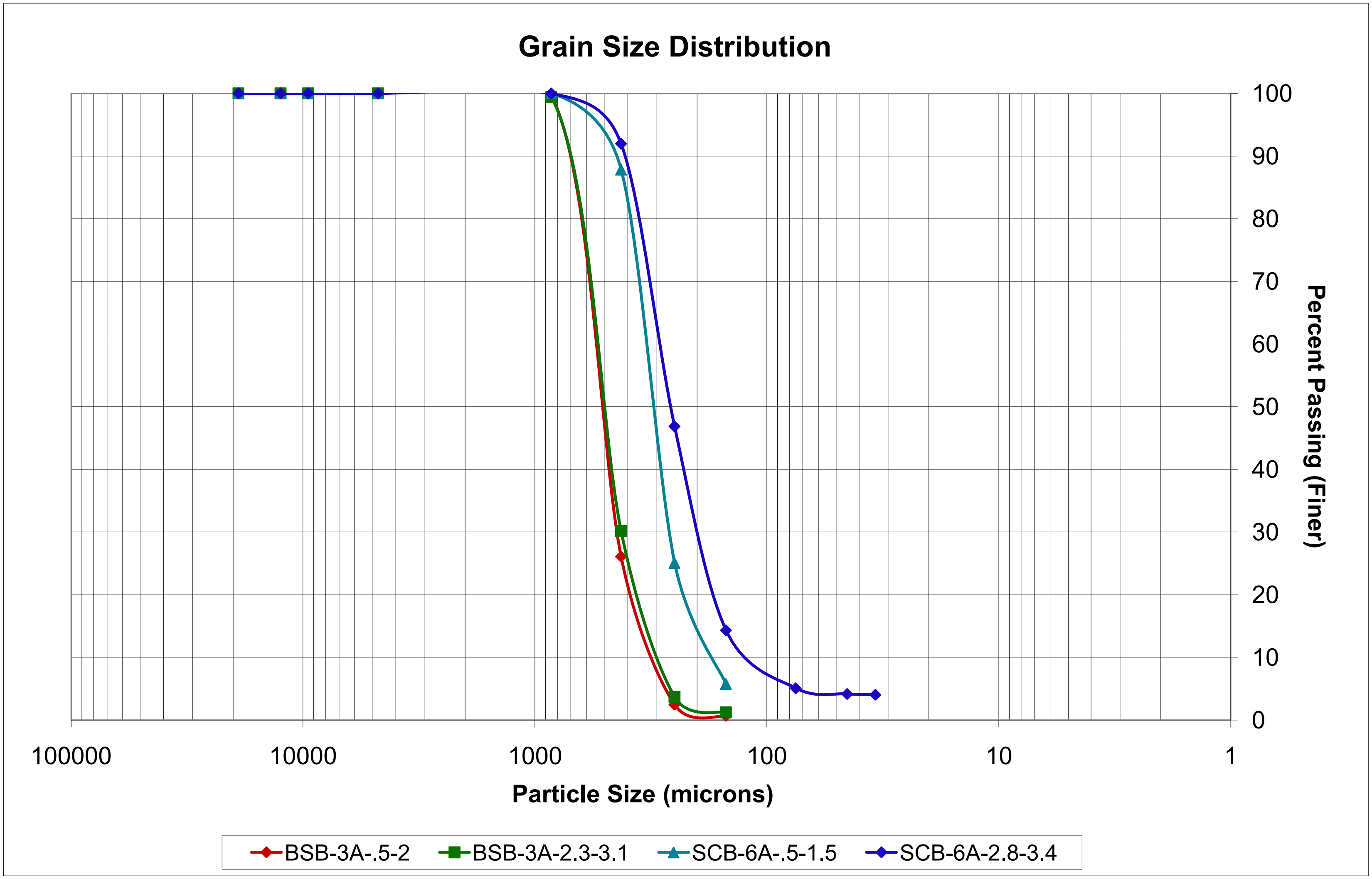
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3



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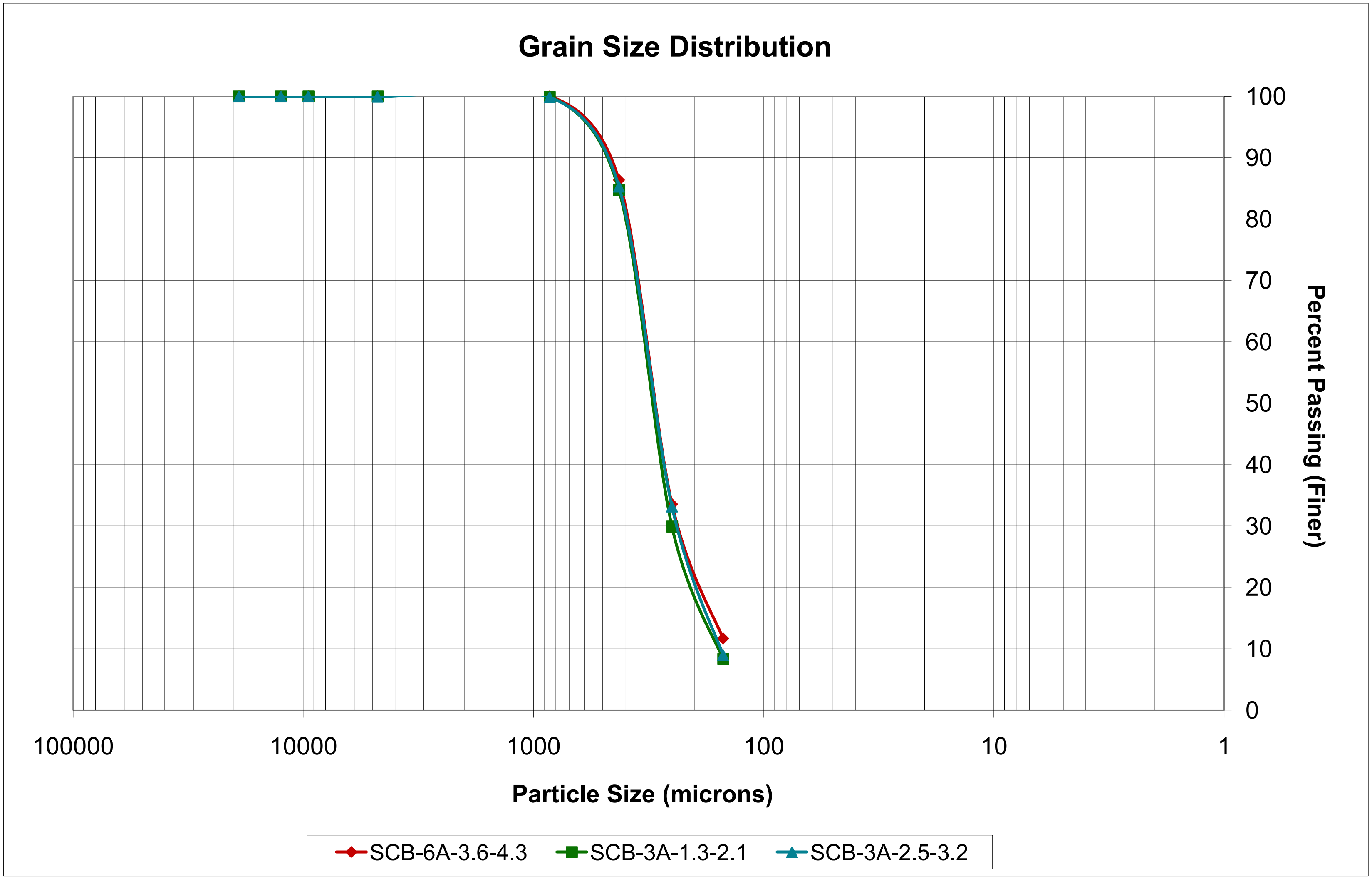
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3



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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

ASTM D-2937 (g/cm3)	BSB3A-0.5-2	BSB3A-2.3-3.1	SCB6A-0.5-1.5	SCB6A-2.8-3.4
Matrix	Soil	Soil	Soil	Soil
Bulk Density	**1.25**	**1.41**	**1.13**	**1.18**

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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

ASTM D-2937 (g/cm3)	SCB6A3.6-4.3	SCB3A-1.3-2.1	SCB3A-2.5-3.2
Matrix	Soil	Soil	Soil
Bulk Density	**1.21**	**1.24**	**1.31**

EI, I

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Chain of Custody Record

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Seattle, WA 98103 Fax: 206-352-7178

Laboratory Project No (internal): CHM100511-3

Date: ______ Page: 1 of: 1

Client: ENVIRONMENT INTERNATIONAL
Address: 5505 34th AVE NE
City, State, Zip: SEATTLE WA 98105
Tel: 206 525 3362

Project Name: UCR SEDIMENT CORING
Location:
Collected by: MARIA BRUMM

Reports To (PM): Fax: Email: Project No:

	Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx Ext.	SEMI VOL 8270C	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals* 8oz Total (T) | Dissolved (D)	Anions (IC)**	TOC 4oz	GRAIN SIZE	Bulk Density	Comments/Depth
1	BSB3A-5-Q	10:35	SEDIMENT	various	5/6/10											X		X	X		3 bottles
2	BSB3A-23-3.1	10:30	sediment	various	5/6/10											X		X	X		3 bottles
3	BSB 903A-5-20	10:45	sediment	various	5/6/10											X		X			2 bottles
4	BSB 24A-12-1.5	12:10	sediment	various	5/6/10											X					1 bottle
5	~~BSB 24A-1.5-4~~																				
6	SCB 6A-0.5-1.5	16:05	sediment	various	5/6/10											X		X	X		3 bottles
7	SCB6A-2.8-3.4	16:20	sediment	various	5/6/10											X		X	X		3 bottles
8	SCB6A-3.6-4.3	16:30	sediment	various	5/6/10											X		X	X		3 bottles
9	SCB3A-1.3-2.1	5:50	sediment	various	5/6/10											X		X	X		3 bottles
10	SCB3A-2.5-3.2	5:55	sediment	various	5/6/10											X		X	X		3 bottles

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Floride Nitrate+Nitrite

Relinquished	Date/Time	Received	Date/Time	Sample Receipt:		Special Remarks
x [signature]	5/11/10	x [signature]	5/11/10 1516	Good?		
Relinquished	Date/Time	Received	Date/Time	Temperature:		
x		x		Seals Intact?:		
				Total Number of Containers:		TAT --> 24HR 48HR Standard

EI, I, 2

Fremont Analytical

Chain of Custody Record

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Laboratory Project No (internal): CHM100511-3

Date:

Page: 1 of: 2

Client: ENVIRONMENT INTERNATIONAL
Address: 5505 34TH AVE NE
City, State, Zip: SEATTLE WA 98105
Tel: 206 525 3362

Project Name: UCR SEDIMENT CORING
Location:
Collected by: MARIA BRUNM

Reports To (PM):
Fax:
Email:
Project No:

	Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx Ext.	SEMI VOL 8270C	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals* Total (T)	Dissolved (D)	Anions (IC)**	TOC	GRAIN SIZE	Comments/Depth
1	Rinsate Blank	5/6/10	DI Water	250ml	5/6/10											X					Rinsate Blank
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Floride Nitrate+Nitrite

Relinquished x [signature]	Date/Time 5/11/10	Received x [signature]	Date/Time: 5/11/10 1516	**Sample Receipt:** Good? Temperature:	Special Remarks
Relinquished x	Date/Time	Received x	Date/Time:	Seals Intact?: Total Number of Containers:	TAT -> 24HR 48HR Standard

Distribution: White - Lab, Yellow - File, Pink - Originator

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Environment International
Attn: Jennifer Arthur
5505 34th Ave. NE
Seattle, WA 98105

RE: UCR Sediment Coring
Fremont Project No: CHM100511-4

May 26th, 2010

Jennifer:

Enclosed are the analytical results for the ***UCR Sediment Coring*** soil and water samples to Fremont Analytical on Tuesday May 11th, 2010.

Sample Receipt:
The samples were received in good condition - in the proper containers, properly sealed, labeled and within holding time. The samples were received in 7 – 16oz soils jars, 7 – 8oz soil jars, 9 – 4oz soil jars and 1 – 250mL HDPE bottles. The samples were received in a cooler with wet ice, with a cooler temperature of 7.9°C, which is within the laboratory recommended cooler temperature range (<4°C - 10°C). The samples were stored in a refrigeration unit at the USEPA-recommended temperature of 4°C ± 2°C.

Sample Receipt Notations:

- Sample *SCB7A-2.3-2.7* was noted on chain of custody. However only a sample marked *SCB7A-2.7-3.6* was delivered. Sample *SCB7A-2.7-3.6* was used for the *SCB7A-2.3-2.7* analyses.

Sample Analysis:
Examination of these samples was conducted for the presence of the following:

- ***Total Metals (TAL) by EPA Method 6020***
- ***Total Organic Carbon by EPA Method 9060A***
- ***Grain Size by ASTM D422***
- ***Bulk Density by ASTM D-2937***

These applications were performed under Washington State Department of Ecology accreditation parameters. All appropriate Quality Assurance / Quality Control method parameters have been applied.

Fremont Analytical

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RE: UCR Sediment Coring
Fremont Project No: CHM100511-4

____

Laboratory Notations (SW6020):

- The *Laboratory Control Sample (LCS)* was within range for all analytes.
- High matrix interferences were present:
  - Sample ID: SCB7A-1.0-2.3: The *relative percent difference (RPD%)* between the sample and sample duplicate exceeded recommended control limits (30%) for *Mercury (Hg).* All other analyte Sample/Sample Duplicate *RPD%* values were within range.
  - Sample ID: SCB7A-1.0-2.3: The *Matrix Spike (MS) and MS Duplicate (MSD)* for the analytes showed poor recoveries due to high concentrations of the analytes and due to the sample matrix. *Post Digestion Spikes (PDS)* were included. Poor *PDS* recoveries were obtained for *Calcium (CA)*, *Iron (Fe)*, *Manganese (Mn)*, Potassium (K),*Vanadium (V)* and *Zinc (Zn)*.

Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical!

Sincerely,

Michael Dee
Sr. Chemist / Principal

mikedee@fremontanalytical.com

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

EPA 6020 (mg/kg)	MRL	Method Blank	LCS	SCB7A-5.6-6.3	SCB7A-5.0-5.6
Date Extracted		5/18/10	5/18/10	5/18/10	5/18/10
Date Analyzed		5/18/10	5/19/10	5/18/10	5/18/10
Matrix				Soil	Soil
Aluminum (Al)	5.5	nd	120%	**3780**	**6782**
Antimony (Sb)	0.20	nd	114%	**0.749**	**2.03**
Arsenic (As)	0.10	nd	88%	**2.11**	**5.59**
Barium (Ba)	0.50	nd	98%	**49.7**	**116**
Beryllium (Be)	0.20	nd	110%	**0.199**	**0.316**
Cadmium (Cd)	0.05	nd	94%	**0.144**	**0.502**
Calcium (Ca)	10	nd	121%	**4,070**	**9,410**
Chromium (Cr)	0.20	nd	101%	**8.90**	**14.5**
Cobalt (Co)	0.20	nd	95%	**5.33**	**12.4**
Copper (Cu)	0.10	nd	97%	**58.5**	**141**
Iron (Fe)	20	nd	112%	**6350**	**20,400**
Lead (Pb)	0.50	nd	97%	**39.0**	**173**
Magnesium (Mg)	10	nd	125%	**1540**	**3740**
Manganese (Mn)	0.20	nd	116%	**180**	**586**
Mercury (Hg)	0.05	nd	92%	**0.134**	**0.408**
Nickel (Ni)	0.10	nd	95%	**4.13**	**8.55**
Potassium (K)	50	nd	95%	**1690**	**4440**
Selenium (Se)	0.50	nd	80%	nd	nd
Silver (Ag)	0.10	nd	98%	**0.149**	**0.441**
Sodium (Na)*	10	**14.7**	122%	**178**	**435**
Thallium (Tl)	0.20	nd	96%	**0.385**	**1.03**
Vanadium (V)	0.10	nd	97%	nd	nd
Zinc (Zn)	0.40	**1.04**	91%	**138**	**352**

"nd" Indicates no detection at the listed reporting limits
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"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be =10 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

EPA 6020 (mg/kg)	MRL	SCB7A-1.0-2.3	Duplicate SCB7A-1.0-2.3	RPD %	SCB907A-1.0-2.3	SCB7A-3.6-4.4
Date Extracted		5/18/10	5/18/10		5/18/10	5/18/10
Date Analyzed		5/18/10	5/18/10		5/19/10	5/18/10
Matrix		Soil	Soil		Soil	Soil
Aluminum (Al)	5.5	**9410**	**9370**	0.4%	**7870**	**15,900**
Antimony (Sb)	0.20	**6.16**	**5.97**	3%	**5.51**	**9.10**
Arsenic (As)	0.10	**6.54**	**5.66**	15%	**7.05**	**20.4**
Barium (Ba)	0.50	**417**	**408**	2%	**389**	**272**
Beryllium (Be)	0.20	**0.574**	**0.580**	1%	**0.489**	**0.604**
Cadmium (Cd)	0.05	**2.03**	**1.80**	12%	**1.76**	**0.818**
Calcium (Ca)	10	**29,700**	**29,100**	2%	**25,600**	**48,000**
Chromium (Cr)	0.20	**36.3**	**34.2**	6%	**27.9**	**24.5**
Cobalt (Co)	0.20	**8.50**	**8.70**	2%	**7.03**	**23.1**
Copper (Cu)	0.10	**410**	**410**	0.05%	**352**	**459**
Iron (Fe)	20	**86,700**	**86,100**	1%	**71400**	**49,200**
Lead (Pb)	0.50	**262**	**227**	14%	**215**	**1170**
Magnesium (Mg)	10	**3520**	**3270**	7%	**2920**	**6570**
Manganese (Mn)	0.20	**3620**	**3620**	0.1%	**2710**	**1890**
Mercury (Hg)	0.05	**1.58**	**1.02**	44%	**0.545**	**1.32**
Nickel (Ni)	0.10	**6.99**	**6.38**	9%	**5.45**	**9.99**
Potassium (K)	50	**4040**	**3930**	3%	**2880**	**10,000**
Selenium (Se)	0.50	nd	nd		**0.684**	nd
Silver (Ag)	0.10	**0.676**	**0.719**	6%	**0.858**	**2.06**
Sodium (Na)*	10	**505**	**496**	2%	**353**	**3050**
Thallium (Tl)	0.20	**2.32**	**2.02**	14%	**1.68**	**8.56**
Vanadium (V)	0.10	nd	nd		nd	nd
Zinc (Zn)	0.40	**8930**	**8460**	5%	**6270**	**4130**

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"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
- Fe, Na, Al, K, Ca = 50%
- Other = 30%

Acceptable Spike Recovery Limits
- Fe, Na, Al, K, Ca = 50% - 150%
- Other = 65% - 135%

Spike Concentration:
- As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
- Fe, Na, Al, K, Ca = 2700 µg/L
- Pb = 50 µg/L
- Se, Hg = 10 µg/L
- Cd, Ag, Sb = 5 µg/L
- Tl = 2.5 µg/L
- Be =10 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

EPA 6020 (mg/kg)	MRL	SCB7A-2.3-2.7	SCB7A-4.4-5.0	SCB12A-3.1-4.1	SCB12A-0.5-1.5
Date Extracted		5/18/10	5/18/10	5/18/10	5/18/10
Date Analyzed		5/19/10	5/18/10	5/19/10	5/18/10
Matrix		Soil	Soil	Soil	Soil
Aluminum (Al)	5.5	**9440**	**8160**	**6880**	**6770**
Antimony (Sb)	0.20	**1040**	**2.73**	**5.74**	**4.86**
Arsenic (As)	0.10	**45.6**	**9.33**	**11.4**	**6.45**
Barium (Ba)	0.50	**170**	**150**	**175**	**407**
Beryllium (Be)	0.20	**0.473**	**0.308**	**0.432**	**0.425**
Cadmium (Cd)	0.05	**4.71**	**0.563**	**1.47**	**2.24**
Calcium (Ca)	10	**19,800**	**19,700**	**16,600**	**22,000**
Chromium (Cr)	0.20	**19.0**	**15.3**	**14.5**	**25.3**
Cobalt (Co)	0.20	**13.5**	**14.2**	**10.0**	**8.15**
Copper (Cu)	0.10	**358**	**252**	**320**	**236**
Iron (Fe)	20	**53,100**	**25,700**	**57,900**	**48,600**
Lead (Pb)	0.50	**2160**	**427**	**767**	**152**
Magnesium (Mg)	10	**4370**	**3718**	**2729**	**6120**
Manganese (Mn)	0.20	**1760**	**3720**	**2730**	**6120**
Mercury (Hg)	0.05	**0.476**	**0.557**	**0.766**	**0.226**
Nickel (Ni)	0.10	**12.3**	**6.84**	**5.66**	**5.24**
Potassium (K)	50	**4340**	**5430**	**2830**	**2190**
Selenium (Se)	0.50	nd	nd	nd	nd
Silver (Ag)	0.10	**1.69**	**0.680**	**0.882**	**0.369**
Sodium (Na)*	10	**1290**	**696**	**455**	**176**
Thallium (Tl)	0.20	**13.9**	**1.79**	**4.99**	**0.817**
Vanadium (V)	0.10	nd	nd	nd	nd
Zinc (Zn)	0.40	**14,500**	**638**	**8740**	**1740**

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"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be =10 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

		MS	MSD		PDS	PDS
EPA 6020 (mg/kg)	**MRL**	**SCB7A-1.0-2.3**	**SCB7A-1.0-2.3**	**RPD %**	**SCB7A-5.0-5.6**	**SCB7A-4.4-5.0**
Date Extracted		5/18/10	5/18/10		5/18/10	5/18/10
Date Analyzed		5/18/10	5/18/10		5/21/10	5/21/10
Matrix		Soil	Soil		Soil	Soil
Aluminum (Al)	5.5	17%	-		90%	99%
Antimony (Sb)	0.20	8%	17%	73%	122%	122%
Arsenic (As)	0.10	65%	67%	3%	128%	129%
Barium (Ba)	0.50	76%	59%	25%	115%	116%
Beryllium (Be)	0.20	93%	110%	17%	109%	91%
Cadmium (Cd)	0.05	78%	76%	3%	122%	119%
Calcium (Ca)	10	-	-		53%	-
Chromium (Cr)	0.20	70%	68%	3%	115%	115%
Cobalt (Co)	0.20	66%	68%	3%	125%	122%
Copper (Cu)	0.10	55%	43%	24%	126%	136%
Iron (Fe)	20	-	-		-	-
Lead (Pb)	0.50	21%	-		88%	-27%
Magnesium (Mg)	10	13%	29%	79%	98%	99%
Manganese (Mn)	0.20	26%	-		-	-
Mercury (Hg)	0.05	115%	108%	6%	92%	88%
Nickel (Ni)	0.10	65%	66%	1%	124%	122%
Potassium (K)	50	40%	70%	54%	44%	15%
Selenium (Se)	0.50	61%	60%	3%	104%	108%
Silver (Ag)	0.10	65%	63%	3%	124%	123%
Sodium (Na)*	10	15%	41%	90%	96%	92%
Thallium (Tl)	0.20	64%	52%	19%	116%	105%
Vanadium (V)	0.10	-	-		11%	20%
Zinc (Zn)	0.40	-	-		61%	9%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be =10 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

					Duplicate		MS	MSD	
EPA 6020 (µg/L)	**MRL**	**Method Blank**	**LCS**	**Rinsate Blank 5/7/2010**	**Rinsate Blank 5/7/2010**	**RPD %**	*Batch 100506-5-1*	*Batch 100506-5-1*	**RPD %**
Date Extracted		5/12/10	5/12/10	5/12/10	5/12/10		5/12/10	5/12/10	
Date Analyzed		5/12/10	5/12/10	5/12/10	5/12/10		5/12/10	5/12/10	
Matrix				Water	Water		Water	Water	
Aluminum (Al)	55	nd	97%	nd	nd		96%	95%	1%
Antimony (Sb)	0.2	nd	113%	**0.440**	**0.440**	0%	113%	114%	1%
Arsenic (As)	1.0	nd	93%	nd	nd		94%	95%	2%
Barium (Ba)	0.3	nd	100%	**14.5**	**13.6**	6%	98%	100%	2%
Beryllium (Be)	0.2	nd	110%	nd	nd		118%	122%	3%
Cadmium (Cd)	0.2	nd	97%	nd	nd		97%	98%	0.2%
Calcium (Ca)	100	**147**	91%	**1330**	**1820**	31%	101%	108%	6%
Chromium (Cr)	0.6	nd	87%	**0.440**	**0.400**	10%	70%	70%	0.4%
Cobalt (Co)	0.3	**0.72**	74%	nd	nd		70%	70%	0%
Copper (Cu)	0.4	nd	92%	**4.64**	**4.24**	9%	88%	89%	1%
Iron (Fe)	100	nd	98%	**515**	**489**	5%	91%	90%	1%
Lead (Pb)	0.2	nd	93%	**7.70**	**7.46**	3%	91%	92%	1%
Magnesium (Mg)	100	nd	95%	**219**	**301**	32%	103%	96%	7%
Manganese (Mn)	2.0	nd	78%	**13.8**	**14.7**	6%	93%	112%	19%
Mercury (Hg)	0.3	nd	99%	nd	nd		99%	106%	7%
Nickel (Ni)	0.5	nd	95%	**1.28**	**0.180 *J***	-	101%	104%	2%
Potassium (K)	500	nd	94%	nd	nd		124%	119%	4%
Selenium (Se)	1.0	nd	83%	nd	nd		84%	89%	5%
Silver (Ag)	0.2	nd	95%	nd	nd		83%	83%	0%
Sodium (Na)	100	nd	82%	nd	nd		107%	99%	8%
Thallium (Tl)	0.20	nd	91%	nd	nd		89%	90%	0.9%
Vanadium (V)	0.50	nd	96%	nd	nd		90%	89%	1%
Zinc (Zn)	1.5	nd	89%	**50.5**	**47.3**	7%	84%	86%	2%

"nd" Indicates no detection at the listed reporting limits
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"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 1250 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb, Be = 5 µg/L
Tl = 2.5 µg/L

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**Method Blank**	**LCS**	**SCB7A-5.6-6.3**	**SCB7A-5.0-5.6**	**SCB7A-1.0-2.3**
Date Analyzed		5/17/10	5/17/10	5/17/10	5/17/10	5/17/10
Matrix				Soil	Soil	Soil
Total Organic Carbon	0.5	nd	99%	nd	nd	**0.125 *J***

"nd" Indicates no detection at the listed reporting limits
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"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

				Duplicate	
EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**SCB907A-1.0-2.3**	**SCB7A-3.6-4.4**	**SCB7A-3.6-4.4**	**SCB7A-2.3-2.7**
Date Analyzed		5/17/10	5/18/10	5/18/10	5/17/10
Matrix		Soil	Soil	Soil	Soil
Total Organic Carbon	0.5	nd	nd	nd	nd

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**SCB7A-4.4-5.0**	**SCB12A-3.1-4.1**	**SCB12A-0.5-1.5**
Date Analyzed		5/18/10	5/17/10	5/17/10
Matrix		Soil	Soil	Soil
Total Organic Carbon	0.5	**0.218 *J***	nd	**1.1**

"nd" Indicates no detection at the listed reporting limits
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"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

		MS	MSD	
EPA 9060A	**MRL**	**SCB7A-3.6-4.4**	**SCB7A-3.6-4.4**	**RPD**
(Percent Organic Carbon by Weight)				**%**
Date Analyzed		5/18/10	5/18/10	
Matrix		Soil	Soil	
Total Organic Carbon	0.5	114%	109%	5%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

Percent Finer (Passing) Than the Indicated Size

UOM = Percent

Sieve Size	3/4"	1/2"	3/8"	#4	#20	#40	#60	#100	#200	#325	#450
particle size (microns)	19000	12500	9500	4750	850	425	250	150	75	45	34
SCB-7A-5.6-6.3	100.00	100.00	100.00	100.00	99.49	61.46	22.34	9.77			
SCB-7A-5.0-5.6	100.00	100.00	100.00	100.00	99.18	68.54	30.16	8.24			
SCB-7A-1.0-2.3	100.00	100.00	100.00	100.00	99.89	78.32	25.19	5.58			
SCB-7A-3.6-4.4	100.00	100.00	100.00	100.00	98.90	54.22	17.83	3.63			
SCB-7A-2.7-3.6	100.00	100.00	100.00	100.00	99.52	86.16	37.46	12.62	5.73	4.64	4.38
SCB-7A-4.4-5.0	100.00	100.00	100.00	100.00	99.77	90.82	47.38	19.21	7.65	4.98	3.96
SCB-12A-3.1-4.1	100.00	100.00	100.00	100.00	100.00	85.78	17.48	2.26			
SCB-12A-.5-1.5	100.00	100.00	100.00	100.00	99.94	96.54	79.94	38.70	9.96	5.61	4.54

