

**QUALITY ASSURANCE PROJECT PLAN  
Upper Columbia River Sturgeon Tissue Study**

**Addendum No. 1  
to the  
Quality Assurance Project Plan for the  
2009 Fish Tissue Study**

**Prepared for:**

U.S. Environmental Protection Agency Region 10  
Seattle, Washington

U.S. Environmental Protection Agency  
Environmental Response Team  
Edison, New Jersey

**Prepared by:**

SRC, Inc. for Lockheed Martin  
Scientific Engineering Response & Analytical Services Contract  
Syracuse, New York

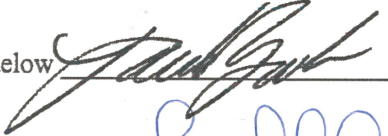
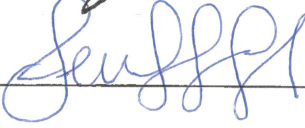
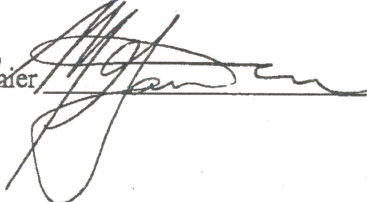
**September 2016**

## SECTION A. PROJECT MANAGEMENT

### A1. TITLE AND APPROVAL SHEET

---

Quality Assurance Project Plan for the Upper Columbia River Sturgeon Tissue Study

EPA R10 Project Manager	Laura Buelow 	Date <u>9/28/16</u>
EPA R10 QA Manager Advisor	Donald M. Brown 	Date <u>09/29/2016</u>
Technical Team Coordinator (CH2M)	Marilyn Gauthier 	Date <u>9/28/16</u>

## **EXECUTIVE SUMMARY**

---

This Quality Assurance Project Plan (QAPP) represents an addendum to the Upper Columbia River (UCR) QAPP for the 2009 Fish Tissue Study (Parametrix et al., 2009). Upon EPA approval of the 2009 QAPP, fish tissue sampling representing several fish species and size classes was conducted in six reaches of the UCR in September and October of 2009. Those data are summarized in the 2013 UCR Fish Tissue Data Summary and Data Gap Report (Exponent and Parametrix, 2013).

This document presents Addendum No. 1 to the 2009 fish tissue QAPP for the UCR Site remedial investigation and feasibility study (RI/FS). The primary objectives of the RI/FS are to investigate the nature and extent of contamination at the Site and to assess risks to human health and the environment to an extent sufficient to develop and evaluate potential remedial alternatives for the Site that will meet applicable or relevant and appropriate requirements (ARARs), and statutory and regulatory requirements.

### **WHAT is the purpose of Addendum No. 1?**

The primary purpose of Addendum No. 1 to the 2009 fish tissue QAPP is to collect information on chemical concentrations in hatchery white sturgeon tissue from the UCR that will be used to fulfill the data needs of the human health risk assessment.

### **WHY is fish tissue sampling being done?**

Following the 2009 QAPP, fish tissue sampling representing several fish species and size classes was conducted in six reaches of the UCR in September and October of 2009. Those data are summarized in the 2013 UCR Fish Tissue Data Summary and Data Gap Report (Exponent and Parametrix, 2013). While the 2009 QAPP (Parametrix et al. 2009) identified white sturgeon as a traditional tribal food source and common sport fish in the Columbia River, the species were not sampled in 2009 as they were not part of a legal fishery in the Upper Columbia River at the time. Long-term monitoring of hatchery white sturgeon in the UCR from the Grand Coulee Dam upstream to the Hugh L. Kennellyside Dam in Canada has shown that survival rates and abundance of these fish are much greater than anticipated (Golder 2015, as cited in McLellan 2016). As a result, the Upper Columbia White Sturgeon Recovery Initiative (UCWSRI) and the Lake Roosevelt Fishery Co-Managers are planning targeted removal of hatchery white sturgeon to avoid diluting the genetic diversity present in wild sturgeon. The preferred removal approach is to establish recreational and subsistence fisheries in the UCR, and to distribute hatchery white sturgeon euthanized during targeted removals to Tribal membership and local food banks (McLellan 2016). Prior to making these fish available for human consumption, hatchery white sturgeon need to be evaluated to determine whether their consumption would result in human health risks. Fish collected during future sampling events may be distributed to Tribal Membership and local food banks, provided the results from this sampling event do not indicate unacceptable risk to sturgeon consumers. As anticipated by the 2009 QAPP, sturgeon tissue data are needed for both a Human Health Risk Assessment (HHRA) and to support Washington Department of Health (WDOH) in their review of the potential need for a UCR sturgeon fish advisory.

**WHERE will the fish be collected?**

Hatchery white sturgeon will be collected by the Lake Roosevelt Fisheries Co-Managers from UCR River Reaches 1-4 (areas extending from Inchelium/Gifford to the U.S.-Canadian border).

**HOW will the sample processing and analysis be performed?**

The sampling plan includes the collection of nine composite samples; each composite sample will include a minimum of eight individual fish. The composites will consist of fillets without the skin.

The composite samples will be analyzed for a suite of chemicals that will include Target Analyte List (TAL) metals/metalloids (including mercury), inorganic arsenic, dioxins/furans, total polychlorinated biphenyls (PCBs), PCB congeners, and polybrominated diphenyl ethers (PBDEs) (Table A-2).

**WHEN will the fish be collected?**

Hatchery white sturgeon will be collected in August and September of 2016.

**Note to Reviewers:**

Addendum No. 1 to the 2009 QAPP considers comments received from TAI on an earlier draft of the data quality objectives for this study. Addendum No. 1 includes updates to risk-based concentrations to reflect changes in exposure factors, oral reference doses (RfDs) and cancer slope factors (CSFs) that have been issued since the 2009 QAPP. Addendum No. 1 also includes updates to method detection and method reporting (quantitation) limits (MDLs and MRLs), based on information provided by ALS Environmental in August 2016 (pers. comm. Poyfair 2016) and Vista Analytical (pers. comm. McCaig 2016). The risk-based concentrations (RBCs), MDLs and MRLs that have changed from the original 2009 QAPP are indicated by shading in Table A-2.

To facilitate review, the section and subsection numbering used in Addendum No. 1 follows the numbering system of the 2009 QAPP. Subsections that do not apply to this addendum were skipped; therefore, the numbering is not sequential in some areas.

### **A3. DISTRIBUTION LIST**

---

<b>ERT Work Assignment Manager (WAM)</b>	David Charters
<b>ERT Quality Coordinator</b>	Stephen Blaze
<b>EPA Region 10 Remedial Project Manager</b>	Laura Buelow
<b>EPA Region 10 QA Manager (RQAM)</b>	Donald M. Brown
<b>EPA Region 10 Regional Sample Control Coordinator (RSCC)/QA Chemist</b>	Jennifer Crawford
<b>SERAS Program Manager</b>	Kevin Taylor
<b>SERAS Quality Assurance/Quality Control (QA/QC) Officer</b>	Deborah Killeen
<b>SRC Program Manager</b>	David Hohreiter
<b>SRC Task Leader (TL)/QC Coordinator</b>	Bill Thayer
<b>CH2M Technical Team Coordinator</b>	Marilyn Gauthier
<b>TAI Project Coordinator</b>	Kris McCaig
<b>TAI Technical Team Coordinator</b>	John Toll
<b>TAI Analytical Chemistry Laboratory Coordinator</b>	Dave Enos
<b>TAI Task QA Coordinator</b>	Rock Vitale
<b>ALS Environmental Project Manager</b>	Jeff Coronado

**ALS Environmental  
QA Manager**

Carl Degner

**Vista Analytical Laboratory  
Project Manager**

Martha Maier

**Vista Analytical QA Manager**

Bahar Amiri

# **TABLE OF CONTENTS**

---

<b>SECTION A. PROJECT MANAGEMENT</b> .....	<b>ii</b>
<b>A1. TITLE AND APPROVAL SHEET</b> .....	<b>ii</b>
<b>A3. DISTRIBUTION LIST</b> .....	<b>3</b>
<b>TABLE OF CONTENTS</b> .....	<b>5</b>
<b>A4. INTRODUCTION AND TASK ORGANIZATION</b> .....	<b>13</b>
<b>A4.1. Introduction</b> .....	<b>13</b>
<b>A4.2. Task Organization</b> .....	<b>14</b>
A4.2.1. ERT and EPA Region 10 Organization and Responsibilities.....	15
A4.2.2. SRC and CH2M Organization and Responsibilities .....	15
A4.2.3. TAI Organization Responsibilities .....	15
A4.2.3. Key Task Personnel .....	15
A4.2.4. Laboratory .....	18
<b>A5. PROBLEM DEFINITION AND BACKGROUND</b> .....	<b>19</b>
<b>A5.1. Preliminary Conceptual Site Model</b> .....	<b>19</b>
<b>A5.2 Overview of Existing Fish Tissue Data</b> .....	<b>19</b>
<b>A5.4 Applicability of Available Data to Risk Assessment</b> .....	<b>20</b>
<b>A6. DATA GAPS</b> .....	<b>20</b>
<b>A8. TASK DESCRIPTION</b> .....	<b>20</b>
<b>A8.1 Overview of Field Activities</b> .....	<b>20</b>
A8.1.1 Fish Tissue Samples.....	20
A8.1.2 Number and Timing of Sampling Events.....	21
<b>A8.2 Laboratory Analyses</b> .....	<b>21</b>
<b>A9. DATA QUALITY OBJECTIVES, CRITERIA, AND DESIGN RATIONALE</b> .....	<b>22</b>
<b>A9.1 Step 1—State the Problem</b> .....	<b>22</b>
<b>A9.2 Step 2—Identify the Goal of the Study</b> .....	<b>23</b>
<b>A9.3 Step 3—Identify Information Inputs</b> .....	<b>24</b>
<b>A9.4 Step 4—Define the Boundaries of the Study</b> .....	<b>25</b>
<b>A9.5 Step 5—Identify the Analytical Approach</b> .....	<b>25</b>
<b>A9.6 Step 6—Specify Performance or Acceptance Criteria</b> .....	<b>26</b>
<b>A9.7 Step 7—Develop the Plan for Obtaining Data</b> .....	<b>26</b>
<b>A10. SPECIAL TRAINING/CERTIFICATES</b> .....	<b>28</b>
<b>A11. DOCUMENTATION AND RECORDS</b> .....	<b>28</b>
<b>A11.1 Field Documentation</b> .....	<b>28</b>
<b>A11.2 Laboratory Documentation</b> .....	<b>29</b>

A11.3 Data Quality Documentation.....	30
<b>SECTION B. DATA GENERATION AND ACQUISITION.....</b>	<b>31</b>
<b>B1. SAMPLING PROCESS DESIGN AND RATIONALE.....</b>	<b>31</b>
B1.1. Investigation Considerations.....	31
B1.2. Target Species, Size Classes, and Rationale.....	31
B1.3. Target Tissue Types and Rationale.....	32
B1.4. Target Sample Types, Locations, and Rationale.....	32
B1.5. Target Analyte List (TAL) .....	33
<b>B2. SAMPLING METHODS .....</b>	<b>33</b>
<b>B3. SAMPLE HANDLING AND CUSTODY .....</b>	<b>33</b>
<b>B4. ANALYTICAL METHODS.....</b>	<b>35</b>
B4.1. Chemical Analyses .....	35
B4.2. Field Measurements .....	35
<b>B5. QUALITY CONTROL .....</b>	<b>35</b>
B5.1. Laboratory Quality Control .....	36
B5.2. Data Quality Indicators for Laboratory.....	36
<b>B6. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE .....</b>	<b>39</b>
<b>B7. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY .....</b>	<b>39</b>
<b>B8. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES .....</b>	<b>39</b>
<b>B10. DATA MANAGEMENT.....</b>	<b>40</b>
B10.1 Field Data .....	41
B10.2. Laboratory Data .....	41
<b>SECTION C. ASSESSMENT AND OVERSIGHT.....</b>	<b>42</b>
<b>C1. ASSESSMENTS AND RESPONSE ACTIONS .....</b>	<b>42</b>
<b>C2. REPORTS TO MANAGEMENT .....</b>	<b>43</b>
<b>SECTION D. DATA VALIDATION AND USABILITY .....</b>	<b>44</b>
<b>D1. DATA REVIEW, VERIFICATION, AND VALIDATION .....</b>	<b>44</b>
<b>D2. VERIFICATION AND VALIDATION METHODS.....</b>	<b>44</b>
<b>D3. RECONCILIATION WITH USER REQUIREMENTS.....</b>	<b>45</b>
<b>SECTION E. REFERENCES .....</b>	<b>46</b>



**Appendix A-1.** Field Sampling Plan for Addendum No. 1 to the 2009 Fish Tissue Study

**Appendix E-1.** Human Health Risk-Based Concentrations for Fish Tissue in Support of Sampling and Analysis Plan Development

## **LIST OF FIGURES**

---

Figure A-1. Organization Chart for Addendum No. 1 to the 2009 Fish Tissue Study

## **LIST OF TABLES**

---

Table A-1. Fish Tissue Task, Team Contact Information

Table A-2. Target Analytes, Method Detection and Reporting Limits, and Human Health Risk-Based Concentrations for Addendum No. 1 to the Quality Assurance Project Plan to the 2009 Fish Tissue Study

Table A-2-1. Method Detection Limits for PCB Congeners

Table A-3. Recommended Methods for Analysis of Contaminants of Interest in Fish Tissue Samples

## ACRONYMS AND ABBREVIATIONS

---

Agreement	June 2, 2006 Settlement Agreement
ACG	analytical concentration goal
ARARs	applicable or relevant and appropriate requirements
BW	body weight
CCT	Confederated Tribes of the Colville Reservation
CF	conversion factor
CFR	Code of Federal Regulations
COC	chain-of-custody
COI	contaminant of interest
CSF	cancer slope factor
CSM	conceptual site model
CV	coefficient of variation
DL	dioxin-like
DMP	data management plan
DQO	data quality objective
DSR	data summary report
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EDL	estimated detection limit
EF	exposure frequency
EPA	U.S. Environmental Protection Agency
ERT	Environmental Response Team
ESI	Environmental Services, Inc.
FL	fork length
FSP	field sampling plan
FSR	field sampling report
GIS	geographic information system
GPS	global positioning system
HHRA	human health risk assessment

HIF	human intake factor
HQ	hazard quotient
HRMS	high resolution mass spectrometry
ID	identification
IR	ingestion rate
Lake Roosevelt Franklin D. Roosevelt Lake	
LRMP	Lake Roosevelt Monitoring Program
LCS	laboratory control sample
LT	lifetime
MDL	method detection limit
MQOs	measurement quality objectives
MRL	method reporting limit
MS/MSD	Matrix spike/matrix spike duplicate
NA	not applicable
NFGs	national functional guidelines
NIST	National Institute of Standards and Technology
Parametrix	Parametrix, Inc.
PARCC	precision, accuracy or bias, representativeness, completeness, and comparability
PBDE	polybrominated diphenyl ether
PCB	polychlorinated biphenyl
QA	quality assurance
QA/QC	quality assurance and quality control
QC	quality control
QAPP	quality assurance project plan
RBCs	risk-based-concentrations
RfD	reference dose
RI/FS	remedial investigation and feasibility study
RM	river mile
RPD	relative percent difference
RPM	Remedial Project Manager
RQAM	Regional Quality Assurance Manager

RSC	relative source contribution
RSCC	Regional Sample Control Coordinator
RSD	relative standard deviation
RSL	Regional Screening Level
S4VM	Stage 4 manual validation
SHSP	site health and safety plan
Site	Upper Columbia River site
SOP	standard operating procedure
SRM	Standard reference material
STI	Spokane Tribe of Indians
TAL	Target Analyte List
TAI	Teck American Incorporated
TBD	to be determined
TCAI	Teck Cominco American, Inc.
TEF	toxic equivalence factor
TEQ	2,3,7,8-tetrachlorinated dibenzo- <i>p</i> -dioxin toxic equivalent
THQ	target hazard quotient
TL	task leader
TR	target cancer risk
TRC	tissue-weighted average
TWA	time-weighted average
UCL95	95 percent upper confidence limit
UCR	Upper Columbia River
UCWSRI	Upper Columbia White Sturgeon Recovery Initiative
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WAM	Work Assignment Manager
WDFW	Washington Department of Fish and Wildlife
WDOH	Washington Department of Health
%	percent

## UNITS OF MEASURE

---

cm	centimeter(s)
dw	dry weight
g	gram(s)
g/day	grams per day
kg	kilograms
kg/g	kilograms per gram
mg	milligram(s)
mg/kg	milligrams per kilogram
mg/kg-day	milligrams per kilogram per day
mL	milliliter(s)
ng	nanogram(s)
pg	picograms
pg/g	picograms/gram
µg/kg	micrograms per kilogram
µL	microliter

## **A4. INTRODUCTION AND TASK ORGANIZATION**

---

### **A4.1. INTRODUCTION**

This document presents Addendum No. 1 to the quality assurance project plan (QAPP) for the 2009 fish tissue study of the Upper Columbia River (UCR) (hereafter the Site<sup>1</sup>), which extends from river mile (RM) 745<sup>2</sup> to RM 596 near the Grand Coulee Dam. This study is one of the tasks that will be completed as part of the remedial investigation and feasibility study (RI/FS) that is being conducted by Teck American Incorporated (TAI) for the Site. The objective of the RI/FS is to investigate and describe the nature and extent of contamination at the Site and assess risks to human health and the environment to an extent sufficient to develop and evaluate potential remedial alternatives for the Site that will meet applicable or relevant and appropriate requirements (ARARs), and statutory and regulatory requirements. The human health risk assessment (HHRA) will be completed by the U.S. Environmental Protection Agency (EPA), and the remaining RI/FS tasks will be completed by TAI, with EPA oversight.

This addendum describes the organization, data quality objectives (DQOs), study design, analytical procedures, and quality assurance and quality control (QA/QC) procedures upon which Addendum No. 1 to the 2009 fish tissue study will be based. The field sampling plan (FSP) describes field sampling and field and lab processing protocols that will be followed when fish tissue samples are collected; the FSP is presented as an appendix to this addendum (Appendix A-1). This format was adopted to provide a stand-alone document for use in the field during sample collection activities.

While the 2009 QAPP (Parametrix et al. 2009) identified white sturgeon as a traditional tribal food source and common sport fish in the Columbia River, white sturgeon were not sampled in 2009 as they were not part of a legal fishery in the UCR at the time. Long-term monitoring of hatchery white sturgeon in the UCR from the Grand Coulee Dam upstream to the Hugh L. Kennellyside Dam in Canada has shown that survival rates and abundance of these fish are much greater than anticipated (Golder 2015, as cited in McLellan 2016). As a result, the Upper Columbia White Sturgeon Recovery Initiative (UCWSRI) and the Lake Roosevelt Fishery Co-Managers are planning targeted removal of hatchery white sturgeon to avoid diluting the genetic diversity present in wild sturgeon. The preferred removal approach is to establish recreational and subsistence fisheries in the UCR, along with targeted removal of specific cohorts, with distribution of euthanized hatchery white sturgeon to Tribal membership and local food banks (McLellan 2016). Prior to making these fish available for human consumption, hatchery white sturgeon need to be evaluated to determine whether their consumption would result in human health risks. Fish collected during future sampling events may be distributed to Tribal Membership and local food banks, if tissue results from this sampling event do not indicate unacceptable risk to sturgeon consumers. Tissue data are

---

<sup>1</sup> The Site is located wholly within Washington State and includes the portion of the UCR extending from the U.S.-Canadian border to Grand Coulee Dam, including Franklin D. Roosevelt Lake (Lake Roosevelt), and the areal extent of related contamination within the United States adjacent to the UCR. The Site includes the areal extent of contamination and all suitable areas in proximity to such contamination necessary for implementation of the response actions described in the Settlement Agreement.

<sup>2</sup> There is a discrepancy in river mile designations by U.S. Geological Survey (USGS) and by EPA (2006a). USGS river miles increase from RM 680 to RM 682 over a less than 1 river mile segment when transitioning between the Inchelium and Rice USGS quadrants, whereas EPA (2006c) increases from RM 680 to RM 681 over the same segment. To remain consistent with international borders, the USGS river mile designations are used herein.

needed for both the UCR HHRA and to support Washington Department of Health (WDOH) in review of the potential need for a UCR sturgeon fish advisory.

#### **A4.2. TASK ORGANIZATION**

This section presents the organizational structure for activities associated with Addendum No. 1 to the 2009 fish tissue study, including task planning, management and oversight, fieldwork, sample analysis, and data management. EPA and its technical team are managing the field processing, shipping and compositing plan for the fish tissue samples, and preparation of the Field Summary Report (FSR). TAI, the TAI technical team, and the TAI contract laboratories will be responsible for laboratory coordination, data management, data validation and preparing the Data Summary Report (DSR). The overall organizational structure for the project is provided in the RI/FS Work Plan. The project organizational chart is illustrated in Figure A-1. Contact information for project team members is provided in Table A-1.

Fish will be collected by the UCWSRI and the Lake Roosevelt Fishery co-managers during targeted removal of specific hatchery white sturgeon brood year classes. Fish collection procedures are described in the Lake Roosevelt Fishery Co-Managers Sampling Plan (<https://www.monitoringresources.org/Document/Protocol/Details/573> ). Euthanized fish that fall within targeted size classes will be provided to EPA for tissue analysis. This QAPP Addendum focuses on activities, procedures and responsibilities that take place after euthanized fish are provided to the CH2M transfer team.

The fish tissue study technical team includes the following personnel and roles:

- Environmental Response Team (ERT) Work Assignment Manager (WAM) and Quality Coordinator
- EPA Region 10 Remedial Project Manager (RPM)
- EPA Region 10 Regional Quality Assurance Manager (RQAM) and Regional Sample Control Coordinator (RSCC)/Quality Assurance (QA) Chemist
- SERAS Program Manager and Quality Assurance (QA)/Quality Control (QC) Officer
- SRC Program Manager and Task Leader (TL)/QC Coordinator
- CH2M Technical Team Coordinator
- CH2M Field Team Personnel
- TAI Project Coordinator
- Project Manager and QA Manager for ALS Environmental.
- Project Manager and QA Manager for Vista Analytical
- TAI Analytical Chemistry Laboratory Coordinator, Technical Team Coordinator, Task QA Coordinator, Database Administrator and Data Validators



Responsibilities associated with these roles are described below.

#### **A4.2.1. ERT and EPA Region 10 Organization and Responsibilities**

ERT and EPA Region 10 will oversee activities associated with Addendum No. 1 to the 2009 fish tissue study and will coordinate U.S. Department of the Interior, Washington State Department of Ecology (Ecology), and tribal (i.e., the Confederated Tribes of the Colville Reservation [CCT] and the Spokane Tribe of Indians [STI]) input with respect to the review of technical documents consistent with the June 2, 2006 Settlement Agreement (Agreement; USEPA 2006c). The EPA RPM is Laura Buelow. Dr. Buelow, along with Kathryn Cerise (EPA Region 8 RPM) and Marc Stifelman (EPA Region 10 Human Health Risk Assessor) will also be responsible for ensuring that the work performed is consistent with all applicable EPA guidance. The EPA RQAM delegated QA Chemists assigned by EPA are Jennifer Crawford and Don Matheny.

#### **A4.2.2. SRC and CH2M Organization and Responsibilities**

SRC and CH2M comprise EPA's contracted technical support team (who, along with EPA, comprise the EPA technical team) and are responsible for conducting Addendum No. 1 to the 2009 fish tissue study. Sturgeon will be collected by the Lake Roosevelt Monitoring Program (LRMP; Jason McLellan will lead this effort) and transferred to CH2M, under the chain of custody (COC) procedures described in the FSP (Appendix A-1, Section 3.2 and SOP-5), for field sample processing by CH2M and delivery to TAI's lab ALS Environmental in Kelso, Washington under the COC procedures described in the FSP (Appendix A-1). Bill Thayer will serve as SRC's TL and will have the primary responsibility for ensuring that all the requirements and associated deliverables specified within the Agreement (USEPA 2006c) are usable for HHRA. Marilyn Gauthier, CH2M's Technical Team Coordinator, will be responsible for overseeing all technical aspects of this task in the field and coordinating with TAI personnel on analytical tasks. Bill Thayer and Marilyn Gauthier will coordinate with ERT and EPA Region 10 and manage the overall task schedule.

#### **A4.2.3. TAI Organization Responsibilities**

TAI will provide the Analytical Chemistry Laboratory and the Task QA Coordinator. The Analytical Chemistry Laboratory Coordinator will verify that the laboratory has implemented the requirements of this QAPP, and the Task QA coordinator will oversee data verification and validation activities for the sturgeon tissue samples analyzed by ALS Environmental Laboratory and Vista Analytical Laboratory.

#### **A4.2.3. Key Task Personnel**

EPA technical team members for Addendum No. 1 to the 2009 fish tissue study and their respective responsibilities are identified below.

**EPA Project Managers** – Dr. Laura Buelow, Dustan Bott, and Kathryn Cerise are responsible for ensuring that the work performed is consistent with all applicable EPA guidance. Kathryn Cerise will oversee sample processing by EPA's contractor, CH2M, coordinate comments on planning documents and reports by U.S. Department of the Interior, Washington State Department of

Ecology (Ecology), local tribes (i.e., the Confederated Tribes of the Colville Reservation [CCT] and the Spokane Tribe of Indians [STI]), and TAI. In addition EPA, under Section 106 of the National Historic Preservation Act, has the primary responsibility for consulting with interested parties.

**Technical Team Coordinator**—Marilyn Gauthier (CH2M) is responsible for coordinating the tasks of all the team members to ensure that required activities are completed in sequence and on time. Ms. Gauthier will work closely with the TL, TAI, and EPA QA to ensure that all requirements are met and study objectives achieved.

**Task Leader**—Bill Thayer (SRC) is the TL and is responsible for conducting Addendum No. 1 to the 2009 fish tissue study. Mr. Thayer will work closely with the technical team coordinator, senior technical advisor, and the task QA coordinator to ensure that the objectives of the study are achieved.

**Field Supervisor**—Cameron Irvine and David Rasmussen, for the weeks of 8/29/16 and 9/5/16, respectively, are responsible for overseeing the planning and coordination of the hatchery white sturgeon tissue sampling efforts, and for all aspects of sample collection activities to ensure that appropriate sampling, quality assurance, and documentation procedures are used. In the event that changes in the QAPP or FSP are needed, Mr. Irvine or Mr. Rasmussen will ensure that proposed changes are coordinated with EPA's project coordinators or other designated EPA staff according to the established lines of communication as noted in Figure A-1 and approved for the RI/FS.

**Principal Investigator**—Dr. Frank Dillon (CH2M) will serve as principal investigator overseeing all project activities once fish are received from the sampling team. Dr. Dillon will review QA reports, approve final project QA needs, and authorize necessary actions and adjustments needed to accomplish program QA objectives.

**Senior Technical Advisor(s)**—Marc Stifelman (EPA Region 10) and David Hohreiter (SRC) are senior technical advisors for Addendum No. 1 to the 2009 fish tissue study, and are responsible for providing technical oversight in the design and implementation of the study, and ensuring that it meets the objectives of the RI/FS.

**Region 10 QA Manager** —Donald M. Brown (EPA Region 10) is the RQAM and is responsible, through delegated QA chemist support, for providing overall QA review and concurrence/approval for Addendum No. 1 to the 2009 fish tissue study; review and approval any change orders; ensuring that the QAPP and FSP contain all components necessary to meet EPA guidelines (USEPA 2002a); reviewing produced project documents as requested (i.e. data summary reports and/or data validation reports) and working with data users to address any data limitations. Mr. Brown / QA designee will work closely with the RPM, technical team coordinator, RSCC, and the field supervisor to ensure that the objectives of the QAPP are met.

**Analytical Chemistry Laboratory Coordinator**—Marilyn Gauthier (CH2M) and the TAI Analytical Chemistry Laboratory Coordinator (Dave Enos) will work closely with the contract laboratories to coordinate the analytical task implementation. Ms. Gauthier is responsible for ensuring that laboratory method selection and/or development is satisfactorily completed prior to the

analysis of samples collected for this task and coordinating sample shipment, delivery and analytical methods with the testing laboratory. Mr. Dave Enos (TAI Analytical Chemistry Laboratory Coordinator) is responsible for tracking the laboratory's progress; verifying that the laboratory has implemented the requirements of this QAPP; addressing QA issues related to the laboratory analyses; ensuring that laboratory capacity is sufficient to undertake the required analyses in a timely manner; and addressing scheduling issues related to laboratory analyses. Mr. Enos will report directly to the TAI Project Coordinator and will work closely with Ms. Gauthier. The EPA R10 QA/RSCC (Jennifer Crawford) will review the methodology for processing and analysis of samples, along with providing the R10 project code and project sample numbers for CH2M Sample Management.

**TAI Project Coordinator** - Kris McCaig will serve as TAI's project coordinator and will have primary responsibility for TAI's coordination with EPA Project Managers and ensuring that laboratory analysis and reporting, and data validation activities meet all requirements and associated deliverables specified within the June 2, 2006 Settlement Agreement (USEPA 2006).

**TAI Technical Team Coordinator**—Dr. Toll (Windward) will oversee task activities, review QA reports, and ensure that required activities are completed in sequence. Dr. Toll will work closely with TAI's project coordinator, principal investigator, and task QA coordinator to ensure that all requirements are met and study objectives achieved.

**TAI Task QA Coordinator**—Rock Vitale (Environmental Services, Inc. [ESI]) is the task QA coordinator and is responsible for providing overall QA support for the study. Mr. Vitale will coordinate validation of laboratory data; communicate data quality issues to the analytical chemistry laboratory coordinator, and will work with the database administrator to address potential data limitations. Mr. Vitale will report directly to the analytical chemistry laboratory coordinator, and will work closely with the database administrator to ensure that the data are of the highest quality.

**TAI Analytical Chemistry Laboratory Coordinator**— Dave Enos (TAI) will serve as the analytical chemistry laboratory coordinator. He will be responsible for ensuring that laboratory coordination is satisfactorily completed prior to the analysis of samples for this task; tracking the laboratories' progress; verifying that the laboratories have implemented the requirements of this FSP; addressing QA issues related to the laboratories' analyses; ensuring that the laboratories' capacities are sufficient to undertake the required analyses in a timely manner; and addressing scheduling issues related to laboratory analyses. Mr. Enos will report directly to TAI's project coordinator and will work closely with EPA's technical team coordinator.

**Database Administrator**— Randy O'Boyle (Exponent) is the database administrator and will have primary responsibility for data management and database maintenance and development. The database administrator will be responsible for overseeing and/or conducting the following activities: establishing storage formats and procedures appropriate for all hatchery white sturgeon tissue data collected; working with the field crew, laboratories, and data validators to ensure all data entries are correct and complete and are delivered in the correct format; maintaining the integrity and completeness of the database; and providing data summaries to data users in the required

formats for interpretation and reporting. The database administrator will report directly to the TAI technical team coordinator and will work closely with the field supervisor, task QA coordinator, and the TAI data validation firm.

**Task Safety Officer**— Cameron Irvine (CH2M) and David Rasmussen are the task safety officers for Addendum No. 1 to the 2009 fish tissue study, for the weeks of 8/29/16 and 9/5/16, respectively, and are responsible for providing health and safety oversight for the field staff that will be processing the fish tissue samples.

#### **A4.2.4. Laboratory**

The following responsibilities apply to the project managers and QA manager at ALS Environmental in Kelso, Washington, and Vista Analytical in El Dorado Hills, CA, which are the analytical laboratories for Addendum No. 1 to the 2009 fish tissue study. TAI will contract the analytical laboratories. The laboratory will have the following staff available for this project.

**Laboratory Project Manager**—The laboratory project managers, Jeff Coronado (ALS) and Martha Maier (Vista), are responsible for the successful and timely completion of sample analyses, as well as the following actions:

- Ensure that samples are received and logged in correctly, that the correct methods and modifications are used for processing and analysis, and that data are reported within specified turnaround times.
- Review analytical data to ensure that procedures were followed as required in this QAPP, the cited methods, and laboratory standard operating procedures (SOPs).
- Apprise the TAI analytical chemistry laboratory coordinator (Dave Enos) of the schedule and status of sample analyses and data package preparation.
- Notify the TAI analytical chemistry laboratory coordinator if problems occur in sample receiving, analysis, or scheduling, or if control limits cannot be met.
- Take appropriate corrective action as necessary.
- Report data and supporting QA information as specified in this QAPP.
- Provide electronic data deliverables (EDDs) with the analytical data in a format compatible with the project database.

**Laboratory QA Manager**—The laboratory QA managers, Carl Degner (ALS) and Bahar Amiri (Vista), are responsible for overseeing the QA activities in the laboratory and ensuring the quality of the data for this task. Specific responsibilities include the following:

- Oversee and implement the laboratory's QA program.
- Maintain QA records for each laboratory production unit.

- Ensure that QA/QC procedures are implemented as required for each method and provide oversight of QA/QC practices and procedures.
- Review and address or approve non-conformity and corrective action reports.
- Coordinate responses to any QC issues that affect this task with the laboratory project manager.

## **A5. PROBLEM DEFINITION AND BACKGROUND**

Chemicals present in fish tissues have the potential to adversely affect human health. The conceptual site model (CSM) for the Site provides the framework for considering the relationships between fish tissues and exposure to people (see Figure A-2 in the 2009 QAPP [Parametrix et al. 2009]). Available fish tissue data were identified and evaluated in the RI/FS Work Plan, Appendix B of the 2009 QAPP (Parametrix et al. 2009), and the 2013 UCR Fish Tissue Data Summary and Data Gap Report (Exponent and Parametrix, 2013). In this section, information on the two sources of existing hatchery white sturgeon tissue data that were identified is reviewed. In subsequent sections, aspects of the 2009 QAPP DQOs that are relevant to Addendum No. 1 are summarized.

In the next subsections, the following information is provided:

- The relevant portions of the preliminary CSM from the 2009 QAPP which frame the potential issues associated with COIs in hatchery white sturgeon tissue are described.
- Important observations and issues related to hatchery white sturgeon tissue problem definition and study design.

### **A5.1. PRELIMINARY CONCEPTUAL SITE MODEL**

The preliminary CSM provides a framework within which complex chemical, physical, and biological processes and interactions can be viewed in a systematic and organized manner. The preliminary CSM (Figure A-2 in the 2009 QAPP [Parametrix et al. 2009]) identifies fish tissue as a potentially important exposure medium and transport pathway for contaminants of interest (COIs). Aspects of the preliminary CSM that relate specifically to fish tissue and human exposures (Figure A-3 in the 2009 QAPP [Parametrix et al. 2009]) provide the foundation for problem definition and are discussed in detail in Steps 1 and 2 of the DQO process (Sections A9.1 and A9.2).

### **A5.2 OVERVIEW OF EXISTING FISH TISSUE DATA**

EPA Region 10 conducted two studies on chemicals in fish in Lake Roosevelt and the Columbia River Basin, including white sturgeon, in the mid- to late-1990s (USEPA 1998; USEPA 2002c). Data on metals and other chemicals in sturgeon tissue are also available for the Lower Columbia River (WCH, 2011). These data include metals, polychlorinated biphenyls (PCBs), and dioxins and furans. Evaluation of these data has been carried out to ensure the number of composite samples and the number of sturgeon per composite are adequate to meet the DQOs for the hatchery white sturgeon sampling effort (Section A9.7).

## **A5.4 APPLICABILITY OF AVAILABLE DATA TO RISK ASSESSMENT**

The available chemical data for white sturgeon collected from the Upper Columbia River are very limited. Data are available for PCBs (Aroclors 1254 and 1260) and 2,3,7,8-dioxin from two samples of white sturgeon collected from Lake Roosevelt in 1994 (USEPA, 1998). A substantial amount of data for contaminants in white sturgeon tissue are available for the Lower Columbia River, downstream of the Grand Coulee Dam (USEPA, 2002; WCH, 2011). The data for the Lower Columbia River may not be representative of the site. Additional data for white sturgeon is required to support risk management decisions in the baseline HHRA.

## **A6. DATA GAPS**

---

The UCR HHRA work plan (USEPA 2009a) identified fish consumption by people residing near or visiting the UCR Site as an exposure pathway. As such, it is critical to have appropriate fish tissue data for COIs that can be used to estimate health risks from fish consumption. The data obtained from the 2009 fish tissue study (Parametrix et al. 2009; Exponent and Parametrix 2013) addressed data gaps including sport fish such as smallmouth bass and kokanee, and fillet data for key sport fish. The 2009 QAPP (Parametrix et al. 2009) identified white sturgeon (*Acipenser transmontanus*) as a traditional tribal food source and common sport fish in the Columbia River; however, due to a fishing ban at the time of the 2009 sampling, white sturgeon were not included in that sampling effort. Since 2002, the sturgeon population in the UCR has been supplemented with hatchery fish. Sturgeon recovery efforts have been successful, and recreational and subsistence fisheries may be implemented. The UCWSRI and the Lake Roosevelt Fishery Co-Managers will be collecting hatchery white sturgeon in August and September of 2016, and will provide EPA with fillet tissue samples. Thus, hatchery white sturgeon tissue will be available to fill this data gap.

This document describes the approach and methods for collecting fish tissue chemistry data to fill the above-mentioned data gaps to support the HHRA being conducted by EPA.

## **A8. TASK DESCRIPTION**

---

Addendum No. 1 to the 2009 fish tissue data collection will support the human health risk assessment to be conducted as part of the RI/FS, and review by WDOH of the potential need for a UCR sturgeon fish advisory. The DQOs and rationale for the sampling design are provided in Section A9.

### **A8.1 OVERVIEW OF FIELD ACTIVITIES**

Tasks that will be completed in the field, including related documentation and QA/QC activities, are described in detail in the FSP (Appendix A-1). The following sections provide a brief overview of the specific elements for the scope of Addendum No. 1 to the 2009 study. Details on study design rationale and specific information inputs are described in Sections A9 and B.

#### **A8.1.1 Fish Tissue Samples**

For the 2005 EPA fish sampling and the 2009 fish tissue study, the UCR was divided into six sampling areas, or reaches, between the U.S.- Canadian border (RM 745) and RM 596 near the Grand Coulee Dam

(River Reaches 1-6, shown in Figure A-4 of the 2009 QAPP [Parametrix et al. 2009]). For the 2016 hatchery white sturgeon sampling, the Lake Roosevelt Fisheries Co-Managers are collecting fish from River Reaches 1-4 (from Inchelium/Gifford to the U.S.-Canadian border). This is where the vast majority of hatchery white sturgeon are distributed (EI 2016). Nine composite samples (minimum eight fish [skinless fillets] per composite) of hatchery white sturgeon will be analyzed to provide information to support the HHRA. Three composites of eight fish for each of three targeted sizes ranges (i.e., 50-97 cm, 98-137 cm, and 138-160 cm.) will be aggregated from a total of 72 individual fish. Sizes are based on fork length (FL).

### **A8.1.2 Number and Timing of Sampling Events**

The Lake Roosevelt Fisheries Co-Managers (CCT, STI, and Washington Department of Fish and Wildlife [WDFW]) will be sampling hatchery white sturgeon for four weeks in the summer of 2016. The start date for this sampling event is scheduled for August 29, 2016. This timeframe is near the end of the growing season for fish in the UCR. The captured fish will have had almost an entire season of feeding and growth before being analyzed for contaminants (USEPA 2005a). In addition, this time period corresponds to the sampling window used by EPA in 2005 (USEPA 2007a) and TAI in 2009 (Parametrix et al. 2009; Exponent and Parametrix 2013). Addendum No. 1 to the 2009 study is anticipated to be conducted under similar temporal conditions as the 2005 and 2009 studies. While the sturgeon composites will consist of fish caught from a single river reach, the sturgeon tissue chemistry data will be of comparable quality with the 2009 tissue data and can be used for risk assessment purposes. If further data gaps are identified through this or other studies, then additional fish sampling may be required.

## **A8.2 LABORATORY ANALYSES**

Current EPA analytical methods for analysis of metals, metalloids, and organic compounds in fish tissues will be used (Table A-3). Reporting limits for the analytical methods are described in Section A9.6. The following will be analyzed in hatchery white sturgeon fillets collected during sampling in late Summer 2016 (see Table A-2 for a complete list of analytes). All analyses will be performed by ALS except the fork length of each fish and the mass of each, which will be measured in the field by the Lake Roosevelt Fisheries Co-Managers and the fish fillet and fillet subsample weights will be measured in the field by CH2M.

### Conventional Parameters

- Fork length
- Total mass
- Fillet mass
- Percent (%) moisture
- Percent (%) lipids

### Metals/Metalloids

- Common TAL metals/metalloids identified as COIs in the 2009 HHRA work plan (USEPA 2009a)
- Total Inorganic arsenic and total arsenic

### Organic Compounds

- Polychlorinated dibenzo-p-dioxins and furans (17 dioxin-like congeners)
- PCBs (PCB congeners [209 forms]) and total PCBs (dioxin-like and non-dioxin-like PCBs will be addressed as described in the 2009 HHRA work plan [USEPA 2009a])
- PBDEs (total PBDEs, BDE-47, BDE-99, BDE-153, and BDE-209).

Sample analysis and data validation for all laboratory analyses are each expected to require approximately 8 to 14 weeks for completion, from the time that sample collection is completed until finalization of the database. This time period is commensurate with the 90-day reporting requirement as defined in the Agreement (USEPA 2006c).

## **A9. DATA QUALITY OBJECTIVES, CRITERIA, AND DESIGN RATIONALE**

The 2009 QAPP (Parametrix et al. 2009) identified white sturgeon (*Acipenser transmontanus*) as a traditional tribal food source and common sport fish in the Columbia River. The species were not sampled in 2009 as they were not part of legal fishery in the UCR at the time; however, the 2009 QAPP anticipated the importance of obtaining sturgeon data as part of the RI/FS. Long-term monitoring of hatchery white sturgeon in the UCR from the Grand Coulee Dam upstream to the Hugh L. Kennellyside Dam in Canada (also referred to as the Transboundary Reach of the Columbia River) has shown that survival rates and abundance of these fish are much greater than anticipated (Golder 2015, as cited in McLellan 2016). As a result, the UCWSRI and the LRMP are planning targeted removal of hatchery white sturgeon to avoid diluting the genetic diversity present in wild sturgeon. The preferred removal approach is to establish recreational and subsistence fisheries in the UCR, and to distribute hatchery white sturgeon euthanized during targeted removals to Tribal membership and local food banks (McLellan 2016). Prior to making these fish available for human consumption, hatchery white sturgeon need to be evaluated to determine potential human health risks. As anticipated by the 2009 QAPP, sturgeon tissue data are needed for both an HHRA and to support WDOH's review of the potential need for a UCR sturgeon fish advisory.

The following amendments to the 2009 DQOs supplement the original DQOs by providing additional details specific to the collection and use of hatchery white sturgeon tissue data to ensure the data are appropriate for evaluating potential exposure to COIs by people consuming hatchery white sturgeon from the UCR. To facilitate the review/QA process, we have included text from the 2009 DQOs below.

DQOs define the type, quality, quantity, purpose, and intended uses of data to be collected. As described in the EPA's DQO guidance (2006b), the DQO process typically follows a seven-step procedure, as follows.

### **A9.1 STEP 1—STATE THE PROBLEM**

The UCR HHRA work plan (USEPA 2009a) identified fish consumption by people residing near or visiting the UCR site as an exposure pathway. A large amount of information has been gathered on fish species and fish communities in the UCR (e.g., Black et al. 2003; Lee et al. 2003, 2006; Scofield et al. 2004). EPA conducted a fish tissue study in 2005 (USEPA 2007a) which identified the presence of some



COIs in fish tissues; several historical studies also measured COIs in UCR fish tissues and are summarized by EPA (2005a). The 2005 EPA study targeted fish species that were abundant in the UCR and commonly consumed by recreational and/or subsistence anglers. To address data gaps such as smaller sized fish, sport fish such as smallmouth bass and kokanee, fillet data for key sport fish, and additional COIs identified during the draft screening level ecological risk assessment (TCAI 2008), Teck Cominco American, Inc. (TCAI) conducted an additional fish tissue study in 2009 (Parametrix et al. 2009; Exponent and Parametrix 2013). This study provided data for evaluating potential risks to humans, as well as ecological receptors. The 2009 QAPP (Parametrix et al. 2009) identified white sturgeon (*Acipenser transmontanus*) as a traditional tribal food source and common sport fish in the Columbia River. This species was not sampled in 2009 as they were not part of a legal fishery in the Upper Columbia River at the time; however, the 2009 QAPP anticipated the importance of obtaining sturgeon data as part of the RI/FS.

Since 2002, the sturgeon population in the UCR has been supplemented with hatchery fish. Because of the success of that program, fisheries managers are now considering implementing a sturgeon fishery and allowing the harvest of hatchery white sturgeon (EI 2016) and as such, sturgeon could now be consumed by recreational and subsistence anglers. The CCT and STI have also reported they would offer sturgeon harvested for fishery management purposes to the tribes and to local food banks for consumption (CH2M 2016; McLellan 2016).

In the summer of 2016, the CCT, STI, and WDFW (Lake Roosevelt Fisheries Co-Managers) are euthanizing hatchery white sturgeon for research purposes and to protect the wild sturgeon population and are willing to provide a sample of the euthanized fish to EPA for analysis. This opportunistic sample will provide sturgeon tissue data that are needed for the HHRA and to support WDOH in review of the potential need for a UCR sturgeon fish advisory.

## **A9.2 STEP 2—IDENTIFY THE GOAL OF THE STUDY**

This amendment to the DQOs is focused to address the HHRA and consumption of hatchery white sturgeon. The primary study goals are to address risk-related questions:

1. To provide information to the HHRA to determine whether contaminants in hatchery white sturgeon tissue in the UCR Site pose an unacceptable risk to human health; and
2. To provide data required by WDOH to evaluate the need for a fish advisory for sturgeon.

### ***Principal Human Health Risk Study Question:***

Does consumption of hatchery white sturgeon pose an unacceptable risk to consumers?

The following are alternative actions for the Site if unacceptable risk is calculated (modified from the 2009 DQOs:<sup>3</sup>

- Evaluate remedial alternatives for source control, surface water and sediment to reduce fish uptake of COIs within the UCR if unacceptable risk is calculated;

---

<sup>3</sup> These are in addition to the possibility that WDOH may issue a fish advisory for sturgeon.

- Refine HHRA risk estimates through additional data collection, if necessary; or
- Take no action.

### **A9.3 STEP 3—IDENTIFY INFORMATION INPUTS**

Step 3 of the DQO process requires consideration of the types and potential sources of information that should be considered to provide estimates or resolve decisions, information needed to provide a basis for specifying performance or acceptance criteria, and information on the performance of appropriate sampling and analysis methods. Determination or estimation of risks requires representative data for COIs in Site fish tissues. Information inputs that are needed to conduct this analysis include knowledge about the likelihood and ability of recreational or subsistence anglers in the UCR to harvest and consume hatchery white sturgeon, methods of preparing sturgeon for cooking and eating, and COI concentrations in sturgeon. Sampling and analytical methods must be appropriate to ensure that chemical measures of exposure can be properly estimated and compared to toxicity benchmarks or other acceptance criteria.

Information that will inform the sampling design and/or the analysis of hatchery white sturgeon include:

- QAPP and data summary reports from the 2005 fish tissue and 2009 fish tissue collection efforts (USEPA 2007a, Parametrix et al. 2009, Exponent and Parametrix 2013)
- HHRA Work Plan for the UCR (USEPA 2009a)
- Memorandum regarding 2016 sturgeon sampling effort by the CCT and Spokane Tribe of Indians Fish and Wildlife Departments (EI 2016, SRC 2016a,b)
- Data Summary Report for the Remedial Investigation of Hanford Site Releases to the Columbia River, Hanford Site, Washington (WCH, 2011).
- Human Health Evaluation of Contaminants in Upper Columbia River Fish (WDOH, 2012).

Hatchery white sturgeon tissue concentrations will be used by EPA as inputs to estimate chemical exposure due to fish consumption. The methods are described in the EPA HHRA work plan (USEPA 2009a). The benchmarks used for risk analysis provide information that will guide decisions used in the DQO process and may be used to assess risk from exposure to COIs once the 2016 hatchery white sturgeon tissue data are available. The benchmarks are specifically used to establish analytical concentration goals (ACGs; achievable analytical laboratory limits) to ensure that reporting limits are sufficiently low to provide data below the benchmarks and therefore can be used by EPA in the HHRA and by WDOH in determining the need for a fish advisory for sturgeon.

RBCs for HHRA, which aid in specifying performance or acceptance criteria (i.e., determination of acceptable or unacceptable level of risk), are provided in Table A-2. ACGs exceed the RBC for the following metals: antimony, total arsenic, total inorganic arsenic, beryllium, boron, cadmium, cobalt, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, and vanadium. The COIs included in Table A-2 are a subset of those included in the 2009 QAPP and include conventional parameters, the “common metals and metalloids” identified as COIs in the 2009 HHRA work plan (USEPA 2009a), and only the organic chemicals that WDOH determined were of concern in updating fish advisories for the Upper Columbia River: PCBs, dioxins and furans, and PBDEs (WDOH 2012). Parameters and equations used to derive the RBCs are provided in Appendix E-1.

#### **A9.4 STEP 4—DEFINE THE BOUNDARIES OF THE STUDY**

This step specifies the population of interest for the study, the geographical boundaries of the Site, and any temporal considerations that may be required. The target population of interest for Addendum No. 1 are people who utilize the Site for recreational or subsistence hatchery white sturgeon fishing.

Hatchery white sturgeon are being collected in the UCR by the Lake Roosevelt Fisheries Co-Managers in the summer of 2016 in River Reaches 1-4 as part of a population stock assessment. As part of this effort hatchery white sturgeon will be euthanized for research purposes. Data from this opportunistic sampling event may be used for the following: 1) to provide information to the HHRA to determine whether contaminants in white sturgeon tissue pose an unacceptable risk to human consumers; and 2) to provide data to WDOH that will be used by WDOH to assess the need for a fish consumption advisory for sturgeon removed from the UCR by anglers or the Lake Roosevelt Fishery Co-Managers. These fish will be sampled in areas extending from Inchelium/Gifford to the U.S.-Canadian border where the vast majority of hatchery white sturgeon are distributed, according to the *Annual Assessment of hatchery kokanee and sonic-tracking of wild and hatchery kokanee in Lake Roosevelt: 2011 Annual Report* (cited in EI 2016). Hatchery white sturgeon are most abundant between Northport and Rickey Point, while abundance decreases between Inchelium and French Rocks and north of Northport, except in isolated pockets (SRC 2016b). Telemetry data show some sturgeon move substantially among the river reaches (SRC, 2006a) and indicate a lot of variability in the range of movement among sturgeon. Therefore, composite samples will not be collected separately by river reach, as was done in the 2009 sampling effort (Parametrix, 2009)

Creel surveys of Lake Roosevelt indicate that angling occurs year-round and peaks in summer months, from June through September (Lee et al. 2006, Fields et al. 2004). During the Summer 2016 sampling effort (scheduled to start August 22, 2016 and run from Tuesday through Friday for 4 consecutive weeks), sturgeon will be set aside for tissue analysis for use in the HHRA as described further in Step 7 below. The timing of the summer 2016 sampling event is consistent with the timing of the 2005 and 2009 sampling events (USEPA 2007a, Exponent and Parametrix 2013).

#### **A9.5 STEP 5—IDENTIFY THE ANALYTICAL APPROACH**

Step 5 of the DQO process provides the analytical approach for evaluating the fish tissue data in the HHRA. Concentrations of COIs in fish tissue will be used to estimate dietary exposure of humans and potential associated health risks. These data will also be used by WDOH to determine whether a fish consumption advisory is needed for sturgeon in the UCR. The analytical procedures for this study are standard EPA-approved analytical protocols with detection limits that are generally sufficiently low to provide detects that are below RBCs.

Methods for analysis of metals/metalloids in fish tissue are EPA Methods 1632, 6010B/C, 6020A, 7471B/1631E. PCB congeners, dioxins and furans, and PBDEs (total PBDEs, as well as BDE-47, BDE-99, BDE-153, and BDE-209<sup>4</sup>) will be analyzed using EPA Methods 1668A, 1613B, and 1614,

---

<sup>4</sup> Total PBDE and the four individual PBDE congeners will be used by WDOH. Results from the 4 individual PBDE congeners will be used for HHRA.

respectively. PCBs will be addressed both as mixtures<sup>5</sup>, estimating Aroclor concentrations from congener concentrations, and as individual congeners, for those congeners having dioxin-like properties.

The 2009 fish sampling QAPP (Parametrix et al. 2009) contains a table of target analytes and ACGs for individual PCB congeners, along with RBCs for those congeners having dioxin-like properties and estimated MDLs. However, an RBC for total PCBs was not included in that table. Tables A-2 and A-2-1 of this DQO addendum contain information for both total PCBs (based on toxicity values for Aroclor 1254® as explained in Appendix E of Parametrix et al. [2009]) and dioxin-like PCB congeners. Given that the data will be used by WDOH as well, analyses will be run on all 209 PCB congeners (at this time these data on individual congeners are of limited use for HHRA as there are toxicity values for only two technical mixtures<sup>6</sup>). Laboratory method reporting limits (MRLs) and method detection limits (MDLs) are given in Tables A-2 and A-2-1 (pers. comm. Poyfair 2016).

