

Riverbank Soil Source Control Screening Evaluation

Portland Cement Terminal
Portland, Oregon

May 2013

Prepared for:
Glacier Northwest, Inc.

www.erm.com



Glacier Northwest, Inc.

Riverbank Soil Source Control
Screening Evaluation
*Portland Cement Terminal
Portland, Oregon*

May 2013

Project No. 0126303

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LIST OF ACRONYMS

AST	above ground storage tank
BMP	best management practices
CAS	Columbia Analytical Services
EQ	exceedance quotient
ERM	ERM-West, Inc.
JSCS	Joint Source Control Strategy
mg/kg	milligrams per kilogram
NCCW	non-contact cooling water
NPDES	National Pollutant Discharge Elimination System
ODEQ	Oregon Department of Environmental Quality
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PEC	probable effects concentration
SCM	source control measures
SCSE	source control screening evaluation
SLV	screening level value
TOC	total organic carbon
TPH-D	diesel-range total petroleum hydrocarbons
TPH-G	gasoline-range total petroleum hydrocarbons
TPH-R	oil-range total petroleum hydrocarbons
USEPA	United States Environmental Protection Agency
Work Plan	<i>Riverbank Soil Sampling Work Plan</i>

1.0

INTRODUCTION

ERM-West, Inc. (ERM) has prepared this report on behalf of Glacier Northwest, Inc. (Glacier Northwest) to document the results of the riverbank soil source control screening evaluation (SCSE) at the Portland Cement Terminal in Portland, Oregon (the “site”). This sampling was performed in accordance with the *Riverbank Soil Sampling Work Plan* (ERM 2012) (Work Plan). This investigation was conducted in response to a letter from the Oregon Department of Environmental Quality (ODEQ), dated 11 June 2012, which requested additional investigation and screening of potentially erodible riverbank soils in the southern portion of the site.

1.1

OBJECTIVE OF SAMPLING

Currently, ODEQ is assessing potential upland sources of contamination to the Willamette River in the area of RM11E. Historically there have been a number of upland sources of polychlorinated biphenyls (PCBs), including electrical equipment use, servicing, and decommissioning, located in the vicinity of the site. This riverbank soil SCSE was performed in order to determine whether potentially erodible soils from the Glacier Northwest site are a source of contamination, and potential recontamination, of river sediments in the Willamette River.

In order to evaluate and control potential adverse impacts to the Willamette River, and to ensure sediments are not re-contaminated following the Portland Harbor Superfund Site sediment cleanup, the ODEQ and United States Environmental Protection Agency (USEPA) developed the Portland Harbor Joint Source Control Strategy (JSCS) guidance document (ODEQ 2005). The JSCS is a guidance document that can be utilized to identify, prioritize, and implement source control measures (SCMs) at upland sites along the Willamette River. This riverbank soil SCSE was conducted in accordance with the JSCS.

It should be noted that the JSCS document does not constitute rulemaking by the ODEQ or USEPA, and may not be relied upon to create a right or benefit, substantive or procedural, enforceable in law or equity, by any person, including the ODEQ or USEPA.

2.0 *SITE INFORMATION*

This section presents site background information, previous investigations performed at the site, and a description of the riverbank conditions. This information was previously presented in the Work Plan.

2.1 *FACILITY LOCATION AND BACKGROUND*

The Glacier Northwest Portland Cement Terminal (the site) is located at 1050 North River Street in Portland, Oregon, along the east bank of the Willamette River, between approximately RM 11.15 and 11.35 (Figure 1). The facility is currently owned and operated by Glacier Northwest as a cement distribution terminal. The site layout is presented in Figure 2.

2.2 *DESCRIPTION OF CURRENT FACILITY USES*

The site has a total area of approximately 5.1 acres. The majority of the site is paved, with smaller unpaved areas of landscaping and greenway vegetation. The primary activity at the site is the wholesale distribution of cement. The site also serves as the regional headquarters for Glacier Northwest's Oregon and Southwest Washington Operations.

The northern portion of the site is paved with asphalt and used by Glacier Northwest only for auxiliary storage. The remainder of the site is occupied by the Cement Storage Dome and the main administrative office building. The southern portion of the site is comprised of visitor and office employee parking, the operations office building and quality control area, the shop and parts storage building, cement silos, and truck load out and weigh scales (Figure 2).

Bulk cement is delivered by ship, pneumatically conveyed to the storage buildings (silos and dome), and loaded into customer trucks and railcars for off-site delivery. There are 15 storage silos with holding capacities ranging from 1,000 to 6,350 tons. The cement storage dome has a holding capacity of 30,000 tons. There are two covered truck loading and scale areas. This is a bulk distribution facility only; there is no manufacturing or processing of cement at the site.

Vehicular access to the site is via a paved road from North River Street at the northeastern corner of the site. The paved road continues around the cement dome and then to the loading areas. The truck exit from the site is via the gate used for site access.

The office buildings and quality control area are located on the eastern boundary of the site. As shown in Figure 2, these buildings along with the majority of the site are surrounded by paved areas, with the exception of small landscaped areas around the office and cement dome, the riprapped riverbank, and the 25-foot greenway setback.

2.3 *PREVIOUS INVESTIGATIONS*

In 2009, the City of Portland performed a surface and subsurface sediment characterization for the east bank of the Willamette River at River Mile 11 east (RM11E). The results of the sediment characterization indicated near-shore sediment was impacted with elevated concentrations of PCBs and some polycyclic aromatic hydrocarbons (PAHs).

In 2009, GSI Water Solutions (GSI), on behalf of the City of Portland, conducted riverbank soil and debris sampling along RM11E, including the Glacier Northwest site. A total of ten riverbank soil samples and five debris samples were collected by GSI. Total PCB concentrations in the riverbank soil samples were significantly lower (i.e. one order of magnitude) than in the adjacent near shore and main channel sediment samples.

PCB concentrations in riverbank debris samples ranged between non-detect and 1,600 µg/kg. The highest PCB concentration in debris was observed in a sample of oily rope deposited on the bank near the waterline (likely from an upstream source). The adjacent riverbank soil sample had a PCB concentration of 87 µg/kg. Samples of debris deposited on the bank from the river are not representative of the condition of riverbank soil.

Based on the magnitude and spatial distribution of riverbank, near shore, and main channel sampling results, riverbank soil does not appear to be a material source of contamination to sediment. It should also be noted that the Glacier Northwest terminal's riverbank is predominantly stabilized with riprap and is heavily vegetated. The purpose of this investigation is to evaluate the limited portion of the riverbank that is considered potentially erodible (i.e., not covered with riprap or vegetated).

2.4 *RIVERBANK CONDITIONS*

Glacier Northwest's riverbank is predominantly armored with riprap and has significant vegetation on the upper portion of the bank. The armoring and vegetation were installed in 1993 as part of a dock replacement

project. A comparatively small area of the riverbank measuring approximately 475 square feet, located in the southern end of the site, was not armored during the dock replacement project. This small area is represented in Figure 3 where the Upper and Lower Bank Sample Areas are the only riverbank areas with no armoring and the only portion of the bank with minimal exposure to potential erosion (475 square feet). As discussed with and agreed to by ODEQ during a site walk on 3 October 2012, the riverbank soil sampling focused on this small area at the southern portion of the riverbank.

The southern-most portion of the riverbank that slopes to the river is covered with large pieces of concrete and asphalt, as well as what appears to be poured concrete. The upper portion of the riverbank in this area is covered with soil and crushed rock to establish the greenway setback and to prevent erosion. The lower portion of the riverbank has limited amounts of soil exposed between the pieces of concrete and asphalt armoring material. The small amount of exposed soil in the lower portion of the riverbank also limited the amount of material that could be collected for sample analysis. Based on the limited amount of exposed soil and the need to physically chip sample material from the riverbank, the southern-most portion of the riverbank is stable with low potential for erosion.

3.0 RIVERBANK SOIL SAMPLING

This section describes the sampling locations, sample analytical parameters, and activities completed during this riverbank soil sampling event. The riverbank soil sampling was conducted in accordance with the procedures detailed in the Work Plan.

3.1 SAMPLING LOCATIONS

A total of eight riverbank soil samples (UB-1 through UB-4 and LB-1 through LB-4) were collected on 10 October 2012. Samples UB-1 through UB-4 were collected from the upper portion of the riverbank and composited as soil sample UB-101012. Samples LB-1 through LB-4 were collected from the lower portion of the riverbank and composited as soil sample LB-101012. All soil sampling locations were collected above Ordinary High Water (Elevation 20 feet NAVD 88) and selected based on availability and accessibility. Soil sample locations are presented in Figure 3. As mentioned above, the upper portion of the riverbank was a mixture of soil and heavily compacted gravel with the lower portion only having discrete areas of exposed soil between armoring material (concrete and asphalt).

3.2 SAMPLING PROCEDURES

3.2.1 *Field Sampling Method*

Sample collection methods were followed in general accordance with the Work Plan (ERM 2012).

All soil samples were collected from the top six inches of soil using a stainless-steel trowel. If necessary, the top two inches of riverbank material and/or debris were removed to limit the amount of soil sampled that may have been deposited during high river levels and therefore obtain riverbank samples that represent the bank material.

All non-disposable field sampling equipment was decontaminated prior to use and between sample locations. Decontamination steps included:

- Mass removal of solids with tap water;
- Scrub with Alconox detergent and distilled water; and
- Rinse with distilled water.

Soil samples were composited using the following method:

- Approximately equal amounts of soil from the four subsamples within each sample area (e.g. UB-1 through UB-4) were placed into a decontaminated stainless-steel bowl.
- The soil samples were then mixed thoroughly using a decontaminated, stainless steel spoon.
- The composite sample was placed into laboratory-provided glassware, labeled, and stored in a cooler containing ice.
- Sampling equipment was then decontaminated, as described above.

Solid waste (disposable equipment and gloves) generated during the sampling event was collected, removed, and disposed of at a landfill as non-hazardous material.

Field notes taken during sampling activities were recorded in a field log book.

3.2.2 *Field Quality Control Samples*

An equipment rinsate blank (RB-101012) was collected from the decontaminated bowl and trowel following the composite of sample LB-101012.

3.2.3 *Laboratory Analytical Methods*

Two composite soil samples were collected in laboratory-provided sample containers, labeled, and stored on ice immediately after each sample was collected. The samples were delivered via courier service to ALS Laboratories (ALS) in Kelso, Washington under proper chain-of-custody procedures. ALS performed the following analyses for each composite soil sample:

- Metals (Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, and zinc) by USEPA Method 6010B;
- Mercury by USEPA Method 7471A;
- PCBs by USEPA Method 8082; and
- PAHs by USEPA Method 8270m.

The rinsate blank was analyzed for the following:

- Total metals (Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, and zinc) by USEPA Method 6010B;
- Total mercury by USEPA Method 7471A;
- PCBs by USEPA Method 8082
- PAHs by USEPA Method 8270m.

A copy of the chain-of-custody form is provided in Appendix A.

4.0 **RIVERBANK SOIL SAMPLING RESULTS AND SCREENING EVALUATION**

This section presents the results of the riverbank soil sampling and analysis. ERM collected soil samples from riverbank on 10 October 2012. The locations of the soil samples and summary of analytical results are presented in Figure 3 and Table 1, respectively. The full laboratory analytical report is presented in Appendix A. The data validation report is provided in Appendix B.

4.1 **RIVERBANK SOIL ANALYTICAL RESULTS**

The results for the riverbank soil sampling and comparison to the JSCS screening level value (SLVs) are presented in Table 1 and discussed below.

It should be noted that an exceedance of an SLV does not necessarily indicate the upland source poses an unacceptable risk to human health or the environment; rather, it means that further consideration of the need for source control be performed through a weight-of-evidence evaluation.

SLVs against which the results are compared (MacDonald Probable Effects Concentration [PEC] and ODEQ 2007 Bioaccumulative Sediment) are guidance values derived for comparison of in-water sediment samples (i.e., sediment in which ecological receptors are present). They are not intended to evaluate upland soil samples. The presence of a constituent in upland soil is not a confirmation that the constituent is migrating to the Willamette River or that it is present in river sediment. Even if migration were to occur, dilution of several orders of magnitude would occur before accumulating in sediment where ecological receptors exist. Therefore, comparison of upland soil concentrations to these in-water ecological risk guidance values is considered extremely conservative.

In order to assess the magnitude of the analytical result exceedance of the applicable SLV, an exceedance quotient (EQ) was calculated for each analyte with an exceedance, as follows:

$$\text{Exceedance Quotient (EQ)} = \frac{\text{Analytical Result}}{\text{Applicable Screening Level Value}}$$

The EQs are calculated based on a comparison to the most conservative SLV available in the JSCS. The results of the EQ calculations for the

riverbank soil sampling results are provided in Table 2 and discussed below.

4.1.1 *Metals*

Concentrations of metals detected in riverbank soils are provided in Table 1. Metals with concentrations that exceeded the SLVs in one or more soil samples are presented in Figure 4.

All 13 metals (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc) were detected in both riverbank soil samples. Concentrations of arsenic, chromium, copper, lead, mercury, and nickel exceeded the SLVs in one or more of the riverbank soil samples. However, as shown in Table 1, SLVs for several of these metals (arsenic, lead, and mercury) are below the natural background concentrations for the Portland Basin (ODEQ 2013). Of the metals for which the soil concentration exceeded the respective SLV, chromium, copper, lead, and nickel also exceeded the respective ODEQ background concentration.

The exceedance quotients for metals in riverbank soil were below 10, with the exception of lead (37.5) in the Lower Bank sample.

4.1.2 *Polychlorinated Biphenyls*

Concentrations of PCBs are provided in Table 1. Aroclor 1260 was the only PCB detected in riverbank soils. The Aroclor 1260 concentration in the Lower Bank sample exceeded the SLV with an EQ of 1.2. The Total PCB Aroclor SLV (0.39 µg/kg) was exceeded in the Lower Bank and Upper Bank samples. The EQs from the Lower Bank and Upper Bank samples were 615.4 and 107.7 respectively. A summary of PCB concentrations is presented in Figure 5.

4.1.3 *Polycyclic Aromatic Hydrocarbons*

Concentrations of PAHs are provided in Table 1. All 17 PAHs were detected in both riverbank soil samples. Concentrations of benzo(g,h,i)perylene and indeno(1,2,3-c,d)pyrene exceeded the SLVs.

The EQs for the detected PAHs ranged from 0.2 to 12.0. The EQs for benzo(g,h,i)perylene were 0.7 and 5.0. The EQs for indeno(1,2,3-c,d)pyrene were 2.0 and 12.0. A summary of PAH concentrations is presented in Figure 6.

All constituents that exceeded the SLVs were carried forward into the weight-of-evidence evaluation. The purpose of this evaluation is to analyze multiple lines of evidence to evaluate the likelihood of adverse effects from migration of soils to surface water and sediment, and to determine if soils SCMs are required. As per the JSCS guidance for erodible soil screening evaluations, the weight-of-evidence evaluation may consider the following site-specific factors:

- Presence of persistent bioaccumulative chemicals;
- Contaminant concentrations (magnitude of exceedance above SLV);
- Regional background soil concentrations for naturally occurring chemicals (i.e., metals);
- Extent of contaminated soil (e.g., area of exposed and/or erodible soil);
- Proximity of source area soil to the river;
- In-water sediment data in proximity to source area;
- Site surface conditions (e.g., exposed soil, paved, slope);
- Riverbank stability (e.g., potential for erosion under extreme rainfall events, potential for erosion under flood conditions, bank erosion rates);
- Soil properties (e.g., soil type, compaction, erodibility, permeability);
- Storm water management;
- Proximity of source area soils to storm water catch basin;
- Evaluation of potential soil erosion and contaminant transport (e.g., modeling, quantitative erosion calculations); and
- Estimate of potential contaminant loading to the river.

The following sections discuss the weight-of-evidence evaluation for riverbank soil compounds that were detected above their respective SLVs.

Chromium, copper, lead, and nickel were detected above the respective SLVs and background concentrations (arsenic and mercury were detected above the respective SLVs, but below the respective background

concentrations). The EQs for these compounds were less than 10, indicating that river bank soil is not a material source of recontamination to river sediment for these compounds.

Lead was detected in the Lower Bank sample at a concentration of 638 mg/kg, which equates to an EQ of 37.5 (8.1 when compared to background concentration). The Upper Bank sample had a concentration of 63.8 mg/kg. Lead results from previous riverbank soil and near shore sediment investigations are presented in Figure 7. The riverbank soil concentrations are within the range of lead concentrations observed in previous riverbank soil investigations. The soil concentrations in riverbank soil are generally similar to, or less than, the concentrations of lead observed in near shore sediments.