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

Percent Retained in Each Size Fraction

UOM = Percent

Sieve Size (microns)	>19000	19000-12500	12500-9500	9500-4750	4750-850	850-425	425-250	250-150	150-75	75-45	45-34	<34
SCB-7A-5.6-6.3	0.00	0.00	0.00	0.00	0.51	38.03	39.12	12.57				
SCB-7A-5.0-5.6	0.00	0.00	0.00	0.00	0.82	30.64	38.38	21.92				
SCB-7A-1.0-2.3	0.00	0.00	0.00	0.00	0.11	21.57	53.13	19.61				
SCB-7A-3.6-4.4	0.00	0.00	0.00	0.00	1.10	44.68	36.40	14.19				
SCB-7A-2.7-3.6	0.00	0.00	0.00	0.00	0.48	13.36	48.70	24.84	6.89	1.09	0.26	0.31
SCB-7A-4.4-5.0	0.00	0.00	0.00	0.00	0.23	8.95	43.45	28.17	11.56	2.67	1.03	0.59
SCB-12A-3.1-4.1	0.00	0.00	0.00	0.00	0.00	14.22	68.30	15.22				
SCB-12A-.5-1.5	0.00	0.00	0.00	0.00	0.06	3.40	16.59	41.24	28.75	4.35	1.07	0.80

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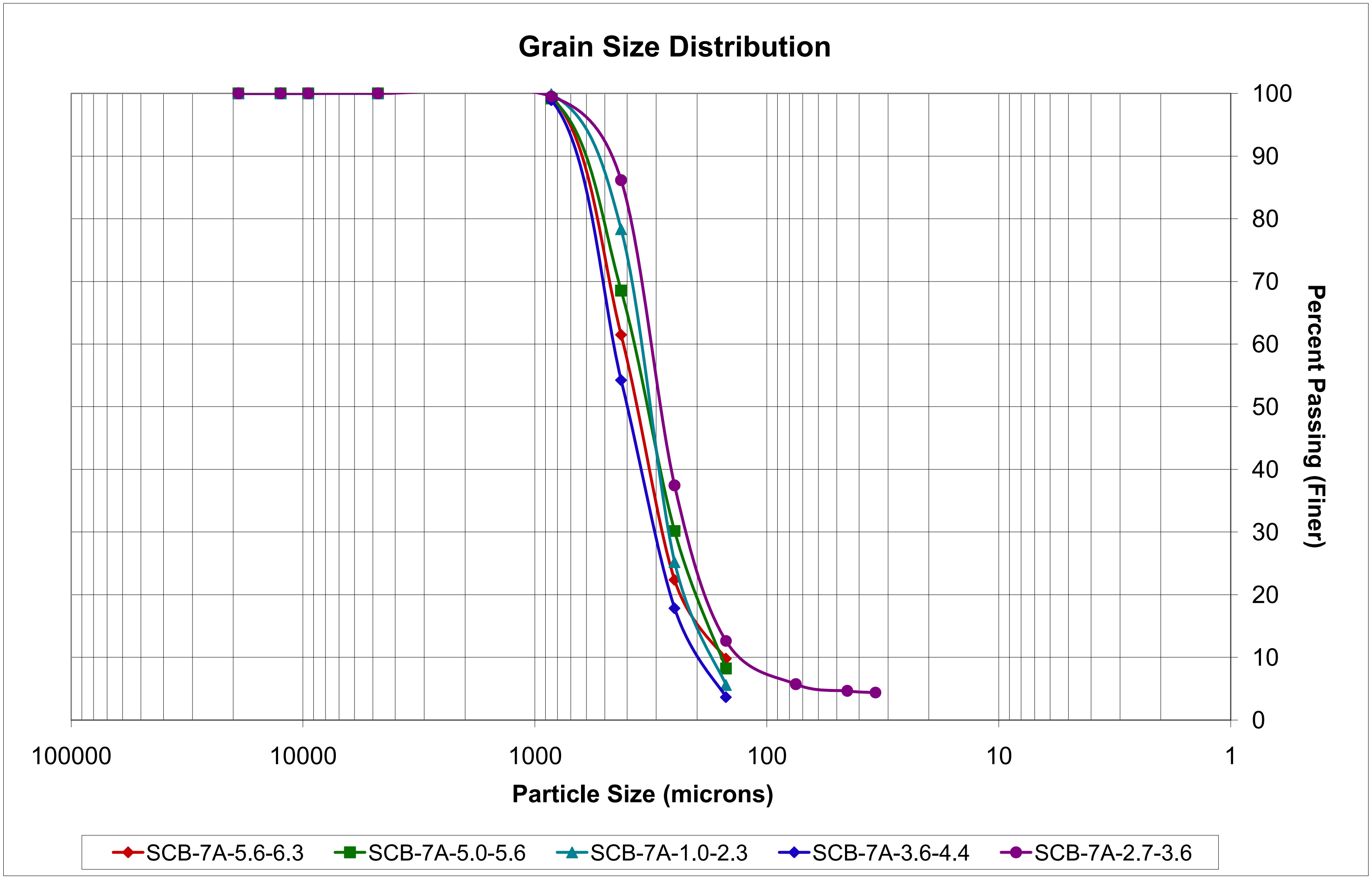
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4



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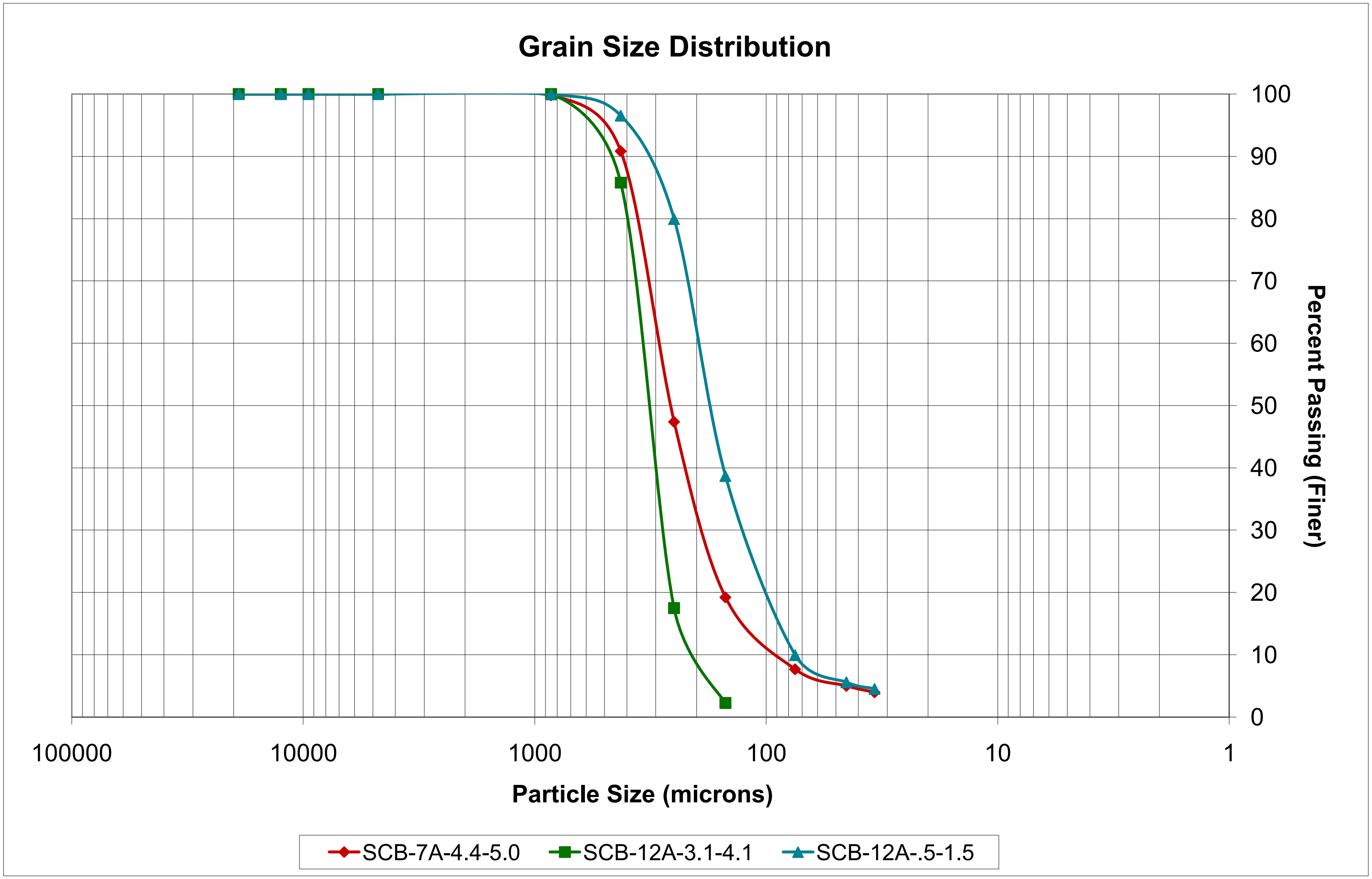
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4



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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

ASTM D-2937 (g/cm3)	**SCB7A-5.6-6.3**	**SCB7A-5.0-5.6**	**SCB7A-1.0-2.3**	**SCB7A-3.6-4.4**
Matrix	Soil	Soil	Soil	Soil
Bulk Density	**1.17**	**1.17**	**1.13**	**1.27**

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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-4

ASTM D-2937 (g/cm3)	SCB7A-2.3-2.7	SCB7A-4.4-5.0	SCB12A-3.1-4.1	SCB12A-0.5-1.5
Matrix	Soil	Soil	Soil	Soil
Bulk Density	**1.07**	**1.21**	**1.18**	**1.19**

EI, II 7 TOC, GS, TAL Metals

Fremont Analytical

Chain of Custody Record

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Date:

Laboratory Project No (internal): CHM1005...

Page: 1 of: 2

Client: Environment Int. - Jennifer Arthur

Address: 5505 34th Ave NE

City, State, Zip: Seattle WA 98105

Tel: (206)525-3362

Project Name: CCT Coring Study

Location:

Collected by:

Reports To (PM):

Fax:

Email:

Project No:

	Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx/Dx Ext.	SEMI VOL 8270C	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals* 8020	Total (T) / Dissolved (D)	Anions (IC)**	TOC 4oz	Grain Size	Bulk Density		Comments/Depth
1	SCB7A-5.6-6.3	2:55	sed	various	5/7/10												X		X	X			3 bottles
2	SCB7A-5.0-5.6	3:00	sed.	various	5/7/10												X		X	X			3 bottles
3	SCB7A-1.0-2.3	3:05	sed	various	5/7/10												X		X	X			3 bottles
4	SCB907A-1.0-2.3	3:10	sed	various	5/7/10												X		X				2 bottles
5	SCB7A-1.0-2.3MS/MSD	3:05	sed	various	5/7/10												X		X	-			MSMSDs 2 bottles
6	SCB7A-3.6-4.4 ~~[illegible]~~	3:25	sed	various	5/7/10												X		X	X			3 bottles
7	SCB7A-2.3-2.7	3:35	sed	various	5/7/10												X		X	X			3 bottles
8	SCB7A-4.4-5.6 ~~[illegible]~~	3:20 ~~[illegible]~~	sed	various	5/7/10												X		X	X			3 bottles
9	SCB12A-3.1-4.1	7:00	sed	various	5/7/10												X		X	X			3 bottles
10	SCB12A-0.5-1.5	7:05	sed	various	5/7/10												X		X	X			3 bottles

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Relinquished	Date/Time	Received	Date/Time	Sample Receipt:		Special Remarks:
x	5/11/10	x	5/11/10 1516	Good?		
Relinquished	Date/Time	Received	Date/Time	Cooler Temperature:		
				Seals Intact?:		
x		x		Total Number of Containers:		TAT --> 24HR 48HR Standard

Distribution: White - Lab, Yellow - File, Pink - Originator

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Chain of Custody Record

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Laboratory Project No (internal): CHM1005 11-4

Date: ______ Page: 2 of: 2

Client: Env. International
Address:
City, State, Zip: Tel:

Project Name: CCT Coring Study
Location:
Collected by:

Reports To (PM): Fax: Email: Project No:

	Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx/Dx Ext.	SEMI VOL 8270C	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals*	Total (T) / Dissolved (D)	Anions (IC)**					Comments/Depth
1	BSB Fremont Rinsate Blank	7:20	rinsate blank	250 poly	5/7												X						Rinsate Blank
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Relinquished	Date/Time	Received	Date/Time
x [signature]	5/10/10	x [signature]	5/11/10 1516
x		x	

Sample Receipt:	
Good?	
Cooler Temperature:	
Seals Intact?:	
Total Number of Containers:	

Special Remarks:

TAT -> 24HR 48HR Standard

Distribution: White - Lab, Yellow - File, Pink - Originator

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Environment International
Attn: Jennifer Arthur
5505 34th Ave. NE
Seattle, WA 98105

RE: UCR Sediment Coring
Fremont Project No: CHM100513-5

May 26th, 2010

Jennifer:

Enclosed are the analytical results for the ***UCR Sediment Coring*** soil and water samples to Fremont Analytical on Tuesday May 13th, 2010.

Sample Receipt:
The samples were received in good condition - in the proper containers, properly sealed, labeled and within holding time. The samples were received in 7 – 16oz soils jars, 7 – 8oz soil jars, 9 – 4oz soil jars and 1 – 250mL HDPE bottles. The samples were received in a cooler with wet ice, with a cooler temperature of 7.9°C, which is within the laboratory recommended cooler temperature range (<4°C - 10°C). The samples were stored in a refrigeration unit at the USEPA-recommended temperature of 4°C ± 2°C.

Sample Analysis:
Examination of these samples was conducted for the presence of the following:

- ***Total Metals (TAL) by EPA Method 6020***
- ***Total Organic Carbon by EPA Method 9060A***
- ***Grain Size by ASTM D422***
- ***Bulk Density by ASTM D-2937***

These applications were performed under Washington State Department of Ecology accreditation parameters. All appropriate Quality Assurance / Quality Control method parameters have been applied.

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RE: UCR Sediment Coring
Fremont Project No: CHM100513-5

____

Laboratory Notations (SW6020):

- The *Laboratory Control Samples (LCS)* were within range for all analytes.
- Matrix interferences were present:
  - Sample ID: QC21A-1.0-2.7: The *Matrix Spike (MS) and MS Duplicate (MSD)* showed poor recoveries due to high concentrations of the analytes and due to the sample matrix. *Post Digestion Spikes (PDS)* were included.
  - Sample ID: Batch *100513-6-10*: The *MS* showed poor recoveries due to high concentrations of the analytes and due to the sample matrix. *Post Digestion Spikes (PDS)* were included.

Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical!

Sincerely,

Michael Dee
Sr. Chemist / Principal

mikedee@fremontanalytical.com

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (mg/kg)	MRL	Method Blank	Method Blank	LCS	LCS
Date Extracted		5/20/10	5/20/10	5/20/10	5/20/10
Date Analyzed		5/21/10	5/21/10	5/21/10	5/21/10
Matrix					
Aluminum (Al)	5.5	nd	nd	128%	136%
Antimony (Sb)	0.20	nd	nd	87%	89%
Arsenic (As)	0.10	nd	nd	89%	89%
Barium (Ba)	0.50	nd	nd	96%	100%
Beryllium (Be)	0.20	nd	nd	99%	118%
Cadmium (Cd)	0.05	nd	nd	107%	79%
Calcium (Ca)	10	nd	**13.1**	108%	111%
Chromium (Cr)	0.20	nd	nd	87%	91%
Cobalt (Co)	0.20	nd	nd	89%	92%
Copper (Cu)	0.10	nd	nd	89%	92%
Iron (Fe)	20	nd	nd	111%	116%
Lead (Pb)	0.50	nd	nd	80%	80%
Magnesium (Mg)	10	nd	nd	124%	133%
Manganese (Mn)	0.20	nd	nd	129%	145%
Mercury (Hg)	0.05	**0.051**	nd	96%	96%
Nickel (Ni)	0.10	nd	nd	89%	92%
Potassium (K)	50	nd	**173**	113%	139%
Selenium (Se)	0.50	nd	nd	86%	74%
Silver (Ag)	0.10	nd	nd	87%	87%
Sodium (Na)*	10	**128**	nd	134%	148%
Thallium (Tl)	0.20	nd	nd	77%	79%
Vanadium (V)	0.10	nd	nd	81%	83%
Zinc (Zn)	0.40	**0.584**	nd	86%	93%

"nd" Indicates no detection at the listed reporting limits
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"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (mg/kg)	MRL	OC15A-0.5-1.5	OC15A-4.2-5.2	OC14Deep-8.0-10.6	OC14Deep-9.0-9.8
Date Extracted		5/20/10	5/20/10	5/20/10	5/20/10
Date Analyzed		5/21/10	5/21/10	5/21/10	5/21/10
Matrix		Soil	Soil	Soil	Soil
Aluminum (Al)	5.5	**16,500**	**16,400**	**9300**	**11,300**
Antimony (Sb)	0.20	**6.12**	**9.01**	**4.46**	**7.63**
Arsenic (As)	0.10	**11.2**	**7.48**	**21.9**	**7.50**
Barium (Ba)	0.50	**474**	**564**	**135**	**393**
Beryllium (Be)	0.20	**0.972**	**1.14**	**1.05**	**1.21**
Cadmium (Cd)	0.05	**3.46**	**3.70**	**12.6**	**2.48**
Calcium (Ca)	10	**42,700**	**52,000**	**43,300**	**30,200**
Chromium (Cr)	0.20	**43.2**	**51.5**	**18.6**	**36.2**
Cobalt (Co)	0.20	**17.0**	**14.7**	**8.69**	**9.62**
Copper (Cu)	0.10	**739**	**752**	**176**	**494**
Iron (Fe)	20	**134,000**	**135,000**	**35,800**	**88,400**
Lead (Pb)	0.50	**645**	**374**	**552**	**305**
Magnesium (Mg)	10	**8300**	**12200**	**19,900**	**6320**
Manganese (Mn)	0.20	**5040**	**4830**	**1380**	**3280**
Mercury (Hg)	0.05	**0.292**	**0.361**	**0.540**	**0.241**
Nickel (Ni)	0.10	**10.1**	**10.6**	**15.6**	**7.53**
Potassium (K)	50	**5730**	**6270**	**4960**	**4690**
Selenium (Se)	0.50	**1.63**	nd	nd	**1.87**
Silver (Ag)	0.10	**1.11**	**0.662**	**0.855**	**1.07**
Sodium (Na)*	10	**1050**	**588**	**504**	**566**
Thallium (Tl)	0.20	**5.80**	**2.14**	**5.20**	**3.00**
Vanadium (V)	0.10	nd	nd	nd	nd
Zinc (Zn)	0.40	**13,400**	**7130**	**3920**	**8340**

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"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (mg/kg)	MRL	OC20A-0.5-1.7	OC21A-0.0-1.0	OC21A-2.7-4.3	OC22A-1.5-2.5
Date Extracted		5/20/10	5/20/10	5/20/10	5/20/10
Date Analyzed		5/21/10	5/21/10	5/21/10	5/21/10
Matrix		Soil	Soil	Soil	Soil
Aluminum (Al)	5.5	**8720**	**9470**	**9200**	**9410**
Antimony (Sb)	0.20	**4.14**	**7.17**	**4.38**	**5.11**
Arsenic (As)	0.10	**8.61**	**7.66**	**7.98**	**7.95**
Barium (Ba)	0.50	**362**	**372**	**433**	**425**
Beryllium (Be)	0.20	**0.833**	**0.838**	**0.828**	**0.923**
Cadmium (Cd)	0.05	**7.22**	**3.83**	**4.95**	**5.01**
Calcium (Ca)	10	**43,600**	**36,300**	**48,600**	**36,600**
Chromium (Cr)	0.20	**26.2**	**27.4**	**23.0**	**26.3**
Cobalt (Co)	0.20	**7.94**	**9.51**	**8.35**	**7.56**
Copper (Cu)	0.10	**252**	**366**	**263**	**326**
Iron (Fe)	20	**50,000**	**33,600**	**52,400**	**60,600**
Lead (Pb)	0.50	**350**	**167**	**343**	**343**
Magnesium (Mg)	10	**22,800**	**7950**	**20,300**	**13,400**
Manganese (Mn)	0.20	**1540**	**1240**	**1260**	**2260**
Mercury (Hg)	0.05	**0.387**	**0.140**	**0.197**	**3.01**
Nickel (Ni)	0.10	**14.4**	**5.68**	**7.65**	**9.15**
Potassium (K)	50	**4950**	**2700**	**3200**	**4500**
Selenium (Se)	0.50	nd	nd	nd	nd
Silver (Ag)	0.10	**0.346**	**0.429**	**0.306**	**0.602**
Sodium (Na)*	10	**301**	**356**	**394**	**549**
Thallium (Tl)	0.20	**1.71**	**1.64**	**2.05**	**3.31**
Vanadium (V)	0.10	nd	nd	nd	nd
Zinc (Zn)	0.40	**2000**	**3100**	**2890**	**5940**

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"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
- Fe, Na, Al, K, Ca = 50%
- Other = 30%

Acceptable Spike Recovery Limits
- Fe, Na, Al, K, Ca = 50% - 150%
- Other = 65% - 135%

Spike Concentration:
- As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
- Fe, Na, Al, K, Ca = 2700 µg/L
- Pb = 50 µg/L
- Se, Hg = 10 µg/L
- Cd, Ag, Sb = 5 µg/L
- Tl = 2.5 µg/L
- Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (mg/kg)	MRL	OC21Deep2-0-1.1	QC21A-1.0-2.7	Duplicate QC21A-1.0-2.7	RPD %	OC921A-1.0-2.7
Date Extracted		5/20/10	5/20/10	5/20/10		5/20/10
Date Analyzed		5/21/10	5/21/10	5/21/10		5/21/10
Matrix		Soil	Soil	Soil		Soil
Aluminum (Al)	5.5	**9240**	**9230**	**9880**	7%	**10,200**
Antimony (Sb)	0.20	**3.87**	**5.84**	**5.99**	2%	**6.14**
Arsenic (As)	0.10	**17.8**	**8.18**	**8.01**	2%	**8.24**
Barium (Ba)	0.50	**194**	**334**	**367**	9%	**356**
Beryllium (Be)	0.20	**0.770**	**0.554**	**0.722**	26%	**1.04**
Cadmium (Cd)	0.05	**2.46**	**4.65**	**5.66**	20%	**4.73**
Calcium (Ca)	10	**22,300**	**32,300**	**35,700**	10%	**34,300**
Chromium (Cr)	0.20	**18.6**	**25.2**	**26.1**	3%	**26.9**
Cobalt (Co)	0.20	**9.06**	**8.38**	**9.54**	13%	**9.25**
Copper (Cu)	0.10	**263**	**329**	**353**	7%	**347**
Iron (Fe)	20	**38,800**	**56,200**	**63,300**	12%	**61400**
Lead (Pb)	0.50	**591**	**327**	**319**	2%	**340**
Magnesium (Mg)	10	**8560**	**12,400**	**14,100**	13%	**14,300**
Manganese (Mn)	0.20	**1520**	**1980**	**2220**	11%	**2310**
Mercury (Hg)	0.05	**0.243**	**0.337**	**0.396**	16%	**0.320**
Nickel (Ni)	0.10	**10.4**	**10.7**	**12.0**	11%	**11.4**
Potassium (K)	50	**4440**	**4140**	**4590**	10%	**4770**
Selenium (Se)	0.50	nd	nd	nd		**0.314**
Silver (Ag)	0.10	**0.814**	**0.550**	**0.565**	3%	**0.597**
Sodium (Na)*	10	**785**	**572**	**592**	3%	**650**
Thallium (Tl)	0.20	**5.43**	**3.19**	**3.20**	1%	**3.33**
Vanadium (V)	0.10	nd	nd	nd		nd
Zinc (Zn)	0.40	**5100**	**4980**	**5360**	7%	**5420**

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"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (mg/kg)	MRL	OC23A-0-1.2	OC923A-0-1.2
Date Extracted		5/20/10	5/20/10
Date Analyzed		5/21/10	5/21/10
Matrix		Soil	Soil
Aluminum (Al)	5.5	**9230**	**8840**
Antimony (Sb)	0.20	**5.23**	**6.32**
Arsenic (As)	0.10	**11.8**	**11.0**
Barium (Ba)	0.50	**300**	**251**
Beryllium (Be)	0.20	**1.16**	**1.10**
Cadmium (Cd)	0.05	**4.16**	**3.82**
Calcium (Ca)	10	**35,800**	**31,900**
Chromium (Cr)	0.20	**26.8**	**27.1**
Cobalt (Co)	0.20	**9.62**	**8.98**
Copper (Cu)	0.10	**234**	**220**
Iron (Fe)	20	**42,900**	**41,900**
Lead (Pb)	0.50	**312**	**310**
Magnesium (Mg)	10	**21,900**	**19,700**
Manganese (Mn)	0.20	**1330**	**1370**
Mercury (Hg)	0.05	**0.296**	**0.268**
Nickel (Ni)	0.10	**15.7**	**15.7**
Potassium (K)	50	**5050**	**4960**
Selenium (Se)	0.50	**0.840**	nd
Silver (Ag)	0.10	**1.13**	**1.88**
Sodium (Na)*	10	**588**	**521**
Thallium (Tl)	0.20	**3.05**	**2.96**
Vanadium (V)	0.10	nd	nd
Zinc (Zn)	0.40	**3140**	**3020**

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"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
- Fe, Na, Al, K, Ca = 50%
- Other = 30%

Acceptable Spike Recovery Limits
- Fe, Na, Al, K, Ca = 50% - 150%
- Other = 65% - 135%

Spike Concentration:
- As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
- Fe, Na, Al, K, Ca = 2700 µg/L
- Pb = 50 µg/L
- Se, Hg = 10 µg/L
- Cd, Ag, Sb = 5 µg/L
- Tl = 2.5 µg/L
- Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (mg/kg)	MRL	MS QC21A-1.0-2.7	MSD QC21A-1.0-2.7	RPD %	MS Batch 100513-6-10
Date Extracted		5/20/10	5/20/10		5/20/10
Date Analyzed		5/21/10	5/21/10		5/21/10
Matrix		Soil	Soil		Soil
Aluminum (Al)	5.5	163%	133%	21%	114%
Antimony (Sb)	0.20	20%	11%	56%	-
Arsenic (As)	0.10	83%	87%	5%	81%
Barium (Ba)	0.50	120%	121%	1%	68%
Beryllium (Be)	0.20	95%	93%	3%	111%
Cadmium (Cd)	0.05	78%	90%	14%	80%
Calcium (Ca)	10	-	56%		75%
Chromium (Cr)	0.20	82%	84%	3%	82%
Cobalt (Co)	0.20	83%	83%	0%	82%
Copper (Cu)	0.10	102%	75%	31%	61%
Iron (Fe)	20	-	-		169%
Lead (Pb)	0.50	83%	58%	36%	87%
Magnesium (Mg)	10	143%	141%	2%	118%
Manganese (Mn)	0.20	-	44%		-
Mercury (Hg)	0.05	97%	97%	1%	92%
Nickel (Ni)	0.10	80%	83%	4%	81%
Potassium (K)	50	153%	124%	21%	108%
Selenium (Se)	0.50	65%	72%	10%	62%
Silver (Ag)	0.10	76%	79%	4%	64%
Sodium (Na)*	10	130%	126%	3%	127%
Thallium (Tl)	0.20	76%	74%	3%	75%
Vanadium (V)	0.10	-	-		-
Zinc (Zn)	0.40	-	-		-

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Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
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Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (mg/kg)	**MRL**	PDS **OC21Deep2-0-1.1**	PDS *Batch 100513-6-1*
Date Extracted		5/20/10	5/20/10
Date Analyzed		5/21/10	5/21/10
Matrix		Soil	Soil
Aluminum (Al)	5.5	119%	113%
Antimony (Sb)	0.20	111%	111%
Arsenic (As)	0.10	103%	100%
Barium (Ba)	0.50	107%	101%
Beryllium (Be)	0.20	105%	108%
Cadmium (Cd)	0.05	100%	99%
Calcium (Ca)	10	103%	102%
Chromium (Cr)	0.20	102%	100%
Cobalt (Co)	0.20	104%	100%
Copper (Cu)	0.10	95%	98%
Iron (Fe)	20	169%	77%
Lead (Pb)	0.50	87%	97%
Magnesium (Mg)	10	118%	116%
Manganese (Mn)	0.20	86%	167%
Mercury (Hg)	0.05	91%	96%
Nickel (Ni)	0.10	103%	101%
Potassium (K)	50	115%	120%
Selenium (Se)	0.50	93%	104%
Silver (Ag)	0.10	100%	94%
Sodium (Na)*	10	132%	126%
Thallium (Tl)	0.20	99%	102%
Vanadium (V)	0.10	88%	84%
Zinc (Zn)	0.40	20%	117%

