DEPARTMENT OF
ECOLOGY
State of Washington

Monitoring, Sampling and Analysis Plan

Spokane River Shoreline Sediment Sites
Heavy Metals (As, Cd, Pb, Zn)
Post-Remediation Monitoring

September 2013

Publication Information

Each study conducted by the Washington State Department of Ecology (Ecology) must have an approved Quality Assurance Project Plan. The plan describes the objectives of the study and the procedures to be followed to achieve those objectives. After completing the study, Ecology will post the final report of the study to the Internet.

Publication No. Not Applicable

Data for this project will be available on Ecology's Environmental Information Management (EIM) website at www.ecy.wa.gov/eim/index.htm. Search User Study ID, SpokRivMetals## where "#" is the two digits of a sampling year.

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Monitoring, Sampling and Analysis Plan

Spokane River Shoreline Sediment Sites
Spokane, WA

September 2013

Approved by:

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Abstract

Areas of the Spokane River and its banks have been impacted by contaminants such as arsenic, cadmium, lead and zinc as a result of mining activities taking place in the Silver Valley area of North Idaho and surrounding region. The U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) have identified specific locations along the Spokane River for remedial action based on potential human and ecological exposures in the Record of Decision for the Bunker Hill Mining and Metallurgical Complex Operable Unit. The areas of recreation that were identified for remedial action are associated with areas that have a fine-grained sediment composition which is more commonly enriched by heavy metals. Cleanup of the identified beaches started in 2006. The beach cleanups that were undertaken are:

- 2006: Starr Road (~ river mile 94.7)
- 2007: Murray Road (~ river mile 94.2, Island Complex (~ river mile 95) and additional work at Starr Road
- 2008: Harvard Road (~ river mile 92.7)
- 2010: Flora Road (~ river mile 89.1); additional work was done in 2012
- 2012: Barker Road North (~ river mile 90.4), Islands Lagoon (~ river mile 84.3), and Myrtle Point (~ river mile 84.9)

The purpose of this Monitoring, Sampling and Analysis Plan (MSAP) is to outline the schedule and the methods for conducting long-term monitoring and sample collection/analysis at each of the beach cleanup sites. The sampling results will support periodic reviews of the cleanup actions taken.

Background

The Spokane River Shoreline Sites are located between Upriver Dam and the Idaho state line. The Sites are associated with State Park recreational land and are heavily used by humans and ecological receptors. Following is a general description of each of the Sites that were remediated by Ecology and are covered in this MSAP. Further discussion of the history of the sites and the remediation actions done at each of the sites can be found in Spokane River Beaches Capping Construction Completion Report (GeoEngineers 2013).

In September 2002, the United State Environmental Protection Agency (USEPA) established Risk-based Screening Concentrations (RBC's) for the sites along the Spokane River in Washington as a part of the Bunker Hill Mining and Metallurgical Complex, Operable Unit Record of Decision (ROD). The RBC's were adopted as site-specific levels protective of human health and are displayed below in Table 1. The cleanup of the beach sites occurred prior to Washington State adopting freshwater sediment cleanup levels for the protection of ecological health, however an estimated appropriate range of sediment cleanup guidelines (SCG) based on current research were made and were used to help delineate remediation areas at each of the

beach sites that were identified as critical habitat. Both the RBCs and SCGs are provided in Table 1.

Table 1: RBC's from USPEA's ROD and SCGs

Contaminant	RBC	SCG [1,2,3]
Arsenic	~10 (background)	33 - 51
Cadmium	49	3 - 5
Lead	700	128 - 430
Zinc	17,109	270 - 459

(all values mg/kg)

Study Area

Starr Road: The Starr Road Site is adjacent to River Road just downstream of the Idaho state line. During the spring runoff, the area of concern at the Site is underwater but is exposed during the summer and fall low flow period. Surrounding the Site to the north is a small area of trees surrounded by brush located on the steep slope directly adjacent to the Site. During remediation activities, the trail was enhanced to provide access to the Site from River Road. The river bar area bordering the fine-grained depositional area to the south, acting as a barrier to the main flow of the Spokane River, contains fish spawning sized gravel intermixed with fine-grained sediment. Approximate total area: ~ 3.0 acres.

Murray Road: The Murray Road Site is adjacent to River Road. During the spring runoff the area of concern at the Site is underwater but is exposed during the summer and fall low flow period. Surrounding the Site to the north is a small area of trees surrounded by brush located on the steep slope directly adjacent to the Site to the north. In the upriver direction of the Site is a recreational trail area that is sparsely covered by trees and small brush which the River flows through during times of high flow. The river bar area bordering the fine-grained depositional area to the south, acting as a barrier to the main flow of the Spokane River, is heavily armored with river cobble. Approximate total area: ~ 1.4 acres.