#### **A9.6 STEP 6—SPECIFY PERFORMANCE OR ACCEPTANCE CRITERIA**

The DQO process is designed to ensure that the type, quantity, and quality of environmental data used in decision making will be appropriate for its intended use, resulting in decisions that are technically and scientifically sound and defensible. ACGs are the desired analytical quantitation limits for the study. If possible, ACGs will be sufficiently low to provide reporting limits below the RBCs, such that non-detected data can be “screened out” as less than RBCs. RBCs were calculated based on the maximally exposed receptor population from the HHRA Work Plan (USEPA 2009). As shown in Table A-2, some COIs have reporting limits that are below RBCs; for those chemicals, the ACGs are the RBCs for human health and should result in analytical COI concentrations in fish tissue that are useable for HHRA. For other COIs, however, the RBC is lower than the MRL or MDL, or an RBC is not available. In these cases, the MRL is used as the ACG. Some of these COIs, such as calcium, sodium, and potassium, are considered essential nutrients and will not drive the risk assessment. Others, such as total arsenic and total inorganic arsenic, are Site-related chemicals; use of the MRL as the ACG for these COIs will result in uncertainty in the HHRA. The ACGs for each COI are listed in Table A-2. Finally, laboratory duplicates, matrix spike/matrix spike duplicates (MS/MSD), and standard reference materials (SRM) samples will be used to evaluate analytical variability and method performance. Analytical data meeting the ACGs and found within analytical method performance criteria will be considered adequate to answer the questions defined in Step 2 above.

#### **A9.7 STEP 7—DEVELOP THE PLAN FOR OBTAINING DATA**

As stated above, the Lake Roosevelt Fisheries Co-Managers (CCT, STI, and WDFW) will be sampling hatchery white sturgeon for four weeks in late summer 2016. Fish targeted will be of harvestable size (50-160 centimeter [cm] FL [20 to 63 inches]) and will represent approximately 8 brood years (EI 2016). Seven hundred fish are expected to be captured during the 2016 collection effort (based on recent white sturgeon surveys), a subset of which will be given to U.S. EPA for analysis. Based on past sampling efforts, wild fish typically represent 5 to 10% of the total catch. The FSP (Appendix A-1) contains details on the sturgeon tissue sample collection and processing.

---

<sup>5</sup> Aroclors are commercial mixtures of PCB congeners; total PCBs can be assessed as either a sum of Aroclors or a sum of congeners.

<sup>6</sup> The PCB congeners that compose the technical mixtures Aroclor 1016® and Aroclor 1254®, for which there are toxicity values, are listed in Parametrix et al. (2009).

In the 2009 sampling effort, 6 composite samples per species were targeted for each of the 6 sampling areas, with each composite generally consisting of 5 individual fish (approximately 90% of samples of >30 cm fish consisted of 5 fish per composite; 10% ranged from 2-4 fish per composite). Even though compositing of sturgeon is not necessary to achieve the mass of tissue required for analysis due to its large size (DOE 2008), sturgeon will be composited prior to tissue analysis to better capture the variability in tissue concentration. Locations where fish are collected will be recorded with a global positioning system (GPS) receiver; however, it is understood that location of collection may not necessarily correlate with exposure area (some sturgeon cover large areas, while others stay in the same area). Because of this, fish will not be composited based on sample location. Sturgeon tissue concentrations are representative of exposure to the site-overall, and do not reflect reach-specific exposure concentrations. Once collected, fish will be euthanized and transferred to EPA onshore for processing, as described in the FSP (Appendix A-1).

In 2009, the target fish sample size was determined based on a statistical analysis of the 2005 fish sampling data, as summarized in Appendix D of Parametrix et al. (2009). SRC evaluated that analysis and found that 6 composites of at least 5 fish per composite would produce reliable 95 percent upper confidence limits (UCL95s) (SRC, 2010). The SRC recommendations were based on a Monte Carlo simulation that used a maximum coefficient of variation (CV) of 0.6 among the 6 composites (SRC, 2010).

The 2009 sampling event produced between 11 and 36 composite samples per species (for the 6 sample areas combined) for use in the HHRA. The 2009 data include 35-36 composite samples for kokanee, rainbow trout and walleye; fewer samples (n) are available for burbot (22), smallmouth bass (11), sucker (21) and whitefish (16). Kokanee (mainly of hatchery origin), rainbow trout, and walleye were caught in all six sample areas. A preliminary HHRA screen for the 2009 fish tissue data identified mercury, thallium, dioxin-like PCBs, and PBDE-47 as potential risk drivers. In the 2009 fish ( $\geq 30$ cm) fillet composite data that will be used in the HHRA, the CV for mercury and thallium ranged from 0.1 to 0.5 (thallium, sucker). The CV for non-dioxin-like PCBs (detects only) were 0.4 or less for all species except sucker (1.1) and rainbow trout (0.8). The CVs for total 2,3,7,8-tetrachlorinated dibenzo-p-dioxin and furan toxic equivalent (TEQ) ranged from 0.3-0.6 (0.1-0.8 for detects only) and total PCBs TEQ CVs ranges from 0.1-0.9.

Composites of sturgeon fillets collected in the summer of 2016 are expected to produce data that exhibit variability less than or equal to the variability found in the 2009 fish tissue composite data. The CVs for total arsenic, mercury and zinc concentrations measured in sturgeon fillet tissue samples collected from four areas of the Lower Columbia River near Hanford ranged from 0.3-0.5, 0.2-0.7 and 0.04 to 0.2, respectively (WCH, 2011). To increase the likelihood of producing data with sufficiently low variability, EPA will request no less than 72 hatchery white sturgeon from the LRMP (the minimum requested is 72). This recommended minimum number of samples will be sufficient to increase the number of fish per composite from 5 (per the 2009 sampling event) to at least 8 fish (resulting in 9 composite samples of at least 8 fish each). The increase to 8 fish per composite is anticipated to reduce variability among the sturgeon composite data, relative to the 2009 data, and therefore to increase reliability of the UCL95 estimates.

Analyses will be conducted on composites of the fillets (without skin). A subsample of each fillet (200 ± 20 g) will be collected and used for the composite sample. COIs will be analyzed in composited fish fillets for HHRA purposes. Additional details on fish sampling and processing are found in the FSP (Appendix A-1) and the 2009 QAPP and field sampling plan (Parametrix et al. 2009).

## **A10. SPECIAL TRAINING/CERTIFICATES**

EPA Region 10 has assembled a technical team with the requisite experience and technical skills to successfully complete Addendum No. 1 to the 2009 fish tissue study. All technical team personnel involved in sample collection have extensive environmental sampling experience. Each field sampling team will have the necessary knowledge and experience to perform all field activities. This will include experience in the collection of fish, the use of the specified sampling gear, and operation of small boats. Minimum training and certification requirements for laboratory personnel will be provided in the laboratory QA plans (to be submitted under separate cover).

Sampling personnel who enter an exclusion zone or contaminant reduction zone (see Appendix A-1, Attachment A1 for definition and discussion of these zones) will be required to have completed the 40-hour Hazardous Waste Operations and Emergency Response standard training course and 8-hour refresher courses. The training provides employees with knowledge and skills that enable them to perform their jobs safely and with minimum risk to their personal health. Training is also consistent with the requirements of the Washington Industrial Safety and Health Act. Documentation of course completion will be maintained in personnel files.

## **A11. DOCUMENTATION AND RECORDS**

Records will be maintained documenting all activities and data related to field sampling and to chemical analysis at the laboratories. Results of data verification and validation activities will also be documented. Procedures for documentation of these activities are described in this section. Components of field documentation are discussed in Section 3 of the FSP (Appendix A-1).

The QAPP, FSP (Appendix A-1), and Site Health and Safety Plan (see Appendix A-1) will be provided to each person listed in Section A3. Any revisions or amendments to any of the documents that make up the FSP will also be provided to these individuals.

A FSR will be prepared by EPA and will include field documentation provided by the Lake Roosevelt Co-Managers. A DSR will be prepared by TAI after data validation is completed and the database is finalized. Validated data is due to EPA within 90 days of receipt of all samples at the laboratory, and the DSR is due to EPA within 150 days of receipt of all samples at the lab. The reporting schedules are discussed further in the RI/FS Work Plan and in Section 5.3 of the FSP (Appendix A-1).

### **A11.1 FIELD DOCUMENTATION**

The EPA Region 10 technical team field supervisor will ensure that the field team receives the final approved version of the QAPP (including the FSP and site health and safety plan [SHSP]) prior to the

initiation of field activities. A relational database will be used to manage the field data as described in the RI/FS Work Plan. Field records that will be maintained include the following:

- Field logbooks
- Photo documentation
- Field data forms
- Sample tracking/COC forms.

The content and use of these documents are described in Section 3 of the FSP. The field reporting schedules are discussed further in Section 5.3 of the FSP (Appendix A-1). EPA SCRIBE software will be used by CH2M for sample management and generation of COCs/labels associated with the field samples shipped to ALS. This project file is published to Scribe.net at the conclusion of the sampling event, with the released .bac file provided to the EPA RSCC.

## **A11.2 LABORATORY DOCUMENTATION**

All activities and results related to sample analysis will be documented at each laboratory. Internal laboratory documentation procedures will be described in the laboratory QA plans (to be submitted following laboratory selection).

The analytical chemistry laboratories will provide a data package for each sample delivery group or analysis batch that is comparable in content to a full Contract Laboratory Program package. It will contain all information required for a complete QA review, including the following:

- A cover letter discussing analytical procedures and any difficulties that were encountered
- A case narrative referencing or describing the procedures used and discussing any analytical problems and deviations from SOPs and this QAPP
- COC and cooler receipt forms
- A summary of analyte concentrations (to two significant figures for results <10, three significant figures for results >10), MRLs, and MDLs
- Laboratory data qualifier codes appended to analyte concentrations, as appropriate, and a summary of code definitions
- Sample preparation, digestion, extraction, dilution, and cleanup logs
- Documentation of laboratory processing procedures including individual fillet subsample and total composite weight, subsample mass, any identified anomalies in fish observed upon receptor.
- Instrument run logs
- Initial and continuing calibration data, including instrument printouts and quantification summaries, for all analytes
- Results for method and calibration blanks

- Results for all QA/QC checks, including serial dilutions, laboratory control samples (LCSs), matrix spike samples, laboratory duplicate or triplicate samples, and any other QC procedures required by applicable method protocols and laboratory SOPs
- Original data quantification reports and printouts of chromatograms and mass spectra for all analyses and samples as applicable
- All laboratory worksheets and standards preparation logs
- A page of example calculations for each analytical method included in the data package
- A documented data deliverable for each analytical method performed and reported.

Full laboratory data reports will be provided in both hard copy and electronic format to the TAI task QA coordinator, who will oversee data verification and validation, for the purpose of archiving the final data and data quality reports in the project file. EDDs will be provided in a format that is compatible with the EPA technical team's database. A relational database will be used to manage the laboratory data as described in the RI/FS Work Plan.

### **A11.3 DATA QUALITY DOCUMENTATION**

Data verification (i.e., confirming the accuracy and completeness of field and laboratory data) will be completed by the EPA technical team for data generated in the field, and by each laboratory for the data that it generates. Data validation and data quality assessment for this task will be completed by TAI and provided to the task QA coordinator. All data generated by the laboratory will undergo Stage 4 data validation (S4VM).

The accuracy of the laboratory EDDs (provided in a database format) will be verified by, or under the direction of, the database administrator. All changes to data stored in the database will be recorded in the database change log. Any data tables prepared from the database for data users will include all qualifiers that were applied by the laboratories and during data validation.

Data validation reports will be prepared and provided to the TAI Task QA manager. Results of the validation reports will be summarized in the field report. Any limitation to the usability of the data will also be discussed in this report. Completed data validation checklists will also be provided to the TAI task QA coordinator by the data validator.



## **SECTION B. DATA GENERATION AND ACQUISITION**

---

### **B1. SAMPLING PROCESS DESIGN AND RATIONALE**

---

Sampling protocols to be implemented by the Lake Roosevelt Fishery Co-Managers are not addressed by this Addendum, but may be accessed

at: <https://www.monitoringresources.org/Document/Protocol/Details/573>. This section presents the design and rationale for the Addendum to the 2009 fish tissue sampling program that pertains to receipt of the selected fish by EPA's field team for processing, labeling, and shipment to the analytical laboratory for compositing and chemical analysis. Hatchery white sturgeon tissue data resulting from the sampling program is intended to fill a human health data gap. It will result in a fish tissue data set that supports assessing risk to humans that consume fish. The sampling approach was developed based on information from previous investigations and discussions with UCR fishery managers.

#### **B1.1. INVESTIGATION CONSIDERATIONS**

In 2005, the EPA targeted fish species that were abundant in the UCR and were known to be commonly consumed by recreational or subsistence anglers (walleye, wild and hatchery rainbow trout, lake and mountain whitefish, largescale sucker, and burbot > 30 cm) (USEPA 2005a). For the HHRA, the 2009 fish sampling study targeted additional fish species representing varying feeding guilds known to be abundant in the UCR and commonly consumed by anglers (walleye, burbot, smallmouth bass, largescale sucker, rainbow trout, kokanee, and mountain and lake whitefish > 30 cm). White sturgeon (*Acipenser transmontanus*) were not included in the 2005 and 2009 sampling efforts because they were not available for human consumption due to a fishing ban. Since 2002, the sturgeon population in the UCR has been supplemented with hatchery fish. Long-term monitoring of hatchery white sturgeon in the upper UCR has shown that survival rates and abundance of these fish are much greater than anticipated (Golder 2015, as cited in McLellan 2016). As a result, the UCWSRI and the Lake Roosevelt Fishery Co-Managers are planning targeted removal of hatchery white sturgeon to avoid diluting the genetic diversity of wild sturgeon. Euthanized fish may be distributed to Tribal members and local food banks (McLellan 2016). Prior to making these fish available for human consumption, hatchery white sturgeon need to be evaluated to determine whether their consumption would result in human health risks. Additionally, recreational and subsistence harvest fisheries may be implemented.

#### **B1.2. TARGET SPECIES, SIZE CLASSES, AND RATIONALE**

Long-term monitoring and catch data indicate substantial disparity in survival amongst hatchery white sturgeon family groups within and across cohorts (brood years). Offspring of relatively few parents (adults spawned) comprise the majority of the hatchery component of the population, which greatly outnumber the wild sturgeon population. There are an estimated 30,000 hatchery white sturgeon age 5 and older in the UCR, compared with a wild population of approximately 3,000 individuals. There is concern that once the hatchery fish achieve sexual maturity, breeding by large numbers of closely related individuals will reduce the genetic diversity of the wild population. The Lake Roosevelt Fishery Co-Managers have recommended reducing the abundance of hatchery white sturgeon produced from adult broodstock crosses completed prior to 2010 (McClellan 2016). The CCT and STI Fish and Wildlife Departments will be sampling hatchery white sturgeon for four weeks beginning August 22, 2016. Seven

hundred fish are expected to be captured during the summer 2016 collection effort, a subset of which will be provided to U.S. EPA for analysis.

Fish targeted for removal will be 50-160 cm FL (20 to 63 inches) (pers. comm. From McLellan August 4, 2016). These are based on the minimum and maximum lengths of hatchery white sturgeon from the selected brood years that have been caught in previous monitoring efforts and have been targeted for reduction by the Lake Roosevelt Fishery Co-Managers.

### **B1.3. TARGET TISSUE TYPES AND RATIONALE**

Although skin-on fillets were collected for the HHRA in the 2005 and 2009 fish sampling events, sturgeon skin is inedible. Fillets with skin removed will be collected from hatchery white sturgeon.

### **B1.4. TARGET SAMPLE TYPES, LOCATIONS, AND RATIONALE**

Hatchery white sturgeon will be collected from the reach of the UCR extending from Inchelium/Gifford to the U.S.-Canadian border, which is where the vast majority of hatchery white sturgeon are distributed (*Annual Assessment of Hatchery Kokanee and Sonic-tracking of Wild and Hatchery Kokanee in Lake Roosevelt: 2011 Annual Report* [cited in EI 2016]). Hatchery white sturgeon are most abundant between Northport and Rickey Point. Abundance decreases between Inchelium and French Rocks; it is also lower north of Northport except in isolated pockets (SRC 2016b). In the areas of lesser abundance, it may be difficult to obtain ideal numbers of fish from targeted size classes. Also, sturgeon vary in whether they remain in one area or cover a wide range. Sturgeon tissue concentrations are expected to be representative of exposure to the site-overall, and do not reflect reach-specific exposure concentrations.

The time frame for sample collection is near the end of the growing season for fish in the UCR; captured fish will have had almost an entire season of feeding and growth before being analyzed for contaminants (USEPA 2005a). This time period corresponds to the sampling window used by EPA in 2005 (USEPA 2007a) and in 2009 (Parametrix et al. 2009; Exponent and Parametrix 2013).

A composite sampling approach, modified from the approach used in 2005 and 2009, will be used. Nine composite samples with at least eight fish per composite will be targeted for collection. Fillets will be sorted into three size classes (50 to 97 cm, 98 to 137 cm, and 138 to 160 cm). The middle size class was selected based on the current downriver fishery from Bonneville Dam – The Dalles Dam (38 inches [in] to 54 in). Sturgeon below 38” and above 54” are being analyzed to determine if these fish can be given to tribal members or food banks from the co-managers in the future as they selectively reduce the number of hatchery fish in selected brood classes. The different size classes will also help the co-managers determine if the currently proposed slot limit (38 in-54 in) is the preferred size class to open a fishery on based upon any resulting fish advisory. Each composite sample will include fillets from one of the size classes. There will be three composite samples per size class. Refer to the FSP (Appendix A-1, Table 2) for further details.

## **B1.5. TARGET ANALYTE LIST (TAL)**

All samples will be analyzed for TAL metals/metalloids identified in the 2009 HHRA work plan (USEPA 2009), total inorganic arsenic, dioxins/furans, PCBs (209 congeners, including dioxin-like PCB congeners), PBDEs (total PBDEs, as well as BDE-47, BDE-99, BDE-153, and BDE-209<sup>7</sup>), total length and mass, percent lipids, and percent moisture.

## **B2. SAMPLING METHODS**

Field sampling methods are described in the FSP (Appendix A-1) and include the following topics:

- Sampling location positioning (Section 2.1.2)
- Field equipment and supplies (Section 2.1.3)
- Fish tissue sampling (Section 2.1.4)
- Fish tissue processing (Section 2.1.5)
- Sample containers and labels (sample labels, sample identifier custody seals, sample custody/tracking procedures) (Section 3)
- Field documentation and procedures (field logbooks, photo documentation, COC form) (Section 3).

SOPs for each sampling method are provided in Attachment A2 to the FSP.

In the event that unanticipated or changed circumstances occur in the field, the field supervisor will institute the necessary changes and issue a QAPP change order (see Appendix A-1, Attachment A3), and ensure that the appropriate procedures are followed. If corrective actions require a departure from the FSP, these changes will be documented on a field change request form (see Appendix A-1, Attachment A3). In any other circumstances where sampling conditions are unexpected, the appropriate sampling actions consistent with this task's objectives will be conducted. This change will be noted in the field log, and a change request form will be completed for the project files and submitted to EPA. Any problems that cannot be easily resolved or that affect the final quality of the work product will be brought to the attention of the CH2M technical team coordinator, CH2M project coordinator, and EPA. EPA will be notified of any problems that may affect the final outcome of this task. Additional information regarding corrective actions and related documentation is provided in Section C1.

## **B3. SAMPLE HANDLING AND CUSTODY**

Fish will be measured by the Lake Roosevelt Fisheries Co-Managers upon collection with a measuring board and scale to obtain gross length and weight measurements of specimens that will be retained for samples. Fish will also be scanned with a pit tag reader to determine the brood year.

---

<sup>7</sup> Total PBDE and the four individual PBDE congeners will be used by WDOH. Results from the 4 individual PBDE congeners will be used for HHRA.

Whole fish within the targeted size ranges will be transferred to CH2M personnel by the UCWSRI and the Lake Roosevelt Fishery Co-Managers. CCT will provide the Pit tag identification (ID), fish brood year, length and weight to CH2M with the tagged fish. All processing will be performed on the boat provided by the National Parks Service. The processing boat will travel to shore and fish processing will be conducted on the boat while beached to provide a stable platform. The tagged fish will be held in a lexan bin with site water prior to processing. Fish will be processed and filleted by CH2M personnel as described in the FSP. Fish will be photographed and examined for external abnormalities (Appendix A-1), filleted with skin removed, and  $200 \pm 20$  g of fillet will be shipped to the laboratory on ice for compositing and chemical analysis.

Fish fillets will be shipped from the field to the offsite processing laboratory (which may be the same as the analytical laboratory) under COC as described in Section 3.2 of the FSP (Appendix A-1). The processing laboratory will homogenize each discrete filet individually. Equal portions (by mass) of each discrete homogenate will then be combined. The combined homogenates are then subjected to an additional mixing procedure to ensure a homogenous composite. When needed, a subsample of the composite will be sent to other analytical laboratories for chemical analysis. Requirements for sample containers, sample preservation, storage temperature, and holding times are summarized in Table A-3. Sample containers will be transferred under the COC procedures described in the Field Sampling Plan (Appendix A-1, Section 3.2 and SOP-5).

Principal documents used to identify samples and to document possession will be field logbooks (Lake Roosevelt Fishery Co-Manager and CH2M logbooks) and COC records. Custody will be documented for all samples at all stages of the analytical or transfer process. COC procedures for sample handling prior to delivery to the laboratories are outlined in Sections 2.2, 2.3, and 3.2 of the FSP.

Upon receipt of samples at each laboratory, the physical integrity of the containers and custody seals will be checked, and the samples will be inventoried by comparing sample labels to those on the COC forms. The laboratories will include the COC and shipping container receipt forms in the data package. Any breaks in the COC or non-conformances will be noted and reported in writing to the laboratory coordinator within 24 hours of receipt of the samples. Each laboratory QA plan (to be provided under separate cover) will include procedures used for accepting custody of samples and documenting samples at the laboratories. The laboratory project manager will ensure that a sample-tracking record is maintained that follows each sample through all stages of sample processing at the laboratory.

Fish fillets (skinless) will be stored in accordance with Table A-3 (frozen at  $-20^{\circ}\text{C}$ ) and partially thawed only immediately prior to processing. A single laboratory facility will homogenize the fish for distribution to all the laboratories performing analyses. Subsamples will be packed with dry ice for shipment to other laboratories in glass containers. Homogenized samples will be stored in accordance with Table A-3 (frozen at  $-20^{\circ}\text{C}$ ). Laboratories will maintain COC documentation and documentation of proper storage conditions for the entire time that the samples are in their possession.

The laboratories will not dispose of the samples for this task until authorized to do so by the RPM.

## **B4. ANALYTICAL METHODS**

Fish tissue samples collected for this study will be analyzed for chemical parameters shown on Table A-2, A-2.1 and A-3. Laboratory methods that will be used to complete the respective analyses are described below.

### **B4.1. CHEMICAL ANALYSES**

Fish tissue samples will be analyzed for metals and metalloids, organic compounds, percent lipids and percent moisture, using the recommended methods listed in Table A-3.

Consistent with the DQOs identified in Section A9, the ACGs for the Addendum to the 2009 fish tissue study are generally below RBCs derived for human receptors (see Appendix E-1 for human health RBCs). The RBCs are concentrations associated with no significant effect on the receptor, under a given set of assumptions about exposure. The ACGs and the RBCs from which they were derived are presented in Table A-2.

The human health RBCs were set equal to a hazard quotient (HQ) of 0.1 or cancer risk of  $1 \times 10^{-6}$  (see Appendix E-1). The ACGs are provided in Table A-2 alongside expected MDLs and MRLs (as reported by ALS Environmental, Kelso, Washington; pers. comm. Poyfair 2016). These expected MDLs and MRLs are below the ACGs in most cases. Every effort will be made to select laboratories and methodology that will provide MDLs and MRLs that are below the ACGs. Every effort will be made to ensure that MRLs will be no more than 2 times greater than MDLs. Standard laboratory methodology is not expected to be sufficiently sensitive to provide MRLs or MDLs below the ACG for several analytes (Table A-2). For most COIs, however, the standard analytical methods for tissue analysis will provide adequate sensitivity for the risk assessment.

MRLs generally are equivalent to the concentration of the lowest calibration standard (i.e., the practical quantification limit) and represent the low end of the analytical calibration range. Analytes that are detected at concentrations below the reporting limit but above the MDL will be reported, but will be qualified as estimated (i.e., a “J” qualifier or equivalent will be appended to the result by the laboratory). Nondetects will be reported at the MRL with a “U” qualifier.

### **B4.2. FIELD MEASUREMENTS**

Field operations will include measurement of fish FL and weight, and fish will be scanned with a pit tag reader to determine the brood year; these measurements will be done by the Lake Roosevelt Fishery Co-Managers and this information will be provided to CH2M with the fish (Section 2.1.5, FSP, Appendix A-1).

## **B5. QUALITY CONTROL**

QC samples will be prepared in the laboratories to monitor the precision of the sample homogenization procedures and the bias and precision of the sample analysis procedures. At least one homogenized composite sample will be used to produce triplicate samples for quality assurance of the homogenization

if sufficient tissue mass is available. Details are provided in Section 4.3.1 of the FSP (Appendix A). Laboratory QC procedures are described below.

### **B5.1. LABORATORY QUALITY CONTROL**

Extensive and detailed requirements for laboratory QC procedures are provided in the EPA methods that will be used for this study (Table A-3). Every method protocol includes descriptions of QC procedures, and many incorporate additional QC requirements by reference to separate QC sections. QC requirements include control limits and requirements for corrective action in many cases. QC procedures will be completed by the laboratories, as required in each protocol and their internal SOPs, and as indicated in this QAPP.

The frequency of analysis for LCSs, matrix spike samples, spike or laboratory duplicates, and method blanks will be one for every 20 samples or one per extraction or analysis batch, whichever is more frequent. Calibration procedures will be completed at the frequency specified in each method description. Equipment (e.g., cutting boards, knives, blenders/Tissuemizers™, and bowls) blanks will be subjected to the same processes as the fish tissue before being poured into a sample bottle.

As required for EPA SW-846 methods (USEPA 2005b), performance-based control limits have been established by the laboratories. These and all other control limits specified in the method descriptions will be used by the laboratories to establish the acceptability of the data or the need for reanalysis of the samples. Laboratory control limits for recovery of internal standards (including certified reference material), matrix spikes, and LCSs, and for relative percent difference (RPD) of laboratory duplicates, are provided in the analytical laboratory's QA manual (to be submitted following laboratory selection). Because high resolution mass spectrometry (HRMS) analyses 1613B, 1668a and 1614 use isotope dilution techniques, analysis of matrix spike and matrix spike duplicate QC samples are not necessary.

### **B5.2. DATA QUALITY INDICATORS FOR LABORATORY**

The overall quality objective for this task is to develop and implement procedures that will ensure the collection of representative data of known and acceptable quality. The QA procedures and measurements that will be used for this task are based on EPA guidance. Data quality indicators such as the precision, accuracy or bias, representativeness, completeness, and comparability (PARCC) parameters and analytical sensitivity will be used to assess conformance of data with quality control criteria (USEPA 2002b). Measurement quality objectives (MQOs) for the quantitative PARCC parameters are provided in Table B-4 of the 2009 QAPP (Parametrix et al. 2009). Data quality indicators and quality control objectives are described in this section.

**Precision** reflects the reproducibility between individual measurements of the same property. Precision will be evaluated using the results of laboratory duplicates and at least one lab processing triplicate (for fish samples with sufficient mass). Precision is expressed in terms of the RPD for two measurements. The following equation is used to calculate the RPD between measurements:

$$RPD = \frac{|C_1 - C_2|}{(C_1 + C_2)/2} \times 100$$

Where: RPD = relative percent difference  
 C1 = first measurement  
 C2 = second measurement

For three or more measurements, the relative standard deviation (RSD) is used to evaluate precision. The RSD is calculated as the ratio of the standard deviation of three or more measurements to the average of the measurements, expressed as a percentage.

**Accuracy and bias** represent the degree to which a measured concentration conforms to a reference value. The results for SRM, matrix spikes, LCSs, field blanks, and method blanks will be reviewed to evaluate the accuracy and bias of the data. The following calculation is used to determine percent recovery for a matrix spike sample:

$$\%R = \frac{M - U}{C} \times 100$$

Where: %R = percent recovery  
 M = measured concentration in the spiked sample  
 U = measured concentration in the unspiked sample  
 C = concentration of the added spike

The following calculation is used to determine percent recovery for a LCS or reference material:

$$\%R = \frac{M}{C} \times 100$$

Where: %R = percent recovery  
 M = measured concentration in the reference sample  
 C = established reference concentration

Results for field and method blanks can reflect systematic bias that results from contamination of samples during collection or analysis. Detection of any target analytes in field or method blanks will be evaluated as potential indicators of bias.

QC samples and procedures are specified in each method protocol (analytical methods are presented in Table A-3). All QC requirements will be completed by the laboratories as described in the protocols, including the following (as applicable to each analysis):

- Initial calibration

- Initial calibration verification
- Continuing calibration
- Calibration or instrument blanks
- Method blanks
- Standard or Certified Reference Materials – fish tissue
- Laboratory control samples
- Internal standards
- Serial dilutions
- Matrix spikes
- Laboratory duplicates

To alert the data user to possible bias or imprecision, data qualifiers will be applied to reported analyte concentrations when associated QC samples or procedures do not meet the criteria identified in this QAPP. Laboratory control limits for the methods that will be used for this study will be provided to EPA by ALS Kelso and Vista Analytical. Data validation criteria and procedures are described in Sections D1 and D2 of this QAPP.

ACGs provide the target concentration required for the chemical analysis. Methods selected for this study are expected to provide sufficient sensitivity to yield ACGs that are below the lowest reference value for this study (Table A-2).

The laboratory will determine a MDL for each analyte, as required by EPA (USEPA 2014a). MDLs are statistically derived and reflect the concentration at which an analyte can be detected in a clean matrix with 99 percent confidence that a false positive result has not been reported. The analytical laboratory will have established MRLs at levels above the MDLs for the task analytes. These values are based on the laboratory's experience analyzing environmental samples and reflect the typical sensitivity obtained by the analytical system; they represent the level of analyte above which concentrations are accurately quantified. Analyte concentrations for this study will be reported to the MDL. Analytes detected at concentrations between the MRL and the MDL will be reported with a "J" qualifier to indicate that the value is an estimate (i.e., the analyte concentration is below the calibration range). Non-detects will be reported to the MRL with a "U" Qualifier and will be adjusted by the laboratory as necessary to reflect sample dilution or matrix interference.

**Representativeness and comparability** are qualitative QA/QC parameters. Representativeness is the degree to which data represent a characteristic of an environmental condition. In the field, representativeness will be addressed primarily in the sampling design, by the selection of sampling sites and sample collection procedures. In the laboratory, representativeness will be ensured by the proper handling and storage of samples, the use of standard performance-based methods, and initiation of analyses within holding times.



**Comparability** is the qualitative similarity of one data set to another (i.e., the extent to which different data sets can be combined for use). Comparability will be addressed through the use of field and laboratory methods that are consistent with methods and procedures recommended by EPA.

**Completeness** is a measure of the amount of valid data obtained from the analytical measurement system and the complete implementation of defined field procedures. The target completeness objective will be 90 percent; the actual completeness may vary depending on the intrinsic nature of the samples. The completeness of the data will be assessed during QC reviews.

Completeness is defined as follows for all measurements:

$$\%C = \frac{V}{T} \times 100$$

Where:            %C = percent completeness  
                      V = number of measurements judged valid  
                      T = total number of measurements

## **B6. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE**

Analytical instrument testing, inspection, maintenance, setup, and calibration will be conducted by the laboratories in accordance with the requirements identified in the laboratory's SOPs and manufacturer instructions. In addition, each of the specified analytical methods provides protocols for proper instrument setup and tuning and critical operating parameters. Instrument maintenance and repair will be documented in the laboratory's maintenance logs or record books.

## **B7. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY**

Laboratory instruments will be properly calibrated, and the calibration will be verified with appropriate check standards and calibration blanks for each parameter before beginning each analysis. Instrument calibration procedures and schedules will conform to analytical protocol requirements and descriptions provided in the laboratories' QA plans.

All calibration standards will be obtained from either the EPA repository or a commercial vendor, and the laboratories will maintain traceability back to the National Institute of Standards and Technology (NIST). Stock standards will be used to establish intermediate standards and calibration standards. Special attention will be given to expiration dating, proper labeling, proper refrigeration, and prevention of contamination. Documentation relating to the receipt, mixing, and use of standards will be recorded in a laboratory logbook. All calibration and spiking standards will be checked against standards from another source, as specified in the methods and the laboratory QA manual.

## **B8. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES**

The quality of supplies and consumables used during sample collection and laboratory analysis can affect the quality of the data. All equipment that comes into contact with the samples and extracts must be

sufficiently clean to prevent detectable contamination, and the analyte concentrations must be accurate in all standards used for calibration and quality control purposes.

The quality of laboratory water used for decontamination will be documented at the laboratory. As discussed in Section B2, certified clean sample containers, if required, will be provided by the laboratory. All containers will be visually inspected prior to use, and any suspect containers will be discarded.

Reagents of appropriate purity and suitably cleaned laboratory equipment will also be used for all stages of laboratory analyses. Details for acceptance requirements for supplies and consumables at the laboratories are provided in the laboratory SOPs and QA plans. All supplies will be obtained from reputable suppliers with appropriate documentation or certification. Supplies will be inspected to confirm that they meet use requirements, and certification records will be retained by the field supervisor (i.e., for supplies used in the field) or the laboratory QA manager (i.e., for supplies used in the laboratory).

## **B10. DATA MANAGEMENT**

---

Data for this task will be generated both in the field and at the analytical laboratory. The final repository for sample information for the sample collection efforts described in the FSP will be a relational database. Procedures to be used to transfer data from the point of generation to the database are described in this section. The final database will include historical as well as current data.

The EPA technical team will follow the data management plan (DMP) established for the Site as described in the RI/FS Work Plan. The DMP establishes standard procedures for the management of all documents and environmental data (field and laboratory) generated during the UCR RI/FS. The DMP describes data management procedures relating to the creation, acquisition, handling, storage, and distribution of task-related data. The data management systems and procedures described below are intended to establish and maintain an efficient organization of large volumes of complex environmental information for a diverse combination of data types. To accomplish this task, four management systems will be used to provide organized and efficient data management and retrieval:

- **Project database.** Stores environmental sampling and analysis data, information pertaining to geographic information system (GIS) files, and citations of documents related to collection, analysis, or interpretation of environmental data that are stored in the database. A relational<sup>8</sup> database will be used to facilitate data retrieval and interpretation. Both current and historical data will be stored in the project database.
- **Geographic information system.** Stores spatial data and enables the cartographic presentation of data trends and patterns.
- **Hard copy files.** Maintains a record and archive of documents from field studies, contractual agreements, and resulting reports. TAI and its technical team will use various document and reference management software to organize hard copy documents.
- **Web site.** Documents, electronic data, and other project information will be available via the

---

<sup>8</sup> A relational database stores distinct types of data (e.g., station descriptions, sample descriptions, and analytical results) in different data tables, where the tables are linked, or related, through shared information (e.g., station identifiers and sample identifiers).

secure project web site. Users with appropriate privileges will be able to download electronic data, documents and SCRIBE database files.

### **B10.1 FIELD DATA**

Data that are generated during fish tissue collection and sample preparation will be manually entered into the field logbook, field data forms, and COC forms. Data from these sources will be entered into the project database directly from the field logbook and field data forms. These data include sample collection coordinates, station names, sampling dates, sample identifiers and numbers, and additional station and sample information. All entries will be reviewed for accuracy and completeness by a second individual, and any errors will be corrected before the data are approved for release to data users.

### **B10.2. LABORATORY DATA**

A variety of manually entered and electronic instrument data will be generated at the laboratories. Data will be manually entered into:

- Standard logbooks
- Lab fish processing/homogenization logbooks
- Digestion and Extraction logs
- Storage temperature logs
- Balance calibration logs
- Instrument logs
- Sample preparation and analysis worksheets
- Maintenance logs
- Individual laboratory notebooks
- Results tables for fish measurements (i.e., tissue sample weights during homogenization)

All manual data entry into the laboratory information management system will be proofed at the analytical laboratories. All data collected from each laboratory instrument, either manually or electronically, will be reviewed and confirmed by analysts before reporting. A detailed description of procedures for laboratory data management and data review and verification is provided in the laboratory QA plans (to be submitted following laboratory selection).

Laboratory data will be entered directly into the project database from the EDD. The electronic data for each data package will be provided for QA review in spreadsheet format. These database entries will be verified against the hard-copy laboratory data packages. Data qualifiers will be entered into the spreadsheet and subsequently entered into the database by the data manager. Data management procedures for this project are provided in the RI/FS Work Plan.

## **SECTION C. ASSESSMENT AND OVERSIGHT**

This task will rely on the knowledge and expertise of the EPA technical team, as described in the FSP. The field team and laboratories will stay in close verbal contact with the task manager during all phases of this task. This level of communication will serve to keep the management team apprised of activities and events, and will allow for informal but continuous task oversight. Few scheduled assessment activities are planned for this task because the scope of the sampling and analysis effort and the size of the team are relatively small.

### **C1. ASSESSMENTS AND RESPONSE ACTIONS**

Assessment activities will include readiness reviews prior to sampling and prior to release of the final data to the data users, as well as internal review while work is in progress. An informal technical systems audit may be conducted if problems are encountered during any phase of this task.

Readiness reviews are conducted to ensure that all necessary preparations have been made for efficient and effective completion of each critical phase of work. The first readiness review will be conducted prior to field sampling. The field supervisor will verify that all field equipment is ready for transfer to the site. The field supervisor will also verify that the field team and subcontractor(s), as required, have been scheduled and briefed (including review of the SHSP) and that the contract for the subcontractor has been signed by both parties. Any deficiencies noted during this readiness review will be corrected prior to initiation of sampling activities.

The second readiness review will be completed before final data are released for use. The database administrator will verify that all results have been received from the laboratories, data validation and data quality assessment have been completed for all of the data, and data qualifiers have been entered into the database and verified. Any deficiencies noted during this review will be corrected by the database administrator, the task QA coordinator, or their designee. Data will not be released for final use until all data have been verified and validated. No report will be prepared in conjunction with the readiness reviews. However, the EPA technical team coordinator and data users will be notified when the data are ready for use.

Technical review of intermediate and final work products generated for this task will be completed throughout the course of all sampling, laboratory, data validation, data management, and data interpretation activities to ensure that every phase of work is accurate and complete and follows the QA procedures outlined in this QAPP. Any problems that are encountered will be resolved between the reviewer and the person completing the work. Any problems that cannot be easily resolved or that affect the final quality of the work product will be brought to the attention of the EPA technical team coordinator and EPA project coordinator. EPA will be notified of any problems that may affect the final outcome of this task, according to the Agreement. Samples will not be discarded by the lab until written permission to do so is provided by the RPM.

The laboratories will be required to have implemented a review system that serves as a formal surveillance mechanism for all laboratory activities. Each phase of work is reviewed by a supervisor before it is approved for release. Details are provided in the laboratory QA plans (to be submitted following laboratory selection). EPA's QA personnel may elect to observe, witness, and critique a dry run

of the laboratory sample processing – filleting, homogenization, and documentation – prior to project initiation.

Technical system audits may be conducted if serious problems are encountered during sampling or analysis operations.

Any task team member who discovers or suspects a non-conformance is responsible for reporting the non-conformance to the task manager, the RPM, or the laboratory project or QA manager, as applicable. The task QA coordinator will ensure that no additional work dependent on the non-conforming activity is performed until a confirmed non-conformance is corrected. Any confirmed non-conformance issues will be relayed to the EPA technical team coordinator. In addition, communication between corrective actions by the field personnel and the laboratory relative to the accuracy and completeness of the chain-of-custody documents will follow corrective-action procedures.

## **C2. REPORTS TO MANAGEMENT**

The laboratories will keep TAI's Analytical Chemistry Laboratory Coordinator apprised of their progress on a weekly basis. The laboratories will provide the following information:

- Inventory and status of samples held at the laboratory in spreadsheet format by sample delivery group.
- Summaries of out-of-control laboratory QC data that resulted in a requirement for corrective action and a description of the corrective actions implemented.
- Descriptions and justification for any significant changes in methodology or QA/QC procedures.

The Laboratory Project Manager and Laboratory QA Manager will provide this information to the TAI Analytical Chemistry Laboratory Coordinator. The laboratory will be required to have implemented routine systems of reporting non-conformance issues and their resolution. These procedures are described in the laboratory QA manuals (to be submitted following laboratory selection). Laboratory non-conformance issues will also be described in the field sampling report if they affect the quality of the data.

Data packages and EDDs will be prepared by the laboratory upon completion of analyses for each sample delivery group. The case narrative will include a description of any problems encountered, control limit exceedances (if applicable), and a description and rationale for any deviations from protocol. Copies of corrective action reports generated at the laboratory will also be included with the data package.

Data that has undergone validation by TAI's Technical Team will be provided electronically to EPA within 90 days of receipt of all samples from the field. These data will also be provided in the DSR, containing an overview of the field event, a sampling location map, sample collection methods used, rationale for any deviations from the FSP and QAPP, validated data, data validation report and summary statistics. EPA will provide documentation and the rationale for all deviations from the FSP and QAPP that occur while samples are in EPA custody.

The draft DSR will be prepared by the TAI technical team and submitted to EPA within 150 days following receipt of all samples from the field.

## **SECTION D. DATA VALIDATION AND USABILITY**

Data generated in the field and at the laboratories will be verified and validated according to criteria and procedures described in this section. Data quality and usability will be evaluated, and a discussion will be included in the data validation report.

### **D1. DATA REVIEW, VERIFICATION, AND VALIDATION**

Field and laboratory data for this task will undergo a formal verification and validation process. Data validation and data quality assessment will be completed and provided to the task QA coordinator. All errors found during the verification of field data, laboratory data, and the database will be corrected prior to release of the final data.

Data verification and validation for metals and organic parameters will be completed by ESI under the oversight of the TAI Task QA Coordinator according to methods described in EPA's guidance documents, including EPA's national functional guidelines (NFGs) and associated analytical method requirements for inorganic, dioxin/furan, PCB congener, and organic data review (USEPA 1995, 1996, 2002b, 2011a, 2014a and 2014b). Data validation will be performed in accordance with the "Guidelines Labeling Externally Validated Laboratory Analytical Data for Superfund Use" (USEPA 2009b). Data will be qualified or rejected as necessary if results for laboratory control samples, matrix spike samples, laboratory duplicates or other required method QC do not meet QC acceptance criteria outlined in this QAPP, the specific analytical methods, or laboratory performance-based control limits, as applicable. Data may also be qualified as undetected based on concentrations of target analytes detected in laboratory or field blanks. Current performance-based control limits will be provided in the laboratory QA plans (to be submitted following laboratory selection), as applicable. All data generated by the laboratory will undergo Stage 4 data validation (S4VM).

Equipment rinse blanks will be evaluated and data qualifiers will be applied in the same manner as method blanks. The equipment blank will be subjected to the same processes as the fish tissue (e.g., cutting boards, knives, blenders/Tissuemizers™, and bowls) before being poured into a sample bottle. Data will be flagged if the RPD for lab processing triplicates exceeds 30%.

### **D2. VERIFICATION AND VALIDATION METHODS**

Field data will be verified during preparation of samples and COC forms. Field notebook entries, field data forms, and COC forms will be checked for consistency daily by the field supervisor or his designee. After field data are entered into the project database, 100% verification of the entries will be completed to ensure the accuracy and completeness of field data in the database. Any discrepancies will be resolved before the final database is released for use.

All of the chemistry data will be fully validated. If problems or questions are encountered during validation, the laboratory will be contacted for resolution. Additional full or focused validation will be completed if required to fully assess the quality of the data or to verify that laboratory errors have been addressed.

Procedures for verification and validation of laboratory data and field QC samples will be completed as summarized in Section D1 above. The accuracy and completeness of each data set will be verified at the laboratory when the EDDs are prepared and again as part of data validation. EDD completeness will be verified electronically to the sample and analyte level when data from the laboratory and from the data validation firm are entered into the database. Ten percent of entries to the database from the laboratory EDDs will be checked against the hard-copy data packages.

In addition to verification of field and laboratory data and information, data qualifier entries into the database will be verified. Any discrepancies will be resolved before the final database is released for use.

ACGs and targeted MRLs for this task are provided in Tables A-2 and A-2-1. Any exceedance of actual MRLs over the target MRLs or ACGs will be discussed in the data validation report.

### **D3. RECONCILIATION WITH USER REQUIREMENTS**

The goal of data validation is to determine the quality of each datum and to identify those that do not meet the task measurement quality objectives. Non-conforming data may be qualified as estimated (i.e., a “J” qualifier appended to the result) or rejected as unusable (i.e., an “R” qualifier appended to the result) during data validation if criteria for data quality are not met. Data may also be qualified as undetected during validation based on laboratory and field (rinstate) blank results. Rejected data will not be used for any purpose. A summary of the qualified data and the reasons for qualification will be included in the data validation report.

Data qualified as estimated will be used for all intended purposes and will be appropriately qualified in the final project database. However, these data may be less precise or less accurate than unqualified data. Data users, in cooperation with the EPA technical team coordinator and the task QA coordinator, are responsible for assessing the effect of the inaccuracy or imprecision of the qualified data on statistical procedures and other data uses. The data quality discussion in the data validation report will include information regarding the direction or magnitude of bias or the degree of imprecision for qualified data to facilitate the assessment of data usability. The data validation report will also include a discussion of data limitations and their effect on data interpretation activities.

## **SECTION E. REFERENCES**

---

- Black, A.R., G.W. Barlow, and A.T. Scholz. 2003. Carbon and nitrogen stable isotope assessment of the Lake Roosevelt aquatic food web. *Northwest Science* 77(1): 1-11.
- CH2M. 2016. Memorandum to file. Sturgeon Sampling to Supplement HHRA. Meeting between U.S. Environmental Protection Agency Region 10 and Participating Parties. June 16.
- DOE. 2008. Remedial Investigation Work Plan for Hanford Site Releases to the Columbia River. United States Department of Energy (DOE), Richland, WA. DOE/RL-208-11. September.
- Environment International (EI). 2016. Memorandum re: data gaps for wild kokanee salmon and hatchery white sturgeon. To Laura Buelow, Dustan Bott, Monica Tonel, and Marc Stifelman. United States Environmental Protection Agency, Region 10. From Whitney Fraser, Environment International on behalf of the Colville Confederated Tribes. [Memo not dated]
- Exponent and Parametrix. 2013. Upper Columbia River Final Fish Tissue Data Summary and Data Gap Report. Prepared for Teck American Incorporated. Prepared by Exponent and Parametrix, in consultation with Integral Consulting, Inc. February.
- Fields, K., B. Scofield, C. Lee, and D. Pavlik. 2004. Lake Roosevelt fisheries evaluation program; limnological and fisheries monitoring, 2002 Annual report. Bonneville Power Administration, Portland, Oregon. Report Number: DOE/BP-00005756-5. 196pp.
- Golder Associates Ltd. 2015. Preliminary analysis of hatchery-reared juvenile white sturgeon population abundance and survival estimates based on 2002-2014 mark-recapture data. Unpub. memo report prepared for BC Hydro, Castlegar, BC. Pp. 15. As cited in McLellan 2016.
- Harper, B.L., B. Flett, S. Harris, C. Abeyta, and F. Kirschner. 2002. The Spokane Tribe's multipathway subsistence exposure scenario and screening level RME. *Risk Analysis* 22: 513-526.
- Lee, C., B. Scofield, D. Pavlik, and K. Fields. 2003. Lake Roosevelt fisheries evaluation program; limnological and fisheries monitoring. 2000 Annual report. Portland, Oregon, Bonneville Power Administration: 271.
- Lee, C., D. Pavlik-Kunkel, K. Fields, and B. Scofield. 2006. Lake Roosevelt fisheries evaluation program; limnological and fisheries monitoring. 2004-2005 Annual Report, Project No. 199404300. Bonneville Power Administration, Portland, Oregon. 202pp. DOE/BP-00014804-1.
- McLellan, J. 2016. Lake Roosevelt hatchery white sturgeon harvest – human consumption. Memorandum to Laura Buelow, Project Manager, U.S. Environmental Protection Agency, from Jason McLellan, Biologist, Colville Confederated Tribes. June 20.



- Parametrix, Integral, and Exponent. 2009. Upper Columbia River Quality Assurance Project Plan for the 2009 Fish Tissue Study. Prepared for Teck American Incorporated, Spokane, WA. Prepared in consultation with HydroQual. September.
- Pers. Comm. from Poyfair, T., ALS Environmental, to K. Kracko, SRC. Detection and Reporting Limit for Metals, Dioxin, PCB Congeners, and PBDEs in Fish Tissue. August 1, 2016.
- Pers. Comm. from McCaig, K., TAI, to L. Buelow, USEPA. Review of Tables A-2, A-2.1 and A-3 by M. Maier, Vista Analytical. September 10, 2016.
- Pers. Comm. From McLellan, J., CCT, to M. Stifleman and K. Cerise, EPA. Sturgeon Size. August 4, 2016.
- Scotfield, B., C. Lee, D. Pavlik, and K. Fields. 2004. Lake Roosevelt fisheries evaluation program; limnological and fisheries monitoring. 2001 Technical Report. Bonneville Power Administration, Portland, Oregon. 201pp.
- Serdar, D., A. Johnson, and S. Magoon. 1991. First progress report on Ecology's dioxin/furan survey of the middle Columbia River. Memo to Gerry Jewett, Bob Barwin, and Carl Meuchterlein. Washington State Department of Ecology, June 21, 1995. 5pp.
- Serdar, D., B. Yake, and J. Cabbage. 1994. Contaminant trends in Lake Roosevelt. Publication No. 94-185. Washington State Department of Ecology, Olympia, Washington.
- Smith, S.B., A.P. Donahue, R.J. Lipkin, V.S. Blazer, C.J. Schmitt, and R.W. Goede. 2002. Illustrated field guide for assessing external and internal anomalies in fish. U.S. Geological Survey Information and Technology Report USGS/BRD/ITR— 2002-0007. U.S. Geological Survey, Reston, Virginia. September.
- SRC. 2010. Memorandum to file entitled: "Memo on Colville letter 03-02-10.doc". Prepared for U.S. Environmental Protection Agency, Region 10. March 2.
- SRC. 2015. Data analysis report for the tribal consumption and resource use survey for the Upper Columbia River site human health risk assessment and remedial investigation/feasibility study. Prepared for U.S. Environmental Protection Agency, Region 10. February 5.
- SRC. 2016a. Memorandum to file. Participating Parties Conference Call – 6/16/16. Sturgeon Sampling. Meeting between U.S. Environmental Protection Agency Region 10 and Participating Parties. June 16.
- SRC. 2016b. Memorandum to file. UCR hatchery white sturgeon sampling program. March 8.

- TCAI. 2008. Upper Columbia River: Draft Screening-Level Ecological Risk Assessment (SLERA). Prepared by Parametrix, Inc. and Integral Consulting, Inc. Teck Cominco American Incorporated, Spokane, Washington.
- USEPA. (United States Environmental Protection Agency). 1992. Supplemental guidance to RAGS: calculating the concentration term. Office of Solid Waste and Emergency Response. Washington, D.C. Publication 9285.7-08I.
- USEPA. 1993. Wildlife exposure factors handbook. Volume I of II. Washington, DC. EPA/600/4-93/187a., United States Environmental Protection Agency, Office of Research and Development.
- USEPA. 1995. EPA Region 10 SOP for the validation of method 1668 toxic, dioxin-like PCB data. U.S. Environmental Protection Agency, Region 10, Environmental Services Division, Seattle, Washington.
- USEPA. 1996. EPA Region 10 SOP for the validation of polychlorinated dibenzodioxin (PCDD) and polychlorinated dibenzofuran (PCDF) data. U.S. Environmental Protection Agency, Region 10, Environmental Services Division, Seattle, Washington.
- USEPA. 1998. Assessment of dioxins, furans, and PCBs in fish tissue from Lake Roosevelt, Washington, 1994. USEPA Region 10, internal report.
- USEPA. 2002a. Guidance for quality assurance project plans. EPA QA/G-5. EPA/240/R-02/009. U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC.
- USEPA. 2002b. Guidance on environmental data verification and validation. EPA QA/G-8. U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC.
- USEPA. 2002c. Columbia River Basin Fish Contaminant Survey 1996-1998. U.S. Environmental Protection Agency, Region 10, Seattle, WA. EPA 910-R-02-006. August 12.
- USEPA. 2005a. Draft Phase I fish tissue sampling approach and rationale, Upper Columbia River Site CERCLA RI/FS. January 14, 2005. Prepared by CH2M HILL. U.S. Environmental Protection Agency, Region 10, Seattle, Washington.
- USEPA. 2005b. SW-846 On-line, test methods for evaluating solid waste- physical/chemical methods. <http://www.epa.gov/epaoswer/hazwaste/test/main.htm>. Accessed January 26, 2007. U.S. Environmental Protection Agency, Seattle, Washington.
- USEPA. 2005d. Final Midnite Mine human health risk assessment report. U.S. Environmental Protection Agency, Region 10, Seattle, WA. September.
- USEPA. 2006a. Screening-level risk assessment for recreational use of beaches, Upper Columbia River, remedial investigation and feasibility study. Prepared by CH2M HILL and Ecology and Environment, Inc. Draft. U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

- USEPA. 2006b. Guidance on systematic planning using the data quality objectives process (EPA QA/G-4). USEPA Washington, D.C. EPA/240/B-06/001.
- USEPA. 2006c. Settlement agreement for implementation of remedial investigation and feasibility study at the Upper Columbia River Site. June 2, 2006. U.S. Environmental Protection Agency, Region 10, Seattle, Washington.
- USEPA. 2007a. Phase I fish tissue sampling data evaluation, Upper Columbia River Site CERCLA RI/FS. Prepared for the U.S. Environmental Protection Agency, Region 10. Prepared by CH2M Hill and Ecology and Environment, Inc. October 2007.
- USEPA. 2008. Upper Columbia River: work plan for the remedial investigation and feasibility study. Modified by the U.S. Environmental Protection Agency based on the draft work plan provided by Teck Cominco American Incorporated. December.
- USEPA. 2009a. Human health risk assessment work plan for the Upper Columbia River site remedial investigation and feasibility study. Prepared for, and with oversight by, United States Environmental Protection Agency, Region 10. Prepared by Syracuse Research Corporation. March.
- USEPA. 2009b. Guidelines labeling externally validated laboratory analytical data for Superfund use, January. Office of Solid Waste and Emergency Response, Washington, DC. No. 9200.1-85, EPA 540-R-08-005.
- USEPA. 2010a. Recommended toxicity equivalence factors (TEFs) for human health risk assessments of 2,3,7,8-tetrachlorodibenzo-p-dioxin and dioxin-like compounds. Risk Assessment Forum, Washington, DC. EPA/600/R-10/005.
- USEPA. 2010b. Guidance for implementing the January 2001 methylmercury water quality criterion. U.S. Environmental Protection Agency, Office of Science and Technology. EPA-823-R-10-001.
- USEPA. 2011a. USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Chlorinated Dibenzo-p-dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review. Office of Superfund Remediation and Technology Innovation. EPA-540-R-11-016. <https://www.epa.gov/sites/production/files/2015-03/documents/dlm22nfg.pdf>.
- USEPA. 2011b. Exposure factors handbook: 2011 edition. U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC. EPA/600/R-090/052F. September.
- USEPA. 2014a. National Functional Guidelines for Inorganic Superfund Data Review. U.S. Environmental Protection Agency Office of Superfund Remediation and Technology Innovation. USEPA-540-R-13-001. [https://www.epa.gov/sites/production/files/2015-03/documents/ism02.2\\_national\\_functional\\_guidelines.pdf](https://www.epa.gov/sites/production/files/2015-03/documents/ism02.2_national_functional_guidelines.pdf).