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Acceptable RPD Limits:
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Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
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Se, Hg = 10 µg/L
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Be = 20 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 6020 (µg/L)	MRL	Method Blank	LCS	Rinsate Blank 5/12/2010	Duplicate Rinsate Blank 5/12/2010	MS *Batch 100511-6-1*	MSD *Batch 100511-6-1*	RPD %
Date Extracted		5/13/10	5/13/10	5/13/10	5/13/10	5/13/10	5/13/10	
Date Analyzed		5/13/10	5/13/10	5/13/10	5/13/10	5/13/10	5/13/10	
Matrix				Water	Water	Water	Water	
Aluminum (Al)	55	nd	93%	nd	nd	96%	96%	0%
Antimony (Sb)	0.2	nd	117%	nd	nd	121%	124%	2%
Arsenic (As)	1.0	nd	94%	nd	nd	96%	98%	2%
Barium (Ba)	0.3	nd	95%	nd	nd	101%	102%	1%
Beryllium (Be)	0.2	nd	87%	nd	nd	85%	84%	0.5%
Cadmium (Cd)	0.2	nd	97%	nd	nd	101%	102%	1%
Calcium (Ca)	100	nd	96%	nd	nd	93%	94%	1%
Chromium (Cr)	0.6	nd	76%	nd	nd	76%	77%	1%
Cobalt (Co)	0.3	nd	77%	nd	nd	75%	76%	1%
Copper (Cu)	0.4	nd	98%	nd	nd	97%	99%	2%
Iron (Fe)	100	nd	97%	nd	nd	106%	98%	8%
Lead (Pb)	0.2	nd	98%	nd	nd	99%	100%	1%
Magnesium (Mg)	100	nd	97%	nd	nd	108%	108%	0.1%
Manganese (Mn)	2.0	nd	81%	nd	nd	88%	66%	29%
Mercury (Hg)	0.3	nd	120%	nd	nd	102%	103%	0.4%
Nickel (Ni)	0.5	nd	96%	nd	nd	94%	96%	2%
Potassium (K)	500	nd	127%	nd	nd	101%	112%	10%
Selenium (Se)	1.0	nd	97%	nd	nd	92%	100%	8%
Silver (Ag)	0.2	nd	95%	nd	nd	82%	83%	2%
Sodium (Na)	100	nd	96%	nd	nd	130%	134%	3%
Thallium (Tl)	0.20	nd	96%	nd	nd	97%	99%	1%
Vanadium (V)	0.50	nd	91%	nd	nd	102%	103%	0.6%
Zinc (Zn)	1.5	nd	98%	nd	nd	106%	101%	5%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 1250 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb, Be = 5 µg/L
Tl = 2.5 µg/L

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**Method Blank**	**LCS**	**LCS**	**OC15A-0.5-1.5**	**OC15A-4.2-5.2**
Date Analyzed		5/24/10	5/24/10	5/25/10	5/24/10	5/24/10
Matrix					Soil	Soil
Total Organic Carbon	0.5	nd	100%	111%	**0.835**	**1.38**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**OC14Deep-8.0-10.6**	**OC20A-0.5-1.7**	**OC21A-0.0-1.0**
Date Analyzed		5/24/10	5/24/10	5/24/10
Matrix		Soil	Soil	Soil
Total Organic Carbon	0.5	**2.75**	**2.03**	**1.13**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**OC21A-2.7-4.3**	Duplicate **OC21A-2.7-4.3**	**RPD %**	**OC22A-1.5-2.5**	**QC21A-1.0-2.7**
Date Analyzed		5/24/10	5/24/10		5/25/10	5/25/10
Matrix		Soil	Soil		Soil	Soil
Total Organic Carbon	0.5	**0.946**	**0.717**	28%	**1.45**	**1.10**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**OC921A-1.0-2.7**	**OC23A-0-1.2**	**OC923A-0-1.2**
Date Analyzed		5/25/10	5/25/10	5/25/10
Matrix		Soil	Soil	Soil
Total Organic Carbon	0.5	**1.38**	**2.19**	**2.07**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100511-3

		MS	MSD	
EPA 9060A	**MRL**	**QC21A-1.0-2.7**	**QC21A-1.0-2.7**	**RPD**
(Percent Organic Carbon by Weight)				**%**
Date Analyzed		5/25/10	5/25/10	
Matrix		Soil	Soil	
Total Organic Carbon	0.5	127%	126%	1%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-5

Percent Finer (Passing) Than the Indicated Size

UOM = Percent

Sieve Size	3/4"	1/2"	3/8"	#4	#20	#40	#60	#100	#200	#325	#450
Particle Size (microns)	19000	12500	9500	4750	850	425	250	150	75	45	34
OC15A-0.5-1.5	100.00	100.00	100.00	100.00	98.83	76.58	25.14	6.84	2.27	1.31	0.92
OC15A-4.2-5.2	100.00	100.00	100.00	100.00	98.95	72.10	38.78	11.60	4.13	2.18	1.49
OC14DEEP-8.0-10.6	100.00	100.00	100.00	100.00	98.90	95.94	90.99	62.85	22.97	11.30	5.87
OC20A-0.5-1.7	100.00	100.00	100.00	100.00	99.84	98.98	82.81	24.10	5.77	2.68	1.12
OC21A-0.0-1.0	100.00	100.00	100.00	100.00	99.67	95.92	48.65	7.66	1.57	0.86	0.50
OC21A-2.7-4.3	100.00	100.00	100.00	100.00	99.15	94.63	59.68	20.42	5.48	2.93	1.50
OC22A-1.5-2.5	100.00	100.00	100.00	100.00	100.00	98.45	65.88	12.39	1.71	0.87	0.58
OC21A-1.0-2.7	100.00	100.00	100.00	100.00	99.65	96.74	52.53	9.41	2.31	1.33	0.67
OC23A-0-1.2	100.00	100.00	100.00	99.75	98.06	97.08	78.69	23.81	8.45	5.39	4.66

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-5

Percent Retained in Each Size Fraction

UOM = Percent

Sieve Size (microns)	>19000	19000-12500	12500-9500	9500-4750	4750-850	850-425	425-250	250-150	150-75	75-45	45-34	<34
OC15A-0.5-1.5	0.00	0.00	0.00	0.00	1.17	22.25	51.45	18.30	4.57	0.96	0.39	0.47
OC15A-4.2-5.2	0.00	0.00	0.00	0.00	1.05	26.85	33.32	27.18	7.47	1.95	0.70	0.84
OC14DEEP-8.0-10.6	0.00	0.00	0.00	0.00	1.10	2.96	4.94	28.15	39.87	11.67	5.44	3.36
OC20A-0.5-1.7	0.00	0.00	0.00	0.00	0.16	0.86	16.17	58.71	18.33	3.09	1.55	0.98
OC21A-0.0-1.0	0.00	0.00	0.00	0.00	0.33	3.75	47.27	40.99	6.08	0.72	0.36	0.45
OC21A-2.7-4.3	0.00	0.00	0.00	0.00	0.85	4.52	34.95	39.26	14.93	2.55	1.43	1.46
OC22A-1.5-2.5	0.00	0.00	0.00	0.00	0.00	1.55	32.57	53.49	10.68	0.84	0.29	0.42
OC21A-1.0-2.7	0.00	0.00	0.00	0.00	0.35	2.91	44.20	43.12	7.10	0.98	0.66	0.60
OC23A-0-1.2	0.00	0.00	0.00	0.25	1.68	0.99	18.39	54.88	15.35	3.06	0.74	0.18

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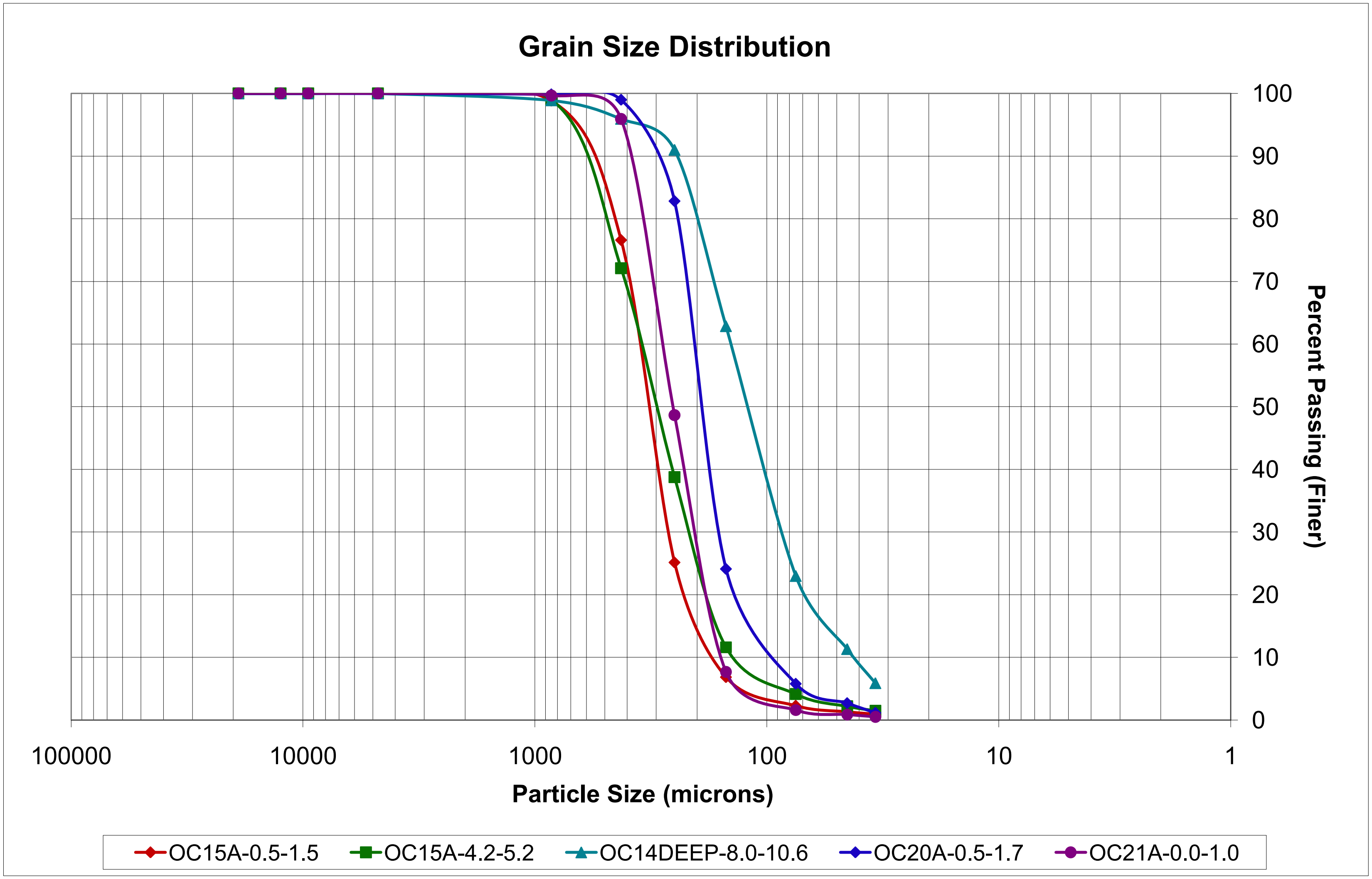
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-5



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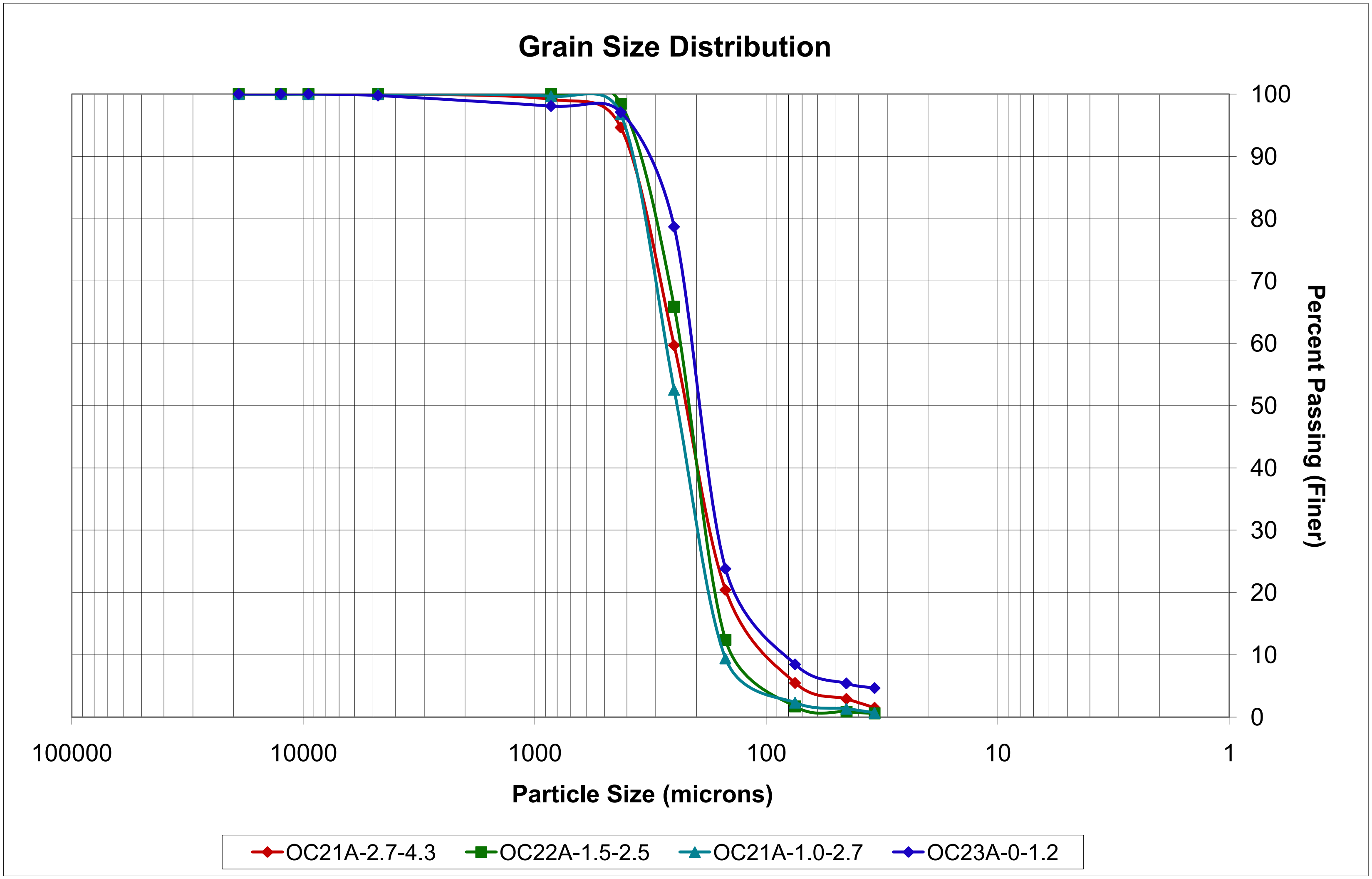
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-5



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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-5

ASTM D-2937 (g/cm3)	OC15A-0.5-1.5	OC15A-4.2-5.2	OC14Deep-8.0-10.6	OC20A-0.5-1.7
Matrix	Soil	Soil	Soil	Soil
Bulk Density	**1.14**	**1.28**	**1.00**	**1.07**

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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-5

ASTM D-2937 (g/cm3)	**OC21A-0.0-1.0**	**OC21A-2.7-4.3**	**OC22A-1.5-2.5**	**QC21A-1.0-2.7**	**OC23A-0-1.2**
Matrix	Soil	Soil	Soil	Soil	Soil
Bulk Density	**1.03**	**1.12**	**1.05**	**0.87**	**1.14**

EI # IV ①

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Chain of Custody Record

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Tel: 206-352-3790
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Laboratory Project No (internal): CHM100513-5

Date: ______ Page: ______ of: ______

Client: Environment International

Address:

City, State, Zip: Seattle WA

Tel:

Project Name: CCT Coring Study

Location:

Collected by:

Reports To (PM):

Fax:

Email:

Project No:

	Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx/Dx Ext.	SEMI VOL 8270C	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals* 8oz Total (T) / Dissolved (D)	Anions (IC)**	TOC - 4oz	GS	Bulk Density 16oz		Comments/Depth
1	OC15A-0.5-1.5	11:35	sed	various	5/9/10											X		X	X	X		3 bottles
2	OC15A-4.2-5.2	11:30	sed	various	5/9/10											X		X	X	X		"
3	OC14 Deep-8.0-10.6	6:15p	sed	various	5/10/10											X		X	X	X		"
4	OC15Deep-9.0-9.8	1:15p	"	8oz	5/11/10											X						one bottle
5	OC20A-0.5-1.7	2:30p	"	various	5/11/10											X		X	X	X		3 bottles
6	OC21A-0.0-1.0	3:30p	"	"	"											X		X	X	X		"
7	OC21A-2.7-4.3	3:40	"	"	"											X		X	X	X		"
8	OC22A-1.5-2.5	4:20	"	"	"											X		X	X	X		"
9	OC21Deep2-0-1.1	11:40	"	8oz	5/12/10											X						1 bottle
10	OC21A-1.0-2.1	2:05	"	various	5/12											X		X	X	X		3 bottles

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Relinquished	Date/Time	Received	Date/Time
x [signature]	5/13/10	[signature]	5/13/10 14:28
x		x	

Sample Receipt:	
Good?	Y
Cooler Temperature:	8.0
Seals Intact?:	N/A
Total Number of Containers:	36

Special Remarks:

TAT --> 24HR 48HR Standard

Distribution: White - Lab, Yellow - File, Pink - Originator

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EI IV ②

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Chain of Custody Record

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Date: ______

Laboratory Project No (internal): ______

Page: ______ of: ______

Client: EI

Address:

City, State, Zip

Tel:

Project Name: CCT Coring

Location:

Collected by:

Reports To (PM):

Fax:

Email:

Project No:

	Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx/Dx Ext.	SEMI VOL 8270C	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals* 802 Total (T) / Dissolved (D)	Anions (IC)**		GS	Split	TOC	Comments/Depth
1	OC21A-1.0-2.7 MS/MSD	2:15p	sed	various	5/12/10											X					X	2 bottles
2	OC921A-1.0-2.7	2:10p	sed	"	"											X					X	2 bottles
3	OC23A-0-1.2	1:30p	sed	"	"											X			X		X	3 bottles
4	OC923A-0-1.2	2:20p	sed	"	5/12/10											X					X	2 bottles
5	Rinsate Blank	2:55	DI water	250	5/12											X						1 bottle
6																						
7																						
8																						
9																						
10																						

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Relinquished	Date/Time	Received	Date/Time	Sample Receipt:		Special Remarks:
x [signature]	5/13/10	x [signature]	5/13/10 14:25	Good?		
				Cooler Temperature:		
Relinquished	Date/Time	Received	Date/Time	Seals Intact?:		
x		x		Total Number of Containers:		TAT -> 24HR 48HR Standard

Distribution: White - Lab, Yellow - File, Pink - Originator

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Environment International
Attn: Jennifer Arthur
5505 34th Ave. NE
Seattle, WA 98105

RE: UCR Sediment Coring
Fremont Project No: CHM100513-6

May 26th, 2010

Jennifer:

Enclosed are the analytical results for the ***UCR Sediment Coring*** soil and water samples to Fremont Analytical on Tuesday May 13th, 2010.

Sample Receipt:
The samples were received in good condition - in the proper containers, properly sealed, labeled and within holding time. The samples were received in 7 – 16oz soils jars, 7 – 8oz soil jars, 9 – 4oz soil jars and 1 – 250mL HDPE bottles. The samples were received in a cooler with wet ice, with a cooler temperature of 7.9°C, which is within the laboratory recommended cooler temperature range (<4°C - 10°C). The samples were stored in a refrigeration unit at the USEPA-recommended temperature of 4°C ± 2°C.

Sample Analysis:
Examination of these samples was conducted for the presence of the following:

- ***Total Metals (TAL) by EPA Method 6020***
- ***Total Organic Carbon by EPA Method 9060A***
- ***Grain Size by ASTM D422***
- ***Bulk Density by ASTM D-2937***

These applications were performed under Washington State Department of Ecology accreditation parameters. All appropriate Quality Assurance / Quality Control method parameters have been applied.

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info@fremontanalytical.com

RE: UCR Sediment Coring
Fremont Project No: CHM100513-6

____

Laboratory Notations (SW6020):

- The *Laboratory Control Samples (LCS)* were within range for all analytes.
- Matrix interferences were present:
  - Sample ID: Batch *100516-5-10*: The *Matrix Spike (MS) and MS Duplicate (MSD)* showed poor recoveries due to high concentrations of the analytes and due to the sample matrix. *Post Digestion Spikes (PDS)* were included.
  - Sample ID: OC10A-0.4-1.3: The *MS* showed poor recoveries due to high concentrations of the analytes and due to the sample matrix. *Post Digestion Spikes (PDS)* were included.

Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical!

Sincerely,

Michael Dee
Sr. Chemist / Principal
mikedee@fremontanalytical.com

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 6020 (mg/kg)	**MRL**	**Method Blank**	**Method Blank**	**LCS**	**LCS**
Date Extracted		5/20/10	5/20/10	5/20/10	5/20/10
Date Analyzed		5/21/10	5/21/10	5/21/10	5/21/10
Matrix					
Aluminum (Al)	5.5	nd	nd	128%	136%
Antimony (Sb)	0.20	nd	nd	87%	89%
Arsenic (As)	0.10	nd	nd	89%	89%
Barium (Ba)	0.50	nd	nd	96%	100%
Beryllium (Be)	0.20	nd	nd	99%	118%
Cadmium (Cd)	0.05	nd	nd	107%	79%
Calcium (Ca)	10	nd	**13.1**	108%	111%
Chromium (Cr)	0.20	nd	nd	87%	91%
Cobalt (Co)	0.20	nd	nd	89%	92%
Copper (Cu)	0.10	nd	nd	89%	92%
Iron (Fe)	20	nd	nd	111%	116%
Lead (Pb)	0.50	nd	nd	80%	80%
Magnesium (Mg)	10	nd	nd	124%	133%
Manganese (Mn)	0.20	nd	nd	129%	145%
Mercury (Hg)	0.05	**0.051**	nd	96%	96%
Nickel (Ni)	0.10	nd	nd	89%	92%
Potassium (K)	50	nd	**173**	113%	139%
Selenium (Se)	0.50	nd	nd	86%	74%
Silver (Ag)	0.10	nd	nd	87%	87%
Sodium (Na)*	10	**128**	nd	134%	148%
Thallium (Tl)	0.20	nd	nd	77%	79%
Vanadium (V)	0.10	nd	nd	81%	83%
Zinc (Zn)	0.40	**0.584**	nd	86%	93%

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"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 6020 (mg/kg)	MRL	BSB6AConf-3.4-3.7	BSB6AConf-2.4-3.4	BSB6AConf-0.5-1.5
Date Extracted		5/20/10	5/20/10	5/20/10
Date Analyzed		5/21/10	5/21/10	5/21/10
Matrix		Soil	Soil	Soil
Aluminum (Al)	5.5	**7540**	**21,200**	**23,100**
Antimony (Sb)	0.20	**2.55**	**6.48**	**3.86**
Arsenic (As)	0.10	**3.00**	**9.91**	**7.17**
Barium (Ba)	0.50	**242**	**663**	**522**
Beryllium (Be)	0.20	**0.299**	**0.996**	**1.31**
Cadmium (Cd)	0.05	**0.592**	**2.07**	**1.56**
Calcium (Ca)	10	**14,000**	**53,500**	**55,400**
Chromium (Cr)	0.20	**17.6**	**70.9**	**57.9**
Cobalt (Co)	0.20	**5.89**	**17.7**	**22.1**
Copper (Cu)	0.10	**173**	**1060**	**1060**
Iron (Fe)	20	**36,900**	**187,000**	**202,000**
Lead (Pb)	0.50	**76.6**	**520**	**294**
Magnesium (Mg)	10	**6500**	**5770**	**6660**
Manganese (Mn)	0.20	**1450**	**7890**	**8480**
Mercury (Hg)	0.05	**0.0639**	**0.212**	**0.177**
Nickel (Ni)	0.10	**10.3**	**8.51**	**9.33**
Potassium (K)	50	**3590**	**7810**	**9410**
Selenium (Se)	0.50	nd	nd	**1.03**
Silver (Ag)	0.10	**0.302**	**1.28**	**1.34**
Sodium (Na)*	10	**303**	**1230**	**1680**
Thallium (Tl)	0.20	**0.959**	**6.11**	**3.53**
Vanadium (V)	0.10	nd	nd	nd
Zinc (Zn)	0.40	**2850**	**20,200**	**18,100**

"nd" Indicates no detection at the listed reporting limits
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"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 6020 (mg/kg)	MRL	OC18A-4.1-5.1	OC18A-0.5-2.0	OC18A-3.3-3.5
Date Extracted		5/20/10	5/20/10	5/20/10
Date Analyzed		5/21/10	5/21/10	5/21/10
Matrix		Soil	Soil	Soil
Aluminum (Al)	5.5	**7980**	**12,900**	**8280**
Antimony (Sb)	0.20	**3.36**	**9.87**	**3.08**
Arsenic (As)	0.10	**9.61**	**10.0**	**5.82**
Barium (Ba)	0.50	**480**	**524**	**391**
Beryllium (Be)	0.20	**0.488**	**0.821**	**0.918**
Cadmium (Cd)	0.05	**5.79**	**3.61**	**3.11**
Calcium (Ca)	10	**65,200**	**34,700**	**33,300**
Chromium (Cr)	0.20	**19.8**	**47.8**	**23.2**
Cobalt (Co)	0.20	**6.65**	**14.2**	**8.07**
Copper (Cu)	0.10	**245**	**643**	**241**
Iron (Fe)	20	**53,000**	**95,200**	**46,700**
Lead (Pb)	0.50	**365**	**358**	**295**
Magnesium (Mg)	10	**27400**	**8820**	**12700**
Manganese (Mn)	0.20	**1970**	**3360**	**1790**
Mercury (Hg)	0.05	**0.571**	**0.289**	**0.679**
Nickel (Ni)	0.10	**12.1**	**12.1**	**16.0**
Potassium (K)	50	**5990**	**5960**	**5460**
Selenium (Se)	0.50	nd	nd	nd
Silver (Ag)	0.10	**0.712**	**1.15**	**0.629**
Sodium (Na)*	10	**620**	**1050**	**69.6**
Thallium (Tl)	0.20	**4.71**	**4.36**	**3.46**
Vanadium (V)	0.10	nd	nd	nd
Zinc (Zn)	0.40	**4630**	**7430**	**4010**

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"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 6020 (mg/kg)	MRL	OC10A-0.4-1.3	Duplicate OC10A-0.4-1.3	RPD %	OC10A-1.3-2.3	OC10A-2.3-3.0
Date Extracted		5/20/10	5/20/10		5/20/10	5/20/10
Date Analyzed		5/21/10	5/21/10		5/21/10	5/21/10
Matrix		Soil	Soil		Soil	Soil
Aluminum (Al)	5.5	**18,600**	**19,500**	5%	**20,300**	**16,600**
Antimony (Sb)	0.20	**7.28**	**6.87**	6%	**9.25**	**7.97**
Arsenic (As)	0.10	**8.59**	**8.24**	4%	**14.2**	**14.8**
Barium (Ba)	0.50	**562**	**556**	1%	**796**	**700**
Beryllium (Be)	0.20	**1.28**	**1.25**	2%	**0.758**	**0.635**
Cadmium (Cd)	0.05	**2.76**	**3.01**	9%	**4.40**	**4.88**
Calcium (Ca)	10	**44,000**	**45,900**	4%	**56,100**	**47,200**
Chromium (Cr)	0.20	**49.3**	**54.3**	10%	**72.3**	**54.0**
Cobalt (Co)	0.20	**16.4**	**16.9**	3%	**17.6**	**15.1**
Copper (Cu)	0.10	**787**	**833**	6%	**997**	**806**
Iron (Fe)	20	**143,000**	**153,000**	7%	**180,000**	**135,000**
Lead (Pb)	0.50	**465**	**424**	9%	**806**	**950**
Magnesium (Mg)	10	**7730**	**7610**	2%	**6630**	**8070**
Manganese (Mn)	0.20	**5760**	**6260**	8%	**7140**	**5520**
Mercury (Hg)	0.05	**0.246**	**0.251**	2%	**0.314**	**0.366**
Nickel (Ni)	0.10	**9.18**	**10.1**	9%	**8.83**	**9.44**
Potassium (K)	50	**8690**	**8300**	5%	**6830**	**6050**
Selenium (Se)	0.50	**1.93**	**1.84**	5%	**1.16**	nd
Silver (Ag)	0.10	**1.11**	**1.18**	6%	**1.23**	**0.910**
Sodium (Na)*	10	**1350**	**1250**	8%	**1170**	**690**
Thallium (Tl)	0.20	**4.42**	**4.17**	6%	**9.21**	**7.97**
Vanadium (V)	0.10	nd	nd		nd	nd
Zinc (Zn)	0.40	**13,800**	**14,100**	2%	**19,900**	**12,300**

