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QUALITY ASSURANCE PROJECT PLAN

CENTREDALE MANOR RESTORATION PROJECT SUPERFUND SITE BASELINE RISK ASSESSMENT, INITIAL PROJECT PLANNING, AND SUPPORT

Volume I of II

Tasks 19–22 QAPP

Field Sampling, Chemical, and Toxicity Testing

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1.0 TITLE AND APPROVAL PAGE (EPA WORKSHEET #1)

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Document Title: *Centredale Manor Tasks 19–22 Quality Assurance Project Plan*

Lead Organization (Agency, State, Tribe, Federal Facility, PRP, or Grantee): *Battelle Duxbury Operations*

Preparer's Name and Organizational Affiliation: *Deirdre Dahlen/Battelle Duxbury Operations*

Preparer's Address and Telephone Number: *397 Washington Street, Duxbury, MA 02332 (781) 934-5253*

Preparation Date (Day/Month/Year): *5/23/01*

Investigative Organization's Project Manager: Will Steinhauer May 23, 2001
Signature/Date
William Steinhauer/Battelle Duxbury Operations 5/23/01
Printed Name/Organization

Investigative Organization's Project QA Officer: Bonnie Bull for May 23, 2001
Signature/Date
Mark Guilmain/Battelle Duxbury Operations 5/23/01
Printed Name/Organization

Lead Organization's Project Manager: Will Steinhauer May 23, 2001
Signature/Date
William Steinhauer/Battelle Duxbury Operations 5/23/01
Printed Name/Organization

Approval Signature:
Signature/Date
Andy Beliveau/ QA Officer
Printed Name/Title
EPA Region 1
Approval Authority

Other Approval Signatures:
Signature/Date
Laureen Borochaner/USACE NAE Project Officer
Printed Name/Title

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GLOSSARY OF TERMS

Term	Definition	Term	Definition
Types of plans/documents		*Sampling Locations*	
FSP	Field sampling plan	APB	Allendale Pond Bottoms
QAPP	Quality assurance project plan (also referred to as sampling and analysis plan, SAP)	APC	Allendale Pond Channel
SOP	Standard Operating Procedure	CMW	Centredale Manor Wetlands
SOW	Statement of Work	DYP	Dyerville Pond
		GMP	Greystone Mill Pond
Field Terms		LPX	Lymansville Pond
ARF	Analytical request form	MAP	Manton Pond
CBR	Critical body residue	RAB	Assapumpsett Brook, Reference
COC	Chain of custody	RWT	Woonasquatucket River, Upstream Reach
DU	Field sample duplicate	WRC	Woonasquatucket River, Centredale Reach
FOL	Field operations leader	WRL	Woonasquatucket River, Lymansville Reach
GPS	Global positioning system	CMS	Centredale Manor Site
IBI	Index of Biotic Integrity		
IDW	Investigation derived waste	*Sample Types*	
RB	Rinsate blank	AE	American eel
WWTP	Waste Water Treatment Plant	BD	Bird tissue (*e.g.*, swallow)
VDS	Vapor diffusion sampler	CF	Crayfish
		FI	Fish

GLOSSARY OF TERMS (cont.)

Term	Definition	Term	Definition
Laboratories		FF	Fish fillet
AMS	Applied Marine Sciences, Inc.	FR	Frog
CBL	Chesapeake Bay Laboratory	LB	Largemouth bass
GLEC	Great Lakes Environmental Center	SE	Sediment
MSL	Battelle Marine Sciences Laboratory	SO	Soil
STL	Severn Trent Laboratories Baltimore	SW	Surface water
		TT	Turtle
Analytical Terms			
AVS	Acid volatile sulfides	MeHg	Methyl mercury
B2EHP	Bis (2-ethylhexyl) phthalate	MPC	Measurement performance criteria
CC	Continuing calibration	MS	Matrix spike
CCV	Continuing calibration verification	MSD	Matrix spike duplicate
COPC	Chemicals of potential concern	OPR	Ongoing precision and recovery
CVAA	Cold vapor atomic absorption	PAH	Polycyclic aromatic hydrocarbons
CVAF	Cold vapor atomic fluorescence	PCB	Polychlorinated biphenyls
DCM	Dichloromethane (also referred to as methylene chloride)	PB	Method/procedural blank
DOC	Dissolved organic carbon	PD	Percent difference
DUP	Laboratory (analytical) sample duplicate	QC	Quality control
ELS	Early life stage	QL	Quantitation limit
EML	Estimated minimum level	RIS	Recovery internal standard
EMDL	Estimated method detection limit	RPD	Relative percent difference
GC/ECD	Gas chromatography/electron capture detection	RRF	Relative response factor
GC/HRMS	Gas chromatography/high resolution mass spectrometry	RSD	Relative standard deviation
GC/MS	Gas chromatography/mass spectrometry	SEM	Simultaneously extracted metal
GFAA	Graphite furnace atomic absorption	SIS	Surrogate internal standard
GPC	Gel permeation chromatography	SRM	Standard reference material
HCX	1,2,4,5,7,8-hexachloroxanthene	SVOC	Semivolatile organic compound
Hg	Mercury	TCX	2,3,6,7-tetrachloroxanthene
HPLC	High performance liquid chromatography	TDN	Total dissolved nitrogen
IC	Initial calibration	TDP	Total dissolved phosphorus
ICP/AES	Inductively coupled plasma/atomic emission spectroscopy	TIC	Tentatively identified compound
ICP/MS	Inductively coupled plasma/mass spectrometry	TOC	Total organic carbon
ICV	Initial calibration verification	TN	Total nitrogen
ICS	Independent control standard	TP	Total phosphorus
LCS	Laboratory control sample	TSS	Total suspended solids
MDL	Method detection limits	VOC	Volatile organic compound

****

This is a Project-Specific Assurance Project Plan.

2.2 Documentation Control Format

Document control format follows Region I, EPA-New England Compendium of Quality Assurance Project Plan Guidance. The format of this QAPP includes a synopsis of QAPP elements followed by all required EPA-NE QAPP Worksheets provided in an Attachment (Attachment A). Other relevant documents/forms are included in Attachments B through G.

2.3 Document Control Numbering System

A document control numbering system is not required for smaller projects and will not be used for the Centredale Manor Tasks19–22 QAPP.

2.4 EPA-NE QAPP Worksheet #2

EPA-NE QAPP Worksheet #2 is included in Attachment A. This QAPP is intended to document field sampling, chemical and toxicological testing activities conducted under Tasks 19–22 of Delivery Order #59, *Centredale Manor Restoration Project Superfund Site Baseline Risk Assessment, Initial Project Planning and Support*. EPA-NE QAPP Worksheets #7, #23a, #23b, and #25 are not applicable to this QAPP and are circled (and bolded) on EPA-NE QAPP Worksheet #2 to indicate that these worksheet are not included in this QAPP.

Many of the EPA-NE QAPP worksheets are specifically designed to document analytical chemistry activities, rather than toxicity testing activities (*e.g.*, Worksheet #9b). As a result, pertinent details related to catfish early life stage (ELS) and bioassay testing methods and QC performance are provided in Attachments E and F, respectively.

3.0 DISTRIBUTION LIST AND PROJECT PERSONNEL SIGN-OFF SHEET

EPA-NE QAPP Worksheet #3 and #4 are included in Attachment A. Project personnel identified on EPA-NE QAPP Worksheet #4 are representative of trained staff at all participating laboratories. If the specified project personnel are not available to conduct project tasks at the time of sample receipt, then alternate staff with a similar level of training will be assigned to the project team. Alternate staff will receive a copy of the QAPP and complete the sign-off sheet.

4.0 PROJECT ORGANIZATION

4.1 Project Organizational Chart

The project organizational chart is shown in Figure 1 (EPA-NE QAPP Worksheet #5a, Attachment A).

4.2 Communication Pathways

Communication pathways are described in EPA-NE QAPP Worksheet #5b (Attachment A).

4.2.1 Modifications to Approved QAPP

Out of scope work will not be conducted without notification and approval (verbal/written) from USACE NAE. All deviations from protocols described in this QAPP will be documented and approved by the Project Manager and discussed in the final report. Notification and approval of modifications will adhere to the communication pathways described in EPA-NE QAPP Worksheet #5b (Attachment A)

4.3 Personnel Responsibilities and Qualifications

Personnel responsibilities and qualifications are described in EPA-NE QAPP Worksheet #6 (Attachment A). Personnel resumes for project personnel are included in Attachment B. Risk assessment activities are not discussed in this QAPP; instead risk assessment activities are discussed in the Final Work Plan (Harding ESE, 2001a).

4.4 Special Training Requirements/Certification

Not applicable.

5.0 PROJECT PLANNING/PROJECT DEFINITION

Case team members responsible for planning the project included Laureen Borochaner (USACE NAE), Cornell Rosiu (EPA Region I), Phil Cook (EPA, Duluth), Andy Beliveau (EPA Region I), Norm Richardson (Harding ESE), William Steinhauer, Donald Gunster, Deirdre Dahlen, Greg Durell, Jeffrey Ward, Heida Diefenderfer, and Susan Blanton.

5.1 Project Planning Meetings

Several formal project planning meetings were held related to catfish early life stage (ELS) testing and chemical analysis techniques. These meetings are documented in EPA-NE QAPP Worksheet #8a (Attachment A). Several informal meetings were held between case team members (*e.g.*, Project Manager, chemistry leaders) to discuss scheduling activities and availability of personnel to perform project tasks. These informal meetings are not itemized in EPA-NE QAPP Worksheet #8a.

5.2 Problem Definition/Site History and Background

Problem definition, site history and background are outlined in EPA-NE QAPP Worksheet #8b (Attachment A).

A synopsis of non-direct measurement data/information from all site reports is outside the scope of this QAPP. However, the baseline ecological risk assessment will include an evaluation of data from earlier investigations as described in Harding ESE (2001a).

6.0 PROJECT DESCRIPTION AND SCHEDULE

Battelle has been contracted by USACE NAE to provide field sampling, chemical and toxicity testing support to EPA-NE. Tissue, sediment, soil, and water samples will be collected in multiple sampling events between April and July, 2001. Samples will be analyzed for a wide suite of chemical parameters

including polychlorinated biphenyls (as Aroclors and congeners), chlorinated pesticides, semivolatile organic compounds, dioxins, furans, 1,2,4,5,7,8-hexachloroxanthene (HCX), 2,3,6,7-tetrachloroxanthene (TCX), metals, methyl mercury, acid volatile sulfide (AVS), simultaneously extracted metals (SEM), hardness, volatile organic compounds, grain size, total organic carbon, nutrients, moisture and lipid content. Catfish ELS testing and bioassay (*Hyllela, Chironomus*) testing are also planned.

Recommended detection limits (also referred to as Project Action Goals) used to support the human health biota consumption risk assessment and the baseline ecological risk assessment are provided in EPA-NE QAPP Worksheet #9b (Attachment A). These values are provided for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Note that there are still no applicable Project Action Goals for the following sediment/soil parameters: AVS/SEM, grain size, TOC, phenols, and phthalates.

Project Action Goals for most parameters (exceptions include hardness and nutrients) in surface water are also provided in EPA-NE QAPP Worksheet #9b (Attachment A). These goals are based on RIDEM ambient water quality criteria and guidelines. Although groundwater remediation is not an objective in this phase of the project, it must be noted that upper concentration levels (UCLs) for contaminants in groundwater are **not** groundwater standards and are not to be used as remedial action limits. Remedial clean-up goals for the groundwater at the site are the RIDEM GB groundwater objective levels.

A field report will be generated at the completion of the field sampling program and will document all field-sampling activities. Results from the chemical and toxicity testing will be submitted to USACE NAE and EPA-NE as letter data reports. In addition, one copy of each high-resolution mass spectrometry (HRMS) analytical data package (*i.e.*, dioxins/furans/HCX/TCX and PCB congeners) will be provided to EPA-NE for Tier III independent validation. One copy of all other analytical chemistry data packages (*i.e.*, PCB Aroclor/pesticides) will be submitted to an independent validator (Environmental Standards) for Tier II validation. A schedule of report and data package submissions is provided in EPA-NE QAPP Worksheet #10 (Attachment A).

6.1 Project Overview

An overview of the project is provided in EPA-NE QAPP Worksheets #9a, 9b, 9c and 9d (Attachment A).

6.2 Project Schedule

A tentative project schedule outlining project tasks and deliverables is provided in EPA-NE QAPP Worksheet #10 (Attachment A). The procedure for notifying project participants concerning project schedule delays is described in Section 4.2. The Battelle Duxbury laboratory holds weekly scheduling meetings to discuss and resolve resource and/or time constraints.

7.0 PROJECT QUALITY OBJECTIVES AND MEASUREMENT PERFORMANCE CRITERIA

7.1 Project Quality Objectives

Project quality objectives applicable to analytical chemistry activities are discussed in EPA-NE QAPP Worksheet #11a (Attachment A).

7.2 Measurement Performance Criteria

Measurement performance criteria (MPC) used to assess analytical chemistry data quality and project quality objectives are discussed EPA-NE QAPP Worksheet #11b (Attachment A). MPC used to assess ELS and bioassay testing are discussed in Attachments E and F, respectively. Oversight split sampling and analysis will not be performed for this project and is not discussed in this QAPP. While field-screening analyses for water quality parameters will be performed, comparability of field screening data generated on site and split sample confirmation data are not applicable to this study.

8.0 SAMPLING PROCESS DESIGN

Field sampling activities are discussed in detail in the Field Sampling Plan (Harding ESE, 2001b). With two exceptions, collection of all samples will be the responsibility of Harding ESE. Exceptions include:

- Fish samples in support of ELS testing collected by USACE NAE
- Tree swallow samples collected by USGS

Details concerning sampling design associated with USACE NAE and USGS collection activities are not documented in this QAPP.

8.1 Sampling Design

Sampling design and rational are discussed in EPA-NE QAPP Worksheet #12a and #12b (Attachment A).

9.0 SAMPLING PROCEDURES AND REQUIREMENTS

Field sampling procedures are discussed both in this QAPP and in the Field Sampling Plan (Harding ESE, 2001b). As noted above, collection of ELS fish and tree swallow samples is not the responsibility of Battelle or Harding ESE. As a result, sampling procedures and requirements applicable to these samples are not discussed in this QAPP.

9.1 Sampling Procedures

Standard operating procedures (SOPs) used to collect biological tissue, sediment, soil, and water samples are identified in EPA-NE QAPP Worksheet #13 (Attachment A); SOPs were provided with the Field Sampling Plan (FSP). Sample containers, volumes and preservation are identified in EPA-NE QAPP Worksheet #12b (Attachment A).

9.2 Sampling SOP Modifications

Modifications to sampling SOPs are not planned, however, if field conditions warrant modifications to meet project quality objectives, then the Field Operations Leader (FOL) will follow the communication pathways identified in EPA-NE QAPP Worksheet #5b (Attachment A) to receive approval prior to implementing any modifications.

9.3 Cleaning and Decontamination of Equipment/Sample Containers

Decontamination of all sampling equipment that comes in contact with biological tissue, sediment, soil, or water samples is discussed in EPA-NE QAPP Worksheet #12a (Attachment A).

9.4 Field Equipment Calibration

Field equipment calibration procedures are identified in EPA-NE QAPP Worksheet #14 (Attachment A).

9.5 Field Equipment Maintenance, Testing and Inspection Requirements

Maintenance, testing and inspection requirements of field equipment are identified in EPA-NE QAPP Worksheet #15 (Attachment A).

9.6 Inspection and Acceptance Requirements for Supplies/Sample Containers

Battelle will provide sample containers for sample collection. Sample containers used to store tissue (all tissue except fish and turtle), sediment, soil, and water samples for organic analysis will be pre-cleaned glass jars/bottles with Teflon-lined hard caps purchased from Environmental Sampling Supply (ESS). A Certificate of Compliance accompanies sample containers and certifies that sample containers are contaminant free (organics, metals). Fish samples will be wrapped in parchment or waxed paper and stored in plastic bags. Turtles will be stored in coolers. Sample containers for metals analysis in solid matrices will be pre-cleaned plastic containers and for water samples will be Teflon bottles supplied by Battelle Marine Sciences Laboratory. Severn Trent Laboratories (STL) will supply containers used for collecting water samples for VOA analyses; four 25-mL VOA vials will be provided for each sample. A VOA trip blank will be included to monitor sampling/transit contamination. Sample containers will be visually inspected to ensure that the containers are not compromised (*i.e.*, broken jar, cracked lid). Additional containers will be provided as contingency in case any of the containers are deemed unacceptable.

10.0 SAMPLE HANDLING, TRACKING AND CUSTODY REQUIREMENTS

Field sample handling, tracking, and custody procedures are discussed both in this QAPP and in the Field Sampling Plan (Harding ESE, 2001b).

10.1 Sample Collection Documentation

Upon completion of the field activities, Harding ESE will prepare a field report summarizing the field data collected during the survey and describing the field conditions encountered. A description of any problems encountered during the survey will also be included.

10.2 Sample Handling and Tracking System

10.2.1 Logbooks

Logbooks will be maintained throughout the field investigation. The site master log, field logbooks, and field equipment logbooks are briefly described below.

Site Master Log—The site master log is the primary field investigation document to be maintained by the FOL. Its primary purpose is to contain within one document the actual field data or references to other field documents that contain a specific description of every activity that has occurred in the field on any given day. Any administrative occurrences, conditions, or activities that have affected the fieldwork will also be recorded. A copy of these reports will be sent to the site managers at the conclusion of the field program. Daily Calibration Data Sheets will be filed as part of the Master Log.

Field Books—Each field team will maintain separate field books, as necessary, for documenting sampling and support activities. Field books will be sequentially numbered by the user and bound with a hard cover. All entries will be in permanent black ink with changes initialed and dated. In general, these books will contain specific details supporting the tasks performed by the person maintaining the field logbook. Information to be recorded in the field books or on supporting field data forms shall include, but not be limited to, the following:

- name and title of author, date and time of entry, and physical/ environmental conditions during the field activity;
- name and titles of field crew, including subcontractors;
- name and titles of site visitors, and time on and off site;
- documentation of health and safety activities;
- sampled media designation (*i.e.*, soil, groundwater);
- sample collection method (*i.e.*, grab or composite);
- number and volume of samples taken;
- description of sampling points;
- date and time of collection;
- sample identification numbers;
- references for maps and photographs of the sampling sites;
- field observations;
- field measurements made (*i.e.*, pH, temperature);

- decontamination procedures;
- instrument calibration; and
- weather conditions.

Field Equipment Notebook— The purpose of the field equipment notebook is to document the proper use, maintenance, and calibration of the field testing equipment. Equipment will be inspected and approved by the FOL before being used. A Calibration Data Sheet will be maintained daily for all monitoring instruments used on site; the bound data sheets will comprise the Field Equipment Notebook, which will be incorporated into the Master Log. Information recorded on the data sheets or on separate pages in the notebook will include, but will not be limited to, the following items:

- name and identifying number of the instrument;
- date calibrated;
- calibration points;
- name and title of the calibrator;
- instrument manufacturer;
- lot number;
- expiration date of calibration standards;
- results of the calibration;
- field maintenance; and
- problems encountered/resolution of problems.

10.2.2 Sample Documentation

Solid or liquid phase sample log sheets (Appendix G of the FSP) will be completed accordingly, for each sample collected. Information recorded will include sample identification, analytes, depth sampled, date and time collected, and other pertinent information. Biological sample logs (as provided in the appendices of the FSP) will also be completed. Analytical Request Forms (ARFs) and all analytical COC forms will be maintained in a file in the site trailer and copies will be sent to the site managers on a weekly basis when analytical samples are being shipped.

10.2.3 Sample Location Summary

Sample station locations will be surveyed using a Global Positioning system (GPS). All sample site locations will be referenced to the Rhode Island State Plane Coordinate System.

10.2.4 Sample Location Identification System

Each analytical sample collected from the study area will be assigned a unique sample location tracking number. Consistent with the Sampling and Analysis Plan (SAP) for the Woonasquatucket River Sediment Investigation (Tetra Tech NUS, 1999), the sample location tracking number will consist of a four- to five-segment, alpha-numeric code that identifies the area, sample medium, specific sample location identifier, sample event, sample depth or the quality control (QC) sample designation, if appropriate. Any other pertinent information regarding sample identification will be recorded in the field logbooks or on sample log sheets.

The alphanumeric coding to be used in the sample location numbering system is explained in the following diagram and the subsequent definitions:

AAA – AA – NNNN – NNN – NN

Where "A" represents an alpha character and "N" represents a numeric character.

1. The three alpha character group identifies the area investigated (*e.g.*, "CMS" for Centredale Manor Site). The character groups for the reaches of the river within the boundaries of the site and the upstream and reference areas are provided below:

River Stations

WRC	–	Woonasquatucket River, Centredale Reach
CMW	–	Centredale Manor Wetlands
APC	–	Allendale Pond Channel
APB	–	Allendale Pond Bottoms
WRL	–	Woonasquatucket River, Lymansville Reach
LPX	–	Lymansville Pond
MAP	–	Manton Pond
DYP	–	Dyerville Pond

Reference/Upstream Stations

RWR	–	Woonasquatucket River, Upstream Reach
GMP	–	Greystone Mill Pond
RAB	–	Assapumpsett Brook, Reference

2. The two alpha character group identifies the matrix sampled as follows:

FP	–	Floodplain Soil/Sediment
SD	–	Aquatic Sediment/Soil
SW	–	Surface Water
CF	–	Crayfish
EW	–	Earthworm
EI	–	Emerging Insects

In addition, a two character alpha group will be established for each of the biota species selected for tissue analysis following initial characterization of the fish fauna and review of consumption patterns (see Section 2.2.2 of the FSP). Target species (with alpha group designation in parentheses) include American eel ("AE"), largemouth bass ("LB"), and turtle ("TT") or frog ("FR"). A unique group designation will be established for any alternate species that is selected.

3. A four numeric character group describing a unique location number identified sequentially. Data collected within site boundaries will use a "4000" series. The "5000" series will be used for upstream and reference areas.

4. A four-digit group stating the depth of the sample collected in feet. As discussed in Section 2.4, sediment samples, collected to support the evaluation of uptake to crayfish tissue, will be collected from 0 – 0.3 feet and sediment samples collected for the laboratory bioassay will be collected from 0 – 0.5 feet.

5. A two digit round number for that station number representing replication – "01" for the first sample collected from that location, and "02" for the second sample collected from that location, etc. For example, the sample identifier, LPX-CF-4001-0003-01 represents a crayfish sample collected from Lymansville Pond at location 4001, collected between 0 and 0.3 feet, and it was the first crayfish sample collected at that location.

QC Samples

1. A three alpha character group identifying the area investigated (see above).

2. A two alpha character group will be used to identify QC samples as identified below. This two character group will replace the character group used to identifying the matrix in the primary sample:

   DU = Duplicate
   RB = Rinsate Blank

3. A six numeric character group describing the date of sample collection (MM/DD/YY) and a letter in sequence (A being the first collected that day, B being the second, etc.). For example, WRL-DU-061501A represents the first duplicate sample collected on June 15, 2001.

10.3 Laboratory Sample Custody

Each laboratory is responsible for the custody of samples, and, therefore, the sample tracking and integrity. Custody of samples is assured by following SOPs, which are defined in EPA-NE QAPP Worksheet #20 (Attachment A). In general, highlights of the procedures include:

- Trained laboratory sample custodians are designated at each analytical laboratory.
- Upon receipt, samples are inspected to verify that (1) integrity is intact (containers are sealed and intact), (2) the sample label and custody forms agree, (3) all shipped samples have been received, and (4) holding temperatures were maintained.
- Sample receipt and the receipt conditions are documented, as are any discrepancies, which are also communicated to the Project Manager immediately.
- Custody forms are signed by the sample custodian and samples are logged into a formal sample receipt system to provide a permanent laboratory record and laboratory sample IDs are assigned.
- Solid matrix samples are stored frozen (–20 °C) in a limited access area; water samples are stored refrigerated (4 ±2 °C) in a limited access area. Water samples for metals are preserved and stored at room temperature in a limited access area.
- Sample receipt and holding times are communicated to the laboratory manager who adds the samples to the laboratory schedule.
- The sample custodian retains custody of the samples until they are transferred from the holding location to the laboratory for analysis. The relinquishing of samples by the custodian and the receipt of sample by the analyst are documented.
- Internal laboratory documentation tracks sample custody location and storage conditions throughout processing and analysis.
- Sample archival and disposal are documented according to SOPs.

11.0 FIELD ANALYTICAL METHOD REQUIREMENTS

Field measurements of water quality parameters (pH, specific conductivity, temperature, redox potential, dissolved oxygen, and turbidity) are described in EPA-NE QAPP Worksheets #17, #18, and #19 (Attachment A). There are no applicable quality control samples associated with the field screening analyses.

12.0 FIXED LABORATORY ANALYTICAL METHOD REQUIREMENTS

12.1 Fixed Laboratory Analytical Methods and SOPs

Analytical methods and SOPs used to analyze environmental samples for required parameters are defined in EPA-NE QAPP Worksheet #20 (Attachment A). Copies of relevant fixed laboratory SOPs are provided in Attachment G (note that sampling SOPs were provided with the FSP.

12.2 Fixed Laboratory Analytical Method/SOP Modifications

Pertinent laboratory SOPs are defined in EPA-NE QAPP Worksheet #20 (Attachment A). One of the SOPs defined in EPA-NE QAPP Worksheet #20 is a draft SOP (Battelle Columbus SOP ASAT.II-009) and will be resubmitted once it has been finalized. Modifications to one of the laboratory SOPs (Battelle Columbus SOP ASAT.II-002-02) is planned; modifications are discussed in EPA-NE QAPP Worksheet #9a. Should additional modifications become necessary to meet project quality objectives (PQOs), then the notification, approval and documentation process will follow methods described in Section 4.2.

12.3 Fixed Laboratory Instrument Calibration

Instrument maintenance and calibration information is provided in EPA-NE QAPP Worksheet #21 (Attachment A).

12.4 Fixed Laboratory Instrument/Equipment Maintenance, Testing and Inspection Requirements

Instrument maintenance, testing and inspection requirements are detailed in EPA-NE QAPP Worksheet #21 (Attachment A).

12.5 Fixed Laboratory Inspection and Acceptance Requirements for Supplies

At Battelle Duxbury, the Laboratory Manager or his/her designee is responsible for tracking laboratory supplies to ensure that sufficient quantities are available to meet project/laboratory needs. Supplies used in the preparation of samples, and which may contribute to common laboratory contamination, are checked and approved by the Laboratory Manager prior to use. Reagent/Receipt logbooks are maintained by the laboratory and document inspection and acceptance of laboratory supplies.

13.0 QUALITY CONTROL REQUIREMENTS

13.1 Sampling Quality Control

The following types of field QC samples will be collected:

- All parameters – 1 field duplicate with every 20 sediment, surface water, and floodplain soil samples collected;
- All parameters – A total of 2 additional water samples from a "clean" site (*e.g.*, reference location) will be collected for use in preparation of fixed laboratory matrix spike and matrix spike duplicate QC samples;
- Selected parameters – 1 equipment rinsate blank with every 20 sediment, surface water, and floodplain soil samples collected (parameters include PCB Aroclor/pesticides, SVOCs (PAHs, phenols, phthalates), metals, VOCs, and nutrients);
- VOC – 1 trip blank for surface waters; and
- VOC – 4 25-mL VOC vials will be collected for each distinct VOC water sample.

Details regarding field QC sample collection and measurement performance criteria (MPC) are provided in EPA-NE Worksheets #22a and #22b (Attachment A).

13.2 Analytical Quality Control

A routine set of QC samples will be analyzed for each analytical parameter to monitor and measure data quality against a set of project quality objectives.

13.2.1 Field Analytical QC

Field measurements of water quality parameters (pH, specific conductivity, temperature, redox potential, dissolved oxygen, and turbidity) will be performed. However, there are no applicable QC samples associated with the field screening analyses and EPA-NE QAPP Worksheets #23a and #23b are not applicable.

13.2.2 Fixed Laboratory QC

Fixed laboratory QC is identified for each analytical parameter in EPA-NE QAPP Worksheet#24a and #24b (Attachment A).

14.0 DATA ACQUISITION REQUIREMENTS

This QAPP is intended to discuss activities associated with field sampling and chemical and toxicity testing only. It is outside the scope of this QAPP to perform an evaluation of historical data and other background information. Consequently EPA-NE QAPP Worksheet #25 will not be completed or included in the QAPP. However, the risk assessment conducted by Harding ESE will include an evaluation of data from earlier investigations and data evaluation procedures are described in Harding (2001a).

15.0 DOCUMENTATION, RECORDS AND DATA MANAGEMENT

Documentation will conform to Battelle SOP 6-017 (*e.g.*, all original data are recorded in ink, corrections are made by placing a single line through the incorrect entry with a date, initials, and explanation). Data acquisition and reduction procedures, as well as the formulas applied to produce final data, are detailed in the SOPs cited in EPA-NE QAPP Worksheet #20 (Attachment A). Statistical evaluations will be performed on all quality control samples. Equations for calculating quality control statistical evaluations are provided in EPA-NE QAPP Worksheet #30 (Attachment A). Data are reported as spreadsheet tables following standard reporting formats.

15.1 Project Documentation Records

Project documentation records are identified in EPA-NE QAPP Worksheet #26 (Attachment A).

15.2 Field Analysis Data Package Deliverables

The field report will include results from field screening analyses and will document all field activities. The field report will be submitted at the completion of the field survey.

15.3 Fixed Laboratory Data Package Deliverables

The contents of each analytical chemistry data package are described in EPA-NE QAPP Worksheet #9a (Attachment A). Contents of ELS and bioassay testing data packages/reports are discussed in Attachments E and F, respectively. Final deliverables will include letter data reports and one copy of each full analytical data package.

Letter data reports will include summary report tables (validated data) and QA/QC narratives. The QA/QC narratives provide a discussion of the quality control results and a description of any MPC exceedences including the impact, if any, they have on the overall data.

Analytical data packages will include raw data (see Attachment C) that will be used for third party validation. Each HRMS analytical data package will receive Tier III validation by EPA-NE. All other analytical chemistry data packages will receive Tier II validation by an independent validator (Environmental Standards).

The schedule for these deliverables is outlined in EPA-NE QAPP Worksheet #10 (Attachment A).