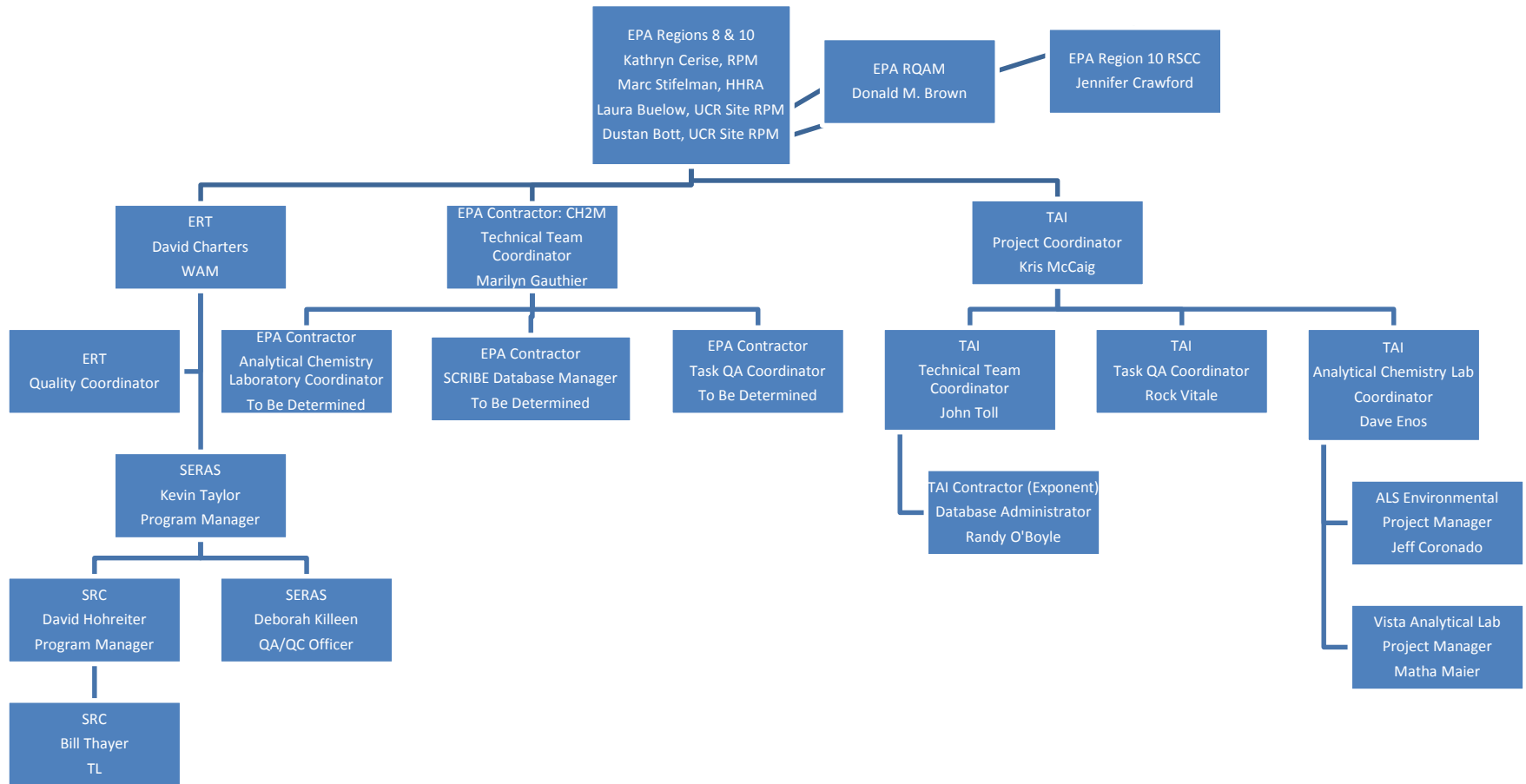
USEPA. 2014b. National Functional Guidelines for Superfund Organic Methods Data Review. Office of Superfund Remediation and Technology Innovation (OSRITI). EPA-540-R-014-002. <https://www.epa.gov/sites/production/files/2015-03/documents/somnfg.pdf>.

Van den Berg, M; Birnbaum, LS; Denison, M; et al. 2006. The 2005 World Health Organization (WHO) reevaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds. *Toxicol Sci* 93(2):223-241.

Washington Closure Hanford (WCH). 2011. Data Summary Report for the Remedial Investigation of Hanford Site Releases to the Columbia River, Hanford Site, Washington. Prepared for the U.S. Department of Energy, Richland Operations Office, Office of the Assistant Manager for River Corridor. January.

WDOH. 2012. Human health evaluation of contaminants in Upper Columbia River fish. Washington State Department of Health, Olympia, WA. DOH 334-317. August

**Figure A-1. Organization Chart for Addendum No. 1 to the 2009 Fish Tissue Study**



**Table A-1. Fish Tissue Task, Team Contact Information**

<b>Name</b>	<b>Task/Role</b>	<b>Organization</b>	<b>Office Phone Number</b>	<b>Email Address</b>
<i>Environmental Protection Agency</i>				
Laura Buelow	UCR Site RPM	EPA R10	509-376-5466	beulow.laura@epa.gov
Dustan Bott	UCR Site RPM	EPA R10	206-553-5502	bott.dustan@epa.gov
Kathryn Cerise	RPM	EPA R8/10	206-553-2589	Cerise.kathryn@epa.gov
Donald M. Brown	Regional QA Manager	EPA R10	206-553-0717	brown.donaldm@epa.gov
Marc Stifelman	Human Health Risk Assessor	EPA R10	206-553-6979	stifelman.marc@epa.gov
Jennifer Crawford	Regional Sample Control Coordinator/QA Chemist	EPA R10	206-553-6261	crawford.jennifer@epa.gov
Don Matheny	QA Chemist	EPA R10	206-553-2599	Matheny.Don@epa.gov
<i>Consultant Team</i>				
Marilyn Gauthier	Technical Team Coordinator/Field Supervisor	CH2M	503-872-4800	Marilyn.gauthier@ch2m.com
TBD	Field Supervisor	CH2M		
Bill Thayer	Task Leader	SRC	315-452-8424	thayer@srcinc.com
David Hohreiter	SRC Program Manager	SRC	315-452-8892	dhohreiter@srcinc.com
Cameron Irvine	Task Safety Officer	CH2M	916-286-0475	Cameron.irvine@CH2m.com

(week of August 29)				
David Rasmussen (week of Sept 5)	Task Safety Officer	CH2M		
<i>TAI Team</i>				
Kris McCaig	Project Team Coordinator	TAI	509-623-4501	kris.mccaig@teck.com
John Toll	Technical Team Coordinator	Windward	206-812-5433	JohnT@windwardenv.com
Dave Enos	Analytical Chemistry Laboratory Coordinator	TAI	509-623-4505	dave.enos@teck.com
Rock Vitale	Task QA Coordinator	ESI	610-935-5577	rvitale@envstd.com
Randy O/Boyle	Database Administrator	Exponent	425-519-8727	robolye@exponent.com
Laboratory (ALS Environmental)				
Jeff Coronado	Laboratory Project Manager	ALS	360-501-3330	jeff.coronado@alsglobal.com
Carl Degner	Laboratory QA Manager	ALS	360-577-7222	carl.degner@alsglobal.com
Laboratory (Vista Analytical Services)				
Martha Maier	Laboratory Project Manager	Vista	916-673-1520 x101	mmaier@vista-analytical.com
Bahar Amiri	Laboratory QA Manager	Vista	916-673-1520 x103	bamiri@vista-analytical.com

**Table A-2. Target Analyte List, Method Detection and Reporting Limits, Analytical Concentration Goals, and Human Health Risk-Based Concentrations for Addendum No. 1 to the Quality Assurance Project Plan to the 2009 Fish Tissue Study.**

Analyte	2009 RBC <sup>a</sup>	Updated RBC <sup>b</sup>	MRL <sup>c</sup>	MDL <sup>c</sup>	ACG <sup>d</sup>
<i>Conventional Parameters</i>					
Total Length	NA <sup>e</sup>	NA	NA	NA	NA
Total Mass	NA	NA	NA	NA	NA
Percent Moisture	NA	NA	0.1	NA	0.1
Percent Lipids	NA	NA	0.1	NA	0.1
<i>Metals (mg/kg dry weight)</i>					
Aluminum	3.2	13.6	2	0.2	13.6
Antimony	0.0013	0.0056	0.05	0.002	0.05
Arsenic – Total	0.00048	0.00226	0.5	0.02	0.5
Arsenic – Total inorganic <sup>f</sup>	0.00048	0.00226	0.02	0.007	0.02
Barium	0.65	2.72	0.05	0.005	2.72
Beryllium	0.0065	0.0272	0.02	0.003	0.0272
Boron	0.65	2.72	2	0.2	2.72
Cadmium	0.0032	0.0136	0.02	0.002	0.02
Calcium	NA	NA	4	2	4
Chromium	4.9	20.32	0.2	0.02	20.32
Cobalt	0.065	0.004	0.02	0.003	0.02
Copper	0.13	0.56	0.1	0.02	0.56
Fluoride	0.19	0.56	1	0.2	1
Iron	2.3	9.6	1	0.2	9.6
Lead	NA	NA	0.02	0.0005	0.02
Magnesium	NA	NA	2	0.6	2
Manganese	0.45	1.88	0.05	0.008	1.88
Mercury	0.00024	0.001	0.001	0.00008	0.001
Molybdenum	0.016	0.068	0.05	0.008	0.068
Nickel	0.065	0.272	0.2	0.02	0.272
Potassium	NA	NA	20	9	20
Selenium	0.016	0.068	0.1	0.05	0.1
Silicon	NA	NA	20	4	20
Silver	0.016	0.068	0.02	0.006	0.068
Sodium	NA	NA	20	2	20
Sulfur	NA	NA	8	4	8
Thallium	0.00023	0.000136	0.02	0.0009	0.02
Tin	NA	8.12	0.05	0.003	8.12
Uranium	0.0097	0.008	0.02	0.0008	0.02
Vanadium	0.0032	0.068	0.2	0.007	0.2



Zinc	0.97	4.08	0.5	0.06	4.08
<b>Dioxin-Like Congeners (ng/kg-wet weight)</b>					
as toxic equivalents (TEQ) <sup>g</sup>	0.00048	0.00054	0.125 <sup>g</sup>	0.12825	0.125
<b>PCBs (µg/kg-wet weight)</b>					
Total PCBs <sup>h</sup>	0.036	0.0424	2.5	0.7	2.5
<b>Analyte</b>	<b>2009 RBC<sup>a</sup></b>	<b>Updated RBC<sup>b</sup></b>	<b>MRL<sup>c</sup></b>	<b>MDL<sup>c</sup></b>	<b>ACG<sup>d</sup></b>
<b>PBDEs (µg/kg-wet weight)</b>					
Total PBDEs <sup>i</sup>	NA	TBD <sup>j</sup>	NA	NA	TBD
2,2',4,4'-TetraBDE (BDE-47)	NA	0.339	0.025	0.014	0.339
2,2',4,4',5-PentaBDE (BDE-99)	NA	0.339	0.025	0.00168	0.339
2,2',4,4',5,5'-HexaBDE (BDE-153)	NA	0.68	0.025	0.004	0.68
Decabromodiphenyl ether (BDE-209)	NA	23.7	0.25	0.00575	23.7

<sup>a</sup>RBCs taken from Parametrix et al. (2009)

<sup>b</sup>RBCs were calculated for both adults and children who consume fish; when calculating the RBC, the human intake factor (HIF) was based on the child for non-cancer and the time-weighted average (TWA) for cancer. The lower of these values was then selected as the RBC. See Appendix E-1 for additional detail.

<sup>c</sup>MRLs and MDLs were taken from ALS Environmental in Kelso, WA (pers. comm. from Poyfair, August 2016). Values for dioxins, PCBs, and PBDEs were converted to wet weight values using 75% moisture for bony fishes, cited in EPA (1993), and the formula Wet Weight = Dry Weight x (Total Solids/100).

<sup>d</sup>ACGs represent the human health RBC unless the RBC is lower than the MRL. In that case, the MRL is used as the ACG. Shaded ACGs are different from those in the 2009 QAPP (Parametrix et al. 2009) due to either changes in laboratory MRLs, or updated RfDs

<sup>e</sup>NA = not available.

<sup>f</sup>Inorganic arsenic will be analyzed using EPA Method 1632.

<sup>g</sup>MRL, MDL, and ACG are for 2,3,7,8-tetrachlorodibenzodioxin (each dioxin congener will have a different MDL, based on its TEF). The current consensus TEF values for mammals (including humans) developed by a panel of experts assembled by the World Health Organization (Van den Berg *et al.* 2006 cited in "*Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds*" (U.S. EPA 2010a) will be used to evaluate the DL-congener data. Initial risk calculations will evaluate non-detects at ½ the DL. Non-detects may also be evaluated at the detection limit.

<sup>h</sup>RBCs for total PCBs are based on the toxicity value for Aroclor 1254<sup>®</sup> (see Appendix E of Parametrix et al. 2009). The MRL and MDL are the values for PCB Aroclors<sup>®</sup> from ALS Environmental in Kelso, WA (August 2016). All 209 PCB congeners will be analyzed; their MDLs are given in Table A-2.1. Dioxin-like and non-dioxin-like PCBs will be addressed as described in the 2009 HHRA work plan (USEPA 2009a). The individual congener data will be used by WDOH. The HHRA will use data for only those congeners with toxicity values.

<sup>i</sup>Total PBDE and the four PBDE congeners will be used by WDOH in their human health fish advisory for sturgeon.

<sup>j</sup>TBD = to be determined.

<b>Table A-2.1. Method Detection Limits for PCB Congeners.</b>		
	<b>Vista Tissue MDL<sup>2</sup></b>	<b>Example EDL<sup>3</sup></b>
		<b>Trout Fish Analysis</b>
<b>PCB Congener</b>	<b>(pg/g dw)<sup>4</sup></b>	<b>(pg/g dw)</b>
CL1-PCB-1	0.05	0.10
CL1-PCB-2	0.09	0.076
CL1-PCB-3	0.09	0.071
CL2-PCB-4	0.07	0.22
CL2-PCB-5	0.07	0.12
CL2-PCB-6	0.11	0.12
CL2-PCB-7	0.06	0.13
CL2-PCB-8	0.18	0.12
CL2-PCB-9	0.13	0.12
CL2-PCB-10	0.09	0.13
CL2-PCB-11	0.29	0.12
CL2-PCB-12/13	0.14	0.13
CL2-PCB-14	0.06	0.12
CL2-PCB-15	0.13	0.12
CL3-PCB-16	0.17	0.13
CL3-PCB-17	0.12	0.083
CL3-PCB-19	0.07	0.13
CL3-PCB-21/33	0.06	0.019
CL3-PCB-22	0.08	0.021
CL3-PCB-23	0.05	0.022
CL3-PCB-24	0.09	0.058
CL3-PCB-25	0.05	0.016
CL3-PCB-26/29	0.08	0.019
CL3-PCB-27	0.14	0.060
CL3-PCB-28/20	0.10	0.020
CL3-PCB-30/18	0.22	0.073
CL3-PCB-31	0.06	0.018
CL3-PCB-32	0.07	0.055
CL3-PCB-34	0.06	0.019
CL3-PCB-35	0.07	0.019
CL3-PCB-36	0.06	0.016
CL3-PCB-37	0.07	0.021
CL3-PCB-38	0.09	0.019
CL3-PCB-39	0.06	0.019
CL4-PCB-41/40/71	0.16	0.040
CL4-PCB-42	0.06	0.039

	Vista Tissue MDL <sup>2</sup>	Example EDL <sup>3</sup>
		Trout Fish Analysis
PCB Congener	(pg/g dw) <sup>4</sup>	(pg/g dw)
CL4-PCB-43	0.12	0.052
CL4-PCB-44/47/65	0.20	0.036
CL4-PCB-45/51	0.19	0.041
CL4-PCB-46	0.10	0.046
CL4-PCB-48	0.07	0.039
CL4-PCB-50/53	0.19	0.041
CL4-PCB-52	0.08	0.036
CL4-PCB-54	0.13	0.13
CL4-PCB-55	0.13	0.023
CL4-PCB-56	0.08	0.021
CL4-PCB-57	0.05	0.021
CL4-PCB-58	0.06	0.021
CL4-PCB-59/62/75	0.12	0.030
CL4-PCB-60	0.10	0.022
CL4-PCB-61/70/74/76	0.16	0.020
CL4-PCB-63	0.08	0.019
CL4-PCB-64	0.08	0.027
CL4-PCB-66	0.12	0.019
CL4-PCB-67	0.09	0.018
CL4-PCB-68	0.05	0.020
CL4-PCB-69/49	0.14	0.032
CL4-PCB-72	0.08	0.020
CL4-PCB-73	0.16	0.029
CL4-PCB-77	0.08	0.022
CL4-PCB-78	0.08	0.021
CL4-PCB-79	0.11	0.019
CL4-PCB-80	0.06	0.018
CL4-PCB-81	0.14	0.022
CL5-PCB-82	0.17	0.051
CL5-PCB-83/99	0.15	0.046
CL5-PCB-84	0.12	0.052
CL5-PCB-88/91	0.13	0.048
CL5-PCB-89	0.12	0.049
CL5-PCB-92	0.14	0.046
CL5-PCB-94	0.10	0.053
CL5-PCB-95	0.19	0.044
CL5-PCB-100/93/102/98	0.20	0.047
CL5-PCB-96	0.10	0.058

	Vista Tissue MDL <sup>2</sup>	Example EDL <sup>3</sup>
		Trout Fish Analysis
PCB Congener	(pg/g dw) <sup>4</sup>	(pg/g dw)
CL5-PCB-103	0.09	0.042
CL5-PCB-104	0.12	0.065
CL5-PCB-105	0.11	0.033
CL5-PCB-106	0.14	0.035
CL5-PCB-108/124	0.20	0.035
CL5-PCB-109/119/86/97/125/87	0.30	0.041
CL5-PCB-107	0.13	0.028
CL5-PCB-111	0.08	0.035
CL5-PCB-112	0.15	0.035
CL5-PCB-113/90/101	0.27	0.043
CL5-PCB-114	0.13	0.032
CL5-PCB-117/116/85/110/115	0.28	0.036
CL5-PCB-118	0.07	0.034
CL5-PCB-120	0.10	0.029
CL5-PCB-121	0.06	0.035
CL5-PCB-122	0.10	0.034
CL5-PCB-123	0.14	0.034
CL5-PCB-126	0.09	0.023
CL5-PCB-127	0.13	0.033
CL6-PCB-128/166	0.17	0.038
CL6-PCB-130	0.13	0.075
CL6-PCB-131	0.12	0.073
CL6-PCB-132	0.12	0.079
CL6-PCB-133	0.09	0.072
CL6-PCB-134/143	0.17	0.074
CL6-PCB-136	0.16	0.051
CL6-PCB-137/164	0.12	0.061
CL6-PCB-138/163/129	0.18	0.061
CL6-PCB-139/140	0.23	0.068
CL6-PCB-141	0.14	0.073
CL6-PCB-142	0.14	0.075
CL6-PCB-144	0.12	0.066
CL6-PCB-145	0.12	0.055
CL6-PCB-146	0.19	0.059
CL6-PCB-147/149	0.23	0.069
CL6-PCB-148	0.13	0.067
CL6-PCB-150	0.13	0.053
CL6-PCB-151/135	0.12	0.070
CL6-PCB-152	0.08	0.051

	Vista Tissue MDL <sup>2</sup>	Example EDL <sup>3</sup>
		Trout Fish Analysis
PCB Congener	(pg/g dw) <sup>4</sup>	(pg/g dw)
CL6-PCB-153/168	0.09	0.055
CL6-PCB-154	0.14	0.059
CL6-PCB-155	0.06	0.055
CL6-PCB-156/157	0.14	0.033
CL6-PCB-158	0.13	0.050
CL6-PCB-159	0.09	0.029
CL6-PCB-160	0.24	0.058
CL6-PCB-161	0.12	0.053
CL6-PCB-162	0.09	0.032
CL6-PCB-165	0.03	0.057
CL6-PCB-167	0.06	0.030
CL6-PCB-169	0.10	0.035
CL7-PCB-170	0.17	0.066
CL7-PCB-171/173	0.18	0.068
CL7-PCB-172	0.11	0.064
CL7-PCB-174	0.16	0.059
CL7-PCB-175	0.15	0.059
CL7-PCB-176	0.14	0.080
CL7-PCB-177	0.15	0.066
CL7-PCB-178	0.14	0.11
CL7-PCB-179	0.14	0.078
CL7-PCB-180/193	0.30	0.051
CL7-PCB-181	0.14	0.063
CL7-PCB-182	0.11	0.061
CL7-PCB-183	0.28	0.056
CL7-PCB-184	0.22	0.078
CL7-PCB-185	0.23	0.068
CL7-PCB-186	0.24	0.085
CL7-PCB-187	0.21	0.057
CL7-PCB-188	0.09	0.065
CL7-PCB-189	0.09	0.033
CL7-PCB-190	0.13	0.045
CL7-PCB-191	0.15	0.047
CL7-PCB-192	0.10	0.053
CL8-PCB-194	0.15	0.055
CL8-PCB-195	0.16	0.059
CL8-PCB-196	0.22	0.12
CL8-PCB-197	0.13	0.090

	Vista Tissue MDL <sup>2</sup>	Example EDL <sup>3</sup>
		Trout Fish Analysis
PCB Congener	(pg/g dw) <sup>4</sup>	(pg/g dw)
CL8-PCB-198/199	0.50	0.13
CL8-PCB-200	0.23	0.090
CL8-PCB-201	0.08	0.086
CL8-PCB-202	0.20	0.064
CL8-PCB-203	0.26	0.12
CL8-PCB-204	0.14	0.087
CL8-PCB-205	0.20	0.065
CL9-PCB-206	0.12	0.076
CL9-PCB-207	0.14	0.066
CL9-PCB-208	0.10	0.065
CL10-PCB-209	0.11	0.044
ALS MDL = ALS Method Detection Limit (August 2016)		
<sup>2</sup> Soxhlet extraction MDL based upon an 20g samples size and determined as per US 40CFR Pt 136 Appendix B		
<sup>3</sup> EDL = Estimated Detection Limit based upon 2.5:1 signal to noise on the actual sample extract injection from a 20g sample size.		
<sup>4</sup> Based upon a 40uL final volume and a 20g sample size		

**Table A-3. Recommended Methods for Analysis of Contaminants of Interest in Fish Tissue Samples**

Matrix	Analytical Group	Analytical and Preparation Method/SOP Reference	Description	Analytical Sample Volume	Containers (number, size and type)	Homogenized Sample Volume per container (need wet, dry or freeze dry basis)	Container after Homogenization	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (Preparation/ Analysis)
Fish Tissue	TAL Metals (plus mercury)	EPA Method 6010B	ICP-AES	30 g	Aluminum foil, resealable plastic bag	0.5 – 1 g freeze-dried tissue	2 4 oz. glass jars	Chemical: None Temperature: Frozen at - 20°C Light: None	Storage up to 1 year after freeze-drying Digestion and Analysis: 180 days except for mercury at 28 days
		/ALS Kelso SOP#: MET-TDIG / EPA Method 6020A	ICP-MS			0.5 – 1 g freeze-dried tissue			
		EPA Method 1631E	CV-AFS			0.5 – 0.6 g freeze-dried tissue			
		EPA 7742 (selenium)	Hydride AA			0.5 – 1 g freeze-dried tissue			
Fish Tissue	Inorganic Arsenic	EPA Method 1632A	HG-QFAAS	30 g	Aluminum foil, resealable plastic bag	0.5 g	2 4 oz. glass jars	Chemical: None Temperature: Frozen at - 20°C Light: None	Storage: up to several year Analysis: 28 days once defrosted
Fish Tissue	PCBs (Congeners )	EPA Method 1668A	HRGC/HRMS	30 g	Aluminum foil, resealable plastic bag	10 g	2 4 oz. glass jars	Chemical: None Temperature: Frozen at - 20°C Light: None	Storage: up to 1 year Analysis: no demonstrated holding time

Fish Tissue	Dioxins/ Furans	EPA Method 1613B	HRGC/HRMS	30 g	Aluminum foil, resealable plastic bag	10 g	2 4 oz. glass jars	Chemical: None Temperature: Frozen at - 20°C Light: None	Storage: up to 1 year Analysis: no demonstrated holding time
Fish Tissue	PBDEs	EPA Method 1614	HRGC/HRMS	30 g	Aluminum foil, resealable plastic bag	10 g	2 4 oz. glass jars	Chemical: None Temperature: Frozen at - 20°C Light: None	Storage: up to 1 year Analysis: no demonstrated holding time
Fish Tissue	% Lipids		Bligh-Dyer/ Gravimetric	30 g	Aluminum foil, resealable plastic bag			Chemical: None Temperature: Frozen at - 20°C Light: None	1 year
Fish Tissue	% Moisture		Freeze-dry/ Gravimetric	30 g	Aluminum foil, resealable plastic bag			Chemical: None Temperature: Frozen at - 20°C Light: None	1 year



FINAL

# Appendix A-1

## Field Sampling Plan - Upper Columbia River Sturgeon Tissue Study (Addendum No. 1 to the QAPP for the 2009 Fish Tissue Study)

*Prepared for*

EPA Region 10  
Seattle, Washington

September 2016



2020 SW 4<sup>th</sup> Ave, Suite 300  
Portland, OR 97201



# Contents

Section	Page
<b>1</b>	<b>Introduction .....1-1</b>
1.1	Overview ..... 1-1
1.2	Task Organization ..... 1-3
<b>2</b>	<b>SAMPLE COLLECTION AND PROCESSING PROCEDURES .....2-1</b>
2.1	FIELD SURVEY AND SAMPLING METHODS..... 2-1
2.1.1	Schedule..... 2-1
2.1.2	Sampling Location Positioning ..... 2-1
2.1.3	Field Equipment and Supplies..... 2-1
2.1.4	Fish Tissue Sampling ..... 2-2
2.1.5	Fish Tissue Processing..... 2-2
2.2	SAMPLE HANDLING..... 2-4
2.3	SAMPLE PACKAGING AND TRANSPORT ..... 2-5
2.4	STUDY-DERIVED WASTE..... 2-5
<b>3</b>	<b>FIELD DOCUMENTATION .....3-1</b>
3.1	FIELD LOGBOOK ..... 3-1
3.2	CHAIN-OF-CUSTODY PROCEDURES..... 3-2
<b>4</b>	<b>LABORATORY ANALYSES .....4-1</b>
4.1	OFFSITE SAMPLE PROCESSING..... 4-1
4.1.1	Sample Containers and Preservatives..... 4-1
4.1.2	Sample Processing Procedures ..... 4-1
4.2	LABORATORY QUALITY ASSURANCE PROCEDURES ..... 4-2
4.2.1	Sample Handling and Preservation ..... 4-3
4.2.2	Equipment Decontamination Procedures ..... 4-3
4.2.3	Containment and Disposal of Investigation-Derived Waste ..... 4-3
4.3	ANALYTICAL LABORATORY METHODS ..... 4-3
4.3.1	Laboratory Homogenate Replicates ..... 4-3
4.3.2	Analytical Quality Control Samples..... 4-3
<b>5</b>	<b>DATA MANAGEMENT AND REPORTING PROCEDURES .....5-1</b>
5.1	FIELD DATA..... 5-1
5.2	LABORATORY DATA..... 5-1
5.3	DATA REVIEW AND REPORTING SCHEDULE..... 5-1
<b>6</b>	<b>REFERENCES .....6-1</b>

## Contents - Continued

### **TABLES**

- 1 Contact Information
- 2 Target Analyte List, Method Detection and Reporting Limits, Analytical Concentration Goals, and Human Health Risk-Based Concentrations for Addendum No. 1 to the Quality Assurance Project Plan for the 2009 Fish Tissue Study
- 3 Number of Fish per Composite
- 4 Recommended Methods for Analysis of COIs in Fish Tissue Samples
- 5 Weights (g) of Individual Homogenates Required for Screening Study Composite Homogenate Sample

### **ATTACHMENTS**

- A1 Site Health and Safety Plan
- A2 Standard Operating Procedures
- A3 Field Forms

# 1 Introduction

This document presents the field sampling plan (FSP) for the addendum to the Upper Columbia River (UCR) Quality Assurance Project Plan (QAPP) for the 2009 fish tissue study (Parametrix et al. 2009). This study represents one of numerous tasks that will be conducted as part of the remedial investigation and feasibility study (RI/FS) for the UCR Site<sup>1</sup> as specified in the RI/FS Work Plan (USEPA 2008).

The primary objective of Addendum No. 1 to the 2009 fish tissue study is to collect information on the chemical concentrations in hatchery white sturgeon tissues in the UCR. During the study, chemicals of interest (COIs) data will be collected from hatchery white sturgeon of three size classes collected in the riverine and lacustrine segments of the UCR Site. This information will be used to support the human health risk assessment (HHRA) that will be conducted as part of the RI/FS.

## 1.1 Overview

The study area comprises the entire length of the UCR from the U.S.-Canadian border to the Grand Coulee Dam. In the RI/FS Work Plan (USEPA 2008) and the Fish Sample Collection Areas (FSCAs) used by EPA in 2005 (USEPA 2007), the Site was divided into six reaches for the 2009 sampling effort:

- Reach 1 (U.S.-Canadian Border at River Mile [RM] 745 to RM 730) – riverine
- Reach 2 (RM 730 to RM 712) – transitional (riverine to lacustrine)
- Reach 3 (RM 712 to RM 700) – Marcus Flats (transitional [riverine to lacustrine])
- Reach 4 (RM 700 to RM 640) – lacustrine
- Reach 5 (RM 640 to RM 617) – lacustrine
- Reach 6 (RM 617 to Grand Coulee Dam near RM 596) – lacustrine.

In the current sturgeon sampling effort, hatchery white sturgeon will be collected in the UCR by the Lake Roosevelt Fisheries Co-Managers (The Confederated Tribes of the Colville Reservation [CCT], Spokane Tribe of Indians [STI], and the Washington Department of Fish and Wildlife [WDFW]). Sampling will occur in the summer of 2016 in River Reaches 1 through 4 of the UCR as part of a population stock assessment. As part of this effort hatchery white sturgeon will be euthanized for research purposes. Data from this opportunistic sampling event may be used for the following: 1) to provide information to the HHRA to determine whether contaminants in hatchery white sturgeon tissue in the UCR Site pose an unacceptable risk to human health; and 2) to provide data required by WDOH to evaluate the need for a fish advisory for sturgeon.

These fish will be collected in areas extending from Inchelium/Gifford to the U.S.-Canadian border, which is where the vast majority of hatchery white sturgeon are distributed, according to the Annual Assessment of hatchery kokanee and sonic-tracking of wild and hatchery kokanee in Lake Roosevelt: 2011 Annual Report (cited in Environment International [EI] 2016). Hatchery white sturgeon are most abundant between Northport and Rickey Point, while abundance decreases between Inchelium and French Rocks and north of Northport, except in isolated pockets (SRC 2016b). Telemetry data show some sturgeon move substantially among the river reaches (SRC, 2016a) and indicate a lot of variability

---

<sup>1</sup> The Site is located wholly within Washington State and includes the portion of the UCR extending from the U.S.-Canadian border to Grand Coulee Dam, including Franklin D. Roosevelt Lake (Lake Roosevelt), and the areal extent of related contamination within the United States adjacent to the UCR.

in the range of movement among the sturgeon. Therefore, composite samples will not be collected separately by river reach, as was done in the 2009 sampling effort (Parametrix, 2009).

During the summer 2016 sampling effort<sup>2</sup> (set lining is scheduled to start August 22, 2016 and fish collection is scheduled to start August 30, 2016 and run from Tuesday through Friday for 4 consecutive weeks), sturgeon will be set aside for tissue analysis for use in the HHRA as described further below. The target is to collect 72 individual for 9 composite samples, such that there are three composites of eight fish for each of three sizes ranges (i.e., 50-97 cm, 98-137 cm, and 138-160 cm.) The timing of the summer 2016 sampling event is consistent with the timing of the 2005 and 2009 sampling events (USEPA 2007, Exponent and Parametrix 2013). The start date for the 2016 sturgeon tissue collection is anticipated that sampling will occur in late August to September of 2016.

The following groups of analytes will be analyzed in fish tissue samples:

- Common Target Analyte List (TAL) metals/metalloids identified in the 2009 HHRA work plan (USEPA 2009)
- Total inorganic arsenic and total arsenic
- Polychlorinated dibenzo-p-dioxins and furans (i.e., 17 dioxin-like congeners [USEPA 2010])
- Polychlorinated biphenyls (PCBs) (PCB congeners [209 forms]) and total PCBs (dioxin-like and non-dioxin-like PCBs will be addressed as described in the 2009 HHRA work plan [USEPA 2009])
- Polybrominated diphenylethers (PBDEs) (total PBDEs, BDE-47, BDE-99, BDE-153, and BDE-209).

This FSP describes the field and laboratory methods that will be used to collect hatchery white sturgeon tissues for Addendum No. 1 to the 2009 fish tissue study. The background, rationale, data quality objectives (DQOs), and overall study design for this study are described in detail in the QAPP addendum. Sections 2 and 3 of this FSP describe the field procedures that will be followed by the technical team during the field study. Section 4 summarizes the laboratory analyses that are described in greater detail in the QAPP addendum. Section 5 provides information on data management procedures. References cited in this document are listed in Section 6.

The following documents are provided as attachments to this FSP:

- **Site Health and Safety Plan (SHSP) Addendum.** This document describes the specific requirements and procedures that will be implemented to minimize the safety risk to personnel who carry out the field study program (Attachment A1). It is an addendum to the project general SHSP (TCAI 2007b).
- **Standard Operating Procedures (SOPs).** The SOPs describe the procedures that will be used to collect fish tissue (Attachment A2 of this addendum). These are revised versions of the 2009 fish tissue study SOPs (Parametrix et al. 2009).
  - SOP-1 – Sample Labeling
  - SOP-2 – Sample Processing for Target Fish Species
  - SOP-3 – Sample Storage, Packing and Shipping
  - SOP-4 – Field Documentation
  - SOP-5 – Sample Custody.

---

<sup>2</sup> The full protocol is available at: <https://www.monitoringresources.org/Document/Protocol/Details/573>

- **Field Forms.** This attachment contains examples of various forms that will be used during field sampling: fish collection, processing, and external examination forms; a chain-of-custody (COC) form; and sample labeling forms (Attachment A3).

## 1.2 Task Organization

The organizational structure for activities associated with the study is described below (see Table 1 for contact information).

**EPA Project Managers** – Dr. Laura Buelow, Dustan Bott, and Katheryn Cerise are responsible for ensuring that the work performed is consistent with all applicable EPA guidance. The project managers will oversee sample processing by EPA’s contractor, CH2M, and will coordinate comments on planning documents and reports by U.S. Department of the Interior, Washington State Department of Ecology (Ecology), local tribes (i.e., the CCT and STI), and Teck American Incorporated (TAI). In addition EPA, under Section 106 of the National Historic Preservation Act, has the primary responsibility for consulting with interested parties.

**EPA Quality Assurance Manager** - . The EPA Region 10 quality assurance (QA) manager is Donald M. Brown. The responsibilities of the QA manager or QA designee will include review and approval of this QAPP addendum.

**Senior Technical Advisor(s)**—Marc Stifelman (EPA Region 10) and David Hohreiter (SRC) are senior technical advisors for Addendum No. 1 to the 2009 fish tissue study, and are responsible for providing technical oversight in the design and implementation of the study, and ensuring that it meets the objectives of the RI/FS.

**Technical Team Coordinator**—Marilyn Gauthier (CH2M) is responsible for coordinating the tasks of all the team members to ensure that required activities are completed in sequence and on time. Ms. Gauthier will work closely with the task leader, TAI, and EPA QA to ensure that all requirements are met and study objectives achieved.

**Task Leader**—Bill Thayer (SRC) is the TL and is responsible for conducting Addendum No. 1 to the 2009 fish tissue study. Mr. Thayer will work closely with the technical team coordinator, senior technical advisor, and the task QA coordinator to ensure that the objectives of the study are achieved.

**Principal Investigator**— Dr. Frank Dillon (CH2M) will serve as principal investigator overseeing all project activities once fish are received from the sampling team. Dr. Dillon will review QA reports, approve final project QA needs, and authorize necessary actions and adjustments needed to accomplish program QA objectives.

**Lake Roosevelt Fisheries Co-Managers Sturgeon Sampling** – Jason McClellan of the CCT will lead sturgeon sampling efforts and provide fish to EPA’s contractor, CH2M, for processing.

**Sample Processing Field Team Leader/ Site Safety Coordinator** – Cameron Irvine will provide onsite supervision as needed to ensure that proper organism collection, preservation, storage, transport, and chain-of-custody (COC) procedures are followed. He is responsible for overseeing the planning and coordination of the sample processing activities to ensure that appropriate sampling, QA, and documentation procedures are used. He will inform the CH2M Principal Investigator and EPA if problems occur and will communicate and document any corrective actions taken. In the event that changes to this QAPP addendum are needed, the field team leader will ensure that proposed changes are coordinated with EPA’s project coordinators, its authorized representative(s) in the field, and TAI’s project coordinator.

**TAI's Project Coordinator** – Kris McCaig will serve as TAI's project coordinator and will have primary responsibility for TAI's coordination with EPA Project Managers and ensuring that laboratory analysis and reporting, and data validation activities meet all requirements and associated deliverables specified within the June 2, 2006 Settlement Agreement (USEPA 2006).

**TAI's Analytical Chemistry Laboratory Coordinator**— Dave Enos (TAI) will serve as the analytical chemistry laboratory coordinator. He will be responsible for ensuring that laboratory coordination is satisfactorily completed prior to the analysis of samples for this task; tracking the laboratories' progress; verifying that the laboratories have implemented the requirements of this FSP; addressing QA issues related to the laboratories' analyses; ensuring that the laboratories' capacities are sufficient to undertake the required analyses in a timely manner; and addressing scheduling issues related to laboratory analyses. Mr. Enos will report directly to TAI's project coordinator and will work closely with EPA's technical team coordinator.

**Laboratory Analyses** - ALS Environmental (ALS) will perform the sample processing and analyses. Jeff Coronado (ALS) and Martha Maier (Vista Analytical) are responsible for the successful and timely completion of sample analyses, as well as the following:

- Ensuring that samples are received and logged correctly, that the correct methods and modifications are used, and that data are reported within specified turnaround times
- Reviewing analytical data to ensure that procedures were followed as required in this QAPP, the cited methods, and laboratory standard operating procedures (SOPs)
- Apprising the laboratory coordinator of the schedule and status of sample analyses and data package preparation
- Notifying the analytical chemistry laboratory coordinator if problems occur in sample receiving, analysis, or scheduling, or if control limits cannot be met
- Taking appropriate corrective action as necessary
- Reporting data and supporting QA information as specified in this QAPP
- Providing electronic data deliverables (EDDs) in a format consistent and compatible with the UCR electronic database.



# 2 SAMPLE COLLECTION AND PROCESSING PROCEDURES

The following sections describe the detailed procedures and methods that will be used during implementation of Addendum No. 1 to the 2009 fish tissue study, including sampling procedures, record keeping, sample handling, storage, and field quality control procedures. Sample collection will be conducted by Lake Roosevelt Fisheries Co-Managers. Sample processing will be conducted by CH2M. Depending on field conditions, procedures specified in the referenced SOPs may be modified if necessary.

## 2.1 FIELD SURVEY AND SAMPLING METHODS

Hatchery white sturgeon will be collected by Lake Roosevelt Fisheries Co-Managers (CCT, STI, and WDFW) via set lining and whole sturgeon will be provided to CH2M for processing.

### 2.1.1 Schedule

Hatchery white sturgeon tissue sampling is planned by the Lake Roosevelt Fisheries Co-Managers to occur during August/September of 2016. Sturgeon from this sampling could be received for sample processing upon EPA approval of the QAPP Addendum / FSP, planned to occur in late August to early September, 2016. The protocol for the Lake Roosevelt Co-Manager sampling effort is available at <https://www.monitoringresources.org/Document/Protocol/Details/573>.

### 2.1.2 Sampling Location Positioning

The Lake Roosevelt Co-Manager sampling team will record the global positioning system (GPS) coordinates (latitude and longitude) and water depth measurement (to the nearest 0.5 meter) at where fish are collected (i.e., point coordinates for set lines). However, it is understood that location of collection may not necessarily correlate with exposure area (some sturgeon cover large areas, while others stay in the same area).

It is anticipated that fish collection will occur in areas extending from Inchelium/Gifford to the U.S.-Canadian border and GPS coordinates will be recorded at each fish tissue collection location.

### 2.1.3 Field Equipment and Supplies

Field equipment and supplies for CH2M fish processing team include fish filleting equipment, decontamination supplies, sample containers, coolers, shipping containers, logbooks and forms, personal protection equipment, and personal gear. Protective wear (e.g., gloves) is required to minimize the possibility of cross-contamination between sampling locations.

Sample containers will be clearly labeled at the time the tissue samples are taken from the caught hatchery sturgeon. Labels will include the task name, sample location and number, CH2M sampler's initials, analyses to be performed, and sample date and time. Sample labeling procedures are provided in SOP-1 and an example sample label is provided in Attachment A3.

## 2.1.4 Fish Tissue Sampling

Fish tissue will be collected in Reaches 1 through 4 of the UCR as part of a population stock assessment. Each field sampling team will have the necessary knowledge and experience to perform all field activities. This will include experience in the collection of fish, the use of the specified sampling gear, and operation of small boats.

Hatchery white sturgeon will be collected live on baited set lines placed using a spatially balanced random sampling strategy (SRC 2016b).

## 2.1.5 Fish Tissue Processing

Fish processing procedures are described below and in detail in SOPs 1, 2, and 3.

### 2.1.5.1 Fish Target Sizes

Hatchery white sturgeon from brood years 2001-2010, expected to be abundant throughout the UCR, will be targeted for tissue collection. The estimated length will range from about 50 to 160 cm fork length [FL] [20-63 inches] (EI 2016). Approximately 700 fish are expected to be captured during the fall 2016 collection effort (based on recent white sturgeon surveys), a subset of which will be given to EPA for analysis. Based on past sampling efforts, wild fish typically represent 5 to 10 percent of the total catch. Only hatchery fish will be retained for possible tissue sample collection.

Even though compositing of sturgeon is not necessary to achieve the mass of tissue required for analysis due to its large size (DOE 2008), sturgeon will be composited to increase the likelihood of producing data with sufficiently low variability. EPA will request 72 hatchery white sturgeon from the Lake Roosevelt Monitoring Program [LRMP] (the minimum requested is 72). This recommended minimum number of samples will be sufficient to increase the number of fish per composite from 5 (per the 2009 sampling event) to 8 fish (resulting in 9 composite samples of 8 fish each). The increase to 8 fish per composite is anticipated to reduce variability among the sturgeon composite data, relative to the 2009 data, and therefore to increase reliability of the UCL95 estimates. The 9 composite samples will be comprised of fish greater than 20 inches in fork length, based on the current sturgeon fisheries downriver (Washington Fish and Wildlife [WFW] 2016). Fish caught that do not fall within target species or length ranges will be returned to the water.

Sturgeon tissue composites will be grouped based on three fish sizes: 50-97 cm, 98-137 cm, and 138-160 cm. Table 3 shows the number of composite samples per size range.

### 2.1.5.2 Fish Collection Location

The Lake Roosevelt Co-Manager sampling team will record the GPS coordinates (latitude and longitude) and water depth measurement (to the nearest 0.5 meter) at where fish are collected (i.e., point coordinates for set lines). However, it is understood that location of collection may not necessarily correlate with exposure area (some sturgeon cover large areas, while others stay in the same area). Because of this, fish will not be composited based on location of collection.

### 2.1.5.3 Sample Handling

Hatchery white sturgeon will be measured by the Lake Roosevelt Fisheries Co-Managers with a measuring board and scale to obtain gross length and weight measurements. Fish will be scanned with a PIT tag reader to determine the brood year. The fish selected for tissue sampling will then be euthanized by the Lake Roosevelt Fisheries Co-Managers and be marked with a waterproof tag. The tag will be either placed in a bag within a resealable plastic bag with the fish or (if necessary) physically

attached to the fish with a cable tie. A sequential numerical coding system will be used for the fish (see Section 2.1.5.4). Tagged fish will be transferred to CH2M for tissue sample processing. The Lake Roosevelt Fisheries Co-Managers will provide CH2M with the PIT tag ID, fish brood year, length and weight at the time the fish is transferred.

#### 2.1.5.4 Individual Fish and Composite Sample Numbering

Individual fish will be identified with the letters “EPA”, a species abbreviation, brood year, a sequential number, and composite bin/replicate identifier (ID) (e.g., EPA-HS-01-001-A1). The codes will include the following information:

Species abbreviation for the hatchery sturgeon will be HS:

- Hatchery sturgeon = HS

Brood year designations will be as follows:

- 2001 – 01
- 2002 – 02
- 2003 - 03
- 2004 – 04
- 2005 – 05
- 2006 – 06
- 2007 – 07
- 2008 – 08
- 2009 – 09
- 2010 - 10

Sequential fish numbers will be expressed as three digits starting with 001 (e.g., 001 or 002).

Composite bins will be:

- A = 50-97cm
- B = 98-137cm
- C = 138-160cm

With sequential numbering for the replicates (i.e., 1-3)

Therefore the example EPA-HS-01-001-A1 would be a hatchery sturgeon, it is from the 2001 brood year, the first fish that was processed and it belongs in the first replicate of the 50-97cm size bin.

Composite sample identification (ID) will be numbered sequentially beginning with the letters “EPA”, species abbreviation, and composite bin/replicate (e.g., EPA-HS-A1). The codes will include the following information:

Species abbreviation for the hatchery sturgeon will be HS:

- Hatchery sturgeon = HS

Composite bins will be:

- A = 50-97cm
- B = 98-137cm
- C = 138-160cm

With sequential numbering for the replicates (i.e., 1-3)

#### 2.1.5.5 Sample Processing

All processing will be performed on the boat provided by the National Parks Service. The processing boat will travel to shore and fish processing will be conducted on the boat while beached to provide a stable platform. The tagged fish will be held in a Lexan bin with site water prior to processing.

Fish will be photographed and examined for external abnormalities, filleted with skin removed, and 200 g (+/- 20 g) of fillet will be shipped to the laboratory on ice for compositing and chemical analysis. Fillets will be processed according to SOP-2.

#### 2.1.5.6 Equipment Decontamination Procedures

The field team will thoroughly rinse all sampling equipment that comes into contact with either fish or bottom sediments between stations and upon completion of the study. Rinsing will be done using lake water away from the shoreline and any areas where sediment has been disturbed. Field equipment used for processing the fish on board will be washed with soap (i.e., Alconox™) and rinsed with lake water at the boat launches after each use. Cleanroom 100 certified nitrile gloves used for handling fish in the field and onshore will be discarded, not decontaminated. Clean gloves will be worn at each sampling location to avoid transfer of potential contaminants among samples.

#### 2.1.5.7 Analyses

The suite of chemicals that will be analyzed in fish tissues will include conventional parameters (total length and mass, percent moisture, percent lipid), common TAL metals/metalloids identified as COIs in the 2009 HHRA work plan (USEPA 2009), total inorganic arsenic and total arsenic, polychlorinated dibenzo-p-dioxins and furans (i.e., 17 dioxin-like congeners [USEPA 2010]), PCBs (PCB congeners [209 forms]) and total PCBs (dioxin-like and non-dioxin-like PCBs), and PBDEs (total PBDEs, BDE-47, BDE-99, BDE-153, and BDE-209).

## 2.2 SAMPLE HANDLING

This section describes procedures for handling samples prior to shipping to the analytical laboratory (see SOP-3 in Attachment A2). Planning and documentation of all activities are emphasized to ensure that sample identity and integrity are preserved during all stages of the field operation. The following documentation will be provided with the tissue samples:

- A field record form that contains information about each fish and sampling area
- A sample identification label that accompanies and identifies each individual fish
- A COC form that provides continuous tracking information for all samples
- A COC label that seals each shipping container.

The following information will be handwritten on the sample label at the time of collection with an indelible marker:

- Reach
- Composite fish sample number
- Individual fish sample number(s)
- Analysis
- Samplers

- Date
- Time

If necessary, corrections will be made on the sample labels by drawing a single line through the error and entering the correct information with an indelible marker. All corrections will be initialed and dated by the person performing the correction. If possible, the individual who made the error will correct it.

The sample labels will be placed inside resealable plastic bags and inserted with each foil- wrapped fillet inside a large resealable plastic bag. When the individual fillets are wrapped for shipment, this sample label will remain with the specimen. Sample packaging is discussed in the following section.

## 2.3 SAMPLE PACKAGING AND TRANSPORT

After completing each day of fish tissue sampling, the sampling vessel will return to the boat launch and the field crew will prepare the fillets for shipment to the processing laboratory.

Sturdy plastic coolers will be used as shipping containers. Enough sample will be placed in each cooler to occupy no more than 60 to 70 percent of the cooler volume, and the remaining space in the cooler will be filled with dry ice. Enough dry ice will be used to keep the samples frozen for at least 48 hours. A completed COC form and copies of the field record forms for the samples will be included in each cooler. Both forms are presented in Attachment A3.

After each cooler is packed with fish samples and dry ice, it will be secured at both ends with nylon strapping tape and the following items will be attached:

- Address label for processing laboratory
- Two custody seals

A courier will receive samples at the end of the work week and deliver the samples to the processing lab the next day. With fish collection and processing occurring Tuesday through Friday there will be a maximum of 72 hours after the first sample collection before courier pickup and 96 hours until delivery to the lab.

## 2.4 STUDY-DERIVED WASTE

All disposable materials used for sample collection and processing, such as paper towels and gloves, will be placed in heavyweight garbage bags or other appropriate containers. Disposable supplies will be removed from the site by sampling personnel and placed in a normal refuse container for disposal at a solid waste landfill. The remainder of the fish and unused portion of the fillet will be returned to the reservoir and submerged by puncturing the swim bladder.

Measurement, examination, and dissection equipment will be decontaminated every time a composite set for a species and size group is processed. Liquid wastes such as nitric acid and methanol are expected to be generated in the field during fish processing. All solvent wastes will be stored in containers and disposed at an off-site facility. Acid waste will be neutralized and disposed locally.



# 3 FIELD DOCUMENTATION

The integrity of each sample from the time of collection to the point of data reporting must be maintained. Proper record-keeping and COC procedures will be implemented to allow samples to be traced from collection to final disposition. Representative photographs will be taken of each type of sampling activity performed during the fish tissue study. Site photographs from various angles and views of the sampling locations will also be collected.