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"MSD" Indicates Matrix Spike Duplicate
"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 6020 (mg/kg)	MRL	OC10A-3.0-4.6	OC14A-0.5-1.5	OC14A-3.3-4.3	OC14A-5.5-6.6
Date Extracted		5/20/10	5/20/10	5/20/10	5/20/10
Date Analyzed		5/21/10	5/21/10	5/21/10	5/21/10
Matrix		Soil	Soil	Soil	Soil
Aluminum (Al)	5.5	**16,100**	**9450**	**9890**	**7690**
Antimony (Sb)	0.20	**7.91**	**10.8**	**7.73**	**2.39**
Arsenic (As)	0.10	**10.8**	**13.0**	**12.8**	**18.7**
Barium (Ba)	0.50	**786**	**338**	**564**	**121**
Beryllium (Be)	0.20	**0.774**	**0.707**	**0.556**	**0.300**
Cadmium (Cd)	0.05	**4.04**	**5.57**	**7.18**	**15.4**
Calcium (Ca)	10	**49,600**	**33,200**	**75,300**	**60,100**
Chromium (Cr)	0.20	**51.0**	**32.1**	**26.4**	**15.4**
Cobalt (Co)	0.20	**13.1**	**11.5**	**8.23**	**7.37**
Copper (Cu)	0.10	**706**	**384**	**277**	**157**
Iron (Fe)	20	**120,000**	**16,400**	**65,000**	**32,700**
Lead (Pb)	0.50	**564**	**129**	**714**	**668**
Magnesium (Mg)	10	**10,400**	**7590**	**31,100**	**25,600**
Manganese (Mn)	0.20	**4900**	**575**	**1280**	**1280**
Mercury (Hg)	0.05	**0.384**	**0.271**	**0.292**	**1.28**
Nickel (Ni)	0.10	**9.18**	**8.44**	**9.18**	**14.8**
Potassium (K)	50	**6720**	**2350**	**3480**	**5590**
Selenium (Se)	0.50	nd	nd	nd	nd
Silver (Ag)	0.10	**0.752**	**1.37**	**0.578**	**0.971**
Sodium (Na)*	10	**732**	**182**	**406**	**474**
Thallium (Tl)	0.20	**4.87**	**1.82**	**4.66**	**8.39**
Vanadium (V)	0.10	nd	nd	nd	nd
Zinc (Zn)	0.40	**8510**	**1060**	**2800**	**3940**

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"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 6020 (mg/kg)	**MRL**	MS *Batch 100516-5-10*	MSD *Batch 100516-5-10*	**RPD %**	MS **OC10A-0.4-1.3**
Date Extracted		5/20/10	5/20/10		5/20/10
Date Analyzed		5/21/10	5/21/10		5/21/10
Matrix		Soil	Soil		Soil
Aluminum (Al)	5.5	163%	133%	21%	114%
Antimony (Sb)	0.20	20%	11%	56%	-
Arsenic (As)	0.10	83%	87%	5%	81%
Barium (Ba)	0.50	120%	121%	1%	68%
Beryllium (Be)	0.20	95%	93%	3%	111%
Cadmium (Cd)	0.05	78%	90%	14%	80%
Calcium (Ca)	10	-	56%		75%
Chromium (Cr)	0.20	82%	84%	3%	82%
Cobalt (Co)	0.20	83%	83%	0%	82%
Copper (Cu)	0.10	102%	75%	31%	61%
Iron (Fe)	20	-	-		169%
Lead (Pb)	0.50	83%	58%	36%	87%
Magnesium (Mg)	10	143%	141%	2%	118%
Manganese (Mn)	0.20	-	44%		-
Mercury (Hg)	0.05	97%	97%	1%	92%
Nickel (Ni)	0.10	80%	83%	4%	81%
Potassium (K)	50	153%	124%	21%	108%
Selenium (Se)	0.50	65%	72%	10%	62%
Silver (Ag)	0.10	76%	79%	4%	64%
Sodium (Na)*	10	130%	126%	3%	127%
Thallium (Tl)	0.20	76%	74%	3%	75%
Vanadium (V)	0.10	-	-		-
Zinc (Zn)	0.40	-	-		-

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"MSD" Indicates Matrix Spike Duplicate
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Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 2700 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb = 5 µg/L
Tl = 2.5 µg/L
Be = 20 µg/L

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Analysis of Total Metals (TAL) in Soil by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

		PDS	PDS
EPA 6020 (mg/kg)	**MRL**	**OC21Deep2-0-1.1**	**BSB6AConf-3.4-3.7**
Date Extracted		5/20/10	5/20/10
Date Analyzed		5/21/10	5/21/10
Matrix		Soil	Soil
Aluminum (Al)	5.5	119%	113%
Antimony (Sb)	0.20	111%	111%
Arsenic (As)	0.10	103%	100%
Barium (Ba)	0.50	107%	101%
Beryllium (Be)	0.20	105%	108%
Cadmium (Cd)	0.05	100%	99%
Calcium (Ca)	10	103%	102%
Chromium (Cr)	0.20	102%	100%
Cobalt (Co)	0.20	104%	100%
Copper (Cu)	0.10	95%	98%
Iron (Fe)	20	169%	77%
Lead (Pb)	0.50	87%	97%
Magnesium (Mg)	10	118%	116%
Manganese (Mn)	0.20	86%	167%
Mercury (Hg)	0.05	91%	96%
Nickel (Ni)	0.10	103%	101%
Potassium (K)	50	115%	120%
Selenium (Se)	0.50	93%	104%
Silver (Ag)	0.10	100%	94%
Sodium (Na)*	10	132%	126%
Thallium (Tl)	0.20	99%	102%
Vanadium (V)	0.10	88%	84%
Zinc (Zn)	0.40	20%	117%

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"PDS" Indicates Post Digestion Spike
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
- Fe, Na, Al, K, Ca = 50%
- Other = 30%

Acceptable Spike Recovery Limits
- Fe, Na, Al, K, Ca = 50% - 150%
- Other = 65% - 135%

Spike Concentration:
- As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
- Fe, Na, Al, K, Ca = 2700 µg/L
- Pb = 50 µg/L
- Se, Hg = 10 µg/L
- Cd, Ag, Sb = 5 µg/L
- Tl = 2.5 µg/L
- Be = 20 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 6020 (µg/L)	MRL	Method Blank	LCS	Rinsate Blank 5/8/2010	Rinsate Blank 5/10/2010
Date Extracted		5/13/10	5/13/10	5/13/10	5/13/10
Date Analyzed		5/13/10	5/13/10	5/13/10	5/13/10
Matrix				Water	Water
Aluminum (Al)	55	nd	93%	nd	nd
Antimony (Sb)	0.2	nd	117%	nd	nd
Arsenic (As)	1.0	nd	94%	nd	nd
Barium (Ba)	0.3	nd	95%	nd	nd
Beryllium (Be)	0.2	nd	87%	nd	nd
Cadmium (Cd)	0.2	nd	97%	nd	nd
Calcium (Ca)	100	nd	96%	**1310**	**10,900**
Chromium (Cr)	0.6	nd	76%	nd	nd
Cobalt (Co)	0.3	nd	77%	nd	nd
Copper (Cu)	0.4	nd	98%	**1.32**	**1.38**
Iron (Fe)	100	nd	97%	nd	**113**
Lead (Pb)	0.2	nd	98%	nd	**3.88**
Magnesium (Mg)	100	nd	97%	**202**	nd
Manganese (Mn)	2.0	nd	81%	**2.86**	**4.68**
Mercury (Hg)	0.3	nd	120%	nd	nd
Nickel (Ni)	0.5	nd	96%	**0.500**	**0.560**
Potassium (K)	500	nd	127%	**1620**	**1762**
Selenium (Se)	1.0	nd	97%	nd	nd
Silver (Ag)	0.2	nd	95%	nd	nd
Sodium (Na)	100	nd	96%	**306**	**1350**
Thallium (Tl)	0.20	nd	96%	nd	nd
Vanadium (V)	0.50	nd	91%	nd	nd
Zinc (Zn)	1.5	nd	98%	**16.7**	**31.7**

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"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 1250 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb, Be = 5 µg/L
Tl = 2.5 µg/L

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Analysis of Total Metals (TAL) in Water by EPA Method 6020

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 6020 (µg/L)	MRL	QA Sample Batch 100513-5-15	QA Duplicate Batch 100513-5-15	MS Batch 100511-6-1	MSD Batch 100511-6-1	RPD %
Date Extracted		5/13/10	5/13/10	5/13/10	5/13/10	
Date Analyzed		5/13/10	5/13/10	5/13/10	5/13/10	
Matrix		Water	Water	Water	Water	
Aluminum (Al)	55	nd	nd	96%	96%	0%
Antimony (Sb)	0.2	nd	nd	121%	124%	2%
Arsenic (As)	1.0	nd	nd	96%	98%	2%
Barium (Ba)	0.3	nd	nd	101%	102%	1%
Beryllium (Be)	0.2	nd	nd	85%	84%	0.5%
Cadmium (Cd)	0.2	nd	nd	101%	102%	1%
Calcium (Ca)	100	nd	nd	93%	94%	1%
Chromium (Cr)	0.6	nd	nd	76%	77%	1%
Cobalt (Co)	0.3	nd	nd	75%	76%	1%
Copper (Cu)	0.4	nd	nd	97%	99%	2%
Iron (Fe)	100	nd	nd	106%	98%	8%
Lead (Pb)	0.2	nd	nd	99%	100%	1%
Magnesium (Mg)	100	nd	nd	108%	108%	0.1%
Manganese (Mn)	2.0	nd	nd	88%	66%	29%
Mercury (Hg)	0.3	nd	nd	102%	103%	0.4%
Nickel (Ni)	0.5	nd	nd	94%	96%	2%
Potassium (K)	500	nd	nd	101%	112%	10%
Selenium (Se)	1.0	nd	nd	92%	100%	8%
Silver (Ag)	0.2	nd	nd	82%	83%	2%
Sodium (Na)	100	nd	nd	130%	134%	3%
Thallium (Tl)	0.20	nd	nd	97%	99%	1%
Vanadium (V)	0.50	nd	nd	102%	103%	0.6%
Zinc (Zn)	1.5	nd	nd	106%	101%	5%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD Limits:
Fe, Na, Al, K, Ca = 50%
Other = 30%

Acceptable Spike Recovery Limits
Fe, Na, Al, K, Ca = 50% - 150%
Other = 65% - 135%

Spike Concentration:
As, Cr, Ba, V, Mn, Mg, Co, Ni, Cu, Zn = 100 µg/L
Fe, Na, Al, K, Ca = 1250 µg/L
Pb = 50 µg/L
Se, Hg = 10 µg/L
Cd, Ag, Sb, Be = 5 µg/L
Tl = 2.5 µg/L

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**Method Blank**	**LCS**	**LCS**	**BSB6AConf-2.4-3.4**	**BSB6AConf-0.5-1.5**
Date Analyzed		5/24/10	5/24/10	5/25/10	5/24/10	5/24/10
Matrix					Soil	Soil
Total Organic Carbon	0.5	nd	100%	111%	nd	nd

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**OC18A-4.1-5.1**	**OC18A-0.5-2.0**	**OC10A-0.4-1.3**	**OC10A-1.3-2.3**
Date Analyzed		5/24/10	5/24/10	5/24/10	5/24/10
Matrix		Soil	Soil	Soil	Soil
Total Organic Carbon	0.5	**0.571**	**1.94**	**0.308**	**0.189**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 9060A *(Percent Organic Carbon by Weight)*	MRL	OC10A-2.3-3.0	Duplicate OC10A-2.3-3.0	RPD %	OC10A-3.0-4.6	OC14A-0.5-1.5
Date Analyzed		5/24/10	5/25/10		5/24/10	5/24/10
Matrix		Soil	Soil		Soil	Soil
Total Organic Carbon	0.5	**0.444**	**0.487**	9%	**0.620**	**2.52**

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Total Organic Carbon by EPA Method 9060A

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

EPA 9060A *(Percent Organic Carbon by Weight)*	**MRL**	**OC14A-3.3-4.3**	**OC14A-5.5-6.6**	MS *Batch* *100513-5-11*	MSD *Batch* *100513-5-11*	**RPD** **%**
Date Analyzed		5/24/10	5/25/10	5/25/10	5/25/10	
Matrix		Soil	Soil	Soil	Soil	
Total Organic Carbon	0.5	**2.33**	**2.88**	127%	126%	1%

"nd" Indicates no detection at the listed reporting limits
"int" Indicates that interference prevents determination
"J" Indicates estimated value
"MRL" Indicates Method Reporting Limit
"LCS" Indicates Laboratory Control Sample
"MS" Indicates Matrix Spike
"MSD" Indicates Matrix Spike Duplicate
"RPD" Indicates Relative Percent Difference

Acceptable RPD is determined to be less than 30%
Acceptable Recovery Limits:
LCS, LCSD, MS, MSD: 65% to 135%
Spike Concentration = 0.05 % by Weight (gm)

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

Percent Finer (Passing) Than the Indicated Size

UOM = percent

Sieve Size	3/4"	1/2"	3/8"	#4	#20	#40	#60	#100	#200	#325	#450
Particle Size (microns)	19000	12500	9500	4750	850	425	250	150	75	45	34
BSB6ACONF-2.4-3.4	100.00	100.00	100.00	100.00	99.05	41.20	3.51	0.83	0.81	0.81	0.81
BSB6ACONF-0.5-1.5	100.00	100.00	100.00	100.00	99.05	26.32	3.34	0.66	0.52	0.52	0.52
OC18A-4.1-5.1	100.00	100.00	100.00	100.00	98.23	97.54	75.48	18.37	4.78	2.70	2.01
OC18A-0.5-2.0	100.00	100.00	100.00	100.00	96.55	77.53	44.26	12.96	2.67	1.28	0.75
OC10A-0.4-1.3	100.00	100.00	100.00	100.00	96.91	46.77	7.42	1.32	0.40	0.34	0.34
OC10A-1.3-2.3	100.00	100.00	100.00	99.80	96.17	49.56	12.25	1.11	0.57	0.50	0.41
0C10A-2.3-3.0	100.00	100.00	100.00	100.00	98.77	64.06	14.42	2.86	2.25	2.25	2.25
OC10A-3.0-4.6	100.00	100.00	100.00	100.00	97.85	62.15	27.15	7.24	2.34	1.16	0.80
OC14A-0.5-1.5	100.00	100.00	100.00	100.00	99.50	98.38	96.62	73.95	21.77	8.38	2.78
OC14A-3.3-4.3	100.00	100.00	100.00	100.00	96.64	84.19	77.39	59.97	23.59	8.45	3.95
OC14A-5.5-6.6	100.00	100.00	100.00	100.00	99.32	98.30	91.20	49.00	11.44	3.01	2.04

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Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

Percent Retained in each Size Fraction

UOM = percent

Sieve Size (microns)	>19000	19000-12500	12500-9500	9500-4750	4750-850	850-425	425-250	250-150	150-75	75-45	45-34	<34
BSB6ACONF-2.4-3.4	0.0	0.0	0.0	0.0	1.0	57.8	37.7	2.7	0.0	0.0	0.0	0.0
BSB6ACONF-0.5-1.5	0.0	0.0	0.0	0.0	1.0	72.7	23.0	2.7	0.1	0.0	0.0	0.0
OC18A-4.1-5.1	0.0	0.0	0.0	0.0	1.8	0.7	22.1	57.1	13.6	2.1	0.7	0.1
OC18A-0.5-2.0	0.0	0.0	0.0	0.0	3.5	19.0	33.3	31.3	10.3	1.4	0.5	0.7
OC10A-0.4-1.3	0.0	0.0	0.0	0.0	3.1	50.1	39.4	6.1	0.9	0.1	0.0	0.0
OC10A-1.3-2.3	0.0	0.0	0.0	0.2	3.6	46.6	37.3	11.1	0.5	0.1	0.1	0.0
0C10A-2.3-3.0	0.0	0.0	0.0	0.0	1.2	34.7	49.6	11.6	0.6	0.0	0.0	0.0
OC10A-3.0-4.6	0.0	0.0	0.0	0.0	2.2	35.7	35.0	19.9	4.9	1.2	0.4	0.3
OC14A-0.5-1.5	0.0	0.0	0.0	0.0	0.5	1.1	1.8	22.7	52.2	13.4	5.6	2.5
OC14A-3.3-4.3	0.0	0.0	0.0	0.0	3.4	12.4	6.8	17.4	36.4	15.1	4.5	3.9
OC14A-5.5-6.6	0.0	0.0	0.0	0.0	0.7	1.0	7.1	42.2	37.6	8.4	1.0	0.5

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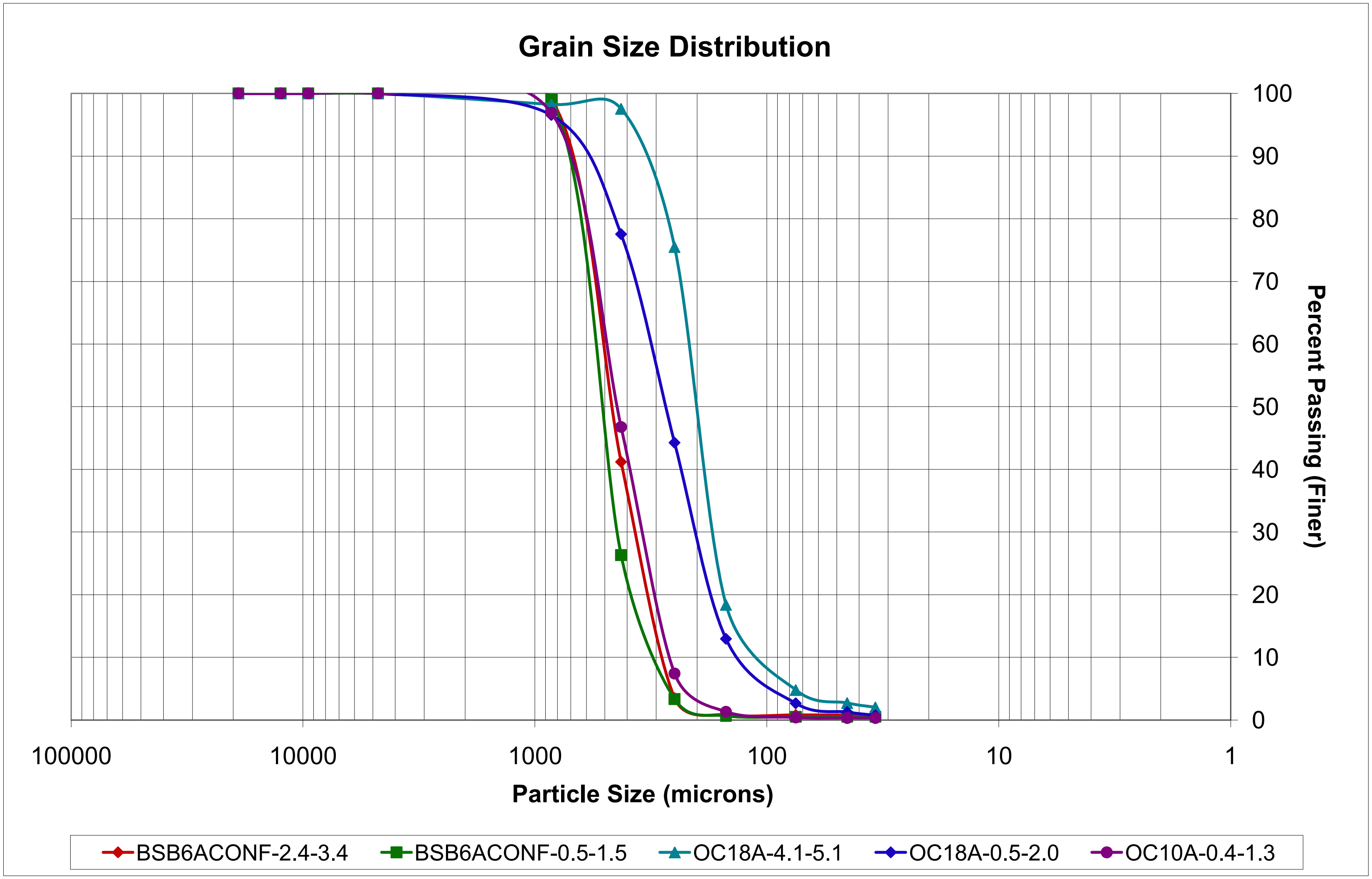
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6



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Grain Size by ASTM D422

Project: UCR Sediment Coring
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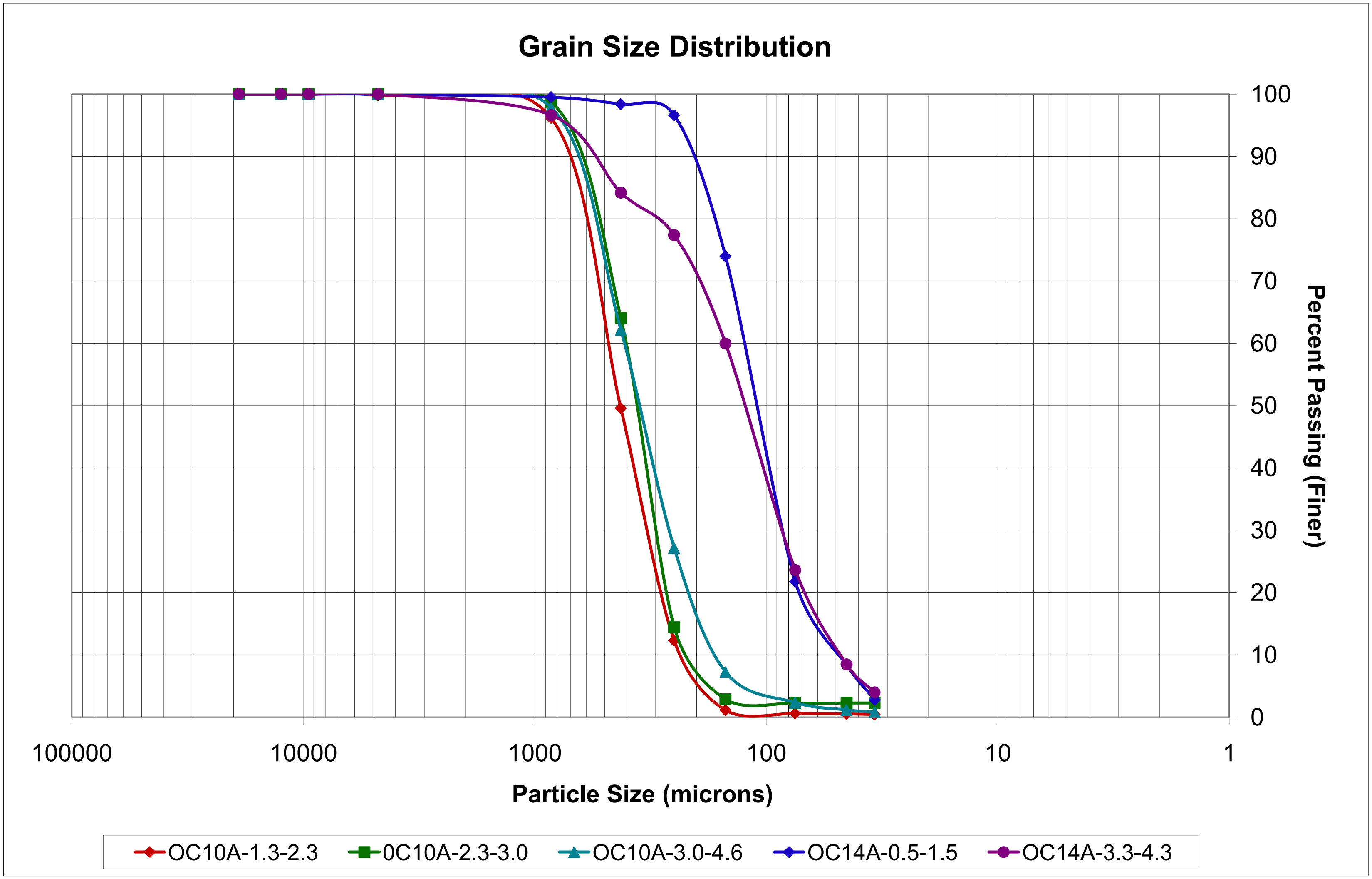
Client Project #: N/A
Lab Project #: CHM100513-6



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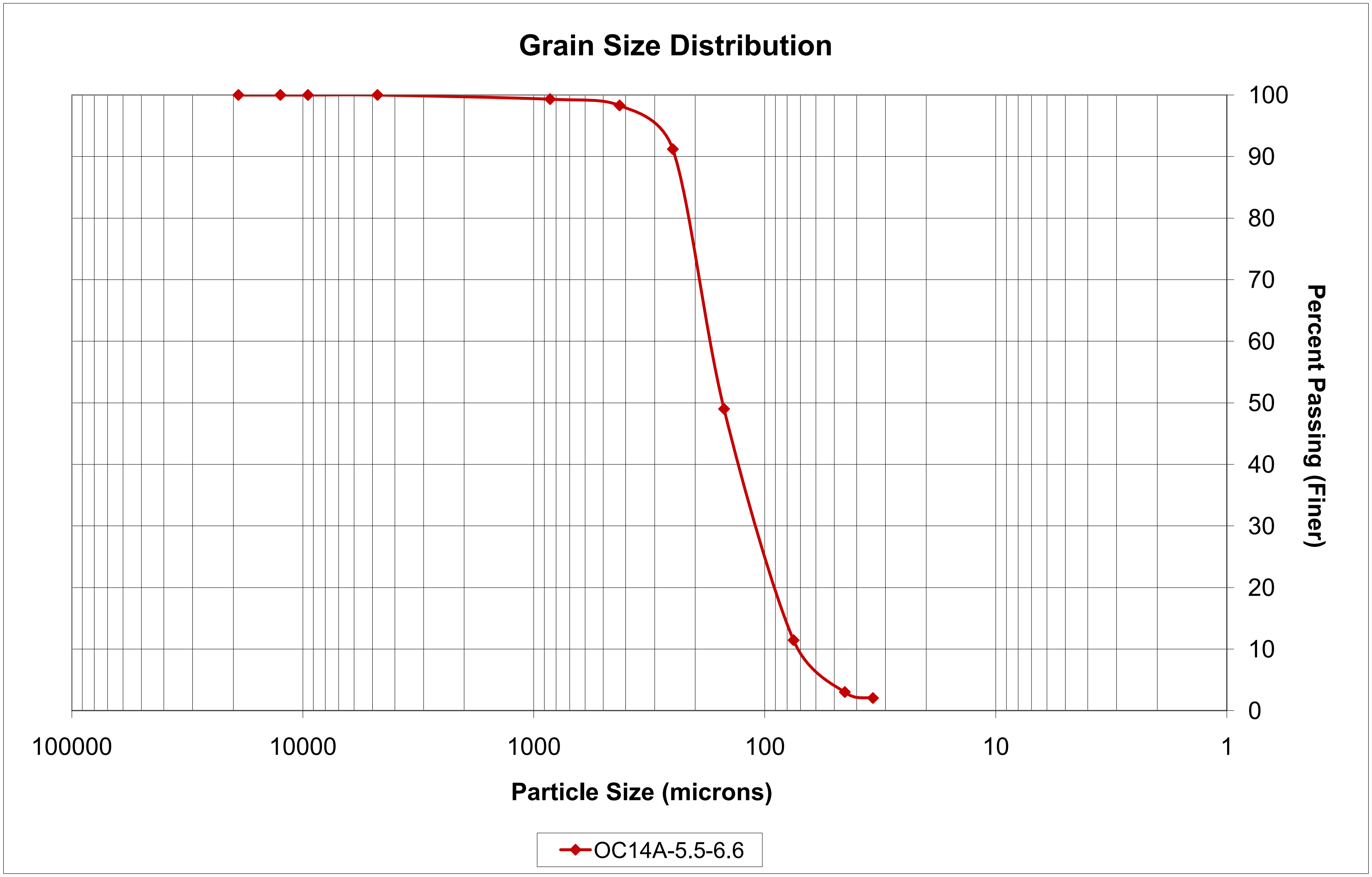
Grain Size by ASTM D422

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6



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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

ASTM D-2937 (g/cm3)	BSB6AConf-2.4-3.4	BSB6AConf-0.5-1.5	OC18A-4.1-5.1	OC18A-0.5-2.0
Matrix	Soil	Soil	Soil	Soil
Bulk Density	**1.41**	**1.29**	**1.03**	**1.21**

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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

ASTM D-2937 (g/cm3)	OC10A-0.4-1.3	OC10A-1.3-2.3	OC10A-2.3-3.0	OC10A-3.0-4.6
Matrix	Soil	Soil	Soil	Soil
Bulk Density	**1.32**	**1.33**	**1.38**	**1.42**

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Bulk Denisty by ASTM D-2937

Project: UCR Sediment Coring
Client: Environment International
Client Project #: N/A
Lab Project #: CHM100513-6

ASTM D-2937 (g/cm3)	OC14A-0.5-1.5	OC14A-3.3-4.3	OC14A-5.5-6.6
Matrix	Soil	Soil	Soil
Bulk Density	**0.99**	**1.22**	**1.13**

EI III 1 TOC GS TALMetals

Fremont Analytical

Chain of Custody Record

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Fax: 206-352-7178

Laboratory Project No (internal): CHM100513-6

Date:

Page: 1 of:

Client: Environment International - Jennifer Arthur

Project Name: CCT Coring Study

Address:

Location:

City, State, Zip: Seattle WA 98103 Tel: (206)5253362

Collected by:

Reports To (PM): Fax: Email: Project No:

Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx/Dx Ext.	SEMI VOL 8270C	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals* 8oz Total (T) Dissolved (D)	Anions (IC)**	GS	Bulk Density 16oz	TOC 4oz		Comments/Depth
1 BSB6AConf-3.4-3.7	2:15	sed.	various	5/8/10											X						1 bottle - 8oz
2 BSB6AConf-2.4-3.4	2:10	sed	various	5/8/10											X		X		X		3 bottles
3 BSB6AConf-0.5-1.5	2:20	sed	various	5/8/10											X		X		X		3 bottles
4 Rinsate Blank	4:00	rinsate DI water	250	5/8/10											X						plastic bottle
5 ~~OC15A-4.2-5.2~~	~~11:30~~	~~sed~~	~~various~~	~~5/9/10~~											~~X~~		~~X~~		~~X~~		~~3 bottles~~
6 ~~OC15A-0.5-1.5~~	~~11:35~~	~~sed~~	~~various~~	~~5/9/10~~											~~X~~		~~X~~		~~X~~		~~3 bottles~~
7 OC18A-4.1-5.1	17:20	Sed	various	5/9/10											X		X		X		3 bottles
8 OC18A-0.5-2.0	16:50	Sed	Various												X		X		X		3 bottles
9 OC18A-3.3-3.5	16:55	Sed	various												X						1 bottle
10 OC10A-0.4-1.3	1:30	sed	various	5/10/10											X		X		X		3 bottles

moved to another cooler

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL Individual: Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Relinquished	Date/Time	Received	Date/Time	Sample Receipt:		Special Remarks:
x [signature]	5/13/10	x [signature]	5/13/10 14:28	Good?	Y	
Relinquished	Date/Time	Received	Date/Time	Cooler Temperature:	8.0	
x		x		Seals Intact?:	n/A	
				Total Number of Containers:	37	TAT → 24HR 48HR Standard

EI III 2

Chain of Custody Record

Fremont Analytical

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Laboratory Project No (internal): CHM100513-6

Date:

Page: of:

Client: Environment International CCT

Project Name: CCT Coring Study

Address:

Location:

City, State, Zip

Tel:

Collected by:

Reports To (PM):

Fax:

Email:

Project No:

	Sample Name	Time	Sample Type (Matrix)	Container Type	Date of Collection	VOA 8260	VOA 8021B BTEX	NWTPH-Gx	NWTPH-HCID	NWTPH-Dx/Dx Ext.	SEMI VOL 8270DC	PAH 8270	PCBs 8082	Cl PESTICIDES 8081	Cl HERBICIDES 8151A	Metals* 8oz	Total (T) / Dissolved (D)	Anions (IC)**	TOC - 4oz	GS	Bulk Density 16oz		Comments/Depth
1	OC10A-1.3-2.3	1:35	5/10/10	various													X		X	X			3 bottles
2	OC10A-2.3-3.0	1:40	5/10/10	various													X		X	X			
3	OC10A-3.0-4.6	1:45	5/10/10														X		X	X			
4	OC14A-0.5-1.5	4:35	5/10/10														X		X	X			
5	OC14A-3.3-4.3	4:45	5/10/10														X		X	X			
6	OC14A-5.5-6.6	4:40	5/10/10														X		X	X			
7	Rinsate Blank	6:15	5/10/10	250													X						1 bottle
8	~~[illegible]~~			~~various~~													~~X~~		~~X~~	~~X~~			
9	↳ moved to another cooler																						
10																							

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Relinquished	Date/Time	Received	Date/Time	Sample Receipt:		Special Remarks:
x [signature]	5/13/10	x [signature]	5/13/10 14:28	Good?		
Relinquished	Date/Time	Received	Date/Time	Cooler Temperature:		
x		x		Seals Intact?:		
				Total Number of Containers:		TAT --> 24HR 48HR Standard

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DATA VALIDATION REVIEW REPORT – EPA LEVEL 2

Project:	Upper Columbia River
Project Number:	100186-01
Date:	August 4, 2010

This report summarizes the review of analytical results for 78 sediment samples collected on April 30, May 1-2, and 4-12, 2010. Samples were collected by Environment International, and submitted to Fremont Analytical (Fremont) in Seattle, Washington. Samples were analyzed for the following:

- Total metals by United States Environmental Protection Agency (USEPA) method 6020
- Total organic carbon (TOC) by USEPA method 9060A
- Grain size by ASTM D422M
- Bulk density by ASTM D2937

Fremont sample data group (SDG) numbers CHM100504-1, CHM100504-2, CHM100507-1, CHM100507-7, CHM100511-3, CHM100511-4, CHM100513-5, and CHM100513-6 were reviewed in this report. The samples reviewed are presented in Table 1.

Table 1
Samples Reviewed

Sample ID	Matrix	Analyses Requested
DE#12A-1.5-3.5	Sediment	Metals, TOC, grain size, bulk density
DE#12A-6-12	Sediment	Metals, TOC, grain size, bulk density
DE#11A2-0-1.3	Sediment	Metals, TOC, grain size, bulk density
DE#11A2-2-2.5	Sediment	Metals
DE#10A-1-2	Sediment	Metals, TOC, grain size, bulk density
DE#10A-2.1-2.5	Sediment	Metals, TOC
DE#8C-0-.75	Sediment	Metals, TOC, grain size, bulk density
DE#8C-1.25-2.25	Sediment	Metals, TOC, grain size, bulk density
DE#15A-0-1	Sediment	Metals, TOC, grain size, bulk density
DE#15A-1.9-2.7	Sediment	Metals, TOC, grain size, bulk density
DE#14A-0-.75	Sediment	Metals, TOC, grain size, bulk density
DE#14A-.75-1	Sediment	Metals
DE#14A-1.4-2	Sediment	Metals, TOC, grain size, bulk density

Sample ID	Matrix	Analyses Requested
DE#14A-2-3	Sediment	Metals, TOC, grain size, bulk density
DE#12A-0-1	Sediment	Metals, TOC, grain size, bulk density
DE#8C-4.25-5	Sediment	Metals, TOC, grain size, bulk density
DE#8C-17.0-24.0	Sediment	Metals
DE#8C-17.0C	Sediment	Metals
DE#8C-10-17	Sediment	Metals, TOC
BSB4A-3.5-4.5	Sediment	Metals, TOC, grain size, bulk density
BSB4A-2.5-3.2	Sediment	Metals, TOC, grain size, bulk density
BSB4A-1.5-2.5	Sediment	Metals, TOC, grain size, bulk density
BSB4A-0.9-1.4	Sediment	Metals, TOC
BSB5A-3.0-3.5	Sediment	Metals, TOC, grain size, bulk density
BSB5A-0.75-1.5	Sediment	Metals, TOC, grain size, bulk density
BSB17A-0.75-1.3	Sediment	Metals, TOC, grain size, bulk density
BSB17A-2.0-3.0	Sediment	Metals, TOC, grain size, bulk density
BSB17A-3.75-4.0	Sediment	Metals, TOC, grain size, bulk density
BSB16A-1.5-2.2	Sediment	Metals, TOC, bulk density
BSB16A-0.25-0.75	Sediment	Metals, TOC
BSB15A-0-1	Sediment	Metals, TOC, grain size, bulk density
BSB15A-1-2	Sediment	Metals, TOC, grain size, bulk density
BSB6A-0-1	Sediment	Metals, TOC, grain size, bulk density
BSB6A-1.5-2.5	Sediment	Metals, TOC, grain size, bulk density
BSB6A-2.5-3.5	Sediment	Metals, TOC, grain size, bulk density
BSB6A-4.0-5.0	Sediment	Metals, TOC, grain size, bulk density
BSB3A-0.5-2	Sediment	Metals, TOC, grain size, bulk density
BSB3A-2.3-3.1	Sediment	Metals, TOC, grain size, bulk density
BSB24A-1.2-1.5	Sediment	Metals, TOC, grain size, bulk density
SCB6A-0.5-1.5	Sediment	Metals, TOC, grain size, bulk density
SCB6A-2.8-3.4	Sediment	Metals, TOC, grain size, bulk density
SCB6A-3.6-4.3	Sediment	Metals, TOC, grain size, bulk density
SCB3A-1.3-2.1	Sediment	Metals, TOC, grain size, bulk density
SCB3A-2.5-3.2	Sediment	Metals, TOC, grain size, bulk density
SCB7A-5.6-6.3	Sediment	Metals, TOC, grain size, bulk density
SCB7A-5.0-5.6	Sediment	Metals, TOC, grain size, bulk density
SCB7A-1.0-2.3	Sediment	Metals, TOC, grain size, bulk density
SCB7A-3.6-4.4	Sediment	Metals, TOC, grain size, bulk density
SCB7A-2.3-2.7	Sediment	Metals, TOC, grain size, bulk density
SCB7A-4.4-5.0	Sediment	Metals, TOC, grain size, bulk density
SCB12A-3.1-4.1	Sediment	Metals, TOC, grain size, bulk density
SCB12A-0.5-1.5	Sediment	Metals, TOC, grain size, bulk density
OC15A-0.5-1.5	Sediment	Metals, TOC, grain size, bulk density
OC15A-4.2-5.2	Sediment	Metals, TOC, grain size, bulk density

Sample ID	Matrix	Analyses Requested
OC14Deep-8.0-10.6	Sediment	Metals, TOC, grain size, bulk density
OC14Deep-9.0-9.8	Sediment	Metals
OC20A-0.5-1.7	Sediment	Metals, TOC, grain size, bulk density
OC21A-0.0-1.0	Sediment	Metals, TOC, grain size, bulk density
OC21A-2.7-4.3	Sediment	Metals, TOC, grain size, bulk density
OC22A-1.5-2.5	Sediment	Metals, TOC, grain size, bulk density
OC21Deep2-0-1.1	Sediment	Metals
OC21A-1.0-2.7	Sediment	Metals, TOC, grain size, bulk density
OC23A-0-1.2	Sediment	Metals, TOC, grain size, bulk density
BSB6AConf-3.4-3.7	Sediment	Metals
BSB6AConf-2.4-3.4	Sediment	Metals, TOC, grain size, bulk density
BSB6AConf-0.5-1.5	Sediment	Metals, TOC, grain size, bulk density
OC18A-4.1-5.1	Sediment	Metals, TOC, grain size, bulk density
OC18A-0.5-2.0	Sediment	Metals, TOC, grain size, bulk density
OC18A-3.3-3.5	Sediment	Metals
OC10A-0.4-1.3	Sediment	Metals, TOC, grain size, bulk density
OC10A-1.3-2.3	Sediment	Metals, TOC, grain size, bulk density
OC10A-2.3-3.0	Sediment	Metals, TOC, grain size, bulk density
OC10A-3.0-4.6	Sediment	Metals, TOC, grain size, bulk density
OC14A-0.5-1.5	Sediment	Metals, TOC, grain size, bulk density
OC14A-3.3-4.3	Sediment	Metals, TOC, grain size, bulk density
OC14A-5.5-6.6	Sediment	Metals, TOC, grain size, bulk density

Data Validation and Qualifications

The following comments refer to the laboratory's performance in meeting the quality assurance/quality control (QA/QC) guidelines outlined in the analytical procedures and data quality objective sections of the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP). Laboratory results were reviewed following *USEPA Contract Laboratory Program National Functional Guidelines for Inorganics Data Review* (USEPA 2004) as a guideline, and applying laboratory and method QC criteria as stated in SW 846, Third Edition, *Test Methods for Evaluating Solid Waste*, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998. Unless noted in this report, laboratory results for the samples listed above were within QC criteria.

Field Documentation

Field documentation was checked for completeness and accuracy. The chain-of-custody (COC) forms were signed by Fremont at the time of sample receipt; the samples were received cold and in good condition.

Holding Times and Sample Preservation and Analytical Methods

Samples were appropriately preserved and analyzed within holding times. Sample BSB16A-1.5-2.2 was not analyzed for grain size as requested due to a missing sample container.

Laboratory Method Blanks

Laboratory method blanks were analyzed at the required frequencies. All method blanks were free of target analytes with the following exceptions:

- SDG CHM100504-1 Metals: Calcium was detected in the method blank above the method reporting limit (MRL). Sample results were significantly greater than (>10x) the level found in the method blank so no data were qualified.
- SDG CHM100507-1 and CHM100507-7 Rinsate Blank Metals: Calcium and cobalt were detected in the method blank at levels above the MRLs. Calcium results were significantly greater than (>10x) the level detected in the blank so no data were qualified. Cobalt was not detected in the associated samples with the exception of Rinsate Blank (5/4/2010). This result has been qualified as non-detect.
- SDG CHM100511-3 and CHM100511-4: Sodium and zinc were detected in the method blank at levels above the MRLs. Sample results were significantly greater than (>10x) the level detected in the method blank, so no data were qualified. Calcium and cobalt were detected in the method blank associated with the rinsate blank at levels above the MRLs. Calcium results were significantly greater (10x) than the level detected in the blank and cobalt was not detected in the associated samples, so no data were qualified.
- SDG CHM100513-5 and CHM100513-6: Calcium, mercury, potassium, sodium, and zinc were detected above the MRLs in the method blanks. Associated results were significantly greater than (>10x) the levels detected in the method blanks with the exceptions of some mercury and sodium results, which have been qualified as non-detects.

See Table 4 for qualified data.

Field Quality Control

Rinse Blanks

Ten rinse blanks were collected with these sample sets. Several target analytes were detected in the rinse blanks above detection limits. Detected results are summarized in Table 2. Metals are identified by their atomic symbol. All rinsate blanks had the same sample ID so they are identified by date of collection minus the year. Blanks were all collected in 2010. The rinse blank collected on May 12 had no detected results.

Table 2
Rinse Blank Detections Summary (µg/L)

Analyte	April 30	May 1	May 2	May 4	May 5	May 6	May 7	May 8	May 10
Al	--	72.5	--	136	--	--	--	--	--
Sb	0.95	--	--	0.96	--	--	0.44	--	--
As	--	1.05	--	--	--	--	--	--	--
Ba	4	8.1	2.32	20.2	1.34	1.02	14.5	--	--
Be	25.3	1.25	--	--	--	--	--	--	--
Ca	1950	15000	2610	2810	2730	2128	1330	1310	10900
Cr	0.85	1.25	--	--	--	--	0.44	--	--
Co	--	0.55	--	--	--	--	--	--	--
Cu	1.25	1.75	1.1	16.9	0.980	0.600	4.64	1.32	1.38
Fe	--	--	--	1590	--	--	515	--	113
Pb	0.65	1.65	0.24	1.58	--	0.480	7.7	--	3.88
Mg	108	283	--	--	--	--	219	202	--
Mn	5.3	4.55	3.2	38.7	2.22	2.44	13.8	2.86	4.68
Hg	--	0.65	--	--	--	--	--	--	--
Ni	--	--	0.72	0.5	0.740	0.880	1.28	0.5	0.56
K	--	--	--	--	819	672	--	1620	1760
Na	3030	1040	267	586	405	142	--	306	1350
Tl	0.2	0.25	--	--	--	--	--	--	--
V	--	0.55	--	--	--	--	--	--	--
Zn	7.1	33.5	36.6	153	28.0	24.8	50.5	16.7	31.7

-- Indicates result was below detection.

No data were qualified based on rinse blank results.

Field Duplicates

Five field duplicates were collected in association with these sample sets. Detected results are summarized in Table 3.

Table 3
Field Duplicate Summary

Analyte	DE#12A-1.5-3.5	DE#912A-1.5-3.5	RPD
Aluminum	13800 mg/kg	12000 mg/kg	14%
Antimony	1.88 mg/kg	2.15 mg/kg	13%
Arsenic	7.35 mg/kg	4.43 mg/kg	49%
Barium	299 mg/kg	248 mg/kg	19%
Beryllium	0.791 mg/kg	0.694 mg/kg	13%
Cadmium	2.02 mg/kg	1.97 mg/kg	3%
Calcium	39100 mg/kg	33000 mg/kg	17%
Chromium	51.3 mg/kg	40.7 mg/kg	23%
Cobalt	14.1 mg/kg	12.0 mg/kg	16%
Copper	783 mg/kg	669 mg/kg	16%
Iron	129000 mg/kg	106000 mg/kg	20%
Lead	274 mg/kg	260 mg/kg	5%
Magnesium	4080 mg/kg	3360 mg/kg	19%
Manganese	5930 mg/kg	5240 mg/kg	12%
Mercury	0.333 mg/kg	0.361 mg/kg	8%
Nickel	5.38 mg/kg	4.13 mg/kg	26%
Potassium	6370 mg/kg	5790 mg/kg	10%
Silver	0.696 mg/kg	0.338 mg/kg	69%
Sodium	895 mg/kg	437 mg/kg	69%
Thallium	4.03 mg/kg	2.34 mg/kg	53%
Zinc	13800 mg/kg	7200 mg/kg	63%
TOC	0.101%	0.119%	16%
4750µm-850µm	0.336%	0.374%	11%
850µm-425µm	60.7%	69.3%	13%
425µm-250µm	29.2%	23.4%	22%
250µm-150µm	8.19%	5.77%	35%
Bulk density	1.11 g/cm^3	1.14 g/cm^3	3%

Analyte	BSB3A-0.5-2	BSB903A-.5-2.0	RPD
Aluminum	14800 mg/kg	15000 mg/kg	1%
Antimony	8.25 mg/kg	14 mg/kg	52%
Arsenic	7.06 mg/kg	7.48 mg/kg	6%
Barium	619 mg/kg	710 mg/kg	14%
Beryllium	0.926 mg/kg	0.957 mg/kg	3%
Cadmium	1.30 mg/kg	1.19 mg/kg	9%
Calcium	52300 mg/kg	54000 mg/kg	3%
Chromium	70.7 mg/kg	75.9 mg/kg	7%
Cobalt	21.7 mg/kg	23.2 mg/kg	7%
Copper	952 mg/kg	889 mg/kg	7%
Iron	154000 mg/kg	158000 mg/kg	3%
Lead	202 mg/kg	185 mg/kg	9%
Magnesium	4520 mg/kg	4660 mg/kg	3%
Manganese	5870 mg/kg	5620 mg/kg	4%
Mercury	0.310 mg/kg	0.235 mg/kg	27%
Nickel	8.39 mg/kg	9.44 mg/kg	12%

Analyte	BSB3A-0.5-2	BSB903A-.5-2.0	RPD
Potassium	5540 mg/kg	6250 mg/kg	12%
Silver	1.10 mg/kg	1.35 mg/kg	20%
Sodium	926 mg/kg	924 mg/kg	0%
Thallium	1.56 mg/kg	1.44 mg/kg	8%
Zinc	13800 mg/kg	13500 mg/kg	2%
TOC	0.5U %	0.165J %	200%

Analyte	SCB7A-1.0-2.3	SCB907A-1.0-2.3	RPD
Aluminum	9410 mg/kg	7870 mg/kg	18%
Antimony	6.16 mg/kg	5.51 mg/kg	11%
Arsenic	6.54 mg/kg	7.05 mg/kg	7%
Barium	417 mg/kg	389 mg/kg	7%
Beryllium	0.574 mg/kg	0.489 mg/kg	16%
Cadmium	2.03 mg/kg	1.76 mg/kg	14%
Calcium	29700 mg/kg	25600 mg/kg	15%
Chromium	36.3 mg/kg	27.9 mg/kg	26%
Cobalt	8.50 mg/kg	7.03 mg/kg	19%
Copper	410 mg/kg	352 mg/kg	15%
Iron	86700 mg/kg	71400 mg/kg	19%
Lead	262 mg/kg	215 mg/kg	20%
Magnesium	3520 mg/kg	2920 mg/kg	19%
Manganese	3620 mg/kg	2710 mg/kg	29%
Mercury	1.58 mg/kg	0.545 mg/kg	98%
Nickel	6.99 mg/kg	5.45 mg/kg	25%
Potassium	4040 mg/kg	2880 mg/kg	34%
Selenium	0.5U mg/kg	0.684 mg/kg	200%
Silver	0.676 mg/kg	0.858 mg/kg	24%
Sodium	505 mg/kg	353 mg/kg	35%
Thallium	2.32 mg/kg	1.68 mg/kg	32%
Zinc	8930 mg/kg	6270 mg/kg	35%
TOC	0.125J %	0.5U %	200%

Analyte	OC21A-1.0-2.7	OC921A-1.0-2.7	RPD
Aluminum	9230 mg/kg	10200 mg/kg	10%
Antimony	5.84 mg/kg	6.14 mg/kg	5%
Arsenic	8.18 mg/kg	8.24 mg/kg	1%
Barium	334 mg/kg	356 mg/kg	6%
Beryllium	0.554 mg/kg	1.04 mg/kg	61%
Cadmium	4.65 mg/kg	4.73 mg/kg	2%
Calcium	32300 mg/kg	34300 mg/kg	6%
Chromium	25.2 mg/kg	26.9 mg/kg	7%
Cobalt	8.38 mg/kg	9.25 mg/kg	10%
Copper	329 mg/kg	347 mg/kg	5%
Iron	56200 mg/kg	61400 mg/kg	9%
Lead	327 mg/kg	340 mg/kg	4%
Magnesium	12400 mg/kg	14300 mg/kg	14%
Manganese	1980 mg/kg	2310 mg/kg	15%

Analyte	OC21A-1.0-2.7	OC921A-1.0-2.7	RPD
Mercury	0.337 mg/kg	0.32 mg/kg	5%
Nickel	10.7 mg/kg	11.4 mg/kg	6%
Potassium	4140 mg/kg	4770 mg/kg	14%
Selenium	0.5U mg/kg	0.314 mg/kg	200%
Silver	0.55 mg/kg	0.597 mg/kg	8%
Sodium	572 mg/kg	650 mg/kg	13%
Thallium	3.19 mg/kg	3.33 mg/kg	4%
Zinc	4980 mg/kg	5420 mg/kg	8%
TOC	1.101%	1.381%	23%

Analyte	OC23A-0-1.2	OC923A-0-1.2	RPD
Aluminum	9230 mg/kg	8840 mg/kg	4%
Antimony	5.23 mg/kg	6.32 mg/kg	19%
Arsenic	11.8 mg/kg	11 mg/kg	7%
Barium	300 mg/kg	251 mg/kg	18%
Beryllium	1.16 mg/kg	1.1 mg/kg	5%
Cadmium	4.16 mg/kg	3.82 mg/kg	9%
Calcium	35800 mg/kg	31900 mg/kg	12%
Chromium	26.8 mg/kg	27.1 mg/kg	1%
Cobalt	9.62 mg/kg	8.98 mg/kg	7%
Copper	234 mg/kg	220 mg/kg	6%
Iron	42900 mg/kg	41900 mg/kg	2%
Lead	312 mg/kg	310 mg/kg	1%
Magnesium	21900 mg/kg	19700 mg/kg	11%
Manganese	1330 mg/kg	1370 mg/kg	3%
Mercury	0.296 mg/kg	0.268 mg/kg	10%
Nickel	15.7 mg/kg	15.7 mg/kg	0%
Potassium	5050 mg/kg	4960 mg/kg	2%
Selenium	0.84 mg/kg	0.5U mg/kg	200%
Silver	1.13 mg/kg	1.88 mg/kg	50%
Sodium	588 mg/kg	521 mg/kg	12%
Thallium	3.05 mg/kg	2.96 mg/kg	3%
Zinc	3140 mg/kg	3020 mg/kg	4%
TOC	2.185%	2.071%	5%

- DE#12A-1.5-3.5 and DE#912A-1.5-3.5: Silver, sodium, thallium, and zinc duplicate relative percent difference (RPD) values exceeded project-specific control limits. The silver RPD value is exaggerated because the results are near the method reporting limit (MRL).
- BSB3A-0.5-2 and BSB903A-.5-2.0: The antimony duplicate RPD value exceeded control limits. The TOC RPD is exaggerated because results are below the MRL.
- SCB7A-1.0-2.3 and SCB907A-1.0-2.3: The mercury duplicate RPD value exceeded control limits. Selenium and TOC have exaggerated RPD values because results are near or below the MRLs.

- OC21A-1.0-2.7 and OC921A-1.0-2.7: Beryllium and selenium have exaggerated RPD values because results are near or below the MRLs.
- OC23A-0-1.2 and OC23A-0-1.2: Selenium has an exaggerated RPD value because results are near or below the MRL.

No data were qualified based on field duplicate results.

Matrix Spike (MS) and Matrix Spike Duplicate (MSD)

MS and MSD samples were analyzed at the required frequencies. All MS/MSD analyses yielded percent recoveries (%R) and/or RPD values within the project data quality objectives with the following exceptions:

- SDG CHM100504-1 Metals: MS and MSD recoveries and/or MS/MSD RPD values for twelve analytes were outside of control limits. Sample concentrations for nine analytes were significantly greater than (>4x) the spike levels, so none of these data were qualified. Selenium and silver recovered below control limits in the MS and MSD. Antimony recovered below limits in the MSD and the MS/MSD RPD value was above control limits. Associated results have been qualified "J" or "UJ" to indicate they are estimated. Vanadium did not recover in the MS or MSD and was below 75% in the post-digestion spike (PDS). Associated results were all non-detects and have been rejected. Mercury recovered above control limits in the MSD associated with the rinsate blanks. This element was not detected in the associated samples so no data were qualified.
- SDG CHM100504-1 and CHM100504-2 TOC: The MSD recovered above project-required control limits. Associated detected results have been qualified "J" to indicate a potentially high bias.
- SDG CHM100504-2 Metals: MS and MSD recoveries and/or MS/MSD RPD values for twelve analytes were outside of control limits. Sample concentrations for nine analytes were significantly greater than (>4x) the spike levels, so none of these data were qualified. Mercury recovered above control limits and selenium recovered below control limits in the MS and MSD. Silver recovered below control limits in the MSD. Associated sample results have been qualified "J" or "UJ" to indicate they are estimated. Vanadium did not recover in the MS or MSD and was below 75% in the PDS. Associated sample results were all non-detects and have been rejected.

- SDG CHM100507-1 Metals: MS and MSD recoveries and/or MS/MSD RPD values for twenty-one analytes were outside of control limits. Sample concentrations for eleven were significantly greater than (>4x) the spike levels, so none of these data were qualified. Chromium, cobalt, mercury, nickel, arsenic, selenium, and silver recovered below control limits in the MS and/or MSD. Vanadium recovered high in the MSD and antimony did not recover in the MS or MSD; however, the PDS recovered within control limits. MS/MSD RPD values were above control limits for cadmium, chromium, selenium, and vanadium. Associated results have been qualified "J" or "UJ" to indicate they are estimated.
- SDG CHM100507-7 Metals: MS and MSD recoveries and/or MS/MSD RPDs for twenty-one analytes were outside of control limits. Sample concentrations for eleven analytes were significantly greater than (>4x) the spike levels so none of these data were qualified. Arsenic, beryllium, chromium, cobalt, nickel, selenium, and silver recovered below control limits in the MS and/or MSD. Antimony recovered below 30% in both the MS and MSD; however, the PDS %R was greater than 75%. The MS/MSD RPD value for this analyte was also above control limits. All associated results have been qualified "J" or "UJ" to indicate that they are estimated. Mercury recovered above control limits in the MS and MSD. Associated detected results have been qualified "J" to indicate a potentially high bias. The MS/MSD RPD value for vanadium was above control limits. This analyte recovered low in the MS and below 10% in the MSD and the PDS recovered below 75%. Associated sample results were all non-detects and have been rejected.
- SDG CHM100511-3 and CHM100511-4 Metals: MS and MSD recoveries and/or MS/MSD RPDs for twenty analytes were outside of control limits. Sample concentrations for eleven analytes were significantly greater than (>4x) the spike levels so none of these data were qualified. Arsenic, chromium, cobalt, nickel, selenium, silver, and thallium recovered below control limits in the MS and MSD. Antimony recovered below 30% in both the MS and MSD; however, the PDS recovered within control limits. Associated results have been qualified "J" or "UJ" to indicate a potentially low bias. Vanadium recovered below 30% in the MS and MSD and below control limits in the PDS. All associated sample results were non-detects and have been rejected.
- SDG CHM100507-1, CHM100507-7, CHM100511-3 and CHM100511-4 Rinsate Blank Metals: Chromium and cobalt recovered below control limits in the MS/MSD. The

MS/MSD analyses were performed on a non-project sample, however, so no data were qualified.