15.4 Data Reporting Formats

Chemistry results are reported as spreadsheet tables following standard reporting formats. The final verified data will include summary Excel tables in hardcopy format for all field and QC data. Data reporting format and content is discussed in detail in EPA-NE QAPP Worksheet #9a (Attachment A).

15.5 Data Handling and Management

Upon receipt of samples at Battelle, samples are logged into the tracking system and assigned unique identifications (IDs). A copy of the sample custody log-in information is provided to the Project Manager and Task Leader(s). The laboratory QAPP is prepared, distributed to the project team, and a kick-off meeting held to review project tasks, deliverables and schedules. The Sample Preparation chemist

prepares the samples in the laboratory for organic analysis and assigns each batch of samples with a unique batch ID. Sample preparation information pertaining to sample IDs and weights are either recorded manually or stored in electronic spreadsheets located on the Battelle network and are electronically accessible to the analysts. Data handling and management procedures related to data acquisition and reduction are further described in EPA-NE QAPP Worksheet #9a (Attachment A).

15.6 Data Tracking and Control

Data acquired from Battelle's GC/ECD, GC/MS, GC/HRMS, GFAA, CVAA, and CVAF systems are backed up minimally each month, and the data operating systems provide a software package for quick and easy data retrieval. Data acquired from Battelle's ICP/MS and ICP/AES systems are backed up minimally each day, and the data is saved in electronic format for quick and easy data retrieval.

Battelle Duxbury final excel tables are named according to the sample matrix, batch ID and analysis parameter. For example, PAH data for tissue batch 00-001 would be named "t00-001ms.xls". Battelle Columbus final excel tables are named according to the HRMS analysis date. For example, PCB data analyzed on 03/30/01 would be named "033001.xls". A copy of the final Excel file(s) is electronically transferred to the Project Manager for the project files. The GC/MS and GC/HRMS analyst also archive a copy of the final files in the GC facility.

Battelle MSL Excel files are named according to the analysis date and instrument. For example, metals data analyzed on the ICP/MS 5000A on April 2, 2001 would be named 040201-5000A. A hard copy of all data is filed in a central location at the MSL under the central file number issued when samples arrive onsite.

Each participating laboratory is responsible for producing electronic (Excel format) tables which meet the same standard as Battelle's data tracking and control.

16.0 ASSESSMENTS AND RESPONSE ACTIONS

Each participating laboratory is responsible for performing a QA audit on the analytical data to ensure adherence to project quality objectives and the QAPP. Assessment and response actions are documented in EPA-NE QAPP Worksheet #27a and #27b (Attachment A).

16.1 Planned Assessments

Planned assessments are documented in EPA-NE QAPP Worksheet #27c (Attachment A)

16.2 Assessment Findings and Corrective Action Responses

Participating laboratories are responsible for reporting results of QA audits to the appropriate analytical Task Leader, Laboratory Manager, and/or the Laboratory Project Manager (EPA-NE QAPP Worksheet #27b, Attachment A). Each laboratory is responsible for ensuring that audit reports are responded to and appropriate corrective action implemented and documented in the project file, and approved by management. Audit reports at Battelle will define any errors, deficiencies, or deviations from the QAPP. The responsible analyst documents the corrective action on the audit report and submits the audit report to the Project Manager for review and approval. Battelle audit reports are available for review at the respective facility.

16.3 Additional QAPP Non-Conformances

Project personnel are responsible for documenting corrective action procedures taken outside of the formal QA audit. Documentation is maintained in the analytical data packages and communicated to the Project Manager for approval.

17.0 QA MANAGEMENT REPORTS

Participating laboratories are responsible for reporting QA findings to Management. The project personnel responsible for reviewing and approving audit reports are outlined in EPA-NE QAPP Worksheet #28 (Attachment A). Reporting of QA findings to Management at Battelle Duxbury will follow internal laboratory SOPs, that encompass copying Management on QA audit findings and communicating the status of each project and any programmatic issues to the Duxbury Operations Manager during Quarterly briefings.

18.0 VERIFICATION AND VALIDATION REQUIREMENTS

Data validation described in this QAPP describes what Battelle and the other participating laboratories will perform internally. One copy of each HRMS data package (*e.g.*, dioxins/furans/HCX) will also be submitted to EPA-NE for Tier III validation. One copy of all other analytical data packages (*e.g.*, PCB Aroclor/pesticides) will be submitted to an independent validator (Environmental Standards) for Tier II validation.

Participating laboratories are responsible for internal verification and validation of data packages. Verification and validation requirements at Battelle will follow internal laboratory SOPs and will encompass the verification and validation steps described in detail in EPA-NE QAPP Worksheet #9a (Attachment A). Participating laboratories will provide a statement of quality assurance to Battelle Duxbury verifying that the analytical data have been internally verified and validated.

19.0 VERIFICATION AND VALIDATION PROCEDURES

Participating laboratories follow established procedures to ensure data quality and are responsible for internal data verification and validation, as described in EPA-NE QAPP Worksheets #29a, b and c (Attachment A). Internal data verification and validation procedures at Battelle will follow laboratory SOPs and are the responsibility of those immediately responsible for overseeing and/or performing analyses, data entry, data reduction, and data reporting. Data validation and review procedures conducted at Battelle follow SOPs 6-027 (Battelle Duxbury), ASAT.II-003 and ASAT.II-010 (Battelle Columbus), and MSL-Q-005 (Battelle MSL). An example of a data validation checklist used at Battelle Duxbury is provided in Attachment D. A series of reviews by technical personnel will be implemented to ensure that the data generated for this work assignment meet the data quality objectives. These reviews are further described in EPA-NE QAPP Worksheet #9a (Attachment A).

20.0 DATA USABILITY/RECONCILIATION WITH PROJECT QUALITY OBJECTIVES

Data usability assessment activities are documented in EPA-NE QAPP Worksheets #9a and #30 (Attachment A). Note that data usability will be performed by Harding ESE after the data have been validated. Details concerning data usability procedures will be discussed in Harding's Data Management Plan.

21.0 REFERENCES

Harding ESE. 2001a. Final Work Plan for the Human Health and Ecological Risk Assessment for the Centredale Manor Restoration Project Superfund Site. March 15, 2001.

Harding ESE. 2001b. Draft Field Sampling Plan for the Human Health and Ecological Risk Assessment for the Centredale Manor Restoration Project Superfund Site. April 6, 2001.

Tetra Tech NUS. 1999. Sampling and Analysis Plan Woonasquatucket River Sediment Investigation, Centredale Manor Site; Prepared for United States Environmental Protection Agency; Response Action Contract (RAC), Region I; EPA Contract No. 68-W6-0045.

ATTACHMENT A

EPA-NE QAPP Worksheets

EPA-NE QAPP Worksheet #2

Site Name/Project Name: Centredale Manor
Site Location: Greystone Mill Pond, Assapumpsett Brook, Allendale Reach, Lymansville Reach, Dyerville Reach, and Woonasquatucket River, North Providence, Rhode Island
Site Number/Code: 016P
Operable Unit:
Contractor Name: Battelle Duxbury Operations
Contractor Number: DACW33-96-D-0005
Contract Title: Centredale Manor Restoration Project Superfund Site Baseline Risk Assessment, Initial Project Planning and Support
Work Assignment Number: Delivery Order #59
Anticipated date of QAPP Implementation: April 2000

1. Identify Guidance used to prepare QAPP: *Region I, EPA-NE Compendium QAPP Guidance, Draft Final September 1998*

2. Identify EPA Program: *Superfund*

3. Identify approval entity: *EPA-NE or State: U.S. Army Corps of Engineers, New England Division and EPA-NE* or other entity:

4. Indicate whether the QAPP is a generic program QAPP or a project-specific QAPP. (underline one)

5. List dates of scoping meetings that were held: December 15, 2000; December 19, 2000; February 28, 2001; March 13, 2001; March 19, 2001; March 20, 2001; and March 26, 2001

6. List title of QAPP documents and approval dates written for previous site work, if applicable:

Title	Approval Date
Sampling and Analysis Plan Woonasquatucket River Sediment Investigation, Centredale Manor Site, North Providence, Rhode Island. (prepared by Tetra Tech NUS, Inc.)	September 1999
Task 15 QAPP, Centredale Manor Restoration Project Superfund Site Baseline Risk Assessment, Initial Project Planning and Support (prepared by Battelle Duxbury Operations)	November 2000

7. List organizational partners (stakeholders) and connection with EPA and/or State:

U.S. Army Corps of Engineers, New England District

EPA Region I

State of Rhode Island

8. List data users:

U.S. Army Corps of Engineers, New England District

EPA Region I

9. If any required QAPP Elements (1-20), Worksheets and/or Required Information are not applicable the project, then circle the omitted QAPP Elements, Worksheets and Required Information on the attached Table. Provide an explanation for their exclusion below:

EPA-NE QAPP Worksheet #7 - No special training required
EPA-NE QAPP Worksheet #23a and #23b – No applicable QC samples associated with field screening analyses
EPA-NE QAPP Worksheet #25 -.Evaluation of historical data for usability described in Harding (2001a)

EPA-NE QAPP Worksheet # 2a

Bold QAPP Elements, Worksheets and/or Required Information that are not applicable to the project and provide an explanation on EPA-NE QAPP Worksheet #2, Item 9.

REQUIRED EPA QA/R-5 QAPP ELEMENTS	REQUIRED EPA-NE QAPP ELEMENTS and CORRESPONDING EPA-NE QAPP SECTIONS		EPA-NE QAPP Worksheet #	REQUIRED INFORMATION
Project Management and Objectives				
A1	1.0	Title and Approval Page	1	- Title and Approval Page
A2	2.0 2.1 2.2 2.3 2.4	Table of Contents and Document Format Table of Contents Document Control Format Document Control Numbering System EPA-NE QAPP Worksheet #2	2	- Table of Contents - EPA-NE QAPP Worksheet
A3	3.0	Distribution List and Project Personnel Sign-off Sheet	3 4	- Distribution List - Project Personnel Sign-off Sheet
A4, A8	4.0 4.1 4.2 4.2.1 4.3 4.4	Project Organization Project Organizational Chart Communication Pathways Modifications to Approved QAPP Personnel Responsibilities and Qualifications Special Training Requirements/ Certification	5a 5b 6 7	- Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - **Special Personnel Training Requirements Table**
A5	5.0 5.1 5.2	Project Planning/Project Definition Project Planning Meetings Problem Definition/Site History and Background	8a 8b	- Project Scoping Meeting Attendance Sheet with Agenda and other Project Planning Meeting Documentation - Problem Definition/Site History and Background - EPA-NE DQO Summary Form - Site Maps (historical and present)
A6	6.0 6.1 6.2	Project Description and Schedule Project Overview Project Schedule	9a 9b 9c 9d 10	- Project Description - Contaminants of Concern and Other Target Analytes Table - Field and Quality Control Sample Summary Table - Analytical Services Table - System Designs - Project Schedule Timeline Table
A7	7.0 7.1 7.2	Project Quality Objectives and Measurement Performance Criteria Project Quality Objectives Measurement Performance Criteria	11a 11b	- Project Quality Objectives/Decision Statements - Measurement Performance Criteria Table

EPA-NE QAPP Worksheet # 2a (continued)

REQUIRED EPA QA/R-5 QAPP ELEMENTS	REQUIRED EPA-NE QAPP ELEMENTS and CORRESPONDING EPA-NE QAPP SECTIONS	EPA-NE QAPP Worksheet #	REQUIRED INFORMATION
	Measurement/Data Acquisition		
B1	8.0 Sampling Process Design 8.1 Sampling Design Rationale	12a 12b	- Sampling Design and Rationale - Sampling Locations, Sampling and Analysis Method/SOP Requirements Table - Sample Location Map
B2, B6, B7, B8	9.0 Sampling Procedures and Requirements 9.1 Sampling Procedures 9.2 Sampling SOP Modifications 9.3 Cleaning and Decontamination of Equipment/Sample Containers 9.4 Field Equipment Calibration 9.5 Field Equipment Maintenance, Testing and Inspection Requirements 9.6 Inspection and Acceptance Requirements for Supplies/Sample Containers	13 12b 14 15	- Sampling SOPs Project Sampling SOP Reference Table - Sampling Container, Volumes and Preservation Table - Field Sampling Equipment Calibration Table Cleaning and Decontamination SOPs - Field Equipment Maintenance, Testing and Inspection Table
B3	10.0 Sample Handling, Tracking and Custody Requirements 10.1 Sample Collection Documentation 10.1.1 Field Notes 10.1.2 Field Documentation Management System 10.2 Sample Handling and Tracking System 10.3 Sample Custody	16	- Sample Handling, Tracking and Custody SOPs - Sample Handling Flow Diagram - Sample Container Label (Sample Tag) - Chain-of-Custody Form and Seal
B4, B6, B7, B8	11.0 Field Analytical Method Requirements 11.1 Field Analytical Methods and SOPs 11.2 Field Analytical Method/SOP Modifications 11.3 Field Analytical Instrument Calibration 11.4 Field Analytical Instrument/ Equipment Maintenance, Testing and Inspection Requirements 11.5 Field Analytical Inspection and Acceptance Requirements for Supplies	17 18 19	- Field Analytical Methods/SOPs - Field Analytical Method/SOP Reference Table - Field Analytical Instrument Calibration Table - Field Analytical Instrument/Equipment Maintenance, Testing and Inspection Table

EPA-NE QAPP Worksheet # 2a (continued)

REQUIRED EPA QA/R-5 QAPP ELEMENTS	REQUIRED EPA-NE QAPP ELEMENTS and CORRESPONDING EPA-NE QAPP SECTIONS		EPA-NE QAPP Worksheet #	REQUIRED INFORMATION
B4, B6, B7, B8	12.0 12.1 12.2 12.3 12.4 12.5	Fixed Laboratory Analytical Method Requirements Fixed Laboratory Analytical Methods and SOPs Fixed Laboratory Analytical Method/SOP Modifications Fixed Laboratory Instrument Calibration Fixed Laboratory Instrument/ Equipment Maintenance, Testing and Inspection Requirements Fixed Laboratory Inspection and Acceptance Requirements for Supplies	20 21	- Fixed Laboratory Analytical Methods/SOPs - Fixed Laboratory Analytical Method/SOP Reference Table - Fixed Laboratory Instrument Maintenance and Calibration Table
B5	13.0 13.1 13.2 13.2.1 13.2.2	Quality Control Requirements Sampling Quality Control Analytical Quality Control Field Analytical QC Fixed Laboratory QC	22a 22b 23a 23b 24a 24b	**Sampling** - Field Sampling QC Table - Field Sampling QC Table cont. **Analytical** - **Field Analytical QC Sample Table** - **Field Analytical QC Sample Table cont.** - **Field Screening/Confirmatory Analysis Decision Tree** - Fixed Laboratory Analytical QC Sample Table - Fixed Laboratory Analytical QC Sample Table cont.
B9	14.0	Data Acquisition Requirements	**25**	- **Non-Direct Measurements Criteria and Limitations Table**
A9, B10	15.0 15.1 15.2 15.3 15.4 15.5 15.6	Documentation, Records and Data Management Project Documentation and Records Field Analysis Data Packa Deliverables Fixed Laboratory Data Package Deliverables Data Reporting Formats Data Handling and Management Data Tracking and Control	26	- Project Documentation and Records Table - Data Management SOPs
Assessment/Oversight				
C1	16.0 16.1 16.2 16.3	Assessments and Response Actions Planned Assessments Assessment Findings and Corrective Action Responses Additional QAPP Non-Conformances	27a 27b 27c	- Assessment and Response Actions - Project Assessment Table - Project Assessment Plan - Audit Checklists
C2	17.0	QA Management Reports	28	- QA Management Reports Table

EPA-NE QAPP Worksheet # 2a (continued)

REQUIRED EPA QA/R-5 QAPP ELEMENTS	REQUIRED EPA-NE QAPP ELEMENTS and CORRESPONDING EPA-NE QAPP SECTIONS	EPA-NE QAPP Worksheet #	REQUIRED INFORMATION
Data Validation and Usability			
D1	18.0 Verification and Validation Requirements		- Validation Criteria Documents *
D2	19.0 Verification and Validation Procedures	29a 29b 29c	- Data Evaluation Process - Data Validation Summary Table - Data Validation Modifications
D3	20.0 Data Usability/Reconciliation with Project Quality Objectives	30	- Data Usability Assessment

* Include Data Validation Criteria Document as an attachment to the QAPP if Region I, EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses will not be used for validating project data.

Note: Required project-specific information should be provided in tabular format, as much as practicable. However, sufficient written discussion in text format should accompany these tables. Certain sections, by their nature, will require more written discussion than others. In particular, Section 8.0 should provide an in-depth explanation of the sampling design rationale and Sections 18-20 should describe the procedures and criteria that will be used to verify, validate and assess data usability.

EPA-NE QAPP Worksheet #3 - Rev. 10/99

Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Document Control Number
Laureen Borochaner	Project Manager	U.S. Army Corps of Engineers, New England District	978-318-8802	NA
Mark Otis	Acting Chief, Engineering/Planning Division	U.S. Army Corps of Engineers, New England District	978-318-8500	NA
Anna Krasko	Remedial Project Manager	EPA Region I	617-918-1232	NA
Cornell Rosiu	Work Assignment Manager	EPA Region I	617-918-1345	NA
Andy Beliveau	QA Officer	EPA Region I	781-860-4607	NA
Karen Foster	Program Manager	Battelle Duxbury	781-952-5370	NA
William Steinhauer	Project Manager	Battelle Duxbury	781-952-5319	NA
Rosanna Buhl	Program QA Manager	Battelle Duxbury	781-952-5309	NA
Mark Guilmain	Project QA Coordinator	Battelle Duxbury	781-952-5316	NA
Deirdre Dahlen	Task 22 Sample Analysis Task Leader	Battelle Duxbury	781-952-5253	NA
Karen Tracy	Dioxin/Furan/HCX/TCX and PCB Congener Task Leader	Battelle Columbus	614-424-4028	NA
Charles D. Lawrie	QA Officer	Battelle Columbus	614-424-3932	NA
Linda Bingler	Metals, AVS/SEM, MeHg, and Hardness Task Leader	Battelle Marine Sciences Laboratory (MSL)	360-681-3627	NA
Heida Diefenderfer	ELS Testing Task Leader	Battelle MSL	360-681-3619	NA
Deborah Coffey	QA Officer	Battelle MSL	360-681-3645	NA
Sarah Shaw	Project Manager	Harding ESE	781-245-6606	NA
Ken Davis	Grain Size and TOC Task Leader	Applied Marine Sciences, Inc.	281-554-7272	NA
Chuck Davis	QA Manager	Applied Marine Sciences, Inc.	281-554-7272	NA
Tara Martz	Laboratory Project Manager (SVOC – Phenol/Phthalate, VOC, BOD Analyses)	Severn Trent Laboratories (STL) Baltimore	410-771-4920	NA
Mimi Uhlfelder	QA Manager	Severn Trent Laboratories Baltimore	410-771-4920	NA
Carl Zimmermann	Senior Faculty Research Assistant (SFRA)	University of Maryland Center for Environmental Science Chesapeake Biological Laboratory (CBL)	410-326-7252	NA
Dennis McCauley	Bioassay Testing Task Leader	Great Lakes Environmental Center (GLEC)	231-941-2230	NA
Robin Silva-Wilkinson	QA Officer/Coordinator	GLEC	231-941-2230	NA

EPA-NE QAPP Worksheet #4 - Rev. 10/99

Project Personnel Sign-Off Sheet

Organization: Battelle Duxbury

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Karen Foster	Program Manager	781-952-5370			
William Steinhauer	Project Manager	781-952-5319			
Rosanna Buhl	Program QA Manager	781-952-5309			
Mark Guilmain	Project QA Coordinator	781-952-5316			
Deirdre Dahlen	Task 22 Sample Analysis Task Leader	781-952-5253			
Robert Lizotte	Laboratory Manager	781-952-5235			
James Hatch	Laboratory Sample Custodian	781-952-5270			
Roxanne Brackett	Sample Preparation Chemist	781-952-5241			
Dan Bardon	SVOC (PAHs) Task Leader/ GC/MS Analyst	781-952-5251			
Jonathan Thorn	Chlorinated Pesticide /PCB Aroclors Task Leader/ GC/ECD Analyst	781-952-5271			

Organization: Battelle Columbus

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Karen Tracy	Dioxin/Furan/HCX/TCX and PCB Congener Task Leader	614-424-4028			
Charles D. Lawrie	QA Officer	614-424-3932			
Mary E. Schrock	Laboratory Manager	614-424-4976			
Mark F. Misita	Sample Preparation Chemist	614-424-7884			
Henry H. Pham	Sample Preparation Chemist and Sample Custodian	614-424-7849			
Susan Winnard	Sample Preparation Chemist	614-424-4365			
Wesley H. Baxter	Sample Preparation Chemist	614-424-7849			
Joseph E. Tabor	GC/HRMS Analyst	614-424-5130			

EPA-NE QAPP Worksheet #4 (continued)- Rev. 10/99

Project Personnel Sign-Off Sheet

Organization: Battelle Marine Sciences Laboratory (MSL)

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Linda Bingler	Metals, MeHg, AVS/SEM, and Hardness Task Leader	360-681-3627			
Deborah Coffey	QA Officer	360-681-3645			
Carolynn Suslick	Sample Custodian	360-681-3624			
Chuck Apts	Sample Preparation and ICP/MS Analyst	360-681-3625			
Jordana Wood	Sample Preparation; ICP/AES, GFAA, and FIAS Analyst	360-681-3622			
Mary Ann Deuth	Sample Preparation and CVAA and CVAF Analyst	360-681-4572			
Tim Fortman	AVS Analyst	360-681-3621			
Heida Diefenderfer	Catfish ELS Testing Task Leader	360-681-3619			
Blythe Barbo	Editor	360-681-3667			
Susan Blanton	Catfish ELS Laboratory Manager	360-681-3615			
Rhonda Karls	Science and Engineering Associate	360-681-3659			
Irv Schultz	Senior Toxicologist	509-376-5031			
Ann Skillman	Senior Research Scientist	360-681-3649			
Jeffrey Ward	Senior Toxicologist	360-681-3669			

Organization: Harding ESE

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Sarah Shah	Project Manager	781-245-6606			
Norman Richardson	Technical Task Lead, Ecological Risk Assessment	781-245-6606			
Pamela Wasel	Technical Task Lead, Biota Consumption Risk Assessment	781-245-6606			
Charles Lyman	Field Operations Leader and Site Safety Officer	781-245-6606			

EPA-NE QAPP Worksheet #4 (continued)- Rev. 10/99

Project Personnel Sign-Off Sheet

Organization: Applied Marine Sciences, Inc.

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Ken Davis	Grain Size and TOC Task Leader; Sample Custodian	281-554-7272			
Chuck Davis	QC Manager	281-554-7272			
Mike Seymour	Analyst	281-554-7272			

Organization: Severn Trent Laboratories (STL) Baltimore

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Tara Martz	Laboratory Project Manager	410-771-4920			
Mimi Uhlfelder	Laboratory QA Manager	410-771-4920			
Mary Asper	Sample Receiving Group Leader	410-771-4920			
Craig Schenning	Organics Manager	410-771-4920			
Michael Sekel	Laboratory Manager	410-771-4920			
Jonathan Haupt	Sample Preparation Chemist	410-771-4920			
Amanda Schenning	GC/MS SVOC (Phenols/Phthalates) Analyst	410-771-4920			
Naomi Howard	GC VOA Analyst	410-771-4920			
Michelle MacKaney	BOD Analyst	410-771-4920			

EPA-NE QAPP Worksheet #4 (continued)- Rev. 10/99

Project Personnel Sign-Off Sheet

Organization: Chesapeake Biological Laboratory (CBL)

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Carl Zimmermann	Senior Faculty Research Assistant (SFRA); Nutrients Task Leader	410-326-7252			
Nancy Kaumeyer	Sample Preparation/Analyst DOC/TOC	Contact Carl Zimmermann			
Cheryl Clark	Sample Preparation/Analyst TSS				
Kim Blodnikar	Sample Preparation/Analyst TN/TP and TDN/TDP				
Carolyn Keefe	Sample Preparation/Analyst Nitrite+Nitrate and Phosphate				
Kathryn Wood	Sample Preparation/Analyst Ammonium and Nitrite				

Organization: Great Lakes Environmental Center (GLEC)

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Dennis McCauley	Bioassay Testing Task Leader	231-941-2230			
Robin Silva-Wilkinson	QA Officer/Coordinator	231/941-2230			
Pam Smith	Laboratory Coordinator/Sample Custodian	231/941-2230			
Jim Sticko	Toxicity Test Task Leader	231/941-2230			
Mailee Woods	Laboratory Technician	231/941-2230			
Angela Millard	Laboratory Technician	231/941-2230			
Don McNew	Laboratory Technician	231/941-2230			

EPA-NE QAPP Worksheet #5a - Rev. 10/99

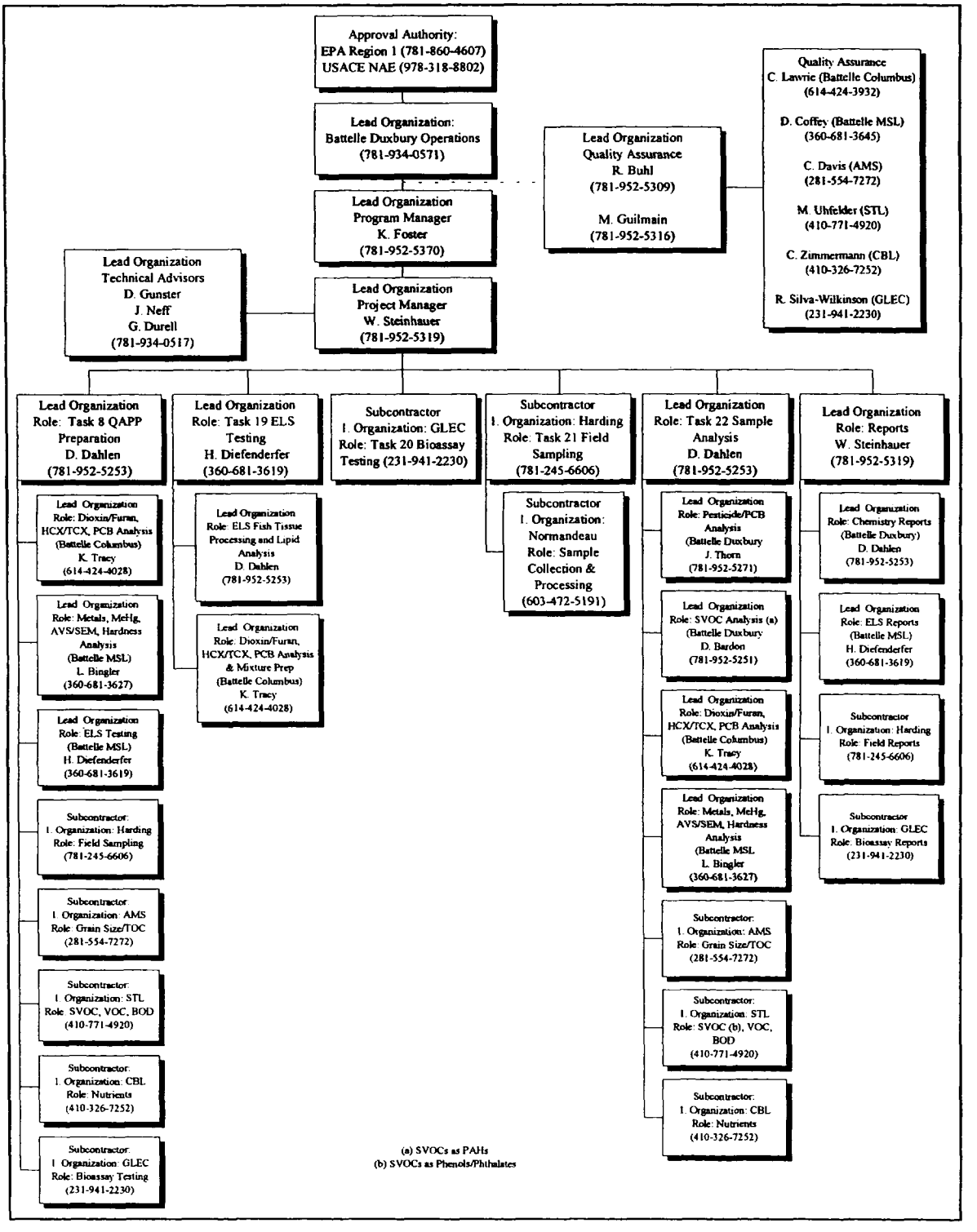

Figure 1. Project Organizational Chart.

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Communication Pathways

Communication pathways will follow the project organization chart (Figure 1). Ms. Laureen Borochaner is the USACE NAE Project Manager. Mr. William Steinhauer is Battelle's Project Manager and is responsible for the technical oversight, overall quality and conduct of the project. He will be the primary contact with the USACE NAE Project Manager. Mr. Don Gunster, Dr. Jerry Neff, and Mr. Gregory Durell will also serve as Technical Advisors to Mr. Steinhauer. Mr. Steinhauer will ensure that the objectives of the project are met within budget and on schedule.

Ms. Rosanna Buhl will serve as Battelle's Program Quality Assurance (QA) Officer, and is responsible for identifying areas for corrective action, coordinating the QA activities such as systems and data audits, and preparing reports to management for this project. She will be assisted by Mr. Mark Guilmain, Battelle's Project QA Coordinator, and the QA Officers at each of the participating laboratories.

As indicated in Figure 1, Task Leaders have been assigned for each of the major project tasks (*e.g.*, QAPP Preparation). The Task Leaders will serve as the point of contact and will direct task activities and monitor task performance to ensure adherence to technical standards, budget, and schedule. They also will be responsible for apprising Mr. Steinhauer of progress and notifying him of any significant problems or delays. For example, the point of contact for resolving issues with Dioxin/Furan/HCX/TCX and PCB congener analyses will be Ms. Karen Tracy.

The need for corrective action may be identified during analysis, during QA reviews, or during management reviews. EPA Worksheets #21 and #24a define the corrective action(s) options for quality control data and calibration exceedences. Corrective action implemented in response to QA audits is documented as part of the analyst's response to the audit. Battelle SOP 4-035 describes Battelle Duxbury's formal Corrective Action program. All internal corrective action is followed up by the QA Officer. Corrective action related to changes in scope, analytical techniques, or financial variances are formally communicated to Ms. Borochaner by Mr. Gunster.