Island Complex: Access to the Island Complex Site is from a gravel trail that was enhanced during cleanup activities from a parking lot adjacent to the river near Exit 299 on I-90. Portions of the Site are contained within Riverside State Park, and the Site is a popular recreation area. The Site contains a backwater area that has served as a depositional zone for fine-grained contaminated sediments. The Spokane River flows by the Site to the north year-round, and during the spring runoff the River flows in a side-channel to the south and west of the Site. The main river channel area to the north and the seasonal side-channel to the west bordering the fine-

[1] Long E.R. and L.G. Morgan. (1991). The potential for biological effects of sediment-sorbed contaminants tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52, National Oceanic and Atmospheric Administration, Seattle, WA, 175 pp + appendices

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

[3] Michelsen, T. (2003). Phase II Report: Development and recommendations of SQV's for freshwater sediments in Washington State. Avocet Consulting. Publication Number: 03-09-088.

grained depositional area contain fish spawning-sized gravel intermixed with fine-grained sediment. During cleanup work, a multi-layered soil cover was placed over contaminated sediments, and native trees and shrubs were planted to stabilize the bank in the backwater area that is formed during high flows. In addition, river gravels were placed below the Ordinary High Water Mark to act as a part of the cover and limit erosion. Approximate total area: ~ 0.25 acres.

Harvard Road: The Harvard Road Site, located on the north side of the Spokane River and just downstream of the Harvard Road Bridge. The Site is accessed through an unimproved dirt road. The Site acts as both as a recreational area for river users and a rainbow trout spawning area. The portion of the Site closest to the bridge acts as a gravel boat launch and is separated from the rest of the Site by large boulders that were placed during cleanup activities to prevent vehicular traffic from accessing the remaining part of the Site. Also during cleanup activities, fish spawning-sized gravel was placed as a part of the cap to promote rainbow trout spawning at the site. The area downstream of the Site is sparsely covered in vegetation during low flows and is heavily armored in cobble-sized rock. Approximate total area: ~ 0.60 acres.

Flora Road: The Flora Road Site is accessed via a short footpath that leads down from the Centennial Trail. During the spring runoff parts of the recreational shoreline area of concern is underwater but is dry and exposed during the summer and fall low flow period. The resulting exposed areas provide an area associated with recreational activity in areas with fine-grained sediment. The area adjacent to the Site to the east is sparsely covered with brush underlined predominantly with gravel and sand with the area adjacent to the Site to the west occupied by cobble- and boulder-sized river rock. Approximate total area: ~ 0.30 acres.

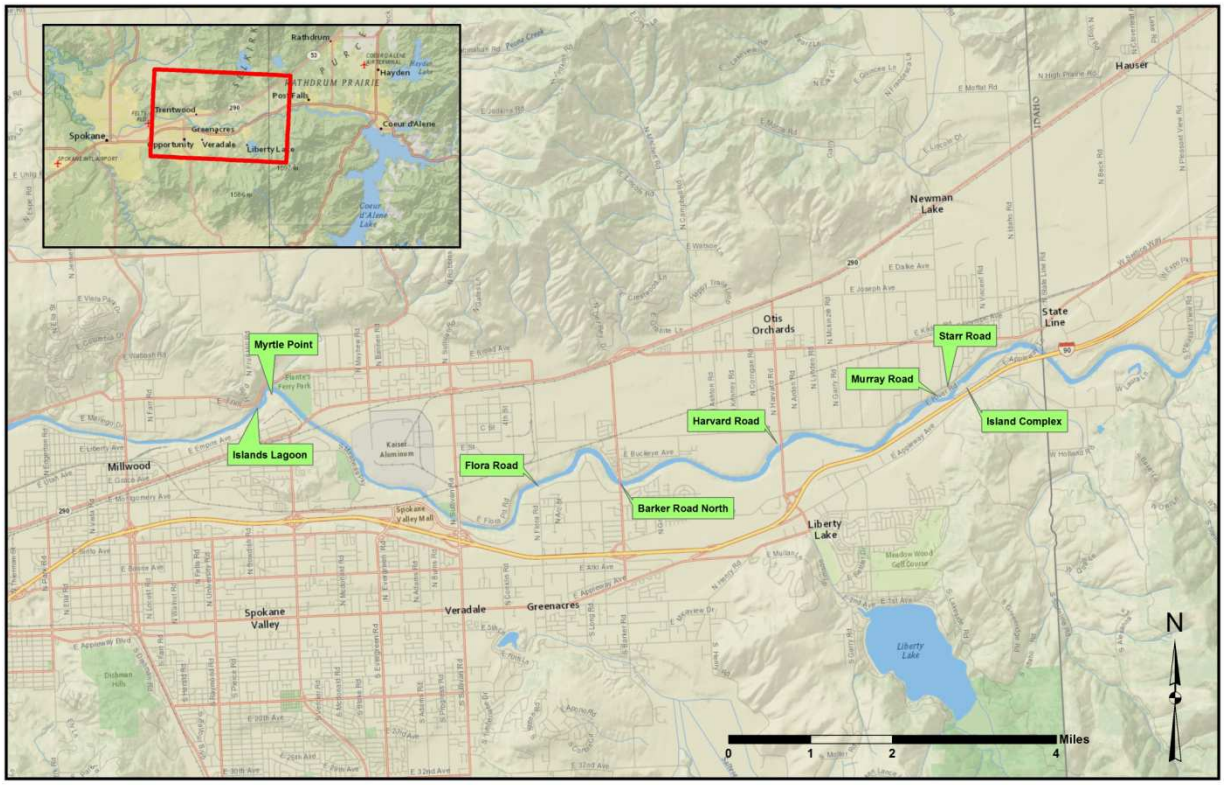
Barker Road North: The Barker Road North Site is located upstream of the Barker Road Bridge along the north bank. During the high flow spring runoff parts of the shoreline area of concern can be flooded but are exposed and dry during the summer and fall low flow period. The Site is surrounded by residential land to the north and east of the Site. The ease of access to the Site from Barker Road and the level plane of the Site provide an area associated with high recreational activity, primarily as a canoe and kayak launch site in areas of fine-grained sediment. Approximate total area: ~ 0.40 acres.