- SDG CHM100513-5 Metals: MS and MSD recoveries and/or MS/MSD RPD values for fourteen analytes were outside of control limits. Sample concentrations for nine analytes were significantly greater than (>4x) the spike levels so none of these data were qualified. Antimony recovered below 30% and vanadium did not recover in both the MS and MSD; however, the PDS recovered within control limits for these analytes. Selenium and thallium recovered below control limits in the MS and/or MSD. Associated results have been qualified "J" or "UJ" to indicate a potentially low bias. Sodium recovered above control limits in the MS and MSD. Associated results have been qualified "J" to indicate a potentially high bias.
- SDG CHM100513-5 Rinsate Blank Metals: Sodium recovered above control limits in the MS and MSD and manganese recovered below limits in the MSD. The manganese MS/MSD RPD value also was above control limits. The MS/MSD analyses were performed on a non-project sample so no data were qualified.
- SDG CHM100513-6 Metals: MS recoveries for ten analytes were outside of control limits. Sample concentrations for five analytes were significantly greater than the spike levels so none of these data were qualified. Selenium and silver recovered below control limits in the MS. Antimony and vanadium did not recover in the MS but were within control limits in the PDS. Results for these analytes have been qualified "J" or "UJ" to indicate a potentially low bias. Sodium recovered above control limits in the MS. Associated detected results have been qualified "J" to indicate a potentially high bias.
- SDG CHM 100513-6 Rinsate Blank Metals: Sodium recovered above control limits in the MS and MSD and manganese recovered below limits in the MSD. The manganese MS/MSD RPD value also was above control limits. The MS/MSD analyses were performed on a non-project sample so no data were qualified.
- CHM100513-5 and CHM100513-6 TOC: The MS and MSD recovered above control limits. Associated detected sample results have been qualified "J" to indicate a potentially high bias.

See Table 4 for qualified data.

Laboratory Control Sample (LCS)

LCSs were analyzed at the required frequencies and resulted in recoveries within project-required control limits with the following exceptions:

- SDGs CHM100504-1 and CHM100504-2 Metals: Manganese recovered above control limits and vanadium recovered below control limits. Detected manganese results have been qualified "J" to indicate a potentially high bias. Vanadium results were previously rejected due to no MS/MSD recoveries. Iron recovered high in the LCS associated with the rinsate blanks however; this analyte was not detected in the associated samples so no data were qualified.
- SDG CHM100507-1 and CHM100507-7 Metals: Vanadium recovered below control limits. Results that were not previously rejected have been qualified "J" or "UJ" to indicate a potentially low bias.
- SDG CHM100507-1, CHM100507-7, CHM100511-3, and, CHM100511-4 Rinsate Blank Metals: Cobalt recovered below control limits in the LCS. Associated results have been qualified "UJ" to indicate a potentially low bias.
- SDG CHM100513-5 and CHM100513-6: Aluminum, manganese, and sodium recovered above control limits in both LCSs and magnesium and potassium recovered above limits in one of the LCSs. Associated detected results have been qualified "J" to indicate a potentially high bias. Selenium recovered below limits in one LCS. Associated results have been qualified "J" or "UJ" to indicate a potentially low bias.
- SDG CHM100513-5 and CHM100513-6 Rinsate Blank Metals: Potassium recovered high in the LCS. Associated detected results have been qualified "J" to indicate a potentially high bias.

See Table 3 for qualified data.

Laboratory Duplicates

Laboratory duplicates were analyzed at the required frequencies. All RPD values were within project-required control limits with the following exceptions:

- SDG CHM100504-1 Metals: The duplicate analyses of antimony and arsenic resulted in RPD values above control limits. Associated results have been qualified "J" or "UJ" to indicate that they are estimated. The duplicate analysis of lead in the rinsate blank resulted in a RPD value above control limits. However, results were less than 5x the MRL and the difference between them was less than the MRL so no data were qualified.

- SDG CHM100504-2 Metals: The duplicate analyses of antimony and mercury resulted in RPD values above control limits. Associated results have been qualified “J” or “UJ” to indicate that they are estimated.
- SDG CHM100507-1 Metals: The duplicate analyses of antimony, arsenic, and mercury resulted in RPD values above control limits. Associated results have been qualified “J” or “UJ” to indicate that they are estimated.
- SDG CHM100507-7 Metals: The duplicate analysis of antimony resulted in a RPD value above control limits. Associated results have been qualified “J” or “UJ” to indicate they are estimated.
- CHM100511-3 and CHM100511-4 Metals: The duplicate analysis of mercury resulted in a RPD value above control limits. Associated results have been qualified “J” or “UJ” to indicate they are estimated.
- SDG CHM100507-1, CHM100507-7, CHM100511-3 and CHM100511-4 Rinsate Blank Metals: The duplicate analysis resulted in high RPD values for calcium and magnesium. Associated results have been qualified “J” or “UJ” to indicate that they are estimated.
- SDG CHM100513-5: The duplicate analysis of beryllium and TOC resulted in RPD values above control limits. However, no data were qualified because the sample and duplicate results for both analytes were less than 5x the MRL and the difference between them was within ± the MRL.

See Table 4 for qualified data.

Method Reporting Limits

Reporting limits were deemed acceptable as reported. All values were reported using the laboratory reporting limits. Values were reported as undiluted, or when reported as diluted, the reporting limit accurately reflects the dilution factor.

Overall Assessment

As was determined by this evaluation, the laboratory followed the specified analytical methods and all requested sample analyses were completed. Accuracy was acceptable as demonstrated by the LCS, and MS/MSD %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the laboratory duplicates and MS/MSD RPD values, with the exceptions noted above. Most data were deemed acceptable as reported; all other data are acceptable as qualified. Table 4 summarizes the qualifiers applied to samples reviewed in this report.

Data Qualifier Definitions

U Indicates the compound or analyte was analyzed for but not detected at or above the specified limit.

J Indicates an estimated value.

R Indicates data is rejected and unusable

UJ Indicates the compound or analyte was analyzed for but not detected and the specified limit reported is estimated

Table 4
Data Qualification Summary

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
DE#12A-1.5-3.5	Metals	Manganese	5930 mg/kg	5930J mg/kg	High LCS %R
		Antimony	1.88 mg/kg	1.88J mg/kg	High duplicate RPD; low MSD%R; high MS/MSD RPD
		Arsenic	7.35 mg/kg	7.35J mg/kg	High duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MS/MSD %R
		Silver	0.696 mg/kg	0.696J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.101%	0.101J %	High MSD %R
DE#912A-1.5-3.5	Metals	Manganese	5240 mg/kg	5240J mg/kg	High LCS %R
		Antimony	2.15 mg/kg	2.15J mg/kg	High duplicate RPD; low MSD%R; high MS/MSD RPD
		Arsenic	4.43 mg/kg	4.43J mg/kg	High duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MS/MSD %R
		Silver	0.338 mg/kg	0.338J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.119%	0.119J %	High MSD %R
DE#12A-6-12	Metals	Manganese	4620 mg/kg	4620J mg/kg	High LCS %R
		Antimony	1.81 mg/kg	1.81J mg/kg	High duplicate RPD; low MSD%R; high MS/MSD RPD
		Arsenic	8.52 mg/kg	8.52J mg/kg	High duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MS/MSD %R
		Silver	0.389 mg/kg	0.389J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
	Conventionals	TOC	0.994%	0.994J %	High MSD %R
DE#11A2-0-1.3	Metals	Manganese	135 mg/kg	135J mg/kg	High LCS %R
		Antimony	3.49 mg/kg	3.49J mg/kg	High duplicate RPD; low MSD%R; high MS/MSD RPD
		Arsenic	6.09 mg/kg	6.09J mg/kg	High duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MS/MSD %R
		Silver	0.130 mg/kg	0.130J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	4.79%	4.79J %	High MSD %R
DE#11A2-2-2.5	Metals	Manganese	383 mg/kg	383J mg/kg	High LCS %R
		Antimony	1.80 mg/kg	1.80J mg/kg	High duplicate RPD; low MSD%R; high MS/MSD RPD
		Arsenic	4.34 mg/kg	4.34J mg/kg	High duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MS/MSD %R
		Silver	0.242 mg/kg	0.242J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
DE#10A-1-2	Metals	Manganese	469 mg/kg	469J mg/kg	High LCS %R
		Antimony	0.52 mg/kg	0.52J mg/kg	High duplicate RPD; low MSD%R; high MS/MSD RPD
		Arsenic	6.53 mg/kg	6.53J mg/kg	High duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MS/MSD %R
		Silver	0.233 mg/kg	0.233J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.267%	0.267J %	High MSD %R
DE#10A-2.1-2.5	Metals	Manganese	709 mg/kg	709J mg/kg	High LCS %R
		Antimony	1.02 mg/kg	1.02J mg/kg	High duplicate RPD; low MSD%R; high MS/MSD RPD
		Arsenic	8.43 mg/kg	8.43J mg/kg	High duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MS/MSD %R
		Silver	0.298 mg/kg	0.298J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.189%	0.189J %	High MSD %R
DE#8C-0-.75	Metals	Manganese	3480 mg/kg	3480J mg/kg	High LCS %R
		Antimony	5.88 mg/kg	5.88J mg/kg	High duplicate RPD; low MSD%R; high MS/MSD RPD
		Arsenic	13.2 mg/kg	13.2J mg/kg	High duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MS/MSD %R
		Silver	1.82 mg/kg	1.82J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
	Conventionals	TOC	0.337%	0.337J %	High MSD %R
DE#8C-1.25-2.25	Metals	Manganese	3470 mg/kg	3470J mg/kg	High LCS %R
		Antimony	7.18 mg/kg	7.15J mg/kg	High duplicate RPD; low MSD%R; high MS/MSD RPD
		Arsenic	15.8 mg/kg	15.8J mg/kg	High duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MS/MSD %R
		Silver	1.51 mg/kg	1.51J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.439%	0.439J %	High MSD %R
DE#15A-0-1	Metals	Antimony	3.71 mg/kg	3.71J mg/kg	High duplicate RPD
		Manganese	4870 mg/kg	4870J mg/kg	High LCS %R
		Mercury	0.791 mg/kg	0.791J mg/kg	High MS/MSD %R and duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MSD and/or MS %R
		Silver	1.22 mg/kg	1.22J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.33%	0.33J %	High MSD %R
DE#15A-1.9-2.7	Metals	Antimony	2.60 mg/kg	2.60J mg/kg	High duplicate RPD
		Manganese	5880 mg/kg	5880J mg/kg	High LCS %R
		Mercury	0.340 mg/kg	0.340J mg/kg	High MS/MSD %R and duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MSD and/or MS %R
		Silver	0.465 mg/kg	0.465J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.10%	0.10J %	High MSD %R
DE#14A-0-.75	Metals	Antimony	3.26 mg/kg	3.26J mg/kg	High duplicate RPD
		Manganese	2540 mg/kg	2540J mg/kg	High LCS %R
		Mercury	0.316 mg/kg	0.316J mg/kg	High MS/MSD %R and duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MSD and/or MS %R
		Silver	0.581 mg/kg	0.581J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.83%	0.83J %	High MSD %R
DE#14A-.75-1	Metals	Antimony	2.64 mg/kg	2.64J mg/kg	High duplicate RPD
		Manganese	693 mg/kg	693J mg/kg	High LCS %R
		Mercury	0.650 mg/kg	0.650J mg/kg	High MS/MSD %R and duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MSD and/or MS %R
		Silver	0.563 mg/kg	0.563J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
DE#14A-1.4-2	Metals	Antimony	0.082 mg/kg	0.082J mg/kg	High duplicate RPD
		Manganese	154 mg/kg	154J mg/kg	High LCS %R

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Mercury	0.05U mg/kg	0.05UJ mg/kg	High MS/MSD %R and duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MSD and/or MS %R
		Silver	0.033 mg/kg	0.033J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.26%	0.26J %	High MSD %R
DE#14A-2-3	Metals	Antimony	0.025 mg/kg	0.025J mg/kg	High duplicate RPD
		Manganese	234 mg/kg	234J mg/kg	High LCS %R
		Mercury	0.05U mg/kg	0.05UJ mg/kg	High MS/MSD %R and duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MSD and/or MS %R
		Silver	0.048 mg/kg	0.048J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.25%	0.25J %	High MSD %R
DE#12A-0-1	Metals	Antimony	8.73 mg/kg	8.73J mg/kg	High duplicate RPD
		Manganese	5300 mg/kg	5300J mg/kg	High LCS %R
		Mercury	0.324 mg/kg	0.324J mg/kg	High MS/MSD %R and duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MSD and/or MS %R
		Silver	2.39 mg/kg	2.39J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.23%	0.23J %	High MSD %R
DE#8C-4.25-5	Metals	Antimony	8.18 mg/kg	8.18J mg/kg	High duplicate RPD
		Manganese	2490 mg/kg	2490J mg/kg	High LCS %R
		Mercury	0.498 mg/kg	0.498J mg/kg	High MS/MSD %R and duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MSD and/or MS %R
		Silver	0.529 mg/kg	0.529J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	0.55%	0.55J %	High MSD %R
DE#8C-17.0-24.0	Metals	Antimony	3.72 mg/kg	3.72J mg/kg	High duplicate RPD
		Manganese	2240 mg/kg	2240J mg/kg	High LCS %R
		Mercury	0.460 mg/kg	0.460J mg/kg	High MS/MSD %R and duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MSD and/or MS %R
		Silver	0.814 mg/kg	0.814J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
DE#8C-17.0C	Metals	Antimony	3.95 mg/kg	3.95J mg/kg	High duplicate RPD
		Manganese	1270 mg/kg	1270J mg/kg	High LCS %R
		Mercury	0.958 mg/kg	0.958J mg/kg	High MS/MSD %R and duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MSD and/or MS %R
		Silver	0.459 mg/kg	0.459J mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
DE#8C-10-17	Metals	Antimony	3.17 mg/kg	3.17J mg/kg	High duplicate RPD
		Manganese	1500 mg/kg	1500J mg/kg	High LCS %R
		Mercury	0.987 mg/kg	0.987J mg/kg	High MS/MSD %R and duplicate RPD
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low MSD and/or MS %R
		Silver	0.403 mg/kg	0.403J mg/kg	
		Vanadium	0.1U mg/kg	R	No MS/MSD %R
	Conventionals	TOC	3.21%	3.21J %	High MSD %R
BSB4A-3.5-4.5	Metals	Antimony	0.4U mg/kg	0.4UJ mg/kg	High duplicate RPD, No MS/MSD %R
		Arsenic	1.80 mg/kg	1.80J mg/kg	High duplicate RPD; low MS/MSD %R
		Mercury	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	Low MS and/or MSD %R and/or high MS/MSD RPD
		Cadmium	0.245 mg/kg	0.245J mg/kg	
		Chromium	7.04 mg/kg	7.04J mg/kg	
		Cobalt	2.52 mg/kg	2.52J mg/kg	
		Nickel	7.37 mg/kg	7.37J mg/kg	
		Silver	0.2U mg/kg	0.2UJ mg/kg	
		Vanadium	0.2U mg/kg	0.2UJ mg/kg	Low LCS, high MSD %R; high MS/MSD RPD
BSB4A-2.5-3.2	Metals	Antimony	2.24 mg/kg	2.24J mg/kg	High duplicate RPD, No MS/MSD %R
		Arsenic	20.4 mg/kg	20.4J mg/kg	High duplicate RPD; low MS/MSD %R
		Mercury	0.369 mg/kg	0.369J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	Low MS and/or MSD %R and/or high MS/MSD RPD
		Cadmium	3.04 mg/kg	3.04J mg/kg	
		Chromium	33.7 mg/kg	33.7J mg/kg	
		Cobalt	17.5 mg/kg	17.5J mg/kg	
		Nickel	6.81 mg/kg	6.81J mg/kg	
		Silver	1.24 mg/kg	1.24J mg/kg	
		Vanadium	0.2U mg/kg	0.2UJ mg/kg	Low LCS, high MSD %R; high MS/MSD RPD
BSB4A-1.5-2.5	Metals	Antimony	3.81 mg/kg	3.81J mg/kg	High duplicate RPD, No MS/MSD %R
		Arsenic	11 mg/kg	11J mg/kg	High duplicate RPD; low MS/MSD %R
		Mercury	0.494 mg/kg	0.494J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	Low MS and/or MSD %R and/or high MS/MSD RPD
		Cadmium	2.17 mg/kg	2.17J mg/kg	
		Chromium	56.3 mg/kg	56.3J mg/kg	
		Cobalt	14.3 mg/kg	14.3J mg/kg	
		Nickel	5.98 mg/kg	5.98J mg/kg	
		Silver	1.06 mg/kg	1.06J mg/kg	
		Vanadium	0.2U mg/kg	0.2UJ mg/kg	Low LCS, high MSD

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
					%R; high MS/MSD RPD
BSB4A-0.9-1.4	Metals	Antimony	0.799 mg/kg	0.799J mg/kg	High duplicate RPD, No MS/MSD %R
		Arsenic	4.01 mg/kg	4.01J mg/kg	High duplicate RPD; low MS/MSD %R
		Mercury	0.463 mg/kg	0.463J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	Low MS and/or MSD %R and/or high MS/MSD RPD
		Cadmium	2.28 mg/kg	2.28J mg/kg	
		Chromium	23.4 mg/kg	23.4J mg/kg	
		Cobalt	9.34 mg/kg	9.34J mg/kg	
		Nickel	7.11 mg/kg	7.11J mg/kg	
		Silver	0.707 mg/kg	0.707J mg/kg	
		Vanadium	0.2U mg/kg	0.2UJ mg/kg	Low LCS, high MSD %R; high MS/MSD RPD
BSB5A-3.0-3.5	Metals	Antimony	1.22 mg/kg	1.22J mg/kg	High duplicate RPD, No MS/MSD %R
		Arsenic	3.93 mg/kg	3.93J mg/kg	High duplicate RPD; low MS/MSD %R
		Mercury	0.183 mg/kg	0.183J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	Low MS and/or MSD %R and/or high MS/MSD RPD
		Cadmium	1.13 mg/kg	1.13J mg/kg	
		Chromium	23.4 mg/kg	23.4J mg/kg	
		Cobalt	10.5 mg/kg	10.5J mg/kg	
		Nickel	3.92 mg/kg	3.92J mg/kg	
		Silver	0.913 mg/kg	0.913J mg/kg	
		Vanadium	0.2U mg/kg	0.2UJ mg/kg	Low LCS, high MSD %R; high MS/MSD RPD
BSB5A-0.75-1.5	Metals	Antimony	4.20 mg/kg	4.20J mg/kg	High duplicate RPD, No MS/MSD %R
		Arsenic	10.9 mg/kg	10.9J mg/kg	High duplicate RPD; low MS/MSD %R
		Mercury	0.265 mg/kg	0.265J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	Low MS and/or MSD %R and/or high MS/MSD RPD
		Cadmium	1.42 mg/kg	1.42J mg/kg	
		Chromium	62.3 mg/kg	62.3J mg/kg	
		Cobalt	32.2 mg/kg	32.2J mg/kg	
		Nickel	9.30 mg/kg	9.30J mg/kg	
		Silver	2.58 mg/kg	2.58J mg/kg	
		Vanadium	0.2U mg/kg	0.2UJ mg/kg	Low LCS, high MSD %R; high MS/MSD RPD
Rinsate Blank (5/5/10)	Metals	Cobalt	0.3U µg/L	0.3UJ µg/L	Low LCS %R
		Calcium	2730 µg/L	2730J µg/L	High duplicate RPD
		Magnesium	100U µg/L	100UJ µg/L	
BSB17A-0.75-1.3	Metals	Antimony	1.91 mg/kg	1.91J mg/kg	Low MS/MSD %R, high MS/MSD and duplicate RPD
		Arsenic	4.43 mg/kg	4.43J mg/kg	Low MS and/or MSD
		Beryllium	0.407 mg/kg	0.407J mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Chromium	35.5 mg/kg	35.5J mg/kg	%R
		Cobalt	9.08 mg/kg	9.08J mg/kg	
		Nickel	8.60 mg/kg	8.60 mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	
		Silver	0.579 mg/kg	0.579J mg/kg	
		Mercury	0.264 mg/kg	0.264J mg/kg	High MS/MSD %R
		Vanadium	0.2U mg/kg	R	Low MS/MSD, PDS %R
BSB17A-2.0-3.0	Metals	Antimony	1.52 mg/kg	1.52J mg/kg	Low MS/MSD %R, high MS/MSD and duplicate RPD
		Arsenic	4.21 mg/kg	4.21J mg/kg	Low MS and/or MSD %R
		Beryllium	0.739 mg/kg	0.739J mg/kg	
		Chromium	35.0 mg/kg	35.0J mg/kg	
		Cobalt	13.0 mg/kg	13.0J mg/kg	
		Nickel	6.06 mg/kg	6.06J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	
		Silver	0.872 mg/kg	0.872J mg/kg	
		Mercury	0.259 mg/kg	0.259J mg/kg	High MS/MSD %R
		Vanadium	0.2U mg/kg	R	Low MS/MSD, PDS %R
BSB17A-3.75-4.0	Metals	Antimony	1.29 mg/kg	1.29J mg/kg	Low MS/MSD %R, high MS/MSD and duplicate RPD
		Arsenic	3.04 mg/kg	3.04J mg/kg	Low MS and/or MSD %R
		Beryllium	1.20 mg/kg	1.20J mg/kg	
		Chromium	34.6 mg/kg	34.6J mg/kg	
		Cobalt	14.9 mg/kg	14.9J mg/kg	
		Nickel	5.93 mg/kg	5.93J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	
		Silver	1.03 mg/kg	1.03J mg/kg	
		Mercury	0.347 mg/kg	0.347J mg/kg	High MS/MSD %R
		Vanadium	0.2U mg/kg	R	Low MS/MSD, PDS %R
BSB16A-1.5-2.2	Metals	Antimony	3.24 mg/kg	3.24J mg/kg	Low MS/MSD %R, high MS/MSD and duplicate RPD
		Arsenic	5.98 mg/kg	5.98J mg/kg	Low MS and/or MSD %R
		Beryllium	1.07 mg/kg	1.07J mg/kg	
		Chromium	70.2 mg/kg	70.2J mg/kg	
		Cobalt	19.1 mg/kg	19.1J mg/kg	
		Nickel	10.1 mg/kg	10.1J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	
		Silver	0.611 mg/kg	0.611J mg/kg	
		Mercury	0.207 mg/kg	0.207J mg/kg	High MS/MSD %R
		Vanadium	0.2U mg/kg	R	Low MS/MSD, PDS %R
BSB16A-0.25-0.75	Metals	Antimony	1.93 mg/kg	1.93J mg/kg	Low MS/MSD %R, high

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
					MS/MSD and duplicate RPD
		Arsenic	2.71 mg/kg	2.71J mg/kg	Low MS and/or MSD %R
		Beryllium	0.346 mg/kg	0.346J mg/kg	
		Chromium	23.4 mg/kg	23.4J mg/kg	
		Cobalt	6.74 mg/kg	6.74J mg/kg	
		Nickel	3.55 mg/kg	3.55J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	
		Silver	0.660 mg/kg	0.660J mg/kg	
		Mercury	0.176 mg/kg	0.176J mg/kg	High MS/MSD %R
		Vanadium	0.2U mg/kg	R	Low MS/MSD, PDS %R
BSB15A-0-1	Metals	Antimony	0.254J mg/kg	0.254J mg/kg	Low MS/MSD %R, high MS/MSD and duplicate RPD
		Arsenic	0.544 mg/kg	0.544J mg/kg	Low MS and/or MSD %R
		Beryllium	0.4U mg/kg	0.4UJ mg/kg	
		Chromium	4.02 mg/kg	4.02J mg/kg	
		Cobalt	1.34 mg/kg	1.34J mg/kg	
		Nickel	0.623 mg/kg	0.623J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	
		Silver	0.127J mg/kg	0.127J mg/kg	
		Vanadium	0.2U mg/kg	R	Low MS/MSD, PDS %R
BSB15A-1-2	Metals	Antimony	1.99 mg/kg	1.99J mg/kg	Low MS/MSD %R, high MS/MSD and duplicate RPD
		Arsenic	5.10 mg/kg	5.10J mg/kg	Low MS and/orMSD %R
		Beryllium	1.03 mg/kg	1.03J mg/kg	
		Chromium	60.7 mg/kg	60.7J mg/kg	
		Cobalt	16.1 mg/kg	16.1J mg/kg	
		Nickel	7.99 mg/kg	7.99J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	
		Silver	0.710 mg/kg	0.710J mg/kg	
		Mercury	0.244 mg/kg	0.244J mg/kg	High MS/MSD %R
		Vanadium	0.2U mg/kg	R	Low MS/MSD, PDS %R
BSB6A-0-1	Metals	Antimony	3.07 mg/kg	3.07J mg/kg	Low MS/MSD %R, high MS/MSD and duplicate RPD
		Arsenic	11.9 mg/kg	11.9J mg/kg	Low MS and/or MSD %R
		Beryllium	0.919 mg/kg	0.919J mg/kg	
		Chromium	48.9 mg/kg	48.9J mg/kg	
		Cobalt	13.6 mg/kg	13.6J mg/kg	
		Nickel	8.41 mg/kg	8.41J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	
		Silver	1.20 mg/kg	1.20J mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Mercury	0.359 mg/kg	0.359J mg/kg	High MS/MSD %R
		Vanadium	0.2U mg/kg	R	Low MS/MSD, PDS %R
BSB6A-1.5-2.5	Metals	Antimony	0.206J mg/kg	0.206J mg/kg	Low MS/MSD %R, high MS/MSD and duplicate RPD
		Arsenic	2.50 mg/kg	2.50J mg/kg	Low MS and/or MSD %R
		Beryllium	0.718 mg/kg	0.718J mg/kg	
		Chromium	9.21 mg/kg	9.21J mg/kg	
		Cobalt	3.57 mg/kg	3.57J mg/kg	
		Nickel	10.7 mg/kg	10.7J mg/kg	
		Selenium	0.141 mg/kg	0.141J mg/kg	
		Silver	0.2U mg/kg	0.2UJ mg/kg	
		Vanadium	0.2U mg/kg	R	Low MS/MSD, PDS %R
BSB6A-2.5-3.5	Metals	Antimony	0.4U mg/kg	0.4UJ mg/kg	Low MS/MSD %R, high MS/MSD and duplicate RPD
		Arsenic	1.85 mg/kg	1.85J mg/kg	Low MS and/or MSD %R
		Beryllium	0.415 mg/kg	0.415J mg/kg	
		Chromium	12.7 mg/kg	12.7J mg/kg	
		Cobalt	2.69 mg/kg	2.69J mg/kg	
		Nickel	8.66 mg/kg	8.66J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	
		Silver	0.2U mg/kg	0.2UJ mg/kg	
		Vanadium	0.2U mg/kg	R	Low MS/MSD, PDS %R
BSB6A-4.0-5.0	Metals	Antimony	0.4U mg/kg	0.4UJ mg/kg	Low MS/MSD %R, high MS/MSD and duplicate RPD
		Arsenic	1.98 mg/kg	1.98J mg/kg	Low MS and/or MSD %R
		Beryllium	0.481 mg/kg	0.481J mg/kg	
		Chromium	9.16 mg/kg	9.16J mg/kg	
		Cobalt	3.10 mg/kg	3.10J mg/kg	
		Nickel	10.6 mg/kg	10.6J mg/kg	
		Selenium	1U mg/kg	1UJ mg/kg	
		Silver	0.2U mg/kg	0.2UJ mg/kg	
		Vanadium	0.2U mg/kg	R	Low MS/MSD, PDS %R
Rinsate Blank (5/2/10)	Metals	Cobalt	0.3U µg/L	0.3UJ µg/L	Low LCS %R
		Calcium	2610 µg/L	2610J µg/L	High duplicate RPD
		Magnesium	100U µg/L	100UJ µg/L	
Rinsate Blank (5/4/10)	Metals	Cobalt	0.88 µg/L	0.88UJ µg/L	Method blank contamination, Low LCS %R
		Calcium	2810 µg/L	2810J µg/L	High duplicate RPD
		Magnesium	100U µg/L	100UJ µg/L	
BSB3A-0.5-2	Metals	Antimony	8.25 mg/kg	8.25J mg/kg	Low MS/MSD %R; high