## 3.1 FIELD LOGBOOK

All field activities and observations will be noted in a field logbook. The field logbook will be a bound document containing individual field and sample log forms. Information will include personnel, date, time, station designation, sampler, types of samples collected, and general observations. Any changes that occur during sampling (e.g., personnel, responsibilities, deviations from the FSP) and the reasons for these changes will be documented in the field logbook and communicated to EPA as soon as practical for review and approval. The logbook will identify onsite visitors (if any) and the number of photographs taken at each sampling location. The field supervisor is responsible for ensuring that the field logbook and all field data forms are correct. Requirements for logbook entries will include the following:

- Logbooks will be bound, with consecutively numbered pages.
- Removal of any pages, even if illegible, will be prohibited.
- Entries will be made legibly with black (or dark) waterproof ink.
- Unbiased, accurate language will be used.
- Entries will be made while activities are in progress or as soon afterward as possible (the date and time that the notation is made should be noted, as well as the time of the observation itself).
- Each consecutive day's first entry will be made on a new, blank page.
- The date and time, based on a 24-hour clock (e.g., 0900 a.m. for 9 a.m. and 2100 for 9 p.m.), will appear on each page.
- When field activity is complete, the logbook will be entered into the team project file.

In addition to the preceding requirements, the person recording the information must initial and date each page of the field logbook. If more than one individual makes entries on the same page, each recorder must initial and date each entry. The bottom of the page must be signed and dated by the individual who makes the last entry. The field supervisor, after reading the day's entries, also must sign and date the last page of each daily entry in the field logbook.

Logbook corrections will be made by drawing a single line through the original entry, allowing the original entry to be read. The corrected entry will be written alongside the original. Corrections will be initialed and dated and may require a footnote for explanation.

The type of information that may be included in the field logbook and/or field data forms includes the following:

- Task name, task location, and task number
- Task start date and end date

- Weather conditions
- Name of person making entries and other field staff
- Onsite visitors, if any
- Sampling vessel, if any
- Sample location
- Date and collection time of each sample
- The sampling location name, date, gear, water depth, and sampling location coordinates derived from GPS
- PIT tag ID, length, weight, brood year.
- Specific information on each type of sampling activity
- Observations made during sample collection, including weather conditions, complications, and other details associated with the sampling effort
- Number of photographs taken at each sampling location
- A record of site health and safety meetings, updates, and related monitoring
- Any deviation from the FSP and reasons for deviation.

In addition, a sampling location map will be updated during sampling and will be maintained throughout the sampling event. All logbooks must be completed at the time any observations are made. Copies of all logbooks and forms will be retained by EPA and its technical team.

## 3.2 CHAIN-OF-CUSTODY PROCEDURES

Samples are in custody if they are in the custodian's view, stored in a secure place with restricted access, or placed in a container secured with custody seals. A COC record will be signed by each person who has custody of the samples and will accompany the samples at all times. Copies of the COC will be included in laboratory and quality assurance/quality control (QA/QC) reports. Attachment A3 of the main QAPP contains an example of the COC form that will be used during the 2009 fish tissue study.

Samples must be accompanied by a chain-of-custody record generated using Scribe sample management software. When transferring samples, the individuals relinquishing and receiving the samples should sign, date, and note the time on the record. This record documents custody transfer from the sampler, often through another person, to the analyst at the laboratory. In addition, the COC XML file must be uploaded to the SMO portal for CLP samples. The COC XML and required XLS file must be submitted to the R10 RSCC on the day of shipment for all samples with shipment notification information.

Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis with a separate chain-of-custody record accompanying each shipping container (one for each field laboratory, and one for samples driven to the laboratory). Courier names and other pertinent information are entered in the "Received by" section of the chain-of-custody record.

All shipments will be accompanied by the chain-of-custody record identifying its contents. The original record and one copy will accompany the shipment to the laboratory, and a second copy will be retained by the PM.

Freight bills, postal service receipts, and bills of lading will be retained as part of the permanent documentation.



ALS will designate a sample custodian who will be responsible for receiving samples and documenting their progress through the laboratory analytical process. The sample custodian for each laboratory will establish the integrity of the custody seals upon sample arrival at the laboratory. The laboratory sample custodian will also ensure that the COC and sample tracking forms are properly completed, signed, dated and initialed upon receipt of the samples.

Upon receipt, the laboratory sample custodian will inventory the tissues by comparing labels (numbers and tags) to those on the COC document. If sample temperature falls below acceptable range (i.e.,  $< 0^{\circ}\text{C}$  indicating the tissues have thawed), the EPA project manager, CH2M field team leader, and TAI's lab coordinator must be alerted immediately. The custodian will enter the sample number into a laboratory tracking system by task code and sample designation. The custodian will assign a laboratory identifier to each fillet and will be responsible for distributing the samples to the appropriate analyst and for storing samples at the correct temperature in an appropriate secure area.

Tissues will be submitted to the lab in the order they are collected and not grouped by composite sample. Once all tissues have been received, the laboratory will pool the tissues comprising each composite sample. This will be achieved using information provided by the field team on sample labels and the COC (i.e., fish and sample identification numbers).



## 4 LABORATORY ANALYSES

This section describes the general offsite sample processing and laboratory analyses to be performed by the contract laboratory. The details provided below are subject to change once the final QAPP Addendum and FSP have been reviewed by EPA and the contract laboratory QA manager.

### 4.1 OFFSITE SAMPLE PROCESSING

Fish tissue will be shipped from the field to the offsite processing laboratory (ALS; Kelso, WA). The processing laboratory will prepare homogenized tissue samples from composited fillets and, if at a different location than the analytical laboratory, will then ship the samples to analytical laboratories for chemical analysis. This section describes the procedures that will be followed for these activities.

#### 4.1.1 Sample Containers and Preservatives

EPA (USEPA 2000) describes container materials that are suitable for storing homogenized fish tissue samples. Borosilicate glass, quartz, and polytetrafluoroethylene (PTFE, or Teflon) are suitable materials for the suite of target analytes for this study (mercury, other metals, organics, and lipids). Pre-cleaned and certified glass jars with Teflon-lined lids will be used. EPA (USEPA 2000) recommends that homogenized fish tissue samples be stored frozen at  $-20$  degrees Celsius ( $^{\circ}\text{C}$ ) or lower. This recommendation will be followed for this investigation. The maximum holding time for a sample depends on the target analyte. Holding times will also be a consideration for future analysis of archived sample aliquots (Table 4).

#### 4.1.2 Sample Processing Procedures

This section describes the procedures and equipment that will be used to create composite fillet samples.

##### 4.1.2.1 Operations Schedule and Personnel

The work will be conducted in a timely manner so that subsequent analytical work can be completed within the maximum holding times (e.g., 6 months to 1 year). Homogenization and containerization will be done within three months of receipt of the frozen samples.

##### 4.1.2.2 Processing Equipment

Equipment that will be used to homogenize samples includes pre-cleaned glass or stainless-steel homogenization containers, an automatic grinder (a high speed blender or homogenizer is sufficient), aliquot containers (pre-cleaned glass jar with Teflon-lined lid), a freezer capable of storing all samples at less than  $-20^{\circ}\text{C}$ .

##### 4.1.2.3 Processing Procedures

All homogenization of fish samples will be conducted in the offsite processing laboratory, not in the field. As described in Section 2.3, samples will be shipped from the onshore processing station to the offsite processing laboratory within 72 hours of collection for next-day delivery. Processing procedures in the offsite laboratory will follow the general guidance in USEPA (2000).

#### 4.1.2.4 Initial Procedures for Homogenization

Composite homogenization will be conducted according to EPA's Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 1 (USEPA 2000). Composite homogenates should be prepared from equal weights of individual homogenates. The same type of individual homogenate (i.e., either single fillet or combined fillet) will be used in a given composite sample. If individual homogenates have been frozen, they should be thawed partially and rehomogenized prior to weighing and compositing. Any associated liquid should be kept as a part of the sample. The weight of each individual homogenate used in the composite homogenate should be recorded, to the nearest gram, on the sample processing record.

Each composite homogenate should be ground and homogenized using an automatic grinder or high-speed blender or homogenizer. Large fillets may be cut into 2.5-cm cubes with high-quality stainless steel or titanium knives or with a food service band saw prior to homogenization. Parts of the blender or homogenizer used to grind the tissue (i.e., blades, probes) should be made of tantalum or titanium rather than stainless steel. Stainless steel blades and/or probes have been found to be a potential source of nickel and chromium contamination (due to abrasion at high speeds) and should be avoided. Grinding and homogenization of tissue is easier when it is partially frozen (Stober, 1991). The fillet sample should be ground until it appears to be homogeneous. The ground sample should then be divided into quarters, opposite quarters mixed together by hand, and the two halves mixed together. The grinding, quartering, and hand-mixing steps should be repeated at least two more times. If chunks of tissue are present at this point, the grinding and homogenization should be repeated. No chunks of tissue or skin should remain in the sample homogenate because these may not be extracted or digested efficiently and could bias the analytical results.

The composite homogenate may be processed immediately for analysis or frozen and stored at -20 °C (see Table 4). If processed immediately, the remainder of each individual homogenate should be archived at -20 °C with the designation "Archive" and the expiration date recorded on the sample label.

The location of the archived samples should be indicated on the sample processing record. It is essential that the weights of individual homogenates yield a composite homogenate of adequate size to perform all necessary analyses. Weights of individual homogenates required for a composite homogenate, based on the number of fish per composite and the weight of composite homogenate recommended for analyses of all screening study target analytes are given in Table 5.

A minimum sample size of 200 g for screening studies generally provides sufficient sample material to (1) analyze for all recommended target analytes at appropriate detection limits; (2) meet minimum QC requirements for the analyses of laboratory duplicate, matrix spike, and matrix spike duplicate samples; and (3) allow for reanalysis if the QC control limits are not met or if the sample is lost (USPEA 2000). This sampling will provide 200 g of tissue per fish and 1600 g of tissue per composite sample, which is more than sufficient for analysis.

## 4.2 LABORATORY QUALITY ASSURANCE PROCEDURES

QA procedures will be followed in the fish processing through record keeping and documenting procedures for processing of all individuals. Specific measures will include maintaining laboratory logs and data sheets, using standard data collection forms, and developing routine procedures, as discussed in this document, to assess the accuracy and completeness of records.

#### 4.2.1 Sample Handling and Preservation

The tissue samples will be stored according to the methods protocols. COC procedures will be followed when the samples are shipped from the processing laboratory to other laboratories for chemical analysis. Sturdy shipping coolers with dry ice will be used for overnight shipping.

#### 4.2.2 Equipment Decontamination Procedures

The tissue samples for this study will be analyzed for both organics and metals, including mercury. Prior to preparing each sample, utensils and containers will be cleaned thoroughly with a detergent solution; rinsed with tap water; rinsed with 20 percent trace-metal-grade nitric acid (HNO<sub>3</sub>) and with trace-metal-free and organics-free deionized water, and solvent rinsed with methanol and hexane. Stainless-steel parts will be cleaned using this procedure, but without the acid rinse (USEPA 2000).

#### 4.2.3 Containment and Disposal of Investigation-Derived Waste

Waste materials generated during preparation of the fish tissue homogenates will be disposed of according to the SOPs of the offsite processing laboratory.

### 4.3 ANALYTICAL LABORATORY METHODS

Project analytes, methods, risk based concentrations, and required quantitation limits are listed in Table 2. The analyses for target analytes will be performed in accordance with the project QAPP Addendum and laboratory SOPs. The analyses will be subject to quality control (QC) requirements specified in Section 4.3.2. For fish analyses, the analytical/laboratory reporting limits are laboratory specific. The laboratories will target the needed levels shown in Table 2 and will report detection levels on a sample/analyte-specific basis. The selected methods will be state of the art and only the methods that are practicable for this study will be used. For reporting limits that are above the levels in Table 2, the project team may use the laboratory-specific method detection limits (MDLs), which are expected to be significantly lower than the reporting levels.

#### 4.3.1 Laboratory Homogenate Replicates

One well-homogenized sample prepared in the laboratory will be used to produce triplicate samples for QA of the homogenization. These replicates primarily provide information about the uniformity of the homogenization procedure, but also provide information about the precision of the analysis.

#### 4.3.2 Analytical Quality Control Samples

The laboratories that analyze the samples will evaluate analytical accuracy by conducting matrix spike/matrix spike duplicate (MS/MSD) analyses on approximately 1 in 20 (or 1 per analytical batch, whichever is more frequent) of the samples and by analyzing certified reference materials. Precision will be evaluated by analyzing spike or laboratory sample duplicates. In addition, the laboratory will analyze reagent blanks to assess the magnitude of any incidental contamination that potentially may bias the results.



# 5 DATA MANAGEMENT AND REPORTING PROCEDURES

During field, laboratory, and data evaluation operations, effective data management is critical to providing consistent, accurate, and defensible data and data products. Data management and reporting are discussed in the following sections.

## 5.1 FIELD DATA

Daily field records (a combination of field logbooks, field electronic GPS files, field forms, photos, and COC forms) will make up the main documentation for field activities. Upon completion of sampling, field notes, forms, and COC forms will be scanned to create an electronic record for use in creating the field data report.

Field data will be manually entered into Excel tables and provided to TAI for upload to the project database. One hundred percent of the transferred data will be verified based on hard copy records. Electronic QA checks to identify anomalous values will also be conducted following entry.

## 5.2 LABORATORY DATA

The contract laboratory will submit data in both electronic and hard-copy format as described in Section A11.2 of the QAPP. The laboratory project managers for the respective testing laboratories will contact each of their respective laboratory QA managers prior to data delivery to discuss specific format requirements. Written documentation will also be used to clarify how field replicate and split samples, and laboratory duplicates and QA/QC samples were recorded in the data tables, and to provide explanations of other issues that may arise. The data management task will include keeping accurate records of field and laboratory QA/QC samples so that EPA technical team personnel who use the data will have appropriate documentation. Data management files will be stored on a secure computer or on a removable hard drive that can be secured.

In addition to placing all data and identifiers in an electronic database, hard copies of all original analytical data or study records will be placed in a filing system. Each analytical data set (or supporting laboratory document) will be given a unique documentation code based on the original source of the data or information, and filed based on that code. A master list of all filed documents, sorted in order by filing code, will be maintained for easy retrieval from the document library.

## 5.3 DATA REVIEW AND REPORTING SCHEDULE

Draft data validation reports will be prepared by an independent validator following receipt of the complete laboratory data package for each round of sampling. Validated data will be provided electronically to EPA within 90 days of receipt of the final samples at the lab. A field sampling report will be prepared by CH2M and submitted to EPA with the data validation reports. The field sampling report will include an overview of the field event, a station location map, sample collection methods used, rationale for any deviations from the FSP and QAPP Addendum, and if appropriate, recommendations for changes to the sampling design for upcoming surveys. Sample results will be reported in tabular format in the field sampling report. A final data summary report will be prepared by TAI and submitted to EPA within 150 days of receipt of the final samples at the lab.





## 6 REFERENCES

- Environment International (EI). 2016. Memorandum re: data gaps for wild kokanee salmon and hatchery white sturgeon. To Laura Buelow, Dustan Bott, Monica Tonel, and Marc Stifelman. United States Environmental Protection Agency, Region 10. From Whitney Fraser, Environment International on behalf of the Colville Confederated Tribes. [Memo not dated]
- Exponent and Parametrix. 2013. Upper Columbia River Final Fish Tissue Data Summary and Data Gap Report. Prepared for Teck American Incorporated. Prepared by Exponent and Parametrix, in consultation with Integral Consulting, Inc. February.
- Fields, K., B. Scofield, C. Lee, and D. Pavlik. 2004. Lake Roosevelt fisheries evaluation program; limnological and fisheries monitoring, 2002 Annual report. Bonneville Power Administration, Portland, Oregon. Report Number: DOE/BP-00005756-5. 196pp.
- Lee, C., D. Pavlik-Kunkel, K. Fields, and B. Scofield. 2006. Lake Roosevelt fisheries evaluation program; limnological and fisheries monitoring. 2004-2005 Annual Report, Project No. 199404300. Bonneville Power Administration, Portland, Oregon. 202pp. DOE/BP-00014804-1.
- Parametrix, Integral, and Exponent. 2009. Upper Columbia River Quality Assurance Project Plan for the 2009 Fish Tissue Study. Prepared for Teck American Incorporated, Spokane, WA. Prepared in consultation with HydroQual. September.
- Smith, R.L. 1985. Guidance on Sampling Aquatic Organisms for Tissue Analyses during FY 1986. Environmental Services Division, Region 3, U.S. Environmental Protection Agency, Philadelphia, PA.
- Smith, S.B., A.P. Donahue, R.J. Lipkin, V.S. Blazer, C.J. Schmitt, and R.W. Goede. 2002. Illustrated field guide for assessing external and internal anomalies in fish. U.S. Geological Survey Information and Technology Report USGS/BRD/ITR— 2002-0007. U.S. Geological Survey, Reston, Virginia. September.
- Stober, Q.J. 1991. Guidelines for Fish Sampling and Tissue Preparation for Bioaccumulative Contaminants. Environmental Services Division, Region 4, U.S. Environmental Protection Agency, Athens, GA.
- SRC. 2016a. Memorandum to file. Participating Parties Conference Call – 6/16/16. Sturgeon Sampling. Meeting between U.S. Environmental Protection Agency Region 10 and Participating Parties. June 16.
- SRC. 2016b. Memorandum to file. UCR hatchery white sturgeon sampling program. March 8.
- TCAI. 2007a. Upper Columbia River: Work plan for the remedial investigation and feasibility study. Prepared by Integral Consulting Inc. and Parametrix, Inc. Teck Cominco American Incorporated, Spokane, Washington.
- TCAI. 2007b. Upper Columbia River: Draft general health and safety plan for the remedial investigation and feasibility study. Prepared for Teck Cominco American Incorporated. December 27, 2007. Integral Consulting Inc., Mercer Island, WA, and Parametrix, Bellevue, Washington.
- USEPA. 2000. Guidance for assessing chemical contaminant data for use in fish advisories, Volume 1, Fish sampling and analysis, Third Edition. USEPA Office of Water. EPA 823-B-00-007.
- USEPA. 2007. Phase I fish tissue sampling data evaluation, Upper Columbia River site CERCLA RI/FS. Prepared for the U.S. Environmental Protection Agency, Region 10. Prepared by CH2M HILL and Ecology and Environment, Inc. October 2007.

USEPA. 2008. Upper Columbia River: work plan for the remedial investigation and feasibility study. Modified by the U.S. Environmental Protection Agency based on the draft work plan provided by Teck Cominco American Incorporated. December.

USEPA. 2009. Human health risk assessment work plan for the Upper Columbia River site remedial investigation and feasibility study. Prepared for, and with oversight by, United States Environmental Protection Agency, Region 10. Prepared by Syracuse Research Corporation. March.

USEPA. 2010. Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds. U.S. Environmental Protection Agency, Risk Assessment Forum. Washington, DC. EPA/100/R-10/005. December.

Washington Fish and Wildlife. 2016. Fishing in Washington: 2016-2017 Sport Fishing Rules Pamphlet. June 2016.

# TABLES

Table 1. Contact Information

<b>Name</b>	<b>Role</b>	<b>Affiliation</b>	<b>Office Phone</b>	<b>Email</b>
Marilyn Gauthier	Project Manager	CH2M	(503) 872-4800	Marilyn.Gauthier@CH2M.com
Cameron Irvine	FTL/SSC	CH2M	(916) 286-0475	Cameron.Irvine@CH2M.com
Kelly O'Neal	Team member	CH2M	(916) 286-0215	Kelly.ONeal@CH2M.com
Dave Rasmussen	FTL/SSC	CH2M	(510) 587-7752	David.Rasmussen@CH2M.com
Frank Dillon	Principal Investigator	CH2M	(517) 657-2417	Frank.Dillon@CH2M.com
John Culley	Regional HSEM	CH2M	(509) 464-7228	John.Culley@CH2M.com
Traci Soebbing	Spokane Office	CH2M	(509) 747-2000	traci.soebbing@ch2m.com
Marion Conley	Spokane Office	CH2M	(509) 464-7239	marion.conley@ch2m.com
Katherine Cerise	Remedial Program Manager	EPA	(206) 553-2589	Cerise.Kathryn@epa.gov
Dustan Bott	Remedial Program Manager	EPA	(206) 553-5502	Bott.Dustan@epa.gov
Laura Buelow	Remedial Program Manager	EPA	(509) 376-5466	Buelow.Laura@epa.gov
Jason McClellan	Fish Collection	CCT	-	Jason.McLellan@colvilletribes.com
Kris McCaig	TAIs Project Coordinator	TAI	(509) 623-4501	Kris.McCaig@teck.com
Dave Enos	TAIs Analytical Laboratory Coordinator	TAI	(509) 623-4505	Dave.Enos@teck.com
Jeff Coronado	Laboratory Manager	ALS, Kelso	(360) 501-3330	jeff.coronado@alsglobal.com
Keith Holliday	Boat Operations	NPS	(509) 754-7858	keith_holliday@nps.gov
Meghan Lyons	Boat Operations	NPS	-	meghan_lyons@nps.gov
Jon Edwards	Boat Operations	NPS	-	jon_edwards@nps.gov

**Table 2. Target Analyte List, Method Detection and Reporting Limits, Analytical Concentration Goals, and Human Health Risk-Based Concentrations for Addendum No. 1 to the Quality Assurance Project Plan for the 2009 Fish Tissue Study.**

Analyte	2009 RBC <sup>a</sup>	Updated RBC <sup>b</sup>	MRL <sup>c</sup>	MDL <sup>c</sup>	ACG <sup>d</sup>
<b>Conventional Parameters</b>					
Total Length	NA <sup>e</sup>	NA	NA	NA	NA
Total Mass	NA	NA	NA	NA	NA
Percent Moisture	NA	NA	0.1	NA	0.1
Percent Lipids	NA	NA	0.1	NA	0.1
<b>Metals (mg/kg dry weight)</b>					
Aluminum	3.2	13.6	2	0.2	13.6
Antimony	0.0013	0.0056	0.05	0.002	0.05
Arsenic – Total	0.00048	0.00226	0.5	0.02	0.5
Arsenic – Total inorganic <sup>f</sup>	0.00048	0.00226	0.02	0.007	0.02
Barium	0.65	2.72	0.05	0.005	2.72
Beryllium	0.0065	0.0272	0.02	0.003	0.0272
Boron	0.65	2.72	2	0.2	2.72
Cadmium	0.0032	0.0136	0.02	0.002	0.02
Calcium	NA	NA	4	2	4
Chromium	4.9	20.32	0.2	0.02	20.32
Cobalt	0.065	0.004	0.02	0.003	0.02
Copper	0.13	0.56	0.1	0.02	0.56
Fluoride	0.19	0.56	1	0.2	1
Iron	2.3	9.6	1	0.2	9.6
Lead	NA	NA	0.02	0.0005	0.02
Magnesium	NA	NA	2	0.6	2
Manganese	0.45	1.88	0.05	0.008	1.88
Mercury	0.00024	0.001	0.001	0.00008	0.001
Molybdenum	0.016	0.068	0.05	0.008	0.068
Nickel	0.065	0.272	0.2	0.02	0.272
Potassium	NA	NA	20	9	20
Selenium	0.016	0.068	0.1	0.05	0.1
Silicon	NA	NA	20	4	20
Silver	0.016	0.068	0.02	0.006	0.068
Sodium	NA	NA	20	2	20
Sulfur	NA	NA	8	4	8
Thallium	0.00023	0.000136	0.02	0.0009	0.02
Tin	NA	8.12	0.05	0.003	8.12
Uranium	0.0097	0.008	0.02	0.0008	0.02
Vanadium	0.0032	0.068	0.2	0.007	0.2
Zinc	0.97	4.08	0.5	0.06	4.08
<b>Dioxin-Like Congeners (ng/kg-wet weight)</b>					
as toxic equivalents (TEQ) <sup>g</sup>	0.00048	0.00054	0.125 <sup>g</sup>	0.12825	0.125
<b>PCBs (µg/kg-wet weight)</b>					
Total PCBs <sup>h</sup>	0.036	0.0424	2.5	0.7	2.5
<b>PBDEs (µg/kg-wet weight)</b>					
Total PBDEs <sup>i</sup>	NA	TBD <sup>j</sup>	NA	NA	TBD
2,2',4,4'-TetraBDE (BDE-47)	NA	0.339	0.025	0.014	0.339
2,2',4,4',5-PentaBDE (BDE-99)	NA	0.339	0.025	0.00168	0.339

**Table 2. Target Analyte List, Method Detection and Reporting Limits, Analytical Concentration Goals, and Human Health Risk-Based Concentrations for Addendum No. 1 to the Quality Assurance Project Plan for the 2009 Fish Tissue Study.**

Analyte	2009 RBC <sup>a</sup>	Updated RBC <sup>b</sup>	MRL <sup>c</sup>	MDL <sup>c</sup>	ACG <sup>d</sup>
2,2',4,4',5,5'-HexaBDE (BDE-153)	NA	0.68	0.025	0.004	0.68
Decabromodiphenyl ether (BDE-209)	NA	23.7	0.25	0.00575	23.7

<sup>a</sup> RBCs taken from Parametrix et al. (2009)

<sup>b</sup> RBCs were calculated for both adults and children who consume fish; when calculating the RBC, the human intake factor (HIF) was based on the child for non-cancer and the time-weighted average (TWA) for cancer. The lower of these values was then selected as the RBC. See Appendix E-1 for additional detail.

<sup>c</sup> MRLs and MDLs were taken from ALS Environmental in Kelso, WA (pers. comm. from Poyfair, August 2016). Values for dioxins, PCBs, and PBDEs were converted to wet weight values using 75% moisture for bony fishes, cited in EPA (1993), and the formula Wet Weight = Dry Weight x (Total Solids/100).

<sup>d</sup> ACGs represent the human health RBC unless the RBC is lower than the MRL. In that case, the MRL is used as the ACG. Highlighted ACGs are different from those in the 2009 QAPP (Parametrix et al. 2009) due to either changes in laboratory MRLs, or updated RfDs

<sup>e</sup> NA = not available.

<sup>f</sup> Inorganic arsenic will be analyzed using EPA Method 1632.

<sup>g</sup> MRL, MDL, and ACG are for 2,3,7,8-tetrachlorodibenzodioxin (each dioxin congener will have a different MDL, based on its TEF). The current consensus TEF values for mammals (including humans) developed by a panel of experts assembled by the World Health Organization (Van den Berg *et al.* 2006 cited in "*Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds*" (U.S. EPA 2010a) will be used to evaluate the DL-congener data. Initial risk calculations will evaluate non-detects at ½ the DL. Non-detects may also be evaluated at the DL.

<sup>h</sup> RBCs for total PCBs are based on the toxicity value for Aroclor 1254<sup>g</sup> (see Appendix E of Parametrix et al. 2009). The MRL and MDL are the values for PCB Aroclors<sup>g</sup> from ALS Environmental in Kelso, WA (August 2016). All 209 PCB congeners will be analyzed; their MDLs are given in Table A-2.1. Dioxin-like and non-dioxin-like PCBs will be addressed as described in the 2009 HHRA work plan (USEPA 2009a). The individual congener data will be used by WDOH. The HHRA will use data for only those congeners with toxicity values.

<sup>i</sup> Total PBDE and the four PBDE congeners will be used by WDOH in their human health fish advisory for sturgeon.

<sup>j</sup> TBD = to be determined.

**Table 3. Number of Fish per Composite**

	Size Range		
	50-97 cm.	98-137 cm.	138-160 cm.
Composite 1	8	8	8
Composite 2	8	8	8
Composite 3	8	8	8
Total	24	24	24

**Table 4. Recommended Methods for Analysis of COIs in Fish Tissue Samples**

Analytes	Analytical method	Description	Container	Holding Time	Preservation
Metals/Metalloids	EPA Method 6010	ICP-AES	Aluminum foil,	1 year, except Hg is 6 months	Frozen at -20 °C
	EPA Method 6020	ICP-MS	Resealable plastic bag		
	EPA Method 7471B/EPA Method 1631B or E (Hg)	CV-AAS	(whole fish)		
	EPA 7000 Series Methods (various metals)				
Inorganic Arsenic	EPA Method 1632A	HG-QFAAS	Aluminum foil, Resealable plastic bag (whole fish)	2 years	Frozen at -20 °C
PCBs (Congeners)	EPA Method 1668A	HRGC/HRMS	Aluminum foil, Resealable plastic bag (whole fish)	1 year	Frozen at -20 °C
Dioxins/Furans	EPA Method 1613B	HRGC/HRMS	Aluminum foil, Resealable plastic bag (whole fish)	1 year	Frozen at -20 °C
PBDEs	EPA Method 1614	HRGC/HRMS	Aluminum foil, Resealable plastic bag (whole fish)	1 year	Frozen at -20 °C

**Notes:**

CV-AAS	Cold vapor - atomic adsorption spectrometry
HG-QFAAS	Hydride generation - quartz furnace atomic adsorption spectrometry
HRGC/HRMS	High resolution gas chromatography - high resolution mass spectrometry
ICP-AES	Inductively-coupled plasma - atomic emission spectrometry
ICP-MS	Inductively-coupled plasma - mass spectrometry



**Table 5. Weights (g) of Individual Homogenates Required for Screening Study Composite Homogenate Sample <sup>a,b</sup> (USEPA 2000)**

Number of fish per sample	Total composite weight		
	100 g (minimum)	200 g (recommended)	500 g (maximum)
3	33	67	167
4	25	50	125
5	20	40	100
6	17	33	84
7	14	29	72
8	13	25	63
9	11	22	56
10	10	20	50

<sup>a</sup> Based on total number of fish per composite and the total composite weight required for analysis in screening studies. The total composite weight required in intensive studies may be less if the number of target analytes is reduced significantly.

<sup>b</sup> Individual homogenates may be prepared from one or both fillets from a fish. A composite homogenate should be prepared only from individual homogenates of the same type (i.e., **either** from individual homogenates each prepared from a single fillet **or** from individual homogenates each prepared from both fillets).



ATTACHMENTS

Attachment A1  
Site Health and Safety Plan

---

*Health and Safety Plan*

# **Upper Columbia River (UCR) RI/FS Oversight and Field Sampling**

Prepared for  
**EPA Region 10**

*August 2016*



# Contents

---

<b>HOSPITAL ROUTE MAP .....</b>	<b>9</b>
INCIDENT NOTIFICATION AND REPORTING.....	110
ESBG INCIDENT REPORTING FLOW DIAGRAM .....	121
<b>1.0 INTRODUCTION .....</b>	<b>1-1</b>
1.1 CH2M HILL POLICY AND COMMITMENT.....	1-1
1.1.1 <i>Safe Work Policy</i> .....	1-1
1.1.2 <i>Health and Safety Commitment</i> .....	1-1
1.1.3 <i>Project-Specific Health, Safety, and the Environment Goals</i> .....	1-1
<b>2.0 APPLICABILITY .....</b>	<b>2-1</b>
<b>3.0 GENERAL PROJECT INFORMATION .....</b>	<b>3-1</b>
3.1 PROJECT INFORMATION AND BACKGROUND.....	3-1
3.2 SITE BACKGROUND AND SETTING .....	3-1
3.3 DESCRIPTION OF TASKS .....	3-1
3.3.1 <i>HAZWOPER-Regulated Tasks</i> .....	3-1
3.3.2 <i>Non-HAZWOPER-Regulated Tasks</i> .....	3-1
<b>4.0 PROJECT ORGANIZATION AND RESPONSIBILITIES .....</b>	<b>4-1</b>
4.1 CLIENT.....	4-1
4.2 CH2M HILL .....	4-1
4.2.1 <i>Project Manager</i> .....	4-1
4.2.2 <i>CH2M HILL Responsible Health and Safety Manager</i> .....	4-2
4.2.3 <i>CH2M HILL Project Environmental Manager</i> .....	4-2
4.2.4 <i>CH2M HILL Safety Coordinator</i> .....	4-2
4.3 CH2M HILL SUBCONTRACTORS .....	4-4
4.4 EMPLOYEE RESPONSIBILITIES .....	4-4
4.5 3 <sup>RD</sup> -PARTY CONTRACTORS .....	4-5
<b>5.0 STANDARDS OF CONDUCT .....</b>	<b>5-1</b>
5.1 STANDARDS OF CONDUCT VIOLATIONS.....	5-1
5.2 DISCIPLINARY ACTIONS.....	5-1
5.3 SUBCONTRACTOR SAFETY PERFORMANCE .....	5-1
5.4 INCENTIVE PROGRAM .....	5-2
5.5 REPORTING UNSAFE CONDITIONS/PRACTICES .....	5-2
<b>6.0 SAFETY PLANNING AND CHANGE MANAGEMENT .....</b>	<b>6-1</b>
6.1 DAILY SAFETY MEETINGS AND PRE-TASK SAFETY PLANS.....	6-1
6.2 CHANGE MANAGEMENT .....	6-1
6.3 AGENCY INSPECTION GUIDANCE .....	6-1
<b>7.0 PROJECT HAZARD ANALYSIS .....</b>	<b>7-1</b>
7.1 ACTIVITY HAZARD ANALYSIS .....	7-1
7.2 SUBCONTRACTOR ACTIVITY HAZARD ANALYSIS .....	7-1
<b>8.0 GENERAL HAZARDS AND CONTROLS.....</b>	<b>8-2</b>
8.1 BLOODBORNE PATHOGENS .....	8-2
8.2 DRIVING SAFETY .....	8-3
8.3 ELECTRICAL SAFETY .....	8-3
8.4 FIELD VEHICLES .....	8-4
8.5 FIRE PREVENTION.....	8-5
8.6 GENERAL PRACTICES AND HOUSEKEEPING .....	8-5

8.7	HAZARD COMMUNICATION/GHS.....	8-6
8.8	KNIFE USE.....	8-7
8.9	LIGHTING.....	8-7
8.10	PERSONAL HYGIENE.....	8-7
8.11	SUBSTANCE ABUSE.....	8-7
8.12	UNKNOWN OR SUSPECT OBJECTS/MATERIALS.....	8-8
8.13	FIELD ERGONOMICS AND MANUAL LIFTING.....	8-8
<b>9.0</b>	<b>PROJECT-SPECIFIC HAZARD CONTROLS.....</b>	<b>9-1</b>
9.1	BOAT SAFETY.....	9-1
9.2	HAND AND POWER TOOLS.....	9-4
9.3	INCLEMENT WEATHER.....	9-4
9.4	OUTDOOR SAFETY TIPS.....	9-5
9.5	TRAFFIC HAZARDS.....	9-5
9.6	UNEVEN WALKING SURFACES.....	9-6
9.7	SOIL SAMPLING.....	9-6
9.8	UTILITIES (UNDERGROUND).....	9-6
<b>10.0</b>	<b>PHYSICAL HAZARDS AND CONTROLS.....</b>	<b>10-1</b>
10.1	NOISE.....	10-1
10.2	ULTRAVIOLET RADIATION (SUN EXPOSURE).....	10-1
10.3	TEMPERATURE EXTREMES.....	10-2
10.3.1	<i>Heat</i> .....	10-2
10.3.2	<i>Cold</i> .....	10-6
10.4	RADIOLOGICAL HAZARDS.....	10-7
<b>11.0</b>	<b>BIOLOGICAL HAZARDS AND CONTROLS.....</b>	<b>11-1</b>
11.1	BEEES AND OTHER STINGING INSECTS.....	11-1
11.2	BIRD DROPPINGS.....	11-1
11.3	HANTAVIRUS.....	11-1
11.4	SNAKES.....	11-2
11.5	SPIDERS - BROWN RECLUSE AND WIDOW.....	11-3
11.6	BLACK BEARS.....	11-4
11.7	TICKS.....	11-4
11.8	FERAL DOGS.....	11-5
<b>12.0</b>	<b>CONTAMINANTS OF CONCERN.....</b>	<b>12-6</b>
<b>13.0</b>	<b>SITE MONITORING.....</b>	<b>13-1</b>
13.1	AIR MONITORING SPECIFICATIONS.....	13-1
13.2	CALIBRATION SPECIFICATIONS.....	13-1
13.3	AIR SAMPLING.....	13-1
<b>14.0</b>	<b>PERSONAL PROTECTIVE EQUIPMENT.....</b>	<b>14-1</b>
14.1	REQUIRED PERSONAL PROTECTIVE EQUIPMENT.....	14-1
<b>15.0</b>	<b>WORKER TRAINING AND QUALIFICATION.....</b>	<b>15-2</b>
15.1	CH2M HILL WORKER TRAINING.....	15-2
15.1.1	<i>Hazardous Waste Operations Training</i> .....	15-2
15.1.2	<i>First Aid/Cardiopulmonary Resuscitation</i> .....	15-2
15.1.3	<i>Safety Coordinator Training</i> .....	15-3
15.1.4	<i>Site-Specific Training</i> .....	15-3
15.1.5	<i>Project-Specific Training Requirements</i> .....	15-3
<b>16.0</b>	<b>MEDICAL SURVEILLANCE AND QUALIFICATION.....</b>	<b>16-1</b>
16.1	HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE.....	16-1
16.2	JOB OR SITE-SPECIFIC MEDICAL SURVEILLANCE.....	16-1
16.3	RESPIRATOR USER QUALIFICATION.....	16-1
16.4	HEARING CONSERVATION.....	16-1

<b>17.0</b>	<b>SITE-CONTROL PLAN .....</b>	<b>17-1</b>
17.1	SITE-CONTROL PROCEDURES .....	17-1
17.2	REMEDATION WORK AREA ZONES .....	17-1
17.2.1	<i>Support Zone</i> .....	17-1
17.2.2	<i>Contamination Reduction Zone</i> .....	17-1
17.2.3	<i>Exclusion Zone</i> .....	17-2
17.2.4	<i>Other Controlled Areas</i> .....	17-2
<b>18.0</b>	<b>DECONTAMINATION.....</b>	<b>18-1</b>
18.1	CONTAMINATION PREVENTION.....	18-1
18.2	PERSONNEL AND EQUIPMENT DECONTAMINATION.....	18-1
18.3	DECONTAMINATION DURING MEDICAL EMERGENCIES .....	18-1
18.4	WASTE COLLECTION AND DISPOSAL .....	18-2
18.5	DIAGRAM OF PERSONNEL-DECONTAMINATION LINE.....	18-2
<b>19.0</b>	<b>EMERGENCY RESPONSE PLAN.....</b>	<b>19-2</b>
19.1	PRE-EMERGENCY PLANNING .....	19-2
19.2	EMERGENCY EQUIPMENT AND SUPPLIES .....	19-2
19.3	INCIDENT RESPONSE .....	19-3
19.4	EMERGENCY MEDICAL TREATMENT.....	19-3
19.5	EVACUATION .....	19-3
19.6	EVACUATION SIGNALS .....	19-4
<b>20.0</b>	<b>SPILL CONTAINMENT PROCEDURES .....</b>	<b>20-4</b>
<b>21.0</b>	<b>INSPECTIONS.....</b>	<b>21-1</b>
21.1	SAFE BEHAVIOR OBSERVATIONS .....	21-1
<b>22.0</b>	<b>INCIDENT NOTIFICATION, REPORTING, AND INVESTIGATION.....</b>	<b>22-2</b>
22.1	GENERAL INFORMATION.....	22-2
22.2	SECTION DEFINITIONS .....	22-2
22.3	REPORTING REQUIREMENTS .....	22-3
22.4	HITS SYSTEM AND INCIDENT REPORT FORM .....	22-3
22.5	INJURY MANAGEMENT/RETURN-TO-WORK (FOR US/PUERTO RICO BASED CH2M HILL STAFF ONLY) .....	22-3
22.5.1	<i>Background</i> .....	22-3
22.5.2	<i>The Injury Management/Return-to-Work Notification Process:</i> .....	22-4
22.6	SERIOUS INCIDENT REPORTING REQUIREMENTS.....	22-4
22.6.1	<i>Serious Incident Determination</i> .....	22-4
22.6.2	<i>Serious Incident Reporting</i> .....	22-5
22.7	INCIDENT ROOT CAUSE ANALYSIS .....	22-5
22.7.1	<i>Corrective Actions</i> .....	22-6
<b>23.0</b>	<b>RECORDS AND REPORTS.....</b>	<b>23-1</b>

**ATTACHMENTS**

Attachment 1	Employee Signoff Form – Health and Safety Plan
Attachment 2	Chemical Inventory/Register Form
Attachment 3	Chemical-Specific Training Form
Attachment 4	Key Target Zero Program Elements
Attachment 5	Fact Sheets
Attachment 6	Agency Inspection Target Zero Bulletin
Attachment 7	Material Safety Data Sheets/SDS



# Approval

---

This site-specific Health and Safety Plan (HSP) has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions and identified scope(s) of work and must be amended if those conditions or scope(s) of work change.

By approving this HSP, the Responsible Health and Safety Manager (RHSM) certifies that the personal protective equipment has been selected based on the project-specific hazard assessment.

Original Plan



RHSM Approval:

John Culley/SPK

Date: April 17, 2012

---

Field Operations Manager Approval:

Date:

---

## Revisions

Revisions Made By: Marilyn Gauthier/PDX

Date: August 30, 2012

Description of Revisions to Plan: Added field activities associated with sediment sampling oversight and collection of split samples for metals analysis



Revisions Approved By: John Culley/SPK

Date: August 31, 2012

---

## Revisions

Revisions Made By: Craig Sauer/SPK

Date: March 2014

Description of Revisions to Plan: Updated tasks, hazards/controls, SC-HW, emergency information, and air monitoring and PPE tables



Revisions Approved By: John Culley/SPK

Date: March 4, 2014

---

## Revisions

Revisions Made By: Rueben Greer/SPK

Date: July 2014

Description of Revisions to Plan: Updated tasks, client contact, hazards/controls, SC-HW, and PPE table



Revisions Approved By: John Culley/SPK

Date: July 21, 2014

---

Revisions

**Revisions Made By:** Cameron Irvine/SPK

**Date:** April 2016

**Description of Revisions to Plan:** Updated tasks, 3<sup>rd</sup>-party contractors, hazards/controls, SC-HW, and PPE table



**Revisions Approved By:** John Culley/SPK

**Date:** April 15, 2016

---

Revisions

**Revisions Made By:** Marilyn Gauthier/PDX

**Date:** August 2016

**Description of Revisions to Plan:** Updated tasks, hazards/controls, and PPE table



**Revisions Approved By:** John Culley/SPK

**Date:** August 17, 2016

---

## Project HS&E Change Management Form

*This evaluation form should be reviewed on a **continuous** basis to determine if the current site health and safety plan adequately addresses ongoing project work, and should be completed whenever new tasks are contemplated or changed conditions are encountered..*

Project Task:	
Project Number:	Project/Task Manager:
Name:	Employee #:

<i><b>Evaluation Checklist</b></i>		Yes	No
1.	Have the CH2MHILL staff listed in the original HSP/FSI changed?		
2.	Has a new subcontractor been added to the project?		
3.	Is any chemical or product to be used that is not listed in Attachment 2 of the plan?		
4.	Have additional tasks been added to the project which were not originally addressed in the plan?		
5.	Have new contaminants or higher than anticipated levels of original contaminants been encountered?		
6.	Have other safety, equipment, activity or environmental hazards been encountered that are not addressed in the plan?		

*If the answer is "YES" to Question 3, an HSP/FSI revision is NOT needed. Please take the following actions:*

- ◆ Add the chemical to Attachment 2, and ensure employees handling the chemical are trained, and training documentation is added to Attachment 3.

*If the answer is "YES" to Questions 1, 2 or 4-6, an HSP/FSI revision MAY BE NEEDED. Please contact HS&E directly.*

## Emergency Contacts

**24-hour CH2M HILL Injury Reporting– 1-866-893-2514**  
**24-hour CH2M HILL Serious Incident Reporting Contact – 720-286-4911**

<b>Medical Emergency – 911</b> <b>Facility Medical Response #:</b> <b>Local Ambulance #:</b>	<b>CH2M HILL- Medical Consultant</b> WorkCare Dr. Peter Greaney M.D. 300 S. Harbor Blvd, Suite 600 Anaheim , CA 92805 800-455-6155 or 714-978-7488
<b>Local Medical Clinic</b>	<b>CH2M HILL Director – Health, Safety, Security &amp; Environment</b> Andy Strickland/DEN (720) 480-0685 (cell) or (720) 286-2393 (office)
<b>Fire/Spill Emergency – 911</b> <b>Facility Fire Response #:</b> <b>Local Fire Dept #:</b>	<b>Responsible Health and Safety Manager (RHSM)</b> Name: John Culley/SPK Phone: 206/660-3367
<b>Security &amp; Police – 911</b> <b>Facility Security #:</b> <b>Local Police #:</b>	<b>Human Resources Department</b> Employee Connect 720/286-4411
<b>Utilities Emergency Phone Numbers</b> Water: Gas: Electric:	<b>Worker’s Compensation:</b> Employee Connect 720/286-4411
<b>Safety Coordinator (SC-HW)</b> Name: Rueben Greer/SPK Phone: 509/847-8819 Name: Steve Demus/SPK Phone: 509/ 944-1785 Name: Nathan Williams/PDX Phone: 509/ 999-2292 Name: Cameron Irvine/SAC Phone: 916/335-2369 Name: Rachel Zajac-Fay/SAC Phone: 919/889-0468 Name: Mark Endo/SEA Phone: 847/347-6607 Name: Shannon Bartow/PDX Phone: 541/337-4415 Name: Dave Rasmussen/BAO Phone: 510/587-7752	<b>Media Inquiries Corporate Strategic Communications</b> Name: Lorrie Paul Crum/DEN Phone: 303/525 2916
<b>Project Manager</b> Name: Marilyn Gauthier/PDX Phone: 425/894-6464	<b>Worker’s Compensation/Automobile Accidents:</b> Contact Mary Ellegood-Oberts/DEN (720-286-2291)
<b>Federal Express Dangerous Goods Shipping</b> Phone: 800/238-5355	<b>CHEMTEL (hazardous material spills)</b> <b>Phone: 800/255-3924</b>
<b>Hospital Name/Address:</b> To be determined by the SC-HW once onsite; whether it is Northport or Colville, WA	
<b>Hospital Phone #:</b>	

## Directions to Hospital

Take most direct route; SC-HW will develop hand-written map once onsite.

**See map next page**

---

# Hospital Route Map

(SC-HW will develop hand-written map once onsite)

## Incident Notification and Reporting

- Notify and submit reports to client as required in contract.
- Serious Incidents must be reported in accordance with CH2M HILL Standard of Practice, *Serious Incident Reporting Process*, immediately. Serious incidents are those that involve any of the following:
  - Work related death, or life threatening injury or illness of a CH2M HILL employee, subcontractor, or public
  - Kidnap/missing person
  - Acts or threats of terrorism
  - Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 in damage.
  - Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

In the event of an emergency, immediately call..... **911**.

- Severe Bleeding
- Loss of consciousness
- Chest Pain
- Broken bones
- All other injuries or illness' (even those that are minor and may only require First Aid) which occur at work, while on business travel or commute must be reported to your supervisor immediately.
- **After informing their supervisor, the injured employee calls CH2M HILL's contracted Occupational Nurse.**

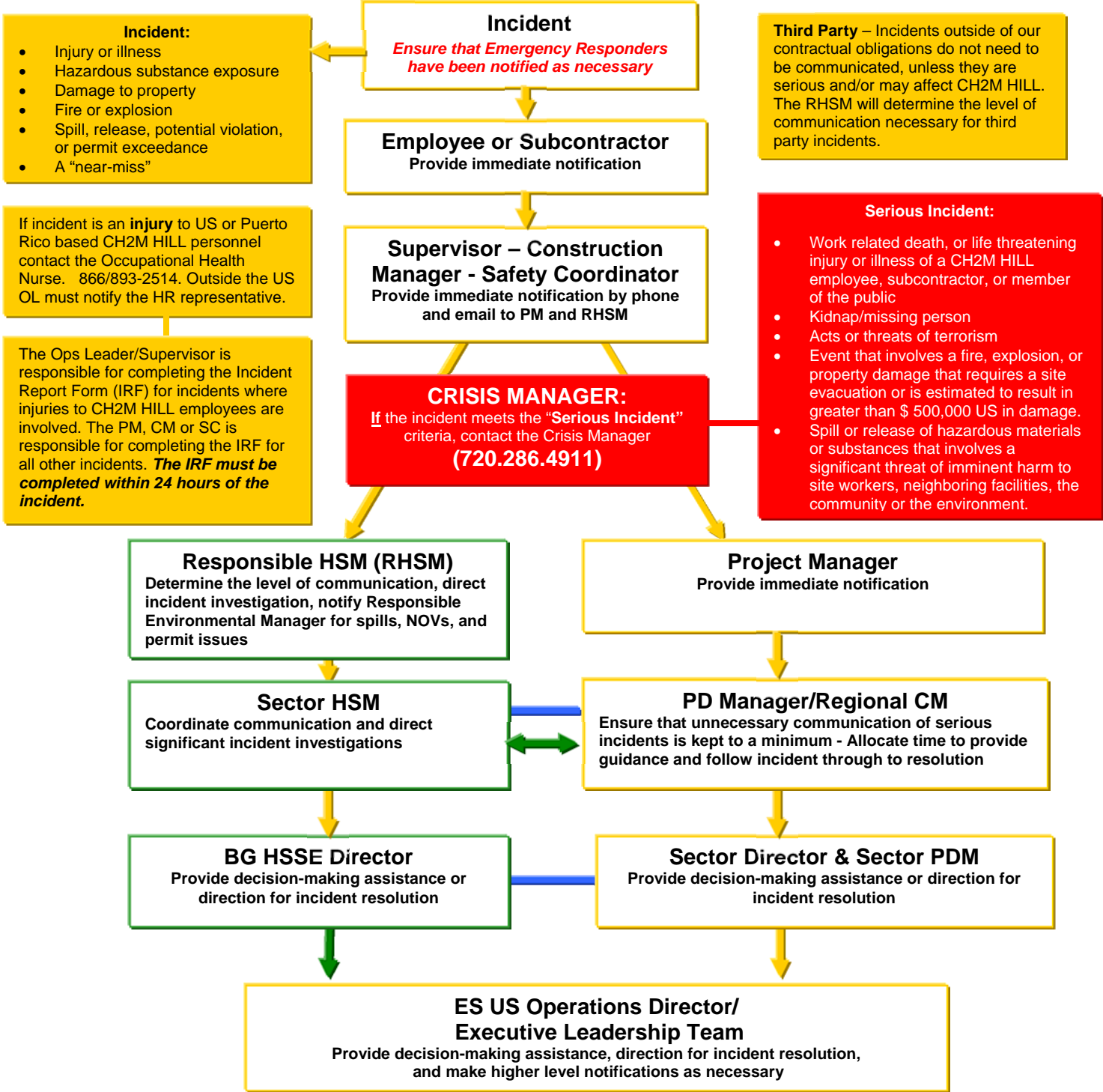
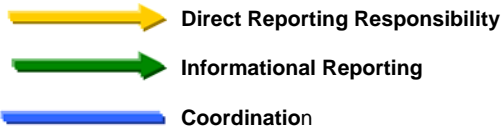
### **24-hour CH2M HILL Emergency Nurse Assistance 1-866-893-2514**

- The Occupational Injury Nurse listens to the injured employee to understand the injury/illness.
- Employee is provided guidance on appropriate treatment options (triage).
- Appropriate treatment details are handled by the Occupational Injury Nurse, and HR Groups.
- Nurse communicates and troubleshoots with and for employee through full recovery.
- Complete a HITS report and notify the HSM.



# ESBG Incident Reporting Flow Diagram

Individual Programs may have additional or alternate reporting procedures



**Incident:**

- Injury or illness
- Hazardous substance exposure
- Damage to property
- Fire or explosion
- Spill, release, potential violation, or permit exceedance
- A "near-miss"

**Third Party** – Incidents outside of our contractual obligations do not need to be communicated, unless they are serious and/or may affect CH2M HILL. The RHSM will determine the level of communication necessary for third party incidents.

If incident is an **injury** to US or Puerto Rico based CH2M HILL personnel contact the Occupational Health Nurse. 866/893-2514. Outside the US OL must notify the HR representative.

**Serious Incident:**

- Work related death, or life threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public
- Kidnap/missing person
- Acts or threats of terrorism
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 US in damage.
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

The Ops Leader/Supervisor is responsible for completing the Incident Report Form (IRF) for incidents where injuries to CH2M HILL employees are involved. The PM, CM or SC is responsible for completing the IRF for all other incidents. **The IRF must be completed within 24 hours of the incident.**

*Post-emergency incident communications regarding serious incidents at a CH2M HILL office or project (regardless of the party involved) shall be considered sensitive in nature and must be controlled in a confidential manner.*



# 1.0 Introduction

## 1.1 CH2M HILL Policy and Commitment

### 1.1.1 Safe Work Policy

It is the policy of CH2M HILL to perform work in the safest manner possible. Safety must never be compromised. To fulfill the requirements of this policy, an organized and effective safety program must be carried out at each location where work is performed.

CH2M HILL believes that all injuries are preventable, and we are dedicated to the goal of a safe work environment. To achieve this goal, every employee on the project must assume responsibility for safety.

Every employee is empowered to:

Conduct their work in a safe manner;

Stop work immediately to correct any unsafe condition that is encountered; and

Take corrective actions so that work may proceed in a safe manner.

Safety, occupational health, and environmental protection will not be sacrificed for production. These elements are integrated into quality control, cost reduction, and job performance, and are crucial to our success.