Myrtle Point: The Myrtle Point Site is easily accessible from the adjacent Centennial Trail along the southerly bank and upstream of the Centennial Trail Footbridge. The Site is located on the upstream end of a bend of the Spokane River providing for slow current water that is associated with recreational activity in areas with fine-grained sediment. Access to the Site is gained via a footpath leading from the Centennial Trail. During the spring runoff, parts of the recreational shoreline area of concern is underwater but becomes dry and exposed during the summer and fall low flow period. Adjacent to the Centennial Trail and surrounding the Site to the east and west are areas heavily covered with small trees and brush. Approximate total area: ~ 0.05 acre.

Islands Lagoon: The Islands Lagoon Site is upstream of the Centennial Trail Footbridge. The Site is bounded by large basalt monoliths and gravel bars within the main channel of the Spokane River, providing a calm water area associated with high recreational activity in areas with fine-grained sediment. During the spring runoff, parts of the recreational shoreline area of concern at the Site is underwater but is exposed during the summer and fall low flow period. Adjacent to the Centennial Trail and surrounding the Site to the south are small slopes covered with trees and

brush. The area adjacent to the Site to the west is sparsely covered with brush underlain predominantly with gravel and sand. Approximate total area: ~ 0.05 acres.

Figure 1. Overview of Spokane River Beach Cleanup Site Locations



Project Description

The objectives of the MSAP are:

1. Evaluation of Cleanup Actions –Make visual observations of the cleanup actions performed at each of the beach sites taking note of: integrity of the gravel cap, health of introduced vegetation, sediment deposition patterns,
2. Confirmatory Analysis – In order to more accurately evaluate the nature and extent of potential recontamination from upstream sources, Ecology will contract for laboratory analysis to be performed as described below to measure contaminants of interest in sediments at concentrations well below the Sediment Cleanup Goal (SCG).

Organization and Schedule

Table 2 lists the people involved in this project. All are employees of the Washington State Department of Ecology. Table 3 presents the proposed schedule for when sampling occurs for this project and Table 4 presents the scheduled field activities for each Site.

Table 2: Organization of project staff and responsibilities.

Staff (all are EAP except client)	Title	Responsibilities
Brendan Dowling TCP-Eastern Regional Office Phone: 509-329-3611	Project Manager/ Principal Investigator	Writes the QAPP. Oversees field sampling and transportation of samples to the laboratory. Conducts QA review of data, analyzes and interprets data, and enters data into EIM. Writes the draft report and final report.
TBD	Field Assistant	Helps collect samples and records field information.
Ginny Darrell TCP-Eastern Regional Office Phone: 509-329-3431	Unit Supervisor for the Project Manager	Provides internal review of the QAPP, approves the budget, and approves the final QAPP.
Mike Hibbler TCP- Eastern Regional Office Phone: 509-329-3568	Section Manager for the Project Manager	Reviews the project scope and budget, tracks progress, reviews the draft QAPP, and approves the final QAPP.
Phil Leinart TCP – Eastern Regional Office Phone: 509-329-3535	TCP Quality Assurance Coordinator	Approves the final QAPP.

EAP: Environmental Assessment Program
EIM: Environmental Information Management database
QAPP: Quality Assurance Project Plan

Table 3: Proposed schedule for completing field and laboratory work, data entry into EIM and reports.

Field and laboratory work	Due date	Lead staff
Field work completed	Late Summer/ Fall As Needed	Project Manager
Laboratory analyses completed	Two months after field work completed	
Environmental Information System (EIM) database		
EIM user study ID	SpokRivMetals## where "#" is the two digits of a sampling year	
Product	Due date	Lead staff
EIM data entry completed	Time of Draft Technical Report	Project Manager
Sample Analysis Report		
Author lead / Support staff	Project Manager / Principal Investigator	

Schedule	
Draft Technical Report for each round due to supervisor	One month after lab results validated
Final Technical Report for each round (all reviews done) due to publications coordinator	One month after supervisor review
Final report due on web	Two Months after submittal of Final Technical Report

Table 4: Schedule of Field Activities

Beach	First Scheduled Sampling Year	Sampling Frequency*	Observation Schedule
Starr Road	2013	5 Years	Yearly
Murray Road	2013	5 Years	Yearly
Island Complex	2013	5 Years	Yearly
Harvard Road	2013	5 Years	Yearly
Flora Road	2017	5 Years	Yearly
Barker Road North	2017	5 Years	Yearly
Myrtle Point	2017	5 Years	Yearly
Islands Lagoon	2017	5 Years	Yearly

* Samples will also be attempted to be collected at all beach sites if a flow of 40,000 cfs is observed in the Spokane River during the given calendar year.