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
					MS/MSD RPD
		Arsenic	7.06 mg/kg	7.06J mg/kg	Low MS/MSD %R
		Chromium	70.7 mg/kg	70.7J mg/kg	
		Cobalt	21.7 mg/kg	21.7J mg/kg	
		Nickel	8.39 mg/kg	8.39J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	1.10 mg/kg	1.10J mg/kg	
		Thallium	1.56 mg/kg	1.56J mg/kg	
		Mercury	0.310 mg/kg	0.310J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
BSB3A-2.3-3.1	Metals	Antimony	5.06 mg/kg	5.06J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	4.91 mg/kg	4.91J mg/kg	Low MS/MSD %R
		Chromium	62.4 mg/kg	62.4J mg/kg	
		Cobalt	14.7 mg/kg	14.7J mg/kg	
		Nickel	8.03 mg/kg	8.03J mg/kg	
		Selenium	0.714 mg/kg	0.714J mg/kg	
		Silver	0.561 mg/kg	0.561J mg/kg	
		Thallium	1.31 mg/kg	1.31J mg/kg	
		Mercury	0.178 mg/kg	0.178J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
BSB903A-.5-2.0	Metals	Antimony	14 mg/kg	14J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	7.48 mg/kg	7.48J mg/kg	Low MS/MSD %R
		Chromium	75.9 mg/kg	75.9J mg/kg	
		Cobalt	23.2 mg/kg	23.2J mg/kg	
		Nickel	9.44 mg/kg	9.44J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	1.35 mg/kg	1.35J mg/kg	
		Thallium	1.44 mg/kg	1.44J mg/kg	
		Mercury	0.235 mg/kg	0.235J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
BSB24A-1.2-1.5	Metals	Antimony	25.1 mg/kg	25.1J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	12.9 mg/kg	12.9J mg/kg	Low MS/MSD %R
		Chromium	48.9 mg/kg	48.9J mg/kg	
		Cobalt	17.5 mg/kg	17.5J mg/kg	
		Nickel	11.7 mg/kg	11.7J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	2.84 mg/kg	2.84J mg/kg	
		Thallium	2.4 mg/kg	2.4J mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Mercury	0.481 mg/kg	0.481J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB6A-0.5-1.5	Metals	Antimony	3.54 mg/kg	3.54J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	3.89 mg/kg	3.89J mg/kg	Low MS/MSD %R
		Chromium	21.0 mg/kg	21.0J mg/kg	
		Cobalt	6.62 mg/kg	6.62J mg/kg	
		Nickel	5.24 mg/kg	5.24J mg/kg	
		Selenium	0.639 mg/kg	0.639J mg/kg	
		Silver	0.646 mg/kg	0.646J mg/kg	
		Thallium	1.29 mg/kg	1.29J mg/kg	
		Mercury	0.295 mg/kg	0.295J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB6A-2.8-3.4	Metals	Antimony	5.98 mg/kg	5.98J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	11.6 mg/kg	11.6J mg/kg	Low MS/MSD %R
		Chromium	18.0 mg/kg	18.0J mg/kg	
		Cobalt	8.75 mg/kg	8.75J mg/kg	
		Nickel	7.28 mg/kg	7.28J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	1.06 mg/kg	1.06J mg/kg	
		Thallium	5.60 mg/kg	5.60J mg/kg	
		Mercury	6.42 mg/kg	6.42J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB6A-3.6-4.3	Metals	Antimony	4.48 mg/kg	4.48J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	8.92 mg/kg	8.92J mg/kg	Low MS/MSD %R
		Chromium	16.4 mg/kg	16.4J mg/kg	
		Cobalt	8.40 mg/kg	8.40J mg/kg	
		Nickel	5.27 mg/kg	5.27J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	0.764 mg/kg	0.764J mg/kg	
		Thallium	3.70 mg/kg	3.70J mg/kg	
		Mercury	0.381 mg/kg	0.381J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB3A-1.3-2.1	Metals	Antimony	5.61 mg/kg	5.61J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	6.12 mg/kg	6.12J mg/kg	Low MS/MSD %R
		Chromium	28.4 mg/kg	28.4J mg/kg	
		Cobalt	8.23 mg/kg	8.23J mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Nickel	5.54 mg/kg	5.54J mg/kg	
		Selenium	0.525 mg/kg	0.525J mg/kg	
		Silver	0.779 mg/kg	0.779J mg/kg	
		Thallium	2.50 mg/kg	2.50J mg/kg	
		Mercury	0.502 mg/kg	0.502J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB3A-2.5-3.2	Metals	Antimony	3.28 mg/kg	3.28J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	9.03 mg/kg	9.03J mg/kg	Low MS/MSD %R
		Chromium	14.0 mg/kg	14.0J mg/kg	
		Cobalt	12.6 mg/kg	12.6J mg/kg	
		Nickel	5.08 mg/kg	5.08J mg/kg	
		Selenium	0.528 mg/kg	0.528J mg/kg	
		Silver	0.628 mg/kg	0.628J mg/kg	
		Thallium	3.48 mg/kg	3.48J mg/kg	
		Mercury	0.286 mg/kg	0.286J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
Rinsate Blank (5/6/2010)	Metals	Cobalt	0.3U µg/L	0.3UJ µg/L	Low LCS %R
SCB7A-5.6-6.3	Metals	Antimony	0.749 mg/kg	0.749J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	2.11 mg/kg	2.11J mg/kg	Low MS/MSD %R
		Chromium	8.90 mg/kg	8.90J mg/kg	
		Cobalt	5.33 mg/kg	5.33J mg/kg	
		Nickel	4.13 mg/kg	4.13J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	0.149 mg/kg	0.149J mg/kg	
		Thallium	0.385 mg/kg	0.385J mg/kg	
		Mercury	0.134 mg/kg	0.134J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB7A-5.0-5.6	Metals	Antimony	2.03 mg/kg	2.03J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	5.59 mg/kg	5.59J mg/kg	Low MS/MSD %R
		Chromium	14.5 mg/kg	14.5J mg/kg	
		Cobalt	12.4 mg/kg	12.4J mg/kg	
		Nickel	8.55 mg/kg	8.55J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	0.441 mg/kg	0.441J mg/kg	
		Thallium	1.03 mg/kg	1.03J mg/kg	
		Mercury	0.408 mg/kg	0.408J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
					%R
SCB7A-1.0-2.3	Metals	Antimony	6.16 mg/kg	6.16J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	6.54 mg/kg	6.54J mg/kg	Low MS/MSD %R
		Chromium	36.3 mg/kg	36.3J mg/kg	
		Cobalt	8.50 mg/kg	8.50J mg/kg	
		Nickel	6.99 mg/kg	6.99J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	0.676 mg/kg	0.676J mg/kg	
		Thallium	2.32 mg/kg	2.32J mg/kg	
		Mercury	1.58 mg/kg	1.58J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB907A-1.0-2.3	Metals	Antimony	5.51 mg/kg	5.51J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	7.05 mg/kg	7.05J mg/kg	Low MS/MSD %R
		Chromium	27.9 mg/kg	27.9J mg/kg	
		Cobalt	7.03 mg/kg	7.03J mg/kg	
		Nickel	5.45 mg/kg	5.45J mg/kg	
		Selenium	0.684 mg/kg	0.684J mg/kg	
		Silver	0.858 mg/kg	0.858J mg/kg	
		Thallium	1.68 mg/kg	1.68J mg/kg	
		Mercury	0.545 mg/kg	0.545J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB7A-3.6-4.4	Metals	Antimony	9.10 mg/kg	9.10J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	20.4 mg/kg	20.4J mg/kg	Low MS/MSD %R
		Chromium	24.5 mg/kg	24.5J mg/kg	
		Cobalt	23.1 mg/kg	23.1J mg/kg	
		Nickel	9.99 mg/kg	9.99J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	2.06 mg/kg	2.06J mg/kg	
		Thallium	8.56 mg/kg	8.56J mg/kg	
		Mercury	1.32 mg/kg	1.32J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB7A-2.3-2.7	Metals	Antimony	1040 mg/kg	1040J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	45.6 mg/kg	45.6J mg/kg	Low MS/MSD %R
		Chromium	19 mg/kg	19J mg/kg	
		Cobalt	13.5 mg/kg	13.5J mg/kg	
		Nickel	12.3 mg/kg	12.3J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Silver	1.69 mg/kg	1.69J mg/kg	
		Thallium	13.9 mg/kg	13.9J mg/kg	
		Mercury	0.476 mg/kg	0.476J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB7A-4.4-5.0	Metals	Antimony	2.73 mg/kg	2.73J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	9.33 mg/kg	9.33J mg/kg	Low MS/MSD %R
		Chromium	15.3 mg/kg	15.3J mg/kg	
		Cobalt	14.2 mg/kg	14.2J mg/kg	
		Nickel	6.84 mg/kg	6.84J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	0.680 mg/kg	0.680J mg/kg	
		Thallium	1.79 mg/kg	1.79J mg/kg	
		Mercury	0.557 mg/kg	0.557J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB12A-3.1-4.1	Metals	Antimony	5.74 mg/kg	5.74J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	11.4 mg/kg	11.4J mg/kg	Low MS/MSD %R
		Chromium	14.5 mg/kg	14.5J mg/kg	
		Cobalt	10.0 mg/kg	10.0J mg/kg	
		Nickel	5.66 mg/kg	5.66J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	0.882 mg/kg	0.882J mg/kg	
		Thallium	4.99 mg/kg	4.99J mg/kg	
		Mercury	0.766 mg/kg	0.766J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
SCB12A-0.5-1.5	Metals	Antimony	4.86 mg/kg	4.86J mg/kg	Low MS/MSD %R; high MS/MSD RPD
		Arsenic	6.45 mg/kg	6.45J mg/kg	Low MS/MSD %R
		Chromium	25.3 mg/kg	25.3J mg/kg	
		Cobalt	8.15 mg/kg	8.15J mg/kg	
		Nickel	5.24 mg/kg	5.24J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	
		Silver	0.369 mg/kg	0.369J mg/kg	
		Thallium	0.817 mg/kg	0.817J mg/kg	
		Mercury	0.226 mg/kg	0.226J mg/kg	High duplicate RPD
		Vanadium	0.1U mg/kg	R	No MS/MSD, low PDS %R
Rinsate Blank (5/7/2010)	Metals	Cobalt	0.3U µg/L	0.3UJ µg/L	Low LCS %R
OC15A-0.5-1.5	Metals	Aluminum	16500 mg/kg	16500J mg/kg	High LCS %R

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Magnesium	8300 mg/kg	8300J mg/kg	
		Manganese	5040 mg/kg	5040J mg/kg	
		Potassium	5730 mg/kg	5730J mg/kg	
		Sodium	1050 mg/kg	1050U mg/kg	Method blank contamination
		Mercury	0.292 mg/kg	0.292U mg/kg	
		Antimony	6.12 mg/kg	6.12J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	5.8 mg/kg	5.8J mg/kg	
		Selenium	1.63 mg/kg	1.63J mg/kg	Low LCS, MS/MSD %R
	Conventionals	TOC	0.835 %	0.835J %	High MS/MSD %R
OC15A-4.2-5.2	Metals	Aluminum	16400 mg/kg	16400J mg/kg	High LCS %R
		Magnesium	12200 mg/kg	12200J mg/kg	
		Manganese	4830 mg/kg	4830J mg/kg	
		Potassium	6270 mg/kg	6270J mg/kg	
		Mercury	0.361 mg/kg	0.361U mg/kg	Method blank contamination
		Sodium	588 mg/kg	588U mg/kg	
		Antimony	9.01 mg/kg	9.01J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	2.14 mg/kg	2.14J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS/MSD %R
	Conventionals	TOC	1.38 %	1.38J %	High MS/MSD %R
OC14Deep-8.0-10.6	Metals	Aluminum	9300 mg/kg	9300J mg/kg	High LCS %R
		Magnesium	19900 mg/kg	19900J mg/kg	
		Manganese	1380 mg/kg	1380J mg/kg	
		Potassium	4960 mg/kg	4960J mg/kg	
		Sodium	504 mg/kg	504U mg/kg	Method blank contamination
		Antimony	4.46 mg/kg	4.46J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	5.2 mg/kg	5.2J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS/MSD %R
	Conventionals	TOC	2.7 5%	2.75J %	High MS/MSD %R
OC14Deep-9.0-9.8	Metals	Aluminum	11300 mg/kg	11300J mg/kg	High LCS %R
		Magnesium	6320 mg/kg	6320J mg/kg	
		Manganese	3280 mg/kg	3280J mg/kg	
		Potassium	4690 mg/kg	4690J mg/kg	
		Mercury	0.241 mg/kg	0.241U mg/kg	Method blank contamination
		Sodium	566 mg/kg	566U mg/kg	
		Antimony	7.63 mg/kg	7.63J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	3 mg/kg	3J mg/kg	
		Selenium	1.87 mg/kg	1.87J mg/kg	Low LCS, MS/MSD %R
OC20A-0.5-1.7	Metals	Aluminum	8720 mg/kg	8720J mg/kg	High LCS %R
		Magnesium	22800 mg/kg	22800J mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Manganese	1540 mg/kg	1540J mg/kg	
		Potassium	4950 mg/kg	4950J mg/kg	
		Mercury	0.387 mg/kg	0.387U mg/kg	Method blank contamination
		Sodium	301 mg/kg	301U mg/kg	
		Antimony	4.14 mg/kg	4.14J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	1.71 mg/kg	1.71J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS/MSD %R
	Conventionals	TOC	2.03 %	2.03J %	High MS/MSD %R
OC21A-0.0-1.0	Metals	Aluminum	9470 mg/kg	9470J mg/kg	High LCS %R
		Magnesium	7950 mg/kg	7950J mg/kg	
		Manganese	1240 mg/kg	1240J mg/kg	
		Potassium	2700 mg/kg	2700J mg/kg	
		Mercury	0.14 mg/kg	0.14U mg/kg	Method blank contamination
		Sodium	356 mg/kg	356U mg/kg	
		Antimony	7.17 mg/kg	7.17J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	1.64 mg/kg	1.64J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS/MSD %R
	Conventionals	TOC	1.13 %	1.13J %	High MS/MSD %R
OC21A-2.7-4.3	Metals	Aluminum	9200 mg/kg	9200J mg/kg	High LCS %R
		Magnesium	20300 mg/kg	20300J mg/kg	
		Manganese	1260 mg/kg	1260J mg/kg	
		Potassium	3200 mg/kg	3200J mg/kg	
		Mercury	0.197 mg/kg	0.197U mg/kg	Method blank contamination
		Sodium	394 mg/kg	394U mg/kg	
		Antimony	4.38 mg/kg	4.38J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	2.05 mg/kg	2.05J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS/MSD %R
	Conventionals	TOC	0.946 %	0.946J %	High MS/MSD %R
OC22A-1.5-2.5	Metals	Aluminum	9410 mg/kg	9410J mg/kg	High LCS %R
		Magnesium	13400 mg/kg	13400J mg/kg	
		Manganese	2260 mg/kg	2260J mg/kg	
		Potassium	4500 mg/kg	4500J mg/kg	
		Sodium	549 mg/kg	549U mg/kg	Method blank contamination
		Antimony	5.11 mg/kg	5.11J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	3.31 mg/kg	3.31J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS/MSD %R
	Conventionals	TOC	1.45 %	1.45J %	High MS/MSD %R
OC21Deep2-0-1.1	Metals	Aluminum	9240 mg/kg	9240J mg/kg	High LCS %R
		Magnesium	8560 mg/kg	8560J mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Manganese	1520 mg/kg	1520J mg/kg	
		Potassium	4440 mg/kg	4440J mg/kg	
		Mercury	0.243 mg/kg	0.243U mg/kg	Method blank contamination
		Sodium	785 mg/kg	785U mg/kg	
		Antimony	3.87 mg/kg	3.87J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	5.43 mg/kg	5.43J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS/MSD %R
OC21A-1.0-2.7	Metals	Aluminum	9230 mg/kg	9230J mg/kg	High LCS %R
		Magnesium	12400 mg/kg	12400J mg/kg	
		Manganese	1980 mg/kg	1980J mg/kg	
		Potassium	4140 mg/kg	4140J mg/kg	
		Mercury	0.337 mg/kg	0.337U mg/kg	Method blank contamination
		Sodium	572 mg/kg	572U mg/kg	
		Antimony	5.84 mg/kg	5.84J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	3.19 mg/kg	3.19J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS/MSD %R
	Conventionals	TOC	1.10 %	1.10J %	High MS/MSD %R
OC921A-1.0-2.7	Metals	Aluminum	10200 mg/kg	10200J mg/kg	High LCS %R
		Magnesium	14300 mg/kg	14300J mg/kg	
		Manganese	2310 mg/kg	2310J mg/kg	
		Potassium	4770 mg/kg	4770J mg/kg	
		Sodium	650 mg/kg	650U mg/kg	Method blank contamination
		Mercury	0.320 mg/kg	0.320U mg/kg	
		Antimony	6.14 mg/kg	6.14J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	3.33 mg/kg	3.33J mg/kg	
		Selenium	0.314 mg/kg	0.314J mg/kg	Low LCS, MS/MSD %R
	Conventionals	TOC	1.38 %	1.38J %	High MS/MSD %R
OC23A-0-1.2	Metals	Aluminum	9230 mg/kg	9230J mg/kg	High LCS %R
		Magnesium	21900 mg/kg	21900J mg/kg	
		Manganese	1330 mg/kg	1330J mg/kg	
		Potassium	5050 mg/kg	5050J mg/kg	
		Mercury	0.296 mg/kg	0.296U mg/kg	Method blank contamination
		Sodium	588 mg/kg	588U mg/kg	
		Antimony	5.23 mg/kg	5.23J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	3.05 mg/kg	3.05J mg/kg	
		Selenium	0.84 mg/kg	0.84J mg/kg	Low LCS, MS/MSD %R
	Conventionals	TOC	2.19 %	2.19J %	High MS/MSD %R
OC923A-0-1.2	Metals	Aluminum	8840 mg/kg	8840J mg/kg	High LCS %R
		Magnesium	19700 mg/kg	19700J mg/kg	
		Manganese	1370 mg/kg	1370J mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Potassium	4960 mg/kg	4960J mg/kg	
		Mercury	0.268 mg/kg	0.268U mg/kg	Method blank contamination
		Sodium	521 mg/kg	521U mg/kg	
		Antimony	6.32 mg/kg	6.32J mg/kg	Low MS and/or MSD %R
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Thallium	2.96 mg/kg	2.96J mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS/MSD %R
	Conventionals	TOC	2.07 %	2.07J %	High MS/MSD %R
BSB6AConf-3.4-3.7	Metals	Aluminum	7540 mg/kg	7540J mg/kg	High LCS %R
		Magnesium	6500 mg/kg	6500J mg/kg	
		Manganese	1450 mg/kg	1450J mg/kg	
		Potassium	3590 mg/kg	3590J mg/kg	
		Mercury	0.0639 mg/kg	0.0639U mg/kg	Method blank contamination
		Sodium	303 mg/kg	303U mg/kg	
		Antimony	2.55 mg/kg	2.55J mg/kg	Low MS %R
		Silver	0.302 mg/kg	0.302J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS %R
BSB6AConf-2.4-3.4	Metals	Aluminum	21200 mg/kg	21200J mg/kg	High LCS %R
		Magnesium	5770 mg/kg	5770J mg/kg	
		Manganese	7890 mg/kg	7890J mg/kg	
		Potassium	7810 mg/kg	7810J mg/kg	
		Sodium	1230 mg/kg	1230J mg/kg	High LCS, MS %R
		Mercury	0.212 mg/kg	0.212U mg/kg	Method blank contamination
		Antimony	6.48 mg/kg	6.48J mg/kg	Low MS %R
		Silver	1.28 mg/kg	1.28J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS %R
BSB6AConf-0.5-1.5	Metals	Aluminum	23100 mg/kg	23100J mg/kg	High LCS %R
		Magnesium	6660 mg/kg	6660J mg/kg	
		Manganese	8480 mg/kg	8480J mg/kg	
		Potassium	9410 mg/kg	9410J mg/kg	
		Sodium	1680 mg/kg	1680J mg/kg	High LCS, MS %R
		Mercury	0.177 mg/kg	0.177U mg/kg	Method blank contamination
		Antimony	3.86 mg/kg	3.86J mg/kg	Low MS %R
		Silver	1.34 mg/kg	1.34J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	1.03 mg/kg	1.03J mg/kg	Low LCS, MS %R
OC18A-4.1-5.1	Metals	Aluminum	7980 mg/kg	7980J mg/kg	High LCS %R
		Magnesium	27400 mg/kg	27400J mg/kg	
		Manganese	1970 mg/kg	1970J mg/kg	
		Potassium	5990 mg/kg	5990J mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Sodium	620 mg/kg	620U mg/kg	Method blank contamination
		Antimony	3.36 mg/kg	3.36J mg/kg	Low MS %R
		Silver	0.712 mg/kg	0.712J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS %R
	Conventionals	TOC	0.571 %	0.571J %	High MS/MSD %R
OC18A-0.5-2.0	Metals	Aluminum	12900 mg/kg	12900J mg/kg	High LCS %R
		Magnesium	8820 mg/kg	8820J mg/kg	
		Manganese	3360 mg/kg	3360J mg/kg	
		Potassium	5960 mg/kg	5960J mg/kg	
		Mercury	0.289 mg/kg	0.289U mg/kg	Method blank contamination
		Sodium	1050 mg/kg	1050U mg/kg	
		Antimony	9.87 mg/kg	9.87J mg/kg	Low MS %R
		Silver	1.15 mg/kg	1.15J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS %R
	Conventionals	TOC	1.94 %	1.94J %	High MS/MSD %R
OC18A-3.3-3.5	Metals	Aluminum	8280 mg/kg	8280J mg/kg	High LCS %R
		Magnesium	12700 mg/kg	12700J mg/kg	
		Manganese	1790 mg/kg	1790J mg/kg	
		Potassium	5460 mg/kg	5460J mg/kg	
		Sodium	69.6 mg/kg	69.6U mg/kg	Method blank contamination
		Antimony	3.08 mg/kg	3.08J mg/kg	Low MS %R
		Silver	0.629 mg/kg	0.629J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS %R
OC10A-0.4-1.3	Metals	Aluminum	18600 mg/kg	18600J mg/kg	High LCS %R
		Magnesium	7730 mg/kg	7730J mg/kg	
		Manganese	5760 mg/kg	5760J mg/kg	
		Potassium	8690 mg/kg	8690J mg/kg	
		Sodium	1350 mg/kg	1350J mg/kg	High LCS, MS %R
		Mercury	0.246 mg/kg	0.246U mg/kg	Method blank contamination
		Antimony	7.28 mg/kg	7.28J mg/kg	Low MS %R
		Silver	1.11 mg/kg	1.11J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	1.93 mg/kg	1.93J mg/kg	Low LCS, MS %R
	Conventionals	TOC	0.308 %	0.308J %	High MS/MSD %R
OC10A-1.3-2.3	Metals	Aluminum	20300 mg/kg	20300J mg/kg	High LCS %R
		Magnesium	6630 mg/kg	6630J mg/kg	
		Manganese	7140 mg/kg	7140J mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Potassium	6830 mg/kg	6830J mg/kg	
		Mercury	0.314 mg/kg	0.314U mg/kg	Method blank contamination
		Sodium	1170 mg/kg	1170U mg/kg	
		Antimony	9.25 mg/kg	9.25J mg/kg	Low MS %R
		Silver	1.23 mg/kg	1.23J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	1.16 mg/kg	1.16J mg/kg	Low LCS, MS %R
	Conventionals	TOC	0.189 %	0.189J %	High MS/MSD %R
OC10A-2.3-3.0	Metals	Aluminum	16600 mg/kg	16600J mg/kg	High LCS %R
		Magnesium	8070 mg/kg	8070J mg/kg	
		Manganese	5520 mg/kg	5520J mg/kg	
		Potassium	6050 mg/kg	6050J mg/kg	
		Mercury	0.366 mg/kg	0.366U mg/kg	Method blank contamination
		Sodium	690 mg/kg	690U mg/kg	
		Antimony	7.97 mg/kg	7.97J mg/kg	Low MS %R
		Silver	0.91 mg/kg	0.91J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS %R
	Conventionals	TOC	0.44 %	0.44J %	High MS/MSD %R
OC10A-3.0-4.6	Metals	Aluminum	16100 mg/kg	16100J mg/kg	High LCS %R
		Magnesium	10400 mg/kg	10400J mg/kg	
		Manganese	4900 mg/kg	4900J mg/kg	
		Potassium	6720 mg/kg	6720J mg/kg	
		Mercury	0.384 mg/kg	0.384U mg/kg	Method blank contamination
		Sodium	732 mg/kg	732U mg/kg	
		Antimony	7.91 mg/kg	7.91J mg/kg	Low MS %R
		Silver	0.752 mg/kg	0.752J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS %R
	Conventionals	TOC	0.620 %	0.620J %	High MS/MSD %R
OC14A-0.5-1.5	Metals	Aluminum	9450 mg/kg	9450J mg/kg	High LCS %R
		Magnesium	7590 mg/kg	7590J mg/kg	
		Manganese	575 mg/kg	575J mg/kg	
		Potassium	2350 mg/kg	2350J mg/kg	
		Mercury	0.271 mg/kg	0.271U mg/kg	Method blank contamination
		Sodium	182 mg/kg	182U mg/kg	
		Antimony	10.8 mg/kg	10.8J mg/kg	Low MS %R
		Silver	1.37 mg/kg	1.37J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS %R
	Conventionals	TOC	2.52 %	2.52J %	High MS/MSD %R
OC14A-3.3-4.3	Metals	Aluminum	9890 mg/kg	9890J mg/kg	High LCS %R
		Magnesium	31100 mg/kg	31100J mg/kg	

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
		Manganese	1280 mg/kg	1280J mg/kg	
		Potassium	3480 mg/kg	3480J mg/kg	
		Mercury	0.292 mg/kg	0.292U mg/kg	Method blank contamination
		Sodium	406 mg/kg	406U mg/kg	
		Antimony	7.73 mg/kg	7.73J mg/kg	Low MS %R
		Silver	0.578 mg/kg	0.578J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS %R
	Conventionals	TOC	2.33 %	2.33J %	High MS/MSD %R
OC14A-5.5-6.6	Metals	Aluminum	7690 mg/kg	7690J mg/kg	High LCS %R
		Magnesium	25600 mg/kg	25600J mg/kg	
		Manganese	1280 mg/kg	1280J mg/kg	
		Potassium	5590 mg/kg	5590J mg/kg	
		Sodium	474 mg/kg	474U mg/kg	Method blank contamination
		Antimony	2.39 mg/kg	2.39J mg/kg	Low MS %R
		Silver	0.971 mg/kg	0.971J mg/kg	
		Vanadium	0.1U mg/kg	0.1UJ mg/kg	
		Selenium	0.5U mg/kg	0.5UJ mg/kg	Low LCS, MS %R
	Conventionals	TOC	2.88 %	2.88J %	High MS/MSD %R
Rinsate Blank (5/8/2010)	Metals	Potassium	1620 µg/L	1620J µg/L	High LCS %R
Rinsate Blank (5/10/2010)	Metals	Potassium	1760 µg/L	1760J µg/L	High LCS %R

REFERENCES

USEPA. 1983. Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio. EPA 600/4 79-020.

USEPA. 1986. Test methods for Evaluating Solid Waste: Physical/Chemical Methods. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 530/SW-846.

USEPA. 2004. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation (OSRTI). EPA 540-R-04-004. October.