All communications will be conducted using electronic mail, phone, telefaxes, and/or reports.

EPA-NE QAPP Worksheet #6 - Rev. 10/99

Personnel Responsibilities and Qualifications Table

Name	Organizational Affiliation	Responsibilities	Location of Personnel Resumes, if not included	Education and Experience Qualifications
William Steinhauer	Battelle Duxbury	Responsible for the technical oversight, overall quality and conduct of the project for lead organization		See attached (Attachment B)
Rosanna Buhl	Battelle Duxbury	Oversee QA/QC activities performed for lead organization		See attached (Attachment B)
Mark Guilmain	Battelle Duxbury	Coordinates QA/QC activities performed for lead organization (Battelle Duxbury)		See attached (Attachment B)
Deirdre Dahlen	Battelle Duxbury	Responsible for preparing QAPP and overseeing technical conduct of Task 22 sample analyses.		See attached (Attachment B)
Robert Lizotte	Battelle Duxbury	Manager of Organics Laboratory		See attached (Attachment B)
James Hatch	Battelle Duxbury	Responsible for laboratory custody of samples	Not available[1]	Braintree High School, 1983; Navy aviation electronic 1984-1988; 2 ½ years experience at Battelle; 1 years experience as Sample Custodian
Roxanne Brackett	Battelle Duxbury	Prepare environmental samples for SVOCs (PAHs) and Chlorinated Pesticide/PCB Aroclors analyses		See attached (Attachment B)
Dan Bardon	Battelle Duxbury	Analyze environmental samples for SVOCs (PAHs); prepare and validate final tables and submit data package(s) to QA for data audit		See attached (Attachment B)
Jonathan Thorn	Battelle Duxbury	Analyze environmental samples for Chlorinated Pesticide/PCB Aroclors; prepare and validate final tables and submit data package(s) to QA for data audit		See attached (Attachment B)
Karen Tracy	Battelle Columbus	Responsible for assisting with QAPP preparation; overseeing technical conduct of dioxin/furan, HCX/TCX, PCB HRMS analyses: and prepare and validate final tables and submit data package(s) to QA for data audit		See attached (Attachment B)

EPA-NE QAPP Worksheet #6 - Rev. 10/99

Personnel Responsibilities and Qualifications Table

Name	Organizational Affiliation	Responsibilities	Location of Personnel Resumes, if not included	Education and Experience Qualifications
Charles D. Lawrie	Battelle Columbus	Oversee QA/QC activities performed for Battelle Columbus; audit data		See attached (Attachment B)
Mary E. Schrock	Battelle Columbus	Dioxin Laboratory Manager		See attached (Attachment B)
Henry Pham	Battelle Columbus	Responsible for sample preparation and laboratory custody of samples		See attached (Attachment B)
Mark Misita	Battelle Columbus	Responsible for sample preparation for dioxin/furan/HCX/TCX and PCB HRMS analyses; assist with analysis of the samples by HRGC/HRMS		See attached (Attachment B)
Susan Winnard	Battelle Columbus	Responsible for sample preparation for dioxin/furan/HCX/TCX and PCB HRMS analyses		See attached (Attachment B)
Wesley H. Baxter	Battelle Columbus	Responsible for sample preparation for dioxin/furan/HCX/TCX and PCB HRMS analyses	Not available[1]	Minerva High School (Middleburg Hgts., OH), 1995; Ohio State University – Spring 2001 expected graduation with B.A. Chemistry; 7 months experience with sample preparation for Dioxin/Furan, PCBs and Pesticides by GC/HRMS, Battelle Columbus.
Joseph E. Tabor	Battelle Columbus	Analyze environmental samples for dioxin/furan/HCX/TCX and PCBs by HRGC/HRMS		See attached (Attachment B)
Linda Bingler	Battelle Marine Sciences Laboratory (MSL)	Responsible for assisting with QAPP preparation; overseeing technical conduct of metals, MeHg, AVS/SEM, and Hardness analyses		See attached (Attachment B)
Deborah Coffey	Battelle MSL	Oversee project QA/QC activities; audit technical systems and data, Catfish ELS QA Review		See attached (Attachment B)

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Personnel Responsibilities and Qualifications Table

Name	Organizational Affiliation	Responsibilities	Location of Personnel Resumes, if not included	Education and Experience Qualifications
Carolynn Suslick	Battelle MSL	Responsible for laboratory custody of samples (and reporting moisture content data for ELS study)		See attached (Attachment B)
Chuck Apts	Battelle MSL	Analyze environmental samples for metals by ICP/MS		See attached (Attachment B)
Jordana Wood	Battelle MSL	Analyze environmental samples for metals by ICP/AES, GFAA, and FIAS		See attached (Attachment B)
Mary Ann Deuth	Battelle MSL	Analyze environmental samples for mercury		See attached (Attachment B)
Tim Fortman	Battelle MSL	Analyze sediment samples for AVS		See attached (Attachment B)
Heida Diefenderfer	Battelle MSL	Oversee Catfish ELS study; input to Work Plan, QAPP, laboratory effort, data interpretation and reporting		See attached (Attachment B)
Blythe Barbo	Battelle MSL	Catfish ELS Editorial Review		See attached (Attachment B)
Susan Blanton	Battelle MSL	Oversee Catfish ELS Laboratory effort; input to Work Plan, QAPP, data interpretation and reporting		See attached (Attachment B)
Val Cullinan	Battelle MSL	Biostatistician for Catfish ELS		See attached (Attachment B)
Gary Dennis	Battelle MSL	Construct and maintain freshwater laboratory system for Catfish ELS		See attached (Attachment B)
Rhonda Karls	Battelle MSL	Perform Catfish ELS Laboratory observations, measurements, and dosing		See attached (Attachment B)
Irv Schultz	Battelle MSL	Catfish ELS Technical Review		See attached (Attachment B)
Ann Skillman	Battelle MSL	Contribute to Catfish ELS Work Plan, laboratory effort, data interpretation and reporting		See attached (Attachment B)
Jeffrey Ward	Battelle MSL	Contribute to Catfish ELS Work Plan, data interpretation and reporting		See attached (Attachment B)
Sarah Shah	Harding ESE	Project Manager responsible for oversight of Harding ESE activities.		See attached (Attachment B)
Norman Richardson	Harding ESE	Responsible for oversight of field sampling, BERA, and development of PRGs.		See attached (Attachment B)

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Personnel Responsibilities and Qualifications Table

Name	Organizational Affiliation	Responsibilities	Location of Personnel Resumes, if not included	Education and Experience Qualifications
Pamela Wasel	Harding ESE	Responsible for oversight of Fish consumption information evaluation, Biota consumption risk assessment, and development of PRGs.		See attached (Attachment B)
Charles Lyman	Harding ESE	On-site coordination of field work.		See attached (Attachment B)
Ken Davis	Applied Marine Sciences	Prepare and analyze sediment/soil samples for grain size and TOC		See attached (Attachment B)
Chuck Davis	Applied Marine Sciences	Senior Geotechnical Engineer and QC Manager		See attached (Attachment B)
Mike Seymour	Applied Marine Sciences	Analyst		See attached (Attachment B)
Tara Martz	Severn Trent Laboratory (STL) Baltimore	Laboratory Project Manager		See attached (Attachment B)
Craig Schenning	STL Baltimore	Organics Manager VOA and SVOC (phenols and phthalates) analysis Task Leader		See attached (Attachment B)
Mary Asper	STL Baltimore	Sample Receipt		See attached (Attachment B)
Cathy Hersey	STL Baltimore	Sample Receipt and Storage		See attached (Attachment B)
Mimi Uhlfelder	STL Baltimore	QA review of data		See attached (Attachment B)
Michael Sekel	STL Baltimore	Laboratory Manager		See attached (Attachment B)
Jonathan Haupt	STL Baltimore	Sample Preparation for sediments/soil and water samples SVOC (phenols and phthalates) analysis		See attached (Attachment B)
Amanda Schenning	STL Baltimore	Analyze environmental samples by GC/MS for SVOCs (phenols and phthalates)	Not available[1]	The Catholic High School of Baltimore, 1982; Towson State University, B.S. Physics, 1987; 11 years experience as extraction, VOA, and BNA analyst

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Personnel Responsibilities and Qualifications Table

Name	Organizational Affiliation	Responsibilities	Location of Personnel Resumes, if not included	Education and Experience Qualifications
Naomi Howard	STL Baltimore	Analyze water samples by purge and trap GC/MS for VOCs	Not available[1]	Plainfield High School (Plainfield, NJ), 1982; Rutgers University; Catonsville Community College VMBC (Chemistry); 10 years experience as VOA GC/MS Analyst
Michelle MacKaney	STL Baltimore	Analyze water samples for BOD	Not available[1]	Friendly High School (Friendly, MD), 1995; Towson University, B.S. Biology, 2000; 6 months experience as laboratory chemist
Carl Zimmermann	CBL	Responsible for assisting with QAPP preparation; overseeing technical conduct of nutrient analyses		See attached (Attachment B)
Nancy Kaumeyer	CBL	Prepare and analyze water samples for DOC/TOC.		See attached (Attachment B)
Cheryl Clark	CBL	Prepare and analyze water samples for TSS.		See attached (Attachment B)
Kim Blodnikar	CBL	Prepare and analyze water samples for TN/TP and TDN/TDP.		See attached (Attachment B)
Carolyn Keefe	CBL	Prepare and analyze water samples for Nitrite+nitrate and Phosphate.		See attached (Attachment B)
Kathryn Wood	CBL	Prepare and analyze water samples for Ammonium and Nitrite.		See attached (Attachment B)
Dennis McCauley	GLEC	Responsible for project management, technical oversight, overall quality control, and conduct of the project for GLEC		See attached (Attachment B)
Robin Silva-Wilkinson	GLEC	Oversee QA/QC activities for GLEC and performs data audits		See attached (Attachment B)
Pam Smith	GLEC	Responsible for sample custody and overseeing the technical conduct of whole sediment toxicity tests, overseeing technical staff in the laboratory and reviewing data during and at the termination of the toxicity tests		See attached (Attachment B)

EPA-NE QAPP Worksheet #6 - Rev. 10/99

Personnel Responsibilities and Qualifications Table

Name	Organizational Affiliation	Responsibilities	Location of Personnel Resumes, if not included	Education and Experience Qualifications
Jim Sticko	GLEC	Responsible for overseeing the technical conduct of the toxicity tests		See attached (Attachment B)
Mailee Woods	GLEC	Responsible for conducting day to day laboratory activities, test initiation and test termination		See attached (Attachment B)
Angela Millard	GLEC	Responsible for conducting day to day laboratory activities, test initiation and test termination		See attached (Attachment B)
Don McNew	GLEC	Responsible for assisting with laboratory activities, test termination, data summation and interpretation		See attached (Attachment B)

[1] Resume not available. Education summarized in next column.

EPA-NE QAPP Worksheet #8a - Rev. 10/99

Project Planning Meetings

EPA Regulation Program: RCRA FIFRA TSCA CERCLA DW CWA CAA (underline one)	**Site Name**: Centredale Manor
Program (Brownfields, NPDES, etc.): Superfund	**Site Location**: North Providence, Rhode Island
Project Date(s) of Sampling: April through October, 2001	**CERCLA Site/Spill Identifier No.**: 016P
Project Manager: William Steinhauer	**Operable Unit**:
	Other Site Number/Code: 016P
	Phase: ERA SA/SI Pre-RI RI (phase I, etc.) FS RD RA post-RA (underline one)
	Other phase:

Date of Meeting: December 15, 2000
Meeting Location: Conference call between EPA-Region 1 in Boston, MA; EPA National Health and Environmental Effects Research Laboratory (NHEERL) Mid-Continent Ecology Division-Duluth, MN; Harding Lawson Associates in Wakefield, MA; and Battelle MSL in Sequim, WA.

Name	Project Role	Affiliation	Phone #	e-Mail Address
Andy Beliveau	QA Chemist	EPA Region 1, Lexington, MA	(781) 860-4607	beliveau.andy@epa.gov
Cornell Rosiu	Work Assignment Manager	EPA Region 1	(617) 918-1345	rosiu.cornell@epa.gov
Phil Cook	Technical Advisor	EPA NHEERL Mid-Continent Ecology Division	(218) 529-5202	cook.philip@epa.gov
Ken Finkelstein	Technical Advisor	NOAA (in EPA Office of Site Remediation & Restoration)	(617) 908-1499	ken.finkelstein@noaa.gov
Norm Richardson	Ecological Risk Assessor	Harding Lawson Associates	(781) 245-6606	nrichard@harding.com
Sue Blanton	Senior Toxicologist	Battelle MSL	(360) 681- 3615	sue.blanton@pnl.gov
Heida Diefenderfer	Catfish ELS Testing Task Leader	Battelle MSL	(360) 681- 3619	heida.diefenderfer@pnl.gov
Ann Skillman	Senior Ichthyologist	Battelle MSL	(360) 681 - 3649	ann.skillman@pnl.gov
Jeff Ward	Senior Toxicologist	Battelle MSL	(360) 681 - 3669	ja.ward@pnl.gov

EPA-NE QAPP Worksheet #8a - Rev. 10/99 (continued)

Project Planning Meetings

Meeting Purpose. Key discussion points included

1) Modeling effects vs. testing with materials from the site
2) Test species selection criteria
3) Schedule for development of workplan and deadline for risk assessment completion
4) Field studies to be conducted by Harding Lawson, to include sampling of fish larvae and adults, in particular gravid females
5) Who might have information on fish species present in the Woonasquatucket River? – RI Div. of Fish and Wildlife
6) How best to back-calculate exposure from sediment?
7) What kind of exposure would be most relevant? Whole sediment? Extract from food web? Sediment extract?
8) What would be the best extraction method/solvent?
9) Sediment exposure or water exposure or microinjection?
10) Does exposure post-fertilization have less effect than maternal transfer?
11) Best to perform a range-finding test first.
12) What would a project like this cost?
13) When would we need to measure chemical concentrations? In eggs? - yes In swim-up fry? – maybe not
14) Prefer to test a benthic species
15) Time from fertilization to feeding is most critical
16) Possibility of conducting a reference toxicant test with tritiated TCDD

Comments. The above discussion ended with a general consensus that we would pursue ELS testing with a benthic fish species, such as a catfish, and that the route of exposure would likely be from a sediment extract, prepared after analyzing sediment from the site for TCDDs and HCXs.

EPA-NE QAPP Worksheet #8a - Rev. 10/99

Project Planning Meetings

EPA Regulation Program: RCRA FIFRA TSCA CERCLA DW CWA CAA (underline one)	**Site Name**: Centredale Manor
Program (Brownfields, NPDES, etc.): Superfund	**Site Location**: North Providence, Rhode Island
Project Date(s) of Sampling: May and June, 2000	**CERCLA Site/Spill Identifier No.**: 016P
Project Manager: William Steinhauer	**Operable Unit**:
	Other Site Number/Code: 016P
	Phase: ERA SA/SI Pre-RI RI (phase I, etc.) FS RD RA post-RA (underline one)
	Other phase:

Date of Meeting: December 19, 2000
Meeting Location: USACE NAE offices, Concord, MA

Name	Project Role	Affiliation	Phone #	e-Mail Address
Anna Krasko	Remedial Project Manager	EPA Region 1	(617) 918-1232	Krasko.Anna@epa.gov
Cornell Rosiu	Work Assignment Manager	EPA Region 1	(617) 918-1345	Rosiu.Cornell@epa.gov
Sarah Levinson	Human Health Risk Assessor	EPA Region 1	(617) 918-1390	Levinson.Sarah@epa.gov
Andy Beliveau	QA Chemist	EPA Region 1	(781) 860-4607	Beliveau.Andy@epa.gov
Mark Sprenger*	Technical Advisor	EPA ERT	(732) 906-6826	Sprenger.mark@epa.gov
Laureen Borochaner	Project Manager	USACE NAE	(978) 318-8802	Laureen.A.Borochaner@usace.army.mil
Karen Foster	Program Manager	Battelle Duxbury	(781) 952-5370	foster@battelle.org
Don Gunster	Project Manager/ Risk Assessor	Battelle Duxbury	(781) 952-5378	gunster@battelle.org
Deirdre Dahlen	Sample Analysis Task Leader	Battelle Duxbury	(781) 952-5253	dahlend@battelle.org
Al Uhler	Technical Advisor	Battelle Duxbury	(781) 952-5225	Uhlera@battelle.org
Norm Richardson	Ecological Risk Assessor	Harding Lawson Associates	(781) 245-6606	nrichard@harding.com
Mike Murphy	Human Health Risk Assessor	Harding Lawson Associates	(781) 245-6606	mmurphy@harding.com
Pam Wasel	Human Health Risk Assessor	Harding Lawson Associates	(781) 245-6606	pwasel@harding.com
Sarah Shah	Project Manager	Harding Lawson Associates	(781) 245-6606	sshah@harding.com

* Attended by phone.

EPA-NE QAPP Worksheet #8a - Rev. 10/99 (continued)

Project Planning Meetings

Meeting Purpose: Review goals and objectives and outline scope of work for the baseline ecological and biota consumption risk assessments.

Points of Discussion - Biota Consumption Risk Assessment (Review of Human Health Risk Evaluation Table 1)

Steps 1 and 2 – Discussion of Goals and Objectives

- EPA confirmed that the human health risk assessment would include an evaluation of fish (including eel) and other aquatic biota such as turtles and frogs.
- EPA stated that a limited angler survey would be useful to evaluate whether the fishing advisory is effective and may be used to identify the types of biota consumed and primary fishing areas. Other consumption parameters (*e.g.*, consumption rates, food preparation methods) will likely be obtained from the literature.
- EPA indicated that, if appropriate, PRGs for sediments would be established. Control of sediment concentrations will probably result in the control of concentrations in fish tissue.
- EPA indicated that the risk assessment should be driven by future exposure. Because of the fishing advisory currently in place, it is assumed that current exposure is non-existent.
- Biota tissue and sediment data must be correlated so that sediment cleanup requirements can be determined. Some existing data are available; however, previous samples do not provide sufficient geographical coverage or analytical data for all the potential chemicals of concern. Biota tissue samples (and perhaps additional sediment data) will need to be collected at different areas and for different species.

Steps 3 and 4 – Discussion of Decision Inputs and Data Needs

- *Identification of Site Boundaries* - The issue of evaluating chemical concentrations over time was raised based on activities performed as part of the Hudson River and Housatonic River projects. This issue will not be evaluated as part of this project because of the limited historic data available and the short timeframe for the project.
- *Exposure Assessment* - Risk will be evaluated for each exposure area/impoundment. Five exposure areas are anticipated for the project: Allendale Pond, Lymansville Pond, Manton Pond, Dyerville Pond, and the upgradient reference area(s) (Caesarville Pond, Assapumpsett Brook and/or Greystone Mill Pond). EPA provided new validated dioxin data for samples collected between Lymansville Dam and Dyerville Dam. Information regarding recreational and residential exposures to sediments and soils is provided in the EE/CA.
- *Hazard Identification* - Surface water and sediment samples may be collected in conjunction with the ecological field sampling that will be conducted to determine uptake factors and BSAFs. EPA prefers to minimize the amount of additional data collected; however, they recognize that there are gaps in the geographic coverage as well as in the list of analytes.
- The number of biota tissue samples to be collected will be limited. The sampling will focus on sensitive species based on lipid content and biota sediment accumulation factors. Site-specific exposure information will be used to supplement and "ground-truth" published values.
- Tissue samples will be selected based on the organs/tissues that local subsistence and recreational anglers eat. Exposure parameters (site-specific or obtained from the literature) will be used to evaluate human health exposures to species present in the four ponds included as part of the site.
- *Assessment of Toxicity* - EPA indicated that the World Health Organization (WHO) TEFs would be used for the project. The EPA TEFs (1989) should not be used. EPA's new guidance for dioxins and dioxin-like PCBs will be finished in Spring 2001.
- EPA requested that development of PRGs be moved from Step 4 to Step 5 on Table 1 because this task is not actually part of the risk assessment.

Limited Creel Angler Survey

- EPA indicated that direct contact surveys are not always reliable because people are not always comfortable in answering truthfully.
- EPA indicated that surveys of people with fishing licenses are not always reliable because it does not include people who fish but do not have licenses.
- EPA suggested a survey of bait shops and police logs. This information can be supplemented by questionnaires distributed at the local community centers and by community groups involved in the project. EPA will provide a copy of a draft questionnaire they have prepared.

EPA-NE QAPP Worksheet #8a - Rev. 10/99 (continued)

Project Planning Meetings

December 19, 2000 Meeting (cont.)

Points of Discussion - Baseline Ecological Risk Assessment (Review of Assessment Endpoint Tables 1 through 6)

Assessment Endpoint No. 1

- EPA stated that in general, PCBs and dioxin do not have much effect on macrointertebrates. The primary stressors are typically pesticides and metals. It will be important to collected appropriate data to determine which stressors are having an effect on the system.
- Table 1 will be revised and organized by chemical class.

Assessment Endpoint No. 2

- Harding ESE anticipates that most of the project resources will be devoted to conducting this task. Reproductive effects to this group are likely to have the most impact to risk in this system. Based on previous discussions with EPA, data will only be collected from Allendale and Lymansville Ponds. Bird and fish data will be extrapolated to lower reaches (Manton and Dyerville Ponds) based on existing fish tissue and sediment data previously collected in those areas.
- Mark Sprenger made the following comments:
  - It may not be practical to predict the risk at Manton and Dyerville Ponds because the relationships may not be linear. Collection of additional data from these two areas may be preferred to modeling/extrapolation.
  - Recommended development of a back up plan to measures of effects 4 and 5 because it may be difficult to catch specific species of fish with eggs at a particular place and time.
  - Recommended fish tissue extractions rather than sediment extractions to develop exposure response relationships for effects of site contaminants on fish.
  - Recommended integrating other stressors and toxins that are present in the environment into the data collection and risk assessment program.
- EPA indicated that measures of effect 1 (mixed-function oxidase liver enzyme levels) may not be necessary because it does not provide additional information. This item will be deleted from Table 2.
- Naive laboratory cultured sources of fish will be used for measures of effect 5.

Assessment Endpoint 3

- EPA indicated that measures of effect 1 (mixed-function oxidase liver enzyme levels) may not be necessary because it does not provide additional information. This item will be deleted from Table 3.
- EPA suggested reducing the inference weight of measures of effect 2 from medium to low.
- EPA indicated that the presence of gross lesions and parasites in individual fish is evidence of stress on the system. EPA requested reconsidering the value of the evaluation of the richness of species because this task is expensive and may not accurately correlate contaminants to population.

Assessment Endpoint 5

- The second phase of the tree swallow study has not yet been approved for next summer. If it is approved, the study may be expanded to include Manton and Dyerville Pond.

EPA-NE QAPP Worksheet #8a - Rev. 10/99 (continued)

Project Planning Meetings

December 19, 2000 Meeting (cont.)

Points of Discussion - Tree Swallow Analytical Data

- Coplanar PCB data is not reported because these constituents are not included in the low resolution PCB analytical suite. The holding times for the sample extractions will expire in approximately 10 days. EPA will notify Battelle if high resolution PBC analysis is required to measure the concentration of the coplanar congeners.
- Battelle recommended an option for collecting coplanar PCB data for lower cost - Since the analytical suite for this project includes dioxin, coplanar data can be collected in the future by performing high resolution PCB analysis for the four coplanar constituents on the dioxin extractions. Low resolution PCB analysis can be performed to collect data for the other PCB congeners. This strategy will be presented to Andy Beliveau for his review and comments prior to implementation.
- Distinct patterns in PCB congener concentrations have been identified in nestling samples collected in the two study areas.

Scope of Work

- Include high resolution PCB analysis of dioxin extractions for coplanar congeners (pending approval by Andy Beliveau).
- DQO tables will be revised based on EPA comments and submitted to EPA on Thursday, December 21, 2000.

Action Items:

Cornell Rosiu
- Provide review comments for ecological tables by Wednesday, December 20, 2000.
- Determine necessity of high resolution PCB analysis for existing nestling extraction samples.
- Provide GE fish consumption questionnaire to Battelle and Harding ESE.

Mark Sprenger
- Provide review comments for ecological tables by Wednesday, December 20, 2000.

Al Uhler
- Prepare summary of PCB analytical recommendations for submittal to Cornell Rosiu and Andy Beliveau.

Donald Gunster
- Coordinate with Norm Richardson to identify detection limit requirements for reference and study areas included in the ecological risk assessment.
- Provide a copy of the nestling data report to Harding ESE.

Norm Richardson
- Coordinate with Don Gunster to identify detection limit requirements for reference and study areas included in the ecological risk assessment.

Comments: Al Uhler followed up with Cornell Rosiu regarding 1) potential environmental forensic investigation in the general environs of the Centredale Manor; 2) analytical strategy to maximize information/minimize costs for PCB congener analysis; and 3) implications for chemistry of hexachlorophene/trichlophenols/HCX/dioxins.

PCB Analytical Strategy – Recent verification studies conducted at Battelle Columbus confirmed that the coplanar PCB congeners were not well recovered along with the Dioxin/Furan extract – due to modifications in the carbon (old AX21 carbon discontinued), silica, and alumina cleanup column methods. Modifications to the cleanup procedures (implemented a few years ago) allowed for a significantly "cleaner" extract for dioxin analysis which has significantly reduced chromatographic interferences.

Battelle Duxbury is currently conducting an IR&D study that will optimize sample cleanup methods such that the 4 coplanar PCBs can be separated from other PCBs and later analyzed by GC/LRMS. Results from the IR&D study will not be available until later this summer. Provided the sample cleanup and analysis methods can be optimized – Battelle will be able to offer a lower cost method for analyzing coplanar PCBs by LRMS.

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Project Planning Meetings

EPA Regulation Program: RCRA FIFRA TSCA CERCLA DW CWA CAA (underline one)	**Site Name**: Centredale Manor
Program (Brownfields, NPDES, etc.): Superfund	**Site Location**: North Providence, Rhode Island
Project Date(s) of Sampling: May and June, 2000	**CERCLA Site/Spill Identifier No.**: 016P
Project Manager: William Steinhauer	**Operable Unit**:
	Other Site Number/Code: 016P
	Phase: ERA SA/SI Pre-RI RI (phase I, etc.) FS RD RA post-RA (underline one)
	Other phase:

Date of Meeting: February 28, 2001
Meeting Location: USACE NAE offices, Concord, MA

Name	Project Role	Affiliation	Phone #	e-Mail Address
Anna Krasko	Remedial Project Manager	EPA Region 1	(617) 918-1232	Krasko.Anna@epa.gov
Cornell Rosiu	Work Assignment Manager	EPA Region 1	(617) 918-1345	Rosiu.Cornell@epa.gov
Sarah Levinson	Human Health Risk Assessor	EPA Region 1	(617) 918-1390	Levinson.Sarah@epa.gov
Chau Vu	Quality Assurance Officer	EPA Region 1	(617) 918-1446	Vu.Chau@epa.gov
Mark Sprenger*	Technical Advisor	EPA ERT	(732) 906-6826	Sprenger.mark@epa.gov
Phil Cook*	Technical Advisor	EPA NHEERL Mid-Continent Ecology Division	(218) 529-5202	cook.philip@epa.gov
Laureen Borochaner	Project Manager	USACE NAE	(978) 318-8802	Laureen.A.Borochaner@usace.army.mil
Tracy Stenner	Risk Assessor	Battelle Duxbury	(781) 952-5370	foster@battelle.org
Deirdre Dahlen	Sample Analysis Task Leader	Battelle Duxbury	(781) 952-5253	dahlend@battelle.org
Norm Richardson	Ecological Risk Assessor	Harding Lawson Associates	(781) 245-6606	nrichard@harding.com
Mike Murphy	Human Health Risk Assessor	Harding Lawson Associates	(781) 245-6606	mmurphy@harding.com
Pam Wasel	Human Health Risk Assessor	Harding Lawson Associates	(781) 245-6606	pwasel@harding.com
Sarah Shah	Project Manager	Harding Lawson Associates	(781) 245-6606	sshah@harding.com

* Attended by phone.

EPA-NE QAPP Worksheet #8a - Rev. 10/99 (continued)

Project Planning Meetings

Meeting Purpose: Review comments to draft Work Plan

EPA and USACE NAE review comments to the draft work plan were discussed in great detail. See meeting minutes for detailed outline of discussion points.

Chemical analysis of tissue, sediment, soils, and water samples was discussed. The final agreement regarding how samples would be analyzed is as follows:

HHRA Fish Tissue – PCB (as Aroclors), chlorinated pesticides, Dalapon, SVOCs (PAHs) with TICs, Dioxins/Furans, HCX, 12 WHO PCBs, metals and MeHg.

ERA Tissue – PCB (as Aroclors), chlorinated pesticides, Dalapon, Dioxins/Furans, HCX, 12 WHO PCBs, metals, MeHg, moisture content, and methlyene chloride extractable lipid content. *Note – metals and MeHg will not be measured in swallow eggs, nestling, or stomach contents, only in livers.*

ELS Tissue – Dioxins/Furans, HCX, 12 WHO PCBs, moisture and methylene chloride extractable lipid content.

Sediments – PCB (as Aroclors), chlorinated pesticides, Dalapon, SVOCs (PAHs, phenols, phthalates), Dioxins/Furans, HCX, 12 WHO PCBs, metals, MeHg, AVS/SEM, grain size, TOC, and moisture content.

Floodplain Soils – PCB (as Aroclors), chlorinated pesticides, Dalapon, SVOCs (PAHs, phenols, phthalates), Dioxins/Furans, HCX, 12 WHO PCBs, metals, MeHg, AVS/SEM, grain size, TOC, and moisture content.

Surface Waters – PCB (as Aroclors), chlorinated pesticides, Dalapon, SVOCs (PAHs, phenols, phthalates), metals, hardness, VOCs, and nutrients.

All PCB analyses will be performed by HRMS.