Quality Objectives

Quality objectives for this project are to obtain data of sufficient quality so that uncertainties are minimized and results are comparable to similar data from other studies. Achieving low detection limits is of particular importance for a successful study outcome. These objectives will be achieved through careful attention to the sampling, measurement, and quality control (QC) procedures described in this plan.

Measurement Quality Objectives

MEL and their contractors are expected to meet all QC requirements of the analytical methods being used for this project. Specific measurement quality objectives (MQOs) selected for the project are shown in Table 5. These MQOs correspond to MEL's QC limits (metals). The lowest concentrations of interest shown in the tables are the lowest currently attainable by MEL and its contract laboratories. Data outside these MQOs will be evaluated for appropriate corrective action.

Table 5: Measurement Quality Objectives: Metals.

Analysis	Laboratory Control Samples (recovery)	Laboratory Duplicates (RPD)	Matrix Spikes (recovery)	Matrix Spike Duplicates (RPD)	Lowest Concentration of Interest (sediment, dw)
Arsenic	85-115%	±20%	75-125%	±20%	0.1 mg/Kg
Cadmium	85-115%	±20%	75-125%	±20%	0.1 mg/Kg
Lead	85-115%	±20%	75-125%	±20%	0.1 mg/Kg
Zinc	85-115%	±20%	75-125%	±20%	5 mg/Kg

(Analyses by MEL.)
RPD: relative percent difference.
NA: not analyzed or not applicable.
ww: wet weight.
dw: dry weight.
mg/Kg: parts per million.

Sampling Procedures

Decision Criteria

Every five years or during a year in which a 40,000cfs flow event occurs in the Spokane River field observations of each of the beach sites should be conducted as described in this MSAP. During these inspections if suitable amounts of material that allows for a collection and analysis of a discrete sample (~8oz) have been deposited on top of the cap, a sample should be collected following the procedure outlined in this MSAP. If material is not able to be collected

during a period of 5 years following the last sample collection and analysis, removal of the overlying cobble layer by hand shall be done at sampling locations to determine if sufficient sediment has accumulated atop of the underlying crushed gravel filter that can yield a suitable sample for laboratory analysis. If suitable amounts of material are not present it should be noted in field notebook.

Field Observations

At each beach site, field observations should be noted to assist in periodic review of the performance of these cleanup actions. Focus of each inspection will primarily be on:

- Integrity of the Gravel Cap: Note whether the cap is intact and undamaged. If it is damaged, note the extent of damage and suspected or apparent cause(s). Note if any debris has accumulated on top of the cap.
- Sediment Deposition Patterns: Note whether sediment or other materials have deposited on or near the cap since the cleanup or last monitoring event.
- Health of Introduced Vegetation: At some of the shoreline sites, plantings were utilized as a part of the remediation. Note the success (health) of those plantings, estimated growth from the previous monitoring event and if other (non-introduced) vegetation has established.

A form for recording field observations can be found in Appendix B.

Procedure for Sampling Surficial Material

Materials should be collected from stations distributed over the Site that target material that was deposited on top of the surface layer of the cap. Sample locations should be determined in the field and will be based on previous sampling results, surface geology, and sediment depositional patterns. Care should be taken to avoid sampling material that was placed as a part of the cap. Appendix A includes figures of the remediated area at beach site. Sampling should be conducted within the areas that were remediated. Approximately 4-6 discrete stations at each site should be sampled. Soil/sediment collected from each station should be homogenized as a single sample. Upon collection, materials should be placed in 1-gallon zip-locking plastic bags. The minimum amount of material needed for each sample is 50g. Each bag will be labeled with proper identification of sample location, date and time. Samples should be named according to each location number with an example being: “Sample 1” which would be collected from Station 1. A handheld Trimble Global Positioning System (GPS) unit should be used to record the coordinates of each sample location. Note the location of each station on the Field Inspection Sheet. Decontamination of sampling equipment should be conducted between samples.

Procedure for Sampling Sub-cobble Layer Material

Materials should be collected following the same the procedures as outlined in the previous subsection however the cobble layer of the cap should be removed from a small area by hand allowing for access to the gravel filter layer of the cap. If a suitable amount of deposited sediment is found, a sample should be collected from this material with care to avoid sampling any of the cap material. Once completed, the removed cobble material should be placed back in the area to ensure the integrity of the cap.