### 1.1.2 Health and Safety Commitment

CH2M HILL has embraced a philosophy for health and safety excellence. The primary driving force behind this commitment to health and safety is simple: employees are CH2M HILL's most significant asset and CH2M HILL management values their safety, health, and welfare. Also, top management believes that all injuries are preventable. CH2M HILL's safety culture empowers employees at all levels to accept ownership for safety and take whatever actions are necessary to eliminate injury. Our company is committed to world-class performance in health and safety and also understands that world-class performance in health and safety is a critical element in overall business success.

CH2M HILL is committed to the prevention of personal injuries, occupational illnesses, and damage to equipment and property in all of its operations; to the protection of the general public whenever it comes in contact with the Company's work; and to the prevention of pollution and environmental degradation.

Company management, field supervisors, and employees plan safety into each work task in order to prevent occupational injuries and illnesses. The ultimate success of CH2M HILL's safety program depends on the full cooperation and participation of each employee.

CH2M HILL management extends its full commitment to health and safety excellence.

### 1.1.3 Project-Specific Health, Safety, and the Environment Goals

All management and employees are to strive to meet the project-specific Health, Safety, and the Environment (HSE) goals outlined below. The team will be successful only if everyone makes a concerted effort to accomplish these goals. The goals allow the project to stay focused on optimizing the health and safety of all project personnel and, therefore, making the project a great success.

The Project has established eleven specific goals and objectives:

Create an injury-free environment;

Have zero injuries or incidents;

Provide management leadership for HSE by communicating performance expectations, reviewing and tracking performance, and leading by example;

Ensure effective implementation of the HSP through education, delegation, and team work;

Ensure 100 percent participation in HSE compliance;

Continuously improve our safety performance;

Maintain free and open lines of communication;

Make a personal commitment to safety as a value;

Focus safety improvements on high-risk groups;

Continue strong employee involvement initiatives; and

Achieve health and safety excellence.

## 2.0 Applicability

This HSP applies to:

All CH2M HILL staff, including subcontractors and tiered subcontractors of CH2M HILL working on the site; and

All visitors to the construction site in the custody of CH2M HILL (including visitors from the Client, the Government, the public, and other staff of any CH2M HILL company).

This HSP does not apply to the third-party contractors, their workers, their subcontractors, their visitors, or any other persons not under the direct control or custody of CH2M HILL.

This HSP defines the procedures and requirements for the health and safety of CH2M HILL staff and visitors when they are physically on the work site. The work site includes the project area (as defined by the contract documents) and the project offices, trailers, and facilities thereon.

This HSP will be kept onsite during field activities and will be reviewed as necessary. The HSP will be amended or revised as project activities or conditions change or when supplemental information becomes available. The HSP adopts, by reference, the Enterprise-wide Core Standards and Standard Operating Procedures (SOPs), as appropriate. In addition, the HSP may adopt procedures from the project Work Plan and any governing regulations. If there is a contradiction between this HSP and any governing regulation, the more stringent and protective requirement shall apply.

All CH2M HILL staff and subcontractors must sign the employee sign-off form included in this document as Attachment 1 to acknowledge review of this document. Copies of the signature page will be maintained onsite by the Safety Coordinator (SC).

## 3.0 General Project Information

### 3.1 Project Information and Background

**PROJECT NO:** 670274

**CLIENT:** USEPA

**PROJECT/SITE NAME:** Upper Columbia River (UCR) RI/FS Oversight and Field Sampling

**SITE ADDRESS:** Kettle Falls, WA to the US/Canada border

**CH2M HILL PROJECT MANAGER:** Marilyn Gauthier/PDX

**DATE HEALTH AND SAFETY PLAN REVISED:** August 2016

**Date(s) of Site Work:** August 17, 2016 through December 31, 2017

### 3.2 Site Background and Setting

Pending Superfund site; primarily concerned over mining/milling related impacts to WQ, sediment, and upland wind-blown effects. The largest concerns are the tailings discharges from Cominco smelter in Trail, BC

**DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED:** See Sections 3.3.1 and 3.3.2

### 3.3 Description of Tasks

Refer also to project documents (i.e., Work Plan) for detailed task information. Tasks other than those listed require an approved amendment or revision to this plan before tasks begin. All CH2M HILL and Subcontractor employees engaging in hazardous waste operations (HAZWOPER) or emergency response shall receive appropriate training as required by 29 CFR 1910.120 and 29 CFR 1926.65 (or if required by Subcontract). Personnel who have not met these training requirements shall not be allowed to engage in hazardous waste operations or emergency response activities. See the following tasks that fall under HAZWOPER requirements.

#### 3.3.1 HAZWOPER-Regulated Tasks

- 3<sup>rd</sup>-party observation of fish, biota, water, sediment, and soil sampling
- Collection of split samples for analysis by EPA laboratory
- Collection of upland sub-surface soil samples from residential properties (using trowels or Terra Core device)
- Collection and sample preparation of fish tissue

#### 3.3.2 Non-HAZWOPER-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. The following tasks do not involve exposure to safety or health hazards associated with the hazardous waste operations. Hazwoper training or medical requirements do not apply for the tasks listed below.

<b>TASKS</b>	<b>CONTROLS</b>
<ul style="list-style-type: none"><li>• Surveying</li><li>• Site reconnaissance</li></ul>	<ul style="list-style-type: none"><li>• Brief on hazards, limits of access, and emergency procedures.</li><li>• Post areas of contamination as appropriate.</li><li>• Perform air sampling/monitoring as specified in Section 13.0.</li><li>• Wear PPE as outlined in Section 14.0</li></ul>

# SITE MAP

## 4.0 Project Organization and Responsibilities

### 4.1 Client

Contact Name: Laura Buelow

Phone: 509/376 5466

### 4.2 CH2M HILL

#### 4.2.1 Project Manager

Name: Marilyn Gauthier/PDX

Phone: 425/894-6464

The project manager (PM) is responsible for providing adequate resources (budget and staff) for project-specific implementation of HSE management process. The PM has overall management responsibility for the tasks listed below. The PM may explicitly delegate specific tasks to other staff, as described in sections that follow, but retains ultimate responsibility for completion of the following in accordance with this document:

Incorporate standard terms and conditions, and contract-specific HSE roles and responsibilities in contract and subcontract agreements (including flow-down requirements to lower-tier subcontractors).

Select safe and competent subcontractors by:

- Choosing potential subcontractors based on technical ability and HSE performance;
- Implementing the subcontractor prequalification process;
- Ensuring that acceptable certificates of insurance, including CH2M HILL as named additional insured, are secured as a condition of subcontract award; and
- Ensuring HSE submittals, subcontract agreements, and appropriate site-specific safety procedures are in place and accepted prior field mobilization.

Ensure copies of training and medical monitoring records, and site-specific safety procedures are being maintained in the project file accessible to site personnel.

Provide oversight of subcontractor HSE practices per the site-specific safety plans and procedures.

Manage the site and interfacing with 3<sup>rd</sup> parties in a manner consistent with the contract and subcontract agreements and the applicable standard of reasonable care.

Ensure that the overall, job-specific, HSE goals are fully and continuously implemented.

Provide visible support and motivation for HSE programs, rules, procedures, processes, and training, leading by example and encouraging CH2M HILL employees to take ownership of HSE issues.

Intervene or stop work when an unsafe condition or behavior is observed, and/or when an environmentally compromising condition is encountered.

Make available to and require CH2M HILL employees to complete required HSE training within established timelines and provide project numbers for such training.

Consistently and even-handedly enforce HSE rules, procedures, and requirements at the office and/or on project work sites.

Promptly report all work-related HSE incidents or near misses.

Wear any required personal protective equipment.

Ensure CH2M HILL employees complete required HSE training within established timelines.

Conduct, cooperate, or assist with HSE incident investigations.

Consult with the Human Resources Delivery Partner before taking any disciplinary action (other than verbal counseling) associated with CH2M HILL Policy 203 and/or HSE programs rules, procedures, processes and training.

#### 4.2.2 CH2M HILL Responsible Health and Safety Manager

RHSM Name: John Culley/SPK

Cellular Number: 206/660-3367

The RHSM is responsible for the following:

Review and evaluate subcontractor HSE performance using the pre-qualification process;

Approve HSP and its revisions as well as Activity Hazard Analyses (AHA);

Review and evaluate subcontractor site-specific safety procedures for adequacy prior to start of subcontractor's field operations;

Support the oversight (or SC's direct oversight) of subcontractor and tiered subcontractor HSE practices;

Permit upgrades and downgrades in respiratory protection after reviewing analytical data;

Conduct audits as determined by project schedule and coordination with PM; and

Participate in incident investigations, lessons learned, loss and near loss reporting.

#### 4.2.3 CH2M HILL Project Environmental Manager

EM Name: Laura Brooks/DEN

Cellular Number: 303/994-5279

The Project EM is responsible for the following:

Provide environmental program support in areas such as training, auditing, planning, permit tracking, and subcontractor oversight as needed or as specified in the project environmental plan;

Review and evaluate qualifications for subcontractors with a history of environmental non-compliance and for waste transportation and disposal subcontractors;

Evaluate any spills, releases, or environmental permit incidents for appropriate follow-up actions, notifications, and recordkeeping requirements; and

Provide environmental compliance and environmental management expertise and advice to the project team as needed during the course of the project.

#### 4.2.4 CH2M HILL Safety Coordinator

Name: Rueben Greer/SPK

Phone: 509/847-8819

Name: Steve Demus/SPK

Phone: 509/ 944-1785

Name: Nathan Williams/PDX

Phone: 509/ 999-2292

Name: Cameron Irvine/SAC

Phone: 916/335-2369

Name: Rachel Zajac-Fay/SAC

Phone: 919/889-0468

Name: Mark Endo/SEA

Phone: 847/347-6607

Name: Shannon Bartow/PDX

Phone: 541/337-4415

The SC is responsible for verifying that the project is conducted in a safe manner including the following specific obligations:

Verify this HSP is current and amended when project activities or conditions change;

Verify CH2M HILL site personnel and subcontractor personnel read the HSP and sign the Employee Sign-Off Form, prior to commencing field activities;

Verify CH2M HILL site personnel have completed any required specialty training (for example, fall protection, confined space entry, among others) and medical surveillance as identified in this HSP;

Verify that project files include copies of subcontractor training and medical monitoring records, and accepted site-specific safety procedures prior to start of subcontractor's field operations;

Act as the project "Hazard Communication Coordinator" and perform the responsibilities outlined in the HSP;

Act as the project "Emergency Response Coordinator" and perform the responsibilities outlined in the HSP;

Hold and/or verify that safety meetings are conducted and documented in the project file initially and as needed throughout the course of the project (as tasks or hazards change);

Verify that project health and safety forms and permits are being used as outlined this HSP;

Perform oversight and assessments of subcontractor HSE practices per the site-specific safety plan and verify that project activity self-assessment checklists are being used as outlined this HSP;

Coordinate with the RHSM regarding CH2M HILL and subcontractor operational performance, and 3<sup>rd</sup> party interfaces;

Verify appropriate personal protective equipment (PPE) use, availability, and training;

Ensure that the overall, job-specific, HSE goals are fully and continuously implemented;

Conduct accident investigations including root cause analysis;

Calibrate and conduct air monitoring in accordance with the HSP; maintain all air monitoring records in project file;

Maintain HSE records and documentation;

Facilitate OSHA or other government agency inspections including accompanying inspector and providing all necessary documentation and follow-up;

Deliver field HSE training as needed based on project-specific hazards and activities;

Consistently enforce HSE rules, procedures, and requirements at the office and/or on project work sites;

Wear any required personal protective equipment;

Conduct, cooperate, or assist with HSE incident investigations;

Contact the PM and RHSM when standards of conduct or CH2M HILL Policy 203 has been violated by a CH2M HILL employee;

Contact the RHSM and PM in the event of an incident;

When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, stop affected work until adequate corrective measures are implemented, and notify the PM and RHSM as appropriate; and

Document all oral health and safety-related communications in project field logbook, daily reports, or other records.



### 4.3 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HSE-215, *Contracts and Subcontracts*)

Subcontractor: E2 Consulting Engineers

Subcontractor Contact Name:

Telephone:

Subcontractor Tasks: Sample transportation, documentation, and shipping

**Safety Procedures Required:** Must fully comply with our HSP

Subcontractors must comply with the following activities, and are responsible to:

Comply with all local, state, and federal safety standards;

Comply with project and owner safety requirements;

Actively participate in the project safety program and either hold or attend and participate in all required safety meetings;

Provide a qualified safety representative to interface with CH2M HILL;

Maintain safety equipment and PPE for their employees;

Maintain and replace safety protection systems damaged or removed by the subcontractor's operations;

Notify the SC of any accident, injury, or incident (including spills or releases) immediately and submit reports to CH2M HILL within 24 hours;

Install contractually required general conditions for safety (for example, handrail, fencing, fall protection systems, floor opening covers);

Conduct and document weekly safety inspections of project-specific tasks and associated work areas;

Conduct site-specific and job-specific training for all subcontractor employees, including review of the CH2M HILL HSP, subcontractor HSPs, and subcontractor AHAs and sign appropriate sign-off forms; and

Determine and implement necessary controls and corrective actions to correct unsafe conditions.

The subcontractors listed above may be required to submit their own site-specific HSP and other plans such as lead or asbestos abatement compliance plans. Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit their plans to CH2M HILL for review and acceptance before the start of field work.

Subcontractors are also required to prepare AHAs before beginning each activity posing hazards to their personnel. The AHA shall identify the principle steps of the activity, potential health and safety hazards for each step and recommended control measures for each identified hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements, and training requirements for the safe operation of the equipment listed must be identified.

### 4.4 Employee Responsibilities

All personnel are assigned responsibility for safe and healthy operations. This concept is the foundation for involving all employees in identifying hazards and providing solutions. For any operation, individuals have full authority to stop work and initiate immediate corrective action or control. In addition, each worker has a right and responsibility to report unsafe conditions or practices. This right represents a significant facet of worker empowerment and program ownership. Through shared values and a belief that all accidents are preventable, our employees accept personal responsibility for working safely.

Each employee is responsible for the following performance objectives:

Understanding and abiding by CH2M HILL and client HSE programs, rules, procedures, processes, and training, including any that are project-specific;

Completing all required HSE training made available and accessible within established timelines;

Always wearing any required personal protective equipment;

Intervening or stopping work for you or other CH2M HILL employees when an unsafe condition or behavior is encountered or observed, and/or when an environmentally compromising condition exists;

Promptly notifying a supervisor, PM, SC, or RHSM when an unsafe condition or behavior is observed, and/or when an environmentally compromising condition exists;

Promptly reporting a supervisor, PM, SC, or RHSM all work-related health, safety, and environmental incidents or near misses;

Attending required project HSE pre-task briefings and meeting prior to performing work; and

Cooperating or assisting with HSE incident investigations.

#### 4.4.1 Employee Authority

Each employee on the project has the obligation and authority to shut down any perceived unsafe work and during employee orientation, each employee will be informed of their authority to do so.

#### 4.5 3<sup>rd</sup>-party Contractors

(Reference CH2M HILL SOP HSE-215, *Contracts, Subcontracts and HSE Management Practices*)

Contractor: Gravity Consulting, LLC

Contractor Contact Name: Sean Hinz

Telephone: 425/281-1471

Contractor Tasks: Watercraft operations

Contractor: Columbia Navigation

Contractor Contact Name: Eric Weatherman

Telephone: 509/680-4335

Contractor Tasks: Watercraft operations

Contractor: AECOM

Contractor Contact Name:	PM and shore-based coordinator – Dr. Jennifer Pretare, 510-681-6401
Telephone:	Field Supervisor #1 (RV Tieton) – Michelle Stegner, 503-310-0087
	Field Supervisor #2 (RV Mazama) – Glen Mejia, 503-962-9007
	Relief Field Supervisor #3 (RV Tieton) – Kim Anderson, 206-353-0414

Contractor Tasks: Biota, fish, sediment, and water sampling; watercraft operations

Contractor: National Park Service

Contractor Contact Name: TBD

Telephone:

Contractor Tasks: Watercraft operations

Contractor: Colville Consolidated Tribes

Contractor Contact Name: TBD

Telephone:

Contractor Tasks: Fish collection

This HSP does not cover contractors that are contracted directly to the client or the owner.

CH2M HILL is not responsible for the health and safety or means and methods of the contractor's work,

and we must never assume such responsibility through our actions (such as advising on health and safety issues). In addition to these instructions, CH2M HILL team members should review contractor safety plans so that we remain aware of appropriate precautions that apply to us. Self-assessment checklists are to be used by the SC and CH2M HILL team members to review the contractor's performance only as it pertains to evaluating CH2M HILL exposure and safety. The RHSM is the only person who is authorized to comment on or approve contractor safety procedures.

Health and safety-related communications with contractors should be conducted as follows:

Request the contractor to brief CH2M HILL team members on the precautions related to the contractor's work;

When an apparent contractor non-compliance or unsafe condition or practice poses a risk to CH2M HILL team members:

- Notify the contractor safety representative;
- Request that the contractor determine and implement corrective actions;
- If necessary, stop affected CH2M HILL work until contractor corrects the condition or practice; and
- Notify the client, PM, and RHSM as appropriate.

If apparent contractor non-compliance or unsafe conditions or practices are observed, inform the contractor safety representative (CH2M HILL's obligation is limited strictly to informing the contractor of the observation; the contractor is solely responsible for determining and implementing necessary controls and corrective actions).

If an apparent imminent danger is observed, immediately warn the contractor employee(s) in danger and notify the contractor safety representative (CH2M HILL's obligation is limited strictly to immediately warning the affected individual(s) and informing the contractor of the observation; the contractor is solely responsible for determining and implementing necessary controls and corrective actions).

All verbal health and safety-related communications will be documented in project field logbook, daily reports, or other records.

## 5.0 Standards of Conduct

All individuals associated with this project must work injury-free and drug-free and must comply with the following standards of conduct, the HSP, and the safety requirements of CH2M HILL. Commonly accepted standards of conduct help maintain good relationships between people. They promote responsibility and self-development. Misunderstandings, frictions, and disciplinary action can be avoided by refraining from thoughtless or wrongful acts.

### 5.1 Standards of Conduct Violations

All individuals associated with this project are expected to behave in a professional manner. Violations of the standards of conduct would include, but not be limited to:

Failure to perform work;

Inefficient performance, incompetence, or neglect of work;

Willful refusal to perform work as directed (insubordination);

Negligence in observing safety regulations, poor housekeeping, or failure to report on-the-job injuries or unsafe conditions;

Unexcused or excessive absence or tardiness;

Unwillingness or inability to work in harmony with others;

Discourtesy, irritation, friction, or other conduct that creates disharmony;

Harassment or discrimination against another individual;

Failure to be prepared for work by wearing the appropriate construction clothing or bringing the necessary tools; or

Violation of any other commonly accepted reasonable rule of responsible personal conduct.

### 5.2 Disciplinary Actions

The Environmental Services (ES) business group employees, employees working on ES business group projects, and subcontractor employees are subject to disciplinary action for not following HSE rules and requirements. Potential disciplinary action is equally applicable to all employees including management and supervision. Disciplinary action may include denial of access to the worksite, warnings, reprimands, and other actions up to and including termination depending on the specific circumstances.

### 5.3 Subcontractor Safety Performance

CH2M HILL should continuously endeavor to observe subcontractors' safety performance and adherence to their plans and AHAs. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. CH2M HILL oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

### 5.3.1 Observed Hazard Form

When apparent non-compliance or unsafe conditions or practices are observed, notify the subcontractor's supervisor or safety representative verbally, and document using the Observed Hazard Form, included as an attachment to this HSP, and require corrective action.

If necessary, stop subcontractor's work using the Stop Work Order Form until corrective actions is implemented for observed serious hazards or conditions. Update the Observed Hazard Form to document corrective actions have been taken. The subcontractor is responsible for determining and implementing necessary controls and corrective actions.

### 5.3.2 Stop Work Order

CH2M HILL has the authority, as specified in the contract, and the responsibility to stop work in the event any CH2M HILL employee observes unsafe conditions or failure of the subcontractor to adhere to its safe-work practices, or observes a condition or practice that may result in a release or violation of an environmental requirement. This authority and action does not in any way relieve the subcontractor of its responsibilities for the means and methods of the work or, therefore, of any corrective actions. Failure to comply with safe work practices can be the basis for restriction or removal of the subcontractor staff from the job site, termination of the subcontract, restriction from future work, or all three.

When an apparent imminent danger is observed, immediately stop work and alert all affected individuals. Remove all affected CH2M HILL employees and subcontractor staff from the danger, notify the subcontractor's supervisor or safety representative, and do not allow work to resume until adequate corrective measures are implemented. Notify the PM, Contract Administrator (KA) and RHSM.

When repeated non-compliance or unsafe conditions are observed, notify the subcontractor's supervisor or safety representative and stop affected work by completing and delivering the Stop Work Order Form (attached to this HSP) until adequate corrective measures are implemented. Consult the KA to determine what the contract dictates for actions to pursue in event of subcontractor non-compliance including work stoppage, back charges, progress payments, removal of subcontractor manager, monetary penalties, or termination of subcontractor for cause.

## 5.4 Incentive Program

Each project is encouraged to implement a safety incentive program that rewards workers for exhibiting exemplary safety behaviors. Actions that qualify are those that go above and beyond what is expected. Actions that will be rewarded include spotting and correcting a hazard, bringing a hazard to the attention of your foreman, telling your foreman about an incident, coming up with a safer way to get the work done, or stopping a crew member from doing something unsafe. The program will operate throughout the project, covering all workers. The incentive program will be communicated to all employees during the project employee orientation and project safety meetings.

## 5.5 Reporting Unsafe Conditions/Practices

Responsibility for effective health and safety management extends to all levels of the project and requires good communication between employees, supervisors, and management. Accident prevention requires a pro-active policy on near misses, close calls, unsafe conditions, and unsafe practices. All personnel must report any situation, practice, or condition which might jeopardize the

safety of our projects. All unsafe conditions or unsafe practices will be corrected immediately. CH2M HILL has zero tolerance of unsafe conditions or unsafe practices.

No employee or supervisor will be disciplined for reporting unsafe conditions or practices. Individuals involved in reporting the unsafe conditions or practices will remain anonymous.

The following reporting procedures will be followed by all project employees:

Upon detection of any unsafe condition or practice, the responsible employee will attempt to safely correct the condition;

The unsafe condition or practice will be brought to the attention of the worker's direct supervisor, unless the unsafe condition or practice involves the employee's direct supervisor. If so, the SC needs to be notified at once by the responsible employee;

Either the responsible employee or responsible employee's direct supervisor is responsible for immediately reporting the unsafe condition or practice to the SC;

The SC will act promptly to correct the unsafe condition or practice; and

Details of the incident or situation will be recorded by the SC in the field logbook or use the Observed Hazard Form if subcontractor was involved.

## 6.0 Safety Planning and Change Management

### 6.1 Daily Safety Meetings and Pre-Task Safety Plans

Daily safety meetings are to be held with all project personnel in attendance to review the hazards posed and required HSE procedures and AHAs that apply for each day's project activities. The Pre-Task Safety Plans (PTSPs) serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisor and their work crews to focus on those hazards posed to individual work crews.

At the start of each day's activities, the crew supervisor completes the PTSP, provided as an attachment to this HSP, with input from the work crew, during their daily safety meeting. The day's tasks, personnel, tools and equipment that will be used to perform these tasks are listed, along with the hazards posed and required HSE procedures, as identified in the HSP and AHA. The use of PTSPs promotes worker participation in the hazard recognition and control process while reinforcing the task-specific hazard and required HSE procedures with the crew each day.

### 6.2 Change Management

This HSP addresses all known activities and associated hazards. As work progresses, if significant changes are identified which could affect health and safety at the site, coordinate with the RHSM to determine whether a HSP update is necessary.

The following are examples of changes that may require a revision to the plan:

Change in CH2M HILL staff;

New subcontractor to perform work;

New chemicals brought to site for use;

Change in scope or addition of new tasks;

Change in contaminants of concern (COCs) or change in concentrations of COCs; and

New hazards or hazards not previously identified that are not addressed in this HSP.

### 6.3 Agency Inspection Guidance

(Reference CH2M HILL SOP HSE-201, *Agency Inspections and Communications*)

Agency inspections (e.g., OSHA, EPA, other regulatory agencies) are on the rise. CH2M HILL implements safety and environmental programs in order to ensure safety to workers, the public, and the environment. This plan addresses things like labeling containers, completing the hazard communication training using the attachments to this HSP, listing training requirements and PPE requirements, and addressing project-specific hazards. Field personnel need to contact the RHSM to update this plan if hazards are encountered that are not addressed.

[SOP HSE-201](#) addresses agency inspections in detail, and the attached **Target Zero Bulletin on Agency Inspections** provides a good summary of the inspection process and what to do if an agency such as OSHA or EPA shows up at the site. It is critical to make immediate notification to the RHSM if an inspector arrives (and EM if it is environmental-related); they can help facilitate and make additional notifications.

Review the Target Zero Bulletin and keep it with your Health and Safety Plan/Environmental Plan. Make it a topic at a safety meeting and keep it readily available in the event of an inspection.

## 7.0 Project Hazard Analysis

A health and safety risk analysis (Table 1) has been performed for each task. In the order listed below, the RHSM considers the various methods for mitigating the hazards. Employees are trained on this hierarchy of controls during their hazardous waste training and reminded of them throughout the execution of projects:

- Elimination of the hazards (use remote sampling methodology to avoid going into a confined space);
- Substitution (reduce exposure to vapors by using of a geoprobe instead of test pitting);
- Engineering controls (ventilate a confined space to improve air quality);
- Warnings (establish exclusion zones to keep untrained people away from hazardous waste work);
- Administrative controls (implement a work-rest schedule to reduce chance of heat stress); or
- Use of PPE (use of respirators when action levels are exceeded).

The hazard controls and safe work practices are summarized in the following sections of this HSP:

- General hazards and controls;
- Project-specific hazards and controls;
- Physical hazards and controls;
- Biological hazards and controls; and
- Contaminants of concern.

### 7.1 Activity Hazard Analysis

An AHA must be developed for each CH2M HILL job activity. The AHA shall define the work tasks required to perform each activity, along with potential HSE hazards and recommended control measures for each hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements to be performed and training requirements for the safe operation of the equipment listed must be identified. Workers are briefed on the AHA before performing the work and their input is solicited prior, during, and after the performance of work to further identify the hazards posed and control measures required. The AHA shall identify the work tasks required to perform each activity, along with potential HSE hazards and recommended control measures for each hazard.

The following hazard controls and applicable CH2M HILL core standards and SOPs should be used as a basis for preparing AHAs.

AHAs prepared for CH2M HILL activities are included as an attachment to this HSP.

### 7.2 Subcontractor Activity Hazard Analysis

CH2M HILL subcontractors are required to provide AHAs specific to their scope of work on the project for acceptance by CH2M HILL. Each subcontractor shall submit AHAs for their field activities, as defined in their scope of work, along with their project-specific safety plan and procedures. Additions or changes in field activities, equipment, tools, or material used to perform work or hazards not addressed in existing AHAs requires either a new AHA to be prepared or an existing AHA to be revised.



Table 1 – General Activity Hazard Analysis

Potential Hazard	Project Activity	3 <sup>rd</sup> -party Observation of Fish, Biota, Water, Sediment, and Soil Sampling	Surveying, Site Reconnaissance	Collection of Split Samples	Collection of Sub-Surface Soil Samples	Collection and Preparation of Fish Tissue Samples
Biological Hazards		X	X	X	X	X
Blood Borne Pathogens		X	X	X	X	X
Chemical Hazard		X		X	X	
Driving		X	X	X	X	X
Electrical Safety		X	X	X		
Field Vehicles		X	X	X	X	X
Fire Prevention		X	X	X		X
Hand & Power Tools		X	X	X	X	X
Hazard Communication		X		X	X	
Ladder Safety		X	X	X		
Lighting		X	X	X	X	X
Manual Lifting		X	X	X	X	X
Noise		X	X	X		X
Boating Safety		X	X	X		X
Temperature Extremes		X	X	X	X	X
Ultraviolet Light exposure (sunburn)		X	X	X	X	X
Underground utilities					X	

## 8.0 General Hazards and Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. It is a summarized list of requirements. Always consult the appropriate CH2M HILL SOP to ensure all requirements are implemented.

### 8.1 Bloodborne Pathogens

(Reference CH2M HILL SOP HSE-202, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or cardiopulmonary resuscitation (CPR), or when coming into contact with landfill waste or waste streams containing potentially infectious material (PIM).

Employees trained in first-aid/CPR or those exposed to PIM must complete CH2M HILL’s 1-hour bloodborne pathogens computer-based training module annually. When performing first-aid/CPR the following shall apply:

Observe universal precautions to prevent contact with blood or other PIMs. Where differentiation between body fluid types is difficult or impossible, consider all body fluids to be potentially infectious materials;

Always wash your hands and face with soap and running water after contacting PIMs. If washing facilities are unavailable, use an antiseptic cleanser with clean paper towels or moist towelettes; and

If necessary, decontaminate all potentially contaminated equipment and surfaces with chlorine bleach as soon as possible. Use one part chlorine bleach (5.25 percent sodium hypochlorite solution) diluted with 10 parts water for decontaminating equipment or surfaces after initially removing blood or other PIMs. Remove contaminated PPE as soon as possible before leaving a work area.

- CH2M HILL will provide exposed employees with a confidential medical examination should an exposure to PIM occur. This examination includes the following procedures:

Documenting the exposure;

Testing the exposed employee's and the source individual's blood (with consent); and

Administering post-exposure prophylaxis.

## 8.2 Driving Safety

Refrain from using a cellular phone while driving. Pull off the road, put the vehicle in park and turn on flashers before talking on a cellular phone;

Never operate a personal digital assistant (PDA), or other device with e-mail, internet, or text messaging function while driving a vehicle;

Obey speed limits; be aware of blind spots or other hazards associated with low visibility. Practice defensive driving techniques, such as leaving plenty of room between your vehicle and the one ahead of you;

Do not drive while drowsy. Drowsiness can occur at any time, but is most likely after 18 hours or more without sleep;

Maintain focus on driving. Eating, drinking, smoking, adjusting controls can divert attention from the road. Take the time to park and perform these tasks when parked rather than while driving; and

Ensure vehicle drivers are familiar with the safe operation of vehicles of the type and size to be operated. Large vehicles such as full size vans and pick-ups have different vision challenges and handling characteristics than smaller vehicles.

## 8.3 Electrical Safety

(Reference CH2M HILL SOP HSE-206, *Electrical Safety*)

Below are the hazard controls and safe work practices to follow when using electrical tools, extension cords, and/or other electrical-powered equipment or when exposed to electrical hazards. Ensure the requirements of the referenced SOP are followed:

Only qualified personnel are permitted to work on unprotected energized electrical systems;

Only authorized personnel are permitted to enter high-voltage areas;

CH2M HILL employees who might from time to time work in an environment influenced by the presence of electrical energy must complete Awareness Level Electrical Safety Training located on the CH2M HILL VO;

Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented;

Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service;

CH2M HILL has selected Ground Fault Circuit Interrupters (GFCIs) as the standard method for protecting employees from the hazards associated with electric shock;

- GFCIs shall be used on all 120-volt, single phase 15 and 20-ampere receptacle outlets which are not part of the permanent wiring of the building or structure.

An assured equipment grounding conductor program may be required under the following scenarios:

- GFCIs cannot be utilized;
- Client requires such a program to be implemented; or
- Business group decides to implement program in addition to GFCI protection.

Extension cords must be equipped with third-wire grounding. Cords passing through work areas must be covered, elevated or protected from damage. Cords should not be routed through doorways unless protected from pinching. Cords should not be fastened with staples, hung from nails, or hung with wire;

Electrical power tools and equipment must be effectively grounded or double-insulated and Underwriters Laboratory (UL) approved;

Operate and maintain electric power tools and equipment according to manufacturers' instructions;

Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet (3 meters) from overhead power lines for voltages of 50 kV or less, and 10 feet (3 meters) plus 0.4 inches (1.0 cm) for every 1 kV over 50 kV;

Temporary lights shall not be suspended by their electric cord unless designed for suspension. Lights shall be protected from accidental contact or breakage; and

Protect all electrical equipment, tools, switches, and outlets from environmental elements.

## 8.4 Field Vehicles

Field vehicles may be personal vehicles, rental vehicles, fleet vehicles, or project vehicles.

Maintain a first aid kit, bloodborne pathogen kit, and fire extinguisher in the field vehicle at all times.

Utilize a rotary beacon on vehicle if working adjacent to active roadway.

Familiarize yourself with rental vehicle features prior to operating the vehicle:

- Vision Fields and Blind Spots
- Vehicle Size
- Mirror adjustments
- Seat adjustments
- Cruise control features, if offered
- Pre-program radio stations and Global Positioning System (GPS), if equipped

Always wear seatbelt while operating vehicle.

Adjust headrest to proper position.

Tie down loose items if utilizing a van or pick-up truck.

Close car doors slowly and carefully. Fingers can get pinched in doors.

Park vehicle in a location easily accessed in the event of an emergency. If not possible, carry a phone.

Have a designated place for storing the field vehicle keys when not in use.

Ensure back-up alarms are functioning, if equipped. Before backing a vehicle, take a walk around the vehicle to identify obstructions or hazards. Use a spotter when necessary to back into or out of an area.

See the Vehicle Accident Guidance attached to this HSP, if a vehicle incident is experienced in a rental or fleet vehicle.

## 8.5 Fire Prevention

(Reference CH2M HILL SOP HSE-403, *Hazardous Material Handling*)

Follow the fire prevention and control procedures listed below.

### 8.5.1 Fire Extinguishers and General Fire Prevention Practices

Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet (30.5 meters). When 5 gallons (19 liters) or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet (15.2 meters). Extinguishers must:

- be maintained in a fully charged and operable condition;
- be visually inspected each month; and
- undergo a maintenance check each year.

The area in front of extinguishers must be kept clear.

Combustible materials stored outside should be at least 10 feet (3 meters) from any building.

Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.

Keep areas neat. Housekeeping is important.

### 8.5.2 Dispensing of Flammable/Combustible Liquids

Areas in which flammable or combustible liquids are dispensed in quantities greater than 5 gallons (22.7 liters) (shall be separated from other operations by at least 25 feet (7.6 meters).

Drainage away from storm drains or surface waters or other means of containment shall be provided to control spills.

Adequate natural or mechanical ventilation shall be provided to maintain the concentration of flammable vapor at or below 10 percent of the lower flammable limit.

Dispensing of flammable liquids from one container to another shall be done only when containers are electrically interconnected (bonded).

Dispensing flammable or combustible liquids by means of air pressure on the container or portable tanks is prohibited.

Dispensing devices and nozzles for flammable liquids shall be of an approved type.

## 8.6 General Practices and Housekeeping

The following are general requirements applicable to all portions of the work:

Site work should be performed during daylight hours whenever possible;

Good housekeeping must be maintained at all times in all project work areas;

Common paths of travel should be established and kept free from the accumulation of materials;

Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions;

Provide slip-resistant surfaces, ropes, or other devices to be used;

Specific areas should be designated for the proper storage of materials;

Tools, equipment, materials, and supplies shall be stored in an orderly manner;

As work progresses, scrap and unessential materials must be neatly stored or removed from the work area;

Containers provided for collecting trash and other debris and shall be removed at regular intervals;

All spills shall be quickly cleaned up; oil and grease shall be cleaned from walking and working surfaces;

Review the safety requirements of each job you are assigned to with your supervisor. You are not expected to perform a job that may result in injury or illness to yourself or to others;

Familiarize yourself with, understand, and follow jobsite emergency procedures;

Do not fight or horseplay while conducting the firm's business;

Do not use or possess firearms or other weapons while conducting the firm's business;

Report unsafe conditions or unsafe acts to your supervisor immediately;

Report emergencies, occupational illnesses, injuries, vehicle accidents, and near misses immediately;

Do not remove or make ineffective safeguards or safety devices attached to any piece of equipment;

Report unsafe equipment, defective or frayed electrical cords, and unguarded machinery to your supervisor;

Shut down and lock out machinery and equipment before cleaning, adjustment, or repair. Do not lubricate or repair moving parts of machinery while the parts are in motion;

Do not run in the workplace;

When ascending or descending stairways, use the handrail and take one step at a time;

Do not apply compressed air to any person or clothing;

Do not wear steel taps or shoes with metal exposed to the sole at any CH2M HILL project location;

Do not wear finger rings, loose clothing, wristwatches, and other loose accessories when within arm's reach of moving machinery;

Remove waste and debris from workplace and dispose in accordance with federal, state or local regulations;

Note the correct way to lift heavy objects (secure footing, firm grip, straight back, lift with legs), and get help if needed. Use mechanical lifting devices whenever possible; and

Check the work area to determine what problems or hazards may exist.

## **8.7 Hazard Communication/GHS**

(Reference CH2M HILL SOPs HSE-107, *Hazard Communication* and HSE-403, *Hazardous Material Handling*)

The hazard communication coordinator is to perform the following:

Complete an inventory of chemicals brought on site by CH2M HILL using the chemical inventory form included as an attachment to this HSP;

Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available;

Request or confirm locations of material safety data sheets/safety data sheets (MSDS/SDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed;

Before or as the chemicals arrive on site, obtain an MSDS/SDS for each hazardous chemical and include on the chemical inventory sheet (attached to this HSP) and add the MSDS/SDS to the MSDS/SDS attachment section of this HSP;

Label chemical containers with the identity of the chemical and with hazard warnings, and store properly;

Give employees required chemical-specific HAZCOM training using the chemical-specific training form included as an attachment to this HSP; and

Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

## 8.8 Knife Use

Open-bladed knives (for example, box cutters, utility knives, pocket knives, machetes, and multi-purpose tools with fixed blades such as a Leatherman™) are prohibited at worksites except where the following three conditions are met:

The open-bladed knife is determined to be the best tool for the job;

An approved Activity Hazard Analysis (AHA) or written procedure is in place that covers the necessary safety precautions (work practices, PPE, and training); and

Knife users have been trained and follow the AHA.

## 8.9 Lighting

Lighting shall be evaluated when conducting work inside buildings, confined spaces, or other areas/instances where supplemental light may be needed (e.g., work before sunrise or after sunset). A light meter can be used to evaluate the adequacy of lighting. The following are common requirements for lighting and the conditions/type of work being performed:

While work is in progress outside construction areas shall have at least 33 lux (lx);

Construction work conducted inside buildings should be provided with at least 55 lux light;

The means of egress shall be illuminated with emergency and non-emergency lighting to provide a minimum 11 lx measured at the floor. Egress illumination shall be arranged so that the failure of any single lighting unit, including the burning out of an electric bulb will not leave any area in total darkness.

## 8.10 Personal Hygiene

Good hygiene is essential for personal health and to reduce the potential of cross-contamination when working on a hazardous waste site. Implement the following:

Keep hands away from nose, mouth, and eyes during work;

Keep areas of broken skin (chapped, burned, etc.) covered; and

Wash hands with soap and water prior to eating, smoking, or applying cosmetics.

## 8.11 Substance Abuse

(Reference CH2M HILL SOP HSE-105, *Drug-Free Workplace*)

Employees who work under the influence of controlled substances, drugs, or alcohol may prove to be dangerous or otherwise harmful to themselves, other employees, clients, the company, the company's assets and interests, or the public. CH2M HILL does not tolerate illegal drug use, or any use of drugs, controlled substances, or alcohol that impairs an employee's work performance or behavior.

Prohibitions onsite include:

Use or possession of intoxicating beverages while performing CH2M HILL work;

Abuse of prescription or nonprescription drugs;

Use or possession of illegal drugs or drugs obtained illegally;

Sale, purchase, or transfer of legal, illegal or illegally obtained drugs; and

Arrival at work under the influence of legal or illegal drugs or alcohol.

- Drug and/or alcohol testing is applicable under CH2M HILL Constructors, Inc. and munitions response projects performed in the United States. In addition, employees may be required to submit to drug and/or alcohol testing as required by clients. When required, this testing is performed in

accordance with SOP HSE-105, Drug-Free Workplace. Employees who are enrolled in drug or alcohol testing are required to complete annual training located on the CH2M HILL Virtual Office (VO).

## 8.12 Unknown or Suspect Objects/Materials

If unknown or suspect objects/materials are encountered (i.e. exposed or partially buried drums, biological waste, cylinders, munitions of explosive concern, unexpected stained/discolored soil) are encountered during site operations, ongoing activities shall be immediately suspended. CH2M HILL or subcontractor personnel encountering unknown or suspect objects/materials shall:

- 1) secure the area and identify the location of the object/material to the extent possible, without causing bodily injury to yourself or others and without disturbing the object,
- 2) evacuate the work area,
- 3) immediately notify the project manager/HSM of the encountered condition and
- 4) not provide additional disturbance or otherwise handle the suspect object/material.

The site supervisor or SC shall contact the Project Manager and the HSM to evaluate potential hazards associated with the specific situation encountered. The project team will then address the need for the use of special procedures, engineering controls, PPE or specialized subcontract personnel to safely mitigate the situation.

## 8.13 Field Ergonomics and Manual Lifting

(Reference CH2M HILL SOP HSE-112, *Manual Lifting*)

Some of the most common injuries during field work are the result of performing work in an awkward body position (poor ergonomics) or pushing the body beyond its natural limits. Workers who have to lift, stoop, kneel, twist, grip, stretch, reach overhead, or work in other awkward positions regularly are at risk of developing discomfort or even an injury. Additionally, back injuries are one of the leading causes of work disability and most back injuries are the result of improper lifting techniques or overexertion.

Contact the RHSM to determine hazard control measures if your task involves:

Repetitive motions;

Lifting and carrying items over long distances or on steep or sloped terrain;

Heavy lifting;

Use of vibrating tools or equipment; or

Being in a static position for extended periods of time;

There are a variety of ergonomically designed tools and work practices that can reduce the potential for discomfort and injury. Following are requirements (“must” or “shall”) and recommendations (“should”) to aid in the prevention of discomfort or injuries while working in the field.

### Fitness for Duty

If manual lifting and repetitive activities are not part of your normal work duties, contact your PM and/or RHSM to help determine if you have the physical capability to perform the work. In many cases adding lifting or repetitive tasks to a subcontractor’s scope of work is desirable to prevent injury. If the work task causes any pain or discomfort stop and get assistance.

### Manual Lifting

All CH2M HILL workers must have training in proper manual lifting either through New Employee Orientation or through the Manual Lifting module located on the VO;

When possible, the task should be modified to minimize manual lifting hazards or awkward body positions;

Lifting loads weighing more than 40 pounds (18 kilograms) shall be evaluated by the SC using the Lifting Evaluation Form contained in SOP HSE-112;

Personnel shall seek assistance when performing manual lifting tasks that appear beyond physical capabilities.

Using mechanical lifting devices such as forklifts; cranes, hoists, and rigging; hand trucks; and trolleys; is the preferred means of lifting heavy objects;

Work in the Power Zone - The power zone for lifting or working is close to the body, between mid-thigh and mid-chest height. This zone is where arms and back can lift the most with the least amount of effort.

Work near elbow height to avoid bending excessive bending (avoid working above the shoulders and below the knees);

- Plan before carrying:
  - Wear appropriate shoes to avoid slips, trips or falls
  - If you wear gloves, wear gloves that fit. Tight-fitting gloves can put pressure on the hands, while loose-fitting gloves reduce grip strength and pose other safety hazards.
  - Avoid carrying large or bulky loads that limit or obstruct your vision
  - Slide, push, or roll instead of carrying when appropriate
  - When there is a choice, push instead of pull
  - Carry only as much as you can safely handle
  - Try to avoid slopes, stairs, or other obstacles that make carrying materials more difficult
  - Beware of and try to avoid slippery floors (e.g., liquids, ice, oil, and fine powders)
  - Use extra caution when moving loads that may be unstable
- In general, the following steps must be practiced when planning and performing manual lifts:
  - Examine the load and the surrounding area
  - Bend knees when lifting a load
  - Look forward to keep back straight
  - Position the load close to the body
  - Maintain a firm grip on the load
  - Test the load for stability and weight prior to lifting
  - Use smooth, controlled movements
  - Keep arms in front of body
  - Turn feet in direction of movement to avoid twisting

### Ergonomic Work Practices

- Avoid repetitive motions, overhead reaching, and kneeling when possible;
- If prolonged awkward postures are unavoidable, use a “supported” posture to compensate; a supported posture uses part of your body to support the weight of another body segment that is in an awkward position;
- Watch your pace – attempting to do something faster can cause you to lose proper form;
- Use a table or move work to a location where you don’t have to be in a bent-over position to do your work;
- Where awkward postures or repetitive motions are unavoidable, rotate with another worker, change tasks, stretch, and take short breaks frequently.



## 9.0 Project-Specific Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the work or the particular hazard. Each person onsite is required to abide by the hazard controls. Always consult the appropriate CH2M HILL SOP to ensure all requirements are implemented. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the RHSM for clarification.

### 9.1 Boat Safety

- Walk cautiously when wading in water. Always wear waders. Always check depth of water when wading. Avoid entering deep or fast moving water.
- When boating, always properly wear PFDs. Keep weight centered in boat. Avoid sudden shifts in position or weight. Enter and exit the boat cautiously and one at a time.
- When loading/unloading boat from vehicle, avoid carrying and loading in a way that might cause back strain. Walk slowly and carefully when carrying equipment or the canoe.
- Ensure all personnel entering area are briefed of potential hazards prior to entering work area (Safety Manager, Site Manager).
- Do not over-load the boat with personnel, equipment, and supplies.
- Plan path to avoid high angle entry and rock climbing; with the least amount of obstructions.
- Wear high traction safety footwear
- Plan steps before making them
- If stuck in mud, move slowly
- Ensure good grip on boat and balance. Do not stand in boat while boat is in motion.
- Vessel operations will be suspended if skippers judge that weather or current conditions become unsafe.
- Know obstructions and shallows, proceed slowly.
- Boats to be handled by experienced personnel only
- Moor or anchor boats securely when not in use
- Load small craft evenly to avoid listing.
- Counterbalance small craft when pulling equipment or debris out of the water. Keep the vessel as level as possible.
- Keep boat free from tripping hazards.
- Be aware of boat position and movement and communicate with the operator.
- Good Hygiene practices to be used at all times. No eating, drinking, smoking or chewing tobacco if contact with contaminated media is expected.

#### **Boating Safety**

Personnel who will operate a boat during the course of a project shall first demonstrate to the site manager that they are experienced in operating boats similar to those used for the project and that they are knowledgeable of the U.S. Coast Guard Boating Safety requirements (33 CFR Subchapter S). Project boats shall be operated by experienced boat operators only. Boat operators shall also possess basic mechanical knowledge necessary to troubleshoot common mechanical problems that can and do occur. The boat operator shall be responsible for the safety of all personnel on board the boat he or she is operating and for the integrity of all boat and safety equipment.

Each designated boat operator shall give a safety briefing to all occupants of the boat prior to leaving the shore. Boats are to be occupied during use by not less than one qualified operator plus one additional person.

The boat skipper has the final authority with regard to boat safety and navigational safety.

Use the attached boat safety checklist to evaluate and verify necessary equipment prior to leaving shore

### **9.1.1 Boat Requirements**

All project boats will meet or exceed U.S. Coast Guard requirements for safety equipment, as applicable to the operation and type of boat. These requirements are summarized below for small craft (less than forty feet [12 meters] in length).

### **9.1.2 Flame Arresters**

All gasoline engines, except outboard motors, installed in a boat must have an approved flame arrestor (backfire preventer) fitted to the carburetor.

### **9.1.3 Sound Signaling Devices**

Boats shall carry at least one air horn or similar sound-signaling device. Radio or cell-phone communication must be in place as well.

### **9.1.4 Personal Flotation Devices**

All personnel and passengers shall wear an approved personal flotation device (PFD) at all times when operating or being transported in a boat. A positively buoyant wet suit or dry suit may be substituted for a PFD. PFDs shall be Type II or higher (capable of turning its wearer in a vertical or slightly backward position in the water). In addition, each boat shall be equipped with at least one Type IV PFD, designed to be thrown to a person in the water and grasped and held by the user until rescued. A buoyant boat cushion equipped with straps and a float ring are two common examples of a Type IV PFD.

### **9.1.5 Fire Extinguishers**

Each boat shall carry at least one Type B-I or B-II fire extinguisher (for use in gasoline, oil and grease fires) approved by Underwriters Laboratories (UL). Each fire extinguisher shall be inspected to ensure that it is sufficiently charged and that the nozzles are free and clear. Discharged fire extinguishers shall be replaced or recharged immediately.

### **9.1.6 Emergency Planning**

As part of the project HSP and AHAs, emergencies and response actions must be addressed for potential emergencies such as fire, sinking, flooding, severe weather, man over-board, hazardous material incidents, etc.

### **9.1.7 Load Capacity**

Boats shall not be loaded (passengers and gear) beyond the weight capacity printed on the U.S. Coast Guard information plate attached to the stern. In addition, several factors must be considered when loading a boat: distribute the load evenly, keep the load low, do not stand up in a small boat or canoe, and do not overload the boat.

### **9.1.8 Tool Kit**

All motorized boats shall carry a tool kit sufficient for the boat operator to troubleshoot common mechanical problems such as fouled spark plugs, flooded carburetor, electrical shorts, etc. Boats operated in remote areas shall also carry appropriate spare parts (propellers, shear pins, patch kits, air pumps, etc). The tool kit shall be maintained by the boat operator and supplies used up shall be replaced immediately.

### **9.1.9 Communications**

All boats operated shall carry a two-way radio or cellular telephone that enables communication back to the field camp or other pre-established location.

### 9.1.10 Good Housekeeping

Personnel using a boat shall properly stow and secure all gear and equipment against unexpected shifts when underway. Decks and open spaces must be kept clear and free from clutter and trash to minimize slip, trip, and fall hazards.

### 9.1.11 Fuel Management

Personnel shall utilize the "one-third rule" in boating fuel management. Use one-third of the fuel to get to the destination, one-third to return, and keep one-third in reserve.

No smoking is permitted on board vessels or during refueling operations.

### 9.1.12 Pollution Control

The Refuse Act of 1989 prohibits the throwing, discharging, or depositing of any refuse matter of any kind (including trash, garbage, oil, and other liquid pollutants) into the waters of the United States. The Federal Water Pollution Control Act prohibits the discharge of oil or hazardous substances in quantities that may be harmful into U.S. navigable waters. No person may intentionally drain oil or oily wastes from any source into the bilge of any vessel. Larger vessels equipped with toilet facilities must be equipped with a U.S. Coast Guard-approved marine sanitation device.

Employees shall report any significant oil spills to water to the \_\_\_\_\_ who must report the spill to the U.S. Coast Guard or other applicable regulatory agency. The procedure for incident reporting and investigation shall be followed when reporting the spill.

- Use the checklist below to evaluate vessel integrity.

Marine Vessel Checklist		
	Yes	N/A
Marine-band radio w/ Channel 16		
Satellite Phone		
Personal Flotation Devices (PFDs)		
Visual Distress Signals		
Anchor and Anchor Line		
Sound-Producing Devices		
Navigation Lights and Shapes		
Fire Extinguishers		
Alternative Propulsion (for example, paddles)		
Overall Vessel Condition Satisfactory		
Marine Sanitation Device		
Navigation Rules		
Ropes and Buoys		
First Aid Kit and Bloodborne Pathogen Kit		
Nonslip Deck		
Personnel Access Ladder		

## 9.2 Hand and Power Tools

(Reference CH2M HILL, SOP HSE-210, *Hand and Power Tools*)

Below are the hazard controls and safe work practices to follow when personnel or subcontractors are using hand and power tools. Ensure the requirements in the referenced SOP are followed:

Tools shall be inspected prior to use and damaged tools will be tagged and removed from service;

Hand tools will be used for their intended use and operated in accordance with manufacturer's instructions and design limitations;

Maintain all hand and power tools in a safe condition;

Use PPE (such as gloves, safety glasses, earplugs, and face shields) when exposed to a hazard from a tool;

Do not carry or lower a power tool by its cord or hose;

Portable power tools will be plugged into GFCI protected outlets;

Portable power tools will be Underwriters Laboratories (UL) listed and have a three-wire grounded plug or be double insulated;

Disconnect tools from energy sources when they are not in use, before servicing and cleaning them, and when changing accessories (such as blades, bits, and cutters);

Safety guards on tools must remain installed while the tool is in use and must be promptly replaced after repair or maintenance has been performed;

Store tools properly in a place where they will not be damaged or come in contact with hazardous materials;

If a cordless tool is connected to its recharge unit, both pieces of equipment must conform strictly with electrical standards and manufacturer's specifications;

Tools used in an explosive environment must be rated for work in that environment (that is, intrinsically safe, spark-proof, etc.); and

Working with manual or pistol-grip hand tools may involve highly repetitive movement, extended elevation, constrained postures, and/or awkward positioning of body members (e.g., hand, wrist, arm, shoulder, neck, etc.). Consider alternative tool designs, improved posture, the selection of appropriate materials, changing work organization, and sequencing to prevent muscular, skeletal, repetitive motion, and cumulative trauma stressors.

### Machine Guarding

Ensure that all machine guards are in place to prevent contact with drive lines, belts, chains, pinch points or any other sources of mechanical injury.

Unplugging jammed equipment will only be performed when equipment has been shut down, all sources of energy have been isolated and equipment has been locked/tagged and tested.

Maintenance and repair of equipment that results in the removal of guards or would otherwise put anyone at risk requires lockout of that equipment prior to work.