Concentrations of lead (as well as most other detected constituents) in the Upper Bank sample were approximately an order of magnitude lower than concentrations in the Lower Bank sample. This may indicate that concentrations detected in the Lower Bank sample are representative of material that has been deposited by the river, rather than material generally present throughout the riverbank.

The amount of exposed soil within the lower bank area is minimal, with limited potential for significant amounts of soil erosion. As noted previously, sampling in the lower area involved chipping material from the bank rather than simple, direct sample extraction. The potential mass of contaminants that can be transported to the river is limited. Based on the low to moderate EQs, limited exposed and erodible soil, and low concentrations relative to in-water sediments, Glacier Northwest's riverbank does not appear to be a material source of lead to the river sediment.

5.2 *POLYCHLORINATED BIPHENYLS*

PCBs were detected in the Lower and Upper Bank samples, with EQs for Total PCBs of 615 and 108, respectively. The historical PCB results for riverbank soils and in-water sediment are presented in Figure 8. The riverbank soil PCB concentrations are within the range of previously observed PCB concentrations in the riverbank. The riverbank soil concentrations are lower than the PCB concentrations in the near shore sediment. PCB concentrations directly upstream from the Glacier site are an order of magnitude higher than the riverbank soil concentrations.

As discussed above, concentrations of PCBs (as well as most other detected constituents) in the Upper Bank sample were approximately an

order of magnitude lower than concentrations in the Lower Bank sample. This may indicate that concentrations detected in the Lower Bank sample are the result of, and representative of, material that has been deposited on the riverbank by the river, rather than as an indication of concentration present in material throughout the riverbank.

As discussed above, the amount of potentially erodible riverbank soil is minimal. Based on the low concentrations relative to in-water sediment, limited exposed and erodible soil, Glacier Northwest's riverbank does not appear to be a material source of PCBs to the river sediment.

5.3 *POLYCYCLIC AROMATIC HYDROCARBONS*

PAHs were detected in both the Lower and Upper Bank samples. Only two PAH compounds, benzo(g,h,k)perylene and indeno(1,2,3-c,d)pyrene were detected above the SLVs, with EQs between 2 and 12. The highest EQ was for indeno(1,2,3-c,d)pyrene in the Upper Bank sample. The historical indeno(1,2,3-c,d)pyrene results for riverbank soil and in-water sediment are presented in Figure 9. The riverbank soil results are within the range of previously observed PAH concentrations in the riverbank. The riverbank soil concentrations are similar to the in-water sediment results.

As discussed previously, the amount of potentially erodible riverbank soil is minimal. Based on the low EQs, similar concentrations to in-water results, and limited exposed and erodible soil, Glacier Northwest's riverbank does not appear to be a material source of PAHs to the river sediment.

Riverbank soil samples were collected from the southern portion of the site in October 2012. The riverbank soil sampling results were screened against applicable JSCS SLVs. Compounds with one or more SLV exceedances were carried through into a weight-of-evidence evaluation.

The qualitative weight-of-evidence evaluation consisted of an assessment of the number and magnitude of SLV exceedances and a comparison to published in-water sediment and previous riverbank soil data.

The results of the weight-of-evidence evaluation indicate the following:

- Metals were detected in the riverbank soils at concentrations above the SLVs. Over half of the detections of metals were below the background concentrations for the Portland Basin (ODEQ 2013). Of the metals for which the soil concentration exceeded the respective SLV, chromium, copper, lead, and nickel also exceeded the respective ODEQ background concentration. The EQs for these four metals were all less than 10. Based on the overall low EQs, the small area of exposed riverbank, the stability of the soils in the sampling area, and the low erodibility of the riverbank in general, riverbank soils at the Glacier Northwest site are not a significant source of metals in sediment.
- The concentration of total PCBs in upper and lower riverbank soil is generally more than an order of magnitude less than the total PCB concentrations observed in sediment samples from the Willamette River. This indicates that the riverbank soils at the Glacier Northwest site are not a significant source of PCBs in sediment.
- PAH concentrations in soil have generally low EQs and are not considered a significant source due to the stability and low erodibility of the riverbank.
- The near shore sediment concentrations of most constituents are generally higher than the riverbank soil concentrations. Concentrations were also generally higher in the Lower Bank sample than the Upper Bank, indicating that the Lower Bank sample is potentially representative of material that has been deposited by the river, rather than material generally present throughout the riverbank.

In general, the overall low erodibility of the riverbank across the entire site and the relatively small exposed area at the southern portion of the riverbank suggest that riverbank soils at the site do not pose a potential

risk of recontamination to the Willamette River. Based on this evaluation, no riverbank soil SCMs are determined to be necessary.

REFERENCES

ERM. October 2012, *Riverbank Soil Sampling Work Plan, Portland Cement Terminal, Portland, Oregon*, for Glacier Northwest Inc., ERM, Portland, Oregon.

GeoEngineers. April 2004, *Spill Prevention, Control and Countermeasures Plan, Portland Cement Terminal, Portland, Oregon*, for Glacier Northwest Inc., ERM, Portland, Oregon.

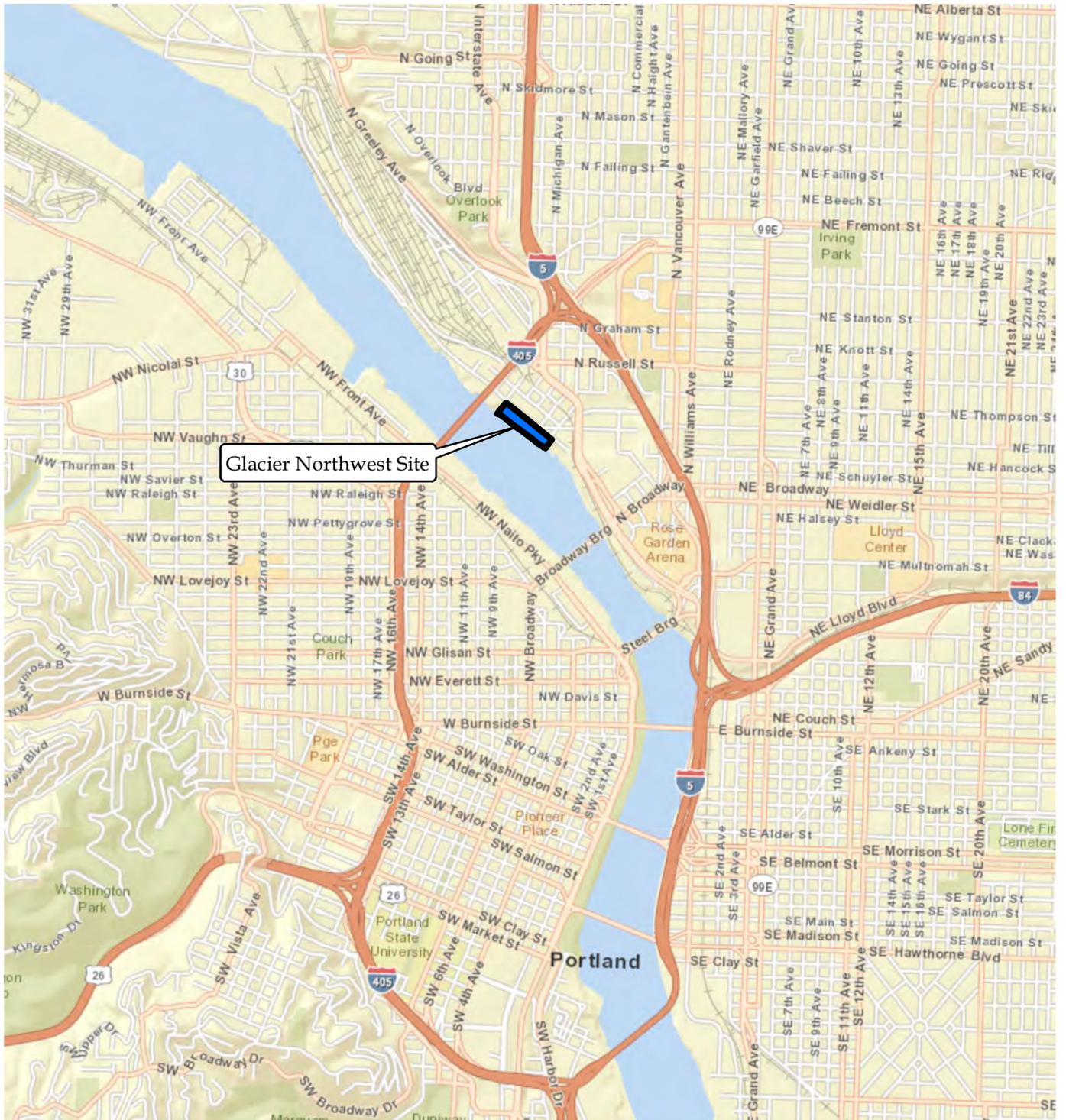
GSI Water Solutions (GSI). 2010. *Draft Bank Soil and Debris Field and Data Report, River Mile 11 East, Focused Sediment Characterization*. June 2010.

GSI. 2009. *Draft Surface and Subsurface Sediment Field and Data Report, River Mile 11 East, Focused Sediment Characterization*. August 2009.

Oregon Department of Environmental Quality (ODEQ) 2013. *Development of Oregon Background Metals Concentrations in Soil*. March 2013.

ODEQ 2005. *Portland Harbor Joint Source Control Strategy*. December 2005.

Figures



Legend

 Site Boundary

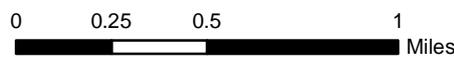
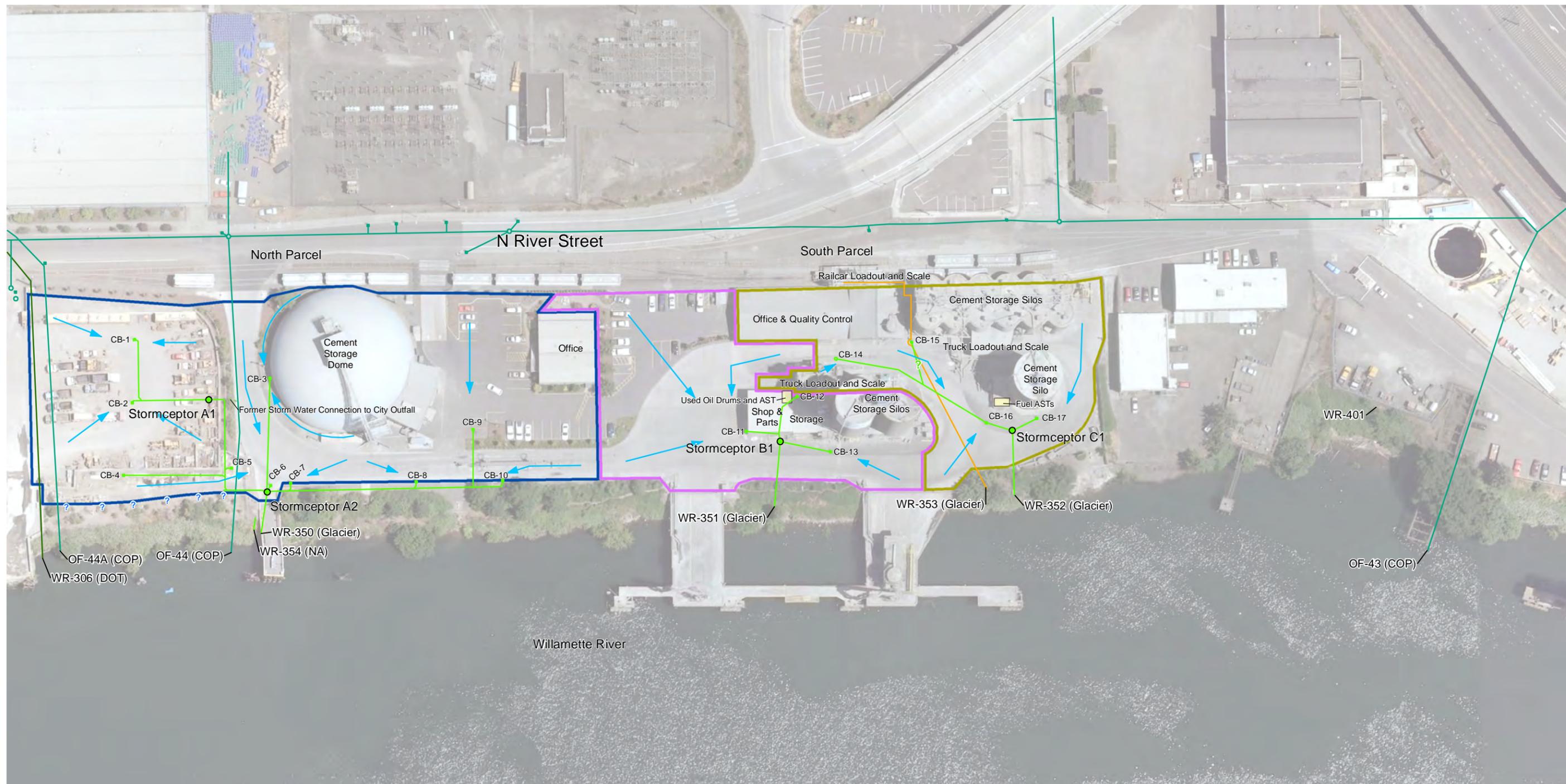


Figure 1
Site Location
Riverbank Erodible Soil
Source Control Evaluation
Glacier Northwest, Inc.
Portland, Oregon

Environmental Resources Management
1001 SW 5th Ave, Suite 1010
Portland, Oregon 97204
503-488-5282





Legend

- Stormceptor
- Glacier Site Storm Sewer Line
- City of Portland Storm Sewer Line
- Oregon Department of Transportation Storm Sewer Line
- - - Former Storm Sewer Connection to Municipal Outfall
- Non-Contact Cooling Water Line
- Surface Water Flow Direction
- Containment Areas
- Catchment WR-350
- Catchment WR-351
- Catchment WR-352

Notes:
 COP- City of Portland
 DOT- Oregon Department of Transportation
 Glacier - Glacier Northwest, Inc.
 NA- Not applicable, not in use.

All drainage area boundaries are approximate, queried where location is uncertain.
 Re-routing of the storm water sewer connection completed prior to SCSE implementation.
 All Aboveground Storage Tanks (ASTs) and drum storage areas have secondary containment.
 Aerial Photo: City of Portland, June 2008.