Sample Preparation Procedure

Sample preparation may be performed in the Ecology ERO sampling room. At the discretion of the project manager all or a subset of the collected samples from each site will be sieved. Prior to sieving, samples will be allowed to dry. Material will be fractioned using a #10 (2 mm) sieve. Split samples of the fine-grained material will be placed in glass jars and appropriately labeled for shipment to a State-certified laboratory for analysis.

Following the analysis, materials will be disposed of. If the materials do not contain concentrations above the SCG, any excess material not provided to the laboratory will be disposed of as regular solid waste. If the excess materials contain concentrations above the SCG, Ecology ERO will work with the laboratory conducting the analysis to ensure for the material's proper disposal.

Table 6: Sample Preparation Procedure

Matrix (Sample Source)	Parameter	Minimum Sample Quantity	Container Type	Preservation technique	Technical (Maximum) Holding Time
Sediment/Soil	Metals (As, Cd, Pb, Zn)	50 grams	Glass Jar	Stored between 0-6°C	6 months

Sample Analysis

Table 7 shows the anticipated number of sediment samples to be analyzed at each beach site, expected range of results, required reporting limits, and analysis methods to be used for this MSAP.

As previously noted, MEL will analyze metals and ancillary parameters.

Table 7: Laboratory Procedures: Sediment Samples.

Analyte	Number of Samples	Expected Range of Results	Reporting Limit	Sample Preparation Method	Analytical Method
Arsenic	4-6	.1-20 mg/Kg	0.1 mg/Kg	EPA 3050B	EPA 200.8
Cadmium	4-6	0.1-10 mg/Kg	0.1 mg/Kg	EPA 3050B	EPA 200.8
Lead	4-6	1-1,000 mg/Kg	0.1 mg/Kg	EPA 3050B	EPA 200.8
Zinc	4-6	1-1,000 mg/Kg	5 mg/Kg	EPA 3050B	EPA 200.8

Quality Control Procedures

Field

Duplicate (split) samples will be used to assess variability in the data due to sample preparation and laboratory procedures. Duplicate sediment samples will be prepared in the field at a rate of least one duplicate sample collected per sampling event. Field duplicate samples will be labeled with "FD" after the sample station name. The collection of a field blank sample is at the discretion of the Project Manager.

Laboratory

Laboratory QC samples to be used in assessing the precision and bias of data obtained through this project are shown in Table 8. The samples for duplicate analysis are those prepared by the study team, as described above. Additional laboratory duplicates are not requested.

Table 8: Laboratory Quality Control Samples.

Analysis	Duplicate (split) Samples	Laboratory Control Samples	Method Blanks	OPR Standards	Labeled Compounds
Metals	1-2/batch	1/batch	1/batch	NA	NA

OPR: ongoing precision and recovery.
NA: not applicable.

Data Management Procedures

Field data will be recorded in a bound notebook of waterproof paper.

The data packages from contract laboratories will include case narratives discussing any problems encountered with the analyses, corrective actions taken, changes to the referenced method, and an explanation of data qualifiers. The narrative should address condition of the samples on receipt, holding time, methods of analysis, sample preparation, instrument calibration, recovery data, and results on QC samples (RPD of laboratory replicates or field splits or matrix spike duplicates, recovery of Laboratory control samples and matrix spikes and spike duplicates, any blank contamination). This information is needed to evaluate the accuracy of the data and to determine whether the MQOs were met.

The contract laboratory will provide the sample results in Excel spreadsheet format.

MEL will provide results and case narratives for their analyses following MEL standard procedures.

All project data will be entered into Ecology's Environmental Information Management System

(EIM). Data entered into EIM follow a formal data review procedure where the data are reviewed by the project lead, the person entering the data, and an independent reviewer.

Data Verification

MEL will conduct a review of all contract laboratory data and case narratives. MEL will verify that methods and protocols specified in this QA Sampling Analysis Plan were followed; that all calibrations, checks on quality control, and intermediate calculations were performed for all samples; and that the data are consistent, correct, and complete, with no errors or omissions. Evaluation criteria will include the acceptability of holding times, procedural blanks, calibration, matrix spike recoveries, labeled compound and internal standard recoveries, ion abundance ratios, duplicates, laboratory control samples, and appropriateness of data qualifiers assigned. MEL will prepare written data verification reports based on the results of their data review.

A case narrative will meet the requirements for a data verification report for MEL's chemical data.

The project lead will examine the data reviews, case narratives, and data packages. To determine if project MQOs have been met, results for laboratory control samples, sample duplicates, matrix spikes, and labeled compound recoveries will be compared to QC limits. The method blanks results will be examined to verify there was no significant contamination of the samples. To evaluate whether the targets for reporting limits have been met, the results will be examined for "non-detects" and any values exceeding the lowest concentration of interest (reporting limit). Based on these assessments of the data quality objectives, the data will be either accepted, accepted with appropriate qualifications, or rejected and re-analysis considered.

Data Analysis

Once the data have been verified, the project lead will determine if they can be used to make the calculations, determinations, and decisions for which the project was conducted. If the results are satisfactory, data analysis will proceed.