Comments. Subsequent to this meeting – Cornell Rosiu, Andy Beliveau, Deirdre Dahlen and Greg Durell participated in a phone conference call (3/19/01) to discuss further the PCB analysis approach. The PCB analysis approach was modified such that only a sub-set of the samples would receive an extended PCB congener analysis, as follows

Tissue, fish (demersal, piscivorous, frog/turtle, crayfish, emerging insects, earthworms; tree swallow, eggs, nestlings, stomach, liver)

>>	PCB 100+ congeners	20%
>>	PCB total, as Aroclor	100%

Tissue ELS, eggs, whole body composite

>>	PCB 100+ congeners	0%
>>	PCB total, as Aroclor	0%
>>	PCB 12 WHO congeners	100%

Where:
PCB 100+ congeners = HRMS analysis that includes the 12 WHO congeners, plus approximately 100 other PCB congeners
PCB total, as Aroclor = GC-ECD analysis quantifying the most strongly identified Aroclor (or mixture of two major Aroclor formulations)
PCB 12 WHO congeners = HRMS analysis of only the 12 WHO PCB congeners

Note: All sediment, soil, and water samples will also be analyzed for PCB total as Aroclor; 20% of the sediment and soil samples will be analyzed for PCB 100+ congeners. PCB congener analysis is not planned for waters.

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Project Planning Meetings

EPA Regulation Program: RCRA FIFRA TSCA CERCLA DW CWA CAA (underline one)	**Site Name**: Centredale Manor
Program (Brownfields, NPDES, etc.): Superfund	**Site Location**: North Providence, Rhode Island
Project Date(s) of Sampling: April through October, 2001	**CERCLA Site/Spill Identifier No.**: 016P
Project Manager: Don Gunster	**Operable Unit**:
	Other Site Number/Code: 016P
	Phase: ERA SA/SI Pre-RI RI (phase I, etc.) FS RD RA post-RA (underline one)
	Other phase:

Date of Meeting: March 13, 2001
Meeting Location: Conference call between EPA National Health and Environmental Effects Research Laboratory (NHEERL) Mid-Continent Ecology Division-Duluth, MN; Harding Lawson Associates in Wakefield, MA; Battelle MSL in Sequim, WA; and Battelle Duxbury in Duxbury, MA.

Name	Project Role	Affiliation	Phone #	e-Mail Address
Phil Cook	Technical Advisor	EPA NHEERL Mid-Continent Ecology Division	(218) 529-5202	cook.philip@epa.gov
Norm Richardson	Ecological Risk Assessor	Harding Lawson Associates	(781) 245-6606	nrichard@harding.com
Heida Diefenderfer	Catfish ELS Test Task Leader	Battelle MSL	(360) 681- 3619	heida.diefenderfer@pnl.gov
Ann Skillman	Senior Ichthyologist	Battelle MSL	(360) 681 - 3649	ann.skillman@pnl.gov
Jeff Ward	Senior Toxicologist	Battelle MSL	(360) 681 - 3669	ja.ward@pnl.gov
Deirdre Dahlen	Sample Analysis Task Leader	Battelle Duxbury	(781) 952-5253	dahlend@battelle.org
William Steinhauer	Project Manager	Battelle Duxbury	(781) 934-0571	steinhauer@battelle.org

EPA-NE QAPP Worksheet #8a - Rev. 10/99 (continued)

Project Planning Meetings

Meeting Purpose. Key discussion points included

1) USEPA comments on draft Work Plan for catfish ELS exposures: sediment extract versus fish extract.
2) Porewater exposures as alternative.
3) Significant exposure pathways and food web.
4) Recent related study from USEPA Duluth: Elonen, GE, RL Spehar, GW Holcombe, RD Johnson, JD Fernandez, RJ Erickson, JE Tietoe, and PM Cook. 1998. Comparative toxicity of 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin to seven freshwater fish species during early life-stage development. *Environmental Toxicology and Chemistry* 17(3):472-483.
5) Appropriate resident fish species for extraction, and acceptability of a mixture of species and both genders.
6) Brown bullhead versus channel catfish embryos as test organism.

Comments. The above discussion concluded with the decision to pursue the fish extract method. An additional meeting between Phil Cook and Battelle Sequim was planned to calculate the number of fish needed, and tasks were assigned, such as a nationwide search for brown bullhead embryos by Battelle Sequim and review of the Elonen et al. method for applicability in this study.

EPA-NE QAPP Worksheet #8a - Rev. 10/99

Project Planning Meetings

EPA Regulation Program: RCRA FIFRA TSCA CERCLA DW CWA CAA (underline one)	**Site Name**: Centredale Manor
Program (Brownfields, NPDES, etc.): Superfund	**Site Location**: North Providence, Rhode Island
Project Date(s) of Sampling: April through October, 2001	**CERCLA Site/Spill Identifier No.**: 016P
Project Manager: William Steinhauer	**Operable Unit**:
	Other Site Number/Code: 016P
	Phase: ERA SA/SI Pre-RI RI (phase I, etc.) FS RD RA post-RA (underline one)
	Other phase:

Date of Meeting: March 19, 2001
Meeting Location: Conference calls (2) between EPA National Health and Environmental Effects Research Laboratory (NHEERL) Mid-Continent Ecology Division-Duluth, MN and Battelle MSL in Sequim, WA.

Name	Project Role	Affiliation	Phone #	e-Mail Address
Phil Cook	Technical Advisor	EPA NHEERL Mid-Continent Ecology Division	(218) 529-5202	cook.philip@epa.gov
Sue Blanton	Senior Toxicologist	Battelle MSL	(360) 681-0826	sue.blanton@pnl.gov
Heida Diefenderfer	Catfish ELS Test Task Leader	Battelle MSL	(360) 681- 3619	heida.diefenderfer@pnl.gov

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Project Planning Meetings

Meeting Purpose. Key discussion points included

1) Result of search for brown bullhead was negative; therefore, channel catfish are test organism of choice.
2) The above result means the reference toxicant test with tritiated TCDD is not necessary though in Phil Cook's view it is still desirable.
3) Availability of data most closely related to the toxicity of dioxin-like compounds to catfish eggs, for use in calculations.
4) Phil Cook called Rich Proule, US EPA, during this conference call and obtained ballpark toxicity information from Proule's 1996 sunfish studies downstream of Allendale pond.
5) Relative accumulation by species and relative lipid content by species (information from Elonen *et al.* 1998, and Phil Cook's experience on the Great Lakes).
6) The method for fish extraction and dosing, and assumptions that needed to be made to make a preliminary calculation of the quantity of fish to be extracted. Assumptions included the following: the concentration of dioxin-like compounds in multi-species whole-fish homogenates from Allendale Pond, extraction efficiency, the slope of the dose-response curve, the number of eggs/liter of solution required to maintain healthy eggs, the percentage of dioxin-like compound lost in the transfer through water (to the walls of the jar, etc.) *i.e.* assimilation efficiency of eggs in water, the weight per egg, the LC_{50} for catfish eggs exposed to TCDD, number of replicates for the rangefinding and definitive tests, the most effective period of development for exposures, and the requisite number of renewals (modification to the work plan using modification of Elonen *et al.* 1998 method).
7) How to avoid the cross-contamination of controls that appears to have occurred in Elonen *et al.* 1998.
8) Cosolvation.
9) Cleanup of the extract.
10) Likely origin of toxicity in Allendale Pond: *i.e.*, either TCDD or TCDD+HCX.
11) Use of a synthetic chemical mixture based on the analysis of whole-fish homogenate for the exposures, as an alternative to a fish extract derived from Allendale Pond; also possible use of microinjection. How to determine the components of this mixture after fish from Allendale Pond are analyzed, and the suggestion for using a spreadsheet to analyze the relative contributions to toxicity of each chemical.

Comments. The calculations made during these phone calls estimated that 400kg of fish would be required to execute the study as described in the work plan with a fish extract modification, and that at best this could be reduced to 40kg using a modification of the method in Elonen *et al.* 1998. The large expense involved in collecting and extracting this much fish, as well as the possibility that the quantity of fish would not be available in Allendale Pond was discussed. It was resolved to present this information to Cornell Rosiu as early as possible, and to revise the final work plan (due the following day) so that it did not describe the apparently impractical use of a fish extract.

EPA-NE QAPP Worksheet #8a - Rev. 10/99

Project Planning Meetings

EPA Regulation Program: RCRA FIFRA TSCA CERCLA DW CWA CAA (underline one)	**Site Name**: Centredale Manor
Program (Brownfields, NPDES, etc.): Superfund	**Site Location**: North Providence, Rhode Island
Project Date(s) of Sampling: April through October, 2001	**CERCLA Site/Spill Identifier No.**: 016P
Project Manager: William Steinhauer	**Operable Unit**:
	Other Site Number/Code: 016P
	Phase: ERA SA/SI Pre-RI RI (phase I, etc.) FS RD RA post-RA (underline one)
	Other phase:

Date of Meeting: March 20, 2001
Meeting Location: Conference call between EPA-Region 1 in Boston, MA; EPA National Health and Environmental Effects Research Laboratory (NHEERL) Mid-Continent Ecology Division-Duluth, MN; Battelle MSL in Sequim, WA; and Battelle Duxbury in Duxbury, MA.

Name	Project Role	Affiliation	Phone #	e-Mail Address
Cornell Rosiu	Work Assignment Manager	EPA Region 1, Boston, MA	(617) 918-1345	rosiu.cornell@epa.gov
Andy Beliveau	QA Chemist	EPA Region 1, Lexington, MA	(781) 860-4607	beliveau.andy@epa.gov
Phil Cook	Technical Advisor	EPA NHEERL Mid-Continent Ecology Division	(218) 529-5202	cook.philip@epa.gov
Sue Blanton	Senior Toxicologist	Battelle MSL	(360) 681- 3615	sue.blanton@pnl.gov
Heida Diefenderfer	Catfish ELS Test Task Leader	Battelle MSL	(360) 681- 3619	heida.diefenderfer@pnl.gov
Jeff Ward	Senior Toxicologist	Battelle MSL	(360) 681 - 3669	ja.ward@pnl.gov
Jerry Neff	Technical Advisor	Battelle Duxbury	(781) 952-5229	neffjm@battelle.org

EPA-NE QAPP Worksheet #8a - Rev. 10/99 (continued)

Project Planning Meetings

Meeting Purpose. Key discussion points included

1) Test exposure method
2) Fish extract was a good idea, but requires too many fish to be feasible
3) Next best alternative is preparing a chemical mixture based on analysis of dioxins, PCBs, and HCXs in whole body fish collected from Allendale Pond.
4) Should pesticides also be analyzed in whole fish from Allendale Pond? Probably not as other evidence indicates that pesticides have relatively little impact compared to the other chemicals of concern, primarily dioxins and dioxin-like compounds.
5) Fish gender: either sex is ok for whole body analysis; resident, benthic fish would be best. White suckers may be best bet for capture success and test relevance.
6) EPA is working on their formal budget and it is possible that ELS testing could be postponed until 2002.

Comments. The above discussion culminated with the decision to pursue ELS testing as though it would happen in 2001 with a chemical cocktail prepared to simulate the compounds found in whole fish sampled at Allendale Pond.

EPA-NE QAPP Worksheet #8b - Rev. 10/99

Problem Definition/Site History and Background

Site History and Background[1]

The Centredale Manor Site (Figure 2) is a multi-unit apartment complex that houses elderly and handicapped adults. It is located at 2074 Smith Street (Route 44) in Centredale, a village of North Providence, Rhode Island. The Centredale Manor apartment building and adjacent apartment building known as "Brook Village", are located on the site of the former Metro-Atlantic Chemical Corporation, which operated from the 1940s to the 1970s in a former mill complex on the site. The Woonasquatucket River follows the west boundary of the site. The remains of a raceway for the former mill complex are present on the eastern boundary of the site.

Historical records of Metro Atlantic Chemical researched by Weston (March 1999) indicate that the site manufactured hexachlorophene and that there were shipments of trichlorophenols to the site. The mill complex was destroyed by fire in the late 1970's and the apartment buildings were constructed in 1982. During construction of the apartment buildings 400 drums and 6,000 cubic yards of contaminated soil were removed from the site. Labels indicated that the drums contained caustics, halogenated solvents, PCBs, and inks.

A study conducted in June 1996 by the EPA Narragansett Laboratories and the Providence Urban Initiative Program (EPA, 1996) determined that elevated levels of dioxin were present in fish collected from the River. A subsequent study of the Woonasquatucket River conducted by the USEPA OEME in June 1998 found elevated concentrations of dioxin and polychlorinated biphenyls (PCBs) in sediments in portions of the river and impoundments adjacent to the downstream of Centredale Manor (EPA, July 1998). Soil and sediment sampling conducted by EPA START personnel in September 1998 found dioxin at concentrations up to 10.1 ppb in sediments collected directly behind the Allendale dam that had a water depth of at least six feet (Weston, March 1999). Allendale Pond was an impoundment located immediately downstream of the Centredale Manor Site (Figure 2). The impoundments dam breached in 1991 exposing the sediments. Further sampling conducted in February 1999 on the Centredale Manor property also found elevated concentrations of dioxin in soils and sediment. Additional historical information on the Centredale Manor Site is available in the Expanded Site Inspection Report, prepared by Weston (March, 1999).

Contaminants of concern include dioxin, 1,2,4,5,7,8-hexachloroxanthene (HCX), 2,3,6,7-tetrachloroxanthene (TCX) and PCBs.

Objectives

The purpose of this study is to collect biological tissue, sediment, floodplain soil, and water samples from multiple sampling locations located along the Woonasquatucket River. Samples will be collected from areas that may have been impacted by contaminants released from the former Metro-Atlantic Chemical property and transported and deposited by the waters of the Woonasquatucket River. Samples will be analyzed for a wide suite of chemical parameters including polychlorinated biphenyls (as aroclors and congeners), chlorinated pesticides, semivolatile organic compounds, dioxins, furans, 1,2,4,5,7,8-hexachloroxanthene (HCX), 2,3,6,7-tetrachloroxanthene (TCX), metals, methyl mercury, acid volatile

[1] Site history and background taken verbatim from the *Sampling and Analysis Plan Woonasquatucket River Sediment Investigation, Centredale Manor Site North Providence, Rhode Island* (Tetra Tech, 1999). Note – references cited in Tetra Tech SAP not available.

sulfide (AVS), simultaneously extracted metals (SEM), volatile organic compounds, grain size, total organic carbon, nutrients, moisture and lipid content. Catfish ELS testing and bioassay (*hyllela, chironomus*) testing are also planned. Chemical testing results will be used to perform human health and ecological risk assessments. Toxicity results will be used to perform ecological risk assessments.

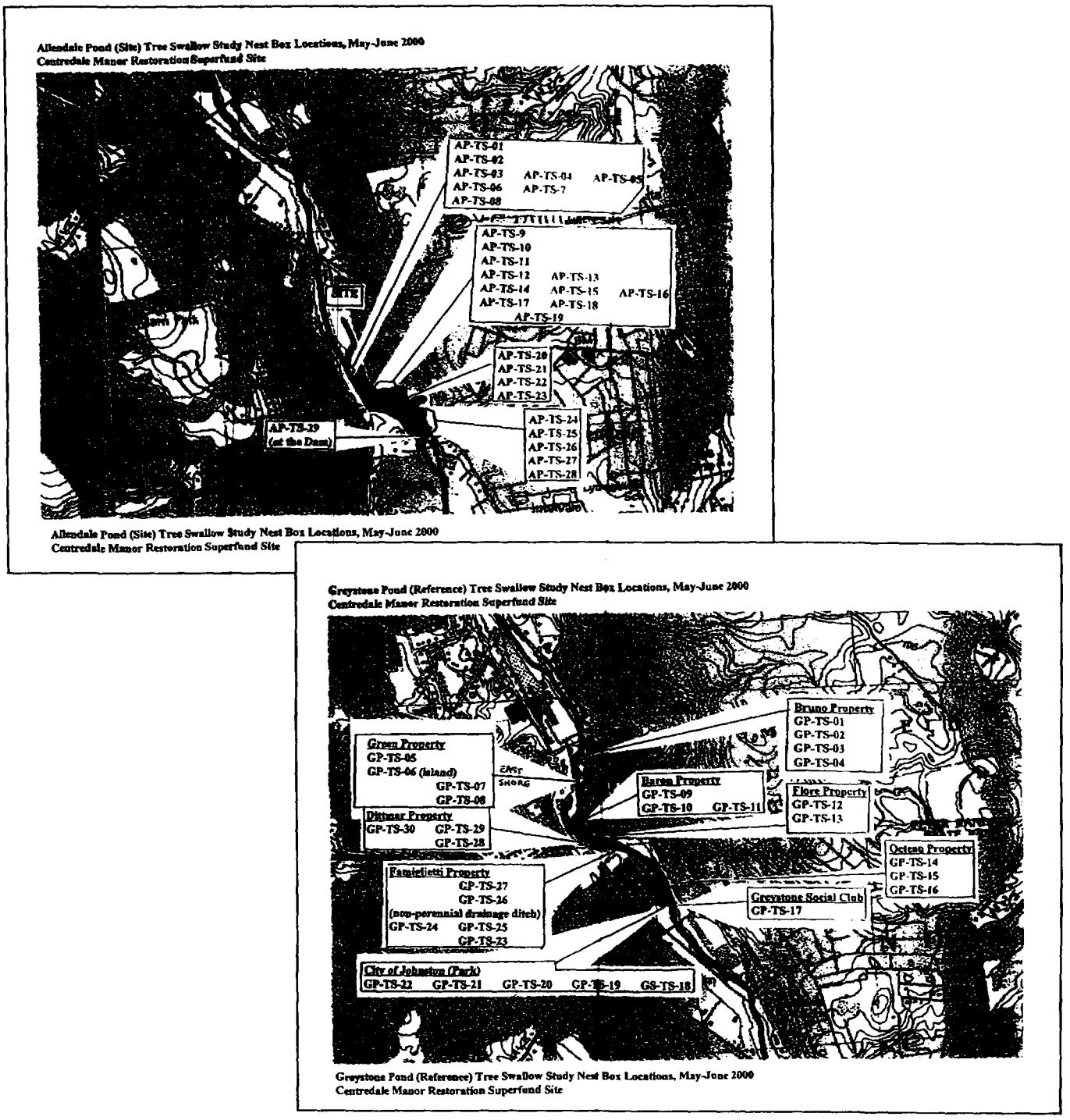

Figure 2. Site Maps.

EPA-NE QAPP Worksheet #9a - Rev. 10/99

Project Description and Schedule

Sampling Tasks:
Field sampling activities, including sampling locations and collection techniques, are discussed in detail in the Field Sampling Plan (Harding ESE, 2001b) and in greater detail in EPA-NE QAPP Worksheet #12a. Briefly, biological tissue, sediment, floodplain soil, and water samples from multiple sampling locations located along the Woonasquatucket River, shown below. The total number of samples collected from each sampling location is defined in EPA-NE QAPP Worksheets #9c and #12b.

Sampling Locations and Required Analytical (Chemistry) Parameters

Sample Matrix	Sample Type	Sampling Locations							Analytical Parameters													
		Greystone Mill Pond	Assapumsett Brook	Allendale Pond	Lymansville Pond	Manton Pond	Dyerville Pond	Total # Samples	Moisture	Lipid Content	PCB (aroclor)/Pest.	SVOC (a)	D/F/HCX/TCX	PCB Congeners (b)	Metals (c)	MeHg	Hardness	AVS/SEM	Grain Size	TOC	VOCs	Nutrients
Tissue (Fish)	Demersal	10	10	10	10	0	0	40	✓	✓	✓	✓	✓	✓	✓	✓						
	Pisc (fillet)	10	10	10	10	3	3	46	✓	✓	✓	✓	✓	✓	✓	✓						
	Pisc (offal)	10	10	10	10	0	0	40	✓	✓	✓	✓	✓	✓	✓	✓						
	Frog/Turtle	10	10	10	10	0	0	40	✓	✓	✓	✓	✓	✓	✓	✓						
Tissue (Diet)	Crayfish	3	1	3	4	0	0	11	✓	✓	✓		✓	✓	✓	✓						
	Emerging insects	5	0	5	5	0	0	15	✓	✓	✓		✓	✓	✓	✓						
	Earthworms	3	1	3	4	0	0	11	✓	✓	✓		✓	✓	✓	✓						
Tissue (Swallow)	Eggs	5	0	5	5	0	0	15	✓	✓	✓		✓	✓								
	Nestlings	5	0	5	5	0	0	15	✓	✓	✓		✓	✓								
	Stomach contents	3	0	3	3	0	0	9	✓	✓	✓		✓	✓								
	Liver	5	0	5	5	0	0	15	✓	✓	✓		✓	✓	✓	✓						
Tissue (ELS)	Eggs	–	–	–	–	–	–	21	✓	✓			✓	✓								
	Fish	–	–	–	–	–	–	7	✓	✓			✓	✓								
Sediment	Invert. Bioassay	1	1	3	3	0	0	8	✓		✓	✓			✓	✓		✓	✓	✓		
Sediment	Crayfish locations	3	1	3	4	0	0	11	✓		✓		✓	✓	✓	✓		✓	✓	✓		
Surface Water		3	2	3	2	0	0	10			✓	✓			✓		✓				✓	✓
Floodplain Soil		3	1	3	4	0	0	11	✓		✓	✓	✓	✓	✓	✓			✓	✓		

(a) Tissue samples will also be analyzed for TICs. Tissue SVOC analysis for PAHs only; Sediment, soil and water SVOC analysis includes PAHs, phenols, and phthalates.
(b) PCB congener analysis for all tissue, sediment, and soil samples will be conducted on 20% of the samples for an extended list of congeners (132 congeners including the 12 WHO PCBs); ELS tissue samples will be analyzed for the 12 WHO PCBs only.
(c) Aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.

EPA-NE QAPP Worksheet #9a - Rev. 10/99 (continued)

Project Description and Schedule

Sample Storage and Holding Times for Chemical Analyses:
Upon arrival at the laboratory, samples will be logged into laboratory's sample tracking system and the laboratory will maintain possession of the original sample custody logs that accompany the samples. Samples will be prepared for chemical analysis within specified holding times, as follows:

Sample Type, Storage and Holding Time Requirements for Chemical Parameters

Sample Type	Storage	Holding Times
Tissue	Frozen (at, or below, –20 °C)	SVOCs (PAHs), Pest/PCB: 1 year (40 days for extracts)
		Dioxins/Furans (w/HCX/TCX), PCBs: 1 year (1 year for extracts if held <-10°C)
		Metals: 6 mo Hg, MeHg: Hg 28 d (60-d for digestate)
Sediment/Soil	Frozen (at, or below, –20 °C)	SVOCs (PAHs), Pest/PCB: 1 year (a) (40 days for extracts)
		Dioxins/Furans (w/HCX/TCX), PCBs: 1 year
	Refrigerated (at approximately 4 °C)	Metals, SEM: 6 mo Hg, MeHg: 28 d (60-d for digestate)
	Frozen (at, or below, –20 °C)	AVS/SEM (sediment only): 14 d
	Refrigerated (at approximately 4 °C)	Grains size, TOC: 28 d
		SVOCs (phenols/phthalates): 14 d
Water	Refrigerated (at approximately 4 °C)	SVOCs (PAHs), Pest/PCB: 7 d (40 days for extracts)
		Metals: 6 mo Hg: 28 d
		VOCs: 14-d
		SVOCs (phenols/phthalates): 7-d
		Nutrients: 24-h for filtration (28-d for processed samples)

(a) EPA, 1992. EMAP Estuaries 1992 Virginian Province Quality Assurance Project Plan.

EPA-NE QAPP Worksheet #9a - Rev. 10/99 (continued)

Project Description and Schedule

Tissue Analysis Tasks:
Tissue samples will be analyzed for moisture content, methylene chloride extractable lipid content, PCB Aroclors, chlorinated pesticides, SVOCs (PAHs), tentatively identified compounds (TICs), dioxins/furans, HCX, TCX, PCB congeners, metals, and MeHg. Definitive data will be produced for each analytical task. All analytical tasks will be performed in a fixed laboratory following standard operating procedures (SOPs) which are provided in Attachment G. General descriptions of analytical methods are described below.

Tissue Processing

Fish will be processed as whole body and/or fillets and offal samples. The decision as to which fish will be processed as whole body, and which will be filleted, will be made after all samples are collected and inventoried. In addition, the decision whether to analyze 1) fish fillets with skin-on or skin-off and 2) turtle as edible muscle only or edible muscle combined with organs, fatty deposits, and eggs is dependent upon the results of the fish consumption evaluation; which will be conducted prior to field sampling. All fish processing decisions (*e.g.*, distribution as whole body vs. fillet and offal; fish fillets with skin-on vs. skin-off) will be documented in the project file and the data report submitted to EPA and NAE.

Tissue processing will be conducted at Battelle MSL. Tissue processing procedures will follow EPA's Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 1. Prior to homogenization all tools and utensils used will be cleaned thoroughly with a detergent solution, rinsed with tap water, soaked in 50% HNO_3 (reagent grade or better), for 12 to 24 hours at room temperature, and then rinsed with organics- and metal-free water. Fish that are to be processed will first be rinsed thoroughly with tap water, followed by a distilled water rinse. Gloves must be talc- or dust-free, and of non-contaminating materials (*i.e.* nitrile). Fish can be filleted on glass or PTFE cutting boards. Cutting boards will be rinsed with DI water between samples. A titanium knife will be used. Prior to filleting, scales will be removed if present. For scaleless fish only, the skin will be removed – provided that fish are to be analyzed without skin (see above).

Turtles should be processed after being frozen for approximately 48 hours. They should only be thawed to the point where it becomes possible to make an incision into the animal's body. All bony ridges located on the ventral side, as well as the plastron should be removed. Resect forelimbs, hindlimbs, neck, and tail muscle from the body. Remove all skin, claws, and bones. Turtle samples will be processed and homogenized as either edible muscle tissue only or as edible muscle tissue combined with organs, fatty deposits, and eggs (see above).

Homogenization Techniques — Samples will be homogenized by mortar and pestle or by using a blender (*i.e.*, Cuisinart). For example, samples with very small sample size (*e.g.*, nestling) may be freeze-dried first and then homogenized using a mortar and pestle following procedures described in the Task 15 QAPP for Centredale (11/8/00). This approach serves to minimize sample loss during homogenizing. Egg type samples, that do not require metals analysis, may be homogenized by using a stainless steel spatula. Otherwise all tissue samples will be homogenized using Cuisinart equipped with a titanium blade. Modifications to tissue processing techniques will be documented in the project file.

EPA-NE QAPP Worksheet #9a - Rev. 10/99 (continued)

Project Description and Schedule

After homogenization, samples will be split for metals and organic analyses (below). The organics samples (frozen) will be shipped by overnight freight to Battelle Duxbury and Columbus for chemical analysis.

Sample Mass, Container, Storage Conditions, Holding Time, and Shipping Requirements

Required Analysis	Sample Mass[a] (g wet)	Container	Storage Conditions	Holding Time	Shipping Address
Metals[b] and MeHg	15-g	Spex jars	Frozen (-20°C)	6-mo (Hg 28-d)	N/A – keep samples onsite at Battelle MSL for analysis
Dioxin/Furan, HCX and extended PCB congeners	20-g	125-mL pre-cleaned glass jar	Frozen (-20°C)	1 year	Attn. Henry Pham Battelle Columbus 505 King Ave Columbus, OH 43210 Phone: (614) 424-7849
PCB (as aroclor)/Pesticide, SVOCs (PAHs), Percent Moisture, Lipid Content	60-g	125-mL pre-cleaned glass jar	Frozen (-20°C)	1 year	Attn: Jim Hatch Battelle Duxbury 397 Washington Street Duxbury, MA 02332 Phone: (781) 952-5270

[a] *An additional 20-g for preparation of MS/MSD QC samples and an additional 10-g for preparation of replicate QC samples will* be removed from each SDG and tissue type (fish demersal, fish piscivorous, frog, turtle, crayfish, emerging insects, earthworms, swallow nestling, swallow eggs, swallow stomach contents, and swallow livers, as applicable).

[b] Aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.

Contingency Plan for Handling Small Samples — Some sample types (*e.g.*, swallow eggs, stomach contents, and liver) are expected to have very small sample sizes (<5-g wet). Samples with insufficient sample size to meet routine analytical requirements will be identified, and USACE NAE and EPA contacted to discuss viable options. Two options for consideration include:

- Prioritize select chemical analyses (*e.g.*, dioxins/furans/HCX/TCX. PCB congeners)
- Composite samples to achieve larger sample size and sub-sample for all planned analyses

Final decisions regarding how small samples will be handled will be documented in the project file and the data report submitted to EPA and NAE.

Laboratory achieved detection limits for samples with very small sample sizes will be higher than detection limits presented in EPA-NE QAPP Worksheet #9b.

EPA-NE QAPP Worksheet #9a - Rev. 10/99 (continued)

Project Description and Schedule

Moisture Content

Moisture content will be determined following Battelle Duxbury SOP 5-190. Briefly, 1 to 5-g of well mixed tissue homogenate is weighed into a pre-weighed, pre-baked, aluminum weighing pan. The pan is placed in a drying oven and dried overnight at ca. 105 °C. After approximately 24 h, the pan is removed from the drying oven and allowed to cool at room temperature for at least 30 min. The pan is reweighed and percent moisture determined as defined in Section 4.0 of the SOP.

Lipid content

Methylene chloride extractable lipid content will be determined following procedures described in Battelle Duxbury SOP 5-190. Briefly, after extraction and concentration, the tissue extract is transferred to a graduated cylinder, the volume adjusted to exactly 10-mL, and a 0.5-mL aliquot (measured using a calibrated syringe) removed and placed into a pre-weighed aluminum weighing pan. Pans are covered with foil and the extract allowed to air dry overnight or until methylene chloride is no longer visible. After drying, the pan is reweighed and the lipid content calculated as described in Section 4 of the SOP.