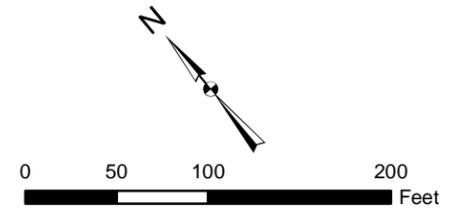
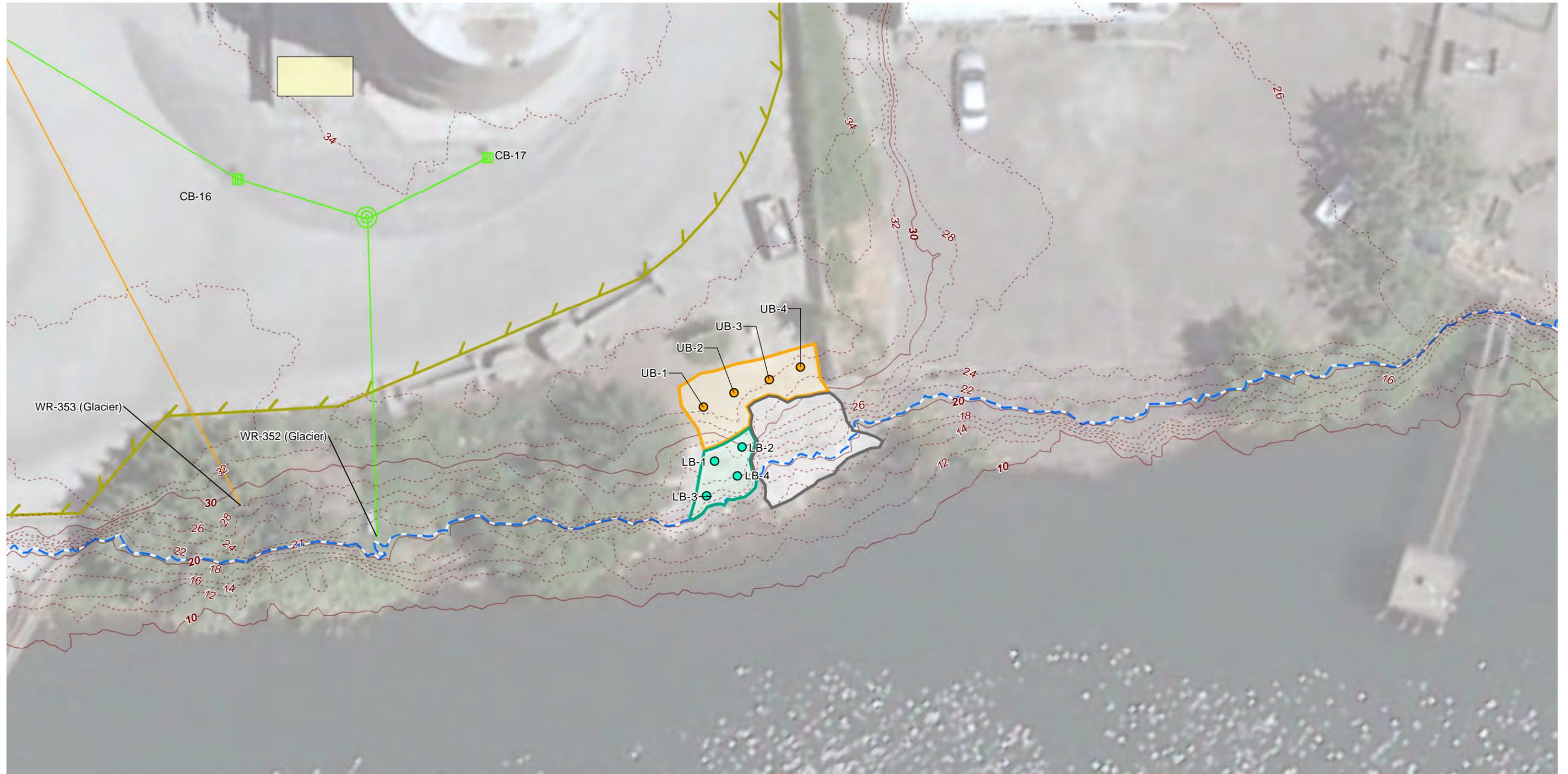


Figure 2
 Site Map
 Riverbank Erodible Soil
 Source Control Evaluation
 Glacier Northwest, Inc.
 Portland, Oregon



Legend

- Upper Bank Aliquot Sample Location
- Lower Bank Aliquot Sample Location
- Ordinary High Water (20.5 ft AMSL)
- Upper Bank Sample Area
- Lower Bank Sample Area
- Concrete Armor Area (Approx.)
- Existing Containment Areas
- Catchment WR-352 (Approx.)
- Glacier Site Storm Sewer Line
- City of Portland Storm Sewer Line
- Oregon DOT Storm Sewer Line
- Non-Contact Cooling Water Line

Notes:

COP- City of Portland
 DOT- Oregon Department of Transportation
 Glacier - Glacier Northwest, Inc.
 NA- Not applicable, not in use.
 AMSL - Above mean sea level

All drainage area boundaries are approximate, queried where location is uncertain.
 Aerial Photo: City of Portland, June 2008.
 Elevation Data: U.S. Army Corps of Engineers, Columbia River LiDAR flown 2010 (interpolated below structures), given in feet above mean sea level

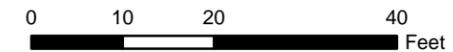
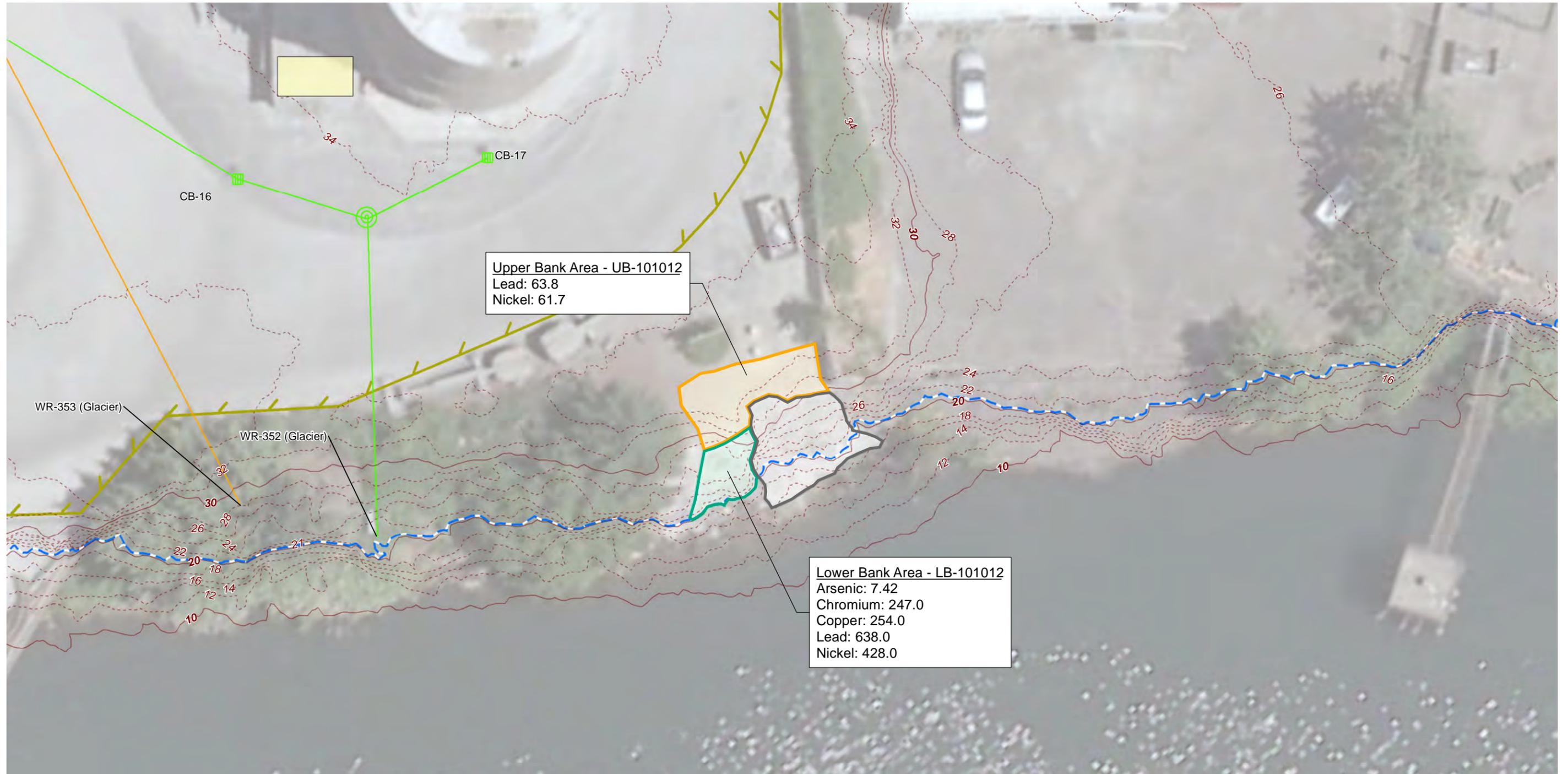


Figure 3
 Riverbank Soil Sampling Locations
 Riverbank Erodible Soil
 Source Control Evaluation
 Glacier Northwest, Inc.
 Portland, Oregon



Upper Bank Area - UB-101012
 Lead: 63.8
 Nickel: 61.7

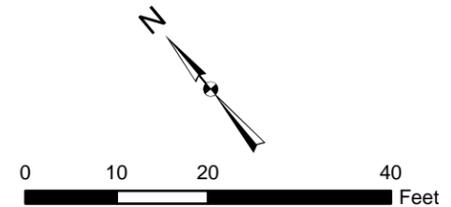
Lower Bank Area - LB-101012
 Arsenic: 7.42
 Chromium: 247.0
 Copper: 254.0
 Lead: 638.0
 Nickel: 428.0

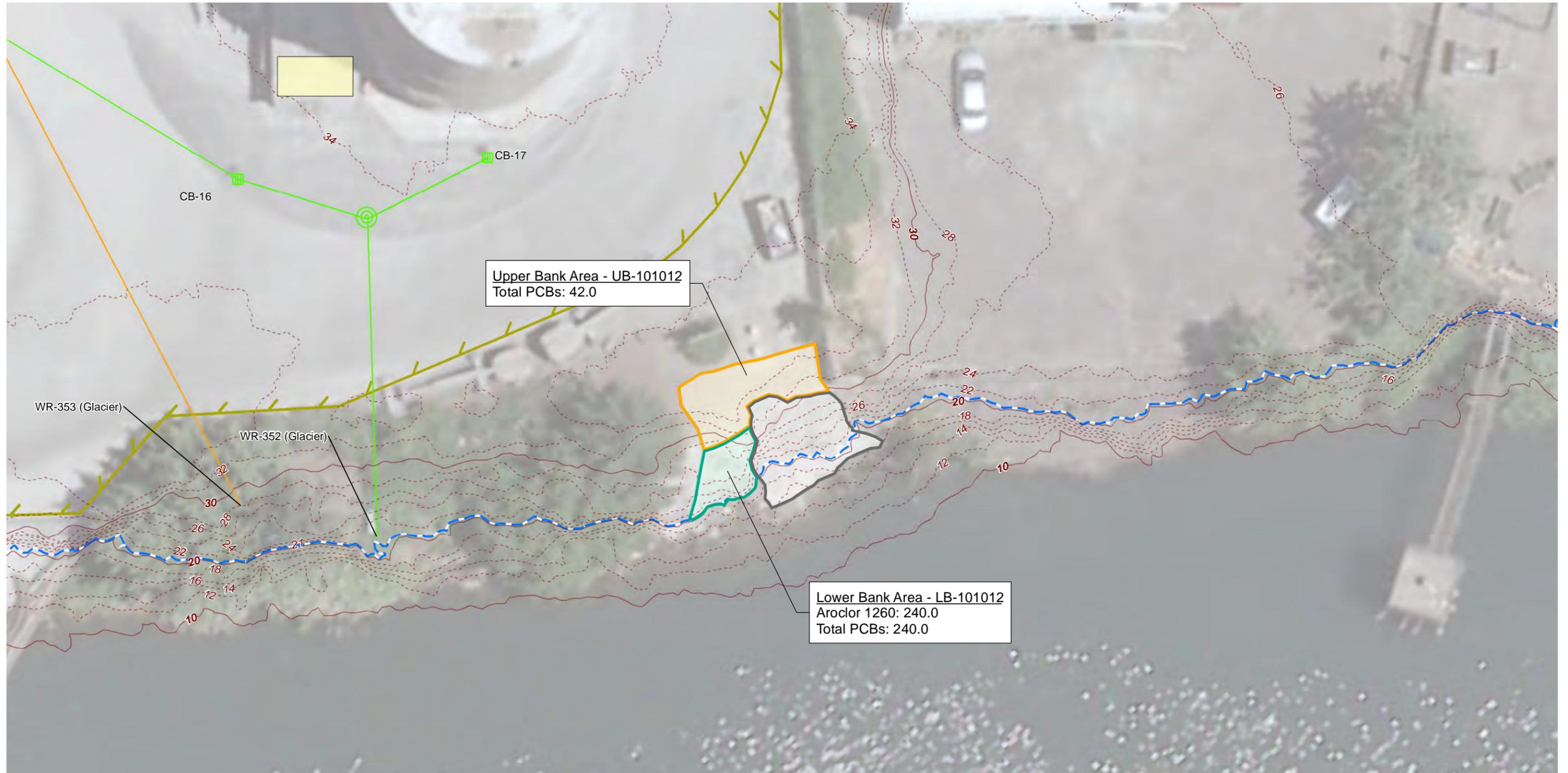
Legend

- - - Ordinary High Water (20.5 ft AMSL)
- Catchment WR-352 (Approx.)
- Upper Bank Sample Area
- Lower Bank Sample Area
- Concrete Armor Area (Approx.)
- Existing Containment Areas
- Glacier Site Storm Sewer Line
- City of Portland Storm Sewer Line
- Oregon DOT Storm Sewer Line
- Non-Contact Cooling Water Line

Notes:
 All results given in milligrams per kilogram.
 Only screening exceedences shown.
 DOT- Oregon Department of Transportation.
 Glacier - Glacier Northwest, Inc.
 NA- Not applicable, not in use.
 AMSL - Above mean sea level.

All drainage area boundaries are approximate, queried where location is uncertain.
 Aerial Photo: City of Portland, June 2008.
 Elevation Data: U.S. Army Corps of Engineers, Columbia River LiDAR flown 2010 (interpolated below structures), given in feet above mean sea level





Legend

- - - Ordinary High Water (20.5 ft AMSL)
- Upper Bank Sample Area
- Lower Bank Sample Area
- Concrete Armor Area (Approx.)
- Existing Containment Areas
- Catchment WR-352 (Approx.)
- Glacier Site Storm Sewer Line
- City of Portland Storm Sewer Line
- Oregon DOT Storm Sewer Line
- Non-Contact Cooling Water Line

Notes:

All results given in micrograms per kilogram.
 PCBs - Polychlorinated biphenyls
 DOT- Oregon Department of Transportation.
 Glacier - Glacier Northwest, Inc.
 NA- Not applicable, not in use.
 AMSL - Above mean sea level.

All drainage area boundaries are approximate, queried where location is uncertain.
 Aerial Photo: City of Portland, June 2008.
 Elevation Data: U.S. Army Corps of Engineers, Columbia River LiDAR flown 2010 (interpolated below structures), given in feet above mean sea level

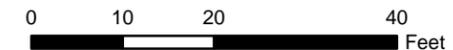


Figure 5
 Summary of Polychlorinated Biphenyls Results
 Riverbank Erodible Soil
 Source Control Evaluation
 Glacier Northwest, Inc.
 Portland, Oregon



Legend

- - - Ordinary High Water (20.5 ft AMSL)
- Catchment WR-352 (Approx.)
- Upper Bank Sample Area
- Lower Bank Sample Area
- Concrete Armor Area (Approx.)
- Existing Containment Areas
- Glacier Site Storm Sewer Line
- City of Portland Storm Sewer Line
- Oregon DOT Storm Sewer Line
- Non-Contact Cooling Water Line

Notes:

All results given in micrograms per kilogram.
 Only screening exceedences shown.
 PAHs - Polycyclic aromatic hydrocarbons.
 DOT- Oregon Department of Transportation.
 Glacier - Glacier Northwest, Inc.
 NA- Not applicable, not in use.
 AMSL - Above mean sea level.