## 9.3 Inclement Weather

- This project may be conducted during months of the year in which severe storms occur at a higher frequency and develop rapidly; especially on the water. Personnel are to take heed of the weather forecast for the day and pay attention for signs of changing weather that indicate an impending storm. Signs include towering thunderheads, darkening skies, or a sudden increase in wind. If stormy

weather ensues, field personnel should discontinue work and seek shelter until the storm has passed.

- Protective measures during a lightning storm include seeking shelter; avoiding projecting above the surrounding landscape (don't stand on a hilltop or stand under a lone tree; seek low areas); staying away from open water, metal equipment, wire fences, and metal pipes; and positioning people several yards apart.
- Remember that lightning may strike several miles from the parent cloud, so work should be stopped/restarted accordingly. If you feel your hair stand on end or smell ozone, lightning may be about to strike you. Immediately drop to your knees and bend forward – **do not** lie flat on the ground.
- Flash floods are also a concern with the high mountains. Pay close attention to thunderstorms in the mountains and be aware of flash flood potential. Look for signs of floodplains.

## 9.4 Outdoor Safety Tips

- When scheduling daily sampling events, always inform someone as to where you are going, your route, and when you expect to return. **Stick to your plan.**
- Carry enough water for each person, each day of your sampling trips (plastic gallon jugs are handy and portable).
- If caught in a storm, find shelter as soon as possible and report your situation to the Project Manager.
- If your vehicle breaks down:
  - Stay near the vehicle. Your emergency supplies are there. A vehicle can be seen for miles, but a person on foot is very difficult to find.
  - Keep clothing on and dress in layers.
  - If you have water, **drink it**. Do not ration it.
  - If water is limited, keep your mouth shut. Do not talk, do not eat, do not smoke, do not drink alcohol, do not take salt.
- A roadway is a sign of civilization. If you find a road, **stay on it.**
- Report all incidents, no matter how minor, to your crew chief/lead, task manager, design manager, or Project Manager as appropriate.
- Incident reports are required for all incidents.
- Two-track roads are inherently difficult; use caution.
- Park the vehicle in a location where it can be accessed easily in the event of an emergency.
- Pay attention, constantly observe the work area for hazards, and implement every effort needed to protect CH2M HILL personnel from onsite hazards.
- Field work will be done during the daylight hours.
- Wear high-visibility orange vests if in areas where hunters may be.

## 9.5 Traffic Hazards

The following precautions must be taken when working around traffic, and in or near an area where traffic controls have been established by a contractor.

- Exercise caution when exiting traveled way or parking along street – avoid sudden stops, use flashers, etc.
- Park in a manner that will allow for safe exit from vehicle, and where practicable, park vehicle so that it can serve as a barrier.
- All staff working adjacent to traveled way or within work area must wear reflective/high-visibility vests.
- Eye protection should be worn to protect from flying debris.
- Remain aware of factors that influence traffic related hazards and required controls – sun glare, rain, wind, flash flooding, limited sight-distance, hills, curves, guardrails, width of shoulder (i.e., breakdown lane), etc.
- Always remain aware of an escape route -- behind an established barrier, parked vehicle, guardrail, etc.
- Always pay attention to moving traffic – never assume drivers are looking out for you
- Work as far from traveled way as possible to avoid creating confusion for drivers.

- When workers must face away from traffic, a “buddy system” should be used, where one worker is looking towards traffic.
- When working on highway projects, obtain a copy of the contractor’s traffic control plan.
- Work area should be protected by a physical barrier – such as a K-rail or Jersey barrier.
- Review traffic control devices to ensure that they are adequate to protect your work area. Traffic control devices should: 1) convey a clear meaning, 2) command respect of road users, and 3) give adequate time for proper traffic response. The adequacy of these devices are dependent on limited sight distance, proximity to ramps or intersections, restrictive width, duration of job, and traffic volume, speed, and proximity.
- Lookouts should be used when physical barriers are not available or practical. The lookout continually watches approaching traffic for signs of erratic driver behavior and warns workers. Vehicles should be parked at least 40 feet away from the work zone and traffic. Minimize the amount of time that you will have your back to oncoming traffic.

## 9.6 Uneven walking surfaces

- Employees walking in ditches, swales and other drainage structures adjacent to roads or across undeveloped land must use caution to prevent slips and falls which can result in twisted or sprained ankles, knees, and backs.
- Whenever possible observe the conditions from a flat surface and do not enter a steep ditch or side of a steep road bed.
- If steep terrain must be negotiated, sturdy shoes or boots that provide ankle support should be used. The need for ladders or ropes to provide stability should be evaluated.
- Wear sturdy footwear appropriate for site walk activities (i.e., hiking boots or work boots).
- Watch for icy conditions, and be aware of slips, trips and falls.

## 9.7 Soil Sampling

- Tie down loose items
- Utilize a spotter if backing vehicles or equipment towards the sampling location
- Inspect the sampling area for obstructions and poison ivy and poison oak, or other physical hazards
- If sample locations are located in dense tall grassy areas consider utilizing a “Bug-Out” suit or DuPont™ Tyvek® to mitigate the potential for tick bites
- If lifting heavy equipment from a vehicle, move items to the rear and get assistance when lifting
- Be alert for bees, wasps, and other insects when sampling
- Log calibration of the Direct Reading Instrument in either a field log book or on the attached form
- Notify others in the area that the task is going to be performed; delineate an exclusion zone, as applicable
- Don personal protective equipment (PPE) as specified in Section 4 of this site-specific HSP
- Position yourself upwind prior to sampling, if possible
- Do not handle sample jars without nitrile gloves

## 9.8 Utilities (Underground)

Name: One Call

Phone: 811

An assessment for underground utilities must be conducted where there is a potential to contact underground utilities or similar subsurface obstructions during intrusive activities. Intrusive activities include excavation, trenching, drilling, hand augering, soil sampling, or similar activities.

The assessment must be conducted before any intrusive subsurface activity and must include at least the following elements:

1. A background and records assessment of known utilities or other subsurface obstructions. *Specifically ask the resident if they buried any lines on their property (e.g. water, gas, electric), and follow the avoidance techniques in 9.8.5 and 9.8.6.*
2. Contacting and using the designated local utility locating service (e.g. 811).
3. Field team will utilize a Pipehorn 800 HL to aid the clearing process of suspect underground utility locations prior to using sampling tools.
4. A visual survey of the area to validate the chosen location (Refer to Section 9.8.4).
5. Conducting an independent field survey to identify, locate, and mark potential underground utilities or subsurface obstructions. *Note: This is independent of, and in addition to, any utility survey conducted by the designated local utility locating service above. NOTE: This requirement has been removed for this project only, if all of the other three provisions are followed, and the employee using the Terra Core instrument is wearing insulated "lineman" gloves when pushing the instrument into the ground (no exceptions)*

When any of these steps identifies an underground utility within 5 feet (1.5 meters) of intrusive work, then non-aggressive means must be used to physically locate the utility before a drill rig, backhoe, excavator or other aggressive method is used.

Aggressive methods are never allowed within 2 feet of an identified high risk utility (see paragraph below).

Any deviation from these requirements must be approved by the Responsible HS Manager and the PM.

### 9.8.1 Background and Records Assessment of Known Utilities

Identify any client- or location-specific permit and/or procedural requirements (e.g., dig permit or intrusive work permit) for subsurface activities. For military installations, contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.

Obtain available utility diagrams and/or as-built drawings for the facility.

Review locations of possible subsurface utilities including sanitary and storm sewers, electrical lines, water supply lines, natural gas lines, fuel tanks and lines, communication lines, lighting protection systems, etc. Note: Use caution in relying on as-built drawings as they are rarely 100 percent accurate.

Request that a facility contact with knowledge of utility locations review and approve proposed locations of intrusive work.

### 9.8.2 Designated Local Utility Locating Service

Contact your designated local utility locating service (e.g., Dig-Safe, Blue Stake, One Call) to identify and mark the location of utilities. Call 811 in the US or go to [www.call811.com](http://www.call811.com) to identify the appropriate local service group. Contacting the local utility locating service is a legal requirement in most jurisdictions.

### 9.8.3 Independent Field Survey (Utility Locate)

The organization conducting the intrusive work (CH2M HILL or subcontractor) shall arrange for an independent field survey to identify, locate, and mark any potential subsurface utilities in the work area. This survey is in addition to any utility survey conducted by the designated local utility locating service.

The independent field survey provider shall determine the most appropriate instrumentation/technique or combinations of instrumentation/techniques to identify subsurface utilities based on their experience and expertise, types of utilities anticipated to be present, and specific site conditions.

A CH2M HILL or subcontractor representative must be present during the independent field survey to observe the utility locate and verify that the work area and utilities have been properly identified and marked. If there is any question that the survey was not performed adequately or the individual was not

qualified, then arrangements must be made to obtain a qualified utility locate service to re-survey the area. Obtain documentation of the survey and clearances in writing and signed by the party conducting the clearance. Maintain all documentation in the project file.

If the site owner (military installation or client) can provide the independent field survey, CH2M HILL or the subcontractor shall ensure that the survey includes:

Physically walking the area to verify the work location and identify, locate, and mark underground utility locations:

Having qualified staff available and instrumentation to conduct the locate;

Agreeing to document the survey and clearances in writing.

Should any of the above criteria not be met, CH2M HILL or subcontractor must arrange for an alternate independent utility locate service to perform the survey.

The markings from utility surveys must be protected and preserved until the markings are no longer required. If the utility location markings are destroyed or removed before intrusive work commences or is completed, the PM, SC, or designee must notify the independent utility locate service or the designated local utility locating service to resurvey and remark the area.

#### 9.8.4 Visual Assessment before and during Intrusive Activities

Perform a “360 degree” assessment. Walk the area and inspect for utility-related items such as valve caps, previous linear cuts, patchwork in pavement, hydrants, manholes, utility vaults, drains, and vent risers in and around the dig area.

The visual survey shall include all surface landmarks; **sheds or shops with power running to them, partially day-lighted lines**, manholes, previous liner cuts, patchwork in pavement, pad-mounted transformers, utility poles with risers, storm sewer drains, utility vaults, and fire hydrants.

If any unanticipated items are found, conduct further research before initiating intrusive activities and implement any actions needed to avoid striking the utility or obstruction.

#### 9.8.5 Subsurface Activities within 5 feet of an Underground Utility or if there is Uncertainty

When aggressive intrusive activities will be conducted within 5 feet (1.5 meters) of an underground utility or when there is uncertainty about utility locations, locations must be physically verified by non-aggressive means such as air or water knifing or hand digging. Non-conductive tools must be used if electrical hazards may be present. If intrusive activities are within 5 feet (1.5 meters) and parallel to a marked existing utility, the utility location must be exposed and verified by non-aggressive methods every 100 feet (30.5 meters). Check to see if the utility can be isolated during intrusive work.

#### 9.8.6 Intrusive Activities within 2 feet of a “day-lighted” Underground Utility

Use non-aggressive methods (hand digging, vacuum excavation, etc.) to perform intrusive activities within 2 feet of a high risk utility (i.e., a utility that cannot be de-energized or would cause significant impacts to repair/replace). Hazardous utilities shall be de-energized whenever possible.

#### 9.8.7 Spotter

A spotter shall be used to monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon, presence of pea gravel or sand in soils, presence of concrete or other debris in soils, refusal of auger or excavating equipment). If any suspicious conditions are encountered stop work immediately and contact the PM or RHSM to evaluate the situation. The spotter must have a method to alert an operator to stop the intrusive activity (e.g., air horn, hand signals).



## 10.0 Physical Hazards and Controls

Physical hazards include exposure to temperature extremes, sun, noise, and radiation. If you encounter a physical hazard that has not been identified in this plan, contact the RHSM so that a revision to this plan can be made.

### 10.1 Noise

(Reference CH2M HILL SOP HSE-108, *Hearing Conservation*)

CH2M HILL is required to control employee exposure to occupational noise levels of 85 decibels, A-weighted, (dBA) and above by implementing a hearing conservation program that meets the requirements of the OSHA Occupational Noise Exposure standard, 29 CFR 1910.95. A noise assessment may be conducted by the RHSM or designee based on potential to emit noise above 85 dBA and also considering the frequency and duration of the task.

Areas or equipment emitting noise at or above 90dBA shall be evaluated to determine feasible engineering controls. When engineering controls are not feasible, administrative controls can be developed and appropriate hearing protection will be provided.

Areas or equipment emitting noise levels at or above 85 dBA, hearing protection must be worn.

Employees exposed to 85 dBA or a noise dose of 50% must participate in the Hearing Conservation program including initial and annual (as required) audiograms.

The RHSM will evaluate appropriate controls measures and work practices for employees who have experienced a standard threshold shift (STS) in their hearing.

Employees who are exposed at or above the action level of 85 dBA are required to complete the online Noise Training Module located on CH2M HILL's virtual office.

Hearing protection will be maintained in a clean and reliable condition, inspected prior to use and after any occurrence to identify any deterioration or damage, and damaged or deteriorated hearing protection repaired or discarded.

In work areas where actual or potential high noise levels are present at any time, hearing protection must be worn by employees working or walking through the area.

Areas where tasks requiring hearing protection are taking place may become hearing protection required areas as long as that specific task is taking place.

High noise areas requiring hearing protection should be posted or employees must be informed of the requirements in an equivalent manner and a copy of the OSHA standard 29 CFR 1910.95 shall be posted in the workplace.

### 10.2 Ultraviolet Radiation (sun exposure)

Health effects regarding ultraviolet (UV) radiation are confined to the skin and eyes. Overexposure can result in many skin conditions, including erythema (redness or sunburn), photoallergy (skin rash), phototoxicity (extreme sunburn acquired during short exposures to UV radiation while on certain medications), premature skin aging, and numerous types of skin cancer. Implement the following controls to avoid sunburn.

#### Limit Exposure Time

Rotate staff so the same personnel are not exposed all of the time.

Limit exposure time when UV radiation is at peak levels (approximately 2 hours before and after the sun is at its highest point in the sky).

Avoid exposure to the sun, or take extra precautions when the UV index rating is high.

### **Provide Shade**

Take lunch and breaks in shaded areas.

Create shade or shelter through the use of umbrellas, tents, and canopies.

Fabrics such as canvas, sailcloth, awning material and synthetic shade cloth create good UV radiation protection.

Check the UV protection of the materials before buying them. Seek protection levels of 95 percent or greater, and check the protection levels for different colors.

### **Clothing**

Reduce UV radiation damage by wearing proper clothing; for example, long sleeved shirts with collars, and long pants. The fabric should be closely woven and should not let light through.

Head protection should be worn to protect the face, ears, and neck. Wide-brimmed hats with a neck flap or "Foreign Legion" style caps offer added protection.

Wear UV-protective sunglasses or safety glasses. These should fit closely to the face. Wrap-around style glasses provide the best protection.

### **Sunscreen**

Apply sunscreen generously to all exposed skin surfaces at least 20 minutes before exposure, allowing time for it to adhere to the skin.

Re-apply sunscreen at least every 2 hours, and more frequently when sweating or performing activities where sunscreen may be wiped off.

Choose a sunscreen with a high sun protection factor (SPF). Most dermatologists advocate SPF 30 or higher for significant sun exposure.

Waterproof sunscreens should be selected for use in or near water, and by those who perspire sufficiently to wash off non-waterproof products.

Check for expiration dates, because most sunscreens are only good for about 3 years. Store in a cool place out of the sun.

No sunscreen provides 100 percent protection against UV radiation. Other precautions must be taken to avoid overexposure.

## **10.3 Temperature Extremes**

(Reference CH2M HILL SOP HSE-211, *Heat and Cold Stress*)

Each employee is responsible for the following:

Recognizing the symptoms of heat or cold stress;

Taking appropriate precautionary measures to minimize their risk of exposure to temperature extremes (see following sections); and

Communicating any concerns regarding heat and cold stress to their supervisor or SC.

### **10.3.1 Heat**

Heat-related illnesses are caused by more than just temperature and humidity factors.

**Physical fitness** influences a person's ability to perform work under heat loads. At a given level of work, the more fit a person is, the less the physiological strain, the lower the heart rate, the lower the

body temperature (indicates less retained body heat – a rise in internal temperature precipitates heat injury), and the more efficient the sweating mechanism.

**Acclimatization** is a gradual physiological adaptation that improves an individual’s ability to tolerate heat stress. Acclimatization requires physical activity under heat-stress conditions similar to those anticipated for the work. With a recent history of heat-stress exposures of at least two continuous hours per day for 5 of the last 7 days to 10 of the last 14 days, a worker can be considered acclimatized. Its loss begins when the activity under those heat-stress conditions is discontinued, and a noticeable loss occurs after 4 days and may be completely lost in three to four weeks. Because acclimatization is to the level of the heat-stress exposure, a person will not be fully acclimatized to a sudden higher level; such as during a heat wave.

**Dehydration** reduces body water volume. This reduces the body’s sweating capacity and directly affects its ability to dissipate excess heat.

The ability of a body to dissipate heat depends on the ratio of its surface area to its mass (surface area/weight). **Heat dissipation** is a function of surface area, while heat production depends on body mass. Therefore, overweight individuals (those with a low ratio) are more susceptible to heat-related illnesses because they produce more heat per unit of surface area than if they were thinner. Monitor these persons carefully if heat stress is likely.

When wearing **impermeable clothing**, the weight of an individual is not as important in determining the ability to dissipate excess heat because the primary heat dissipation mechanism, evaporation of sweat, is ineffective.

SYMPTOMS AND TREATMENT OF HEAT STRESS					
	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool—but not cold—water. Call ambulance, and get medical attention immediately!

### Precautions

Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°Fahrenheit (10 degrees Celsius [C]) to 60°Fahrenheit (F) (15.6 degrees C) should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons (7.5 liters) per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.

Acclimate yourself by slowly increasing workloads (do not begin with extremely demanding activities).

Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.

Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.

Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.

Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.

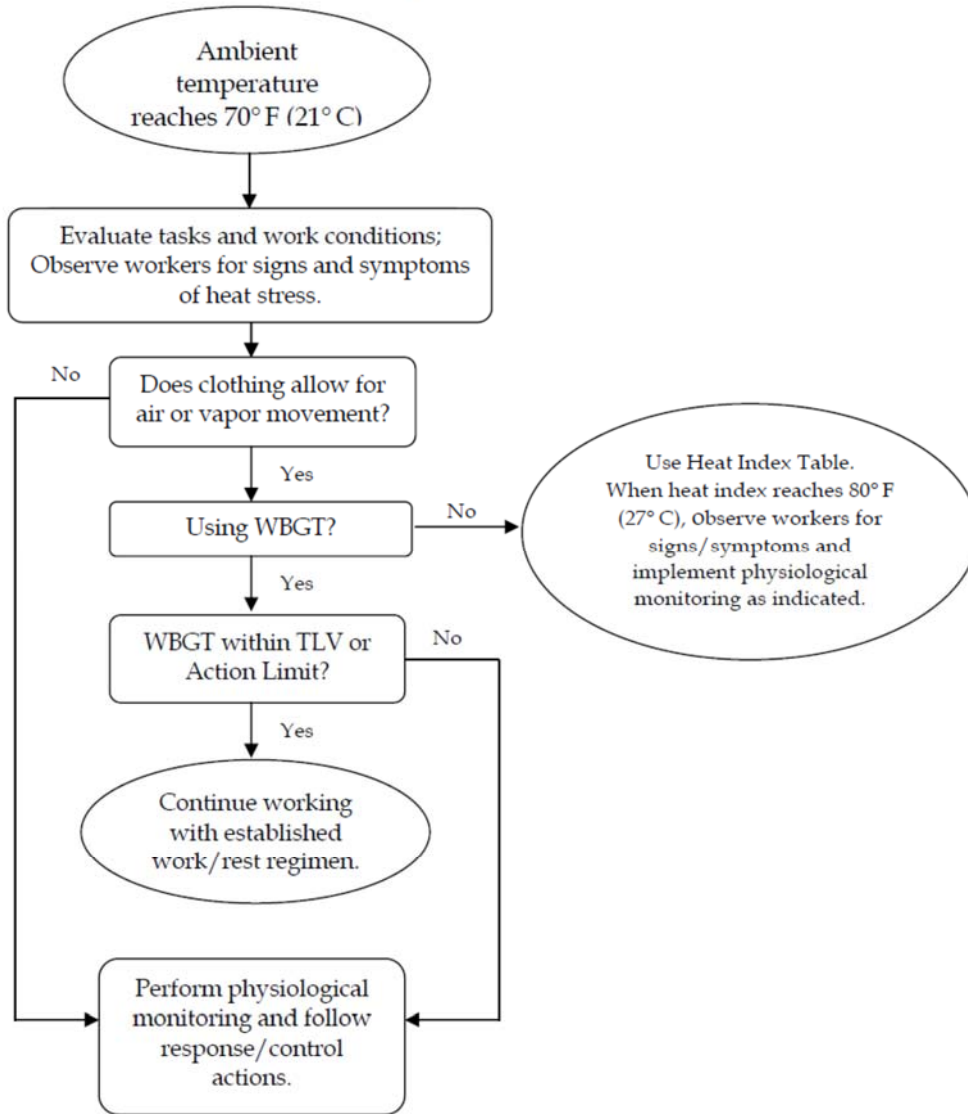
Provide adequate shade to protect personnel against radiant heat (sun, flames, hot metal).

Maintain good hygiene standards by frequently changing clothing and showering.

Observe one another for signs of heat stress. PREVENTION and communication is key.

### Thermal Stress Monitoring

**Thermal Stress Monitoring Flow Chart**

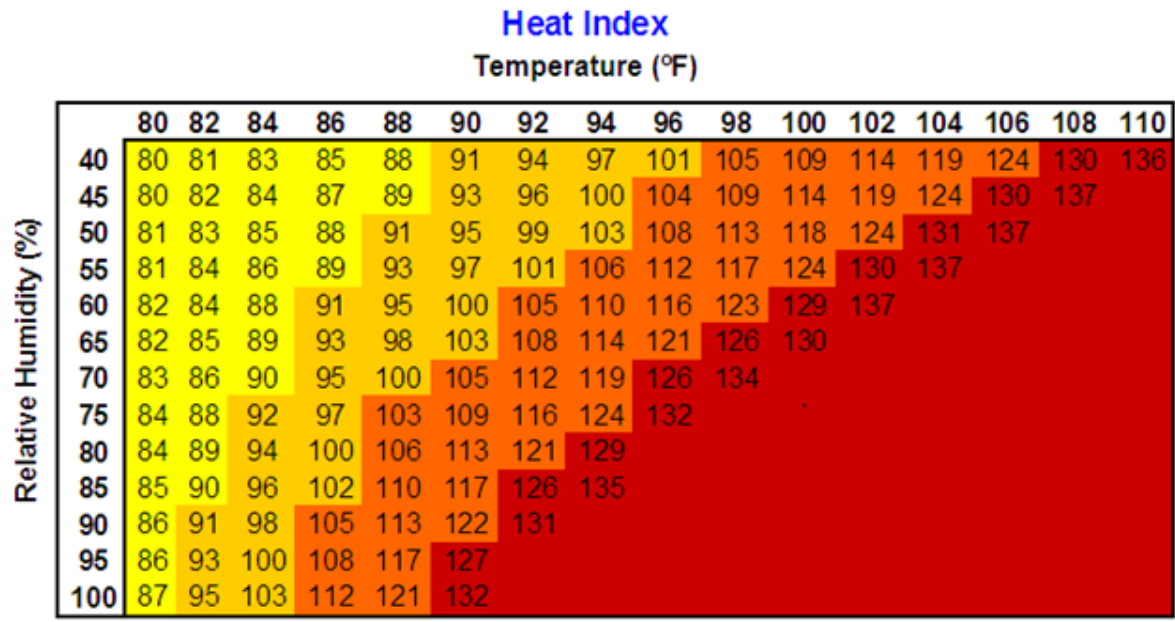


### Thermal Stress Monitoring – Permeable or Impermeable Clothing

When permeable work clothes are worn (street clothes or clothing ensembles over street clothes), regularly observe workers for signs and symptoms of heat stress and implement physiological monitoring as indicated below. This should start when the heat index reaches 80° F (27° C) [see Heat Index Table below], or sooner if workers exhibit symptoms of heat stress indicated in the table above. These heat index values were devised for shady, light wind conditions; exposure to full sunshine can

increase the values by up to 15°F (8°C). Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

When wearing **impermeable clothing** (e.g., clothing doesn't allow for air or water vapor movement such as Tyvek), physiological monitoring as described below shall be conducted when the ambient temperature reaches 70°F (21°C) or at a lower temperature when workers begin to exhibit signs and symptoms of heat stress.



Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution
  Extreme Caution
  Danger
  Extreme Danger

Heat Index	Possible Heat Disorders	Minimum Frequency of Physiological Monitoring
80°F - 90°F (27°C - 32°C)	Fatigue possible with prolonged exposure and/or physical activity	Observe Workers for signs of heat stress and implement physiological monitoring if warranted.
90°F - 105°F (32°C - 41°C)	Sunstroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity	Every 2 hours, or sooner, if signs of heat stress are observed.
105°F - 130°F (41°C - 54°C)	Sunstroke, heat cramps, or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity.	Every 60 minutes or sooner if signs of heat stress are observed.
130°F or Higher (54°C or Higher)	Heat/Sunstroke highly likely with continued exposure.	Every 30 minutes or sooner if signs of heat stress are observed.

Source: National Weather Service

### Physiological Monitoring and Associated Actions

The following physiological monitoring protocol below, using either radial pulse or aural temperature, will occur when the heat index is 80 degrees F or greater (or when personnel exhibit signs of heat stress), the following will be performed:

The sustained heart rate during the work cycle should remain below 180 beats per minute (bpm) minus the individual's age (e.g. 180 - 35 year old person = 145 bpm). The sustained heart rate can be estimated by measuring the heart rate at the radial pulse for 30 seconds as quickly as possible prior to starting the rest period.

The heart rate after one minute rest period should not exceed 120 beats per minute (bpm).

If the heart rate is higher than 120 bpm, the next work period should be shortened by 33 percent, while the length of the rest period stays the same.

If the pulse rate still exceeds 120 bpm at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent.

Continue this procedure until the rate is maintained below 120 bpm.

Alternately, the body temperature can be measured, either oral or aural (ear), before the workers have something to drink.

If the oral or aural temperature exceeds 99.6° F (37.6 ° F) at the beginning of the rest period, the following work cycle should be shortened by 33 percent.

Continue this procedure until the oral or aural (ear) temperature is maintained below 99.6 ° F (37.6° C). While an accurate indication of heat stress, oral temperature is difficult to measure in the field, however, a digital aural (aural) thermometer is easy to obtain and inexpensive to purchase.

### Procedures for when Heat Illness Symptoms are Experienced

**Always** contact the RHSM when any heat illness related symptom is experienced so that controls can be evaluated and modified, if needed.

In the case of cramps, reduce activity, increase fluid intake, move to shade until recovered.

In the case of all other heat-related symptoms (fainting, heat rash, heat exhaustion), and if the worker is a CH2M HILL worker, contact the occupational physician at 1-866-893-2514 and immediate supervisor.

In the case of heat stroke symptoms, call 911, have a designee give location and directions to ambulance service if needed, follow precautions under the emergency medical treatment of this HSP.

### 10.3.2 Cold

#### General

Low ambient temperatures increase the heat lost from the body to the environment by radiation and convection. In cases where the worker is standing on frozen ground, the heat loss is also due to conduction.

Wet skin and clothing, whether because of water or perspiration, may conduct heat away from the body through evaporative heat loss and conduction. Thus, the body cools suddenly when chemical protective clothing is removed if the clothing underneath is perspiration soaked.

Movement of air across the skin reduces the insulating layer of still air just at the skin's surface. Reducing this insulating layer of air increases heat loss by convection.

Non-insulating materials in contact or near-contact with the skin, such as boots constructed with a metal toe or shank, conduct heat rapidly away from the body.

Certain common drugs, such as alcohol, caffeine, or nicotine, may exacerbate the effects of cold, especially on the extremities. These chemicals reduce the blood flow to peripheral parts of the body, which are already high-risk areas because of their large surface area to volume ratios. These substances may also aggravate an already hypothermic condition.

## Precautions

Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in wet weather.

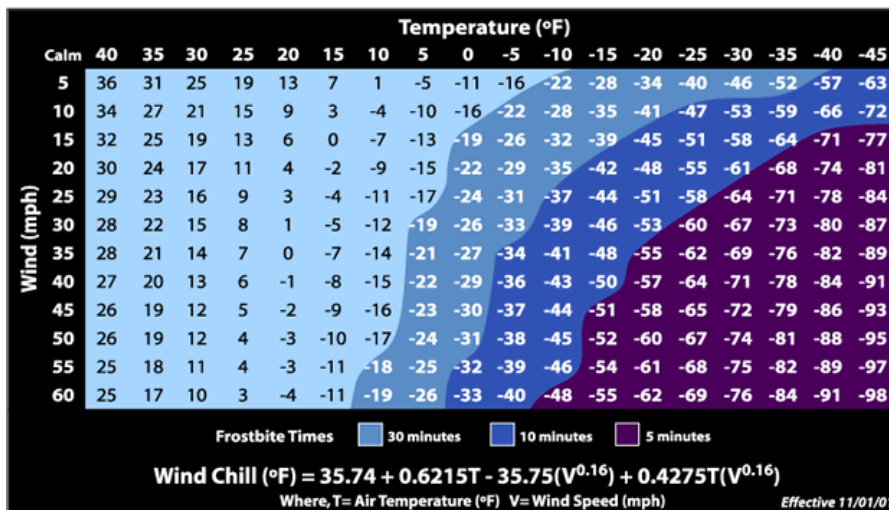
Wind-Chill Index (below) is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.

Persons who experience initial signs of immersion foot, frostbite, and/or hypothermia should report it immediately to their supervisor/PM to avoid progression of cold-related illness.

Observe one another for initial signs of cold-related disorders.

Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

SYMPTOMS AND TREATMENT OF COLD STRESS			
	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm—but <b>not</b> hot—water. Have victim drink warm fluids, but <b>not</b> coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but <b>not</b> coffee or alcohol. Get medical attention.



## 10.4 Radiological Hazards

Refer to CH2M HILL’s Core Standard, Radiological Control and Radiological Controls Manual for additional requirements.

Hazards	Controls
None Known	None Required

## 11.0 Biological Hazards and Controls

Biological hazards are everywhere and change with the region and season. If you encounter a biological hazard that has not been identified in this plan, contact the RHSM so that a revision to this plan can be made. Whether it is contact with a poisonous plant, a poisonous snake, or a bug bite, do not take bites or stings lightly. If there is a chance of an allergic reaction or infection, or to seek medical advice on how to properly care for the injury, contact the occupational nurse at 1-866-893-2514.

### 11.1 Bees and Other Stinging Insects

Bees and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform your supervisor and/or a buddy. If you are stung, contact the occupational nurse at 1-866-893-2514. If a stinger is present, remove it as soon as possible using something with a thin, hard edge (e.g., credit card) to scrape the stinger out. Be sure to sanitize the object first with hand sanitizer, alcohol or soap and water. Wash and disinfect the wound, cover it, and apply ice. Watch for an allergic reaction if you have never been stung before. Call 911 if the reaction is severe.

### 11.2 Bird Droppings

Large amounts of bird droppings may present a disease risk. The best way to prevent exposure to fungus spores in bird droppings is to avoid disturbing it. A brief inhalation exposure to highly contaminated dust may be all that is needed to cause infection and subsequent development of fungal disease.

If disturbing the droppings or if removal is necessary to perform work, follow these controls:

Use dust control measures (wetting with water or HEPA vacuuming) for all activities that may generate dust from the accumulated droppings.

Wear Tyvek with hoods, disposable gloves and booties, and air-purifying respirators with a minimum N95 rating.

Put droppings into plastic/poly bags and preferably into a 55-gallon drum to prevent bag from ripping.

### 11.3 Hantavirus

Hantavirus pulmonary syndrome (HPS) is a disease caused by a virus which can be transmitted from certain rodents to humans and is prevalent throughout the United States. Avoid disturbing rodent nests. Contact is most likely to occur when there is a current rodent infestation in things like control boxes, storage sheds, wellheads, remediation equipment, or trailers. Once excreted into the environment by the rodent, hantaviruses can survive in the environment and remain infectious for a period of 2-3 days. Ultraviolet rays in sunlight inactivate hantaviruses. Nesting material and droppings must be removed if work is necessary in a rodent-infested area. PPE for removal shall include:

Tyvek coveralls;

Rubber boots or disposable shoe covers;

Rubber, latex, or vinyl gloves;

Respiratory protection such as a full face or half-mask air-purifying respirator with a high-efficiency particulate air (HEPA) filter; and

Protective goggles if wearing a half-mask respirator.

Spray any urine, droppings, and nesting materials with either a bleach and water solution (1 parts bleach to 9 parts water) or a household disinfectant prepared according to the label instructions for



dilution and disinfection time. Soak well and let stand for 15 minutes. Use a paper towel or rag to pick up the materials and dispose of them.

Mop floors after spraying them using bleach and water solution or a disinfectant. Dirt floors can be sprayed with either bleach and water solution or a disinfectant. Personal protective gear shall be decontaminated upon removal at the end of the day. All potentially infective waste material (including respirator filters) from clean-up operations shall be double-bagged in plastic bags.

### Symptoms of HPS

Symptoms develop between 14 and 31 days after exposure to infected rodents and include fatigue, fever, and muscle aches, especially the large muscle groups--thighs, hips, back and sometimes shoulders. About half of all HPS patients also experience headaches, dizziness, chills and/or abdominal pain. Four to 10 days after the initial phase of the illness, late symptoms of HPS may appear. These include coughing and shortness of breath. If you develop symptoms suggestive of HPS, call the occupational nurse at 1-866-893-2514.

## 11.4 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Call the occupational nurse at 1-866-893-2514 immediately. Do not apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings. Below is a guide to identifying poisonous snakes from non-poisonous snakes.

### Identification of Poisonous Snakes

<p align="center"><b>Major Identification Features Non-venomous Snake</b></p>	<p align="center"><b>Major Identification Features Venomous Snake</b></p>
<ol style="list-style-type: none"> <li>1. Round pupils</li> <li>2. No sensing pit</li> <li>3. Head slightly wider than neck</li> <li>4. Divided anal plate</li> <li>5. Double row of scales on the underside of the tail</li> </ol>	<ol style="list-style-type: none"> <li>1. Elliptical pupils</li> <li>2. Sensing pit between eye and nostril</li> <li>3. Head much wider than neck</li> <li>4. Single anal plate</li> <li>5. Single scales on the underside of the tail</li> </ol>

## 11.5 Spiders - Brown Recluse and Widow

The Brown Recluse spider can be found most anywhere in the United States. It varies in size in shape, but the distinguishing mark is the violin shape on its body. They are typically non-aggressive. Keep an eye out for irregular, pattern-less webs that sometimes appear almost tubular built in a protected area such as in a crevice or between two rocks. The spider will retreat to this area of the web when threatened.

The Black Widow, Red Widow and the Brown Widow are all poisonous. Most have globose, shiny abdomens that are predominantly black with red markings (although some may be pale or have lateral stripes), with moderately long, slender legs. These spiders are nocturnal and build a three-dimensional tangled web, often with a conical tent of dense silk in a corner where the spider hides during the day.

### Hazard Controls

Inspect or shake out any clothing, shoes, towels, or equipment before use.

Wear protective clothing such as a long-sleeved shirt and long pants, hat, gloves, and boots when handling stacked or undisturbed piles of materials.

Minimize the empty spaces between stacked materials.

Remove and reduce debris and rubble from around the outdoor work areas.

Trim or eliminate tall grasses from around outdoor work areas.

Store apparel and outdoor equipment in tightly closed plastic bags.

Keep your tetanus boosters up-to-date (every 10 years). Spider bites can become infected with tetanus spores.

If you think you have been bit by a poisonous spider, immediately call the occupational nurse at 1-866-893-2514 and follow the guidance below:

Remain calm. Too much excitement or movement will increase the flow of venom into the blood;

Apply a cool, wet cloth to the bite or cover the bite with a cloth and apply an ice bag to the bite;

Elevate the bitten area, if possible;

Do not apply a tourniquet, do not try to remove venom; and

Try to positively identify the spider to confirm its type. If the spider has been killed, collect it in a plastic bag or jar for identification purposes. Do not try to capture a live spider – especially if you think it is a poisonous spider.

Black Widow



Red Widow



Brown Widow



Brown Recluse



If you are stung by a scorpion, call the occupational nurse 1-866-893-2514 and try to note the description of the scorpion. Cleanse the sting area and apply ice.

## 11.6 Black Bears

Bears may inhabit wooded areas where there is scarce continuous human presence. Make your presence known-especially when vegetation and terrain make it hard to see. Make noise, sing, or talk loudly. Avoid thick brush. Try to walk with the wind at your back so your scent will warn bears of your presence.

Give bears plenty of room. Every bear has a "personal space" - the distance within which a bear feels threatened - that can be from a few feet to a few hundred feet. If you stray within that zone, a bear may act aggressively. Never approach bears, even if only out of curiosity, and never attempt to feed bears.

If a bear cannot recognize you, he may come closer or stand on his hind legs for a better view. You may try to back away slowly diagonally, but if the bear follows, stop and stand your ground. If the bear moves closer or acts aggressively, stay close together and wave your arms and shout.

Do not climb a tree - black bears are good climbers.

Do not run. Bears have been clocked at speeds of up to 35 mph, and like dogs, will chase fleeing animals. Bears often make bluff charges, sometimes up to 10 feet away without making contact. Continue waving your arms and shouting. Never imitate bears sounds or use high-pitched squeals.

If attacked, do not run. Clasp your hands tightly over the back of your neck or if you are carrying a backpack use it to protect your head and neck and remain still. For Black bears, if the attack lasts for more than a few seconds, respond aggressively - use sticks, rocks, your fists or noise. Black bears will sometimes back off if they are challenged.

## 11.7 Ticks

Every year employees are exposed to tick bites at work and at home putting them at risk of illness. Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch (6.4 mm) in size. In some geographic areas exposure is not easily avoided. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray only outside of clothing with permethrin or permanone and spray skin with only DEET; and check yourself frequently for ticks.

Where site conditions (vegetation above knee height, tick endemic area) or when tasks (having to sit or kneel in vegetation) diminish the effectiveness of the other controls mentioned above, bug-out suits (check with your local or regional warehouse) or Tyvek shall be used. Bug-out suits are more breathable than Tyvek.

Take precautions to avoid exposure by including pre-planning measures for biological hazards prior to starting field work. Avoid habitats where possible, reduce the abundance through habitat disruption or application of acaricide. If these controls aren't feasible, contact your local or regional warehouse for preventative equipment such as repellants, protective clothing and tick removal kits. Use the buddy system and perform tick inspections prior to entering the field vehicle. If ticks were not planned to be encountered and are observed, do not continue field work until these controls can be implemented.

See Tick Fact Sheet (Attachment 5) for further precautions and controls to implement when ticks are present. If bitten by a tick, follow the removal procedures found in the tick fact sheet, and call the occupational nurse at 1-866-893-2514.

Be aware of the symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme disease is a rash that might appear that looks like a bull's eye with a small welt in the center. RMSF is a rash of red spots under the skin 3 to 10 days after the tick bite. In both RMSF and Lyme disease, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, again contact the occupational nurse at 1-866-893-2514.

Be sure to complete an Incident Report (either use the Hours and Incident Tracking System [HITS] system on the VO) if you do come in contact with a tick.

## 11.8 Feral Dogs

Avoid all dogs - both leashed and stray. Do not disturb a dog while it is sleeping, eating, or caring for puppies. If a dog approaches to sniff you, stay still. An aggressive dog has a tight mouth, flattened ears and a direct stare. If you are threatened by a dog, remain calm, do not scream and avoid eye contact. If you say anything, speak calmly and firmly. Do not turn and run, try to stay still until the dog leaves, or back away slowly until the dog is out of sight or you have reached safety (e.g. vehicle). If attacked, retreat to vehicle or attempt to place something between you and the dog. If you fall or are knocked to the ground, curl into a ball with your hands over your head and neck and protect your face. If bitten, wash the wound vigorously with soap and water, and contact the occupational nurse at 1-866-893-2514. Report the incident to the local authorities, and try to get as much information about the dog as possible (e.g. breed, size, color, owner, location, signs of sickness, erratic behavior other than the aggressiveness of the attack) .

## 12.0 Contaminants of Concern

The table below summarizes the potential contaminants of concern (COC) and their occupational exposure limit and signs and symptoms of exposure.

Contaminants of Concern					
Contaminant	Location and Maximum <sup>a</sup> Concentration	Exposure Limit <sup>b</sup>	IDLH <sup>c</sup>	Symptoms and Effects of Exposure	PIP <sup>d</sup> (eV)
Arsenic	Present in slag material; or as a result upland deposition	0.01 mg/m <sup>3</sup>	5 Ca	Ulceration of nasal septum, respiratory irritation, dermatitis, gastrointestinal disturbances, peripheral neuropathy, hyper-pigmentation	NA
Barium		0.5 mg/m <sup>3</sup>	50	Irritation to eyes, skin, upper resp; skin burns; gastroenteritis; slow pulse	NA
Cadmium		0.005 mg/m <sup>3</sup>	9 Ca	Pulmonary edema, coughing, chest tightness/pain, headache; chills, muscle aches, nausea, vomiting, diarrhea; difficulty breathing; loss of sense of smell; emphysema; mild anemia	NA
Cobalt (Metal Dusts)		0.05 mg/m <sup>3</sup>	20	Coughing; difficulty breathing; wheezing; decreased pulmonary function; diffuse nodule fibroses; dermatitis; respiratory hypersensitivity; asthma	NA
Copper		1 mg/m <sup>3</sup>	100	Irritation to eyes, skin, nose, and pharynx; metallic taste; dermatitis	NA
Lead		0.05 mg/m <sup>3</sup>	100	Weakness lassitude, facial pallor, pal eye, weight loss, malnutrition, abdominal pain, constipation, anemia, gingival lead line, tremors, paralysis of wrist and ankles, encephalopathy, kidney disease, irritated eyes, hypertension	NA
Manganese		1 mg/m <sup>3</sup>	500	Insomnia; mental confusion; meta fume fever; dry throat; cough; flu-like fever; vomit; malaise	NA
Zinc		5 mg/m <sup>3</sup>	500	Chills; aches; nausea; fever; cough; dry throat; headache; blurred vision; vomit; fatigue	NA
Footnotes: <sup>a</sup> Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), SS (Surface Soil), SL (Sludge), SW (Surface Water). <sup>b</sup> Appropriate value of permissible exposure limit (PEL), recommended exposure limit (REL), or threshold limit value (TLV) listed. <sup>c</sup> IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen. <sup>d</sup> PIP = photoionization potential; NA = Not applicable; UK = Unknown. eV = electron volt; mg/kg = milligram per kilogram; mg/m <sup>3</sup> = milligrams per cubic meter					
Potential Routes of Exposure					
<b>Dermal:</b> Contact with contaminated media. This route of exposure is minimized through use of engineering controls, administrative controls and proper use of PPE.		<b>Inhalation:</b> Vapors and contaminated particulates. This route of exposure is minimized through use of engineering controls, administrative controls and proper use of respiratory protection when other forms of control do not reduce the potential for exposure.		<b>Other:</b> Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).	

## 13.0 Site Monitoring

(Reference CH2M HILL SOP HSE-207, *Exposure Monitoring for Airborne Chemical Hazards*)

When performing site monitoring, record all the information, such as in a field logbook. Note date and time, describe monitoring location (for example, in breathing zone, at source and site location), and what the reading is. If any action levels are reached, note it in the field logbook and note the action taken.

Exposure records (air sampling) must be preserved for the duration of employment plus thirty years. Ensure that copies of the field log book are maintained in the project file.

Copies of all project exposure records (e.g., copies of field logbook pages where air monitoring readings are recorded and associated calibration) shall be sent to the regional SPA for retention and maintained in the project files.

### 13.1 Air Monitoring Specifications

Instrument	Tasks	Action Levels <sup>a</sup>	Frequency <sup>b</sup>	Calibration
Visual Dust Monitor	<ul style="list-style-type: none"> <li>3<sup>rd</sup>-party observation of fish, biota, water, sediment, and/or soil sampling</li> <li>Collection of upland surface soil samples</li> <li>Split sample collection</li> </ul>	No Visual Dust → Level D  Visual Dust → Implement dust control measures	Initially and continuously during tasks	None

<sup>a</sup> Action levels apply to **sustained** breathing-zone measurements above background for **more than 5 minutes**.

<sup>b</sup> The exact frequency of monitoring depends on field conditions and is to be determined by the SC-HW; generally, every 5 to 15 minutes if acceptable; it may be appropriate to do so more frequently. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (for example, "Breathing Zone/MW-3," "at surface/SB-2," etc.).

**Note: Based on the COCs and scope of work, at this time, there does not appear to be an inhalation exposure hazard. Employees should still use good personal hygiene, wash hands before meals, and wear chemical resistant gloves when conducting field activities listed in Section 3.3.1 and handling any potential contaminated media. If analytical data indicates an increase in contamination, or the scope of work changes, notify the Health and Safety Manager to reevaluate air monitoring for future tasks onsite.**

### 13.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Instrument	Gas	Span	Reading	Method
Not Applicable at this time				

### 13.3 Air Sampling

**Method Description:** Based on current site conditions, recent analytical data, and the tasks planned in this work order, air sampling will not be required at this time. If site conditions or tasks change, notify the Health and Safety Manager to reevaluate the need for air sampling.

# 14.0 Personal Protective Equipment

(Reference CH2M HILL- SOP HSE-117, *Personal Protective Equipment*)

## 14.1 Required Personal Protective Equipment

PPE must be worn by employees when actual or potential hazards exist and engineering controls or administrative practices cannot adequately control those hazards. A PPE assessment has been conducted by the RHSM based on project tasks (see PPE specifications below). Verification and certification of assigned PPE by task is completed by the RHSM that approved this plan. Below are items that need to be followed when using any form of PPE:

Employees must be trained to properly wear, limitations, and maintain of the PPE;

In work areas where actual or potential hazards are present at any time, PPE must be worn by employees working or walking through the area;

PPE inspected prior to use to identify any deterioration or damage; maintained in a clean and reliable condition; discarded if damaged; not modified, tampered with, or repaired beyond routine maintenance.

### Project-Specific Personal Protective Equipment Requirements<sup>a</sup>

Task	Level	Body	Head	Respirator <sup>b</sup>
<ul style="list-style-type: none"> <li>Site reconnaissance</li> <li>Surveying</li> </ul>	N/A	<p><b>Coveralls:</b> Standard field attire (i.e. long pants and shirts w/ sleeves)</p> <p><b>Boots:</b> Steel-toe, chemical-resistant boots OR steel-toe, leather work boots</p> <p><b>Gloves:</b> Leather gloves (if necessary based on hazards).</p> <p><b>Personal Flotation Device:</b> A coast guard approved PFD required when onboard a boat, tumbling into swift-moving or deep water, or wading in water exceeding 3 feet in depth.</p> <p><b>Waders:</b> Waders will be used when wading in water above the boot line.</p>	<p>Hardhat<sup>c</sup></p> <p>Safety glasses</p> <p>Ear protection<sup>d</sup></p>	None required.
<ul style="list-style-type: none"> <li>3<sup>rd</sup>-party observation of fish, biota, water, sediment, and/or soil sampling</li> <li>Collection of upland surface soil samples</li> <li>Split sample collection</li> <li>Collection and sample preparation of fish tissue</li> </ul>	Modified D	<p><b>Coveralls:</b> Cotton coveralls or rain gear, or uncoated Tyvek® if cotton coveralls cannot be kept clean.</p> <p><b>Boots:</b> Steel-toe, chemical-resistant boots OR steel-toe, leather work boots</p> <p><b>Gloves:</b> Nitrile gloves when sampling.</p> <p><b>Gloves:</b> Insulated “line-man” gloves when using the Terra-Core instrument</p> <p><b>Gloves:</b> Cut-resistant gloves when using knives for fish tissue sample preparation (cut Level 4 minimum)</p> <p><b>Personal Flotation Device:</b> A coast guard approved PFD required when onboard a boat, tumbling into swift-moving or deep water, or wading in water exceeding 3 feet in depth.</p> <p><b>Waders:</b> Waders will be used when wading in water above the boot line.</p>	<p>Hardhat<sup>c</sup></p> <p>Splash shield<sup>c</sup></p> <p>Safety glasses</p> <p>Ear protection<sup>d</sup></p>	None required.

### Reasons for Upgrading or Downgrading Level of Protection (with RHSM approval)

Upgrade <sup>c</sup>	Downgrade
<ul style="list-style-type: none"> <li>Request from individual performing tasks.</li> <li>Change in work tasks that will increase contact or potential contact with hazardous materials.</li> <li>Occurrence or likely occurrence of gas or vapor emission.</li> <li>Known or suspected presence of dermal hazards.</li> <li>Instrument action levels in the “Site Monitoring” section exceeded.</li> </ul>	<ul style="list-style-type: none"> <li>New information indicating that situation is less hazardous than originally thought.</li> <li>Change in site conditions that decrease the hazard.</li> <li>Change in work task that will reduce contact with hazardous materials.</li> </ul>

<sup>a</sup> Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

<sup>b</sup> No facial hair that would interfere with respirator fit is permitted.

<sup>c</sup> Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the RHSM, and an SC qualified at that level is present.

## 15.0 Worker Training and Qualification

### 15.1 CH2M HILL Worker Training

(Reference CH2M HILL SOP HSE-110, *Training*)

#### 15.1.1 Hazardous Waste Operations Training

All employees engaging in hazardous waste operations or emergency response shall receive appropriate training as required by 29 CFR 1910.120 and 29 CFR 1926.65. At a minimum, the training shall have consisted of instruction in the topics outlined in 29 CFR 1910.120 and 29 CFR 1926.65. Personnel who have not met these training requirements shall not be allowed to engage in hazardous waste operations or emergency response activities.

##### 15.1.1.1 Initial Training

General site workers engaged in hazardous waste operations shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations, unless otherwise noted in the above-referenced standards.

Employees who may be exposed to health hazards or hazardous substances at treatment, storage, and disposal (TSD) operations shall receive a minimum of 24 hours of initial training to enable the employee to perform their assigned duties and functions in a safe and healthful manner.

Employees engaged in emergency response operations shall be trained to the level of required competence in accordance with 29 CFR 1910.120.

##### 15.1.1.2 Three-Day Actual Field Experience

General site workers for hazardous waste operations shall have received three days of actual experience (on-the-job training) under the direct supervision of a trained, qualified supervisor and shall be documented. If the field experience has not already been received and documented at a similar site, this supervised experience shall be accomplished and documented at the beginning of the assignment of the project.

##### 15.1.1.3 Refresher Training

General site workers and TSD workers shall receive 8-hours of refresher training annually (within the previous 12-month period) to maintain qualifications for fieldwork. Employees engaged in emergency response operations shall receive annual refresher training of sufficient content and duration to maintain their competencies or shall demonstrate competency in those areas at least annually.

##### 15.1.1.4 Eight-Hour Supervisory Training

On site management or supervisors who will be directly responsible for, or supervise employees engaged in hazardous waste site operations, will have received at least 8 hours of additional specialized training on managing such operations. Employees designated as Safety Coordinator - Hazardous Waste are considered 8-hour HAZWOPER Site Safety Supervisor trained.

#### 15.1.2 First Aid/Cardiopulmonary Resuscitation

First aid and CPR training consistent with the requirements of a nationally recognized organization such as the American Red Cross Association or National Safety Council shall be administered by a certified trainer. A minimum of two personnel per active field operation will have first aid and CPR training. Bloodborne pathogen training located on CH2M HILL's Virtual Office is also required for those designated as first aid/CPR trained.



### 15.1.3 Safety Coordinator Training

SCs are trained to implement the HSE program on CH2M HILL field projects. A qualified SC is required to be identified in the site-specific HSP for CH2M HILL field projects. SCs must also meet the requirements of the worker category appropriate to the type of field project (construction or hazardous waste). In addition, the SCs shall have completed additional safety training required by the specific work activity on the project that qualifies them to implement the HSE program (for example, fall protection, excavation).

### 15.1.4 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed site-specific training that will address the contents of applicable HSPs, including the activities, procedures, monitoring, and equipment used in the site operations. Site-specific training will also include site and facility layout, potential hazards, risks associated with identified emergency response actions, and available emergency services. This training allows field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and work operations for their particular activity.

### 15.1.5 Project-Specific Training Requirements

Project-specific training for this project includes:

- Safety Coordinator Training - CH2M HILL SC-HW must have current SC- Haz Waste
- FA/CPR - The assigned SC-HW onsite must have current FA/CPR training.
- Fire Extinguisher - The assigned SC-HW onsite must take the on-line fire extinguisher training course.
- Waste Management - The assigned SC-HW onsite must take the on-line waste management training course.
- Blood-borne Pathogen - The assigned SC-HW must take the CH2M HILL on-line BBP training course.
- Dangerous Goods Shipping Training - The SC-HW onsite must take the on-line DG training course

## 16.0 Medical Surveillance and Qualification

(Reference CH2M HILL SOP HSE-113, *Medical Surveillance*)

All site workers participating in hazardous waste operations or emergency response (HAZWOPER) will maintain an adequate medical surveillance program in accordance with 29 CFR 1910.120 or 29 CFR 1926.65 and other applicable OSHA standards. Documentation of employee medical qualification (e.g., physician's written opinion) will be maintained in the project files and made available for inspection.