Chlorinated Pesticides/PCB Aroclors and Semi-Volatile Organics (PAHs)

Tissues will be extracted and cleaned following procedures in Battelle SOP 5-190, which are methods developed by Battelle in support of NOAA's National Status and Trends Mussel Watch Project (Peven and Uhler, 1993a). Approximately 10 to 30-g of wet tissue homogenate will be weighed into a Teflon extraction jar, spiked with the appropriate surrogate internal standard (SIS) compounds, combined with 75 mL DCM and sodium sulfate, macerated with a Tissuemizer and centrifuged. The extract will be decanted into an Erlenmeyer flask. This process is repeated a second time using an additional 75 mL DCM. A third extraction will be performed on the sample using 50 mL DCM and shaking on a shaker table for approximately 30 minutes. The sample is then centrifuged a third time and the solvent decanted into the Erlenmeyer with the rest of the sample extract. The combined extract will be dried over sodium sulfate, filtered (if necessary), and concentrated by Kuderna-Danish (KD) technique to approximately 10 mL. A measured aliquot of extract is removed for lipid determination (above). The remaining extract is concentrated to approximately 2 to 3 mLs and processed through an alumina cleanup column:

- Packing: 40 g F20 (2% deactivated) alumina, in DCM
- Elution: 275 mL DCM (to ensure Endrin aldehyde elution)

After alumina column cleanup, all sample extracts will be concentrated by KD and nitrogen blow down techniques to approximately 900-µL for additional HPLC cleanup (Battelle SOP 5-191 – using a "USACE PAH/PACB/pesticides with methoxychlor collection window"). The post-HPLC extract will be concentrated under nitrogen to approximately 1 mL, and spiked with recovery internal standard (RIS) compounds. The extract will be split qualitatively, one half going to GC/MS for SVOC (PAHs) analysis, and the other half solvent exchanged with hexane and transferred to GC/ECD for chlorinated pesticides /PCB Aroclors analysis.

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Note that a routine set of quality control samples will be prepared and analyzed with each batch of 20 or fewer samples (defined in EPA-NE QAPP Worksheet #9a) to monitor data quality in terms of accuracy and precision. In particular, it should be noted that two laboratory control samples (LCS) will be prepared with each analytical batch of samples. One of the LCS samples will be spike with a universal matrix spike solution that includes chlorinated pesticides, individual PCB congeners (18 congeners), and PAHs. (This same solution will also be used to fortify the matrix spike (MS) and matrix spike duplicate (MSD) QC samples contains.) The second LCS sample will be fortified with an alternative MS solution that contains Aroclor 1016 and Aroclor 1260 only. The second LCS will be used to demonstrate data quality in terms of accuracy for PCBs as Aroclors (as opposed to congeners). This approach will be used throughout the study – for all matrices (sediment/soil and water samples).

GC/ECD Analysis — Chlorinated Pesticides/PCB Aroclors will be analyzed by GC/ECD (Hewlett Packard 5890 Series 2 GC) using a 60-m DB5 column and hydrogen as the carrier gas (Battelle SOP 5-128). A minimum of a five-point calibration curve will be used for pesticide analysis ranging from approximately 0.008 to 0.3 µg/mL. A single point calibration at approximately 2 µg/mL will be used for Technical Chlordane and PCB Aroclors analysis. And a single point calibration at approximately 4 µg/mL will be used for Toxaphene analysis

The total PCB will be determined as the most predominant Aroclor formulation, or mixture of two major Aroclor formulations. If, based on the review of the data, it appears that the PCB composition of the samples is dominated by one Aroclor, then that formulation will be used for quantitation. If the PCB composition appears to be primarily a combination of two Aroclor formulations (*e.g.*, Aroclors 1248/1254 or 1254/1260), then a standard of those mixtures will be analyzed and used for quantitation and data reporting. The same approach will apply to other matrices (sediment/soil and water samples).

GC/MS Analysis — SVOCs (PAHs) will be analyzed by GC/MS in the SIM mode using a 60-m DB5 column and a Hewlett Packard 5972 (or 5973) detector (Battelle SOP 5-157).

Concentrations for all target analytes will be determined by the method of internal standard, using RISs for quantification. Sample results will be reported on wet weight basis.

Tentatively Identified Compounds (for fish, frog and turtle samples only)

Tentatively identification of unknown compounds will be performed for fish, frog, and turtle samples following Battelle Duxbury SOP 5-157. Briefly, Tentatively Identified Compound (TIC) reports shall be submitted in hard copy format. A completed Tentatively Identified Compound List form for each sample shall accompany the quant report for each sample. The concentration of the TIC in the sample (not in the extract) shall be reported. Chromatograms, mass spectra, and library matches will be used to support the identification of a compound and will be provided as part of the TIC data submission. Up to 10 organic compounds of greatest apparent concentration not listed in Worksheet #9b, excluding the surrogate and internal standard compounds, shall be identified tentatively using a forward search of the NIST (May 1992 release or later), or an equivalent mass spectral library. The following will be reported:

1) Substances with responses less than 10 percent of the internal standard (as determined by inspection of the peak areas or heights); and

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2) Substances which elute earlier than 30 seconds before the first SVOC listed in Worksheet #9b, or three minutes after the last SVOC listed in Worksheet #9b.

If, after careful review and in the technical judgement of the mass spectral interpretation specialist, no valid tentative identification can be made, the compound should be reported as follows:

- If the library search produces a match at or above 85%, report the first compound (highest).
- If the library search produces more than one compound at above 85%, report the first compound (highest).
- If the library search produces no matches at or above 85%, the compound should be reported as unknown. The mass spectral specialist should give additional classification of the unknown compound, if possible. (*e.g.*, unknown aromatic, unknown hydrocarbon, unknown acid type, unknown chlorinated compound). If probable molecular weights can be distinguished, include them.

An estimated concentration for non-target compounds tentatively identified will be quantitated by the internal standard method. Total area counts (or peak heights) from the total ion chromatograms will be used for both the TICs and the internal standard. A relative response factor (RRF) of one (1) will be assumed. The resulting concentration shall be qualified as "X" (estimated, due to lack of a compound specific response factor), and "N" (presumptive evidence of presence). An estimated concentration will be calculated for all TICs as well as those identified as unknowns.

Dioxin/Furan/HCX/TCX and PCB (extended congeners and/or 12 WHO)

Tissue samples will be extracted and analyzed for the seventeen 2,3,7,8-substituted PCDD/PCDF, HCX and TCX following the general procedures in EPA Method 1613, Revision B, as described in Battelle Columbus SOPs ASAT.II-001-02 and ASAT.II-002-02 with modifications noted below. Tissue samples will be extracted and analyzed for PCBs congeners following the general procedures in EPA Method 1668, Revision A, as described in Battelle Columbus Operations draft SOP ASAT.II-009-00 and as noted below. Note that all tissue samples with the exception of ELS tissue samples (eggs, fish) will be analyzed for an extended PCB congener list; whereas ELS tissue samples will only be analyzed for the 12 WHO PCBs.

Approximately 1- 10 g (wet weight) of each tissue will be spiked with isotopically labeled analogs of fifteen of the seventeen 2,3,7,8-substituted PCDD/PCDF and 27 PCB congeners for those samples which require both analyses. The spike level for samples which will receive both the PCDD/PCDF/HCX/TCX and PCB determinations will be twice the typical spike level recommended in the methods to accommodate splitting the sample extracts. Samples which require PCDD/PCDF/HCX/TCX analysis only will just receive the PCDD/PCDF labeled compounds at the typical method spiking level. Samples will be extracted with methylene chloride: hexane (1:1) in a Soxhlet apparatus for a minimum of sixteen hours. Alternatively samples may be extracted by an Accelerated Solvent Extraction (ASE) procedure which is currently undergoing method demonstration. Sample extracts requiring both

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Project Description and Schedule

PCDD/PCDF/HCX/TCX and PCB analysis will be split in half prior to separate cleanups for PCDD/PCDF/HCX/TCX and PCB. The entire extract for samples requiring only PCDD/PCDF/HCX/TCX will be put through cleanup for those analytes.

All extracts for PCDD/PCDF/HCX/TCX analysis and will be spiked with $^{37}Cl_4$-2,3,7,8-TCDD cleanup standard, partitioned against acid solutions, and processed through acid/base silica, alumina, and carbon Celite columns. Extracts will be spiked with $^{13}C_{12}$-1,2,3,4-TCDD/$^{13}C_{12}$-1,2,3,7,8,9-HxCDD recovery standard and concentrated to a final volume of 20 µL.

All extracts for PCB analysis will be spiked with 28L/111L/178L isotopically labeled cleanup standard. Samples will be partitioned against acid solutions and processed through silica and carbon/Celite cleanup columns. Gel Permeation Chromatography (GPC) may be used as an optional cleanup procedure. Extracts will be spiked with 9L/52L/101L/138L/194L, recovery standard and concentrated to a final volume of 20 - 50 µL.

Sample extracts will be analyzed by high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) in the selected ion monitoring mode (SIM) at a resolution of approximately 10,000. Initial analysis for PCDD/PCDF/HCX/TCX will be on a DB-5 or equivalent column. Because 2,3,7,8-TCDF is not completely separated from all of the other TCDF isomers on the DB-5 column, second column confirmation of 2,3,7,8-TCDF levels above the lowest calibration level in the initial analysis will be carried out on a DB-Dioxin or DB-225 column. Initial analysis for PCBs will be on an SPB-Octyl or equivalent column. Second column confirmation of any co-eluting PCBs is not planned. All analytes will be quantified by isotope dilution or by the method of internal standards using surrogate compounds.

Concentrations of the seventeen 2,3,7,8-substituted PCDD/PCDF and PCB congeners in tissues will be reported on a wet weight basis. Total concentrations of dioxins and furans in a given level of chlorination will be reported by summing the concentrations of all isomers identified within the level of chlorination, including both 2,3,7,8-substituted and non-2,3,7,8-substituted isomers. Dioxin/furan results will also be reported as 2,3,7,8-TCDD Toxic Equivalents (TEQ). The TEQ values will be calculated by multiplying concentrations for each isomer by its Toxicity Equivalency Factor (TEF). The TEQs for each isomer detected within a sample will be summed to report a total TEQ value for each sample.

HCX will be determined by the analysis of an initial calibration curve. Due to the lack of commercially available labeled HCX standard, HCX will be identified and quantitated in the following way:

- Peaks at ion mass 389.8156 and 391.8127 need to co-elute within two seconds.
- Ratio of peak areas for ion masses M+4/M+6 must be 2.31 ± 15%.
- The signal to noise ratio of peaks at the M+4 and M+6 ion masses must be > 2.5.
- Response factors for HCX will be generated using either $^{13}C_{12}$-1,2,3,7,8,9-HxCDF or $^{13}C_{12}$-1,2,3,7,8,9-HxCDD as the internal standard for quantitation.

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Due to the lack of commercially available labeled TCX standard, TCX will be identified by the results of a full scan analysis on the native standard to determine the retention time and to identify the ion masses. TCX will be quantified against the closest eluting labeled tetra-dioxin or tetra-furan using an assumed response factor of one unless an initial calibration curve can be generated.

Metals

Percent moisture will be determined for the tissue samples by freeze-drying, following Battelle MSL SOP MSL-C-003. Tissue samples will be digested following MSL SOP MSL-I-024 for mixed acid tissue digestion. Approximately 0.3 grams of tissue will be digested with nitric and hydrochloric acid (aqua regia digestion) by oven heating. Chloride can be an interfering element for some metals; therefore, a second digestion may be necessary where the samples are digested using nitric and hydrofluoric acids.

Samples will be analyzed for some metals following MSL SOP-MSL-I-022 for the determination of elements in aqueous and digestate samples by ICP/MS. Sample material in solution is introduced by pneumatic nebulization into a radio-frequency plasma where energy-transfer processes cause desolvation, atomization and ionization. The ions are extracted from the plasma through a differentially pumped vacuum interface and separated on the basis of their mass-to-charge ratio by a quadrapole mass spectrometer having a minimum resolution capability of 1 amu peak width at 5% peak height. The ions transmitted through the quadrapole are detected by a continuous dynode electron multiplier assembly and the ion information processed by a data handling system.

Some metals will be analyzed following SOP MSL-I-027 for the determination of metals in aqueous and digestate samples by ICP/AES. The measurement of atomic emission by elements is obtained by an optical spectroscopic technique. Samples are nebulized and the aerosol that is produced is transported to the plasma torch where dissociation and excitation occurs. Characteristic atomic-line emission spectra are produced by a radio-frequency ICP. The spectra are dispersed by an echelle-grating spectrometer and the intensities of the emission lines are monitored by a segmented-array charge coupled-device detector (SCD).

Other metals may be analyzed following SOP MSL-I-029 for the determination of metals in aqueous and digestate samples by GFAA. Following an appropriate digestion, an aliquot of each sample is injected into a graphite furnace. Using a lamp emitting light at a wavelength characteristic to the element to be determined, the absorption of light is measured during sample atomization.

Samples will be analyzed by CVAA for Hg following MSL SOP MSL-I-016 (Attachment E). Mercury ions in a digestate are reduced by acidic stannous chloride to ionic Hg, then carried through a flow cell on a stream of inert gas. A photometric detector measures the luminous intensity of monochromatic light that has passed through the sample and compares it with the luminous intensity of the same light that has passed through a reference beam.

Metals results will be reported on a dry weight basis and converted to a wet weight basis, using the following equation:

$$\text{Wet Weight Conc.} = \text{Dry Weight Conc.} \times \text{Percent Dry Weight}$$

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MeHg

Tissue samples will be digested with potassium hydroxide (KOH)/methanol (MeOH) reagent prior to analysis. Samples will be analyzed following MSL SOP MSL-I-015-05.

MeHg results will be reported on a dry weight basis and converted to a wet weight basis, using the following equation:

$$\text{Wet Weight Conc.} = \text{Dry Weight Conc.} \times \text{Percent Dry Weight}$$

Sediment/Soil Analysis Tasks:
Sediment and soil samples will be analyzed for moisture content, PCB Aroclors, chlorinated pesticides, SVOCs (PAHs, phenols, and phthalates), dioxins/furans, HCX, TCX, PCB congeners, metals, MeHg, AVS/SEM (sediment only), grain size, and TOC. Definitive data will be produced for each analytical task. All analytical tasks will be performed in a fixed laboratory following standard operating procedures (SOPs) which are provided in Attachment G. General descriptions of analytical methods are described below.

Moisture Content

Moisture content will be determined following Battelle Duxbury SOP 5-192. Approximately 5 to 10 g of each original sediment/soil sample will be taken for moisture content determination. The sample aliquot will be dried to a constant weight and weighed to the nearest 0.01 g.

Chlorinated Pesticides/PCB Aroclors and Semi-Volatile Organics (PAHs)

Sediment/soil samples will be extracted for SVOCs (PAHs) and chlorinated pesticides/PCB Aroclors following Battelle Duxbury SOP 5-192. This method was developed by Battelle in support of NOAA's National Status and Trends Mussel Watch Project (Peven and Uhler, 1993a). Briefly, approximately 30 g of wet sediment material will be weighed into a Teflon extraction jar and spiked with the SIS compounds. Next, the sample will be extracted three times with 100 mL DCM using shaker techniques. After each extraction, the sample will be centrifuged, and the solvent extract decanted into a receiving vessel. The combined extract will be dried over sodium sulfate, concentrated to approximately 2 to 3 mLs using Kuderna-Danish and nitrogen evaporation techniques. Sample extracts may be treated with activated copper to remove elemental sulfur. The extract is processed through an alumina cleanup column:

- Packing: 40 g F20 (2% deactivated) alumina, in DCM
- Elution: 275 mL DCM (to ensure Endrin aldehyde elution)

Size-exclusion high-performance liquid chromatography (HPLC) will be used to further clean the concentrated extract (SOP 5-191; using the "USACE PAH/PACB/pesticides with methoxychlor collection window"). This procedure removes common contaminants including elemental sulfur that interfere with instrumental analysis. The post-HPLC extract will be concentrated under nitrogen to

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Project Description and Schedule

approximately 1 mL, fortified with RIS that are used for quantification, and split for SVOC (PAHs) and chlorinated pesticides/PCB Aroclors analyses by GC/MS and GC/ECD, respectively. The extract for GC/ECD analysis will be solvent exchanged into hexane prior to analysis.

GC/MS and GC/ECD analyses and QC sample preparation will follow procedures described above for tissue samples. Concentrations for all target analytes will be determined by the method of internal standard, using RISs for quantification. Sample results will be reported on a dry weight basis.

Dioxin/Furan/HCX/TCX and PCBs (extended congeners)

Sediment and soil samples will be processed and reported in the same manner as described for tissues (above) except that methylene chloride or toluene will be used as the Soxhlet extraction solvent. Additionally, sample extracts will undergo both acid and base partitioning in the cleanup process.

Sediments/soils will be reported on a dry weight basis. The % dry weight will be determined as follows: Labeled aluminum boats will be weighed and the weight recorded in the lab record book (LRB). Approximately 10g of each sample will be weighed onto individual pre-weighed, labeled aluminum boats and the weight of each recorded in the LRB. The samples will be dried in an oven overnight at 100°C. After the samples have cooled to room temperature the weight will be taken and recorded again and the percent dry weight determined.

Metals

Sediments and soils will be freeze-dried at MSL, then homogenized using a Spex Ball Mill. Percent moisture will be determined for sediment and soil samples, following Battelle MSL SOP MSL-C-003.

Sediment and soil samples will be digested following MSL SOP MSL-I-004, sediment evaporation digestion using nitric acid, hydrogen peroxide and hydrofluoric acids. In some instances, certain metals are better quantified using an aqua regia digestion, following MSL SOP MSL-I-006-01, mixed acid digestion.

Samples will be analyzed for metals following SOP-MSL-I-022 (ICP/MS), SOP MSL-I-027 (ICP/AES), and/or SOP MSL-I-029 (GFAA). Samples will be analyzed by CVAA for Hg following MSL SOP MSL-I-016. Results will be reported on a dry weight basis.

MeHg

Sediment and soil samples will be distilled or extracted into a clean water matrix prior to analysis. Samples will be analyzed following MSL SOP MSL-I-015. Results will be reported on a dry weight basis.

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Acid Volatile Sulfide (AVS) and Simultaneously Extracted Metals (SEM)

For sediment samples, AVS is converted to hydrogen sulfide by the addition of hydrochloric acid at room temperature. The hydrogen sulfide is purged from the sample by an inert gas and trapped in a sodium hydroxide solution. With the addition of a mixed-diamine reagent the sulfide is converted to methylene blue and measured on a spectrometer. The acid produced in this method is then analyzed for simultaneously extractable metals (SEM); metals solubilized during the acidification step. All SEM metals except Hg will be analyzed following MSL SOP MSL-M-001; Hg will be analyzed following SOP MSL-I-016. AVS will be determined following MSL SOP MSL-C-001. AVS is analyzed with a Beckman DU-8 Spectrophotometer.

Grain Size

This method covers the quantitative determination of the distribution of particle sizes in soils. The distribution of particle sizes larger than 74μm (retained on the No. 200 sieve) is determined by sieving, while the distribution of particle sizes smaller than 74μm is determined using a hydrometer to secure the necessary data.

Each sample is homogenized using a stainless steel spatula. Separate grain size and water content aliquots are secured. The grain size aliquot is treated with 30% hydrogen peroxide to remove organic matter, and dispersed in a solution of sodium hexametaphosphate. The course-grained fraction (>74μm) is separated from the fine-grained fraction (<74μm) by sieving the sample through a No.200 sieve. The portion remaining on the No. 200 sieve is washed into a beaker and dried. This dried fraction is sorted through a series of nested sieves to provide the distribution of course-grained particles.

The fraction passing the No. 200 sieve is washed into a hydrometer cylinder and brought to volume. The sample is stirred and hydrometer readings are taken at 2, 5, 15, 60, 250, and 1440 minute intervals. The resulting data are combined with the sieve data to generate a grain size distribution curve. Percent, gravel and sand values may be calculated directly from the sieve data, while the silt and clay values are read from the graph.

Total Organic Carbon

This method covers the determination of total organic carbon in sediment and soil samples. An aliquot of sample is secured and dried at low temperature (70°C). The sample is ground and acidified with dilute solution (pH<2) of HCl to remove inorganic carbon. The sample is rinsed with distilled water until the pH is 7. The sample is dried to remove water. A small aliquot of sample is weighed into a precombusted sample boat and combusted at 900°C in a stream of oxygen to convert organic substances to CO_2. The CO_2 stream is scrubbed to remove interferants such as water vapor, NO_X and SO_X, and swept into the coulometer cell. The amount of CO_2 produced is measured, recorded digitally, and printed as a hard copy report.

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Project Description and Schedule

Semi-Volatile Organics (phenols and phthalates)

Sediments and soils will be analyzed for SVOCs – as phenols and phthalates – at STL Baltimore. Sediment and soil extraction procedures will follow SOPs STL-M-3520 and STL-M-3540C. The solid sample will be mixed with anhydrous sodium sulfate and extracted using methylene chloride in a Soxhlet extractor for 16-24 hours. The extract will be dried, concentrated, and cleaned prior to analysis. Clean-up procedures will follow SOP STL-M-3640A, for Gel-Permeation cleanup. The GPC column will be calibrated to determine the range for the analytes of concern. The extract will be concentrated to 4.0 mL (or a multiple of 4) and half of it is loaded onto the GPC column. The column will be eluted with the appropriate amount if methylene chloride and the appropriate fraction will be collected. The final extract will then be concentrated to one half of the target final volume. This will account for the dilution factor of 2.

Extracts will then be analyzed for phenols and phthalate by GC/MS following SOP STL-M-8270-C. Semi volatile compounds will be introduced to the GC/MS by injecting the sample extract into a GC with a narrow-bore fused silica capillary column. Analytes eluted from the capillary column will be introduced into the mass spectrometer by direct connection. Identification of target analytes will be accomplished by comparing their mass spectra with the electron impact spectra of authentic standards. Quantification will be accomplished by comparing the response of a major (quantitation) ion relative to an internal standard with a 5-point calibration curve. Results will be reported on a dry weight basis.

Water Analysis Tasks:
Surface water samples will be analyzed for PCB Aroclors, chlorinated pesticides, SVOCs (PAHs, phenols, and phthalates), metals, hardness, VOCs, and nutrients. Nutrient parameters include: biological oxygen demand (BOD), dissolved inorganic nutrients (DIN), total dissolved nitrogen (TDN) and phosphorus (TDP), total nitrogen (TN) and phosphorus (TP), dissolved organic carbon (DOC), total organic carbon (TOC), and total suspended solids (TSS). Definitive data will be produced for each analytical task. All analytical tasks will be performed in a fixed laboratory following standard operating procedures (SOPs) which are provided in Attachment G. General descriptions of analytical methods are described below.

Chlorinated Pesticides/PCB Aroclors and Semi-Volatile Organics (PAHs)

Water samples will be extracted for SVOCs (PAHs) and chlorinated pesticides/PCB Aroclors following Battelle Duxbury SOP 5-200. Briefly, 2-L of water sample (measured using a graduated cylinder) is transferred to a separatory funnel, extraction solvent added (120 mLs methylene chloride), and the sample fortified with SIS compounds. Samples are serially extracted three times using separatory funnel techniques. The combined extract is dried over sodium sulfate and concentrated to 1 mL using Kuderna-Danish and nitrogen evaporation techniques. Optional alumina column and HPLC (SOP 5-191) cleanup may be performed. The final extract (1 mL) is fortified with RIS and split for SVOC (PAHs) and chlorinated pesticides/PCB Aroclors analyses by GC/MS and GC/ECD, respectively. The extract for GC/ECD analysis will be solvent exchanged into hexane prior to analysis.

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GC/MS and GC/ECD analysis and QC sample preparation follows methods described above (Tissue Analysis Task). Concentrations for all target analytes will be determined by the method of internal standard, using RISs for quantification. Results are reported on a volume basis.

Metals

Water samples will be filtered as appropriate and acidified to a pH less than 2. Total recoverable metal samples will be acid digested, then analyzed according to MSL SOP MSL-I-022-02 for ICP/MS determination of elements, MSL SOP MSL-I-027 by ICP/AES, and/or SW846 7742 for HGAA/FIAS. Dissolved samples will be analyzed direct following MSL SOP MSL-I-022. Dissolved and total samples will be analyzed by CVAF for Hg, following MSL SOP MSL-I-013. Results will be reported on a volume basis.

Hardness

Hardness will be calculated from the concentration of Ca and Mg determined according to MSL SOP MSL-I-022. Results will be reported on a volume basis.

Volatile Organic Compounds

Water samples will be analyzed for VOCs at STL Baltimore following SOPs STL-M-5030B and STL-M-8260B. Samples will be prepared for analysis using the purge-and-trap procedure described in SOP STL-M-5030B. A 25-mL purge will be used. Purged sample components will be trapped in a tube containing suitable sorbent materials. After purging is complete, the tube will be back flushed with helium to desorb trapped sample components. The analytes will be desorbed directly to a large bore capillary for analysis.

Compounds will be identified using GC/MS instruments following SOP STL-M-8260B. Qualitative identifications will be confirmed by analyzing standards under the same conditions used for samples and comparing resultant mass spectra and GC retention times. Each compound will be quantified by relating the MS response for an appropriate selected ion produced by that compound to the MS response ion produced by an internal standard.

Semi-Volatile Organics (phenols and phthalates)

Water samples will be analyzed for phenols and phthalates at STL Baltimore following STL-M-3520, STL-M-3640A, and STL-M-8270-C. Briefly, a measured amount of sample (usually 1 L) will be placed into a continuous liquid-liquid extractor. The pH will be adjusted as necessary. Samples will be extracted for 18-24 hours using methylene chloride. Extracts will be dried and cleaned (if necessary). Clean-up procedures will follow SOP STL-M-3640A, for Gel-Permeation cleanup.

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Extracts will then be analyzed for phenols and phthalate by GC/MS following SOP STL-M-8270-C. Semivolatile compounds will be introduced to the GC/MS by injecting the sample extract into a GC with a narrow-bore fused silica capillary column. Analytes eluted from the capillary column are introduced into the mass spectrometer by direct connection. Identification of target analytes will be accomplished by comparing their mass spectra with the electron impact spectra of authentic standards. Quantification will be accomplished by comparing the response of a major (quantitation) ion relative to an internal standard with a 5-point calibration curve. Results will be reported on a volume basis.

Biochemical Oxygen Demand (BOD)

Water will be collected in 1-L unpreserved plastic bottles and held at 4°C ± 2°C until analyzed. The NPDES holding time for BOD is 48 hours. If the sample pH is outside the range of 6.5-8, the sample will be neutralized to approximately 7 with 1 N H_2SO_4 or 1 N NaOH. Samples containing more than 9 mg/L of dissolved oxygen at 20°C are supersaturated and must be deoxygenated before being used to determine BOD. To reduce oxygen content, a bottle will be partially filled with sample and shaken vigorously.

BOD samples will be prepared and analyzed following the SOP *Biochemical Oxygen Demand (5 Day)* (EAL-M-405.1-01). BOD bottles will be filled with three or four sample dilutions bracketing the expected BOD value. The initial dissolved oxygen of the samples, blanks, and QC sample will be measured using a YSI DO meter Model 54 or 57. The samples will then be incubated at 20 ± 1°C for five days. On the fifth day, the final dissolved oxygen in each bottle is measured. Only those dilutions showing a residual dissolved oxygen of at least 1 mg/L and a depletion of at least 2 mg/L are used in the calculation of BOD, according to the equation:

$$\text{BOD (mg } O_2\text{/L)} = (DO_i - DO_f - S)\ DF$$

Where: DO_i = initial dissolved oxygen of prepared sample (mg/L)
DO_f = final dissolved oxygen of prepared sample (mg/L)
S = seed correction factor (mg/L0
DF = dilution factor = $300/V_s$
V_s = volume of sample used (mL)

For dilution water blanks that have oxygen depletion more than the recommended 0.2 mg/L, it is possible to correct the BOD data for the dilution water blank. The formula listed below only applies when the high value for the blank is due to the dilution water and not to dirty bottles that might not affect all samples. The effect of a high blank will be evident when the BODs calculated from a series of dilutions of a sample do not agree, the BOD value increasing as the volume of sample decreases. A dilution water correction must be calculated for each dilution used and the resulting BOD values flagged to indicate that the dilution water blank was out of control.

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Project Description and Schedule

The correction factor for the dilution water blank, B, is calculated for each sample volume used following the equation:

$$B\ (mg/L) = (Do_i - Do_f)\ \frac{300 - V_s}{300}$$

where: Do_i = initial dissolved oxygen of dilution water blank (mg/L)
Do_f = final dissolved oxygen of dilution water blank (mg/L)
V_s = volume of sample diluted (ml)

Dissolved Inorganic Nutrients (DIN)

A 60-mL syringe will be used to inject sample water from a transfer jar, through an in-line filter (Gelman glass acrodisc filter) and directly into autoanalyzer vials used for the various analyses. After rinsing three pre-labeled autoanalyzer cups three times, the cups are filled ¾ full. The caps are also sample rinsed. The vials are capped and then frozen. The samples will remain frozen until analyzed. Maximum holding time to analysis for these samples is 28 days.

D'Elia, *et al.* (1997) describes the analysis of dissolved inorganic nutrients. The filtrate concentrations of ammonium and nitrite will be measured on a Technicon TrAAcs-800 Nutrient Analyzer and the nitrate + nitrite, and phosphate will be measured on a Technicon Autoanalyzer II. Both these instruments' method of detection is colorimetric, and they automate standard manual techniques for the analysis of nutrients. The analysis of ammonium will be based on the technique of Solorzano (1969), whereby absorbance of an indophenol blue complex is measured at 630 nm. Nitrite will be measured by the method of Bendschneider and Robinson (1952). The total of nitrate and nitrite is determined by reducing all nitrate in the sample to nitrite and analyzing for nitrite as above. The concentration of nitrate is obtained by the difference between nitrate + nitrite and nitrite only. The reduction is accomplished using a cadmium column (Morris and Riley 1963). The analysis of phosphate will be based on the molybdate blue procedure of Murphy and Riley (1962).

Total Nitrogen and Total Phosphorus (TN/TP)

Samples for total nitrogen and total phosphorus (TN/TP) will be dispensed into clean 30-mL glass screw cap test tubes that have been rinsed with sample three times. Exactly 10 mL of sample is then added to the tube. Samples will be stored frozen until analysis. Maximum holding time to analysis for these samples is 28 days.

CBL will use the Technicon Autoanalyzer II to perform this analysis according to the methods of D'Elia *et al.* (1997) and Valderrama (1981). This method is a persulfate oxidation technique for nitrogen and phosphorus where, under alkaline conditions, nitrate is the sole nitrogen product and phosphate is the sole phosphorus product. Dissolved organic P is the difference between total dissolved P and Phosphate. Dissolved organic N is the difference between total dissolved N and dissolved inorganic nitrogen components.