All drainage area boundaries are approximate, queried where location is uncertain.
 Aerial Photo: City of Portland, June 2008.
 Elevation Data: U.S. Army Corps of Engineers, Columbia River LiDAR flown 2010 (interpolated below structures), given in feet above mean sea level

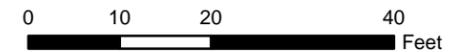
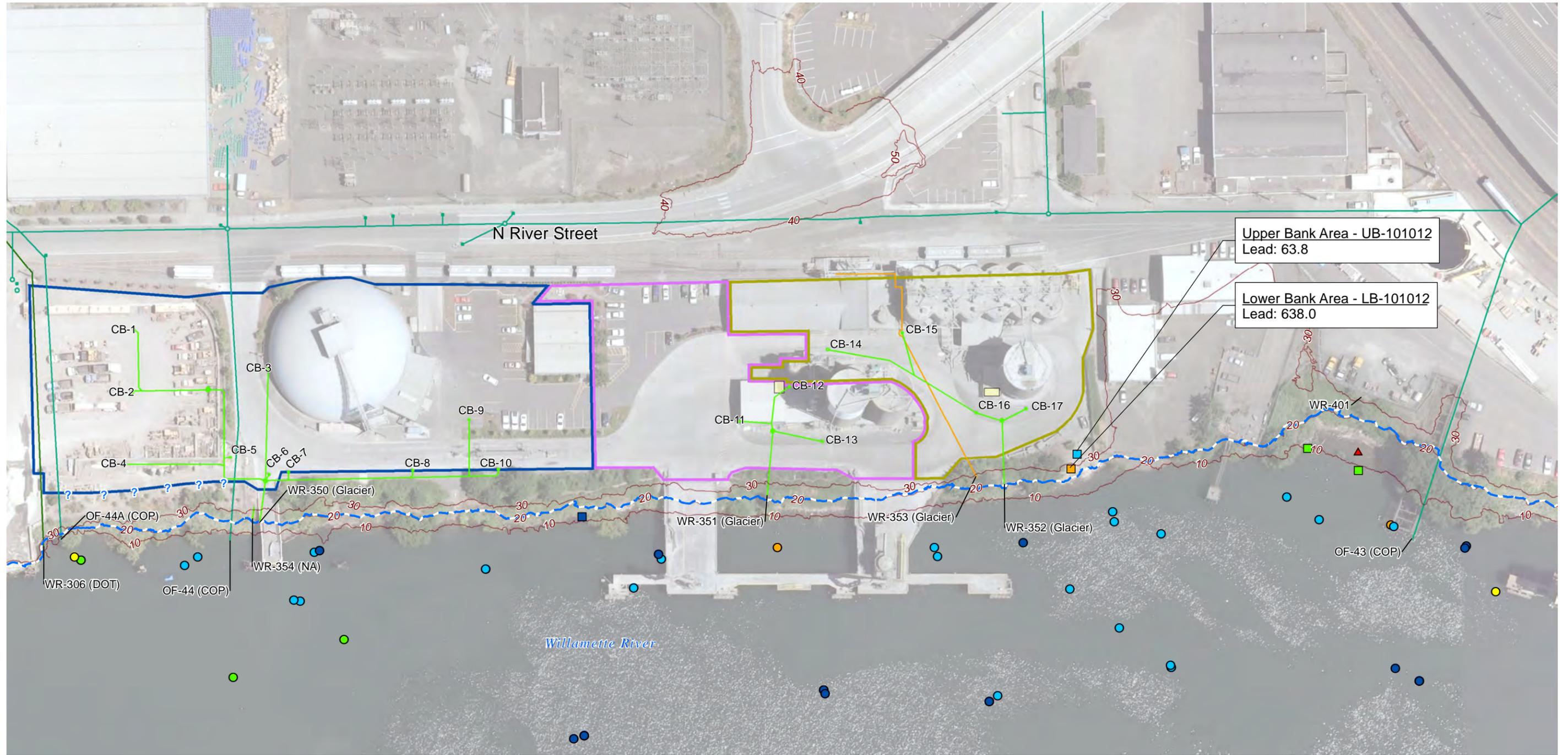


Figure 6
 Summary of PAH Results
 Riverbank Erodible Soil
 Source Control Evaluation
 Glacier Northwest, Inc.
 Portland, Oregon



Legend

Sample Locations

- △ Riverbank Debris Sample
- Riverbank Soil Sample
- In-water Sediment Sample
- ▭ Catchment WR-350
- ▭ Catchment WR-351
- ▭ Catchment WR-352

Containment Areas

- Ordinary High Water (20.5 ft AMSL)
- Glacier Site Storm Sewer Line
- City of Portland Storm Sewer Line
- Oregon DOT Storm Sewer Line
- Non-Contact Cooling Water Line

Concentrations of Lead

- < 17 mg/kg
- 17 - 128 mg/kg
- 128 - 300 mg/kg
- 300 - 500 mg/kg
- 500 - 1000 mg/kg
- > 1000 mg/kg

Notes:

All results in milligrams per kilogram.
Only screening exceedences shown.
CB- Catch Basin
COP- City of Portland
DOT- Oregon Department of Transportation
Glacier - Glacier Northwest, Inc.

All drainage area boundaries are approximate, queried where location is uncertain.
Aerial Photo: City of Portland, June 2008
Elevation Data: U.S. Army Corps of Engineers, Columbia River LiDAR flown 2010 (interpolated below structures), given in feet above mean sea level

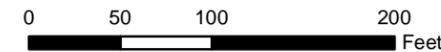
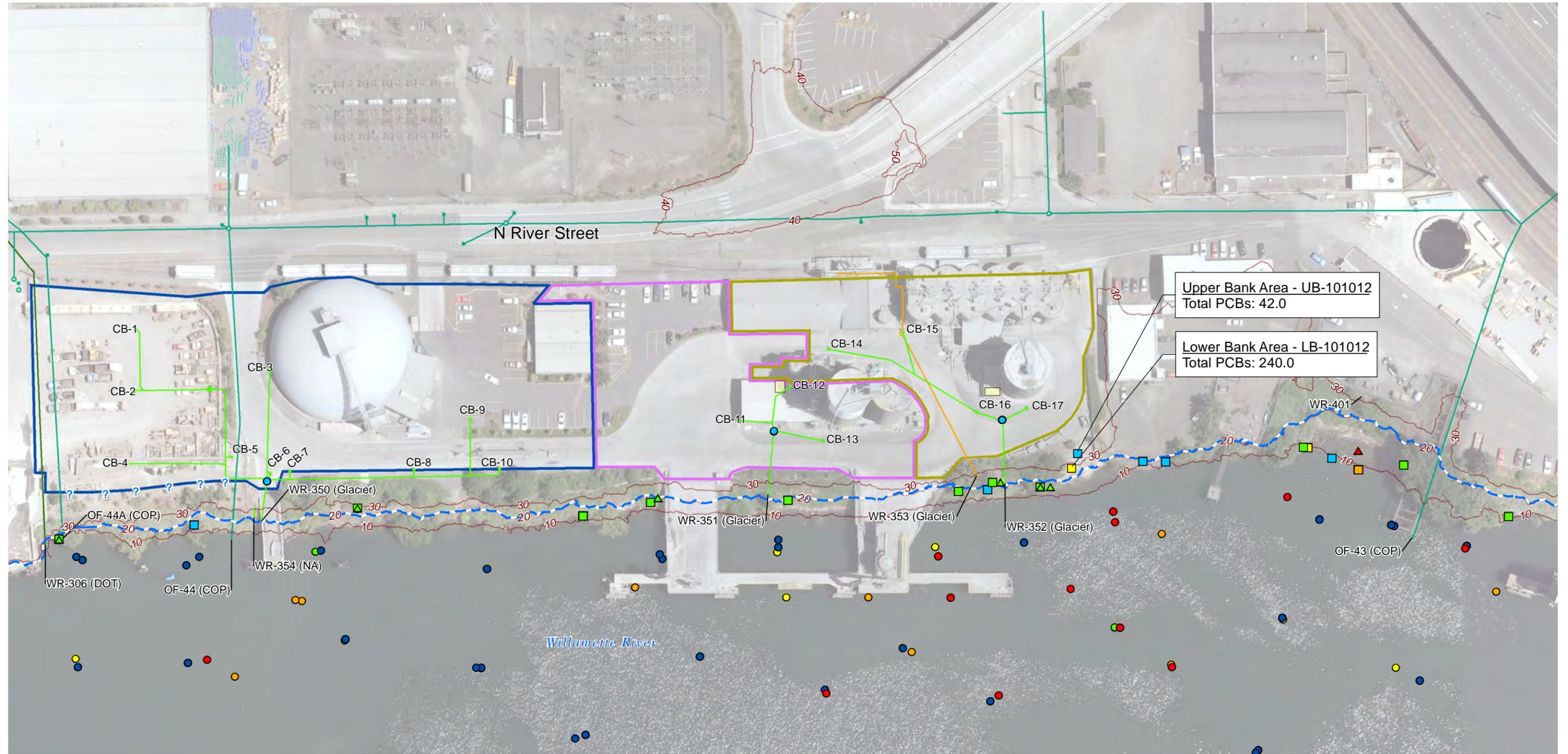


Figure 7
*Sitewide Lead Results
Riverbank Erodible Soil
Source Control Evaluation
Glacier Northwest, Inc.
Portland, Oregon*



Legend

Sample Locations

- △ Riverbank Debris Sample
- Riverbank Soil Sample
- In-water Sediment Sample
- ▭ Catchment WR-350
- ▭ Catchment WR-351
- ▭ Catchment WR-352

Containment Areas

- Ordinary High Water (20.5 ft AMSL)
- Glacier Site Storm Sewer Line
- City of Portland Storm Sewer Line
- Oregon DOT Storm Sewer Line
- Non-Contact Cooling Water Line

Concentrations of Total PCB Aroclors

- < 34 µg/kg
- 34 - 75 µg/kg
- 75 - 150 µg/kg
- 150 - 300 µg/kg
- 300 - 1,000 µg/kg
- > 1000 µg/kg

Notes:

All results in micrograms per kilogram.
 PCBs - Polychlorinated biphenyls
 CB- Catch Basin
 COP- City of Portland
 DOT- Oregon Department of Transportation
 Glacier - Glacier Northwest, Inc.

All drainage area boundaries are approximate, queried where location is uncertain.
 Aerial Photo: City of Portland, June 2008
 Elevation Data: U.S. Army Corps of Engineers, Columbia River LiDAR flown 2010 (interpolated below structures), given in feet above mean sea level

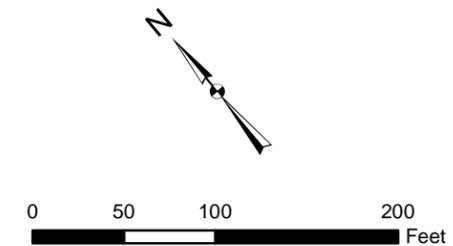
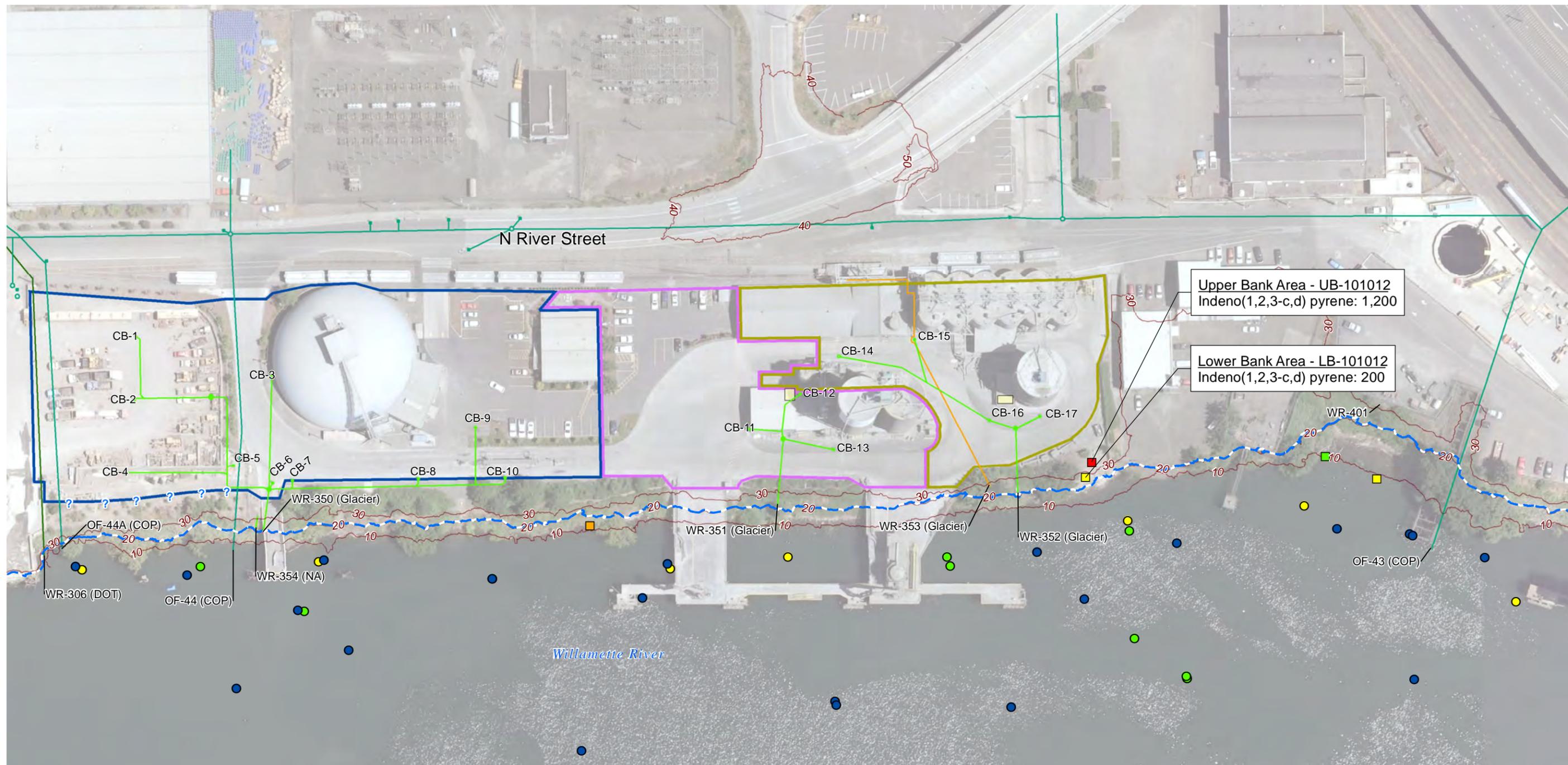


Figure 8
 Sitewide Total Polychlorinated Biphenyl Results
 Riverbank Erodible Soil
 Source Control Evaluation
 Glacier Northwest, Inc.
 Portland, Oregon



Upper Bank Area - UB-101012
Indeno(1,2,3-c,d) pyrene: 1,200

Lower Bank Area - LB-101012
Indeno(1,2,3-c,d) pyrene: 200

Legend

Sample Locations

- Riverbank Soil Sample
- In-water Sediment Sample
- ▭ Catchment WR-350
- ▭ Catchment WR-351
- ▭ Catchment WR-352

Containment Areas

- Ordinary High Water (20.5 ft AMSL)
- Glacier Site Storm Sewer Line
- City of Portland Storm Sewer Line
- Oregon DOT Storm Sewer Line
- Non-Contact Cooling Water Line

Concentrations of Indeno(1,2,3-c,d)pyrene

- < 50 µg/kg
- 50 - 100 µg/kg
- 100 - 500 µg/kg
- 500 - 1000 µg/kg
- > 1000 µg/kg

Notes:

All results in milligrams per kilogram.
 CB- Catch Basin
 COP- City of Portland
 DOT- Oregon Department of Transportation
 Glacier - Glacier Northwest, Inc.

All drainage area boundaries are approximate, queried where location is uncertain.
 Aerial Photo: City of Portland, June 2008
 Elevation Data: U.S. Army Corps of Engineers, Columbia River LiDAR flown 2010 (interpolated below structures), given in feet above mean sea level

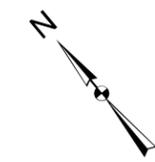


Figure 9
 Sitewide Indeno(1,2,3-c,d)pyrene Results
 Riverbank Erodible Soil
 Source Control Evaluation
 Glacier Northwest, Inc.
 Portland, Oregon

Tables

Table 1
Laboratory Analytical Results
Riverbank Soil Sampling
Portland Cement Terminal
Glacier Northwest, Inc.
Portland, Oregon