### 16.1 Hazardous Waste Operations and Emergency Response

CH2M HILL personnel expected to participate in on site HAZWOPER tasks are required to have a current medical qualification for performing this work. Medical qualification shall consist of a qualified physician's written opinion regarding fitness for duty at a hazardous waste site, including any recommended limitations on the employee's assigned work. The physician's written opinion shall state whether the employee has any detected medical conditions that would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use.

### 16.2 Job or Site-Specific Medical Surveillance

Due to the nature of hazards for a particular job or work site, specialized medical surveillance may be necessary. This surveillance could include biological monitoring for specific compounds, or specialized medical examinations.

### 16.3 Respirator User Qualification

Personnel required to wear respirators must have a current medical qualification to wear respirators. Medical qualification shall consist of a qualified physician's written opinion regarding the employee's ability to safely wear a respirator in accordance with 29 CFR 1910.134.

### 16.4 Hearing Conservation

Personnel working in hazardous waste operations or operations that fall under 29 CFR 1910.95 and exposed to noise levels in excess of the 85dBA time-weighted average shall be included in a hearing conservation program that includes annual audiometric testing.

## 17.0 Site-Control Plan

### 17.1 Site-Control Procedures

(Reference CH2M HILL SOP HSE-218, *Hazardous Waste Operations*)

Site control is established to prevent the spread of contamination throughout the site and to ensure that only authorized individuals are permitted into potentially hazardous areas.

The SC will implement site control procedures including the following bulleted items.

Establish support, contamination reduction, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.

Establish onsite communication consisting of the following:

- Line-of-sight and hand signals;
- Air horn; and
- Two-way radio or cellular telephone if available.

Establish offsite communication.

Establish and maintain the “buddy system.”

### 17.2 Remediation Work Area Zones

(Reference CH2M HILL SOP HSE-218 Hazardous Waste Operations)

A three-zone approach will be used to control areas where site contaminants exist. Access will be allowed only after verification of appropriate training and medical qualification. The three-zone approach shall include an EZ, Contamination Reduction Zone (CRZ) and a Support Zone (SZ). The three-zone approach is not required for construction work performed outside contaminated areas where control of site contamination is not a concern.

Specific work control zones shall be established as necessary during task planning. Site work zones should be modified in the field as necessary, based on such factors as equipment used, air monitoring results, environmental conditions, or alteration of work plans. The following guidelines shall be used for establishing and revising these preliminary zone designations.

#### 17.2.1 Support Zone

The SZ is an uncontaminated area (trailers, offices, field vehicles, etc.) that will serve as the field support area for most operations. The SZ provides field team communications and staging for emergency response. Appropriate sanitary facilities and safety and emergency response equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged and decontaminated materials, or personnel with medical emergencies that cannot be decontaminated.

#### 17.2.2 Contamination Reduction Zone

The CRZ is established between the EZ and the SZ, upwind of the contaminated area where possible. The CRZ provides an area for decontamination of personnel, portable handheld equipment and tools, and heavy equipment. In addition, the CRZ serves as access for heavy equipment and emergency support services.

### **17.2.3 Exclusion Zone**

The EZ is where activities take place that may involve exposure to site contaminants and/or hazardous materials or conditions. This zone shall be demarcated to prevent unauthorized entry. More than one EZ may be established if there are different levels of protection to be employed or different hazards that exist in the same work area. The EZ shall be large enough to allow adequate space for the activity to be completed, including field personnel and equipment, as well as necessary emergency equipment.

The EZ shall be demarcated with some form of physical barrier or signage. The physical barrier or signage shall be placed so that they are visible to personnel approaching or working in the area. Barriers and boundary markers shall be removed when no longer needed.

### **17.2.4 Other Controlled Areas**

Other work areas may need to be controlled due to the presence of an uncontrolled hazard, to warn workers of requirements, or to prevent unauthorized entry. Examples include general construction work areas, open excavations, high noise areas, vehicle access areas, and similar activities or limited access locations. These areas shall be clearly demarcated with physical barriers (fencing, cones, reinforced caution tape or rope) as necessary and posted with appropriate signage.

## 18.0 Decontamination

(Reference CH2M HILL SOP HSE-218, *Hazardous Waste Operations*)

Decontamination areas will be established for work in potentially contaminated areas to prevent the spread of contamination. Decontamination areas should be located upwind of the exclusion zone where possible and should consider any adjacent or nearby projects and personnel. The SC must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SC. The SC must ensure that procedures are established for disposing of materials generated on the site.

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SC should establish areas for eating, drinking, and smoking.

### 18.1 Contamination Prevention

Preventing or avoiding contamination of personnel, tools, and equipment will be considered in planning work activities at all field locations. Good contamination prevention and avoidance practices will assist in preventing worker exposure and result in a more efficient decontamination process. Procedures for contamination prevention and avoidance include the following:

Do not walk through areas of obvious or known contamination;

Do not directly handle or touch contaminated materials;

Make sure there are no cuts or tears in PPE;

Fasten all closures in suits and cover them with duct tape, if appropriate;

Take particular care to protect any skin injuries;

Stay upwind of airborne contamination, where possible;

Do not eat or drink in contaminated work areas;

Do not carry food, beverages, tobacco, or flame-producing equipment into contaminated work areas;

Minimize the number of personnel and amount of equipment in contaminated areas to that necessary for accomplishing the work;

Choose tools and equipment with nonporous exterior surfaces that can be easily cleaned and decontaminated;

Cover monitoring and sampling equipment with clear plastic, leaving openings for the sampling ports, as necessary; and

Minimize the amount of tools and equipment necessary in contaminated areas.

### 18.2 Personnel and Equipment Decontamination

Personnel exiting an EZ must ensure that they are not spreading potential contamination into clean areas or increasing their potential for ingesting or inhaling potential contaminants. Personal decontamination may range from removing outer gloves as exiting the EZ, to proceeding through an outer layer doffing station including a boot and glove wash and rinse, washing equipment, etc. Equipment that has come into contact with contaminated media must also be cleaned/decontaminated when it is brought out of the EZ.

### 18.3 Decontamination During Medical Emergencies

Standard personnel decontamination practices will be followed whenever possible. For emergency life saving first aid and/or medical treatment, normal decontamination procedures may need to be abbreviated or omitted. In this situation, site personnel shall accompany contaminated victims to advise

emergency response personnel on potential contamination present and proper decontamination procedures.

Outer garments may be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Protective clothing can be cut away. If the outer garments cannot be safely removed, a plastic barrier between the individual and clean surfaces should be used to help prevent contaminating the inside of ambulances or medical personnel. Outer garments can then be removed at the medical facility.

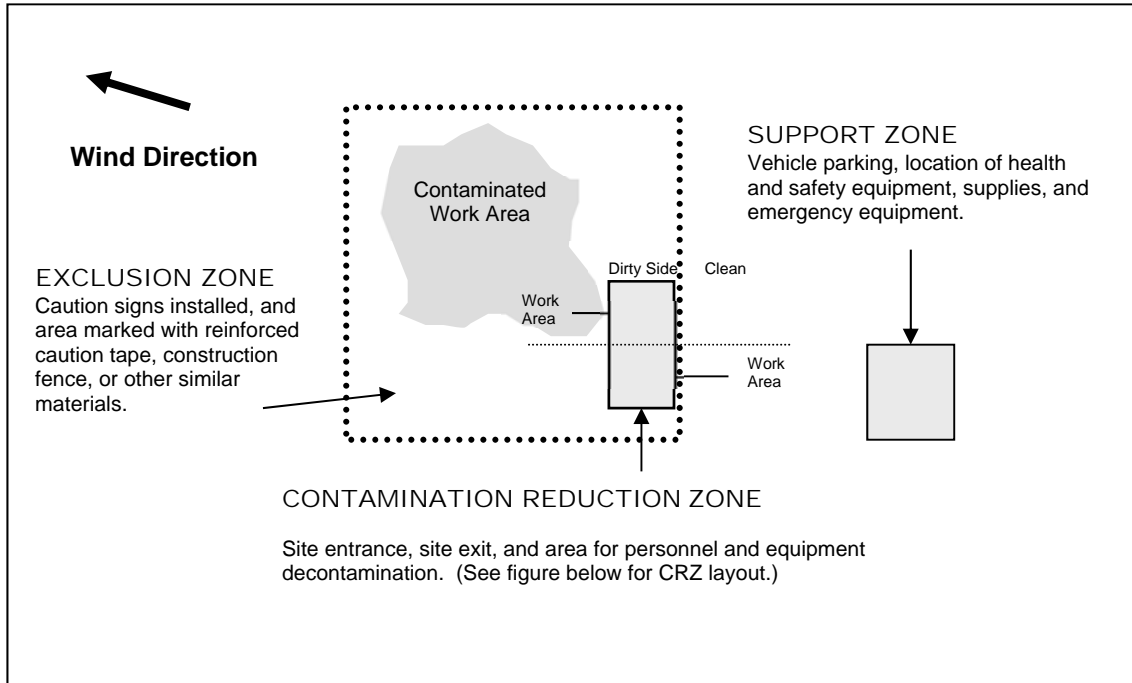
## **18.4 Waste Collection and Disposal**

All contaminated material generated through the personnel and equipment decontamination processes (e.g., contaminated disposable items, gross debris, liquids, sludges) will be properly containerized and labeled, stored at a secure location, and disposed in accordance with the project plans.

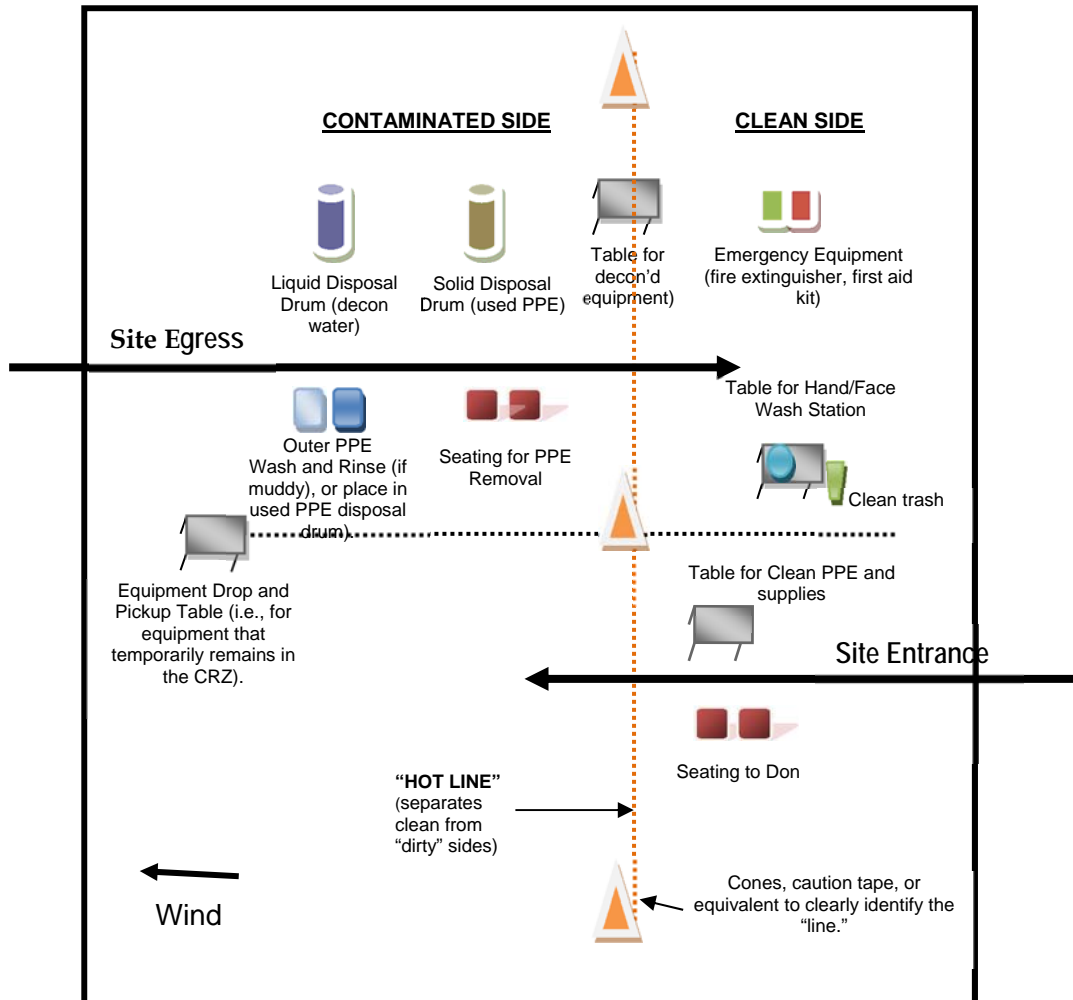
## **18.5 Diagram of Personnel-Decontamination Line**

The following figure illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SC to accommodate task-specific requirements.

Work Area - Set up appropriately based on wind direction



### Typical Contamination Reduction Zone



# 19.0 Emergency Response Plan

(Reference CH2M HILL SOP HSE-106, *Emergency Planning*)

## 19.1 Pre-Emergency Planning

The Emergency Response Coordinator (ERC), typically the SC or designee, performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate. Pre-Emergency Planning activities performed by the ERC include:

Review the facility emergency and contingency plans where applicable;

Determine what onsite communication equipment is available (two-way radio, air horn);

Determine what offsite communication equipment is needed (nearest telephone, cell phone);

Confirm and post the “Emergency Contacts” page and route to the hospital located in this section in project trailer(s) and keep a copy in field vehicles along with evacuation routes and assembly areas. Communicate the information to onsite personnel and keep it updated;

Field Trailers: Post “Exit” signs above exit doors, and post “Fire Extinguisher” signs above locations of extinguishers. Keep areas near exits and extinguishers clear;

Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures;

Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies;

Inventory and check site emergency equipment, supplies, and potable water;

Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases;

Rehearse the emergency response plan before site activities begin. This may include a “tabletop” exercise or an actual drill depending on the nature and complexity of the project. Drills should take place periodically but no less than once a year;

Brief new workers on the emergency response plan; and

The ERC will evaluate emergency response actions and initiate appropriate follow-up actions.

## 19.2 Emergency Equipment and Supplies

The ERC shall ensure the following emergency equipment is on the site. Verify and update the locations of this equipment as needed. The equipment will be inspected in accordance with manufacturer’s recommendations. The inspection shall be documented in a field logbook or similar means to be kept in the project files.

<b>Emergency Equipment and Supplies</b>	<b>Location</b>
20 (or two 10) class A,B,C fire extinguisher	Field vehicle/Boat
First aid kit	Field vehicle/Boat
Potable water	Field vehicle/Boat
Bloodborne-pathogen kit	Field vehicle/Boat
Marine-band Radio	Boat
Satellite phone	Field Vehicle/Boat (if cell coverage is not expected); AECOM boats will be equipped with marine-band radios and satellite phones based on discussions with them
Additional equipment (specify): Cellular phone	Field vehicle/Boat



## 19.3 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

Notify appropriate response personnel;

Shut down CH2M HILL operations and evacuate the immediate work area;

Account for personnel at the designated assembly area(s);

Assess the need for site evacuation, and evacuate the site as warranted;

Implement HSE-111, Incident Notification, Reporting and Investigation; and

Notify and submit reports to clients as required in contract.

- Small fires or spills posing minimal safety or health hazards may be controlled with onsite spill kits or fire extinguishers without evacuating the site. When in doubt evacuate. Follow the incident reporting procedures in the “Incident Notification, Reporting, and Investigation” section of this HSP.

## 19.4 Emergency Medical Treatment

Emergency medical treatment is needed when there is a life-threatening injury (such as severe bleeding, loss of consciousness, breathing or heart has stopped). When in doubt if an injury is life-threatening or not, treat it as needing emergency medical treatment.

Notify 911 or other appropriate emergency response authorities as listed in the “Emergency Contacts” page located in this section.

The ERC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.

Prevent further injury, perform decontamination (if applicable) where feasible; lifesaving and first aid or medical treatment takes priority.

Initiate first aid and CPR where feasible.

Notify supervisor and if the injured person is a CH2M HILL employee, the supervisor will call the occupational nurse at 1-866-893-2514 and make other notifications as required by HSE SOP-111, *Incident Notification, Reporting and Investigation*.

Make certain that the injured person is accompanied to the emergency room.

Follow the Serious Incident Reporting process in HSE SOP-111, Incident Notification, Reporting and Investigation, and complete incident report using the HITS system on the VO or if not feasible, use the hard copy forms provided as an attachment to this HSP.

Notify and submit reports to client as required in contract.

## 19.5 Evacuation

Evacuation routes, assembly areas, and severe weather shelters (and alternative routes and assembly areas) are to be specified on the site map.

Evacuation route(s) and assembly area(s) will be designated by the ERC or designee before work begins.

Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.

The ERC and a “buddy” will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.

The ERC will account for all personnel in the onsite assembly area.

A designated person will account for personnel at alternate assembly area(s).

The ERC will follow the incident reporting procedures in the “Incident Notification, Reporting and Investigation” section of this HSP.

## 19.6 Evacuation Signals

<b>Signal</b>	<b>Meaning</b>
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

## 20.0 Spill Containment Procedures

CH2M HILL and subcontractor personnel working at the project site shall be knowledgeable of the potential health, safety and environmental concerns associated with petroleum and other substances that could potentially be released at the project site.

The following is a list of criteria that must be addressed in CH2M HILL's or the subcontractor's plans in the event of a spill or release. In the event of a large quantity spill notify emergency services. Personnel discovering a spill shall (only if safe to do so):

Stop or contain the spill immediately (if possible) or note source. Shut off the source (e.g., pump, treatment system) if possible. If unsafe conditions exist, then leave the area, call emergency services, inform nearby personnel, notify the site supervisors, and initiate incident reporting process. The SC shall be notified immediately;

Extinguish sources of ignition (flames, sparks, hot surfaces, cigarettes);

Clear personnel from the spill location and barricade the area;

Use available spill control equipment in an effort to ensure that fires, explosions, and releases do not occur, recur, or spread;

Use sorbent materials to control the spill at the source;

Construct a temporary containment dike of sorbent materials, cinder blocks, bricks or other suitable materials to help contain the spill;

Attempt to identify the character, exact source, amount, and extent of the released materials. Identification of the spilled material should be made as soon as possible so that the appropriate cleanup procedure can be identified;

Assess possible hazards to human health or the environment as a result of the release, fire or explosion; and

Follow incident notification, reporting, and investigation section of this plan.

## 21.0 Inspections

### 21.1 Safe Behavior Observations

Safe Behavior Observations (SBOs) are a tool to be used by supervisors to provide positive reinforcement for work practices performed correctly, while also identifying and eliminating deviations from safe work procedures that could result in a loss.

The SC or designee shall perform at least one SBO each week for any field work performed by subcontractors or when there are at least two CH2M HILL personnel performing field work.

The SC or designee shall complete the SBO form (attached to this HSP) for the task/operation being observed and submit them weekly.

For commercial projects, SBOs may be submitted electronically by e-mailing them to the address, "CH2MHILL ES COM Safe Behavior Observations" when connected to the network or at [SafeBehaviorObservations@ch2m.com](mailto:SafeBehaviorObservations@ch2m.com). For Federal projects, SBOs may be submitted electronically by e-mailing them to the address, "CH2M HILL ES FED Safe Behavior Observations" when connected to the network or at [CH2MHILLESFEDSafeBehaviorObservation@ch2m.com](mailto:CH2MHILLESFEDSafeBehaviorObservation@ch2m.com).

## 22.0 Incident Notification, Reporting, and Investigation

(Reference CH2M HILL SOP HSE-111, *Incident Notification, Reporting and Investigation*)

### 22.1 General Information

This section applies to the following:

All injuries involving employees, third parties, or members of the public;

Damage to property or equipment;

Interruptions to work or public service (hitting a utility);

Incidents which attract negative media coverage;

Near misses;

Spills, leaks, or regulatory violations; and

Motor vehicle accidents.

Documentation, including incident reports, investigation, analysis and corrective measure taken, shall be kept by the SC and maintained onsite for the duration of the project.

### 22.2 Section Definitions

**Incident:** An incident is an event that causes or could have caused undesired consequences. An incident may be caused by natural forces, employees, subcontractors, or third parties in any location associated with CH2M HILL operations, including offices, warehouses, project sites, private property, or public spaces. Incidents include:

Injury or illness to a CH2M HILL employee or subcontractor employee, or member of the public;

Property damage;

Spill or release;

Environmental requirement or permit violation;

A “near-miss”; or

Other (e.g., fire, explosion, bomb threat, workplace violence, threats)

**Accident:** an incident involving actual loss through injury, damage to assets, or environmental harm.

**Near Miss:** A near-miss occurs when an intervening factor prevented an injury or illness, property damage, spill or release, permit violation or other event from occurring. Examples of near-miss situations include: a hard hat or other personal protective equipment (PPE) prevented an injury; secondary containment or emergency shutoff prevented a spill; or an alert co-worker prevented an incident.

#### **Serious Incident:**

A Serious Incident must be immediately reported to senior management includes:

- Work related death, or life threatening injury or illness of a CH2M HILL employee;
- subcontractor, or member of the public;
- Kidnap/missing person;
- Acts or threats of terrorism;
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 in damage; or

- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

## 22.3 Reporting Requirements

All employees and subcontractors' employees shall immediately report any incident (including "near misses," as defined in the section above) in which they are involved or witness to their supervisor.

The CH2M HILL or Subcontractor supervisor, upon receiving an incident report, shall inform his immediate superior and the CH2M HILL SC.

The SC shall immediately report the following information to the RHSM and PM by phone and e-mail:

Project Name and Site Manager;

Date and time of incident;

Description of incident;

Extent of known injuries or damage;

Level of medical attention; and

Preliminary root cause/corrective actions

The RHSM shall immediately inform the EM (or available alternate) of spills, potential environmental permit compliance, or any environmental situation that could result in a notice of violation from an agency.

The CH2M HILL team shall comply with all applicable statutory incident reporting requirements such as those to OSHA, the police, or state or Federal environmental agency.

## 22.4 HITS System and Incident Report Form

CH2M HILL maintains a HITS entry and/or Incident Report Form (IRF) for all work-related injuries and illnesses sustained by its employees in accordance with recordkeeping and insurance requirements. A HITS entry and/or IRF will also be maintained for other incidents (property damage, fire or explosion, spill, release, potential violation, and near misses) as part of our loss prevention and risk reduction initiative.

The SC shall complete an entry into the Hours and Incident Tracking System (HITS) database system located on CH2M HILL's Virtual Office (or if VO not available, use the hard copy Incident Report Form and Root Cause Analysis Form and forward it to the RHSM) within 24 hours and finalize those forms within 3 calendar days.

## 22.5 Injury Management/Return-to-Work (for US/Puerto Rico based CH2M HILL Staff Only)

(Reference CH2M HILL, SOP HSSE-124, Injury Management/Return-to-Work)

### 22.5.1 Background

The Injury Management Program has been established to provide orderly, effective and timely medical treatment and return-to-work transition for an employee who sustains a work-related injury or illness. It also provides guidance and assistance with obtaining appropriate treatment to aid recovery, keep supervisors informed of employee status, and to quickly report and investigate work-related injury/illnesses to prevent recurrence.

To implement the Injury Management/Return-to-Work Program successfully, supervisors and/or SC should:

Ensure employees are informed of the Injury Management/Return-to-Work Program;  
Become familiar with the Notification Process (detailed below); and  
Post the Injury Management/Return-to-Work Notification Poster.

### **22.5.2 The Injury Management/Return-to-Work Notification Process:**

Employee informs their supervisor.

Employee calls the Injury Management Program toll free number 1-866-893-2514 immediately and speaks with the Occupational Injury Nurse. This number is operable 24 hours per day, 7 days a week.

Supervisor ensures employee immediately calls the Injury Management Program number. Supervisor makes the call with the injured worker or for the injured worker, if needed.

Nurse assists employee with obtaining appropriate medical treatment, as necessary schedules clinic visit for employee (calls ahead, and assists with any necessary follow up treatment). The supervisor or SC accompanies the employee if a clinic visit is necessary to ensure that employees receive appropriate and timely care.

Supervisor or SC completes the HITS entry or Incident Report Form immediately (within 24 hours) and forwards it to the Project Manager and RHSM.

Nurse notifies appropriate CH2M HILL staff by e-mail (supervisor, Health & Safety, Human Resources, Workers' Compensation).

Nurse communicates and coordinates with and for employee on treatment through recovery.

Supervisor ensures suitable duties are identified and available for injured or ill workers who are determined to be medically fit to return to work on transitional duty (temporary and progressive).

Supervisor ensures medical limitations prescribed (if any) by physician are followed until the worker is released to full duty.

## **22.6 Serious Incident Reporting Requirements**

(Reference CH2M HILL SOP HSE-111, *Incident Reporting, Notification and Investigation*)

The serious incident reporting requirements ensures timely notification and allows for positive control over flow of information so that the incident is handled effectively, efficiently, and in conjunction with appropriate corporate entities. This standard notification process integrates Health, Safety, Security and Environment and Firm Wide Security Operations requirements for the consistent reporting of and managing of serious events throughout our operations.

### **22.6.1 Serious Incident Determination**

The following are general criteria for determining whether an incident on CH2M HILL owned or managed facilities or program sites is considered serious and must be immediately reported up to Group President level through the reporting/notification process:

Work related death, or life threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public;

Kidnap or missing person;

Acts or threats of terrorism;

Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 in damage; or

Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

## 22.6.2 Serious Incident Reporting

*If an incident meets the "Serious Incident" criteria, the Project Manager is to immediately contact the Crisis Manager at 720-286-4911, then follow the standard incident reporting procedure.*

For all serious incidents this standard reporting process is implemented immediately so as to ultimately achieve notification to the Business Group President within 2 hours of incident onset or discovery, and notification to appropriate corporate Crisis Management Support Team.

## 22.7 Incident Root Cause Analysis

The accident analysis is essential if all causes of the incident are to be identified for the correct remedial actions to be taken to prevent the same and similar type of incident from recurring. Root Cause Analysis (RCA) shall be completed for all recordable injuries, property damage incidents in excess of \$5000.00 (US), environmental permit violations, spills and releases which are required to be reported to regulatory agencies, and any other incident, including near misses where they RHSM or PM determines an RCA is appropriate. The RHSM/REM is responsible for ensuring it is completed and results entered in the incident report form in HITS. RCA's must be completed using a Team that includes, at least the RHSM or designee, the involved party(ies), a responsible operations representative (e.g. PM, construction manager, crew supervisor, etc.) and an independent management representative not associated with the incident.

The Root Cause Analysis Form must be completed for all Loss Incidents and Near Loss Incidents. This form must be submitted to the investigation team for review.

For minor losses or near losses, the information may be gathered by the supervisor or other personnel immediately following the loss. Based on the complexity of the situation, this information may be all that is necessary to enable the investigation team to analyze the loss, determine the root cause, and develop recommendations. More complex situations may require the investigation team to revisit the loss site or re-interview key witnesses to obtain answers to questions that may arise during the investigation process.

Photographs or videotapes of the scene and damaged equipment should be taken from all sides and from various distances. This point is especially important when the investigation team will not be able to review the loss scene.

The investigation team must follow the Root Cause Analysis Flow Chart (see Attachment 4 of the SOP) to assist in identifying the root cause(s) of a loss. Any loss may have one or more root causes and contributing factors. The root cause is the primary or immediate cause of the incident, while a contributing factor is a condition or event that contributes to the incident happening, but is not the primary cause of the incident. Root causes and contributing factors that relate to the person involved in the loss, his or her peers, or the supervisor should be referred to as "personal factors." Causes that pertain to the system within which the loss or injury occurred should be referred to as "job factors."

Personal factors include:

Lack of skill or knowledge;

Correct way takes more time and/or requires more effort;

Short-cutting standard procedures is positively reinforced or tolerated; or

Person thinks there is no personal benefit to always doing the job according to standards.

Job Factors include:

Lack of or inadequate operational procedures or work standards;  
Inadequate communication of expectations regarding procedures or standards; or  
Inadequate tools or equipment.

The root cause(s) could be any one or a combination of these seven possibilities or some other uncontrollable factor. In the vast majority of losses, the root cause is very much related to one or more of these seven factors. Uncontrollable factors should be used rarely and only after a thorough review eliminates all seven other factors.

### **22.7.1 Corrective Actions**

Include all corrective actions taken or those that should be taken to prevent recurrence of the incident. Include the specific actions to be taken, the employer and personnel responsible for implementing the actions, and a timeframe for completion. Be sure the corrective actions address the causes.

Once the investigation report has been completed, the PM shall hold a review meeting to discuss the incident and provide recommendations. The responsible supervisors shall be assigned to carry out the recommendations, and shall inform the SC upon successful implementation of all recommended actions.

Evaluation and follow-up of the IRF will be completed by the type of incident by the RHSM, EM, or FWSO.

Incident investigations must be initiated and completed as soon as possible but no later than 72 hours after the incident.



## 23.0 Records and Reports

An organized project filing system is essential for good documentation and recordkeeping. There are many benefits to an organized filing system:

Other CH2M HILL employees can easily and quickly find documents;

Records are readily available for review;

Records may be needed during OSHA investigations, audits, or other legal matters;

Records may be needed on short notice in case of an accident, illness or other emergency; and

Systematic recordkeeping aids in overall project organization.

The project filing system shall be established at the beginning of the project and maintained throughout all phases of construction and archived in accordance with CH2M HILL's Records Retention Policy. The information contained in the filing system shall be updated regularly and/or as specified in this document. The PM and SC are responsible for collecting documentation, including subcontractor documentation, and maintaining a complete and organized filing system.

Below are examples of records that must be maintained as the project progresses:

Exposure records includes air monitoring data (including calibration records), MSDSs, exposure modeling results;

Physical hazard exposure records include noise, ionizing radiation, non-ionizing radiation, vibration, and lasers exposure assessments and measurements;

Respiratory fit test records;

Training records;

Incident reports, investigations and associated back-up information such as agency notifications, calculations, and corrective actions taken;

Federal or state agency inspection records;

Other Records:

- HSE audits and assessments;
- Project-specific HSE plans;
- SBOs;

The RHSM shall coordinate with the PM or designee to ensure that final project-specific HSE records described in this section, including negative exposure determinations, are maintained with the project files in accordance with the CH2M HILL records retention schedule, or forwarded to the Medical Surveillance Program Administrator, as appropriate. Records retention requirements are detailed in the Recordkeeping and Access to Records SOP, HSE-119.

**CH2M HILL Health and Safety Plan**  
**Attachment 1**

**Health and Safety Plan Employee Sign-off Form**



**CH2M HILL Health and Safety Plan**  
**Attachment 2**

**Chemical Inventory/Register Form**

**CHEMICAL INVENTORY/REGISTER FORM**

---

Refer to SOP HSE-107, Attachment 1, for instructions on completing this form.

Location: HCC: <input type="checkbox"/> Office <input type="checkbox"/> Warehouse <input type="checkbox"/> Laboratory <input type="checkbox"/> Project: Project No.:
---

Regulated Product	Location	Container labeled (✓if yes)	MSDS available (✓if yes)

MSDS for the listed products will be maintained at:
---

**CH2M HILL Health and Safety Plan**  
**Attachment 3**

**Chemical-Specific Training Form**

**CHEMICAL-SPECIFIC TRAINING FORM**

Refer to SOP HSE-107 Attachment 1 for instructions on completing this form.

Location:	Project # :
HCC:	Trainer:

**TRAINING PARTICIPANTS:**

NAME	SIGNATURE	NAME	SIGNATURE

**REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:**


The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

- Physical and health hazards
- Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)
- Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL’s written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

# **CH2M HILL Health and Safety Plan**

## **Attachment 4**

### **Key Target Zero Program Elements (blank forms for field use)**

**Activity Hazard Analysis**

**Pre-Task Safety Plans**

**Safe Behavior Observation**



## ACTIVITY HAZARD ANALYSIS

<b>Activity:</b>	<b>Date:</b>
<b>Description of the work:</b>	<b>Project Name:</b>
	<b>Site Supervisor:</b>
	<b>Site Safety Officer:</b>
	<b>Review for latest use: Before the job is performed</b>

<b>Work Activity Sequence</b> (Identify the principal steps involved and the sequence of work activities)	<b>Potential Health and Safety Hazards</b> (Analyze each principal step for potential hazards)	<b>Hazard Controls</b> (Develop specific controls for each potential hazard)

## ACTIVITY HAZARD ANALYSIS

<b>Work Activity Sequence</b> (Identify the principal steps involved and the sequence of work activities)	<b>Potential Health and Safety Hazards</b> (Analyze each principal step for potential hazards)	<b>Hazard Controls</b> (Develop specific controls for each potential hazard)

<b>Equipment to be used</b> (List equipment to be used in the work activity)	<b>Inspection Requirements</b> (List inspection requirements for the work activity)	<b>Training Requirements</b> (List training requirements including hazard communication)

# ACTIVITY HAZARD ANALYSIS

PRINT NAME

SIGNATURE

Supervisor Name: \_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

Safety Officer Name: \_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

Employee Name(s): \_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

**Pre-Task Safety Plan (PTSP) and Safety Meeting Sign-in Sheet**

Project: _____ Location: _____ Date: _____		
Supervisor: _____ Job Activity: _____		
Attendees:		
Print Name		Sign Name
_____		
_____		
_____		
_____		
_____		
List Tasks and verify that applicable AHAs have been reviewed:		
_____		
_____		
_____		
Tools/Equipment Required for Tasks (ladders, scaffolds, fall protection, cranes/rigging, heavy equipment, power tools):		
_____		
_____		
_____		
Potential H&S Hazards, including chemical, physical, safety, biological and environmental (check all that apply):		
<input type="checkbox"/> Chemical burns/contact	<input type="checkbox"/> Trench, excavations, cave-ins	<input type="checkbox"/> Ergonomics
<input type="checkbox"/> Pressurized lines/equipment	<input type="checkbox"/> Overexertion	<input type="checkbox"/> Chemical splash
<input type="checkbox"/> Thermal burns	<input type="checkbox"/> Pinch points	<input type="checkbox"/> Poisonous plants/insects
<input type="checkbox"/> Electrical	<input type="checkbox"/> Cuts/abrasions	<input type="checkbox"/> Eye hazards/flying projectile
<input type="checkbox"/> Weather conditions	<input type="checkbox"/> Spills	<input type="checkbox"/> Inhalation hazard
<input type="checkbox"/> Heights/fall > 6 feet	<input type="checkbox"/> Overhead Electrical hazards	<input type="checkbox"/> Heat/cold stress
<input type="checkbox"/> Noise	<input type="checkbox"/> Elevated loads	<input type="checkbox"/> Water/drowning hazard
<input type="checkbox"/> Explosion/fire	<input type="checkbox"/> Slips, trip and falls	<input type="checkbox"/> Heavy equipment
<input type="checkbox"/> Radiation	<input type="checkbox"/> Manual lifting	<input type="checkbox"/> Aerial lifts/platforms
<input type="checkbox"/> Confined space entry	<input type="checkbox"/> Welding/cutting	<input type="checkbox"/> Demolition
<input type="checkbox"/> Underground Utilities	<input type="checkbox"/> Security	<input type="checkbox"/> Poor communications
Other Potential Hazards (Describe):		
_____		
_____		
_____		

Hazard Control Measures (Check All That Apply):			
PPE <input type="checkbox"/> Thermal/lined <input type="checkbox"/> Eye <input type="checkbox"/> Dermal/hand <input type="checkbox"/> Hearing <input type="checkbox"/> Respiratory <input type="checkbox"/> Reflective vests <input type="checkbox"/> Flotation device <input type="checkbox"/> Hard Hat	Protective Systems <input type="checkbox"/> Sloping <input type="checkbox"/> Shoring <input type="checkbox"/> Trench box <input type="checkbox"/> Barricades <input type="checkbox"/> Competent person <input type="checkbox"/> Locate buried utilities <input type="checkbox"/> Daily inspections <input type="checkbox"/> Entry Permits/notification	Fire Protection <input type="checkbox"/> Fire extinguishers <input type="checkbox"/> Fire watch <input type="checkbox"/> Non-spark tools <input type="checkbox"/> Grounding/bonding <input type="checkbox"/> Intrinsically safe equipment	Electrical <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Grounded <input type="checkbox"/> Panels covered <input type="checkbox"/> GFCI/extension cords <input type="checkbox"/> Power tools/cord inspected <input type="checkbox"/> Overhead line clearance <input type="checkbox"/> Underground utils ID'd
Fall Protection <input type="checkbox"/> Harness/lanyards <input type="checkbox"/> Adequate anchorage <input type="checkbox"/> Guardrail system <input type="checkbox"/> Covered opening <input type="checkbox"/> Fixed barricades <input type="checkbox"/> Warning system	Air Monitoring <input type="checkbox"/> PID/FID <input type="checkbox"/> Detector tubes <input type="checkbox"/> Radiation <input type="checkbox"/> Personnel sampling <input type="checkbox"/> LEL/O2 <input type="checkbox"/> No visible dust <input type="checkbox"/> Other	Proper Equipment <input type="checkbox"/> Aerial lift/ladders/scaffolds <input type="checkbox"/> Forklift/heavy equipment <input type="checkbox"/> Backup alarms <input type="checkbox"/> Hand/power tools <input type="checkbox"/> Crane with current inspection <input type="checkbox"/> Proper rigging <input type="checkbox"/> Operator qualified	Welding & Cutting <input type="checkbox"/> Cylinders secured/capped <input type="checkbox"/> Cylinders separated/upright <input type="checkbox"/> Flash-back arrestors <input type="checkbox"/> No cylinders in CSE <input type="checkbox"/> Flame retardant clothing <input type="checkbox"/> Appropriate goggles
Confined Space Entry <input type="checkbox"/> Isolation <input type="checkbox"/> Air monitoring <input type="checkbox"/> Trained personnel <input type="checkbox"/> Permit completed <input type="checkbox"/> Rescue	Medical/ER <input type="checkbox"/> First-aid kit <input type="checkbox"/> Eye wash <input type="checkbox"/> FA-CPR trained personnel <input type="checkbox"/> Route to hospital	Heat/Cold Stress <input type="checkbox"/> Work/rest regime <input type="checkbox"/> Rest area <input type="checkbox"/> Liquids available <input type="checkbox"/> Monitoring <input type="checkbox"/> Training	Vehicle/Traffic <input type="checkbox"/> Traffic control <input type="checkbox"/> Barricades <input type="checkbox"/> Flags <input type="checkbox"/> Signs
Permits <input type="checkbox"/> Hot work <input type="checkbox"/> Confined space <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Excavation <input type="checkbox"/> Demolition <input type="checkbox"/> Energized work	Demolition <input type="checkbox"/> Pre-demolition survey <input type="checkbox"/> Structure condition <input type="checkbox"/> Isolate area/utilities <input type="checkbox"/> Competent person <input type="checkbox"/> Hazmat present	Inspections: <input type="checkbox"/> Ladders/aerial lifts <input type="checkbox"/> Lanyards/harness <input type="checkbox"/> Scaffolds <input type="checkbox"/> Heavy equipment <input type="checkbox"/> Drill rigs/geoprobe rigs <input type="checkbox"/> Cranes and rigging <input type="checkbox"/> Utilities marked	Training: <input type="checkbox"/> Hazwaste (current) <input type="checkbox"/> Construction <input type="checkbox"/> Competent person <input type="checkbox"/> Task-specific <input type="checkbox"/> FA/CPR <input type="checkbox"/> Confined Space <input type="checkbox"/> Hazcom
Underground Utilities <input type="checkbox"/> Dig alert called <input type="checkbox"/> 3 <sup>rd</sup> Party locator <input type="checkbox"/> As-builts reviewed <input type="checkbox"/> Interview site staff <input type="checkbox"/> Client review <input type="checkbox"/> soft locate necessary?	Incident Communications <input type="checkbox"/> Work stops until cleared by TM/CM <input type="checkbox"/> Immediate calls to TM/CM <input type="checkbox"/> Client notification <input type="checkbox"/> 24 hour notification setup <input type="checkbox"/> Clear communications	AHA' s <input type="checkbox"/> reviewed and approved by HSM <input type="checkbox"/> on site and current <input type="checkbox"/> applicable for this day's work <input type="checkbox"/> Communication and incident processes included?	
Field Notes (including observations from prior day, etc.): _____ _____ _____			

Name (Print): \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

<b>Safe Behavior Observation Form</b>			
<input type="checkbox"/> Federal or <input type="checkbox"/> Commercial Sector (check one)		<input type="checkbox"/> Construction or <input type="checkbox"/> Consulting (check one)	
Project Number:		Client/Program:	
Project Name:		Observer:	Date:
Position/Title of worker observed:		Background Information/ comments:	
Task/Observation Observed: _____			
<ul style="list-style-type: none"> <li>❖ Identify and reinforce safe work practices/behaviors</li> <li>❖ Identify and improve on at-risk practices/acts</li> <li>❖ Identify and improve on practices, conditions, controls, and compliance that eliminate or reduce hazards</li> <li>❖ Proactive PM support facilitates eliminating/reducing hazards (do you have what you need?)</li> <li>❖ Positive, corrective, cooperative, collaborative feedback/recommendations</li> </ul>			
Actions & Behaviors	Safe	At-Risk	Observations/Comments
Current & accurate Pre-Task Planning/Briefing (Project safety plan, STAC, AHA, PTSP, tailgate briefing, etc., as needed)			<b>Positive Observations/Safe Work Practices:</b>
Properly trained/qualified/experienced			
Tools/equipment available and adequate			
Proper use of tools			<b>Questionable Activity/Unsafe Condition Observed:</b>
Barricades/work zone control			
Housekeeping			
Communication			
Work Approach/Habits			
Attitude			
Focus/attentiveness			<b>Observer's Corrective Actions/Comments:</b>
Pace			
Uncomfortable/unsafe position			
Inconvenient/unsafe location			
Position/Line of fire			
Apparel (hair, loose clothing, jewelry)			<b>Observed Worker's Corrective Actions/Comments:</b>
Repetitive motion			
Other...			

---

**CH2M HILL Health and Safety Plan**  
**Attachment 5**

**Fact Sheets**  
**Vehicle Accident Guidance**  
**Ticks**



---

## 2011 Vehicle Accident Guidance – ESBG

Remember that if you are **renting** a non-CH2M HILL owned vehicle (short-term rental) in the U.S., you should carry the [insurance card](#) from the state where your driver's license is issued.

If you operate a **fleet vehicle**, carry the [insurance card](#) where the vehicle is registered.

### **For ALL Vehicles if you are in an accident:**

1. If you are injured, call 911 for emergency medical treatment or 1-866-893-2514 to contact the CH2M HILL Occupational Nurse/Physician for minor injuries. If you feel you have not been injured, contact the RHSM for guidance on whether calling the CH2M HILL Occupation Nurse/Physician is applicable.
2. **Call the Police**--For any vehicle accident/ damage, it is recommended that the local police (or site security/emergency services if working on a client site that provides such services) be called to determine if a report needs to be filed. In some instances, a report may not be required (during accident alerts, or in public parking lots). Document that the authorities were called and follow up with any guidance they give you. State requirements vary. If a report is filed, obtain a copy.
3. Notify Supervisor, (and PM/RHSM if working on a project site)
4. Complete a HITS report on the VO.

### **Additional Steps**

To report an auto accident, and before a claim can be taken by telephonic reporting, have available your name (the company name alone is no longer accepted, a driver's name must be provided even for fender benders), location of accident and your office address if different than the accident location, business group and project number. A claim cannot be taken without your name, address, business group and your project number. By location the state where the accident occurred, and which office you are aligned to, i.e., accident occurs in Idaho, but you are out of the Denver office. Advise the claim recorder the accident occurred in ID, but that your office location is Denver. This will assist the claim intake person in identifying location coding for the claims.

### **Auto accidents involve two different sections of an Auto policy:**

- 1) Liability to others due to Bodily Injury and Property Damage
- 2) Physical Damage - Comprehensive and Collision - damage to the vehicle CH employee is driving

CH2M Hill has Liability coverage for any auto - our policy will respond on either a primary or excess basis.

Refer to the table below for additional notifications to make based on the type of accident experienced and type of vehicle being used.

---

### **Liability - Bodily Injury or Property Damage to Others**

---





Scenario	Which Coverage Responds	What to do if in an accident
CH2M HILL fleet, pool or project vehicle - long term lease - lower 48	CH2M HILL - Primary	Contact Broadspire (1-800-753-6737); Mary Ellegood-Oberts/DEN (720-286-2291); Linda George/DEN (720-286-2057)
CH2M HILL fleet, pool or project vehicle - long term lease - Alaska (North Slope)	CH2M HILL - Primary	Mary Ellegood-Oberts/DEN (720-286-2291)
Client vehicle driven by CH2M HILL employee	Client's auto policy unless client has made CH2M HILL responsible for vehicle	Contact Broadspire (1-800-753-6737); Mary Ellegood-Oberts/DEN (720-286-2291); contact client
Short term lease (30 days or less)	Rental car company if rented through Enterprise, Budget or Hertz; CH2M HILL excess	Contact Broadspire (1-800-753-6737); Contact local branch of rental car company where vehicle leased (ERAC includes 24 hour roadside assistance) and Mary Ellegood-Oberts/DEN (720-286-2291)
Short term lease (30 days or less)	CH2M HILL - Primary if rented through company other than our national agreements; \$100,000 deductible	Contact Broadspire (1-800-753-6737); Contact rental car company and Mary Ellegood-Oberts/DEN (720-286-2291)
Personal vehicle used on business	Employee's personal auto policy; CH2M HILL on an excess basis	Contact personal auto insurance company; contact Mary Ellegood-Oberts/DEN (720-286-2291)

### Physical Damage - damage to vehicle CH employee was driving

Scenario	Which Coverage Responds	What to do if in an accident
CH2M HILL fleet, pool or project vehicle - long term lease - lower 48	CH2M HILL ONLY if vehicle is scheduled on policy - \$5,000 deductible	Contact Broadspire (1-800-753-6737); Mary Ellegood-Oberts/DEN (720-286-2291); Linda George/DEN (720-286-2057)
CH2M HILL fleet, pool or project vehicle - long term lease - Alaska (North Slope)	CH2M HILL Equipment Schedule if scheduled on policy	Contact Mary Ellegood-Oberts/DEN (720-286-2291)
CH2M HILL fleet, pool or project vehicle - long term lease	ARI if physical damage coverage purchased - \$500 deductible	Contact Mary Ellegood-Oberts/DEN (720-286-2291); call ARI at 1-800-221-1645 give them Client Code and ARI fleet vehicle number; and notify Linda George/DEN - Fleet Coordinator - 720-286-2057
Client vehicle CH2M HILL Employee is driving	Client's auto policy unless client has made CH2M HILL contractually responsible for vehicle	Contact Mary Ellegood-Oberts/DEN (720-286-2291); contact client; contact Broadspire (1-800-753-6737)
Short term lease (30 days or less) using corporate VISA	VISA if corporate credit card used and vehicle is not a pickup, truck, cargo van or used off-road	Contact VISA - 1-800-847-2911 or <a href="http://www.visa.com/eclaim">http://www.visa.com/eclaim</a>
Short term lease (30 days or less) through Enterprise (ERAC) and vehicle is used off-road and physical damage coverage included when vehicle leased	ERAC up to \$3,000 in damage; CH2M HILL's coverage is excess	Notify Rental Car Company; contact Mary Ellegood-Oberts/DEN (720-286-2291) if damage over \$5,000
Short term lease (30 days or less) did <b>not</b> use corporate VISA	CH2M HILL - \$5,000 deductible (project responsibility)	Contact Broadspire (1-800-753-6737); Contact Mary Ellegood-Oberts/DEN (720-286-2291); contact VISA - 1-800-847-2911 or <a href="http://www.visa.com/eclaim">http://www.visa.com/eclaim</a>
Personal vehicle used on business	CH will reimburse the amount of the deductible carried on the employee's policy up to \$500 whichever is less	Contact Mary Ellegood-Oberts/DEN (720-286-2291); contact client; contact Broadspire (1-800-753-6737)

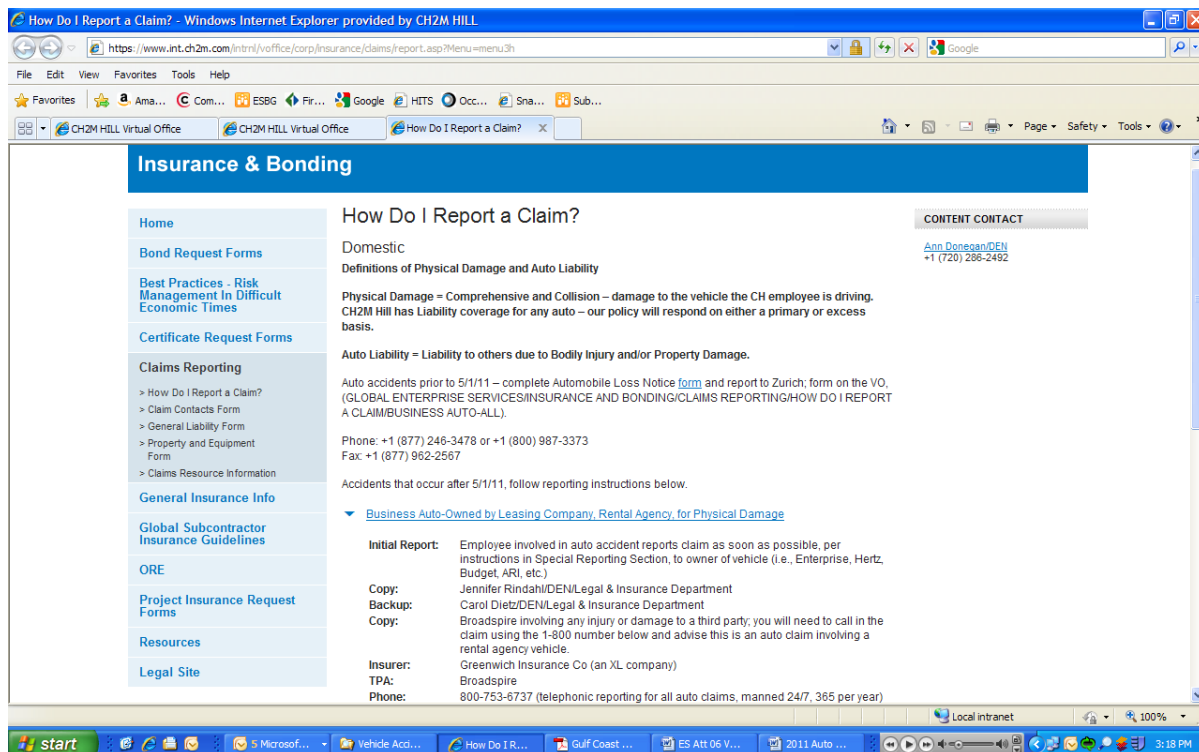


Details for reporting a claim on the CH2M HILL VO are accessed by going to the VO home page and clicking:

GLOBAL ENTERPRISE SERVICES/INSURANCE & BONDING/CLAIMS REPORTING

HOW DO I REPORT A CLAIM TAB or access the following URL:

<https://www.int.ch2m.com/intrnl/voffice/corp/insurance/claims/report.asp?Menu=menu3h>



### **For Personally Owned Vehicles (POVs):**

CH2M HILL does not provide auto insurance for POVs, it is responsibility of the owner. If you are in a vehicle accident conducting company business, contact the police as above, supervisor, and 911 or CH2M HILL's occupational nurse/physician as stated above. Complete a HITS report. Contact Julie Zimmerman/DEN for assistance for meeting personal insurance deductibles (up to \$500) with proof of insurance and deductible.

If using your POV for extended project use, notify the PM to make sure a rental car is not needed. Check your insurance policy for guidance on using the POV for business use.

### **Additional Resources:**

[Claims Resource Manual](#)

---

## Tick-Borne Pathogens — A Fact Sheet

Most of us have heard of Lyme disease or Rocky Mountain Spotted Fever (RMSF), but there are actually six notifiable tick-borne pathogens that present a significant field hazard. In some areas, these account for more than half of our serious field incidents. The following procedures should be applied during any field activity—even in places that are predominantly paved with bordering vegetation.

### Hazard Recognition

An important step in controlling tick related hazards is understanding how to identify ticks, their habitats, their geographical locations, and signs and symptoms of tick-borne illnesses.

### Tick Identification

There are five varieties of hard-bodied ticks that have been associated with tick-borne pathogens. These include:

Deer (Black Legged) Tick (eastern and pacific varieties)

Lone Star Tick

Dog Tick

Rocky Mountain Wood Tick

These varieties and their geographical locations are illustrated on the following page.

### Tick Habitat

In eastern states, ticks are associated with deciduous forest and habitat containing leaf litter. Leaf litter provides a moist cover from wind, snow, and other elements. In the north-central states, is generally found in heavily wooded areas often surrounded by broad tracts of land cleared for agriculture.

On the Pacific Coast, the bacteria are transmitted to humans by the western black-legged (deer) tick and habitats are more diverse. For this region, ticks have been found in habitats with forest, north coastal scrub, high brush, and open grasslands. Coastal tick populations thrive in areas of high rainfall, but ticks are also found at inland locations.