EPA-NE QAPP Worksheet #9a - Rev. 10/99 (continued)

Project Description and Schedule

Total Dissolved Nitrogen and Phosphorus (TDN & TDP)

Samples for total dissolved nitrogen and phosphorus will be obtained from the filtrate collected from filtering a 60-mL sample through the Gelman acrodisc (see DIN procedure). A 10-mL aliquot is placed into a 30 mL clean glass screw cap test tube after that tube has been sample rinsed three times. Samples will be stored frozen until analysis. Maximum holding time to analysis for these samples is 28 days.

CBL will use the Technicon Autoanalyzer II to perform this analysis according to the methods of D'Elia *et al.* (1997) and Valderrama (1981). This method is a persulfate oxidation technique for nitrogen and phosphorus where, under alkaline conditions, nitrate is the sole nitrogen product and phosphate is the sole phosphorus product. Dissolved organic P is the difference between total dissolved P and Phosphate. Dissolved organic N is the difference between total dissolved N and dissolved inorganic nitrogen components.

Total and Dissolved Organic Carbon (TOC/DOC)

Samples for total organic carbon (TOC) will be processed in the following manner. A clean thirty mL Teflon screw cap bottle will be sample rinsed three times. The bottle will then be filled 2/3 full with sample and frozen. Samples for dissolved organic carbon (DOC) will follow the same procedure with sample that has been filtered through the Gelman acrodisc. Samples will be stored frozen until analysis. Maximum holding time to analysis for these samples is 28 days.

CBL's Shimadzu 5000 Total Carbon Analyzer will be used to perform both analyses. This instrument uses an automated, high-temperature (680 °C) combustion technique where the sample is oxidized into carbon dioxide. A platinum catalyst greatly enhances this reaction. The carbon dioxide content is measured via a non-dispersive infrared detector (Menzel and Vaccaro 1964).

Total Suspended Solids (TSS)

Whole water samples for TSS will be collected in 1-L dark bottles from surface depths. The samples will be stored on ice (~4°C) and in the dark and delivered to CBL for processing and analysis.

Within 24 hours of delivery to the analytical laboratory, samples for total suspended solids (TSS) determination will be processed in a particulate-free area according to APHA method 208D. Using a vacuum-filter system, up to 500 mL of water will be passed through a pre-cleaned and pre-weighed 0.7-micron pore size Whatman GF/F 47-mm-diameter membrane filter. Should the filtration rate slow substantially, a lesser volume will be processed. Duplicate filters will be processed in parallel for each sample. Filters will be folded in half, placed in aluminum foil pouches, and stored frozen. Filters will be dried as per APHA method 208-D. TSS will be calculated as the net filter weight and will be reported as the mean of the duplicate samples.

EPA-NE QAPP Worksheet #9a - Rev. 10/99 (continued)
Project Description and Schedule

Toxicological Testing Tasks:

Catfish Early Life Stage (ELS) Testing – In order to evaluate the lethal and sublethal effects of dioxin/furan, PCB, and HCX associated with sediments from Allendale Pond in the vicinity of Centredale Manor in Providence, RI, a catfish early-life stage (ELS) test will be conducted. Details concerning test methods, quality control/quality assessment, scheduling, method assumptions, and references are provided in Attachment E.

Sediment Bioassay Testing – Whole sediment samples will be analyzed for toxicity following the general procedures outlined in EPA/600/R99/064; Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated contaminants to Freshwater Organisms. Specifically, chronic toxicity tests will be conducted against *Hyalella azteca* and *Chironomus tentans* following the procedures outlined in Attachment F and GLEC SOPs (defined in EPA-NE QAPP Worksheet #20 and provided in Attachment G). In these tests, each species are exposed to whole sediment samples over a specified period of time, and survival, growth, and reproduction of the organisms are monitored throughout the toxicity tests. Adverse effects due to exposure to the sediment are determined by comparing reference and laboratory control sediment exposure results to the results obtained from field collected sediments.

Quality Control Tasks:
A routine set of fixed laboratory quality control (QC) samples will accompany every set of samples processed and analyzed for this project. The type and frequency of fixed laboratory QC samples are defined in EPA-NE QAPP Worksheet #24a; QC monitoring for toxicity testing is defined in Attachments E (ELS) and F (bioassay).

In general, QC samples for chemical and nutrient testing include:

Chemistry

- one procedural/method blank (PB)
- one laboratory control sample (LCS)
- one matrix spike/matrix spike duplicate set (MS/MSD)
- one standard reference material (SRM)
- multiple surrogate internal standards (SIS) per sample
- one independent control sample (internal QA only)
- one laboratory (analytical) sample duplicate (DUP)

Nutrients

- one procedural blank (PB)
- one laboratory (analytical) sample duplicate (DUP)
- one standard reference material (SRM)
- one matrix spike (MS)

Toxicity Testing

In general, quality control in toxicity tests is addressed by replication and in the case of whole sediment bioassay testing – quality control is also addressed by minimum survival and growth criteria and acceptable young production requirements. In addition, laboratory control sediments are tested with each group of field collected sediments tested. Quality control procedures for catfish ELS and whole sediment bioassay toxicity testing are discussed in detail in Attachments E and F, respectively.

EPA-NE QAPP Worksheet #9a - Rev. 10/99 (continued)

Project Description and Schedule

Secondary Data:
Not applicable.

Data Management Tasks:
GC/MS data (and organics data at STL) will be acquired and reduced on Hewlett-Packard PC based chemstation minicomputers with dedicated chromatography software (EnviroQuant). GC/ECD data will be acquired and reduced by the Thermo Lab Systems XCHROME System. The dioxin/furan, HCX, TCX, and extended PCB congener data generated by GC/HRMS will be acquired on a Alpha station personal work station 600AU using VG OPUS and OPUSquan software. All GC/MS, GC/ECD, and GC/HRMS data files will be transferred electronically to a PC so that the data can be incorporated into an electronic database or spreadsheets for final quantification and tabular result presentation. ICP/MS, ICP/AES, GFAA and CVAA/CVAF data are acquired electronically with hardcopy reports and data are electronically transferred to a spreadsheet. Data generated for grain size are hand entered; all other physical chemistry measurements (TOC, %total solids) are acquired on instrument software and downloaded to spreadsheets.

Results of the nutrient (DIN, TN/TP, and TDN/TDP) analyses are continuously recorded by strip chart recorders or by computer using an IBM compatible DP500 software system by Labtronics Inc. Each recorder can simultaneously monitor two separate analyses and the DP500 system can collect and analyze data from up to four different detectors simultaneously. One of the two Shimadzu 5000 Analyzers used for TOC/DOC analyses is interfaced to a computer, and the sample concentrations are calculated by the computer's software. The Mettler AE100 has an interface and software package (Mettler Balance Link) that automatically records the weights into a LOTUS file and calculates TSS based on volume.

Gateway 2000 Pentium microcomputers with complete spreadsheet packages are used heavily in data reduction and management. Nutrient, TOC/DOC, and TSS data are input into a pre-determined format onto IBM compatible floppy disks in LOTUS-123 spreadsheet format on a microcomputer. Print-outs of the data are made and verified by laboratory personnel. Any necessary corrections are noted and made. Any data indicating errors are given specific error codes. Final printed data files are created and sent along with an electronic copy to the client.

The appropriate analyst/data manager assigned to the project team will perform all data reduction. The final reduction of analytical chemistry data will account for the size of the processed sample and dilution factors. Data provided by participating laboratories will be requested in electronic format (Excel).

EPA-NE QAPP Worksheet #9a - Rev. 10/99 (continued)

Project Description and Schedule

Chemistry reports will include:

- Sample Identification
- Tissue results on a wet weight basis
  - ⇒ Moisture and lipid content – % wet
  - ⇒ SVOCs (PAHs), pesticides and PCB Aroclors – ng/g
  - ⇒ Dioxins/Furans, HCX and TCX – pg/g
  - ⇒ 132 PCB congeners, total PCB by chlorination level, and total PCB (sum of the detected 132 PCB congeners) – ng/g or pg/g, as appropriate
  - ⇒ Metals and MeHg – µg/g
  - ⇒ Reconstructed whole body (RWB) concentrations – all parameters – will be determined for fillet/offal samples only, as follows:

    $RWB = (C_F * P_F) + (C_O * P_O)$

    Where,

    C_F = concentration of contaminant in fillet
    P_F = proportion of fillet to whole body sample (= Weight Fillet/Weight Whole Body)
    C_O = concentration of contaminant in offal
    P_O = proportion of offal to whole body sample (= Weight of Offal/Weight of Whole Body)

- Sediment and soil results on a dry weight basis
  - ⇒ Moisture – %
  - ⇒ SVOCs (PAHs), pesticides, and PCB Aroclors – ng/g
  - ⇒ Dioxins/Furans, HCX and TCX – pg/g
  - ⇒ 132 PCB congeners, total PCB by chlorination level, and total PCB (sum of the detected 132 PCB congeners) – ng/g or pg/g, as appropriate
  - ⇒ Metals, MeHg and AVS/SEM– µg/g
  - ⇒ Grain size and TOC – %
- Water results on a volume basis
  - ⇒ SVOCs (PAHs), pesticides, and PCB Aroclors – ng/L
  - ⇒ Metals and hardness – µg/L
  - ⇒ SVOCs (phenols/phthalates) and VOCs – µg/L
  - ⇒ Nutrients – mg/L
- PB results – reported on a concentration basis to two decimal places.
- Recovery of SISs added to each sample – reported as whole numbers.
- Amounts expected and recovered, and percent recoveries, for MS, MSD, and LCS samples. Concentration data reported to two decimal places and recovery data reported as whole numbers.

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Project Description and Schedule

- The relative percent difference (RPD) between the MS and MSD results – reported to one decimal place.
- The average and relative percent difference of the duplicate sample analysis – RPD reported to one decimal place.
- Results of SRM analyses, certified values, and the percent difference (PD) between the results and the certified values. All PD results will be reported to one decimal place. *Note* – for SVOCs (PAHs) and Pest/PCBs analysis the PD is determined from the range of certified values (see EPA-NE QAPP Worksheet #24a, Attachment A).

Sample-specific detection limits will also be reported. Results reported to two decimal places.

Chemistry reports will also include a QA/QC narrative that define the QC criteria that were to be met along with results that were achieved. QA/AC narratives are further described in EPA-NE QAPP Worksheet #9a, Data Usability Assessment Tasks.

The following header information should be used, listed in this order on the final report tables:

Data Report Header Format

Header Information	Comments
Client Sample ID	
Laboratory Sample ID	
Sample Type	Tissue type (*e.g.*, nestling), Sediment, Soil and/or Water
Batch ID	
Moisture Content	Tissue, Sediment, and Soil samples only
Lipid Content (% wet)	Tissue samples only
Sample Wet Weight (g)	
Sample Dry Weight (g)	
Reporting Units	

Documentation and Records:
Documentation associated with laboratory analyses will include sample receipt and log-in records, sample processing logs, sample preparation records, analytical instrument printouts, and equipment logs. Initially, all data will be recorded either (1) electronically onto a computer storage media from laboratory systems or (2) manually into laboratory notebooks or on established data forms. All notes will be written in ink. Corrections to hand-entered data will be initialed, dated and justified. Complete forms, laboratory notebooks, or other forms of hand-entered data will be signed and dated by the individual entering the data. It will be the responsibility of the laboratory manager and/or task leader to ensure that all data entries and hand calculations are verified. Laboratory records of sample preparation will be maintained in bound laboratory record books. In addition to these documentation procedures, sample logs associated with field and laboratory custody and tracking will be maintained in project files.

EPA-NE QAPP Worksheet #9a - Rev. 10/99 (continued)

Project Description and Schedule

Data Packages:
Analytical Task Leaders will prepare a project-specific data package (project records), which will be submitted to the Quality Assurance Unit for an independent Quality Assurance review.

Data packages are considered a deliverable and will be maintained by the laboratory. Content and format of data packages prepared at Battelle Duxbury are defined below. *Note* – while the format of data packages prepared by participating laboratories may vary, the content will be consistent and will contain pertinent raw data elements (see Attachment C) necessary for third party validation. The format of data packages prepared at Battelle Duxbury is as follows.

Content of Data Packages Prepared at Battelle Duxbury

Section	Contents
Title Page	Project name; analysis parameter; Batch ID; matrix; approvals
Signature Page	Name (printed, signature, and initials) of laboratory staff
Workplan	Hardcopy of laboratory QAPP and Project-specific memorandums
Tables	Preliminary QC Checklist (summary of QC results evaluated against measurement performance criteria); Final hardcopy of Excel report tables
Misc. Docs.	Documentation of project-specific issues (corrective action, changes in scope, etc...) Data Validation Checklist – see Attachment D
Sample Prep	Hardcopy of sample preparation records
Calibrations	Initial and continuing calibration reports
Sample Data	Quantification reports for authentic and QC samples
Chromatograms	Sample chromatograms
Unused Data	File copy of data not used or reported

Each copy of the analytical data packages (for sediment, soil, and water only) will include the Region I DQO Summary Form. This form will be completed prior to sample collection and submitted to the participating laboratories with the sample custody forms.

One copy of each HRMS data package, including raw data, will be submitted to EPA-NE for Tier III validation. One copy of all other analytical data packages will be submitted to Environmental Standards for Tier II validation. Raw data are defined in Attachment C.

Assessment/Audit Tasks:
Quality assurance encompasses all planned and systematic activities necessary to assure management that the products generated, and the services performed by Battelle meet the quality standards established in this QAPP. The primary mechanism for accomplishing this goal is audits. Audits refer to the formal assessment of conformance to the QA Program and its effectiveness. During an audit, the agreement with QA policy documents (*e.g.*, SOPs) is evaluated, deficiencies are identified, and corrective action is

EPA-NE QAPP Worksheet #9a - Rev. 10/99 (continued)

Project Description and Schedule

taken. Ideally, audits also serve to increase awareness and understanding of QA policies and procedures. Mr. Mark Guilmain will serve as Battelle's QA Coordinator and is responsible for identifying areas for corrective action, coordinating the QA activities such as systems and data audits, and preparing reports to management for this project. QA Officers at participating laboratories will be responsible for coordinating and performing QA activities at participating laboratories. The identity of auditors and their qualification are presented in EPA-NE QAPP Worksheet #6. The following QA audits are planned for this project.

- A technical system (initiation) audit is conducted as part of the review of this QAPP to (1) ensure that the work assignment scope and all required elements are addressed adequately, (2) verify that all required SOPs are approved and current, and (3) to verify that all participants have the required qualifications and documented training to perform their assigned tasks.
- Performance audits are independent checks of routinely obtained data. One Certified or Standard Reference Material (CRM or SRM, respectively) will be incorporated into each batch of tissue chemistry samples (as applicable) to assess the accuracy and precision with which target analytes of known concentration are recovered from a representative matrix. The acceptance criteria are discussed in EPA-NE QAPP Worksheet #11b.

Data audits will be conducted for all reported data. These audits will reconstruct representative data from each sample based on sample processing records, instrument calibration factors (*e.g.*, response factors) and output (*e.g.*, area counts), and sample manipulations and spiking. Samples will be tracked from receipt and processing through analysis and reporting to ensure that the reported data are accurate, complete, and traceable. Section 17 discusses the reporting of audit results to management and Section16.2 describes corrective action procedures resulting from audit findings. A QA Statement submitted to the Project Manager with each deliverable describes the audit and review activities conducted to assess the deliverable accuracy, and any outstanding issues that could impact data quality. Results of QA audits will be reported to the Task Leader and Project Manager. The audit reports will define any errors, deficiencies, or deviations from the QAPP. The responsible analyst documents the corrective action on the audit report and submits the audit report to the Project Manager for review and approval. Battelle audit reports are available for review at Battelle Duxbury.

One on-site field audit will also be conducted by Ms. Rosanna Buhl, Battelle Duxbury's QA Officer (see EPA-NE QAPP Worksheet #27c).

The data reports submitted to USACE NAE will be reviewed by the appropriate Task Leaders, the Project Manager, and the Quality Assurance Unit.

Data Verification and Validation Tasks:
Data validation discussed in this QAPP describes what Battelle and other participating laboratories will perform internally. Data validation is the responsibility of those immediately responsible for overseeing and/or performing analyses, data entry, data reduction, and data reporting. The data validator will validate final report tables for accuracy and completeness (*i.e.*, calculation, manual entries). Battelle's procedures for data validation and review activities are described in SOPs 6-027 (Battelle Duxbury),

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Project Description and Schedule

SOPs ASAT.II-003 and ASAT.II-010 (Battelle Columbus), and MSL-Q-005 (Battelle MSL).

A series of reviews by technical personnel will be implemented to ensure that the data generated for this work assignment meet the data quality objectives. These reviews will include the following activities.

- Data and related project records will be reviewed by laboratory personnel at the end of each working day to ensure that analytical activities are completely and adequately documented.
- The Task Leaders will be responsible for reviewing analytical results and supporting documentation. The results of QC sample analyses will be compared to pre-established criteria as a measure of data acceptability.
- All hand-entered or transcribed data will be 100% validated.
- All calculations performed manually will be checked for accuracy. Calculations performed by software will be checked at a frequency sufficient to verify their accuracy.

All data will be validated to ensure that the measurement performance criteria (MPCs) described in EPA-NE QAPP Worksheet #11b have been met, instrument calibration and maintenance requirements also specified in EPA-NE QAPP Worksheet #21 have been met, and that the data are complete, accurate, and traceable.

All data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed at the Project Manager's discretion. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (below), and the rationale for accepting the analysis will be thoroughly documented.

Third Party Validation — PCDD/PCDF/HCX/TCX and PCB HRMS data will receive Tier III validation by EPA-NE. All other analytical chemistry data packages will receive Tier II validation by Environmental Standards.

Data Reporting Qualifiers – Chemistry

Data Qualifier	Definition	Data Qualifier	Definition
J	Detected, but below the detection limit[1]	~	QC value outside the accuracy or precision criteria goal (EPA-NE QAPP Worksheet #11b) – but meets contingency criteria.
E	Estimate; significant matrix interference.	B	Analyte detected at > detection limit and concentration in associated samples <10× blank levels.
T	Holding time exceeded	U	Not detected; sample-specific detection limit reported.
N	Presumptive evidence of presence	X	Estimated, due to lack of a compound specific response factor
#	Result from second column confirmation analysis	&	QC value outside the accuracy or precision criteria goal (EPA-NE QAPP Worksheet #11b).

Detection Limits (MDLs, QLs) are defined in EPA-NE QAPP Worksheet #9b; Achieved detection limits will be reported with the data.

[1]Analyte signal sufficient to confidently identify and quantify analyte (Battelle Duxbury standard is a signal-to-noise ratio of minimally 3:1), but concentration is below the reported detection limit.

EPA-NE QAPP Worksheet #9a - Rev. 10/99 (continued

Project Description and Schedule

Data Reporting Qualifiers - Nutrients

Qualifier	Description	Qualifier	Description
	Value is not qualified	Le	Dark, not reported
A	Not detected and <MDL	L	Analytical concentration reported from dilution
A	Over maximum detection limit (TNTC)	M	Initial
B5	Blank-corrected, blank <5 x MDL	N	Light bottle
B	Below limit of quantitation	P	Lab sample bottles mislabeled - caution data use
C	Ambient	R	Precision >DQO
E	Not reported	S	Suspect
E	Calibration level exceeded	T	Holding time exceeded
F	Value reported <MDL	V	Arithmetic mean
G	Recovery outside DQO	X	Matrix interference
G	Coalluting compound interferences	1	Present
H	Below standard curve	2	Absent
I	Interference from standard	P	Present, uncounted
J	Estimated value above detection limit		
L	Dark bottle		

DQO = Data Quality Objective; MDL = Method Detection Limit

Data Usability Assessment Tasks:
The review of quality control data is a critical step in the data validation process because quality control data that are within the QAPP acceptance criteria indicate that the sample processing and analysis systems are in control. Quality control data will be evaluated for usability as described in Figure 3 (EPA-NE QAPP Worksheet #30). EPA-NE QAPP Worksheet #24a describes the type of quality control samples that will be analyzed with each analytical batch and corrective action for out-of-control quality control data and instrumentation calibrations. All quality control data that do not meet the measurement performance criteria will be flagged (see above table of data qualifiers) and brought to the attention of the Task Leader and the Project Manager, who will determine the appropriate corrective action (*e.g.*, reanalysis or data reported with qualifiers).

QA/QC narratives will present quality control criteria and the quality control results. They will be prepared for each analytical batch and will describe any MPC exceedances and what, if any, impact they may have on the overall data.

Data usability will be performed by Harding ESE after the data have been validated. Details concerning data usability procedures will be discussed in Harding's Data Management Plan.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, FF, CF(Crayfish) and BD
Analytical Parameter: Chlorinated Pesticides and PCB Aroclors
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-9

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (ng/g wet weight)	Project Action ECO Goal* (ng/g wet weight)	Analytical Method[1]		Achievable Laboratory Limits (WET WT – ng/g)	
				MDLs	Method QLs	MDLs[2]	QLs[3]
4,4'-DDD	50-29-3	4	Not available	Not provided in 8080	Not provided in 8080	0.04	0.45
4,4'-DDE	72-54-8	2.83	As above	As above	As above	0.035	0.45
4,4'-DDT	72-55-9	2.83	0.87	As above	As above	0.025	0.45
Aldrin	309-00-2	0.0565	Not available	As above	As above	0.023	0.45
alpha-BHC	319-84-6	0.153	As above	As above	As above	0.03	0.45
alpha-Chlordane	5103-71-9	2.75 **	6020 **	As above	As above	0.021	0.45
beta-BHC	319-85-7	0.534	Not available	As above	As above	0.026	0.45
delta-BHC	319-86-8	20.59	As above	As above	As above	0.031	0.45
Dieldrin	60-57-1	0.06	27	As above	As above	0.025	0.45
Endosulfan I	959-98-8	247	Not available	As above	As above	0.033	0.45
Endosulfan II	33213-65-9	247	As above	As above	As above	0.049	0.45
Endosulfan Sulfate	1031-07-8	247	As above	As above	As above	0.052	0.45
Endrin	72-20-8	12.4	11.5	As above	As above	0.017	0.45
Endrin Aldehyde	7421-93-4	12.4	11.5	As above	As above	0.032	0.45
Endrin Ketone	53494-70-5	12.4	11.5	As above	As above	0.037	0.45
gamma-BHC	58-89-9	0.739	Not available	As above	As above	0.03	0.45
gamma-Chlordane	5103-74-2	2.75 **	6020 **	As above	As above	0.018	0.45
Heptachlor	76-44-8	0.214	Not available	As above	As above	0.027	0.45
Heptachlor Epoxide	1024-57-3	0.106	As above	As above	As above	0.019	0.45

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, FF, CF(Crayfish) and BD
Analytical Parameter: Chlorinated Pesticides and PCB Aroclors
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-9

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (ng/g wet weight)	Project Action ECO Goal* (ng/g wet weight)	Analytical Method[1]		Achievable Laboratory Limits (WET WT – ng/g)	
				MDLs	Method QLs	MDLs[2]	QLs[3]
Methoxychlor	72-43-5	206	Not available	Not provided in 8080	Not provided in 8080	0.037	0.45
Technical chlordane	57-74-9	Not available	As above	As above	As above	Not available	5.6 [b]
Toxaphene	8001-35-2	0.873	As above	As above	As above	As above	5.6 [b]
Aroclor-1016	12674-11-2	0.48	17	As above	As above	As above	5.6
Aroclor-1221	1104-28-2	0.48	17	As above	As above	As above	5.6 [b]
Aroclor-1232	11141-16-5	0.48	17	As above	As above	As above	5.6 [b]
Aroclor-1242	53469-21-9	0.48	17	As above	As above	As above	5.6 [b]
Aroclor-1248	12672-29-6	0.48	17	As above	As above	As above	5.6 [b]
Aroclor-1254	11097-69-1	0.48	17	As above	As above	As above	5.6 [b]
Aroclor-1260	11096-82-5	0.48	17	As above	As above	As above	5.6
Aroclor-1268	11100-14-4	0.48	17	As above	As above	As above	5.6 [b]
Aroclor, Total [a]	Not applicable	Not applicable	Not applicable	As above	As above	Not applicable	Not applicable

[1] There is no applicable EPA methods for analysis of Chlorinated Pesticides/PCB Aroclors in tissue samples.
[2] Achievable MDLs are from a seven replicate MDL study and are based on a sample size of 25-g average sample size (wet). MDLs for some compounds are not available. Data will be evaluated against QLs.
[3] QLs determined from the low calibration standard and adjusted for sample processing volumes and factors. QL = [(low calibration std., 0.01to 0.008 ng/µL) * (pre-injection volume, 1000 µL) * (dilution factor, 1.667)] / (Sample wet wt., 30-g). Actual QLs will vary depending upon sample processing factors – actual QLs will be reported with the data.
[a] Total Aroclor = sum of the detected Aroclors.
[b] Single point calibration is used for this target, QL is derived from low calibration standard of Aroclor 1016 and Aroclor 1260.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

**Recommended detection limit for Chlordane used for both alpha- and gamma-chlordane.

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, and FF
Analytical Parameter: SVOCs (PAHs)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-10

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte[a]	CAS Number	Project Action HH Goal* (ng/g wet weight)	Project Action ECO Goal* (ng/g wet weight)	Analytical Method[1]		Achievable Laboratory Limits (WET WT – ng/g)	
				MDLs	Method QLs	MDLs[2]	QLs[3]
Biphenyl	92-52-4	2060	Not available	Not provided in 8270C		0.054	0.56
2-Methylnaphthalene	91-57-6	824	7800	As above	As above	0.036	0.56
Acenaphthene	83-32-9	2470	2200	As above	As above	0.022	0.56
Acenaphthylene	208-96-8	2470	2200	As above	As above	0.02	0.56
Anthracene	120-12-7	12400	2200	As above	As above	0.016	0.56
Benz[a]anthracene	56-55-3	1.32	2200	As above	As above	0.017	0.56
Benzo[a]pyrene	50-32-8	0.132	2200	As above	As above	0.023	0.56
Benzo[b]fluoranthene	205-99-2	1.32	2200	As above	As above	0.017	0.56
Benzo[g,h,i]perylene	191-24-2	1240	2200	As above	As above	0.012	0.56
Benzo[k]fluoranthene	207-08-9	13.2	2200	As above	As above	0.02	0.56
Chrysene	218-01-9	132	2200	As above	As above	0.024	0.56
Dibenz[a,h]anthracene	53-70-3	0.132	400000	As above	As above	0.016	0.56
Dibenzofuran	132-64-9	165	150	As above	As above	0.049	0.56
Fluoranthene	206-44-0	1650	3500	As above	As above	0.207	0.56
Fluorene	86-73-7	1650	88000	As above	As above	0.027	0.56
Indeno[1,2,3-cd]pyrene	193-39-5	1.32	2200	As above	As above	0.009	0.56
Naphthalene	91-20-3	824	2200	As above	As above	0.423	0.56
Phenanthrene	85-01-8	1240	240000	As above	As above	0.164	0.56
Pyrene	129-00-0	1240	64000	As above	As above	0.135	0.56
Total PAH[b]	Not applicable	Not available	Not available	As above	As above	Not applicable	

[1] There is no applicable EPA methods for analysis of SVOCs (PAHs) in tissue samples.
[2] Achievable MDLs are from a seven replicate MDL study and are based on a sample size of 25-g average sample size (wet). MDLs for some compounds are not available. Data will be evaluated against QLs.
[3] QLs determined from the low calibration standard and adjusted for sample processing volumes and factors. QL = [(low calibration std., 0.01to 0.008 ng/µL) * (pre-injection volume, 1000 µL) * (dilution factor, 1.667)] / (Sample wet wt., 30-g). Actual QLs will vary depending upon sample processing factors – actual QLs will be reported with the data.
[a] Bolded PAHs represent the EPA 16 PAH priority pollutants.
[b] Total PAH = sum of the detected PAHs, in case of a "not detected", "0"value will be used for the non-detected.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, FF, CF(Crayfish) and BD
Analytical Parameter: Lipid/ Moisture
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-11

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (Units) (wet weight)	Project Action ECO Goal* (Units) (wet weight)	Analytical Method[1]		Achievable Laboratory Limits (Wet WT)	
				MDLs	Method QLs	MDLs	QLs
Lipid	Not available	Not applicable	Not applicable	Not applicable	Not applicable	Not available	0.01% [b]
Moisture	Not available	As above	As above	As above	As above	As above	0.03% [c]

[1] No applicable EPA method.
[b] QLs determined from the maximum sensitivity of the balance.
QL =[(maximum sensitivity of the balance, 0.0001 g) *100]%.
[c] QLs determined from the maximum sensitivity of the balance and adjusted for sample processing volumes.
QL =[(maximum sensitivity of the balance, 0.01 g) * / (Sample wet wt., 30-g)*100]%.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, FF, CF(Crayfish) and BD
Analytical Parameter: Dioxin/Furan/HCX/TCX
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-23

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (pg/g wet weight)	Project Action ECO Goal* (pg/g wet weight)	Analytical Method[1]		Achievable Laboratory Limits (WET WT – pg/g)	
				MDLs[2]	Method QLs[2]	MDLs[3]	QLs[3]
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	0.00616	0.0007	Not provided	1	0.5	0.5
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	0.0616	0.006	As above	1	0.4	0.5
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	0.00616	0.0007	As above	5	1.7	2.5
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	0.123	0.014	As above	5	1.2	2.5
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	0.0123	0.0014	As above	5	0.9	2.5
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	0.0616	0.007	As above	5	3.4	2.5
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	0.0616	0.007	As above	5	3.6	2.5
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	0.0616	0.007	As above	5	2.2	2.5
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	0.0616	0.007	As above	5	1.7	2.5
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	0.0616	0.007	As above	5	1.7	2.5
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	0.0616	0.007	As above	5	1.1	2.5
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	0.0616	0.007	As above	5	1.4	2.5
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	0.616	0.07	As above	5	14.4	2.5
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	0.616	0.07	As above	5	1.6	2.5
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	0.616	0.07	As above	5	2.9	2.5
Octachlorodibenzo-p-dioxin	3268-87-9	61.6	7	As above	10	4.2	5
Octachlorodibenzofuran	39001-02-0	61.6	7	As above	10	13.1	5
1,2,4,5,7,8-Hexachloro-9-Xanthene (HCX)	NA	0.00616	0.0007	As above	NA	NA	NA
2,3,6,7-Tetrachloroxanthene (TCX)	NA	Not available	Not available	As above	NA	NA	NA
Total HpCDD	37871-00-4	As above	As above	As above	NA	NA	NA
Total HpCDF	38998-75-3	As above	As above	As above	NA	NA	NA
Total HxCDD	34465-46-8	As above	As above	As above	NA	NA	NA
Total HxCDF	55684-94-1	As above	As above	As above	NA	NA	NA
Total PeCDD	36088-22-9	As above	As above	As above	NA	NA	NA
Total PeCDF	30402-15-4	As above	As above	As above	NA	NA	NA
Total TCDD	41903-57-5	As above	As above	As above	NA	NA	NA
Total TCDF	55722-27-5	As above	As above	As above	NA	NA	NA