Contaminant Group	Constituent	Method	Units	JSCS Screening Levels		DEQ Background Concentrations Portland Basin ²	Lower Bank 10/10/2012	Upper Bank 10/10/2012
				MacDonald PECs and other SQVs	DEQ 2007 Bioaccumulative Sediment SLVs			
Total Metals	Antimony	USEPA 6020	mg/kg	64	--	0.56	1.2 J	1 J
	Arsenic	USEPA 6020	mg/kg	33	7	8.8	7.42	5.16
	Beryllium	USEPA 6020	mg/kg	--	--	2	0.348	0.317
	Cadmium	USEPA 6020	mg/kg	4.98	1	0.63	0.492	0.475
	Chromium	USEPA 6020	mg/kg	111	--	76	247	54.5
	Copper	USEPA 6020	mg/kg	149	--	34	254	50.8
	Lead	USEPA 6020	mg/kg	128	17	79	638	63.8
	Nickel	USEPA 6020	mg/kg	48.6	--	47	428	61.7
	Selenium	USEPA 6020	mg/kg	5	2	0.71	0.4	0.3
	Silver	USEPA 6020	mg/kg	5	--	0.82	0.168	0.127
	Thallium	USEPA 6020	mg/kg	--	--	5.2	0.092	0.072
	Zinc	USEPA 6020	mg/kg	459	--	180	243	134
	Mercury	USEPA 6020	mg/kg	1.06	0.07	0.23	0.121	0.07
PCBs	Aroclor 1016	USEPA 8082	µg/kg	530	--	--	<5.1	<5.2
	Aroclor 1221	USEPA 8082	µg/kg	--	--	--	<11	<11
	Aroclor 1232	USEPA 8082	µg/kg	--	--	--	<5.1	<5.2
	Aroclor 1242	USEPA 8082	µg/kg	--	--	--	<5.1	<5.2
	Aroclor 1248	USEPA 8082	µg/kg	1,500	--	--	<5.1	<5.2
	Aroclor 1254	USEPA 8082	µg/kg	300	--	--	<5.1	<5.2
	Aroclor 1260	USEPA 8082	µg/kg	200	--	--	240	42
	Aroclor 1262	USEPA 8082	µg/kg	--	--	--	<5.1	<5.2
	Aroclor 1268	USEPA 8082	µg/kg	--	--	--	<5.1	<5.2
	Total PCBs	USEPA 8082	µg/kg	--	0.39	--	240	42
PAHs	Chrysene	USEPA 8270m	µg/kg	--	--	--	180	940
	2-Methylnaphthalene	USEPA 8270m	µg/kg	200	--	--	7.9	4.6
	Acenaphthene	USEPA 8270m	µg/kg	300	--	--	33	3.2
	Acenaphthylene	USEPA 8270m	µg/kg	200	--	--	3	77
	Anthracene	USEPA 8270m	µg/kg	845	--	--	16	61
	Benzo(a) anthracene	USEPA 8270m	µg/kg	1050	--	--	120	420
	Benzo(a) pyrene	USEPA 8270m	µg/kg	1450	--	--	210	1100 D
	Benzo(b) fluoranthene	USEPA 8270m	µg/kg	--	--	--	260	1400 D
	Benzo(g,h,i) perylene	USEPA 8270m	µg/kg	300	--	--	200	1500 D
	Benzo(k) fluoranthene	USEPA 8270m	µg/kg	13,000	--	--	98	470
	Dibenzo(a,h) anthracene	USEPA 8270m	µg/kg	1,300	--	--	47	270
	Fluoranthene	USEPA 8270m	µg/kg	2,230	37,000	--	120	180
	Fluorene	USEPA 8270m	µg/kg	536	--	--	6.2	7.7
	Indeno(1,2,3-c,d) pyrene	USEPA 8270m	µg/kg	100	--	--	200	1200 D
	Naphthalene	USEPA 8270m	µg/kg	561	--	--	15	7.2
	Phenanthrene	USEPA 8270m	µg/kg	1170	--	--	120	66
	Pyrene	USEPA 8270m	µg/kg	1,520	1,900	--	230	340
Total PAHs	USEPA 8270m	µg/kg	--	--	--	1866.1	8046.7	

Notes and Key:

-- = No JSCS Screening Level or Background Concentration available
 < = Not detected above method detection limit
 JSCS = Portland Harbor Joint Source Control Strategy
 mg/kg = milligrams per kilogram
 PAHs = Polycyclic aromatic hydrocarbons
 PCBs = Polychlorinated biphenyls
 USEPA = United States Environmental Protection Agency
 µg/kg = micrograms per kilogram

Bold text indicates that compound was detected.

Grey shading indicates the most conservative JSCS Screening Level used for screening
 Yellow shading indicates compound concentration was greater than applicable JSCS Screening Level

Laboratory Data Qualifiers:

D = The reported result is from a dilution
 J = Estimated value, analyte detected below the laboratory reporting limit.

Table 2
Exceedance Quotient Results
Riverbank Soil Sampling
Portland Cement Terminal
Glacier Northwest, Inc.
Portland, Oregon

Contaminant Group	Constituent	Method	Units	JSCS Screening Levels		DEQ Background Concentrations Portland Basin (mg/kg) ²	Lower Bank 10/10/2012	Upper Bank 10/10/2012
				MacDonald PECs and other SQVs (µg/kg)	DEQ 2007 Bioaccumulative Sediment SLVs (µg/kg)			
Total Metals	Antimony	USEPA 6020	mg/kg	64	--	0.56	0.0	0.0
	Arsenic	USEPA 6020	mg/kg	33	7	8.8	1.1	0.7
	Beryllium	USEPA 6020	mg/kg	--	--	2	0.0	0.0
	Cadmium	USEPA 6020	mg/kg	4.98	1	0.63	0.5	0.5
	Chromium	USEPA 6020	mg/kg	111	--	76	2.2	0.5
	Copper	USEPA 6020	mg/kg	149	--	34	1.7	0.3
	Lead	USEPA 6020	mg/kg	128	17	79	37.5	3.8
	Nickel	USEPA 6020	mg/kg	48.6	--	47	8.8	1.3
	Selenium	USEPA 6020	mg/kg	5	2	0.71	0.2	0.2
	Silver	USEPA 6020	mg/kg	5	--	0.82	0.0	0.0
	Thallium	USEPA 6020	mg/kg	--	--	5.2	0.0	0.0
	Zinc	USEPA 6020	mg/kg	459	--	180	0.5	0.3
	Mercury	USEPA 7471A	mg/kg	1.06	0.07	0.23	1.7	1.0
PCBs	Aroclor 1016	USEPA 8082	µg/kg	530	--	--	0.0	0.0
	Aroclor 1221	USEPA 8082	µg/kg	--	--	--	0.0	0.0
	Aroclor 1232	USEPA 8082	µg/kg	--	--	--	0.0	0.0
	Aroclor 1242	USEPA 8082	µg/kg	--	--	--	0.0	0.0
	Aroclor 1248	USEPA 8082	µg/kg	1,500	--	--	0.0	0.0
	Aroclor 1254	USEPA 8082	µg/kg	300	--	--	0.0	0.0
	Aroclor 1260	USEPA 8082	µg/kg	200	--	--	1.2	0.2
	Aroclor 1262	USEPA 8082	µg/kg	--	--	--	0.0	0.0
	Aroclor 1268	USEPA 8082	µg/kg	--	--	--	0.0	0.0
	Total PCBs	USEPA 8082	µg/kg	--	0.39	--	615.4	107.7
PAHs	1,2-Benzphenanthracene	USEPA 8270m	µg/kg	--	--	--	0.0	0.0
	2-Methylnaphthalene	USEPA 8270m	µg/kg	200	--	--	0.0	0.0
	Acenaphthene	USEPA 8270m	µg/kg	300	--	--	0.1	0.0
	Acenaphthylene	USEPA 8270m	µg/kg	200	--	--	0.0	0.4
	Anthracene	USEPA 8270m	µg/kg	845	--	--	0.0	0.1
	Benzo(a) anthracene	USEPA 8270m	µg/kg	1050	--	--	0.1	0.4
	Benzo(a) pyrene	USEPA 8270m	µg/kg	1450	--	--	0.1	0.8
	Benzo(b) fluoranthene	USEPA 8270m	µg/kg	--	--	--	0.0	0.0
	Benzo(g,h,i) perylene	USEPA 8270m	µg/kg	300	--	--	0.7	5.0
	Benzo(k) fluoranthene	USEPA 8270m	µg/kg	13,000	--	--	0.0	0.0
	Dibenzo(a,h) anthracene	USEPA 8270m	µg/kg	1,300	--	--	0.0	0.2
	Fluoranthene	USEPA 8270m	µg/kg	2,230	37,000	--	0.1	0.1
	Fluorene	USEPA 8270m	µg/kg	536	--	--	0.0	0.0
	Indeno(1,2,3-c,d) pyrene	USEPA 8270m	µg/kg	100	--	--	2.0	12.0
	Naphthalene	USEPA 8270m	µg/kg	561	--	--	0.0	0.0
	Phenanthrene	USEPA 8270m	µg/kg	1170	--	--	0.1	0.1
Pyrene	USEPA 8270m	µg/kg	1,520	1,900	--	0.2	0.2	
	Total PAHs	USEPA 8270m	µg/kg	--	--	--	0.0	0.0

Notes and Key:

-- = No JSCS Screening Level available
 < = Not detected above method detection limit
 JSCS = Portland Harbor Joint Source Control Strategy
 mg/kg - milligrams per kilogram
 PAHs = Polycyclic aromatic hydrocarbons
 PCBs = Polychlorinated biphenyls

USEPA = United States Environmental Protection Agency
 µg/kg = micrograms per kilogram

Grey shading indicates the most conservative JSCS Screening Level

Indicates result concentration exceeds SLV by a factor between 1 and 10
 Indicates result concentration exceeds SLV by a factor between 10 and 100
 Indicates result concentration exceeds SLV by a factor greater than 100

Appendix A
Laboratory Reports



November 5, 2012

Analytical Report for Service Request No: K1210254

Brendan Robinson
ERM - Northwest, Incorporated
1001 SW 5th Ave. #1010
Portland, OR 97204

RE: Glacier Riverbank Soil/0126303.08

Dear Brendan:

Enclosed are the results of the samples submitted to our laboratory on October 10, 2012. For your reference, these analyses have been assigned our service request number K1210254.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.caslab.com. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3364. You may also contact me via Email at Howard.Holmes@alsglobal.com.

Respectfully submitted,

Columbia Analytical Services, Inc. dba ALS Environmental

Howard Holmes
Project Manager

HH/ln

Page 1 of 49



ADDRESS: 1001 SW 5th Ave, Portland, OR 97204
PHONE: 503.253.5700 FAX: 503.253.5701
Columbia Analytical Services, Inc.

DUFhcZHY5@G; fci d'5 7Ua dVY'6fch.Yfg@ja JhYX 7ca dUbm

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
 - i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
 - i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

**Columbia Analytical Services, Inc. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses**

Agency	Web Site	Number
Alaska DEC UST	http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2286
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L12-28
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Georgia DNR	http://www.gaepd.org/Documents/techguide_pcb.html#cel	881
Hawaii DOH	Not available	-
Idaho DHW	http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx	-
Indiana DOH	http://www.in.gov/isdh/24859.htm	C-WA-01
ISO 17025	http://www.pjlabs.com/	L12-27
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	3016
Louisiana DHH	Not available	LA110003
Maine DHS	Not available	WA0035
Michigan DEQ	http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html	9949
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-368
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA35
New Jersey DEP	http://www.nj.gov/dep/oqa/	WA005
New Mexico ED	http://www.nmenv.state.nm.us/dwb/Index.htm	-
North Carolina DWQ	http://www.dwqlab.org/	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA200001
South Carolina DHEC	http://www.scdhec.gov/environment/envserv/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	4704427-08-TX
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C1203
Wisconsin DNR	http://dnr.wi.gov/	998386840
Wyoming (EPA Region 8)	http://www.epa.gov/region8/water/dwhome/wyomingdi.html	-
Kelso Laboratory Website	www.caslab.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.caslab.com or at the accreditation bodies web site
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.

ALS ENVIRONMENTAL

Client: ERM Northwest
Project: Glacier Riverbank Soil
Sample Matrix: Soil & Water

Service Request No.: K1210254
Date Received: 10/10/12

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), and Laboratory Control Sample (LCS).

Sample Receipt

One water & two soil samples were received for analysis at ALS Environmental on 10/10/12. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

Total Metals

Matrix Spike Recovery Exceptions:

Antimony recoveries are generally low for soil and sediment samples when digested using EPA Method 3050B. Despite anticipated low recoveries, the method is still generally prescribed because of its versatility for general metals analysis. Antimony results (in conjunction with the matrix spike recovery) from this procedure should only be used as indicators to estimate concentrations. The matrix spike recovery of Antimony for sample UB-101012 was below the Method control criterion. Since low recoveries resulted from a method defect and were possibly magnified by certain matrix components, no corrective action was appropriate. Alternative procedures that specifically target Antimony are available but were not specified for this project. The associated QA/QC results (e.g. control sample, calibration standards, etc.) indicated the analysis was in control.

Relative Percent Difference Exceptions:

The Relative Percent Difference (RPD) for the replicate analysis of Antimony in sample UB-101012 was outside the Method control limits. The variability in the results was attributed to the heterogeneous character of the sample. Standard mixing techniques were used, but were not sufficient for complete homogenization of this sample.

No other anomalies associated with the analysis of these samples were observed.

PCB Aroclors by EPA Method 8082

Sample Notes and Discussion:

Insufficient sample volume was received to perform a Matrix Spike/Matrix Spike Duplicate (MS/MSD) for extraction lot KWG1212406. A Laboratory Control Sample/Duplicate Laboratory Control Sample (LCS/DLCS) was analyzed and reported in lieu of the MS/MSD for these samples.

No other anomalies associated with the analysis of these samples were observed.

Approved by _____



Polynuclear Aromatic Hydrocarbons by EPA Method 8270

Matrix Spike Recovery Exceptions:

The control criteria for matrix spike recovery of Naphthalene and 2-Methylnaphthalene for sample Batch QC (KWG1212106) were not applicable. The analyte concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

The control criteria for matrix spike recovery of Acenaphthylene for sample Batch QC (KWG1212106) were not applicable. The chromatogram of the parent sample indicated the presence of non-target background components. The matrix interference prevented adequate resolution of the target compound at the normal limit. The result was flagged in the parent sample to indicate the matrix interference.

No other anomalies associated with the analysis of these samples were observed.

Approved by _____



Environmental Resources Management

CHAIN OF CUSTODY RECORD

K1210264

NO: 1736

1001 S.W. 5th Avenue, Suite 1010 • Portland, OR • 97204 • (503) 488-5282 • FAX (503) 488-5142

Page 1 of 1

PROJECT #		PROJECT NAME							# OF CONTAINERS	MATRIX			REQUESTED PARAMETERS										
0126303.08		Glacier Riverbank Soil								SOIL	WATER	GAS	Copper, lead, zinc 6010B PCB 8082 PAH 8270 SIM										
SAMPLER: (PRINT NAME)				(SIGNATURE)																			
Shira Debrood																							
RECEIVING LABORATORY																							
ALS Kelso																							
SAMPLE I.D.	DATE	TIME	COMP	GRAB	SAMPLING METHOD	PRESERVATIVE	ICE (Y/N)	SAMPLING VOLUME															
UB-101012	10-10-12	0905		X	Hand	X	Y	24oz	3	X				X	X	X							
LB-101012	↓	0935		X	↓	X	Y	24oz	3	X				X	X	X							
RB-101012	↓	0955		X	↓	HNO3	Y	3.25L	4	X				X	X	X							
RELINQUISHED BY (SIGNATURE)										DATE	TIME	RECEIVED BY			DATE	TIME	FIELD REMARKS						
										10-10-12	1100				10/10/12	1100							
RELINQUISHED BY (SIGNATURE)										DATE	TIME	RECEIVED BY			DATE	TIME	FIELD REMARKS						
															10/10/12	1400							
RELINQUISHED BY (SIGNATURE)										DATE	TIME	RECEIVED BY			DATE	TIME	FIELD REMARKS						
REMARKS ON SAMPLE RECEIPT										ERM REMARKS										SEND REPORT TO:			
<input type="checkbox"/> BOTTLE INTACT <input type="checkbox"/> CUSTODY SEALS <input type="checkbox"/> CHILLED <input type="checkbox"/> PRESERVED <input type="checkbox"/> SEALS INTACT <input type="checkbox"/> SEE REMARKS										7										Brendan Robinson			



PC K2

Cooler Receipt and Preservation Form

Client / Project: ERM Service Request K12 10264

Received: 10/10/12 Opened: 10/10/12 By: [Signature] Unloaded: 10/10/12 By: [Signature]

- 1. Samples were received via? Mail Fed Ex UPS DHL PDX Courier Hand Delivered
- 2. Samples were received in: (circle) Cooler Box Envelope Other NA
- 3. Were custody seals on coolers? NA Y N If yes, how many and where? _____
If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Temp	Corr. Temp	Raw Blank	Corr. Blank	Corr. Factor	Thermometer ID	Cooler/COC ID	Tracking Number	Filed
<u>0.6</u>	<u>0.7</u>	<u>1.8</u>	<u>2.0</u>	<u>+0.2</u>	<u>294</u>	<u>NA</u>	<u>NA</u>	<input checked="" type="checkbox"/>

- 7. Packing material: Inserts Baggies Bubble Wrap Gel Packs Wet Ice Dry Ice Sleeves _____
- 8. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
- 9. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA Y N
- 10. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
- 11. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA Y N
- 12. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
- 13. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
- 14. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
- 15. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count	Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

Analytical Results

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Sediment

Service Request: K1210254

Total Solids

Prep Method: NONE
Analysis Method: 160.3M
Test Notes:

Units: PERCENT
Basis: Wet

Sample Name	Lab Code	Date Collected	Date Received	Date Analyzed	Result	Result Notes
UB-101012	K1210254-001	10/10/2012	10/10/2012	10/12/2012	96.6	
LB-101012	K1210254-002	10/10/2012	10/10/2012	10/12/2012	98.1	

QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Sediment

Service Request: K1210254
Date Collected: 10/10/2012
Date Received: 10/10/2012
Date Analyzed: 10/12/2012