Summary statistics will be calculated for each chemical and outliers identified. The data will be plotted to compare contaminant concentrations among the identified Spokane River Beach Sites and identify spatial patterns.

A comparison will be provided with available human health, aquatic life, and wildlife criteria.

Audits and Reports

Audits

MEL participates in performance and system audits of their routine procedures. Results of these audits are available on request. No audits will be conducted of MEL contract laboratories.

Reports

The following reports will be prepared for this project:

1. A draft technical report summarizing the results of a given round of sampling for review by ERO staff associated with the project one month after validation of the lab data. Responsible Staff: Project Manager.
2. The final technical report for each round of sampling will be completed within one month of the completed review of the draft technical report. Responsible staff: Project Manager.
3. The project data will be entered into EIM on or before the final technical report for a given round of sampling. Responsible staff: Project Manager.

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Appendices

Appendix A. Figures of Remediated Area at each Beach Site
Appendix B. Monitoring Check-List Form
Appendix C. Health and Safety Plan
Appendix D. Glossary, Acronyms, Abbreviations

Appendix A. Figures of Remediated Area at each Beach Site

Figure A-1. Islands Lagoon

Figure A-2. Myrtle Point

Figure A-3. Flora Road

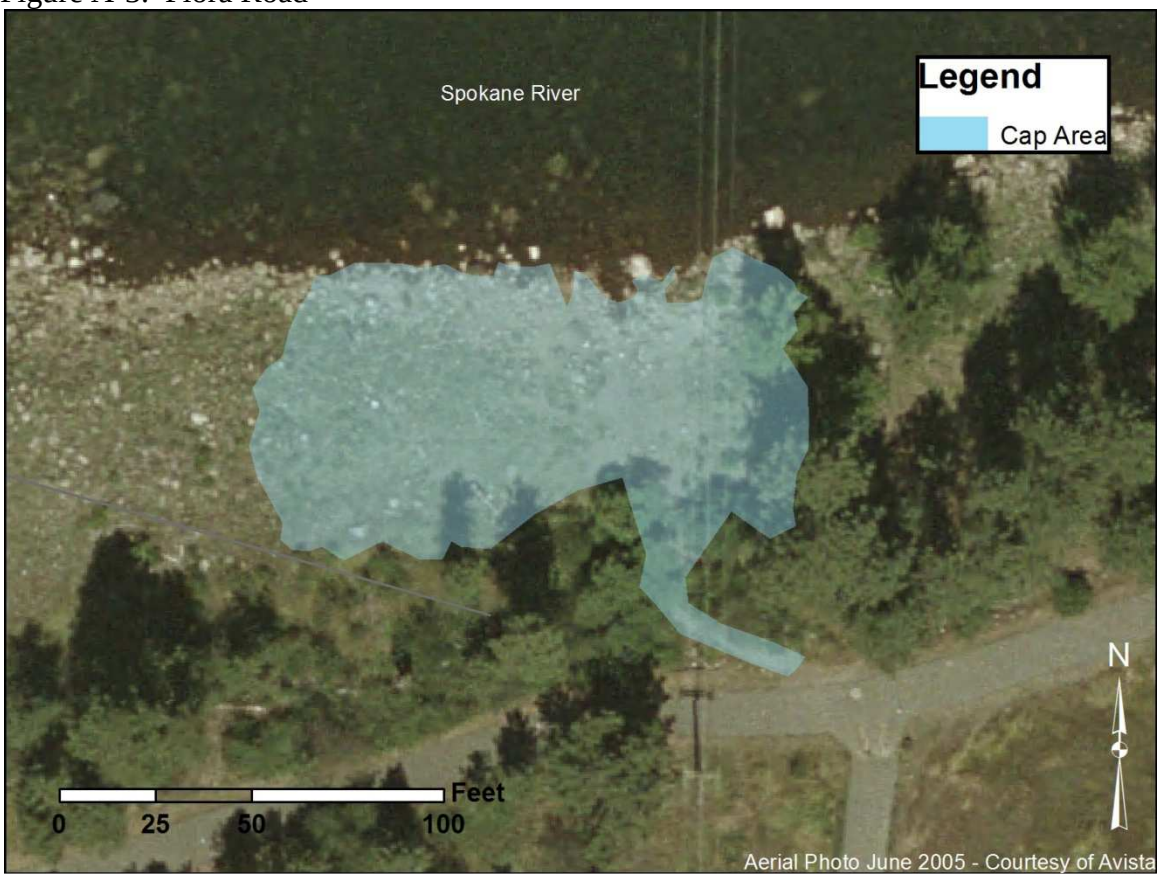


Figure A-4. Barker Road North

Figure A-5. Harvard Road

Figure A-6. Murray Road

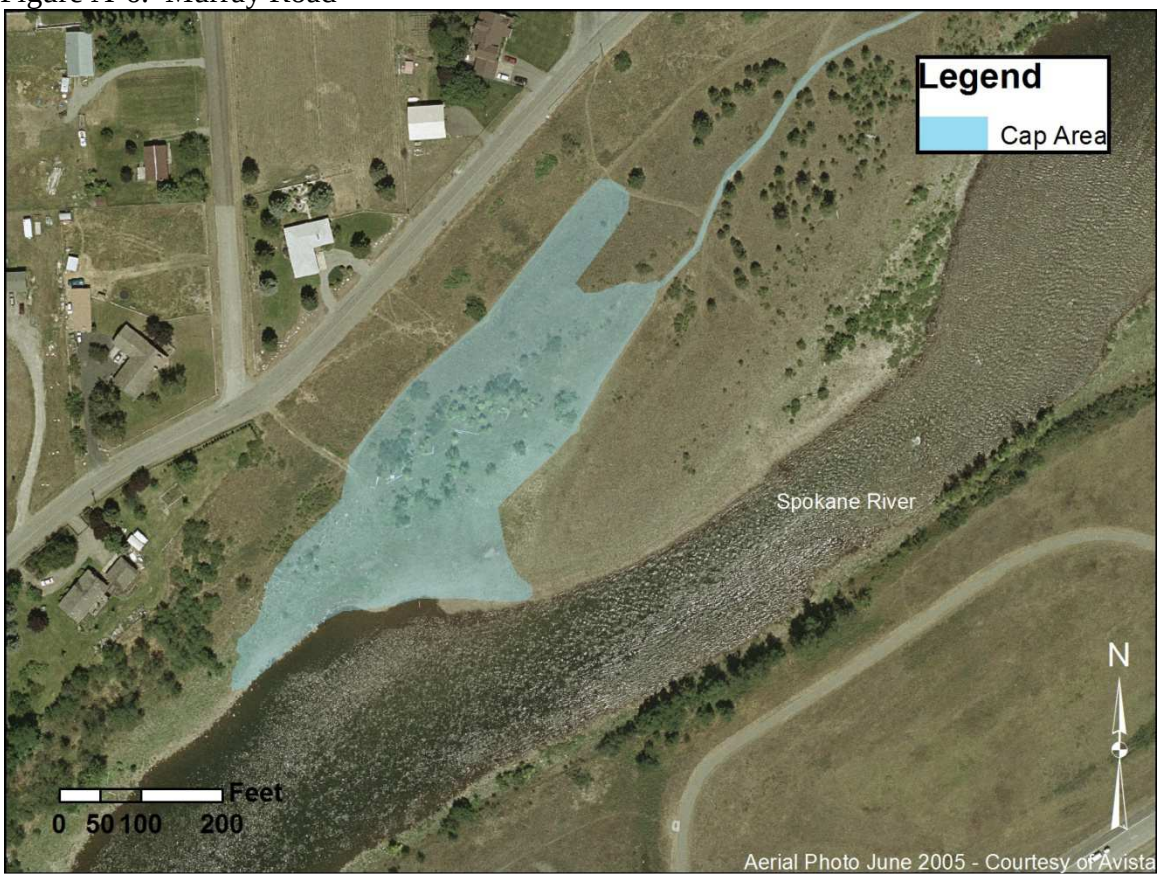
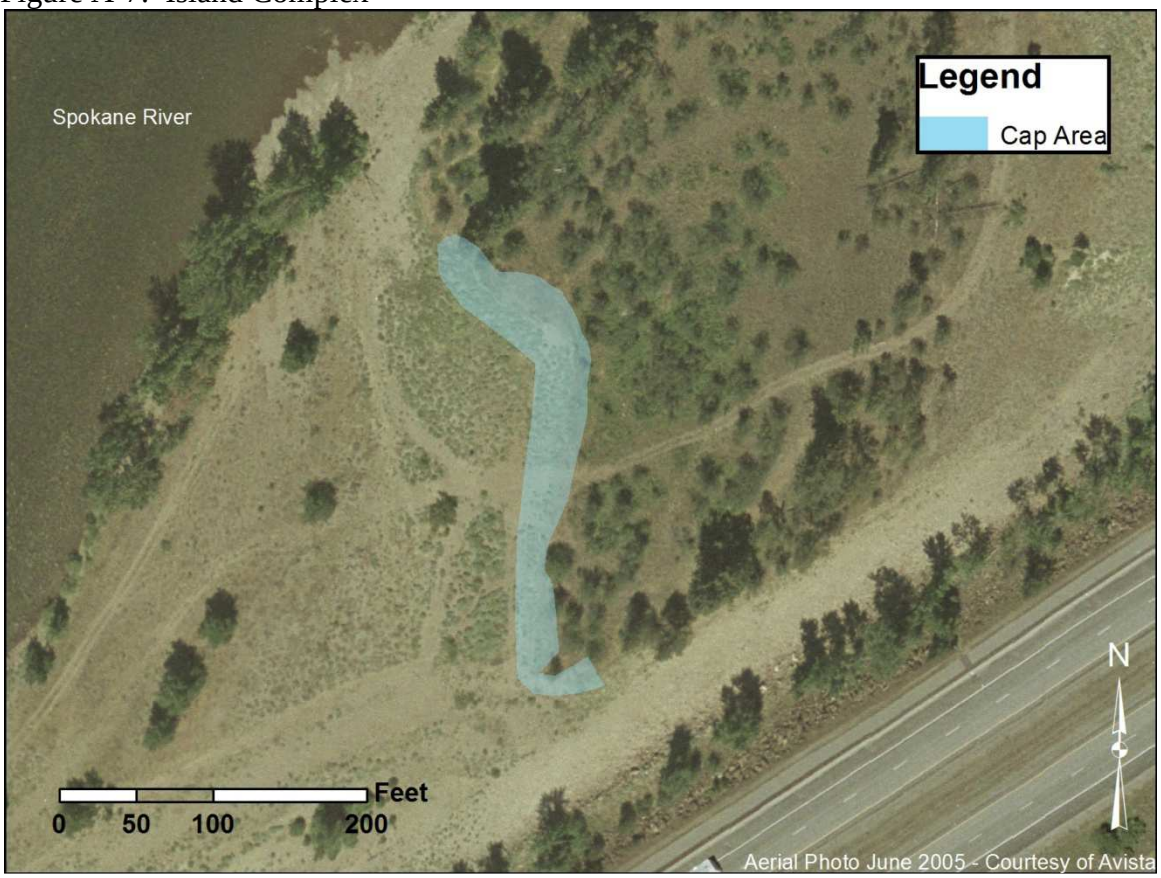