NA – Not applicable.
[1] Method 1613B.
[2] Analytical method MDLs and QLs documented in validated methods. These limits are based on a sample size of 10 g.
[3] Achievable MDLs from a seven replicate MDL study (based on 10-g sample size) and the QL values are based on the lowest calibration standard, sample size (10g), and extract volume 20µL). Actual MDLs will be reported with the final data.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, FF, CF(Crayfish) and BD
Analytical Parameter: PCB Congeners
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-32

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte[a]	CAS Number	Project Action HH Goal* (pg/g wet weight)	Project Action ECO Goal* (pg/g wet weight)	Analytical Method (pg/g wet)[1]		Achievable Laboratory Limits (pg/g wet)	
				EMDLs	Method QLs/EMLs	MDLs[2]	EMLs[3]
PCB1	2051-60-7	Not available	Not available	8	20	TBD	20
PCB3	2051-62-9	As above	As above	9	20	As above	20
PCB4	13029-08-8	As above	As above	17	50	As above	50
PCB5	16605-91-7	As above	As above	1	5	As above	5
PCB6	25569-80-6	As above	As above	1	5	As above	5
PCB7	33284-50-3	As above	As above	2	5	As above	5
PCB8	34883-43-7	As above	As above	12	50	As above	50
PCB9	34883-39-1	As above	As above	2	5	As above	5
PCB10	33146-45-1	As above	As above	2	5	As above	5
PCB12	2974-92-7	As above	As above	3	10	As above	10
PCB13	2974-90-5	As above	As above	3	10	As above	10
PCB16	38444-78-9	As above	As above	4	10	As above	10
PCB17	37680-66-3	As above	As above	9	20	As above	20
PCB18	37680-65-2	As above	As above	17	50	As above	50
PCB19	38444-73-4	As above	As above	4	10	As above	10
PCB20	38444-84-7	As above	As above	19	50	As above	50
PCB21	55702-46-0	As above	As above	19	50	As above	50
PCB22	38444-85-8	As above	As above	9	20	As above	20
PCB24	55702-45-9	As above	As above	5	20	As above	20
PCB25	55712-37-3	As above	As above	5	20	As above	20
PCB26	38444-81-4	As above	As above	8	20	As above	20
PCB27	38444-76-7	As above	As above	5	20	As above	20
PCB28	7012-37-5	As above	As above	19	50	As above	50
PCB29	158-07-4	As above	As above	8	20	As above	20
PCB31	16606-02-3	As above	As above	15	50	As above	50
PCB32	38444-77-8	As above	As above	8	20	As above	20
PCB33	38444-86-9	As above	As above	19	50	As above	50
PCB40	38444-93-8	As above	As above	12	50	As above	50

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, FF, CF(Crayfish) and BD
Analytical Parameter: PCBs
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-32

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (pg/g wet weight)	Project Action ECO Goal* (pg/g wet weight)	Analytical Method (pg/g wet)[1]		Achievable Laboratory Limits (pg/g wet)	
				EMDLs	Method QLs/EMLs	MDLs[2]	EMLs[3]
PCB41	52663-59-9	Not available	Not available	12	50	TBD	50
PCB42	36559-22-5	As above	As above	6	20	As above	20
PCB43	70362-46-8	As above	As above	9	20	As above	20
PCB44	41464-39-5	As above	As above	19	50	As above	50
PCB45	70362-45-7	As above	As above	5	20	As above	20
PCB46	41464-47-5	As above	As above	10	20	As above	20
PCB47	2437-79-8	As above	As above	19	50	As above	50
PCB48	70362-47-9	As above	As above	8	20	As above	20
PCB49	41464-40-8	As above	As above	11	50	As above	50
PCB51	68194-04-7	As above	As above	5	20	As above	20
PCB52	35693-99-3	As above	As above	19	20	As above	20
PCB53	41464-41-9	As above	As above	6	20	As above	20
PCB56	41464-43-1	As above	As above	10	20	As above	20
PCB59	74472-33-6	As above	As above	6	20	As above	20
PCB60	33025-41-1	As above	As above	13	50	As above	50
PCB63	74472-34-7	As above	As above	14	50	As above	50
PCB64	52663-58-8	As above	As above	7	20	As above	20
PCB66	32598-10-0	As above	As above	16	50	As above	50
PCB70	32598-11-1	As above	As above	17	50	As above	50
PCB71	41464-46-4	As above	As above	12	50	As above	50
PCB74	32690-93-0	As above	As above	17	50	As above	50
PCB75	32598-12-2	As above	As above	6	20	As above	20
PCB76	70362-48-0	As above	As above	17	50	As above	50
PCB77	32598-13-3	61.6	7	17	50	As above	50
PCB81	70362-50-4	61.6	7	18	50	As above	50
PCB82	52663-62-4	Not available	Not available	13	50	As above	50
PCB83	60145-20-2	As above	As above	22	50	As above	50
PCB84	52663-60-2	As above	As above	12	50	As above	50
PCB85	65510-45-4	As above	As above	10	20	As above	20
PCB87	38380-02-8	As above	As above	15	50	As above	50

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, FF, CF(Crayfish) and BD
Analytical Parameter: PCBs
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-32

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (pg/g wet weight)	Project Action ECO Goal* (pg/g wet weight)	Analytical Method (pg/g wet)[1]		Achievable Laboratory Limits (pg/g wet)	
				EMDLs	Method QLs/EMLs	MDLs[2]	EMLs[3]
PCB89	73575-57-2	Not available	Not available	19	50	TBD	50
PCB90	68194-07-0	As above	As above	24	100	As above	100
PCB91	68194-05-8	As above	As above	12	50	As above	50
PCB92	52663-61-3	As above	As above	12	50	As above	50
PCB95	38379-99-6	As above	As above	22	50	As above	50
PCB97	41464-51-1	As above	As above	15	50	As above	50
PCB99	38380-01-7	As above	As above	22	50	As above	50
PCB100	39485-83-1	As above	As above	22	50	As above	50
PCB101	37680-73-2	As above	As above	24	100	As above	100
PCB105	32598-14-4	61.6	7	11	20	As above	20
PCB107	70424-68-9	Not available	Not available	27	100	As above	100
PCB110	38380-03-9	As above	As above	24	100	As above	100
PCB114	74472-37-0	12.3	1.4	23	50	As above	50
PCB115	74422-38-1	Not available	Not available	24	100	As above	100
PCB118	31508-00-6	61.6	7	19	50	As above	50
PCB119	56558-17-9	Not available	Not available	15	50	As above	50
PCB123	65510-44-3	61.6	7	15	50	As above	50
PCB124	70424-70-3	Not available	Not available	27	50	As above	50
PCB126	57465-28-8	0.0616	0.007	14	100	As above	100
PCB128	38380-07-3	Not available	Not available	12	50	As above	50
PCB129	55215-18-4	As above	As above	21	50	As above	50
PCB130	52663-66-8	As above	As above	14	50	As above	50
PCB131	61798-70-7	As above	As above	12	50	As above	50
PCB132	38380-05-1	As above	As above	12	50	As above	50
PCB134	52704-70-8	As above	As above	13	50	As above	50
PCB135	52744-13-5	As above	As above	11	50	As above	50
PCB136	38411-22-2	As above	As above	9	20	As above	20
PCB137	35694-06-5	As above	As above	30	100	As above	100
PCB138	35065-28-2	As above	As above	21	50	As above	50
PCB141	52712-04-6	As above	As above	9	20	As above	20

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, FF, CF(Crayfish) and BD
Analytical Parameter: PCBs
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-32

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (pg/g wet weight)	Project Action ECO Goal* (pg/g wet weight)	Analytical Method (pg/g wet)[1]		Achievable Laboratory Limits (pg/g wet)	
				EMDLs	Method QLs/EMLs	MDLs[2]	EMLs[3]
PCB144	68194-14-9	Not available	Not available	17	50	TBD	50
PCB146	51908-16-8	As above	As above	18	100	As above	100
PCB149	38380-04-0	As above	As above	18	50	As above	50
PCB151	52663-63-5	As above	As above	11	50	As above	50
PCB153	35065-27-1	As above	As above	13	50	As above	50
PCB156	38380-08-4	12.3	1.4	13	50	As above	50
PCB157	69782-90-7	12.3	1.4	13	50	As above	50
PCB158	74472-42-7	Not available	Not available	10	20	As above	20
PCB160	74472-43-8	As above	As above	21	50	As above	50
PCB163	74472-44-9	As above	As above	21	50	As above	50
PCB167	52663-72-6	616	70	11	50	As above	50
PCB169	32774-16-6	0.616	0.07	16	50	As above	50
PCB170	35065-30-6	Not available	Not available	16	50	As above	50
PCB171	52663-71-5	As above	As above	37	100	As above	100
PCB172	52663-74-8	As above	As above	38	100	As above	100
PCB173	68194-16-1	As above	As above	37	100	As above	100
PCB174	38411-25-5	As above	As above	19	50	As above	50
PCB175	40186-70-7	As above	As above	38	100	As above	100
PCB176	52663-65-7	As above	As above	39	100	As above	100
PCB177	52663-70-4	As above	As above	14	50	As above	50
PCB178	52663-67-9	As above	As above	22	50	As above	50
PCB180	35065-29-3	As above	As above	14	50	As above	50
PCB182	60145-23-5	As above	As above	40	100	As above	100
PCB183	52663-69-1	As above	As above	40	100	As above	100
PCB184	74472-48-3	As above	As above	40	100	As above	100
PCB185	52712-05-7	As above	As above	40	100	As above	100
PCB187	52663-68-0	As above	As above	19	50	As above	50
PCB189	39635-31-9	61.6	7	18	50	As above	50
PCB190	41411-64-7	Not available	Not available	23	50	As above	50

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, FF, CF(Crayfish) and BD
Analytical Parameter: PCBs
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L32

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (pg/g wet weight)	Project Action ECO Goal* (pg/g wet weight)	Analytical Method (pg/g wet)[1]		Achievable Laboratory Limits (pg/g wet)	
				EMDLs	Method QLs/EMLs	MDLs[2]	EMLs[3]
PCB191	74472-50-7	Not available	Not available	42	100	TBD	100
PCB193	69782-91-8	As above	As above	14	50	As above	50
PCB194	35694-08-7	As above	As above	17	50	As above	50
PCB195	52663-78-2	As above	As above	43	100	As above	100
PCB196	42740-50-1	As above	As above	43	100	As above	100
PCB197	33091-17-7	As above	As above	25	100	As above	100
PCB198	68194-17-2	As above	As above	20	20	As above	20
PCB199	52663-75-9	As above	As above	20	20	As above	20
PCB200	52663-73-7	As above	As above	25	100	As above	100
PCB201	40186-71-8	As above	As above	44	100	As above	100
PCB203	52663-76-0	As above	As above	44	100	As above	100
PCB205	74472-53-0	As above	As above	45	100	As above	100
PCB206	40186-72-9	As above	As above	45	100	As above	100
PCB207	52663-79-3	As above	As above	45	100	As above	100
PCB209	2051-24-3	As above	As above	15	50	As above	50
Total PCB by Chlorination Level [b]	Not applicable	As above	As above	—	—	As above	—
Total PCB [c]	1336-36-3	As above	As above	—	—	As above	—

TBD To be determined – for a subset of the 132 congeners.
[1] Method 1668, Revision A.
[2] MDL study for the PCB congeners by HRMS in progress. PCB data will be evaluated against EMLs.
[3] EMDL and EMLs determined from Method 1668A Table 2.
[a] The 18 bolded congeners are the NOAA NS&T and EPA EMAP PCB analytes.
[b] Total PCB by chlorination level = sum of the detected PCB congeners for chlorination level 1, 2, 3, etc; in cases where an individual congener is not detected, a value of 0.0 will be used in the summation.
[c] Total PCB = sum of the detected 132 PCB congeners; in cases where an individual congener is not detected, a value of 0.0 will be used in the summation.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, FF, CF(Crayfish) and BD
Analytical Parameter: Metals
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: 1638, 1640/L-42 (ICP/MS); 200.7, SW6010B/L-44 (ICP/AES); 200.9, SW700 series/L-45 (GFAA); 245.5/L-41 (CVAA) (multiple analysis methods may be used to optimize detection limits and reduce interferences)

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (µg/g dry weight)	Project Action ECO Goal* (µg/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (DRY WT - µg/g)	
				MDLs[2]	Method QLs[2]	MDLs[3]	QLs[3]
Aluminum	7429-90-5	206	40	2.4	9.6	1	4
Antimony	7440-36-0	0.0824	Not available	NA	NA	0.03	0.12
Arsenic	7440-38-2	0.0032	As above	NA	NA	0.03	0.12
Barium	7440-39-3	14.4	95	0.07	0.28	0.01	0.04
Beryllium	7440-41-7	0.412	Not available	0.014	0.056	0.004	0.016
Cadmium	7440-43-9	0.206	0.015	0.184	0.736	0.178	0.712
Chromium	7440-47-3	0.618	Not available	0.376	1.5	0.24	0.96
Cobalt	7440-48-4	37.1	22	0.376	1.5	0.336	1.34
Copper	7440-50-8	7.65	2.5	0.29	1.16	0.065	0.26
Iron	7439-89-6	Not available	Not available	0.328	1.31	0.28	1.12
Lead	7439-92-1	0.154	1.7	NA	NA	0.02	0.08
Manganese	7439-96-5	28.8	Not available	0.074	0.296	0.016	0.064
Mercury	7439-97-6	0.0618	As above	NA	NA	0.002	0.008
Molybdenum	13939-06-5	1.03	As above	0.424	1.7	0.288	1.152
Nickel	7440-02-0	4.12	As above	0.8	3.2	0.286	1.14
Selenium	7782-49-2	1.03	3.8	NA	NA	0.4	1.6
Silver	7440-22-4	1.03	Not available	0.376	1.5	0.054	0.22
Thallium	7440-28-0	0.0165	1.2	NA	NA	0.02	0.08
Vanadium	7440-62-2	1.44	0.1	0.4	1.6	0.16	0.64
Zinc	7440-66-6	61.8	Not available	0.096	0.384	0.096	0.384

NA – Not available.
[1] Methods 1638, 1640; 200.7, SW6010B; 200.9, SW700 series; 245.5.
[2] Analytical method MDLs and QLs documented in validated methods. These limits are based on a sample size of 0.3 g dry weight. QLs are usually 3-10 times higher than the MDLs.
[3] Achievable MDLs are from a seven replicate MDL study and are based on a sample size of approx. 0.3-g dry. QLs are based on 4 × the achievable laboratory MDL.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. All limits presented to three significant figures. Note that detection limits provided by Harding ESE were on a wet weight basis; detection limits were converted to a dry weight basis assuming 80% moisture (Dry Weight value = Wet Weight Value ÷ Percent Dry Weight).

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Tissue
Region I Matrix Code (from EPA-NE DQO Summary Form): FI, OF, FF, CF(Crayfish) and BD
Analytical Parameter: Methyl Mercury
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: Bloom 1989/L-40 (CVAF)

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (µg/g dry weight)	Project Action ECO Goal* (µg/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (DRY WT - µg/g)	
				MDLs	Method QLs	MDLs[2]	QLs[2]
Methyl Mercury	22967-92-6	0.021	0.054	NA	NA	0.0025	0.01

NA – Not available.
[1] Method Bloom (1989).
[2] Achievable MDLs are from a seven replicate MDL study and are based on a sample size of approx.0.1 to 0.3-g dry. QLs are based on 4 × the achievable laboratory MDL.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. All limits presented to three significant figures. Note that detection limits provided by Harding ESE were on a wet weight basis; detection limits were converted to a dry weight basis assuming 80% moisture (Dry Weight value = Wet Weight Value ÷ Percent Dry Weight).

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Sediment
Region I Matrix Code (from EPA-NE DQO Summary Form): SE
Analytical Parameter: Chlorinated Pesticides and PCB Aroclors
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-9

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (ng/g dry weight)	Project Action ECO Goal* (ng/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (Dry WT – ng/g)	
				MDLs	Method QLs	MDLs[2]	QLs[3]
4,4'-DDD	50-29-3	0.52	Not available	Not provided in 8080	Not provided in 8080	0.045	0.67
4,4'-DDE	72-54-8	0.367	As above	As above	As above	0.041	0.67
4,4'-DDT	72-55-9	1.69	0.52	As above	As above	0.042	0.67
Aldrin	309-00-2	0.101	Not available	As above	As above	0.029	0.67
alpha-BHC	319-84-6	0.0587	As above	As above	As above	0.024	0.67
alpha-Chlordane	5103-71-9	0.575 **	1260 **	As above	As above	0.033	0.67
beta-BHC	319-85-7	0.205	Not available	As above	As above	0.05	0.67
delta-BHC	319-86-8	7.92	As above	As above	As above	0.041	0.67
Dieldrin	60-57-1	0.00903	4	As above	As above	0.044	0.67
Endosulfan I	959-98-8	44.9	Not available	As above	As above	0.046	0.67
Endosulfan II	33213-65-9	44.9	As above	As above	As above	0.045	0.67
Endosulfan Sulfate	1031-07-8	44.9	As above	As above	As above	0.047	0.67
Endrin	72-20-8	6.5	As above	As above	As above	0.04	0.67
Endrin Aldehyde	7421-93-4	6.5	As above	As above	As above	0.065	0.67
Endrin Ketone	53494-70-5	6.5	As above	As above	As above	0.044	0.67
gamma-BHC	58-89-9	0.284	As above	As above	As above	0.03	0.67
gamma-Chlordane	5103-74-2	0.575 **	1260 **	As above	As above	0.035	0.67
Heptachlor	76-44-8	0.214	Not available	As above	As above	0.037	0.67
Heptachlor Epoxide	1024-57-3	0.106	As above	As above	As above	0.035	0.67

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Sediment
Region I Matrix Code (from EPA-NE DQO Summary Form): SE
Analytical Parameter: Chlorinated Pesticides and PCB Aroclors
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-9

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (ng/g dry weight)	Project Action ECO Goal* (ng/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (DRY WT – ng/g)	
				MDLs	Method QLs	MDLs[2]	QLs[3]
Methoxychlor	72-43-5	361	Not available	Not provided in 8080	Not provided in 8080	0.051	0.67
Technical chlordane	57-74-9	Not available	As above	As above	As above	Not available	8.3 [b]
Toxaphene	8001-35-2	As above	As above	As above	As above	As above	8.3 [b]
Aroclor-1016	12674-11-2	12.6	447	As above	As above	As above	8.3
Aroclor-1221	1104-28-2	12.6	447	As above	As above	As above	8.3 [b]
Aroclor-1232	11141-16-5	12.6	447	As above	As above	As above	8.3 [b]
Aroclor-1242	53469-21-9	12.6	447	As above	As above	As above	8.3 [b]
Aroclor-1248	12672-29-6	12.6	447	As above	As above	As above	8.3 [b]
Aroclor-1254	11097-69-1	12.6	447	As above	As above	As above	8.3 [b]
Aroclor-1260	11096-82-5	12.6	447	As above	As above	As above	8.3
Aroclor-1268	11100-14-4	12.6	447	As above	As above	As above	8.3 [b]
Aroclor, Total [a]	Not applicable	Not available	Not available	As above	As above	Not applicable	Not applicable

[1] Method 8080.
[2] Achievable MDLs are from a seven replicate MDL study and are based on a sample size of 32.6-g average sample size (dry). MDLs for some compounds are not available. Data will be evaluated against QLs.
[3] QLs determined from the low calibration standard and adjusted for sample processing volumes and factors. QL = [(low calibration std., 0.01to 0.008 ng/µL) * (pre-injection volume, 1000 µL) * (dilution factor, 1.667)] / (Sample dry wt., 20-g). Actual QLs will vary depending upon sample processing factors – actual QLs will be reported with the data.
[a] Total Aroclor = sum of the detected Aroclors.
[b] Single point calibration is used for this target, QL is derived from low calibration standard of Aroclor 1016 and Aroclor 1260.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

** Recommended detection limit for Chlordane used for both alpha- and gamma-chlordane.

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SO
Analytical Parameter: Chlorinated Pesticides and PCB Aroclors
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-9

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (ng/g dry weight)	Project Action ECO Goal* (ng/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (DRY WT – ng/g)	
				MDLs	Method Practical QLs (wet wt – ng/g)	MDLs[2]	QLs[3]
4,4'-DDD	50-29-3	0.52	Not available	Not provided in 8080	7.4	0.045	0.53
4,4'-DDE	72-54-8	0..367	As above	As above	2.7	0.041	0.54
4,4'-DDT	72-55-9	1.69	0.52	As above	8	0.042	0.53
Aldrin	309-00-2	0.101	Not available	As above	2.7	0.029	0.53
alpha-BHC	319-84-6	0.0587	As above	As above	2	0.024	0.53
alpha-Chlordane	5103-71-9	0.575 **	1260 **	As above	Not provided in 8080	0.033	0.53
beta-BHC	319-85-7	0.205	Not available	As above	4	0.05	0.53
delta-BHC	319-86-8	7.92	As above	As above	6	0.041	0.54
Dieldrin	60-57-1	0.00903	4	As above	1.3	0.044	0.53
Endosulfan I	959-98-8	44.9	Not available	As above	9.4	0.046	0.53
Endosulfan II	33213-65-9	44.9	As above	As above	2.7	0.045	0.53
Endosulfan Sulfate	1031-07-8	44.9	As above	As above	44	0.047	0.53
Endrin	72-20-8	6.5	As above	As above	4	0.04	0.53
Endrin Aldehyde	7421-93-4	6.5	As above	As above	15	0.065	0.53
Endrin Ketone	53494-70-5	6.5	As above	As above	Not provided in 8080	0.044	0.53
gamma-BHC	58-89-9	0.284	As above	As above	2.7	0.03	0.53
gamma-Chlordane	5103-74-2	0.575 **	1260 **	As above	Not provided in 8080	0.035	0.53
Heptachlor	76-44-8	0.214	As above	As above	2	0.037	0.53
Heptachlor Epoxide	1024-57-3	0.106	As above	As above	56	0.035	0.53

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SO
Analytical Parameter: Chlorinated Pesticides and PCB Aroclors
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-9

Contaminants of Concern and Other Target Analytes Table

(Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (ng/g dry weight)	Project Action ECO Goal* (ng/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (DRY WT – ng/g)	
				MDLs	Method Practical QLs (wet wt – ng/g)	MDLs[2]	QLs[3]
Methoxychlor	72-43-5	361	Not available	Not provided in 8080	118	0.051	0.53
Technical chlordane	57-74-9	Not available	As above	As above	9.4	Not available	6.7 [b]
Toxaphene	8001-35-2	As above	As above	As above	160	As above	6.7 [b]
Aroclor-1016	12674-11-2	12.6	447	As above	Not determined	As above	6.7
Aroclor-1221	1104-28-2	12.6	447	As above	Not determined	As above	6.7 [b]
Aroclor-1232	11141-16-5	12.6	447	As above	Not determined	As above	6.7 [b]
Aroclor-1242	53469-21-9	12.6	447	As above	43.55	As above	6.7 [b]
Aroclor-1248	12672-29-6	12.6	447	As above	Not determined	As above	6.7 [b]
Aroclor-1254	11097-69-1	12.6	447	As above	Not determined	As above	6.7 [b]
Aroclor-1260	11096-82-5	12.6	447	As above	Not determined	As above	6.7
Aroclor-1268	11100-14-4	12.6	447	As above	Not provided in 8080	As above	6.7 [b]
Aroclor, Total [a]	Not applicable	Not available	Not available	As above	As above	Not applicable	Not applicable

[1] Method 8080.
[2] Achievable MDLs are from a seven replicate MDL study (in sediment) and are based on a sample size of 32.6-g average sample size (dry). MDLs for some compounds are not available. Data will be evaluated against QLs.
[3] QLs determined from the low calibration standard and adjusted for sample processing volumes and factors.
QL = [(low calibration std., 0.01to 0.008 ng/µL) * (pre-injection volume, 1000 µL) * (dilution factor, 1.667)] / (Sample dry wt., 25-g).
Actual QLs will vary depending upon sample processing factors – actual QLs will be reported with the data.
[a] Total Aroclor = sum of the detected Aroclors.
[b] Single point calibration is used for this target, QL is derived from low calibration standard of Aroclor 1016 and Aroclor 1260.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures. Used Sediment detection limits for Soil.

** Recommended detection limit for Chlordane used for both alpha- and gamma-chlordane.

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Sediment
Region I Matrix Code (from EPA-NE DQO Summary Form): SE
Analytical Parameter: SVOCs (PAHs)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-10.

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte[a]	CAS Number	Project Action HH Goal* (ng/g dry weight)	Project Action ECO Goal* (ng/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (DRY WT – ng/g)	
				MDLs	Method Estimated QLs (wet wt – ng/g)	MDLs[2]	QLs[3]
Biphenyl	92-52-4	Not available	Not available	Not provided in 8270C		0.017	0.83
2-Methylnaphthalene	91-57-6	1130	10700	As above	Not provided	0.037	0.83
Acenaphthene	83-32-9	3380	3010	As above	660	0.016	0.83
Acenaphthylene	208-96-8	3380	3010	As above	660	0.026	0.83
Anthracene	120-12-7	16900	3010	As above	660	0.024	0.83
Benzaldehyde	100-52-7	Not available	Not available	As above	Not provided	NA	0.83
Benz[a]anthracene	56-55-3	1.8	3010	As above	660	0.017	0.83
Benzo[a]pyrene	50-32-8	0.18	3010	As above	660	0.021	0.83
Benzo[b]fluoranthene	205-99-2	1.8	3010	As above	660	0.018	0.83
Benzo[g,h,i]perylene	191-24-2	1690	3010	As above	660	0.013	0.83
Benzo[k]fluoranthene	207-08-9	18	3010	As above	660	0.013	0.83
Chrysene	218-01-9	180	3010	As above	660	0.013	0.83
Dibenz[a,h]anthracene	53-70-3	0.18	548000	As above	660	0.018	0.83
Dibenzofuran	132-64-9	3290	Not available	As above	660	0.091	0.83
Fluoranthene	206-44-0	2260	4790	As above	660	0.025	0.83
Fluorene	86-73-7	2260	121000	As above	660	0.023	0.83
Indeno[1,2,3-cd]pyrene	193-39-5	1.8	3010	As above	660	0.01	0.83
Naphthalene	91-20-3	1130	3010	As above	660	1.5	0.83
Phenanthrene	85-01-8	1690	329000	As above	660	0.03	0.83
Pyrene	129-00-0	1690	87700	As above	660	0.02	0.83
Total PAH[b]	Not applicable	Not available	Not available	As above	Not provided in 8270C	NA	NA

[1] Method 8270C.
[2] Achievable MDLs are from a seven replicate MDL study and are based on a sample size of 32.6-g average sample size (dry). MDLs for some compounds are not available. Data will be evaluated against QLs.
[3] QLs determined from the low calibration standard and adjusted for sample processing volumes and factors. QL = [(low calibration std., 0.01to 0.008 ng/µL) * (pre-injection volume, 1000 µL) * (dilution factor, 1.667)] / (Sample dry wt., 20-g). Actual QLs will vary depending upon sample processing factors – actual QLs will be reported with the data.
[a] Bolded PAHs represent the EPA 16 PAH priority pollutants.
[b] Total PAH = sum of the detected PAHs; in cases where an individual PAH is not detected, 0.0 will be used in the summation.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SO
Analytical Parameter: SVOCs (PAHs)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-10

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte[a]	CAS Number	Project Action HH Goal* (ng/g dry weight)	Project Action ECO Goal* (ng/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (DRY WT – ng/g)	
				MDLs	Method Estimated QLs (wet wt – ng/g)	MDLs[2]	QLs[3]
Biphenyl	92-52-4	Not available	Not available	Not provided in 8270C		0.017	0.67
2-Methylnaphthalene	91-57-6	1130	10700	As above	As above	0.037	0.67
Acenaphthene	83-32-9	3380	3010	As above	660	0.016	0.67
Acenaphthylene	208-96-8	3380	3010	As above	660	0.026	0.67
Anthracene	120-12-7	16900	3010	As above	660	0.024	0.67
Benzaldehyde	100-52-7	Not available	Not available	As above	Not provided in 8270C	Not available	0.67
Benz[a]anthracene	56-55-3	1.8	3010	As above	660	0.017	0.67
Benzo[a]pyrene	50-32-8	0.18	3010	As above	660	0.021	0.67
Benzo[b]fluoranthene	205-99-2	1.8	3010	As above	660	0.018	0.67
Benzo[g,h,i]perylene	191-24-2	1690	3010	As above	660	0.013	0.67
Benzo[k]fluoranthene	207-08-9	18	3010	As above	660	0.013	0.67
Chrysene	218-01-9	180	3010	As above	660	0.013	0.67
Dibenz[a,h]anthracene	53-70-3	0.18	548000	As above	660	0.018	0.67
Dibenzofuran	132-64-9	3290	Not available	As above	660	0.091	0.67
Fluoranthene	206-44-0	2260	4790	As above	660	0.025	0.67
Fluorene	86-73-7	2260	121000	As above	660	0.023	0.67
Indeno[1,2,3-cd]pyrene	193-39-5	1.8	3010	As above	660	0.01	0.67
Naphthalene	91-20-3	1130	3010	As above	660	1.5	0.67
Phenanthrene	85-01-8	1690	329000	As above	660	0.03	0.67
Pyrene	129-00-0	1690	87700	As above	660	0.02	0.67
Total PAH[b]	Not applicable	Not available	Not available	As above	Not provided in 8270C	Not applicable	Not applicable

[1] Method 8270C.
[2] Achievable MDLs are from a seven replicate MDL study and are based on a sample size of 32.6-g average sample size (dry). MDLs for some compounds are not available. Data will be evaluated against QLs.
[3] QLs determined from the low calibration standard and adjusted for sample processing volumes and factors. QL = [(low calibration std., 0.01to 0.008 ng/µL) * (pre-injection volume, 1000 µL) * (dilution factor, 1.667)] / (Sample dry wt., 25-g). Actual QLs will vary depending upon sample processing factors – actual QLs will be reported with the data.
[a] Bolded PAHs represent the EPA 16 PAH priority pollutants.
[b] Total PAH = sum of the detected PAHs; in cases where an individual PAH is not detected, 0.0 will be used in the summation.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures. Used Sediment detection limits for Soil.