Duplicate Sample Summary
Total Solids

Prep Method: NONE
Analysis Method: 160.3M
Test Notes:

Units: PERCENT
Basis: Wet

Sample Name	Lab Code	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
UB-101012	K1210254-001	96.6	95.6	96.1	1	

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- Cover Page -

INORGANIC ANALYSIS DATA PACKAGE

Client: GTO 'P qty y guv.'kpeqtr qtevgf
Project Name: I raelgt'TkxgtdepmiUqln
Project No.: 23485250

Service Request: MB432476

<u>Sample Name:</u>	<u>Lab Code:</u>
<u>Batch QCS</u>	<u>K1209832-002S</u>
<u>Batch QCSD</u>	<u>K1209832-002SD</u>
<u>UB-101012</u>	<u>K1210254-001</u>
<u>UB-101012D</u>	<u>K1210254-001D</u>
<u>UB-101012S</u>	<u>K1210254-001S</u>
<u>LB-101012</u>	<u>K1210254-002</u>
<u>Method Blank</u>	<u>K1210254-MB</u>

Comments:

Metals

- 5A -

SPIKE SAMPLE RECOVERY

Client: ERM Northwest, Incorporated Service Request: K1210254
 Project No.: 0126303.08 Units: MG/KG
 Project Name: Glacier Riverbank Soil Basis: DRY
 Matrix: SEDIMENT % Solids: 72.1

Sample Name: Batch QCS

Lab Code: K1209832-002S

Analyte	Control Limit %R	Spike Result C	Sample Result C	Spike Added	%R	Q	Method
Mercury	60 - 135	0.454	0.024	0.47	91.5		7471B

Metals

- 5A -

SPIKE SAMPLE RECOVERY

Client: ERM Northwest, Incorporated Service Request: K1210254
 Project No.: 0126303.08 Units: MG/KG
 Project Name: Glacier Riverbank Soil Basis: DRY
 Matrix: SEDIMENT % Solids: 96.6

Sample Name: UB-101012S

Lab Code: K1210254-001S

Analyte	Control Limit %R	Spike Result C	Sample Result C	Spike Added	%R	Q	Method
Antimony	75 - 125	24.1	1.00	102.49	22.5	N	6020A
Arsenic	78 - 121	56.2	5.16	51.25	99.6		6020A
Beryllium	80 - 132	5.390	0.317	5.12	99.1		6020A
Cadmium	75 - 125	5.530	0.475	5.12	98.7		6020A
Chromium	75 - 125	75.5	54.5	20.50	102.4		6020A
Copper	75 - 125	78.0	50.8	25.62	106.2		6020A
Lead	75 - 125	121	63.8	51.25	111.6		6020A
Nickel	75 - 125	106	61.7	51.25	86.4		6020A
Selenium	75 - 125	50.4	0.3 J	51.25	97.8		6020A
Silver	75 - 125	9.91	0.127	10.25	95.4		6020A
Thallium	84 - 116	52.6	0.072	51.25	102.5		6020A
Zinc	75 - 125	174	134	51.25	78.0		6020A

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Metals

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DUPLICATES

Client: ERM Northwest, Incorporated **Service Request:** K1210254
Project No.: 0126303.08 **Units:** MG/KG
Project Name: Glacier Riverbank Soil **Basis:** DRY
Matrix: SEDIMENT **% Solids:** 72.1

Sample Name: Batch QCSD

Lab Code: K1209832-002SD

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Mercury	20	0.454		0.445		2.0		7471B

An empty field in the Control Limit column indicates the control limit is not applicable.

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Metals

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DUPLICATES

Client: ERM Northwest, Incorporated Service Request: K1210254
 Project No.: 0126303.08 Units: MG/KG
 Project Name: Glacier Riverbank Soil Basis: DRY
 Matrix: SEDIMENT % Solids: 96.6

Sample Name: UB-101012D

Lab Code: K1210254-001D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Antimony	20	1.00		4.69		129.7	*	6020A
Arsenic	20	5.16		5.12		0.8		6020A
Beryllium	20	0.317		0.334		5.2		6020A
Cadmium	20	0.475		0.461		3.0		6020A
Chromium	20	54.5		65.4		18.2		6020A
Copper	20	50.8		49.9		1.8		6020A
Lead	20	63.8		68.0		6.4		6020A
Nickel	20	61.7		61.9		0.3		6020A
Selenium		0.3	J	0.3	J	0.0		6020A
Silver	20	0.127		0.119		6.5		6020A
Thallium		0.072		0.061		16.5		6020A
Zinc	20	134		129		3.8		6020A

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals
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LABORATORY CONTROL SAMPLE

Client: ERM Northwest, Incorporated

Service Request: K1210254

Project No.: 0126303.08

Project Name: Glacier Riverbank Soil

Aqueous LCS Source: CAS MIXED

Solid LCS Source: ERA D076-540

Analyte	Aqueous (ug/L)			Solid (mg/kg)						
	True	Found	%R	True	Found	C	Limits	%R		
Antimony				93.3	73.8		50	150	79.1	
Arsenic				94.5	89.0		78	122	94.2	
Beryllium				57.6	52.5		83	117	91.1	
Cadmium				60.5	57.2		81	119	94.5	
Chromium				70.4	62.9		80	119	89.3	
Copper				79.6	74.3		83	116	93.3	
Lead				91.8	92.1		79	121	100.3	
Mercury		5	5.09	101.8	3.73	3.37		72	128	90.3
Nickel				57.6	55.3		81	118	96.0	
Selenium				86.4	80.3		80	120	92.9	
Silver				34.4	35.3		66	134	102.6	
Thallium				120	119		79	120	99.2	
Zinc				140	117		73	121	83.6	

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INORGANIC ANALYSIS DATA PACKAGE

Client: ERM Northwest, Incorporated
Project Name: Glacier Riverbank Soil
Project No.: 0126303.08

Service Request: K1210254

Sample Name:

Lab Code:

Batch QCD

K1210060-005D

Batch QCS

K1210060-005S

RB-101012

K1210254-003

Method Blank

K1210254-MB

Comments:

Metals

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INORGANIC ANALYSIS DATA PACKAGE

Client: ERM Northwest, Incorporated Service Request: K1210254
 Project No.: 0126303.08 Date Collected: 10/10/12
 Project Name: Glacier Riverbank Soil Date Received: 10/10/12
 Matrix: WATER Units: ug/L
 Basis: NA

Sample Name: RB-101012 Lab Code: K1210254-003

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Antimony	6020A	0.050	0.003	1.0	10/18/12	10/23/12	0.189		
Arsenic	6020A	0.50	0.02	1.0	10/18/12	10/22/12	0.02	U	
Beryllium	6020A	0.020	0.004	1.0	10/18/12	10/22/12	0.004	U	
Cadmium	6020A	0.020	0.007	1.0	10/18/12	10/22/12	0.007	U	
Chromium	6020A	0.20	0.03	1.0	10/18/12	10/23/12	0.07	J	
Copper	6020A	0.10	0.02	1.0	10/18/12	10/22/12	1.94		
Lead	6020A	0.020	0.002	1.0	10/18/12	10/22/12	0.080		
Mercury	7470A	0.20	0.02	1.0	10/12/12	10/15/12	0.02	U	
Nickel	6020A	0.20	0.01	1.0	10/18/12	10/23/12	0.02	J	
Selenium	6020A	1.0	0.2	1.0	10/18/12	10/22/12	0.2	U	
Silver	6020A	0.020	0.005	1.0	10/18/12	10/22/12	0.006	J	
Thallium	6020A	0.0200	0.0004	1.0	10/18/12	10/22/12	0.0119	J	
Zinc	6020A	0.50	0.08	1.0	10/18/12	10/22/12	0.63		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: ERM Northwest, Incorporated Service Request: K1210254
 Project No.: 0126303.08 Date Collected:
 Project Name: Glacier Riverbank Soil Date Received:
 Matrix: WATER Units: ug/L
 Basis: NA

Sample Name: Method Blank Lab Code: K1210254-MB

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Antimony	6020A	0.050	0.003	1.0	10/18/12	10/23/12	0.006	J	
Arsenic	6020A	0.50	0.02	1.0	10/18/12	10/22/12	0.02	U	
Beryllium	6020A	0.020	0.004	1.0	10/18/12	10/22/12	0.004	U	
Cadmium	6020A	0.020	0.007	1.0	10/18/12	10/22/12	0.007	U	
Chromium	6020A	0.20	0.03	1.0	10/18/12	10/23/12	0.03	U	
Copper	6020A	0.10	0.02	1.0	10/18/12	10/22/12	0.02	U	
Lead	6020A	0.020	0.002	1.0	10/18/12	10/22/12	0.002	U	
Mercury	7470A	0.20	0.02	1.0	10/12/12	10/15/12	0.02	U	
Nickel	6020A	0.20	0.01	1.0	10/18/12	10/23/12	0.01	U	
Selenium	6020A	1.0	0.2	1.0	10/18/12	10/22/12	0.2	U	
Silver	6020A	0.020	0.005	1.0	10/18/12	10/22/12	0.005	U	
Thallium	6020A	0.0200	0.0004	1.0	10/18/12	10/22/12	0.0004	U	
Zinc	6020A	0.50	0.08	1.0	10/18/12	10/22/12	0.18	J	

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.

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Metals

- 6 -

DUPLICATES

Client: ERM Northwest, Incorporated **Service Request:** K1210254
Project No.: 0126303.08 **Units:** UG/L
Project Name: Glacier Riverbank Soil **Basis:** NA
Matrix: WATER

Sample Name: Batch QCD **Lab Code:** K1210060-005D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Mercury		0.02	U	0.02	U			7470A

An empty field in the Control Limit column indicates the control limit is not applicable.

COLUMBIA ANALYTICAL SERVICES, INC.

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Metals

- 6 -

DUPLICATES

Client: ERM Northwest, Incorporated

Service Request: K1210254

Project No.: 0126303.08

Units: UG/L

Project Name: Glacier Riverbank Soil

Basis: NA

Matrix: WATER

Sample Name: LCSWD

Lab Code: LCSWD

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Antimony	20	50.6		51.5		1.8		6020A
Arsenic	20	53.9		54.1		0.4		6020A
Beryllium	20	2.7		2.7		0.0		6020A
Cadmium	20	25.7		26.1		1.5		6020A
Chromium	20	10.3		10.4		1.0		6020A
Copper	20	13.1		13.3		1.5		6020A
Lead	20	52.1		51.3		1.5		6020A
Nickel	20	24.9		25.6		2.8		6020A
Selenium	20	54.2		54.7		0.9		6020A
Silver	20	12.9		12.6		2.4		6020A
Thallium	20	51.9		50.7		2.3		6020A
Zinc	20	26.2		26.8		2.3		6020A

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals
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LABORATORY CONTROL SAMPLE

Client: ERM Northwest, Incorporated

Service Request: K1210254

Project No.: 0126303.08

Project Name: Glacier Riverbank Soil

Aqueous LCS Source:

CAS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Antimony	50.0	50.6	101.2					
Arsenic	50.0	53.9	107.8					
Beryllium	2.5	2.7	108.0					
Cadmium	25.0	25.7	102.8					
Chromium	10.0	10.3	103.0					
Copper	12.5	13.1	104.8					
Lead	50.0	52.1	104.2					
Mercury	5	5.02	100.4					
Nickel	25.0	24.9	99.6					
Selenium	50.0	54.2	108.4					
Silver	12.5	12.9	103.2					
Thallium	50.0	51.9	103.8					
Zinc	25.0	26.2	104.8					

Metals
 - 7 -

LABORATORY CONTROL SAMPLE

Client: ERM Northwest, Incorporated

Service Request: K1210254

Project No.: 0126303.08

Project Name: Glacier Riverbank Soil

Aqueous LCS Source: CAS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Antimony	50.0	51.5	103.0					
Arsenic	50.0	54.1	108.2					
Beryllium	2.5	2.7	108.0					
Cadmium	25.0	26.1	104.4					
Chromium	10.0	10.4	104.0					
Copper	12.5	13.3	106.4					
Lead	50.0	51.3	102.6					
Nickel	25.0	25.6	102.4					
Selenium	50.0	54.7	109.4					
Silver	12.5	12.6	100.8					
Thallium	50.0	50.7	101.4					
Zinc	25.0	26.8	107.2					

COLUMBIA ANALYTICAL SERVICES, INC.

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Analytical Results

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Water

Service Request: K1210254
Date Collected: 10/10/2012
Date Received: 10/10/2012

Polychlorinated Biphenyls (PCBs)

Sample Name: RB-101012
Lab Code: K1210254-003
Extraction Method: EPA 3535A
Analysis Method: 8082A

Units: ug/L
Basis: NA
Level: Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Aroclor 1016	ND	U	0.21	0.0095	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1221	ND	U	0.41	0.0095	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1232	ND	U	0.21	0.0095	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1242	ND	U	0.21	0.0095	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1248	ND	U	0.21	0.0095	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1254	ND	U	0.21	0.0095	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1260	ND	U	0.21	0.0095	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1262	ND	U	0.21	0.0095	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1268	ND	U	0.21	0.0095	1	10/17/12	10/19/12	KWG1212406	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Decachlorobiphenyl	103	36-113	10/19/12	Acceptable

Comments: _____

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

Analytical Results

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Water

Service Request: K1210254
Date Collected: NA
Date Received: NA

Polychlorinated Biphenyls (PCBs)

Sample Name: Method Blank
Lab Code: KWG1212406-3
Extraction Method: EPA 3535A
Analysis Method: 8082A

Units: ug/L
Basis: NA
Level: Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Aroclor 1016	ND	U	0.20	0.0094	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1221	ND	U	0.40	0.0094	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1232	ND	U	0.20	0.0094	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1242	ND	U	0.20	0.0094	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1248	ND	U	0.20	0.0094	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1254	ND	U	0.20	0.0094	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1260	ND	U	0.20	0.0094	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1262	ND	U	0.20	0.0094	1	10/17/12	10/19/12	KWG1212406	
Aroclor 1268	ND	U	0.20	0.0094	1	10/17/12	10/19/12	KWG1212406	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Decachlorobiphenyl	89	36-113	10/19/12	Acceptable

Comments: _____

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

Analytical Results

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Sediment

Service Request: K1210254
Date Collected: 10/10/2012
Date Received: 10/10/2012

Polychlorinated Biphenyls (PCBs)

Sample Name: UB-101012
Lab Code: K1210254-001
Extraction Method: EPA 3541
Analysis Method: 8082A

Units: ug/Kg
Basis: Dry
Level: Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Aroclor 1016	ND	U	5.2	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1221	ND	U	11	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1232	ND	U	5.2	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1242	ND	U	5.2	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1248	ND	U	5.2	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1254	ND	U	5.2	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1260	42		5.2	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1262	ND	U	5.2	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1268	ND	U	5.2	2.1	1	10/12/12	10/16/12	KWG1212287	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Decachlorobiphenyl	123	35-133	10/16/12	Acceptable

Comments: _____

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

Analytical Results

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Sediment

Service Request: K1210254
Date Collected: 10/10/2012
Date Received: 10/10/2012

Polychlorinated Biphenyls (PCBs)

Sample Name: LB-101012
Lab Code: K1210254-002
Extraction Method: EPA 3541
Analysis Method: 8082A

Units: ug/Kg
Basis: Dry
Level: Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Aroclor 1016	ND	U	5.1	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1221	ND	U	11	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1232	ND	U	5.1	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1242	ND	U	5.1	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1248	ND	U	5.1	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1254	ND	U	5.1	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1260	240		5.1	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1262	ND	U	5.1	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1268	ND	U	5.1	2.1	1	10/12/12	10/16/12	KWG1212287	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Decachlorobiphenyl	64	35-133	10/16/12	Acceptable

Comments: _____

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

Analytical Results

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Sediment

Service Request: K1210254
Date Collected: NA
Date Received: NA

Polychlorinated Biphenyls (PCBs)

Sample Name: Method Blank
Lab Code: KWG1212287-4
Extraction Method: EPA 3541
Analysis Method: 8082A

Units: ug/Kg
Basis: Dry
Level: Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Aroclor 1016	ND	U	5.0	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1221	ND	U	10	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1232	ND	U	5.0	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1242	ND	U	5.0	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1248	ND	U	5.0	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1254	ND	U	5.0	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1260	ND	U	5.0	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1262	ND	U	5.0	2.1	1	10/12/12	10/16/12	KWG1212287	
Aroclor 1268	ND	U	5.0	2.1	1	10/12/12	10/16/12	KWG1212287	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Decachlorobiphenyl	112	35-133	10/16/12	Acceptable