### Illnesses and Signs & Symptoms

There are six notifiable tick-borne pathogens that cause human illness in the United States. These pathogens may be transmitted during a tick bite—normally hours after attachment. The illnesses, presented in approximate order of most common to least, include:

Lyme (bacteria)

RMSF (bacteria)

Ehrlichiosis (bacteria)

STARI (Southern Tick-Associated Rash Illness) (bacteria)

Tularemia (Rabbit Fever) (bacteria)

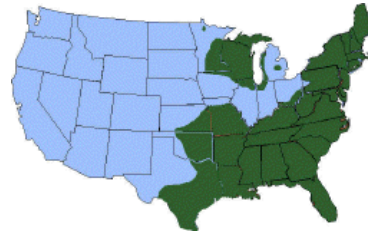
Babesia (protozoan parasite)

Symptoms will vary based on the illness, and may develop in infected individuals typically between 3 and 30 days after transmission. Some infected individuals will not become ill or may develop only mild symptoms. These illnesses present with some or all of the following signs & symptoms: fever, headache, muscle aches, stiff neck,

joint aches, nausea, vomiting, abdominal pain, diarrhea, malaise, weakness, small solid, ring-like, or spotted rashes. The bite site may be red, swollen, or develop ulceration or lesions. For Lyme disease, the bite area will sometimes resemble a target pattern. A variety of long-term symptoms may result if the illness is left untreated, including debilitating effects and death.



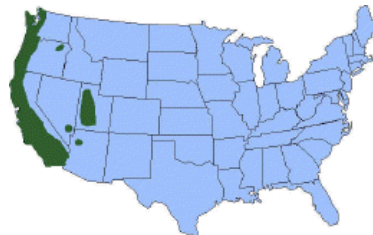
Deer Tick



Distribution of Deer Tick (dark green)



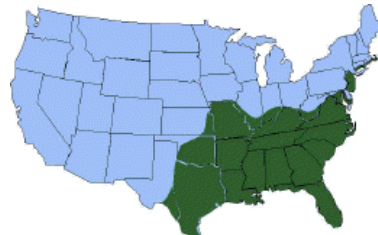
From Left: adult female, adult male, nymph, and larvae Deer Tick (cm scale)



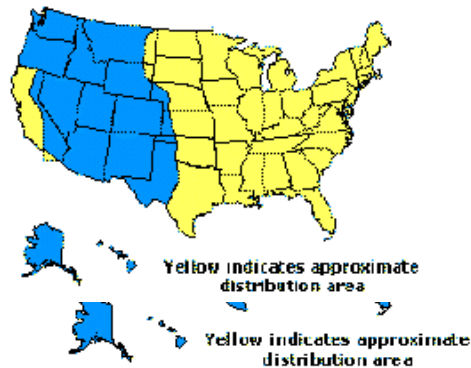
Distribution of Pacific Deer Tick (dark green)



Lone Star Tick



Distribution of Lone Star Tick (Green)



---

## Hazard Control

The methods for controlling exposure to ticks include, in order of most- to least-preferred:

Avoiding tick habitats and ceasing operations in heavily infested areas

Reducing tick abundance through habitat disruption or application of acaricide

Personal protection through use of repellants and protective clothing

Frequent tick inspections and proper hygiene

Vaccinations are not available and preventative antibiotic treatment after a bite is generally not recommended.

### Avoidance and Reduction of Ticks

To the extent practical, tick habitats should be avoided. In areas with significant tick infestation, consider stopping work and withdrawing from area until adequate tick population control can be achieved. Stopping and withdrawing should be considered as seriously as entering an area without proper energy control or with elevated airborne contaminants—tick-borne pathogens present risk of serious illness!

In areas where significant population density or infestation exists, tick reduction should be considered. Tick reduction can be achieved by disrupting tick habitats and/or direct population reduction through the use of tick-toxic pesticides (Damminix, Dursban, Sevin, etc.).

Habitat disruption may include only simple vegetative maintenance such as removing leaf litter and trimming grass and brush. Tick populations can be reduced by between 72 and 100 percent when leaf litter alone is removed. In more heavily infested areas, habitat disruption may include grubbing, tree trimming or removal, and pesticide application (Damminix, Dursban, Sevin, etc.). This approach is practical in smaller, localized areas or perimeter areas that require occasional access. Habitat controls are to be implemented with appropriate health and safety controls, in compliance with applicable environmental requirements, and may be best left to the property owner or tenant or to a licensed pesticide vendor. Caution should be exercised when using chemical repellents or pesticides in or around areas where environmental or industrial media samples will be collected for analysis.

### Personal Protection

After other prevention and controls are implemented, personal protection is still necessary to control exposure to ticks. Personal protection must include all of the following steps:

So that ticks may be easily seen, wear light-colored clothing. Full-body New Tyvek (paper-like disposable coveralls) may also be used

To prevent ticks from getting underneath clothing tuck pant legs into socks or tape to boots

Wear long-sleeved shirts, a hat, and high boots

Apply DEET repellent to exposed skin or clothing per product label

Apply permethrin repellent to the outside of boots and clothing before wearing, per product label

Frequently check for ticks and remove from clothing

At the end of the day, search your entire body for ticks (particularly groin, armpits, neck, and head) and shower

To prevent pathogen transmission through mucous membranes or broken/cut skin, wash or disinfect hands and/or wear surgical-style nitrile gloves any time ticks are handled

Pregnant individuals and individuals using prescription medications should consult with their physician and/or pharmacists before using chemical repellents. Because human health effects may not be fully known, use of chemical repellents should be kept to a minimum frequency and quantity. Always follow manufacturers' use instructions and precautions. Wash hands after handling, applying, or removing protective gear and clothing. Avoid situations such as hand-to-face contact, eating, drinking, and smoking when applying or using repellents.

---

Remove and wash clothes per repellent product label. Chemical repellents should not be used on infants and children.

Vaccinations are generally not available for tick-borne pathogens. Although production of the LYMERix™ Lyme disease vaccination has been ceased, vaccination may still be considered under specific circumstances and with concurrence from the consulting physician.

### Tick Check

A tick check should be performed after field survey before entering the field vehicle (you do not want to infest your field vehicle with ticks). Have your field partner check your back; the backs of your legs, arms, and neck; and your hairline. Shake off clothing as thorough as possible before entering the vehicle. Once the field day is complete, repeat this procedure and perform a thorough self check.

If a tick has embedded itself into the skin, remove the tick as described below.

### Tick Removal

1. Use the tick removal kit obtained through the CH2M HILL Milwaukee warehouse, or a fine-tipped tweezers or shield your fingers with a tissue, paper towel, or nitrile gloves.

**Error! Objects cannot be created from editing field codes.**

2. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with tweezers. Consult your healthcare provider if infection occurs.



3. Avoid squeezing, crushing or puncturing the body of the tick because its fluids (saliva, hemolymph, gut contents) may contain infectious organisms. Releasing these organisms to the outside of the tick's body or into the bite area may increase the chance of infectious organism transmission.

4. Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin. This precaution is particularly directed to individuals who remove ticks from domestic animals with unprotected fingers. Children, elderly persons, and immunocompromised persons may be at greater risk of infection and should avoid this procedure.

5. After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.

6. Should you wish to save the tick for identification, place it in a plastic bag, with the date of the tick bite, and place in your freezer. It may be used at a later date to assist a physician with making an accurate diagnosis (if you become ill).

**Note:** Folklore remedies such as petroleum jelly or hot matches do little to encourage a tick to detach from skin. In fact, they may make matters worse by irritating the tick and stimulating it to release additional saliva, increasing the chances of transmitting the pathogen. These methods of tick removal should be avoided. In addition, a number of tick removal devices have been marketed, but none are better than a plain set of fine tipped tweezers.

### First-Aid and Medical Treatment

Tick bites should always be treated with first-aid. Clean and wash hands and disinfect the bite site after removing embedded tick. Individuals previously infected with Lyme disease does not confer immunity—re-infection from future tick bites can occur even after a person has contracted a tick-borne disease.

The employee should contact the Injury Management/Return To Work provider (IMRTW), WorkCare using the toll-free number 866-893-2514 to report the tick bite. WorkCare will follow-up with each CH2M Hill

---

employee who reports a tick bite and is at risk of developing Lyme disease by monitoring for symptoms up to 45 days, and will refer the employee to a medical provider for evaluation and treatment as necessary.

---

# **CH2M HILL HEALTH AND SAFETY PLAN**

## **Attachment 6**

### **Agency Inspection Target Zero Bulletin**



# TARGET ZERO BULLETIN

**Subject: HSSE Agency Inspections (OSHA, EPA, DOT, State Health Department)**

## **Do you know what YOU would do if an agency inspector arrived at your site unannounced?**

Recently, a State Occupational Safety and Health Administration (OSHA) inspector made an unannounced visit to one of our Federal project sites. OSHA, U.S. Environmental Protection Agency (EPA), and authorized state or local agencies have authority to inspect any facility that is subject to health, safety, and environmental legislation. Inspections may be announced or unannounced. This particular inspector indicated that the project was targeted for an inspection because the work was funded by the American Recovery and Reinvestment Act (ARRA).

Enterprise Standard Operating Procedure (SOP) HSE-201, *Agency Inspections and Communications*, describes the responsibilities, procedures, and requirements associated with inspections conducted by external regulatory agencies, as well as the methods for communicating information to key individuals. This Target Zero Bulletin is a brief summary of what to do in the event of an agency inspection at your site. Refer to the SOP for more specific guidance.

### **Notification of Inspections**

- If the inspection is an announced regulatory agency inspection, the Project Manager (PM) should notify the Responsible Health and Safety Manager (RHSM) and Responsible Environmental Manager (REM) well in advance of the inspection.
- If an unannounced agency inspector visits one of our projects, Field personnel must immediately notify the project Emergency Response Coordinator (ERC). Typically the ERC is the Safety Coordinator (SC).
- The **ERC must immediately notify the RHSM/REM**, as appropriate, of unannounced inspections, or designate someone to call the RHSM/REM. The RHSM/REMs can provide guidance to the field staff and PM.

### **Inspector Credential Verification**

- Upon arrival, the ERC must request the inspector to provide official credentials. Record the inspector's name and office phone number or obtain the inspector's business card.
- The inspector shall sign the visitors log and be given a site-specific health, safety, and environmental protection briefing.
- The inspector shall meet any site access requirements associated with security clearances, specialized training, and medical monitoring. The CH2M HILL representative shall verify that the inspector possesses these requirements; access will only be granted to those areas where appropriate access requirements are met. Some inspectors have the authority to gain access to any work area at any time, such as an inspector with a search warrant. In these cases, we can stop work operations as necessary to protect the safety of the inspector(s).

### **Opening Conference**

- The CH2M HILL Project Manager, ERC, RHSM, or REM, and the inspector shall determine attendees for the opening conference. The RHSM (for OSHA and other worker health and safety inspections) or REM (for environmental inspections) shall join the opening conference via conference call.
- The inspector shall inform CH2M HILL of the purpose of the inspection and provide a copy of the complaint, if applicable.
- The inspector shall outline the scope of the inspection, including employee interviews conducted in private, physical inspection of the workplace and records, possible referrals, discrimination complaints, and the closing conference(s).

### **Requests for OSHA Logs**

- An OSHA inspector may request to review the project OSHA Injury/Illness log, better known as the OSHA 300 Log. Contact your RHSM for assistance in obtaining the OSHA 300 Log.

- 
- Field projects with a continuous duration of one year or longer are considered to be separate establishments and are required to maintain an OSHA 300 log specific to the project. The project OSHA 300 log should be maintained onsite and kept current.
  - Recordable injuries and illnesses sustained on field projects less than one year in duration are maintained on the CH2M HILL office log where the injured employee is based.

### **The Inspection**

- The scope of the inspection shall be limited to that indicated by the inspector in the opening conference. The inspector shall be escorted to relevant areas only. The ERC or other designated by the RHSM or REM must accompany the inspector during the inspection.
- Ensure that the inspection is limited to the scope that the inspector disclosed during the opening conference. The ERC should always take notes which identify: areas inspected, machinery or equipment and materials examined, employees or other persons interviewed, and photographs taken by the inspector.
- The inspector will observe safety, health, and environmental conditions and practices and document the inspection process. The inspector may also take photos and instrument readings, examine records, collect air samples, measure noise levels, survey existing engineering controls, and monitor employee exposure to toxic vapors, gases, and dusts.
- CH2M HILL should gather duplicate information (photographs, readings, samples) in the same manner and condition as the inspector. If the equipment needed to take duplicate samples is not onsite, ask the inspector if the sampling can wait until the equipment is available. If samples are taken, request a description of the tests that the agency intends to perform on the samples and request results as soon as they are available.
- Employees may be questioned during the inspection tour. The employee can refuse to speak to an inspector, can speak to the inspector with a company representative (including management) present, or can speak to the inspector privately. It is CH2M HILL policy that employees who wish to speak to the inspector are not discriminated against, intimidated, or otherwise mistreated for exercising their rights during compliance inspections.
- Copies of documents should not be provided to the inspector without the approval of the RHSM or REM or Legal Insurance Department (LID). **DO NOT** voluntarily release documents. Respond only to inspection team requests.
- During the course of the inspection, the inspector may point out violations. For each violation, the CH2M HILL representative should ask the inspector to discuss possible corrective action. Where possible, violations detected by the inspector should be corrected immediately and noted by the inspector as corrected.
- For those items which cannot be corrected immediately, an action plan shall be formulated for timely correction. In any instance, employees exposed to hazards shall be removed from the area.

### **Closing Conference**

After the inspection, a closing conference is normally held as follows:

- The CH2M HILL PM, ERC, RHSM or REM shall be involved via conference call in the closing conference, at a minimum;
- The inspector shall describe the apparent violations found during the inspection and other pertinent issues as deemed necessary by the inspector. CH2M HILL shall be advised of their rights to participate in any subsequent conferences, meetings or discussions. Any unusual circumstances noted during the closing conference shall be documented by the ERC;
- The inspector shall discuss violations observed during the inspection and indicate for which violations a citation and a proposed penalty may be issued or recommended;
- The ERC shall request receipts for all samples and approved documents photocopied by the inspector, request a photocopy of the inspector's photograph log, and request a copy of the final inspection report; and
- Any documentation from an agency inspection must be transmitted immediately to the RHSM or REM, and LID.

**Unannounced regulatory agency inspections may happen at any time on our projects -**

**Get your RHSM/REM and PM involved immediately if an Inspector arrives.**

# **CH2M HILL HEALTH AND SAFETY PLAN**

## **Attachment 7**

**Completed CH2M HILL AHAs**

---

# **CH2M HILL HEALTH AND SAFETY PLAN**

## **Attachment 8**

### **Material Safety Data Sheets**

Attachment A2  
Standard Operating Procedures

# Sample Labeling

---

## Scope and Applicability

This standard operating procedure (SOP) describes the general CH2M procedures for sample labeling that will be used on the 2016 UCR fish tissue sampling project.

## Sample Identifier Labels

Sample identifiers will be established before field sampling begins and assigned to each sample as it is collected. Sample identifiers consist of codes designed to fulfill three purposes: 1) to identify related samples (i.e., composites) to ensure proper data analysis and interpretation; to obscure the relationships between samples so that laboratory analysis will be unbiased by presumptive similarities between samples; and, 3) to track individual sample containers to ensure that the laboratory receives all of the material associated with a single sample. To accomplish these purposes, each container (i.e., zip lock bag containing an individual fish tissue) may have two different codes associated with it: the individual fish ID, and the composite sample ID. These codes and their uses are described below.

## Individual Fish and Composite Sample Numbering

Individual fish will be identified with the letters “EPA”, a species abbreviation, brood year, a sequential number, and composite bin/replicate identifier (ID) (e.g., EPA-HS-01-001-A1). The codes will include the following information:

Species abbreviation for the hatchery sturgeon will be HS:

- Hatchery sturgeon = HS

Brood year designations will be as follows:

- 2001 – 01
- 2002 – 02
- 2003 - 03
- 2004 – 04
- 2005 – 05
- 2006 – 06
- 2007 – 07
- 2008 – 08
- 2009 – 09
- 2010 - 10

Sequential fish numbers will be expressed sequentially as three digits starting with 001 (e.g., 001 or 002).

Composite bins will be:

- A = 50-97cm
- B = 98-137cm
- C = 138-160cm

With sequential numbering for the replicates (i.e., 1-3)

Therefore the example EPA-HS-01-001-A1 would be a hatchery sturgeon, it is from the 2001 brood year, the first fish that was processed and it belongs in the first replicate of the 50-97cm size bin.

Composite sample identification (ID) will be numbered sequentially beginning with the letters “EPA”, species abbreviation, and composite bin/replicate (e.g., EPA-HS-A1). The codes will include the following information:

Species abbreviation for the hatchery sturgeon will be HS:

- Hatchery sturgeon = HS

Composite bins will be:

- A = 50-97cm
- B = 98-137cm
- C = 138-160cm

With sequential numbering for the replicates (i.e., 1-3)

# SAMPLE PROCESSING FOR TARGET FISH SPECIES

---

## Purpose

The purpose of this standard operating procedure (SOP) is to describe the procedures used for filleting, measuring fish fillet weights, subsampling and preparing samples for shipment to the analytical laboratory during the Upper Columbia River (UCR) Fish Tissue Study during Fall 2016.

## Scope and Applicability

This SOP applies to all sturgeon collected during the fall 2016 sampling.

## Equipment and Materials

- Coolers, dry ice, thermometers
- Balance and calibration weight
- Examination board (such as a plastic cutting board or stainless steel pan or tray)
- Pit Tag Reader
- Cleanroom 100 certified nitrile gloves
- Heavy-duty aluminum foil
- Various sizes of resealable plastic bags
- Spray bottle (containing lake water for rinsing equipment)<sup>1</sup>
- Processing forms
- Secondary field tags
- Roll of plastic sheeting (for processing area)
- Stainless steel utility knife
- Scalpel with replaceable stainless steel blades
- Stainless steel fillet knives
- Cut proof gloves
- Forceps

---

<sup>1</sup> Lake water used in processing will come from the same reach where the fish were collected



- Field notebook
- Marine band radio and cell phone
- Digital camera
- Alconox soap and brushes
- 20% nitric acid
- Pesticide grade methanol
- Kim wipes™

## Procedures

The filleting, measurements, and sorting of fish will be performed on the National Park Service Boat following transfer of capture fish from the Lake Roosevelt Fisheries Co-Managers (CCT, Spokane Tribe of Indians, and WDFW).

Fish length and weight provided by the Lake Roosevelt Fisheries Co-Managers will be documented on the fish processing form and the sample ID provided on the fish tag will be confirmed prior to processing. Filleting will follow general EPA guidelines for assessing chemical contaminant data for use in fish advisories (USEPA 2000). Fish will be filleted with the skin removed. The following general procedures will be used:

1. Prior to resection, hands will be washed with Ivory soap and rinsed thoroughly in tap water, followed by contaminant-free, deionized water, and a clean pair of cleanroom 100 certified nitrile gloves will be worn.
2. All cutting boards and utensils will be cleaned prior to use by washing with laboratory detergent and deionized water, three times with pesticide-grade methanol followed by three times with 20 percent nitric acid, then three times with deionized water and allowed to air dry before use.
3. Care will be taken to ensure that specimens come into contact only with decontaminated cutting boards and utensils.
4. Individual fish will be placed on decontaminated glass or Teflon® cutting board or on one that has been covered with clean heavy-duty aluminum foil.
5. A clean, high-quality stainless-steel, ceramic, or titanium filleting knife will be used to remove one fillet. The belly flap will be included in each fillet.
6. Bones remaining in the tissue after filleting (e.g., rib bones or fins) will be carefully removed with decontaminated stainless-steel pliers or forceps, or cut out with a knife.
7. Any dark muscle tissue in the vicinity of the lateral line will not be separated from the light muscle tissue that constitutes the rest of the muscle tissue mass. One fillet from each fish will be removed and 200 g of the fillet will be cut from a cross-section in the middle of the fillet for the composite sample.
8. Fillets will be weighed to the nearest gram and recorded on the fish processing form.
9. All cutting boards and utensils will be cleaned between samples with detergent and with trace-metal-free and organics-free deionized water, followed by pesticide-grade methanol and 20 percent nitric acid rinses between samples.

10. If an aluminum-foil-covered cutting board is used, the foil will be changed between fish. Care will also be taken to avoid contaminating fillet tissues with material released by the inadvertent puncture of internal organs. If the fillet is inadvertently contaminated, the fillet tissue will be rinsed in contaminant-free, distilled water and blotted dry with Kim Wipes™. In addition, documentation of the potential contamination will be completed on the fish processing form.
11. Following resection, fillet tissue will be individually wrapped in aluminum foil – shiny side out - and placed in a resealable plastic bag. The bagged fillet will then be placed inside a second bag with the fish ID and composite sample ID so that these labels are between the 2 resealable plastic bags. This will facilitate identification and sample organization at the homogenization/analytical laboratory without unwrapping the fish.
12. Bagged and labelled fillets will be stored in a cooler on wet ice while on the sampling boat. These tissues will then be transferred to a cooler with dry ice for shipment (see Section 2.3).
13. The remaining fillet will be sunk in the reservoir with the carcass.

## References

- Wydoski, R.S. and R.R. Whitney. 2003. Inland fishes of Washington, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland and University of Washington Press, Seattle.
- Smith, S.B., A.P. Donahue, R.J. Lipkin, V.S. Blazer, C.J. Schmitt, and R.W. Goede. 2002. Illustrated field guide for assessing external and internal anomalies in fish.
- Geological Survey Information and Technology Report USGS/BRD/ITR—2002-0007. U.S. Geological Survey, Reston, Virginia.

# SAMPLE STORAGE, PACKING, AND SHIPPING

---

## Scope and Applicability

Specific requirements for sample storage on-site, packaging of sample coolers, and shipment to the off-site analytical laboratory are addressed in this Standard Operating Procedure (SOP) for the UCR 2016 Fish Tissue Sampling Program.

## Equipment and Materials

Specific equipment or supplies necessary to properly pack and ship fish tissue samples include the following:

- Quality Assurance Project Plan for 2009 Fish Tissue Study
- thermometers
- Resealable plastic bags (assorted sizes)
- Dry ice or, if dry ice is not available, wet ice in doubled, sealable bags
- Coolers
- Bubble wrap
- Fiber-reinforced packing tape and clear plastic packing tape
- Scissors or knife
- Chain-of-custody (COC) forms
- COC seals
- Large plastic garbage bags (preferably 3 mil thick) for cooler lining
- Paper towels
- “Fragile,” “This End Up,” or “Handle With Care” labels

## Procedures

All shipping will utilize a commercial courier or shipping service.

As a courier service will be used, CH2M field personnel will need to be aware of any potentially limiting factors to timely shipping (e.g., availability of overnight service and weekend deliveries to specific areas of the country, shipping regulations “restricted articles” [e.g., dry ice]) prior to shipping the samples.

## On-Site Sample Storage

Samples will be placed in secure storage (i.e., locked room or vehicle) or remain in the possession of CH2M sampling personnel before shipment. Any sample storage areas will be locked and secured to maintain sample integrity and COC requirements.

## Packing and Preparation

The following steps should be followed to ensure the proper transfer of samples from the field to the off-site analytical laboratory.

1. Check sample containers against the COC form to ensure all samples intended for shipment are accounted for.
2. Choose the appropriate size cooler (or coolers) and make sure that the outside and inside of the cooler is clean of gross contamination. If the cooler has a drain on the outside at the bottom of the cooler, the drain should be capped and thoroughly taped shut with duct tape.
3. The cooler should be lined with a large plastic bag (preferably a bag with a thickness of 3 mil) should be opened and placed inside the cooler.
4. Place the individual fish tissue subsamples (which during the sample processing step had already been placed in plastic bags) into the large plastic bag in the cooler, leaving sufficient room for dry ice to keep the samples cold (i.e., 4°C).
5. Check sample containers against the COC form to ensure all of the sub-samples that were collected are in the cooler.
6. As the samples have a required storage temperature, add enough dry ice to keep the samples refrigerated during overnight shipping (i.e., <0°C). Always over-estimate the amount of ice that you think will be required. Ice should be enclosed in a resealable plastic bag. After all samples and ice have been added to the cooler, use bubble wrap (or other available clean packing material) to fill any empty space to keep the samples from shifting during transport.
7. Sign and date the completed COC form and retain the pink (back) copy for project files. Place the rest of the signed COC form in a resealable bag and tape the bag containing the form to the inside of the cooler lid. Each cooler should contain an individual COC form for the samples contained in each respective cooler. If time constraints impact sample shipping and it becomes necessary to combine all of the samples onto a single set of COC forms and the shipment contains multiple coolers, indicate on the outside of the respective cooler "Chain-of-Custody Inside."
8. After the cooler is sufficiently packed to prevent shifting of the containers, close the lid and seal it shut with fiber-reinforced packing tape. The cooler should be taped shut around the opening between the lid and the bottom of the cooler and around the circumference of the cooler at both hinges.
9. As security against unauthorized handling of the samples, apply two COC seals across the opening of the cooler lid. One seal should be placed on the front right portion of the cooler and one seal should be placed on the back left portion of the cooler. Be sure the seals are properly affixed to the cooler so they are not removed during shipment. Additional clear packing tape across the seal may be necessary if the outside of the cooler is wet.

The sample processing coordinator (SPC) should notify the laboratory contact will be shipped and the estimated arrival time. The SPC should also send copies of all COC forms to CH2M's project manager, as appropriate.

## Shipping

Fish samples will usually be driven to the lab by a courier weekly after processing. Add other appropriate stickers, such as "This End Up," "Fragile," and "Handle With Care." If the shipment contains multiple

coolers, indicate on the mailing label the number of coolers that the testing laboratory should expect to receive (e.g., 1 of 2; 2 of 2).

# FIELD DOCUMENTATION

---

## Scope and Applicability

The integrity of each sample from the time of collection to the point of data reporting must be maintained throughout the study. Proper record keeping will be implemented in the field to allow samples to be traced from collection to final disposition.

All information pertaining to field operations during sample collection must be properly documented to ensure transparency (and reproducibility) of methods and procedures. Several types of field documents will be used for this purpose by field personnel.

## Field Logbooks

During field sampling events, field logbooks are used to record all daily field activities on each vessel used for fish tissue collection. The purpose of the field logbook is to document events that occur during field activities and to record data measured in the field to ensure transparency and reproducibility.

The field logbook is the responsibility of, and maintained by the FTL for each vessel. The site logbook will be kept current by the Field Supervisor (FS) during field activities and will be placed in the project files at the conclusion of field activities.

The field logbook will be bound and waterproof with consecutively numbered pages. All entries will be made using indelible ink and no erasures will be made. Any necessary corrections in the logbook should consist of a single line-out deletion, followed by the author's initials and the date. The author will initial and date each page of the field logbook, sign and date the last page at the end of each day, and draw a line through the remainder (unused portion) of that page.

The project name, dates of the field work, site name, and location (city and state) should be written on the cover of the field logbook. If more than one logbook is used during a single sampling event, then the upper right hand corner of the logbook will be annotated (e.g., Volume 1 of 2, 2 of 2) to indicate the number of logbooks used during the field event. Field logbooks will be stored in a secure manner when not in use in the field.

At a minimum, the following information will be recorded in the field logbook:

- Project name and location.
- Purpose and description of the field task.
- Project start date and end date.
- Date and time of entry (24-hour clock).
- Time and duration of daily sampling activities.
- Weather conditions at the beginning of the field work and any changes that occur throughout the day, including the approximate time of the change (e.g., wind speed and direction, rain, thunder, wave action, vessel traffic, temperature of both the air and water).

- Name and affiliation of person making entries and other field personnel and their duties, including the times that they are present.
- The location and description of the work area, including sketches, map references, and photograph log, if appropriate.
- Level of personal protection being used.
- Onsite visitors (names and affiliations), if any, including the times that they are present (e.g., cultural resource personnel, agency observers, etc.).
- The name, affiliation, and telephone number(s) of any key field contacts.
- Notation of the coordinate system used to determine the station location information.
- The sample identifier and analysis code for each sample to be submitted for laboratory analysis, if not included on separate field data sheets (cross reference provided).
- All field measurements made (or reference to specific field data sheets used for this purpose), including the time that the measurement was collected and the date of calibration, if appropriate.
- The sampling location name, date, gear, water depth (if applicable), and sampling location coordinates, if not included on separate field data sheets.
- The type of vessel used (e.g., size, power, type of engine) (for aquatic sampling only).
- Specific information on each type of sampling activity.
- The sample type (e.g., fish tissue, surface sediment), sample number, sample tag number, and preservatives used (if any), if not included on separate field data sheets.
- Sample storage methods.
- Cross-references of numbers for duplicate samples.
- A description of the sample [for fish sampling this would include approximate number of target/non-target fish by species caught for each gear set or whether gear was unsuccessful; any debris caught in sample gear; unusual odors, etc.].
- Photographs (uniquely identified) taken at the sampling location, if any.
- Details of the work performed.
- Variations, if any, from the project-specific Quality Assurance Project Plan (QAPP) or standard operating protocols and reasons for deviation.
- Details pertaining to unusual events which might have occurred during sample collection (e.g., possible sources of sample contamination, equipment failure, unusual appearance of sample integrity).
- References to other logbooks or field forms used to record information (e.g., field data sheets, health and safety log).
- Sample shipment information (e.g., shipping manifests, COC form numbers, carrier, air bill numbers, time addresses).
- A record of quantity of investigation derived wastes (if any) and storage and handling procedures.

During the field day, as listed above, a summary of all site activities should be recorded in the logbook. The information need not duplicate anything recorded in other field logbooks or field forms (e.g., Site Health

and Safety Officer's logbook, calibration logbook, field data sheets), but should summarize the contents of the other logbooks and refer to the page locations in these logbooks for detailed information.

If measurements are made at any location, the measurements and equipment used must either be recorded in the field logbook or reference must be made to the logbook and page number(s) on which they are recorded. All maintenance and calibration records for equipment should be traceable through field records to the person using the instrument and to the specific piece of instrumentation itself.

Upon completion of the field sampling event, the FS will be responsible for submitting all field logbooks to be copied. A discussion of copy distribution is provided below.

## Sample Processing and Field Data Forms

Sample processing and field data forms will be generated during this field sampling event (e.g., fish health assessment form) to record the relevant sample information collected during a sampling event.

Upon completion of the field sampling event, the FS will be responsible for submitting all field data forms to be copied. A discussion of copy distribution is provided below.

## Photographs

In certain instances, photographs (print or digital) of sampling stations may be taken using a camera-lens system with a perspective similar to the naked eye. Photographs should include a measured scale in the picture, when practical (e.g., pencil, coin, ruler, etc.). Photographs may also be taken of sample characteristics and routine sampling activities. Telephoto or wide-angle shots will not be used because they cannot be used in enforcement proceedings. The following items should be recorded in the field logbook for each photograph taken:

1. The photographer's name or initials, the date, the time of the photograph, and the general direction faced (orientation).
2. A brief description of the subject and the field work portrayed in the picture.
3. For print photographs, the sequential number of the photograph and the film roll number (if applicable) on which it is contained.
4. For digital photographs, the sequential number of the photograph, the file name, the file location, and back-up Compact Disc (CD) number (if applicable).

Upon completion of the field sampling event, the FS will be responsible for submitting all photographic materials to be developed (prints) or to be copied (CDs), as appropriate. The prints or CDs (as appropriate) and associated negatives will be placed in the project files (at the CH2M Project Manager's location). Photo logs and any supporting documentation from the field logbooks will be photocopied and placed in the project files with the prints or disks.

## Distribution of Copies

Two copies of all field logbooks and additional field data forms will be made at CH2M. The first copy will be stamped with a "COPY" stamp. This copy will be placed in the project file and will be available for general staff use. The second copy will be stamped with a "FILE" stamp. This copy will be placed in the data management file with the laboratory data packages and will be used by the data management and quality assurance staff only. The original field logbooks and forms will be placed in a locked file cabinet at the Project Manager's location.



# SAMPLE CUSTODY

---

## Scope and Applicability

This SOP describes CH2M procedures for custody management of environmental samples during the 2009 UCR fish tissue sampling program. The procedure outlined herein will be used in conjunction with SOP-8, which covers sample packaging and shipping; SOP-9, which covers the use of field logbooks and other types of field documentation; and SOP-2, which covers sample labeling.

Chain-of-custody (COC) forms ensure that samples are traceable from the time of collection through processing and analysis until final disposition. A sample is considered to be in a person's custody if any of the following criteria are met:

1. The sample is in the person's possession
2. The sample is in the person's view after being in possession
3. The sample is in the person's possession and is being transferred to a designated secure area
4. The sample has been locked up to prevent tampering after it was in the person's possession.

At no time is it acceptable for samples to be outside of CH2M personnel's custody unless the samples have been transferred to a secure area (i.e., locked up and custody sealed). If the samples cannot be placed in a secure area, then a CH2M field team member must physically remain with the samples (e.g., at lunch time one team member must remain with the samples).

## Chain-of-Custody Forms

The COC form is critical because it documents sample possession from the time of collection through the final disposition of the sample. The form also provides information to the laboratory regarding what analyses are to be performed on the samples that are shipped.

The COC form will be completed after each field collection activity and before the samples are shipped to the laboratory. Sampling personnel are responsible for the care and custody of the samples until they are shipped. When transferring possession of the samples, the individuals relinquishing and receiving the samples must sign the COC form(s), indicating the time and date that the transfer occurs.

The COC forms each consist of 3-part carbon-less paper with white, yellow, and pink copies. The white sheet and the yellow sheet will be placed into a plastic sealable bag and secured to the inside top of each transfer container (e.g., cooler). The pink sheet will be retained by the field staff for filing at the CH2M Project Manager's location. Each COC form has a unique number. This number and the samples on the form shall be recorded in the field logbook. CH2M also uses computer-generated COC forms. If computer-generated forms are used, then the forms will be printed in triplicate, sequentially numbered, and all three sheets signed so that two sheets can accompany the shipment to the laboratory and one sheet can be retained on file at the CH2M Project Manager's location. Alternatively, if sufficient lead time is available, the computer-generated forms will be printed on 3-part carbon-less paper.

The individual fish sample labels and composite fish sample labels will be recorded on the COC form. The COC form will also identify the sample collection date and time, the type of sample, the project, and the sampling personnel. In addition, the COC form provides information on the preservative or other sample

pretreatment applied in the field and the analyses to be conducted by referencing a list of specific analyses or the statement of work for the laboratory. The COC form will be sent to the laboratory along with the sample(s).

## Procedures

The following guidelines will be followed to ensure the integrity of the samples:

1. At the end of each sampling day and prior to shipping or storage, COC entries will be made for all samples and COCs will be filled out for all samples. Information on the COCs will be checked against field logbook entries.
2. At the bottom of each COC form is a space for the signatures of the persons relinquishing and receiving the samples and the time and date that the transfer occurred. Usually either the Sample Processing Coordinator (SPC) or Field Supervisor (FS) will relinquish the samples. The time that the samples were relinquished should match. Each COC form must be appropriately signed and dated by the sampling personnel. The person who relinquishes custody of the samples must also sign this form.
3. The COC form should not be signed until the information has been checked for inaccuracies by the FS. All changes should be made by drawing a single line through the incorrect entry and initialing and dating it. Revised entries should be made in the space below the entries. Any blank lines remaining on the COC form after corrections are made should be marked out with single lines that are initialed and dated. This procedure will preclude any unauthorized additions.
4. At the bottom of each COC form is a space for the signatures of the persons relinquishing and receiving the samples and the time and date that the transfer occurred. The time that the samples were relinquished should match exactly the time they were received by another party. Under no circumstances should there be any time when custody of the samples is undocumented.
5. If samples are sent by a commercial carrier not affiliated with the laboratory, such as Federal Express (FedEx) or United Parcel Service (UPS), the name of the carrier should be recorded on the COC form. Any tracking numbers supplied by the carrier should be also entered on the COC form. The time of transfer should be as close to the actual drop-off time as possible. After the COC forms are signed and the “pink” copy has been removed, they should be sealed inside the transfer container.
6. If errors are found after the shipment has left the custody of sampling personnel, a corrected version of the forms must be made and sent to all relevant parties. Minor errors can be rectified by making the change on a copy of the original with a brief explanation and signature. Errors in the signature block may require a letter of explanation.
7. Upon completion of the field sampling event, the FS will be responsible for submitting all COC forms to be copied.

## Custody Seal

As security against unauthorized handling of the samples during shipping, two custody seals will be affixed to each sample cooler. The custody seals will be placed across the opening of the cooler (front right and back left) prior to shipping. Be sure the seals are properly affixed to the cooler so they cannot be removed during shipping. Additional tape across the seal may be prudent.

## Shipping Air Bills

When samples are shipped from the field to the testing laboratory via a commercial carrier (e.g., Federal Express, UPS), an air bill or receipt is provided by the shipper. Upon completion of the field sampling event, the FS will be responsible for submitting the sender's copy of all shipping air bills to be copied. The air bill number (or tracking number) should be noted on the applicable COC forms or alternatively the applicable COC form number should be noted on the air bill to enable the tracking of samples if a cooler becomes lost.

## Acknowledgement of Sample Receipt Forms

In most cases, when samples are sent to a testing laboratory, an Acknowledgment of Sample Receipt form is faxed to the project QA/QC coordinator the day the samples are received by the laboratory. It is the responsibility of the person receiving this form (designated by Project Manager) to review the form and make sure that all the samples that were sent to the laboratory were received by the laboratory and that the correct analyses were requested. If an error is found, the laboratory must be called immediately. Decisions made during the telephone conversation should be documented in writing on the Acknowledgment of Sample Receipt Form. In addition, corrections should be made to the COC form and the corrected version of the COC form should be faxed to the laboratory.

The Acknowledgment of Sample Receipt form (and any modified COC forms) will then be submitted to be copied.

## Archive Record Forms

On occasion, samples are archived at a CH2M office or a CH2M authorized laboratory. If samples are to be archived, it is the responsibility of the project manager or analytical laboratory manager to complete an Archive Record form. This form is to be accompanied by a copy of the COC form for the samples, and will be placed in a locked file cabinet. The original COC form will remain with the samples in a resealable plastic bag.

## **APPENDIX E-1**

### **HUMAN HEALTH RISK-BASED CONCENTRATIONS FOR FISH TISSUE IN SUPPORT OF SAMPLING AND ANALYSIS PLAN DEVELOPMENT**

## Human Health Risk-Based Concentrations for Fish Ingestion

Risk-based concentrations (RBCs) are based on the maximally exposed receptor population (traditional subsistence scenario) from the human health risk assessment (HHRA) work plan for the Upper Columbia River (UCR) (United States Environmental Protection Agency [USEPA] 2009). RBCs were back-calculated based on a target hazard quotient (THQ) of 0.1 for non-cancer and a target cancer risk (TR) of 1E-06. For arsenic, the fish tissue RBC was calculated based on an assumption that 10% of arsenic in fish tissue is in a biologically available form. The RBC for methylmercury is a fish tissue residue criterion (TRC) that adjusts the oral reference dose (RfD) by a relative source contribution (RSC) that accounts for methylmercury in marine fish consumed (USEPA 2010).

The equations used to calculate the RBCs for non-cancer hazard and cancer risk are:

$$RBC_{non-cancer} = \frac{THQ \times AT \times ED \times BW}{EF \times ED \times \frac{1}{RfD} \times IR \times CF}$$

and

$$RBC_{cancer} = \frac{TR \times AT \times LT}{CSF \times CF \times \left[ \left( EF \times ED_{child} \times \frac{IR_{child}}{BW_{child}} \right) + \left( EF \times ED_{adult} \times \frac{IR_{adult}}{BW_{adult}} \right) \right]}$$

where:

THQ	=	total hazard quotient (0.1)
AT	=	averaging time (365 days/year; USEPA 2011)
ED	=	exposure duration (64 years for adults; 4 years for children <sup>9</sup> ; Harper et al. 2002)
BW	=	body weight (80 kg for adults; 15 kg for children; USEPA 2011)
EF	=	exposure frequency (365 days/year; Harper et al. 2002 and professional judgement)
RfD	=	oral reference dose (see table)
IR	=	fish ingestion rate (885 g/day for adults; 442.5 g/day for children 2-6 years old; USEPA 2005a) <sup>10</sup>
CF	=	conversion factor (1E-3 kg/g)
TR	=	total cancer risk (1E-6)
LT	=	lifetime (70 years; U.S. EPA 2011), and
CSF	=	oral cancer slope factor (see table).

Oral RfDs and CSFs for the COIs were obtained from the U.S. EPA Regional Screening Level (RSL) calculator ([www.epa.gov/risk/regional-screening-levels-rsls-equations-may-2016](http://www.epa.gov/risk/regional-screening-levels-rsls-equations-may-2016)) except for uranium,

<sup>9</sup> The four year exposure duration for children assumes that they will be breastfed for the first two years of life.

<sup>10</sup> Adult fish consumption rate taken from Table I, high fish diet; child consumption rate assumed to equal one-half of the adult rate.

which has a site-specific RfD of 0.0006 mg/kg-day.<sup>11</sup> The CSF for dioxin was taken from WDOH (2012). These toxicity values are shown in Table 1 below.

**Table 1. Toxicity Values for Contaminants of Interest.**

Analyte	Oral RfD <sup>a</sup> (mg/kg-day)	Oral CSF (mg/kg-day) <sup>-1</sup>
Aluminum	1	NA <sup>b</sup>
Antimony	0.0004	NA
Arsenic	0.0003	1.5
Barium	0.2	NA
Beryllium	0.002	NA
Boron	0.2	NA
Cadmium	0.001	NA
Calcium	NA	NA
Chromium	1.5	NA
Cobalt	0.0003	NA
Copper	0.04	NA
Fluoride	0.04	NA
Iron	0.7	NA
Lead	NA	NA
Magnesium	NA	NA
Manganese	0.14	NA
Mercury	0.000073 <sup>c</sup>	NA
Molybdenum	0.005	NA
Nickel	0.02	NA
Potassium	NA	NA
Selenium	0.005	NA
Silicon	NA	NA
Silver	0.005	NA
Sodium	NA	NA
Sulfur	NA	NA
Thallium	0.00001	NA
Tin	0.6	NA
Uranium	0.0006	NA
Vanadium	0.005	NA
Zinc	0.3	NA
Dioxins (as TEQ)	0.0000000007	156000
Total PCBs (high risk)	0.000023	2
Total PBDE	NA	NA
PBDE-47	0.0001	NA
PBDE-99	0.0001	NA
PBDE-153	0.0002	NA
PBDE-209	0.007	0.0007

<sup>a</sup>Shaded toxicity values have been updated since the 2009 QAPP (Parametrix et al. 2009).

<sup>b</sup>NA = not available.

<sup>11</sup> In a July 3, 2008 memorandum to Monica Tonel (U.S. EPA), Marc Stifelman (U.S. EPA) recommended that 0.0006 mg/kg-day be used as the oral RfD for uranium.

<sup>c</sup>Value shown is oral RfD minus an RSC of 0.027  $\mu\text{g}/\text{kg}\text{-day}$  (see text for explanation).

## References

- Harper, B.L., B. Flett, S. Harris, C. Abeyta, and F. Kirschner. 2002. The Spokane Tribe's multipathway subsistence exposure scenario and screening level RME. *Risk Analysis* 22: 513-526.
- USEPA. 2005. Final Midnite Mine human health risk assessment report. U.S. Environmental Protection Agency, Region 10, Seattle, WA. September.
- USEPA. 2009. Human health risk assessment work plan for the Upper Columbia River site remedial investigation and feasibility study. Prepared for, and with oversight by, United States Environmental Protection Agency, Region 10. Prepared by Syracuse Research Corporation. March.
- USEPA. 2010. Guidance for implementing the January 2001 methylmercury water quality criterion. U.S. Environmental Protection Agency, Office of Science and Technology. EPA-823-R-10-001.
- USEPA. 2011. Exposure factors handbook: 2011 edition. U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC. EPA/600/R-090/052F. September.
- Washington Department of Health (WDOH). 2012. Human health evaluation of contaminants in Upper Columbia River fish. Washington State Department of Health, Olympia, WA. DOH 334-317. August.



Attachment A3  
Field Forms

**2016 Fish Collection Form**  
**Upper Columbia River (UCR) Fish Tissue Study**

Date: \_\_\_\_\_

Individual Fish ID	Pit tag #	Fish Composite ID	Time	Sex	Abnormalities (v)	Photo ID	Weight of Fillet (g)	Weight of subsample for Composite (g)	Collectors Initials

Notes:

**2016 FISH EXTERNAL EXAMINATION FORM**  
**Upper Columbia River (UCR) Fish Tissue Study**

Date (MM/DD/YYYY): \_\_\_\_\_ Reach: \_\_\_\_\_ Indiv. Fish Sample No. \_\_\_\_\_

Time: \_\_\_\_\_

Weight (g): \_\_\_\_\_ Length (cm): \_\_\_\_\_

Species: \_\_\_\_\_

**EXTERNAL EXAMINATION: (check all that apply)**

<p><b>BODY SURFACE:</b></p> <input type="checkbox"/> normal <input type="checkbox"/> raised growth(s) <input type="checkbox"/> reddened lesion(s) <input type="checkbox"/> spinal deformities <input type="checkbox"/> hemorrhagic body <input type="checkbox"/> focal discoloration <input type="checkbox"/> body fungus <input type="checkbox"/> parasites(s) (specify): white spots <input type="checkbox"/> leech(es) <input type="checkbox"/> black spot(s) <input type="checkbox"/> Anchor worm(s) <input type="checkbox"/> other (specify): <input type="checkbox"/> _____ _____	<p><b>HEAD &amp; ORAL CAVITY:</b></p> <input type="checkbox"/> normal head <input type="checkbox"/> deformed head <input type="checkbox"/> upper lip growth <input type="checkbox"/> lower lip growth <input type="checkbox"/> swollen nare <p><b>BARBELS:</b></p> <input type="checkbox"/> normal <input type="checkbox"/> missing <input type="checkbox"/> stubbed <input type="checkbox"/> deformed <input type="checkbox"/> other (specify): _____ _____ _____	<p><b>EYES:</b></p> <table style="width:100%; border: none;"> <tr> <td style="width:50%; border: none; vertical-align: top;"> <p align="center"><u>Left</u></p> <input type="checkbox"/> normal  <input type="checkbox"/> exophthalmic  <input type="checkbox"/> opaque  <input type="checkbox"/> missing  <input type="checkbox"/> hemorrhagic  <input type="checkbox"/> emboli  <input type="checkbox"/> other(specify): _____            _____            _____            _____         </td> <td style="width:50%; border: none; vertical-align: top;"> <p align="center"><u>Right</u></p> <input type="checkbox"/> normal  <input type="checkbox"/> exophthalmic  <input type="checkbox"/> opaque  <input type="checkbox"/> missing  <input type="checkbox"/> hemorrhagic  <input type="checkbox"/> emboli  <input type="checkbox"/> other(specify): _____            _____            _____            _____         </td> </tr> </table>	<p align="center"><u>Left</u></p> <input type="checkbox"/> normal <input type="checkbox"/> exophthalmic <input type="checkbox"/> opaque <input type="checkbox"/> missing <input type="checkbox"/> hemorrhagic <input type="checkbox"/> emboli <input type="checkbox"/> other(specify): _____ _____ _____ _____	<p align="center"><u>Right</u></p> <input type="checkbox"/> normal <input type="checkbox"/> exophthalmic <input type="checkbox"/> opaque <input type="checkbox"/> missing <input type="checkbox"/> hemorrhagic <input type="checkbox"/> emboli <input type="checkbox"/> other(specify): _____ _____ _____ _____
<p align="center"><u>Left</u></p> <input type="checkbox"/> normal <input type="checkbox"/> exophthalmic <input type="checkbox"/> opaque <input type="checkbox"/> missing <input type="checkbox"/> hemorrhagic <input type="checkbox"/> emboli <input type="checkbox"/> other(specify): _____ _____ _____ _____	<p align="center"><u>Right</u></p> <input type="checkbox"/> normal <input type="checkbox"/> exophthalmic <input type="checkbox"/> opaque <input type="checkbox"/> missing <input type="checkbox"/> hemorrhagic <input type="checkbox"/> emboli <input type="checkbox"/> other(specify): _____ _____ _____ _____			

<p><b>OPERCULA:</b></p> <input type="checkbox"/> normal <input type="checkbox"/> slight shortening <input type="checkbox"/> severe shortening	<input type="checkbox"/> Other (specify): _____ _____ _____ _____
---	--

<p><b>GILLS:</b></p> <table style="width:100%; border: none;"> <tr> <td style="width:50%; border: none; vertical-align: top;"> <p><u>Left:</u></p> <input type="checkbox"/> normal  <input type="checkbox"/> frayed  <input type="checkbox"/> marginate  <input type="checkbox"/> pale  <input type="checkbox"/> other (specify): _____         </td> <td style="width:50%; border: none; vertical-align: top;"> <p><u>Right:</u></p> <input type="checkbox"/> normal  <input type="checkbox"/> frayed  <input type="checkbox"/> marginate  <input type="checkbox"/> pale  <input type="checkbox"/> other (specify): _____         </td> </tr> </table>	<p><u>Left:</u></p> <input type="checkbox"/> normal <input type="checkbox"/> frayed <input type="checkbox"/> marginate <input type="checkbox"/> pale <input type="checkbox"/> other (specify): _____	<p><u>Right:</u></p> <input type="checkbox"/> normal <input type="checkbox"/> frayed <input type="checkbox"/> marginate <input type="checkbox"/> pale <input type="checkbox"/> other (specify): _____	<p><b>DELTS:</b></p> <input type="checkbox"/> Deformities <input type="checkbox"/> Erosion <input type="checkbox"/> Lesions <input type="checkbox"/> Tumors
<p><u>Left:</u></p> <input type="checkbox"/> normal <input type="checkbox"/> frayed <input type="checkbox"/> marginate <input type="checkbox"/> pale <input type="checkbox"/> other (specify): _____	<p><u>Right:</u></p> <input type="checkbox"/> normal <input type="checkbox"/> frayed <input type="checkbox"/> marginate <input type="checkbox"/> pale <input type="checkbox"/> other (specify): _____		

<p><b>FINS:</b></p> <input type="checkbox"/> normal <input type="checkbox"/> mild erosion <input type="checkbox"/> severe erosion <input type="checkbox"/> frayed	<input type="checkbox"/> hemorrhagic <input type="checkbox"/> emboli <input type="checkbox"/> other (specify): _____
--	--

## 2016 Hatchery Sturgeon Tissue Collection

(Record the Capture Date/fish Tag number when collected)

Replicate 1		
A: 50-97cm	B: 98-137cm	C: 138-160cm
1 EPA-HS-____-__-A1	EPA-HS-____-__-B1	EPA-HS-____-__-C1
2 EPA-HS-____-__-A1	EPA-HS-____-__-B1	EPA-HS-____-__-C1
3 EPA-HS-____-__-A1	EPA-HS-____-__-B1	EPA-HS-____-__-C1
4 EPA-HS-____-__-A1	EPA-HS-____-__-B1	EPA-HS-____-__-C1
5 EPA-HS-____-__-A1	EPA-HS-____-__-B1	EPA-HS-____-__-C1
6 EPA-HS-____-__-A1	EPA-HS-____-__-B1	EPA-HS-____-__-C1
7 EPA-HS-____-__-A1	EPA-HS-____-__-B1	EPA-HS-____-__-C1
8 EPA-HS-____-__-A1	EPA-HS-____-__-B1	EPA-HS-____-__-C1
EPA-HS-A1	EPA-HS-B1	EPA-HS-C1

Replicate 2		
A: 50-97cm	B: 98-137cm	C: 138-160cm
1 EPA-HS-____-__-A2	EPA-HS-____-__-B2	EPA-HS-____-__-C2
2 EPA-HS-____-__-A2	EPA-HS-____-__-B2	EPA-HS-____-__-C2
3 EPA-HS-____-__-A2	EPA-HS-____-__-B2	EPA-HS-____-__-C2
4 EPA-HS-____-__-A2	EPA-HS-____-__-B2	EPA-HS-____-__-C2
5 EPA-HS-____-__-A2	EPA-HS-____-__-B2	EPA-HS-____-__-C2
6 EPA-HS-____-__-A2	EPA-HS-____-__-B2	EPA-HS-____-__-C2
7 EPA-HS-____-__-A2	EPA-HS-____-__-B2	EPA-HS-____-__-C2
8 EPA-HS-____-__-A2	EPA-HS-____-__-B2	EPA-HS-____-__-C2
EPA-HS-A2	EPA-HS-B2	EPA-HS-C2

Replicate 3		
A: 50-97cm	B: 98-137cm	C: 138-160cm
1 EPA-HS-____-__-A3	EPA-HS-____-__-B3	EPA-HS-____-__-C3
2 EPA-HS-____-__-A3	EPA-HS-____-__-B3	EPA-HS-____-__-C3
3 EPA-HS-____-__-A3	EPA-HS-____-__-B3	EPA-HS-____-__-C3
4 EPA-HS-____-__-A3	EPA-HS-____-__-B3	EPA-HS-____-__-C3
5 EPA-HS-____-__-A3	EPA-HS-____-__-B3	EPA-HS-____-__-C3
6 EPA-HS-____-__-A3	EPA-HS-____-__-B3	EPA-HS-____-__-C3
7 EPA-HS-____-__-A3	EPA-HS-____-__-B3	EPA-HS-____-__-C3
8 EPA-HS-____-__-A3	EPA-HS-____-__-B3	EPA-HS-____-__-C3
EPA-HS-A3	EPA-HS-B3	EPA-HS-C3

**Notes:**

1) insert the brood year code and sequential fish number (3 digits) into the ID

Brood Year = last 2 digits of year

2001 = 01	2006 = 06
2002 = 02	2007 = 07
2003 = 03	2008 = 08
2004 = 04	2009 = 09
2005 = 05	2010 = 10

2) and the date (to the right of fish ID)