Sediment Core Study - Analytical Results

Sample ID	Longitude	Latitude	Date Collected	Top Depth	Bottom Depth	Dept Unit	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Calcium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Magnesium (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)
BSB15A-0-1	-117.64847	48.97097	5/4/2010	0.0	12.0	in	1060	0.254 J	0.544 J	63.0	0.4 UJ	0.10 U	4900	4.02 J	1.34 J	104	11700	14.0	393	304	0.100 U
BSB15A-1-2	-117.64847	48.97097	5/4/2010	12.0	24.0	in	21200	1.99 J	5.10 J	643	1.03 J	1.23	80900	60.7 J	16.1 J	1310	223000	253	6250	5840	0.244 J
BSB16A-0.25-0.75	-117.64780	48.97124	5/4/2010	3.0	9.0	in	6870	1.93 J	2.71 J	436	0.346 J	0.78	38000	23.4 J	6.74 J	544	77000	110	2630	1920	0.176 J
BSB16A-1.5-2.2	-117.64780	48.97124	5/4/2010	18.0	26.4	in	22800	3.24 J	5.98 J	821	1.07 J	1.44	96700	70.2 J	19.1 J	1630	245000	249	6830	6480	0.207 J
BSB17A-0.75-1.3	-117.64750	48.97110	5/4/2010	9.0	15.6	in	10000	1.91 J	4.43 J	506	0.407 J	1.64	43400	35.5 J	9.08 J	566	103000	130	6480	2280	0.264 J
BSB17A-2.0-3.0	-117.64750	48.97110	5/4/2010	24.0	36.0	in	16900	1.52 J	4.21 J	472	0.739 J	1.04	64200	35.0 J	13.0 J	991	16900	188	4650	4660	0.259 J
BSB17A-3.75-4.0	-117.64750	48.97110	5/4/2010	45.0	48.0	in	20200	1.29 J	3.04 J	398	1.20 J	2.12	73400	34.6 J	14.9 J	1460	196000	299	5900	6710	0.347 J
BSB24A-1.2-1.5	-117.64194	48.97311	5/6/2010	14.4	18.0	in	7390	25.1 J	12.9 J	606	0.507	4.23	43000	48.9 J	17.5 J	763	64600	263	6560	2220	0.481 J
BSB3A-0.5-2	-117.64670	48.97350	5/6/2010	6.0	24.0	in	14800	8.25 J	7.06 J	619	0.926	1.30	52300	70.7 J	21.7 J	952	154000	202	4520	5870	0.310 J
BSB3A-2.3-3.1	-117.64670	48.97350	5/6/2010	27.6	37.2	in	14100	5.06 J	4.91 J	472	0.801	1.10	49500	62.4 J	14.7 J	747	145000	166	4510	5240	0.178 J
BSB4A-0.9-1.4	-117.64744	48.97336	5/5/2010	10.8	16.8	in	13100	0.80 J	4.01 J	360	0.616	2.28 J	44100	23.4 J	9.34 J	445	120000	198	5710	3300	0.463 J
BSB4A-1.5-2.5	-117.64744	48.97336	5/5/2010	18.0	30.0	in	20400	3.81 J	11.0 J	643	1.100	2.17 J	78900	56.3 J	14.3 J	1400	220000	805	4500	6960	0.494 J
BSB4A-2.5-3.2	-117.64744	48.97336	5/5/2010	30.0	38.4	in	20900	2.24 J	20.4 J	506	1.006	3.04 J	72600	33.7 J	17.5 J	1320	216000	1650	6530	6550	0.369 J
BSB4A-3.5-4.5	-117.64744	48.97336	5/5/2010	42.0	54.0	in	4020	0.4 UJ	1.80 J	44.0	0.391	0.25 J	8580	7.04 J	2.52 J	13	9250	15.0	6260	410	0.1 UJ
BSB5A-0.75-1.5	-117.64730	48.97334	5/5/2010	9.0	18.0	in	20100	4.20 J	10.9 J	996	1.241	1.42 J	81700	62.3 J	32.2 J	1870	201000	356	5570	6160	0.265 J
BSB5A-3.0-3.5	-117.64730	48.97334	5/5/2010	36.0	42.0	in	14400	1.22 J	3.93 J	389	0.758	1.13 J	53600	23.4 J	10.5 J	886	124000	322	3850	4320	0.183 J
BSB6A-0-1	-117.64710	48.97347	5/5/2010	0.0	12.0	in	17300	3.07 J	11.9 J	616	0.919 J	2.23	63600	48.9 J	13.6 J	1170	181000	610	5180	5210	0.359 J
BSB6A-1.5-2.5	-117.64710	48.97347	5/5/2010	18.0	30.0	in	5540	0.21 J	2.50 J	54.0	0.718 J	0.3	6420	9.21 J	3.57 J	13	12300	12.0	5740	546	0.100 U
BSB6A-2.5-3.5	-117.64710	48.97347	5/5/2010	30.0	42.0	in	4390	0.4 UJ	1.85 J	51.0	0.415 J	0.23	9080	12.7 J	2.69 J	9	9280	5.0	6800	390	0.100 U
BSB6A-4.0-5.0	-117.64710	48.97347	5/5/2010	48.0	60.0	in	5150	0.4 UJ	1.98 J	58.0	0.481 J	0.27	8410	9.16 J	3.10 J	14	10400	9.0	7600	450	0.100 U
BSB6AConf-0.5-1.5	-117.64721	48.94010	5/8/2010	6.0	18.0	in	23100 J	3.86 J	7.17	522	1.31	1.56	55400	57.9	22.1	1060	202000	294	6660 J	8480 J	0.177 U
BSB6AConf-2.4-3.4	-117.64721	48.94010	5/8/2010	28.8	40.8	in	21200 J	6.48 J	9.91	663	0.996	2.07	53500	70.9	17.7	1060	187000	520	5770 J	7890 J	0.212 U
BSB6AConf-3.4-3.7	-117.64721	48.94010	5/8/2010	40.8	44.4	in	7540 J	2.55 J	3.00	242	0.299	0.59	14000	17.6	5.89	173	36900	77.0	6500 J	1450 J	0.064 U
BSB903A-.5-2.0	-117.64670	48.97350	5/6/2010	6.0	24.0	in	15000	14.0 J	7.48 J	710	0.957	1.19	54000	75.9 J	23.2 J	889	158000	185	4660	5620	0.235 J
DE#10A-1-2	-117.73411	48.94182	5/2/2010	12.0	24.0	in	3620	0.52 J	6.53 J	40.0	0.169	0.42	3950	7.60	3.42	63	13200	228	2440	469 J	0.096
DE#10A-2.1-2.5	-117.73411	48.94182	5/2/2010	25.2	30.0	in	4490	1.02 J	8.43 J	54.0	0.18	0.51	5200	12.0	5.17	101	17900	312	2800	709 J	0.099
DE#11A2-0-1.3	-117.73111	48.94165	5/1/2010	0.0	15.6	in	5320	3.49 J	6.09 J	223	0.506	4.76	30200	16.8	6.18	143	3610	39.0	2260	135 J	0.072
DE#11A2-2-2.5	-117.73111	48.94165	5/1/2010	24.0	30.0	in	3080	1.80 J	4.34 J	173	0.205	5.15	41000	10.9	3.82	126	19600	218	23400	383 J	0.153
DE#12A-0-1	-117.73290	48.93992	4/30/2010	0.0	12.0	in	12900	8.73 J	11.19	794	0.889	1.71	39900	81.8	40.6	1110	112000	222	5180	5300 J	0.324 J
DE#12A-1.5-3.5	-117.73290	48.93992	4/30/2010	18.0	42.0	in	13800	1.88 J	7.35 J	299	0.791	2.02	39100	51.3	14.1	783	129000	274	4080	5930 J	0.333
DE#12A-6-12	-117.73290	48.93992	5/1/2010	72.0	144.0	in	11500	1.81 J	8.52 J	337	0.606	3.12	39100	20.7	10.8	522	88000	476	7224	4616 J	0.292
DE#14A-.75-1	-117.73323	48.94164	4/30/2010	9.0	12.0	in	6600	2.64 J	7.54	213	0.485	6.79	37300	19.4	6.14	160	20900	151	10100	693 J	0.650 J
DE#14A-0-.75	-117.73323	48.94164	4/30/2010	0.0	9.0	in	8970	3.26 J	6.45	292	0.523	2.89	24500	27.2	8.60	325	62200	241	7230	2540 J	0.316 J
DE#14A-1.4-2	-117.73323	48.94164	4/30/2010	16.8	24.0	in	3900	0.08 J	2.44	43.0	0.2 U	0.24	3870	9.10	3.44	19	9470	13.0	3550	154 J	0.05 UJ
DE#14A-2-3	-117.73323	48.94164	4/30/2010	24.0	36.0	in	3920	0.02 J	1.95	43.0	0.201	0.21	3770	8.80	2.91	12	8010	9.0	3490	234 J	0.05 UJ
DE#15A-0-1	-117.73268	48.94020	4/30/2010	0.0	12.0	in	13400	3.71 J	7.02	487	0.791	1.60	36000	50.7	22.2	748	112000	256	5320	4870 J	0.791 J
DE#15A-1.9-2.7	-117.73268	48.94020	4/30/2010	22.8	32.4	in	15200	2.60 J	6.74	398	0.91	2.04	38400	51.2	13.6	734	129000	353	4750	5880 J	0.340 J
DE#8C-0-.75	-117.73488	48.94153	5/2/2010	0.0	9.0	in	9870	5.88 J	13.2 J	629	0.694	1.99	31500	59.8	26.1	873	83599.9	200	5150	3480 J	0.314
DE#8C-1.25-2.25	-117.73488	48.94153	5/2/2010	15.0	27.0	in	9500	7.18 J	15.8 J	627	0.683	3.26	32900	55.2	18.5	982	83300	309	4850	3470 J	0.788
DE#8C-10-17	-117.73488	48.94153	5/2/2010	120.0	204.0	in	6560	3.17 J	7.49	176	0.432	9.19	62400	14.4	5.90	192	34100	361	22300	1500 J	0.987 J
DE#8C-17.0-24.0	-117.73488	48.94153	5/2/2010	204.0	240.0	in	8570	3.72 J	14.59	150	0.459	5.99	40600	13.9	11.9	360	53900	925	12400	2240 J	0.460 J
DE#8C-17.0C	-117.73488	48.94153	5/2/2010	0.0	0.0	in	5670	3.95 J	6.90	124	0.52	11.64	45100	12.4	4.92	187	31000	428	16900	1270 J	0.958 J
DE#8C-4.25-5	-117.73488	48.94153	5/2/2010	51.0	60.0	in	8740	8.18 J	7.34	423	0.532	3.13	27000	44.2	10.5	469	68100	171	6080	2490 J	0.498 J
DE#912A-1.5-3.5	-117.73290	48.93992	4/30/2010	18.0	42.0	in	12000	2.15 J	4.43 J	248	0.694	1.97	33000	40.7	12.1	669	106000	260	3360	5240 J	0.361
OC10A-0.4-1.3	-117.80490	48.90162	5/10/2010	4.8	15.6	in	18600 J	7.28 J	8.59	562	1.280	2.76	44000	49.3	16.4	787	143000	465	7730 J	5760 J	0.246 U
OC10A-1.3-2.3	-117.80490	48.90162	5/10/2010	15.6	27.6	in	20300 J	9.25 J	14.2	796	0.758	4.40	56100	72.3	17.6	997	180000	806	6630 J	7140 J	0.314 U

Sample ID	Longitude	Latitude	Date Collected	Top Depth	Bottom Depth	Dept Unit	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Calcium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Magnesium (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)
OC10A-2.3-3.0	-117.80490	48.90162	5/10/2010	27.6	36.0	in	16600 J	7.97 J	14.8	700	0.635	4.88	47200	54.0	15.1	806	135000	950	8070 J	5520 J	0.366 U
OC10A-3.0-4.6	-117.80490	48.90162	5/10/2010	36.0	55.2	in	16100 J	7.91 J	10.8	786	0.774	4.04	49600	51.0	13.1	706	120000	564	10400 J	4900 J	0.384 U
OC14A-0.5-1.5	-117.80427	48.90048	5/10/2010	6.0	18.0	in	9450 J	10.8 J	13.0	338	0.707	5.57	33200	32.1	11.5	384	16400	129	7590 J	575 J	0.271 U
OC14A-3.3-4.3	-117.80427	48.90048	5/10/2010	39.6	51.6	in	9890 J	7.73 J	12.8	564	0.556	7.18	75300	26.4	8.23	277	65000	714	31100 J	1280 J	0.292 U
OC14A-5.5-6.6	-117.80427	48.90048	5/10/2010	66.0	79.2	in	7690 J	2.39 J	18.7	121	0.300	15.40	60100	15.4	7.37	157	32700	668	25600 J	1280 J	1.28
OC14Deep-8.0-10.6	-117.80427	48.90048	5/10/2010	96.0	127.2	in	9300 J	4.46 J	21.9	135	1.05	12.60	43300	18.6	8.69	176	35800	552	19900 J	1380 J	0.540
OC14Deep-9.0-9.8	-117.80427	48.90048	5/10/2010	108.0	117.6	in	11300 J	7.63 J	7.50	393	1.21	2.48	30200	36.2	9.62	494	88400	305	6320 J	3280 J	0.241 U
OC15A-0.5-1.5	-117.80457	48.90388	5/9/2010	6.0	18.0	in	16500 J	6.12 J	11.2	474	0.972	3.46	42700	43.2	17.0	739	134000	645	8300 J	5040 J	0.292 U
OC15A-4.2-5.2	-117.80457	48.90388	5/9/2010	50.4	62.4	in	16400 J	9.01 J	7.48	564	1.14	3.70	52000	51.5	14.7	752	135000	374	12200 J	4830 J	0.361 U
OC18A-0.5-2.0	-117.80290	48.90298	5/9/2010	6.0	24.0	in	12900 J	9.87 J	10.0	524	0.821	3.61	34700	47.8	14.2	643	95200	358	8820 J	3360 J	0.289 U
OC18A-3.3-3.5	-117.80290	48.90298	5/9/2010	39.6	42.0	in	8280 J	3.08 J	5.82	391	0.918	3.11	33300	23.2	8.07	241	46700	295	12700 J	1790 J	0.679
OC18A-4.1-5.1	-117.80290	48.90298	5/9/2010	49.2	61.2	in	7980 J	3.36 J	9.61	480	0.488	5.79	65200	19.8	6.65	245	53000	365	27400 J	1970 J	0.571
OC20A-0.5-1.7	-117.82441	48.89640	5/11/2010	6.0	20.4	in	8720 J	4.14 J	8.61	362	0.833	7.22	43600	26.2	7.94	252	50000	350	22800 J	1540 J	0.387 U
OC21A-0.0-1.0	-117.84349	48.87619	5/11/2010	0.0	12.0	in	9470 J	7.17 J	7.66	372	0.838	3.83	36300	27.4	9.51	366	33600	167	7950 J	1240 J	0.140 U
OC21A-1.0-2.7	-117.84349	48.87619	5/11/2010	12.0	32.4	in	9230 J	5.84 J	8.18	334	0.554	4.65	32300	25.2	8.38	329	56200	327	12400 J	1980 J	0.337 U
OC21A-2.7-4.3	-117.84349	48.87619	5/11/2010	32.4	51.6	in	9200 J	4.38 J	7.98	433	0.828	4.95	48600	23.0	8.35	263	52400	343	20300 J	1260 J	0.197 U
OC21Deep2-0-1.1	-117.84350	48.87623	5/12/2010	0.0	13.2	in	9240 J	3.87 J	17.8	194	0.770	2.46	22300	18.6	9.06	263	38800	591	8560 J	1520 J	0.243 U
OC22A-1.5-2.5	-117.84427	48.87589	5/11/2010	18.0	30.0	in	9410 J	5.11 J	7.95	425	0.923	5.01	36600	26.3	7.56	326	60600	343	13400 J	2260 J	3.01
OC23A-0-1.2	-117.82434	48.89630	5/12/2010	0.0	14.4	in	9230 J	5.23 J	11.8	300	1.16	4.16	35800	26.8	9.62	234	42900	312	21900 J	1330 J	0.296 U
OC921A-1.0-2.7	-117.84349	48.87619	5/11/2010	12.0	32.4	in	10200 J	6.14 J	8.24	356	1.04	4.73	34300	26.9	9.25	347	61400	340	14300 J	2310 J	0.320 U
OC923A-0-1.2	-117.82434	48.89630	5/12/2010	0.0	14.4	in	8840 J	6.32 J	11.0	251	1.10	3.82	31900	27.1	8.98	220	41900	310	19700 J	1370 J	0.268 U
SCB12A-0.5-1.5	-117.63892	48.99684	5/7/2010	6.0	18.0	in	6770	4.86 J	6.45 J	407	0.425	2.24	22000	25.3 J	8.15 J	236	48600	152	6120	6120	0.226 J
SCB12A-3.1-4.1	-117.63892	48.99684	5/7/2010	37.2	49.2	in	6880	5.74 J	11.4 J	175	0.432	1.47	16600	14.5 J	10.0 J	320	57900	767	2729	2730	0.766 J
SCB3A-1.3-2.1	-117.63934	48.99650	5/6/2010	15.6	25.2	in	8960	5.61 J	6.12 J	407	0.574	3.18	31600	28.4 J	8.23 J	412	82900	338	4050	3360	0.502 J
SCB3A-2.5-3.2	-117.63934	48.99650	5/6/2010	30.0	38.4	in	7030	3.28 J	9.03 J	139	0.439	2.28	13900	14.0 J	12.6 J	335	66000	519	2830	2380	0.286 J
SCB6A-0.5-1.5	-117.63885	48.99696	5/6/2010	6.0	18.0	in	6790	3.54 J	3.89 J	226	0.432	1.17	20900	21.0 J	6.62 J	292	61200	158	2620	2270	0.295 J
SCB6A-2.8-3.4	-117.63885	48.99696	5/6/2010	33.6	40.8	in	8530	5.98 J	11.6 J	573	0.553	4.73	34800	18.0 J	8.75 J	417	70800	799	6590	2720	6.425 J
SCB6A-3.6-4.3	-117.63885	48.99696	5/6/2010	43.2	51.6	in	8110	4.48 J	8.92 J	357	0.514	1.92	23700	16.4 J	8.40 J	365	66800	536	3030	2630	0.381 J
SCB7A-1.0-2.3	-117.63903	48.99671	5/7/2010	12.0	27.6	in	9410	6.16 J	6.54 J	417	0.574	2.03	29700	36.3 J	8.50 J	410	86700	262	3520	3620	1.58 J
SCB7A-2.3-2.7	-117.63903	48.99671	5/7/2010	27.6	32.4	in	9440	1040 J	45.6 J	170	0.473	4.71	19800	19.0 J	13.5 J	358	53100	2160	4370	1760	0.476 J
SCB7A-3.6-4.4	-117.63903	48.99671	5/7/2010	43.2	52.8	in	15900	9.10 J	20.4 J	272	0.604	0.82	48000	24.5 J	23.1 J	459	49200	1170	6570	1890	1.32 J
SCB7A-4.4-5.0	-117.63903	48.99671	5/7/2010	52.8	60.0	in	8160	2.73 J	9.33 J	150	0.308	0.56	19700	15.3 J	14.2 J	252	25700	427	3718	3720	0.557 J
SCB7A-5.0-5.6	-117.63903	48.99671	5/7/2010	60.0	67.2	in	6782	2.03 J	5.59 J	116	0.316	0.5	9410	14.5 J	12.4 J	141	20400	173	3740	586	0.408 J
SCB7A-5.6-6.3	-117.63903	48.99671	5/7/2010	67.2	75.6	in	3780	0.75 J	2.11 J	50.0	0.199	0.14	4070	8.90 J	5.33 J	59	6350	39.0	1540	180	0.13 J
SCB907A-1.0-2.3	-117.63903	48.99671	5/7/2010	12.0	27.6	in	7870	5.51 J	7.05 J	389	0.489	1.76	25600	27.9 J	7.03 J	352	71400	215	2920	2710	0.545 J

Sediment Core Study - Analytical Results

Sample ID	Nickel (mg/kg)	Potassium (mg/kg)	Selenim (mg/kg)	Silver (mg/kg)	Sodium (mg/kg)	Thallium (mg/Kg)	Vanadium (mg/Kg)	Zinc (mg/Kg)	Total Organic Carbon (%)
BSB15A-0-1	0.623 J	439	1 UJ	0.127 J	72.0	0.4 U	0.2 R	1080	0.133
BSB15A-1-2	7.99 J	8320	1 UJ	0.710 J	1240	1.57	0.2 R	19800	0.5 U
BSB16A-0.25-0.75	3.55 J	3330	1 UJ	0.660 J	398	0.74	0.2 R	7720	0.185
BSB16A-1.5-2.2	10.1 J	8180	1 UJ	0.611 J	1160	1.57	0.2 R	23100	0.122
BSB17A-0.75-1.3	8.60 J	3540	1 UJ	0.579 J	464	0.96	0.2 R	7860	0.313
BSB17A-2.0-3.0	6.06 J	5890	1 UJ	0.872 J	994	1.26	0.2 R	15500	0.124
BSB17A-3.75-4.0	5.93 J	7890	1 UJ	1.03 J	1440	1.67	0.2 R	24100	
BSB24A-1.2-1.5	11.7 J	3550	0.50 UJ	2.84 J	364	2.40 J	0.2 R	5350	
BSB3A-0.5-2	8.39 J	5540	0.50 UJ	1.10 J	926	1.57 J	0.2 R	13800	0.5 U
BSB3A-2.3-3.1	8.03 J	5020	0.71 J	0.561 J	710	1.31 J	0.2 R	12200	0.5 U
BSB4A-0.9-1.4	7.11 J	5940	1 UJ	0.707 J	776	1.25	0.2 UJ	10900	0.285
BSB4A-1.5-2.5	5.98 J	5500	1 UJ	1.06 J	1150	3.91	0.2 UJ	27700	0.5 U
BSB4A-2.5-3.2	6.81 J	8560	1 UJ	1.24 J	1440	7.57	0.2 UJ	31300	0.144
BSB4A-3.5-4.5	7.37 J	1960	1 UJ	0.20 UJ	219	0.25	0.2 UJ	151	0.444
BSB5A-0.75-1.5	9.30 J	8410	1 UJ	2.58 J	1780	1.90	0.2 UJ	22600	0.5 U
BSB5A-3.0-3.5	3.92 J	6620	1 UJ	0.913 J	1010	1.70	0.2 UJ	16600	0.5 U
BSB6A-0-1	8.41 J	6530	1 UJ	1.20 J	981	3.20	0.2 R	21400	0.5 U
BSB6A-1.5-2.5	10.7 J	1970	0.14 J	0.20 UJ	258	0.21	0.2 R	95.7	0.146
BSB6A-2.5-3.5	8.66 J	1910	1 UJ	0.20 UJ	231	0.4 U	0.2 R	58.9	0.398
BSB6A-4.0-5.0	10.6 J	2090	1 UJ	0.20 UJ	261	0.4 U	0.2 R	116	0.265
BSB6AConf-0.5-1.5	9.33	9410 J	1.03 J	1.34 J	1680 J	3.53	0.1 UJ	18100	0.5 U
BSB6AConf-2.4-3.4	8.51	7810 J	0.5 UJ	1.28 J	1230 J	6.11	0.1 UJ	20200	0.5 U
BSB6AConf-3.4-3.7	10.3	3590 J	0.5 UJ	0.302 J	303 U	0.96	0.1 UJ	2850	
BSB903A-.5-2.0	9.44 J	6250	0.5 UJ	1.35 J	924	1.44 J	0.1 R	13500	0.165
DE#10A-1-2	5.51	1510	0.5 UJ	0.233 J	174	3.05	0.1 R	1690	0.267 J
DE#10A-2.1-2.5	7.00	1640	0.5 UJ	0.298 J	206	4.07	0.1 R	2460	0.189 J
DE#11A2-0-1.3	1.90	655.2	0.5 UJ	0.130 J	61.0	0.580	0.1 R	300	4.790 J
DE#11A2-2-2.5	3.02	1550	0.5 UJ	0.242 J	214	1.46	0.1 R	893	
DE#12A-0-1	10.7	41200	0.5 UJ	2.39 J	1320	3.00	0.1 R	10900	0.230 J
DE#12A-1.5-3.5	5.38	6370	0.5 UJ	0.696 J	895	4.03	0.1 R	13800	0.101 J
DE#12A-6-12	4.13	5670	0.5 UJ	0.389 J	445	4.16	0.1 R	6510	0.994 J
DE#14A-.75-1	6.01	12900	0.5 UJ	0.563 J	282	2.13	0.1 R	1560	
DE#14A-0-.75	7.42	21500	0.5 UJ	0.581 J	281	1.83	0.1 R	2910	0.825 J
DE#14A-1.4-2	4.21	4030	0.5 UJ	0.033 J	89.0	0.2 U	0.1 R	37.5	0.263 J
DE#14A-2-3	7.17	6300	0.5 UJ	0.048 J	151	0.2 U	0.1 R	38.93	0.246 J
DE#15A-0-1	7.46	34100	0.5 UJ	1.22 J	1030	3.33	0.1 R	10600	0.326 J
DE#15A-1.9-2.7	5.98	39900	0.5 UJ	0.465 J	528	2.77	0.1 R	8610	0.101 J
DE#8C-0-.75	10.0	5180	0.5 UJ	1.82 J	921	2.76	0.1 R	7360	0.337 J
DE#8C-1.25-2.25	13.5	5600	0.5 UJ	1.51 J	798	4.40	0.1 R	7380	0.439 J
DE#8C-10-17	9.03	34800	0.5 UJ	0.403 J	623	4.91	0.1 R	4460	3.21 J
DE#8C-17.0-24.0	7.28	33600	0.5 UJ	0.814 J	881	11.9	0.1 R	9630	
DE#8C-17.0C	8.13	27100	0.5 UJ	0.459 J	477	5.77	0.1 R	4270	
DE#8C-4.25-5	8.98	25900	0.5 UJ	0.529 J	508	2.46	0.1 R	5250	0.549 J
DE#912A-1.5-3.5	4.13	5790	0.5 UJ	0.338 J	437	2.34	0.1 R	7200	0.119 J
OC10A-0.4-1.3	9.18	8690 J	1.93 J	1.11 J	1350 J	4.42	0.1 UJ	13800	0.308 J
OC10A-1.3-2.3	8.83	6830 J	1.16 J	1.23 J	1170 U	9.21	0.1 UJ	19900	0.189 J

Sediment Core Study - Analytical Results

Sample ID	Nickel (mg/kg)	Potassium (mg/kg)	Selenim (mg/kg)	Silver (mg/kg)	Sodium (mg/kg)	Thallium (mg/Kg)	Vanadium (mg/Kg)	Zinc (mg/Kg)	Total Organic Carbon (%)
OC10A-2.3-3.0	9.44	6050 J	0.5 UJ	0.910 J	690 U	7.97	0.1 UJ	12300	0.444 J
OC10A-3.0-4.6	9.18	6720 J	0.5 UJ	0.752 J	732 U	4.87	0.1 UJ	8510	0.620 J
OC14A-0.5-1.5	8.44	2350 J	0.5 UJ	1.37 J	182 U	1.82	0.1 UJ	1060	2.52 J
OC14A-3.3-4.3	9.18	3480 J	0.5 UJ	0.58 J	406 U	4.66	0.1 UJ	2800	2.33 J
OC14A-5.5-6.6	14.8	5590 J	0.5 UJ	0.97 J	474 U	8.39	0.1 UJ	3940	2.88 J
OC14Deep-8.0-10.6	15.6	4960 J	0.5 UJ	0.860	504 U	5.20 J	0.1 UJ	3920	2.75 J
OC14Deep-9.0-9.8	7.53	4690 J	1.87 J	1.07	566 U	3.00 J	0.1 UJ	8340	
OC15A-0.5-1.5	10.1	5730 J	1.63 J	1.11	1050 U	5.80 J	0.1 UJ	13400	0.835 J
OC15A-4.2-5.2	10.6	6270 J	0.5 UJ	0.660	588 U	2.14 J	0.1 UJ	7130	1.38 J
OC18A-0.5-2.0	12.1	5960 J	0.5 UJ	1.15 J	1050 U	4.36	0.1 UJ	7430	1.94 J
OC18A-3.3-3.5	16.0	5460 J	0.5 UJ	0.629 J	70 U	3.46	0.1 UJ	4010	
OC18A-4.1-5.1	12.1	5990 J	0.5 UJ	0.712 J	620 U	4.71	0.1 UJ	4630	0.571 J
OC20A-0.5-1.7	14.4	4950 J	0.5 UJ	0.350	301 U	1.71 J	0.1 UJ	2000	2.03 J
OC21A-0.0-1.0	5.68	2700 J	0.5 UJ	0.430	356 U	1.64 J	0.1 UJ	3100	1.13 J
OC21A-1.0-2.7	10.7	4140 J	0.5 UJ	0.550	572 U	3.19 J	0.1 UJ	4980	1.10 J
OC21A-2.7-4.3	7.65	3200 J	0.5 UJ	0.310	394 U	2.05 J	0.1 UJ	2890	0.946 J
OC21Deep2-0-1.1	10.4	4440 J	0.5 UJ	0.810	785 U	5.43	0.1 UJ	5100	
OC22A-1.5-2.5	9.15	4500 J	0.5 UJ	0.600	549 U	3.31 J	0.1 UJ	5940	1.45 J
OC23A-0-1.2	15.7	5050 J	0.840 J	1.13	588 U	3.05 J	0.1 UJ	3140	2.19 J
OC921A-1.0-2.7	11.4	4770 J	0.314 J	0.600	650 U	3.33 J	0.1 UJ	5420	1.38 J
OC923A-0-1.2	15.7	4960 J	0.5 UJ	1.88	521 U	2.96 J	0.1 UJ	3020	2.07 J
SCB12A-0.5-1.5	5.24 J	2190	0.50 UJ	0.369 J	176	0.817 J	0.2 R	1740	1.11
SCB12A-3.1-4.1	5.66 J	2830	0.50 UJ	0.882 J	455	4.99 J	0.2 R	8740	0.5 U
SCB3A-1.3-2.1	5.54 J	3180	0.525 J	0.779 J	411	2.50 J	0.2 R	8940	0.23
SCB3A-2.5-3.2	5.08 J	2680	0.528 J	0.628 J	341	3.48 J	0.2 R	8280	0.5 U
SCB6A-0.5-1.5	5.24 J	2500	0.639 J	0.646 J	312	1.29 J	0.2 R	5830	0.111
SCB6A-2.8-3.4	7.28 J	3440	0.5 UJ	1.06 J	441	5.60 J	0.2 R	9410	0.264
SCB6A-3.6-4.3	5.27 J	3160	0.5 UJ	0.764 J	427	3.70 J	0.2 R	6870	0.5 U
SCB7A-1.0-2.3	6.99 J	4040	0.5 UJ	0.676 J	505	2.32 J	0.2 R	8930	0.125
SCB7A-2.3-2.7	12.3 J	4340	0.5 UJ	1.69 J	1290	13.9 J	0.2 R	14500	0.5 U
SCB7A-3.6-4.4	9.99 J	10000	0.5 UJ	2.06 J	3050	8.56 J	0.2 R	4130	0.5 U
SCB7A-4.4-5.0	6.84 J	5430	0.5 UJ	0.680 J	696	1.79 J	0.2 R	638	0.218
SCB7A-5.0-5.6	8.55 J	4440	0.5 UJ	0.441 J	435	1.03 J	0.2 R	352	0.5 U
SCB7A-5.6-6.3	4.13 J	1690	0.5 UJ	0.149 J	178	0.385 J	0.2 R	138	0.5 U
SCB907A-1.0-2.3	5.45 J	2880	0.684 J	0.858 J	353	1.68 J	0.2 R	6270	0.5 U

Notes:
U - not detected
J - estimated value
R - data rejected
UJ - non-detect, estimated reporting limit