Comments: _____

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Water

Service Request: K1210254

Surrogate Recovery Summary
Polychlorinated Biphenyls (PCBs)

Extraction Method: EPA 3535A
Analysis Method: 8082A

Units: PERCENT
Level: Low

<u>Sample Name</u>	<u>Lab Code</u>	<u>Sur1</u>
RB-101012	K1210254-003	103
Method Blank	KWG1212406-3	89
Lab Control Sample	KWG1212406-1	93
Duplicate Lab Control Sample	KWG1212406-2	88

Surrogate Recovery Control Limits (%)

Sur1 = Decachlorobiphenyl 36-113

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Sediment

Service Request: K1210254

Surrogate Recovery Summary
Polychlorinated Biphenyls (PCBs)

Extraction Method: EPA 3541
Analysis Method: 8082A

Units: PERCENT
Level: Low

<u>Sample Name</u>	<u>Lab Code</u>	<u>Sur1</u>
UB-101012	K1210254-001	123
LB-101012	K1210254-002	64
Method Blank	KWG1212287-4	112
UB-101012MS	KWG1212287-1	128
UB-101012DMS	KWG1212287-2	132
Lab Control Sample	KWG1212287-3	121

Surrogate Recovery Control Limits (%)

Sur1 = Decachlorobiphenyl 35-133

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Sediment

Service Request: K1210254
Date Extracted: 10/12/2012
Date Analyzed: 10/16/2012

**Matrix Spike/Duplicate Matrix Spike Summary
 Polychlorinated Biphenyls (PCBs)**

Sample Name: UB-101012
Lab Code: K1210254-001
Extraction Method: EPA 3541
Analysis Method: 8082A

Units: ug/Kg
Basis: Dry
Level: Low
Extraction Lot: KWG1212287

Analyte Name	Sample Result	UB-101012MS KWG1212287-1 Matrix Spike			UB-101012DMS KWG1212287-2 Duplicate Matrix Spike			%Rec Limits	RPD	RPD Limit
		Result	Spike Amount	%Rec	Result	Spike Amount	%Rec			
Aroclor 1016	ND	86.3	104	83	89.2	103	87	27-128	3	40
Aroclor 1260	42	119	104	74	124	103	80	29-131	5	40

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Water

Service Request: K1210254
Date Extracted: 10/17/2012
Date Analyzed: 10/19/2012

Lab Control Spike/Duplicate Lab Control Spike Summary
Polychlorinated Biphenyls (PCBs)

Extraction Method: EPA 3535A
Analysis Method: 8082A

Units: ug/L
Basis: NA
Level: Low
Extraction Lot: KWG1212406

Analyte Name	Lab Control Sample KWG1212406-1 Lab Control Spike			Duplicate Lab Control Sample KWG1212406-2 Duplicate Lab Control Spike			%Rec Limits	RPD	RPD Limit
	Result	Spike Amount	%Rec	Result	Spike Amount	%Rec			
Aroclor 1016	1.82	2.00	91	1.75	2.00	87	41-113	4	30
Aroclor 1260	1.83	2.00	92	1.77	2.00	89	47-117	3	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Sediment

Service Request: K1210254
Date Extracted: 10/12/2012
Date Analyzed: 10/16/2012

Lab Control Spike Summary
Polychlorinated Biphenyls (PCBs)

Extraction Method: EPA 3541
Analysis Method: 8082A

Units: ug/Kg
Basis: Dry
Level: Low
Extraction Lot: KWG1212287

Lab Control Sample
KWG1212287-3
Lab Control Spike

Analyte Name	Result	Spike Amount	%Rec	%Rec Limits
Aroclor 1016	176	200	88	37-121
Aroclor 1260	177	200	89	42-123

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

Analytical Results

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Water

Service Request: K1210254
Date Collected: 10/10/2012
Date Received: 10/10/2012

Polynuclear Aromatic Hydrocarbons

Sample Name: RB-101012
Lab Code: K1210254-003
Extraction Method: EPA 3520C
Analysis Method: 8270D SIM

Units: ug/L
Basis: NA
Level: Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Naphthalene	0.0057	J	0.020	0.0038	1	10/11/12	10/19/12	KWG1212106	
2-Methylnaphthalene	ND	U	0.020	0.0023	1	10/11/12	10/19/12	KWG1212106	
Acenaphthylene	ND	U	0.020	0.0034	1	10/11/12	10/19/12	KWG1212106	
Acenaphthene	ND	U	0.020	0.0044	1	10/11/12	10/19/12	KWG1212106	
Fluorene	ND	U	0.020	0.0038	1	10/11/12	10/19/12	KWG1212106	
Phenanthrene	ND	U	0.020	0.0050	1	10/11/12	10/19/12	KWG1212106	
Anthracene	ND	U	0.020	0.0036	1	10/11/12	10/19/12	KWG1212106	
Fluoranthene	ND	U	0.020	0.010	1	10/11/12	10/19/12	KWG1212106	
Pyrene	ND	U	0.020	0.0053	1	10/11/12	10/19/12	KWG1212106	
Benz(a)anthracene	ND	U	0.020	0.0026	1	10/11/12	10/19/12	KWG1212106	
Chrysene	ND	U	0.020	0.0034	1	10/11/12	10/19/12	KWG1212106	
Benzo(b)fluoranthene	ND	U	0.020	0.0041	1	10/11/12	10/19/12	KWG1212106	
Benzo(k)fluoranthene	ND	U	0.020	0.0030	1	10/11/12	10/19/12	KWG1212106	
Benzo(a)pyrene	ND	U	0.020	0.0043	1	10/11/12	10/19/12	KWG1212106	
Indeno(1,2,3-cd)pyrene	ND	U	0.020	0.0026	1	10/11/12	10/19/12	KWG1212106	
Dibenz(a,h)anthracene	ND	U	0.020	0.0025	1	10/11/12	10/19/12	KWG1212106	
Benzo(g,h,i)perylene	ND	U	0.020	0.0029	1	10/11/12	10/19/12	KWG1212106	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Fluorene-d10	75	46-114	10/19/12	Acceptable
Fluoranthene-d10	86	51-121	10/19/12	Acceptable
Terphenyl-d14	84	58-140	10/19/12	Acceptable

Comments: _____

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

Analytical Results

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Water

Service Request: K1210254
Date Collected: NA
Date Received: NA

Polynuclear Aromatic Hydrocarbons

Sample Name: Method Blank
Lab Code: KWG1212106-5
Extraction Method: EPA 3520C
Analysis Method: 8270D SIM

Units: ug/L
Basis: NA
Level: Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Naphthalene	ND	U	0.019	0.0038	1	10/11/12	10/20/12	KWG1212106	
2-Methylnaphthalene	ND	U	0.019	0.0023	1	10/11/12	10/20/12	KWG1212106	
Acenaphthylene	ND	U	0.019	0.0034	1	10/11/12	10/20/12	KWG1212106	
Acenaphthene	ND	U	0.019	0.0044	1	10/11/12	10/20/12	KWG1212106	
Fluorene	ND	U	0.019	0.0038	1	10/11/12	10/20/12	KWG1212106	
Phenanthrene	ND	U	0.019	0.0050	1	10/11/12	10/20/12	KWG1212106	
Anthracene	ND	U	0.019	0.0036	1	10/11/12	10/20/12	KWG1212106	
Fluoranthene	ND	U	0.019	0.010	1	10/11/12	10/20/12	KWG1212106	
Pyrene	ND	U	0.019	0.0053	1	10/11/12	10/20/12	KWG1212106	
Benz(a)anthracene	ND	U	0.019	0.0026	1	10/11/12	10/20/12	KWG1212106	
Chrysene	ND	U	0.019	0.0034	1	10/11/12	10/20/12	KWG1212106	
Benzo(b)fluoranthene	ND	U	0.019	0.0041	1	10/11/12	10/20/12	KWG1212106	
Benzo(k)fluoranthene	ND	U	0.019	0.0030	1	10/11/12	10/20/12	KWG1212106	
Benzo(a)pyrene	ND	U	0.019	0.0043	1	10/11/12	10/20/12	KWG1212106	
Indeno(1,2,3-cd)pyrene	ND	U	0.019	0.0026	1	10/11/12	10/20/12	KWG1212106	
Dibenz(a,h)anthracene	ND	U	0.019	0.0025	1	10/11/12	10/20/12	KWG1212106	
Benzo(g,h,i)perylene	ND	U	0.019	0.0029	1	10/11/12	10/20/12	KWG1212106	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Fluorene-d10	80	46-114	10/20/12	Acceptable
Fluoranthene-d10	89	51-121	10/20/12	Acceptable
Terphenyl-d14	91	58-140	10/20/12	Acceptable

Comments: _____

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

Analytical Results

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Sediment

Service Request: K1210254
Date Collected: 10/10/2012
Date Received: 10/10/2012

Polynuclear Aromatic Hydrocarbons

Sample Name: UB-101012
Lab Code: K1210254-001
Extraction Method: EPA 3541
Analysis Method: 8270D SIM

Units: ug/Kg
Basis: Dry
Level: Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Naphthalene	7.2		2.6	0.60	1	10/15/12	10/30/12	KWG1212236	
2-Methylnaphthalene	4.6		2.6	0.46	1	10/15/12	10/30/12	KWG1212236	
Acenaphthylene	77		2.6	0.59	1	10/15/12	10/30/12	KWG1212236	
Acenaphthene	3.2		2.6	0.76	1	10/15/12	10/30/12	KWG1212236	
Fluorene	7.7		2.6	0.61	1	10/15/12	10/30/12	KWG1212236	
Phenanthrene	66		2.6	1.4	1	10/15/12	10/30/12	KWG1212236	
Anthracene	61		2.6	0.58	1	10/15/12	10/30/12	KWG1212236	
Fluoranthene	180		2.6	0.98	1	10/15/12	10/30/12	KWG1212236	
Pyrene	340		2.6	0.76	1	10/15/12	10/30/12	KWG1212236	
Benz(a)anthracene	420		2.6	0.72	1	10/15/12	10/30/12	KWG1212236	
Chrysene	940		2.6	0.80	1	10/15/12	10/30/12	KWG1212236	
Benzo(b)fluoranthene	1400	D	13	4.6	5	10/15/12	10/30/12	KWG1212236	
Benzo(k)fluoranthene	470		2.6	0.87	1	10/15/12	10/30/12	KWG1212236	
Benzo(a)pyrene	1100	D	13	3.8	5	10/15/12	10/30/12	KWG1212236	
Indeno(1,2,3-cd)pyrene	1200	D	13	4.4	5	10/15/12	10/30/12	KWG1212236	
Dibenz(a,h)anthracene	270		2.6	0.80	1	10/15/12	10/30/12	KWG1212236	
Benzo(g,h,i)perylene	1500	D	13	4.3	5	10/15/12	10/30/12	KWG1212236	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Fluorene-d10	33	17-104	10/30/12	Acceptable
Fluoranthene-d10	51	27-106	10/30/12	Acceptable
Terphenyl-d14	61	35-109	10/30/12	Acceptable

Comments: _____

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

Analytical Results

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Sediment

Service Request: K1210254
Date Collected: 10/10/2012
Date Received: 10/10/2012

Polynuclear Aromatic Hydrocarbons

Sample Name: LB-101012
Lab Code: K1210254-002
Extraction Method: EPA 3541
Analysis Method: 8270D SIM

Units: ug/Kg
Basis: Dry
Level: Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Naphthalene	15		2.6	0.60	1	10/15/12	10/30/12	KWG1212236	
2-Methylnaphthalene	7.9		2.6	0.46	1	10/15/12	10/30/12	KWG1212236	
Acenaphthylene	33		2.6	0.59	1	10/15/12	10/30/12	KWG1212236	
Acenaphthene	3.0		2.6	0.76	1	10/15/12	10/30/12	KWG1212236	
Fluorene	6.2		2.6	0.61	1	10/15/12	10/30/12	KWG1212236	
Phenanthrene	120		2.6	1.4	1	10/15/12	10/30/12	KWG1212236	
Anthracene	16		2.6	0.58	1	10/15/12	10/30/12	KWG1212236	
Fluoranthene	200		2.6	0.98	1	10/15/12	10/30/12	KWG1212236	
Pyrene	230		2.6	0.76	1	10/15/12	10/30/12	KWG1212236	
Benz(a)anthracene	120		2.6	0.72	1	10/15/12	10/30/12	KWG1212236	
Chrysene	180		2.6	0.80	1	10/15/12	10/30/12	KWG1212236	
Benzo(b)fluoranthene	260		2.6	0.92	1	10/15/12	10/30/12	KWG1212236	
Benzo(k)fluoranthene	98		2.6	0.87	1	10/15/12	10/30/12	KWG1212236	
Benzo(a)pyrene	210		2.6	0.76	1	10/15/12	10/30/12	KWG1212236	
Indeno(1,2,3-cd)pyrene	200		2.6	0.87	1	10/15/12	10/30/12	KWG1212236	
Dibenz(a,h)anthracene	47		2.6	0.80	1	10/15/12	10/30/12	KWG1212236	
Benzo(g,h,i)perylene	200		2.6	0.85	1	10/15/12	10/30/12	KWG1212236	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Fluorene-d10	49	17-104	10/30/12	Acceptable
Fluoranthene-d10	53	27-106	10/30/12	Acceptable
Terphenyl-d14	61	35-109	10/30/12	Acceptable

Comments: _____

COLUMBIA ANALYTICAL SERVICES, INC.

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Analytical Results

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Soil

Service Request: K1210254
Date Collected: NA
Date Received: NA

Polynuclear Aromatic Hydrocarbons

Sample Name: Method Blank
Lab Code: KWG1212236-7
Extraction Method: EPA 3541
Analysis Method: 8270D SIM

Units: ug/Kg
Basis: Dry
Level: Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Naphthalene	ND	U	2.5	0.60	1	10/15/12	10/30/12	KWG1212236	
2-Methylnaphthalene	ND	U	2.5	0.46	1	10/15/12	10/30/12	KWG1212236	
Acenaphthylene	ND	U	2.5	0.59	1	10/15/12	10/30/12	KWG1212236	
Acenaphthene	ND	U	2.5	0.76	1	10/15/12	10/30/12	KWG1212236	
Fluorene	ND	U	2.5	0.61	1	10/15/12	10/30/12	KWG1212236	
Phenanthrene	ND	U	2.5	1.4	1	10/15/12	10/30/12	KWG1212236	
Anthracene	ND	U	2.5	0.58	1	10/15/12	10/30/12	KWG1212236	
Fluoranthene	ND	U	2.5	0.98	1	10/15/12	10/30/12	KWG1212236	
Pyrene	ND	U	2.5	0.76	1	10/15/12	10/30/12	KWG1212236	
Benz(a)anthracene	ND	U	2.5	0.72	1	10/15/12	10/30/12	KWG1212236	
Chrysene	ND	U	2.5	0.80	1	10/15/12	10/30/12	KWG1212236	
Benzo(b)fluoranthene	ND	U	2.5	0.92	1	10/15/12	10/30/12	KWG1212236	
Benzo(k)fluoranthene	ND	U	2.5	0.87	1	10/15/12	10/30/12	KWG1212236	
Benzo(a)pyrene	ND	U	2.5	0.76	1	10/15/12	10/30/12	KWG1212236	
Indeno(1,2,3-cd)pyrene	ND	U	2.5	0.87	1	10/15/12	10/30/12	KWG1212236	
Dibenz(a,h)anthracene	ND	U	2.5	0.80	1	10/15/12	10/30/12	KWG1212236	
Benzo(g,h,i)perylene	ND	U	2.5	0.85	1	10/15/12	10/30/12	KWG1212236	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Fluorene-d10	70	17-104	10/30/12	Acceptable
Fluoranthene-d10	75	27-106	10/30/12	Acceptable
Terphenyl-d14	87	35-109	10/30/12	Acceptable

Comments: _____

COLUMBIA ANALYTICAL SERVICES, INC.

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QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Water

Service Request: K1210254

**Surrogate Recovery Summary
 Polynuclear Aromatic Hydrocarbons**

Extraction Method: EPA 3520C
Analysis Method: 8270D SIM

Units: PERCENT
Level: Low

<u>Sample Name</u>	<u>Lab Code</u>	<u>Sur1</u>	<u>Sur2</u>	<u>Sur3</u>
Batch QC	K1210191-003	92	82	93
RB-101012	K1210254-003	75	86	84
Method Blank	KWG1212106-5	80	89	91
Batch QCMS	KWG1212106-1	83 D	86 D	89 D
Batch QCDMS	KWG1212106-2	85 D	86 D	89 D
Lab Control Sample	KWG1212106-3	81	91	89
Duplicate Lab Control Sample	KWG1212106-4	81	91	90

Surrogate Recovery Control Limits (%)

Sur1 = Fluorene-d10	46-114
Sur2 = Fluoranthene-d10	51-121
Sur3 = Terphenyl-d14	58-140

Results flagged with an asterisk (*) indicate values outside control criteria.
 Results flagged with a pound (#) indicate the control criteria is not applicable.