Figure A-7. Island Complex



Appendix B. Monitoring Check-List Form

Spokane River Metals Beach Sites
Site-Visit Monitoring Log

Site Name:_____ Date of Visit: _____

Person Filling Out the Form:_____

Were sediment samples collected? YES _____ NO_____ If YES, how many? _____

Sediment Deposition Patterns
Has additional sediment deposited on or near the cap since the last monitoring event? YES_____ NO _____ If YES, note the areas and amount of newly deposited sediment:

Signage and Pedestrian Access
Condition of pedestrian access pathways and signage if placed as a part of the remedial action:

Vegetation Health
Note the success (health) of plantings that were used as a part of the remedy: Estimated amount of growth since last monitoring event: Has additional (non-introduced) vegetation established on the cap? YES _____ NO _____ If YES, note the areas and types of new vegetation and is estimated growth since the last monitoring event:

Gravel Cap Observations
Is the gravel cap intact and undamaged? YES_____ NO_____ If NO, note the areas/extent of damage and suspected or apparent cause(s):
Note any debris that has accumulated on top of the cap:
Effect of cap, if any, on beach area immediately up-stream or downstream (e.g. erosion, bulk-heading):

Photo Log	
Photo ID	**Description**

Appendix C. Health and Safety Plan

HEALTH AND SAFETY SITE PLAN

Name of Ecology inspector(s)_____

Training requirements for this inspection_____

Medical monitoring requirements_____

Date_____ Arrival time_

Total anticipated time on site_

Site name____

Site location__

Nearest city_____ Nearest hospital ___

Emergency numbers Statewide - 911 Hospital_____ Ambulance_

Name of contractor (if on site)_____

Is the site currently active? Yes___ No___ Will the buddy system be used? Yes___ No_

Site description_____

_____

Scope/objective of work_____

_____

_____

Known contaminants on site _____

Routes of chemical exposure: Inhalation_____ Dermal_____ No exposure___

Overall risk of chemical exposure: Serious____ Moderate_____ Low_____ Unknown____

Physical hazards: Confined space_____ Noise_____ Heat/cold stress_____

(continued on next page)

Describe any area on site that could function as a confined/enclosed space_

_____

Was air monitoring conducted? Yes___ No___

Personal protection level required A B C D

Personal protective equipment required_____

Other (specify)_____

Overall risk of physical hazards: Serious_____ Moderate_____ Low_____ Unknown_____

Expected parameters/contaminants to be sampled___

_____

_____

Sampling matrix: Air_____ Surface water_____ Groundwater_____ Soil_____
Sediment_____ Containers_____ Other_____

Appendix D. Acronyms, and Abbreviations

Acronyms and Abbreviations

Following are acronyms and abbreviations used frequently in this report.

BMP	Best management practices
e.g.	For example
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management database
et al.	And others
GIS	Geographic Information System software
GPS	Global Positioning System
i.e.	In other words
MEL	Manchester Environmental Laboratory
MQO	Measurement quality objective
QA	Quality assurance
ROD	Record of Decision
RM	River mile
RPD	Relative percent difference
RSD	Relative standard deviation
SOP	Standard operating procedures
SRM	Standard reference materials
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

Units of Measurement

dw	dry weight
ft	feet
g	gram, a unit of mass
kg	kilograms, a unit of mass equal to 1,000 grams
m	meter
mg	milligram
mg/Kg	milligrams per kilogram (parts per million)
ug/g	micrograms per gram (parts per million)