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Soil

Service Request: K1210254

Surrogate Recovery Summary
Polynuclear Aromatic Hydrocarbons

Extraction Method: EPA 3541
Analysis Method: 8270D SIM

Units: PERCENT
Level: Low

<u>Sample Name</u>	<u>Lab Code</u>	<u>Sur1</u>	<u>Sur2</u>	<u>Sur3</u>
Batch QC	K1210207-003	70	71	86
UB-101012	K1210254-001	33	51	61
LB-101012	K1210254-002	49	53	61
Method Blank	KWG1212236-7	70	75	87
Batch QCMS	KWG1212236-1	67	71	78
Batch QCDMS	KWG1212236-2	65	67	73
Lab Control Sample	KWG1212236-5	62	66	71
Duplicate Lab Control Sample	KWG1212236-6	61	64	70

Surrogate Recovery Control Limits (%)

Sur1 = Fluorene-d10 17-104
Sur2 = Fluoranthene-d10 27-106
Sur3 = Terphenyl-d14 35-109

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.

COLUMBIA ANALYTICAL SERVICES, INC.

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QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Water

Service Request: K1210254
Date Extracted: 10/11/2012
Date Analyzed: 10/20/2012

Matrix Spike/Duplicate Matrix Spike Summary
Polynuclear Aromatic Hydrocarbons

Sample Name: Batch QC
Lab Code: K1210191-003
Extraction Method: EPA 3520C
Analysis Method: 8270D SIM

Units: ug/L
Basis: NA
Level: Low
Extraction Lot: KWG1212106

Analyte Name	Sample Result	Batch QCMS KWG1212106-1 Matrix Spike			Batch QCDMS KWG1212106-2 Duplicate Matrix Spike			%Rec Limits	RPD	RPD Limit
		Result	Spike Amount	%Rec	Result	Spike Amount	%Rec			
Naphthalene	10	11.9	2.45	74 #	14.5	2.45	181 #	37-118	20	30
2-Methylnaphthalene	40	41.7	2.45	80 #	47.3	2.45	310 #	37-117	13	30
Acenaphthylene	ND	2.26	2.45	92 #	2.38	2.45	97 #	43-114	5	30
Acenaphthene	0.44	2.55	2.45	86	2.65	2.45	90	45-114	4	30
Fluorene	0.53	2.81	2.45	93	2.91	2.45	97	45-123	4	30
Phenanthrene	0.0053	2.32	2.45	94	2.44	2.45	99	42-127	5	30
Anthracene	ND	2.39	2.45	98	2.53	2.45	103	32-125	6	30
Fluoranthene	ND	2.52	2.45	103	2.62	2.45	107	48-134	4	30
Pyrene	ND	2.38	2.45	97	2.51	2.45	102	44-130	5	30
Benz(a)anthracene	ND	2.12	2.45	86	2.16	2.45	88	41-128	2	30
Chrysene	ND	2.45	2.45	100	2.58	2.45	105	48-128	5	30
Benzo(b)fluoranthene	ND	2.16	2.45	88	2.19	2.45	89	40-139	1	30
Benzo(k)fluoranthene	ND	2.43	2.45	99	2.52	2.45	103	48-134	4	30
Benzo(a)pyrene	ND	2.11	2.45	86	2.15	2.45	88	35-132	2	30
Indeno(1,2,3-cd)pyrene	ND	1.95	2.45	80	1.85	2.45	76	40-135	5	30
Dibenz(a,h)anthracene	ND	2.16	2.45	88	2.25	2.45	92	43-135	4	30
Benzo(g,h,i)perylene	ND	2.18	2.45	89	2.25	2.45	92	44-128	3	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

COLUMBIA ANALYTICAL SERVICES, INC.

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QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Soil

Service Request: K1210254
Date Extracted: 10/15/2012
Date Analyzed: 10/30/2012

Matrix Spike/Duplicate Matrix Spike Summary
Polynuclear Aromatic Hydrocarbons

Sample Name: Batch QC
Lab Code: K1210207-003
Extraction Method: EPA 3541
Analysis Method: 8270D SIM

Units: ug/Kg
Basis: Dry
Level: Low
Extraction Lot: KWG1212236

Analyte Name	Sample Result	Batch QCMS KWG1212236-1 Matrix Spike			Batch QCDMS KWG1212236-2 Duplicate Matrix Spike			%Rec Limits	RPD	RPD Limit
		Result	Spike Amount	%Rec	Result	Spike Amount	%Rec			
Naphthalene	17	747	1130	65	731	1130	63	23-114	2	40
2-Methylnaphthalene	30	771	1130	66	770	1130	66	24-115	0	40
Acenaphthylene	ND	764	1130	68	730	1130	65	32-117	5	40
Acenaphthene	ND	757	1130	67	728	1130	65	33-118	4	40
Fluorene	2.5	773	1130	68	753	1130	67	33-125	3	40
Phenanthrene	ND	755	1130	67	722	1130	64	29-125	4	40
Anthracene	ND	797	1130	71	757	1130	67	30-127	5	40
Fluoranthene	ND	816	1130	72	772	1130	69	35-139	5	40
Pyrene	ND	851	1130	76	814	1130	72	27-134	4	40
Benz(a)anthracene	ND	784	1130	70	734	1130	65	35-122	7	40
Chrysene	ND	844	1130	75	797	1130	71	36-126	6	40
Benzo(b)fluoranthene	ND	882	1130	78	829	1130	74	35-124	6	40
Benzo(k)fluoranthene	ND	895	1130	80	832	1130	74	38-124	7	40
Benzo(a)pyrene	ND	846	1130	75	789	1130	70	37-123	7	40
Indeno(1,2,3-cd)pyrene	ND	799	1130	71	756	1130	67	28-133	5	40
Dibenz(a,h)anthracene	ND	815	1130	72	735	1130	65	32-125	10	40
Benzo(g,h,i)perylene	ND	828	1130	74	780	1130	69	33-128	6	40

Results flagged with an asterisk (*) indicate values outside control criteria.

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

COLUMBIA ANALYTICAL SERVICES, INC.

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QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Water

Service Request: K1210254
Date Extracted: 10/11/2012
Date Analyzed: 10/20/2012

Lab Control Spike/Duplicate Lab Control Spike Summary
Polynuclear Aromatic Hydrocarbons

Extraction Method: EPA 3520C
Analysis Method: 8270D SIM

Units: ug/L
Basis: NA
Level: Low
Extraction Lot: KWG1212106

Analyte Name	Lab Control Sample KWG1212106-3 Lab Control Spike			Duplicate Lab Control Sample KWG1212106-4 Duplicate Lab Control Spike			%Rec Limits	RPD	RPD Limit
	Result	Spike Amount	%Rec	Result	Spike Amount	%Rec			
Naphthalene	2.02	2.50	81	1.93	2.50	77	39-110	5	30
2-Methylnaphthalene	1.89	2.50	76	1.77	2.50	71	39-115	6	30
Acenaphthylene	2.34	2.50	94	2.25	2.50	90	44-115	4	30
Acenaphthene	2.26	2.50	90	2.16	2.50	86	44-113	5	30
Fluorene	2.36	2.50	94	2.33	2.50	93	48-118	1	30
Phenanthrene	2.42	2.50	97	2.40	2.50	96	47-120	1	30
Anthracene	2.42	2.50	97	2.39	2.50	96	44-117	1	30
Fluoranthene	2.66	2.50	107	2.65	2.50	106	48-128	1	30
Pyrene	2.44	2.50	98	2.45	2.50	98	42-133	0	30
Benz(a)anthracene	2.39	2.50	96	2.40	2.50	96	48-125	0	30
Chrysene	2.51	2.50	100	2.52	2.50	101	50-128	0	30
Benzo(b)fluoranthene	2.48	2.50	99	2.51	2.50	101	49-131	1	30
Benzo(k)fluoranthene	2.61	2.50	104	2.61	2.50	104	54-131	0	30
Benzo(a)pyrene	2.57	2.50	103	2.57	2.50	103	43-134	0	30
Indeno(1,2,3-cd)pyrene	2.41	2.50	96	2.39	2.50	96	45-133	1	30
Dibenz(a,h)anthracene	2.42	2.50	97	2.40	2.50	96	49-133	0	30
Benzo(g,h,i)perylene	2.38	2.50	95	2.37	2.50	95	51-124	0	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

COLUMBIA ANALYTICAL SERVICES, INC.

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QA/QC Report

Client: ERM Northwest, Incorporated
Project: Glacier Riverbank Soil/0126303.08
Sample Matrix: Soil

Service Request: K1210254
Date Extracted: 10/15/2012
Date Analyzed: 10/30/2012

Lab Control Spike/Duplicate Lab Control Spike Summary
Polynuclear Aromatic Hydrocarbons

Extraction Method: EPA 3541
Analysis Method: 8270D SIM

Units: ug/Kg
Basis: Dry
Level: Low
Extraction Lot: KWG1212236

Analyte Name	Lab Control Sample KWG1212236-5 Lab Control Spike			Duplicate Lab Control Sample KWG1212236-6 Duplicate Lab Control Spike			%Rec Limits	RPD	RPD Limit
	Result	Spike Amount	%Rec	Result	Spike Amount	%Rec			
Naphthalene	323	500	65	309	500	62	32-124	4	40
2-Methylnaphthalene	326	500	65	315	500	63	27-126	3	40
Acenaphthylene	337	500	67	325	500	65	38-126	4	40
Acenaphthene	335	500	67	322	500	64	39-124	4	40
Fluorene	339	500	68	325	500	65	39-129	4	40
Phenanthrene	332	500	66	318	500	64	39-123	4	40
Anthracene	351	500	70	336	500	67	38-130	4	40
Fluoranthene	355	500	71	342	500	68	39-135	4	40
Pyrene	366	500	73	355	500	71	39-134	3	40
Benz(a)anthracene	336	500	67	324	500	65	46-120	3	40
Chrysene	360	500	72	348	500	70	49-120	3	40
Benzo(b)fluoranthene	373	500	75	361	500	72	51-121	3	40
Benzo(k)fluoranthene	377	500	75	366	500	73	55-120	3	40
Benzo(a)pyrene	359	500	72	347	500	69	49-122	3	40
Indeno(1,2,3-cd)pyrene	338	500	68	340	500	68	40-128	1	40
Dibenz(a,h)anthracene	340	500	68	321	500	64	43-125	6	40
Benzo(g,h,i)perylene	356	500	71	343	500	69	49-122	4	40

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

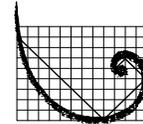
Appendix B
Data Validation Review

Memorandum

**Environmental
Resources
Management**

To: Brendan Robinson
From: Shira DeGrood
Date: 30 November 2012
Subject: Data Review of Glacier Portland Riverbank Soil
Samples Collected 10 October 2012
Project Number: 0126303.08
Data Package: Columbia Analytical Services, Inc. data package
K1210254

1001 SW 5th Avenue,
Suite 1010
Portland, OR 97204
(503) 488-5282
(503) 488-5124 (fax)



ERM®

The quality of the data was assessed and any necessary qualifiers were applied following the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, October 1999 and the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, July 2004.

HOLDING TIME AND PRESERVATION EVALUATION

The samples were prepared and analyzed within the method prescribed time period from the date of collection. The sample shipments were received at the laboratory within the method prescribed temperature preservation requirements. None of the data were qualified based on holding time or temperature preservation exceedances.

BLANK EVALUATION

The method and rinsate blank sample results were nondetected for the target analytes with limited exceptions. The rinsate blank contained several metals and one polynuclear aromatic hydrocarbon (PAH). The rinsate blank detections are listed in Table 1. Associated sample results were not qualified because sample concentrations were much greater than the blank concentrations.

BLANK SPIKE EVALUATION

The laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) recoveries were within the laboratory's limits of acceptance. The LCS recoveries indicate acceptable laboratory accuracy and precision.

MATRIX SPIKE EVALUATION

The matrix spike (MS)/matrix spike duplicate (MSD) recoveries were within the laboratory's limits of acceptance with limited exceptions. The MS/MSD recoveries indicate acceptable matrix interference in the samples. There were multiple percent recoveries for metals and for PAHs that were outside of the MS/MSD control limits. PAH results were not qualified as the sample selected for matrix spike was not for this project and not representative of the matrix of the project site. The antimony results associated with the MS outlier are qualified as estimated, biased low (J-) and listed in Table 2.

SURROGATE SPIKE EVALUATION

The surrogate recoveries were within acceptable limits. No qualifications were required based on surrogate recoveries. The surrogate recoveries indicate minimal matrix interference in the samples.

LAB DUPLICATE EVALUATION

Soil and water samples were analyzed in duplicate for metals and total solids. The RPD between duplicate and primary samples indicates acceptable precision. The RPD for antimony was greater than the control limit and the associated sample results were qualified as estimated (J), as shown in Table 3.

OVERALL ASSESSMENT

No data required rejection. All of the data, including qualified data, can be used for decision-making purposes. The quality of the data generated during this investigation is acceptable for the preparation of technically defensible documents.

Table 1
Blank and Associated Suspect Sample Detections
Riverbank Soil Samples
Portland Cement Terminal
Portland, Oregon

Lab Package	Blank ID	Associated Samples	Detected Compound	Reported Concentration	Report Limit	Units	ERM Qualifier
K1210254	Rinsate Blank RB-101012	--	Antimony	0.189	0.05	µg/L	--
K1210254	Rinsate Blank RB-101012	--	Chromium	0.07	0.2	µg/L	--
K1210254	Rinsate Blank RB-101012	--	Copper	1.94	0.1	µg/L	--
K1210254	Rinsate Blank RB-101012	--	Lead	0.08	0.02	µg/L	--
K1210254	Rinsate Blank RB-101012	--	Nickel	0.02	0.2	µg/L	--
K1210254	Rinsate Blank RB-101012	--	Silver	0.006	0.02	µg/L	--
K1210254	Rinsate Blank RB-101012	--	Thallium	0.0119	0.02	µg/L	--
K1210254	Rinsate Blank RB-101012	--	Zinc	0.63	0.5	µg/L	--
K1210254	Rinsate Blank RB-101012	--	Naphthalene	0.0057	0.02	µg/L	--

Lab reports reviewed: K1210254

Key:

µg/L = Micrograms per liter

Table 2
Spike Recoveries Outside of Acceptable Limits
Riverbank Soil Samples
Portland Cement Terminal
Portland, Oregon

Lab Package	Spike Sample ID	Associated Sample	Compound	Recovery (%)	Limit (%)	RPD	RPD Limit	Result	Units	ERM Qualifier
MS/MSD										
K1210254	UB-101012S	--	Antimony	22.5	75-125	--	--	--	--	--
K1210254	--	UB-101012	Antimony	--	--	--	--	1.00	mg/kg	J-
K1210254	--	LB-101012	Antimony	--	--	--	--	1.20	mg/kg	J-
K1210254	Batch MS/MSD KWG1212106-1	--	Naphthalene	74/181	37-118	20	30	--	--	--
K1210254	Batch MS/MSD KWG1212106-1	--	2-Methylnaphthalene	80/310	37-117	13	30	--	--	--
K1210254	Batch MS/MSD KWG1212106-1	--	Acenaphthylene	92/97	43-114	5	30	--	--	--

Lab reports reviewed: K1210254

Key:

- = Biased low

J= Estimated detected

mg/kg = Milligrams per kilogram

MS/MSD = Matrix spike/matrix spike duplicate

RPD = Relative percent difference

Table 3
Lab Duplicate Results and Calculated Relative Percent Differences
Riverbank Soil Samples
Portland Cement Terminal
Portland, Oregon

Lab Package	Sample ID	Associated Sample	Compound	Concentration		Report Limit	Units	RPD (%)	ERM Qualifier
				Sample	Duplicate				
K1210254	UB-101012D	UB-101012	Antimony	1.00	4.69	0.051	mg/kg	129.7	J
K1210254	UB-101012D	LB-101012	Antimony	--	--	--	--	--	J

Lab reports reviewed: K1210254

Key:

J= Estimated detected

mg/kg = Milligrams per kilogram

RPD = Relative percent difference