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SE / SO
Analytical Parameter: Moisture
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-13

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (ng/g dry weight)	Project Action ECO Goal* (ng/g dry weight)	Analytical Method		Achievable Laboratory Limits (WET WT)	
				MDLs	Method QLs	MDLs	QLs[1]
Moisture	Not available	Not applicable	Not applicable	Not applicable	Not applicable	Not available	0.03%

[1] QLs determined from the maximum sensitivity of the balance and adjusted for sample processing volumes.
QL =[(maximum sensitivity of the balance, 0.01 g) * / (Sample wet wt., 30-g)*100]%.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures. Used Sediment detection limits for Soil.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SE / SO
Analytical Parameter: Dioxin/Furan/HCX/TCX
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-23

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (pg/g dry weight)	Project Action ECO Goal* (pg/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (DRY WT – pg/g)	
				MDLs	Method QLs[2]	MDLs[3]	QLs[3]
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	0.0684	0.008	Not provided	2	0.7	1.0
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	0.587	0.057	As above	2	1.0	1.0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	0.0821	0.009	As above	10	2.3	5.0
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	4.11	0.467	As above	10	2.9	5.0
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	0.0747	0.008	As above	10	2.1	5.0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	2.05	0.233	As above	10	2.0	5.0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	4.11	0.467	As above	10	2.5	5.0
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	4.11	0.467	As above	10	2.3	5.0
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	1.37	0.156	As above	10	1.9	5.0
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	2.05	0.233	As above	10	1.9	5.0
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	1.37	0.156	As above	10	1.5	5.0
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	1.37	0.156	As above	10	2.0	5.0
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	205	23.3	As above	10	1.1	5.0
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	2050	233	As above	10	2.0	5.0
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	41.1	4.67	As above	10	2.1	5.0
Octachlorodibenzo-p-dioxin	3268-87-9	41100	4670	As above	20	6.8	10
Octachlorodibenzofuran	39001-02-0	137000	15600	As above	20	39.7	10
1,2,4,5,7,8-Hexachloro-9-Xanthene (HCX)	NA	0.00137	132	As above	NA	NA	NA
2,3,6,7-Tetrachloroxanthene (TCX)	NA	Not available	Not available	As above	NA	NA	NA
Total HpCDD	37871-00-4	As above	As above	As above	NA	NA	NA
Total HpCDF	38998-75-3	As above	As above	As above	NA	NA	NA
Total HxCDD	34465-46-8	As above	As above	As above	NA	NA	NA
Total HxCDF	55684-94-1	As above	As above	As above	NA	NA	NA
Total PeCDD	36088-22-9	As above	As above	As above	NA	NA	NA
Total PeCDF	30402-15-4	As above	As above	As above	NA	NA	NA
Total TCDD	41903-57-5	As above	As above	As above	NA	NA	NA
Total TCDF	55722-27-5	As above	As above	As above	NA	NA	NA

[1] Method 1613B.
[2] Analytical method MDLs and QLs documented in validated methods. These limits are based on a sample size of 10 g wet weight and an average sample % dry weight of 50% to give a final sample size of 5 g dry weight.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits are based on a sample size of 5 g dry weight. The MDL values are from a seven replicate MDL study and the QL values are based on the lowest calibration standard, sample size (10g wet weight and an average sample % dry weight of 50% to give a final sample size of 5 g dry weight, and extract volume 20µL).
* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SE / SO
Analytical Parameter: PCB Congeners
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-32

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte[a]	CAS Number	Project Action HH Goal* (pg/g dry weight)	Project Action ECO Goal* (pg/g dry weight)	Analytical Method (pg/g Dry)[1]		Achievable Laboratory Limits (pg/g Dry)	
				EMDLs	Method QLs/EMLs	MDLs[2]	EMLs[3]
PCB1	2051-60-7	Not available	Not available	16	40	TBD	40
PCB3	2051-62-9	As above	As above	18	40	As above	40
PCB4	13029-08-8	As above	As above	34	100	As above	100
PCB5	16605-91-7	As above	As above	2	10	As above	10
PCB6	25569-80-6	As above	As above	2	10	As above	10
PCB7	33284-50-3	As above	As above	4	10	As above	10
PCB8	34883-43-7	As above	As above	24	100	As above	100
PCB9	34883-39-1	As above	As above	8	10	As above	10
PCB10	33146-45-1	As above	As above	4	10	As above	10
PCB12	2974-92-7	As above	As above	6	20	As above	20
PCB13	2974-90-5	As above	As above	6	20	As above	20
PCB16	38444-78-9	As above	As above	8	20	As above	20
PCB17	37680-66-3	As above	As above	18	40	As above	40
PCB18	37680-65-2	As above	As above	24	100	As above	100
PCB19	38444-73-4	As above	As above	8	20	As above	20
PCB20	38444-84-7	As above	As above	38	100	As above	100
PCB21	55702-46-0	As above	As above	38	100	As above	100
PCB22	38444-85-8	As above	As above	18	40	As above	40
PCB24	55702-45-9	As above	As above	10	40	As above	40
PCB25	55712-37-3	As above	As above	10	40	As above	40
PCB26	38444-81-4	As above	As above	16	40	As above	40
PCB27	38444-76-7	As above	As above	10	40	As above	40
PCB28	7012-37-5	As above	As above	38	100	As above	100
PCB29	158-07-4	As above	As above	16	40	As above	40
PCB31	16606-02-3	As above	As above	30	100	As above	100
PCB32	38444-77-8	As above	As above	16	40	As above	40
PCB33	38444-86-9	As above	As above	38	100	As above	100
PCB40	38444-93-8	As above	As above	24	100	As above	100

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SE / SO
Analytical Parameter: PCB Congeners
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-32

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (pg/g dry weight)	Project Action ECO Goal* (pg/g dry weight)	Analytical Method (pg/g dry)[1]		Achievable Laboratory Limits (pg/g dry)	
				EMDLs	Method QLs/EMLs	MDLs[2]	EMLs[3]
PCB41	52663-59-9	Not available	Not available	24	100	TBD	100
PCB42	36559-22-5	As above	As above	12	40	As above	40
PCB43	70362-46-8	As above	As above	19	40	As above	40
PCB44	41464-39-5	As above	As above	38	100	As above	100
PCB45	70362-45-7	As above	As above	10	40	As above	40
PCB46	41464-47-5	As above	As above	20	40	As above	40
PCB47	2437-79-8	As above	As above	38	100	As above	100
PCB48	70362-47-9	As above	As above	16	40	As above	40
PCB49	41464-40-8	As above	As above	22	100	As above	100
PCB51	68194-04-7	As above	As above	10	40	As above	40
PCB52	35693-99-3	As above	As above	38	40	As above	40
PCB53	41464-41-9	As above	As above	12	40	As above	40
PCB56	41464-43-1	As above	As above	20	40	As above	40
PCB59	74472-33-6	As above	As above	12	40	As above	40
PCB60	33025-41-1	As above	As above	26	100	As above	100
PCB63	74472-34-7	As above	As above	28	100	As above	100
PCB64	52663-58-8	As above	As above	14	40	As above	40
PCB66	32598-10-0	As above	As above	32	100	As above	100
PCB70	32598-11-1	As above	As above	34	100	As above	100
PCB71	41464-46-4	As above	As above	24	100	As above	100
PCB74	32690-93-0	As above	As above	34	100	As above	100
PCB75	32598-12-2	As above	As above	12	40	As above	40
PCB76	70362-48-0	As above	As above	34	100	As above	100
PCB77	32598-13-3	212	0.207	34	100	As above	100
PCB81	70362-50-4	91.9	0.179	36	100	As above	100
PCB82	52663-62-4	Not available	Not available	26	100	As above	100
PCB83	60145-20-2	As above	As above	44	100	As above	100
PCB84	52663-60-2	As above	As above	24	100	As above	100
PCB85	65510-45-4	As above	As above	20	40	As above	40
PCB87	38380-02-8	As above	As above	30	100	As above	100

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SE / SO
Analytical Parameter: PCB Congeners
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-32

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (pg/g dry weight)	Project Action ECO Goal* (pg/g dry weight)	Analytical Method (pg/g dry)[1]		Achievable Laboratory Limits (pg/g dry)	
				EMDLs	Method QLs/EMLs	MDLs[2]	EMLs[3]
PCB89	73575-57-2	Not available	Not available	38	100	TBD	100
PCB90	68194-07-0	As above	As above	48	200	As above	200
PCB91	68194-05-8	As above	As above	24	100	As above	100
PCB92	52663-61-3	As above	As above	24	100	As above	100
PCB95	38379-99-6	As above	As above	44	100	As above	100
PCB97	41464-51-1	As above	As above	30	100	As above	100
PCB99	38380-01-7	As above	As above	44	100	As above	100
PCB100	39485-83-1	As above	As above	44	100	As above	100
PCB101	37680-73-2	As above	As above	48	200	As above	200
PCB105	32598-14-4	13.7	1.56	22	40	As above	40
PCB107	70424-68-9	Not available	Not available	54	200	As above	200
PCB110	38380-03-9	As above	As above	48	200	As above	200
PCB114	74472-37-0	2.74	0.312	46	100	As above	100
PCB115	74422-38-1	Not available	Not available	48	200	As above	200
PCB118	31508-00-6	35.8	4.07	38	100	As above	100
PCB119	56558-17-9	Not available	Not available	30	100	As above	100
PCB123	65510-44-3	13.7	1.56	30	100	As above	100
PCB124	70424-70-3	Not available	Not available	54	100	As above	100
PCB126	57465-28-8	0.0192	0.00218	28	200	As above	200
PCB128	38380-07-3	Not available	Not available	24	100	As above	100
PCB129	55215-18-4	As above	As above	42	100	As above	100
PCB130	52663-66-8	As above	As above	28	100	As above	100
PCB131	61798-70-7	As above	As above	24	100	As above	100
PCB132	38380-05-1	As above	As above	24	100	As above	100
PCB134	52704-70-8	As above	As above	26	100	As above	100
PCB135	52744-13-5	As above	As above	22	100	As above	100
PCB136	38411-22-2	As above	As above	18	40	As above	40
PCB137	35694-06-5	As above	As above	60	200	As above	200
PCB138	35065-28-2	As above	As above	42	100	As above	100

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SE / SO
Analytical Parameter: PCB Congeners
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-32

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (pg/g dry weight)	Project Action ECO Goal* (pg/g dry weight)	Analytical Method (pg/g dry)[1]		Achievable Laboratory Limits (pg/g dry)	
				EMDLs	Method QLs/EMLs	MDLs[2]	EMLs[3]
PCB141	52712-04-6	Not available	Not available	18	40	TBD	40
PCB144	68194-14-9	As above	As above	34	100	As above	100
PCB146	51908-16-8	As above	As above	36	200	As above	200
PCB149	38380-04-0	As above	As above	36	100	As above	100
PCB151	52663-63-5	As above	As above	22	100	As above	100
PCB153	35065-27-1	As above	As above	26	100	As above	100
PCB156	38380-08-4	2.74	0.312	26	100	As above	100
PCB157	69782-90-7	2.74	0.312	26	100	As above	100
PCB158	74472-42-7	Not available	Not available	20	40	As above	40
PCB160	74472-43-8	As above	As above	42	100	As above	100
PCB163	74472-44-9	As above	As above	42	100	As above	100
PCB167	52663-72-6	893	101	22	100	As above	100
PCB169	32774-16-6	0.137	0.0156	32	100	As above	100
PCB170	35065-30-6	Not available	Not available	32	100	As above	100
PCB171	52663-71-5	As above	As above	74	200	As above	200
PCB172	52663-74-8	As above	As above	76	200	As above	200
PCB173	68194-16-1	As above	As above	74	200	As above	200
PCB174	38411-25-5	As above	As above	38	100	As above	100
PCB175	40186-70-7	As above	As above	76	200	As above	200
PCB176	52663-65-7	As above	As above	78	200	As above	200
PCB177	52663-70-4	As above	As above	28	100	TBD	100
PCB178	52663-67-9	As above	As above	44	100	As above	100
PCB180	35065-29-3	As above	As above	28	100	As above	100
PCB182	60145-23-5	As above	As above	80	200	As above	200
PCB183	52663-69-1	As above	As above	80	200	As above	200
PCB184	74472-48-3	As above	As above	80	200	As above	200
PCB185	52712-05-7	As above	As above	80	200	As above	200
PCB187	52663-68-0	As above	As above	38	100	As above	100
PCB189	39635-31-9	86.7	9.86	36	100	As above	100
PCB190	41411-64-7	Not available	Not available	46	100	As above	100

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SE / SO
Analytical Parameter: PCB Congeners
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-32

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (pg/g dry weight)	Project Action ECO Goal* (pg/g dry weight)	Analytical Method (pg/g dry)[1]		Achievable Laboratory Limits (pg/g dry)	
				EMDLs	Method QLs/EMLs	MDLs[2]	EMLs[3]
PCB191	74472-50-7	Not available	Not available	84	200	TBD	200
PCB193	69782-91-8	As above	As above	28	100	As above	100
PCB194	35694-08-7	As above	As above	34	100	As above	100
PCB195	52663-78-2	As above	As above	86	200	As above	200
PCB196	42740-50-1	As above	As above	86	200	As above	200
PCB197	33091-17-7	As above	As above	50	200	As above	200
PCB198	68194-17-2	As above	As above	40	40	As above	40
PCB199	52663-75-9	As above	As above	40	40	As above	40
PCB200	52663-73-7	As above	As above	50	200	As above	200
PCB201	40186-71-8	As above	As above	88	200	As above	200
PCB203	52663-76-0	As above	As above	88	200	As above	200
PCB205	74472-53-0	As above	As above	90	200	As above	200
PCB206	40186-72-9	As above	As above	90	200	As above	200
PCB207	52663-79-3	As above	As above	90	200	As above	200
PCB209	2051-24-3	As above	As above	30	100	As above	100
Total PCB by Chlorination Level [b]	Not applicable	As above	As above	—	—	Not applicable	—
Total PCB [c]	1336-36-3	As above	As above	—	—	As above	—

TBD To be determined – for a subset of the 132 congeners.
[1] Method 1668, Revision A, calculated using 50% dry weight.
[2] MDL study for the PCB congeners by HRMS in progress. PCB data will be evaluated against EMLs.
[3] EMDL and EMLs determined from Method 1668A Table 2.
[a] The 18 bolded congeners are the NOAA NS&T and EPA EMAP PCB analytes
[b] Total PCB by chlorination level = sum of the detected PCB congeners for chlorination level 1, 2, 3, etc
[c] Total PCB = sum of the detected 132 PCB congeners.
In cases where an individual congener is not detected, a value of 0.0 will be used in the summation.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SE / SO
Analytical Parameter: Metals
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: 1638, 1640/L-42 (ICP/MS); 200.7, SW6010B/L-44 (ICP/AES); 200.9, SW700 series/L-45 (GFAA); 245.5/L-41 (CVAA) (multiple analysis methods may be used to optimize detection limits and reduce interferences)

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (µg/g dry weight)	Project Action ECO Goal* (µg/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (DRY WT - µg/g)	
				MDLs[2]	Method QLs[2]	MDLs[3]	QLs[3]
Aluminum	7429-90-5	549	Not available	2.4	9.6	1	4
Antimony	7440-36-0	0.329	As above	NA	NA	0.02	0.08
Arsenic	7440-38-2	0.097	As above	NA	NA	0.5	2
Barium	7440-39-3	384	As above	0.07	0.28	0.01	0.04
Beryllium	7440-41-7	1.65	As above	0.014	0.056	0.004	0.016
Cadmium	7440-43-9	0.0294	As above	0.184	0.736	0.178	0.71
Chromium	7440-47-3	0.772 **	As above	0.376	1.5	0.24	0.96
Cobalt	7440-48-4	7.41	As above	0.376	1.5	0.336	1.34
Copper	7440-50-8	9.56	As above	0.29	1.16	0.097	0.388
Iron	7439-89-6	Not available	As above	0.328	1.31	0.28	1.12
Lead	7439-92-1	0.396	As above	NA	NA	0.1	0.4
Manganese	7439-96-5	288	As above	0.074	0.296	0.016	0.064
Mercury	7439-97-6	0.000727	As above	NA	NA	0.002	0.008
Molybdenum	13939-06-5	Not available	As above	0.424	1.7	0.4	1.6
Nickel	7440-02-0	3.58	As above	0.8	3.2	0.78	3.12
Selenium	7782-49-2	0.271	As above	NA	NA	0.265	1.06
Silver	7440-22-4	1.37	As above	0.376	1.5	0.089	0.356
Thallium	7440-28-0	0.00165	As above	NA	NA	0.02	0.08
Vanadium	7440-62-2	2.22	As above	0.4	1.6	0.27	1.08
Zinc	7440-66-6	6.86	As above	0.096	0.384	0.096	0.384

NA – Not available.
[1] Methods 1638, 1640; 200.7, SW6010B; 200.9, SW700 series; 245.5.
[2] Analytical method MDLs and QLs documented in validated methods. These limits are based on a sample size of 0.2 to 1.0 g dry weight. QLs are usually 3-10 times higher than the MDLs.
[3] Achievable MDLs are from a seven replicate MDL study and are based on a sample size of 0.2 to 1.0 g dry weight. QLs are based on 4 × the achievable laboratory MDL.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

** Cr VI

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SE / SO
Analytical Parameter: Methyl Mercury
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: Bloom (1989)/L-40

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (µg/g dry weight)	Project Action ECO Goal* (µg/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (WET WT - µg/g)	
				MDLs	Method QLs	MDLs[2]	QLs[2]
Methyl Mercury	22967-92-6	0.000242	0.001	NA	NA	0.00005	0.0002

NA – Not available.
[1] Method Bloom (1989).
[2] Achievable MDLs are from a seven replicate MDL study and are based on a sample size of approx. 0.1 to 1.0 g wet weight. QLs are based on 4 × the achievable laboratory MDL.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Sediment
Region I Matrix Code (from EPA-NE DQO Summary Form): SE
Analytical Parameter: AVS/SEM
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: 1640, 1638/L-42 (ICP/MS); L41 (CVAA) (multiple analysis methods for SEM metals may be used to optimize detection limits and reduce interferences)

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (dry weight)	Project Action ECO Goal* (dry weight)	Analytical Method[1]		Achievable Laboratory Limits (Dry WT - µg/g)	
				MDLs[2]	Method QLs[2]	MDLs[3]	QLs[3]
Acid Volatile Sulfide	N/A	Not available	Not available	NA	NA	0.607 (wet)	2.428 (wet)
SEM-Cadmium	7440-47-3	As above	As above	NA	NA	0.04	0.16
SEM-Copper	7440-50-8	As above	As above	NA	NA	0.008	0.032
SEM-Lead	7439-92-1	As above	As above	NA	NA	0.02	0.08
SEM-Mercury	7439-97-6	As above	As above	NA	NA	0.02	0.08
SEM-Nickel	7440-02-0	As above	As above	NA	NA	0.1	0.4
SEM-Zinc	7440-66-6	As above	As above	NA	NA	0.2	0.8
AVS/SEM[a]	N/A	As above	As above	NA	NA	NA	NA

[1] Methods 1640, 1638, and 245.5.
[2] Not available.
[3] Achievable MDLs values are from a seven replicate MDL study based on average sample size of 0.2 to 1.0 g dry weight except AVS which is based on average sample size of 0.1 to 1.0 g wet weight. QLs are based on 4 × the achievable laboratory MDL.
[a] AVS/SEM = (AVS ,µmole/g) ÷ (Sum of SEM metals, (µmole/g)

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SE / SO
Analytical Parameter: Grain Size
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-46

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (dry weight)	Project Action ECO Goal* (dry weight)	Analytical Method[1]		Achievable Laboratory Limits (DRY WT - %)	
				MDLs	Method QLs	MDLs	QLs[2]
% gravel	Not available	Not applicable	Not applicable	NA	NA	NA	0.01
% coarse sand	As above	As above	As above	NA	NA	NA	0.01
% medium sand	As above	As above	As above	NA	NA	NA	0.01
% fine sand	As above	As above	As above	NA	NA	NA	0.01
% silt	As above	As above	As above	NA	NA	NA	0.01
% clay	As above	As above	As above	NA	NA	NA	0.01
grain size distribution curve	As above	As above	As above	NA	NA	NA	NA

[1]ASTM D422

[2] The reporting limit for sieve fraction is 0.01%; for the fine fraction (hydrometer analysis) readings are taken at 0.5 gram intervals and reported at 0.01%. Note that a weight percent less than 0.01% can be measured gravimetrically, but it has no relevance in characterizing the sediment type.
NA – Not available/applicable.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form): SE / SO
Analytical Parameter: TOC
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-49

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (dry weight)	Project Action ECO Goal* (dry weight)	Analytical Method[1]		Achievable Laboratory Limits (DRY WT - %)	
				MDLs	Method QLs	MDLs[2]	QLs[2]
% TOC	Not available	Not applicable	Not applicable	0.1%	not provided	range from 0.001% to 0.01%	

[1] Method 9060.
[2]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Sediment / Soil
Region I Matrix Code (from EPA-NE DQO Summary Form):SE / SO
Analytical Parameter: SVOCs (phthalates and phenols)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-61

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (ng/g dry weight)	Project Action ECO Goal* (ng/g dry weight)	Analytical Method[1]		Achievable Laboratory Limits (ng/g DRY WT)	
				MDLs[2]	Method Estimated QLs (wet wt – ng/g)[2]	MDLs[3]	QLs[3]
2,4,5-Trichlorophenol	95-95-4	Not available	Not available	No provided	660	65	1700
2,4-Dinitrophenol	51-28-5	As above	As above	As above	3300	630	1700
2-Nitrophenol	88-75-5	As above	As above	As above	3300	55	330
4-Methylphenol	106-44-5	As above	As above	As above	660	160	330
4-Nitrophenol	100-02-7	As above	As above	As above	3300	52	1700
Bis (2-ethylhexyl)phthalate	117-81-7	As above	As above	As above	660	53	330
Butyl benzyl phthalate	85-68-7	As above	As above	As above	660	56	330
Carbazole	86-74-8	As above	As above	As above	Not provided	46	330
di-n-Butyl phthalate	84-74-2	As above	As above	As above	Not determined	46	330
di-n-Octyl phthalate	117-84-0	As above	As above	As above	660	64	330
Pentachlorophenol	87-86-5	As above	As above	As above	3300	310	1700
Phenol	108-95-2	As above	As above	As above	660	66	330

[1] Method 8270C.
[2] Analytical method MDLs and QLs documented in validated methods. QLs are usually 3-10 times higher than the MDLs.
[3] Achievable MDL and QL values determined per 40CFR Part 136.

* Recommended detection limits used to support the human health (HH) biota consumption risk assessment and the baseline ecological (ECO) risk assessment. These values were provided by Harding ESE for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment. Goals presented to three significant figures.

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: Chlorinated Pesticides and PCB Aroclors
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-9

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (ng/L)	Project Action AL Goal * (ng/L)	Analytical Method[1]		Achievable Laboratory Limits	
				MDLs (ng/L)	Method Practical QLs (ng/L)	MDLs[2] (ng/L)	QLs[6] (ng/L)
4,4'-DDD	50-29-3	8.3	Not available	11	110	0.36	4.0
4,4'-DDE	72-54-8	5.9	As above	4	40	0.5	4.0
4,4'-DDT	72-55-9	5.9	1	12	120	0.33	4.0
Aldrin	309-00-2	1.3	3000 (acute)	4	40	1.7	4.0
alpha-BHC	319-84-6	39	Not available	3	30	0.64	4.0
alpha-Chlordane	5103-71-9	5.7	4.3	Not provided in 8080	Not provided in 8080	0.65	4.0
beta-BHC	319-85-7	140	Not available	6	60	3	4.0
delta-BHC	319-86-8	Not available	As above	9	90	1.7	4.0
Dieldrin	60-57-1	1.4	1.9	2	20	0.59	4.0
Endosulfan I	959-98-8	930	56	14	140	0.67	4.0
Endosulfan II	33213-65-9	930	56	4	40	0.31	4.0
Endosulfan Sulfate	1031-07-8	930	Not available	66	660	0.34	4.0
Endrin	72-20-8	760	2.3	6	60	0.59	4.0
Endrin Aldehyde	7421-93-4	760	Not available	23	230	0.51	4.0
Endrin Ketone	53494-70-5	Not available	As above	Not provided in 8080	Not provided in 8080	0.41	4.0
gamma-BHC	58-89-9	190	80	4	40	0.58	4.0
gamma-Chlordane	5103-74-2	5.7	4.3	Not provided in 8080	Not provided in 8080	0.65	4.0
Heptachlor	76-44-8	2.1	3.8	3	30	0.7	4.0
Heptachlor Epoxide	1024-57-3	1.0	3.8	83	830	0.57	4.0

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: Chlorinated Pesticides and PCB Aroclors
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-9

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (ng/L)	Project Action AL Goal * (ng/L)	Analytical Method[1]		Achievable Laboratory Limits	
				MDLs (ng/L)	Method Practical QLs (ng/L)	MDLs[2] (ng/L)	QLs[6] (ng/L)
Methoxychlor	72-43-5	Not available	Not available	176	1760	0.48	4.0
Technical chlordane	57-74-9	5.7	4.3	14	140	Not available	50 [b]
Toxaphene	8001-35-2	7.3	0.2	240	2400	As above	50 [b]
Aroclor-1016	12674-11-2	0.44	14	Not determined	Not determined	As above	50
Aroclor-1221	1104-28-2	0.44	14	Not determined	Not determined	As above	50 [b]
Aroclor-1232	11141-16-5	0.44	14	Not determined	Not determined	As above	50 [b]
Aroclor-1242	53469-21-9	0.44	14	65	650	As above	50 [b]
Aroclor-1248	12672-29-6	0.44	14	Not determined	Not determined	As above	50 [b]
Aroclor-1254	11097-69-1	0.44	14	Not determined	Not determined	As above	50 [b]
Aroclor-1260	11096-82-5	0.44	14	Not determined	Not determined	As above	50
Aroclor-1268	11100-14-4	Not available	Not available	Not provided in 8080	Not provided in 8080	As above	50 [b]
Aroclor, Total [a]	Not applicable	As above	As above	As above	As above	Not applicable	Not applicable

[1] Method 8080.
[2] Achievable MDLs are from a seven replicate MDL study and are based on a sample size of 1-L. MDLs for some compounds are not available. Data will be evaluated against QLs.
[3] QLs determined from the low calibration standard and adjusted for sample processing volumes and factors. QL = [(low calibration std., 0.01to 0.008 ng/µL) * (pre-injection volume, 1000 µL) * (dilution factor, 1.0)] / (Sample volume, 2-L). Actual QLs will vary depending upon sample processing factors – actual QLs will be reported with the data.
[a] Total Aroclor = sum of the detected Aroclors.
[b] Single point calibration is used for this target, QL is derived from low calibration standard of Aroclor 1016 and Aroclor 1260.

* Project Action Human Health (HH) Goals from RIDEM Human Health Criteria for Class A waters (Water and Fish Consumption); Project Action Aquatic Life (AL) Goals from RIDEM Aquatic Life Criteria for Freshwater Chronic. These values are provided for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: SVOCs (PAHs)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-10

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte[a]	CAS Number	Project Action HH Goal* (ng/L)	Project Action AL Goal * (ng/L)	Analytical Method[1]		Achievable Laboratory Limits	
				MDLs	Method Estimated QLs (ng/L)	MDLs[2] (ng/L)	QLs[3] (ng/L)
Biphenyl	92-52-4	Not available	Not available	Not provided in 8270C	Not provided in 8270C	0.5	5
2-Methylnaphthalene	91-57-6	As above	As above	As above	Not provided in 8270C	0.59	5
Acenaphthene	83-32-9	1200000	1900	As above	10,000	0.64	5
Acenaphthylene	208-96-8	Not available	Not available	As above	10,000	0.5	5
Anthracene	120-12-7	9600000	As above	As above	10,000	0.42	5
Benzaldehyde	100-52-7	Not available	As above	As above	Not provided in 8270C	Not available	5
Benz[a]anthracene	56-55-3	28	As above	As above	10,000	0.83	5
Benzo[a]pyrene	50-32-8	28	As above	As above	10,000	0.78	5
Benzo[b]fluoranthene	205-99-2	28	As above	As above	10,000	0.51	5
Benzo[g,h,i]perylene	191-24-2	Not available	As above	As above	10,000	0.68	5
Benzo[k]fluoranthene	207-08-9	28	As above	As above	10,000	0.52	5
Chrysene	218-01-9	28	As above	As above	10,000	0.44	5
Dibenz[a,h]anthracene	53-70-3	28	As above	As above	10,000	1.3	5
Dibenzofuran	132-64-9	Not available	As above	As above	10,000	0.79	5
Fluoranthene	206-44-0	300000	44000	As above	10,000	0.53	5
Fluorene	86-73-7	1300000	Not available	As above	10,000	0.59	5
Indeno[1,2,3-cd]pyrene	193-39-5	28	As above	As above	10,000	1.1	5
Naphthalene	91-20-3	Not available	2600	As above	10,000	20	5
Phenanthrene	85-01-8	As above	Not available	As above	10,000	0.45	5
Pyrene	129-00-0	960000	As above	As above	10,000	0.57	5
Total PAH [b]	Not applicable	Not available	As above	As above	Not provided in 8270C	Not applicable	Not applicable

[1] Method 8270C.
[2] MDLs for some compounds are not available. Data will be evaluated against QLs.
[3] QLs determined from the low calibration standard and adjusted for sample processing volumes and factors.
QL = [(low calibration std., 0.01to 0.008 ng/µL) * (pre-injection volume, 1000 µL) * (dilution factor, 1.0)] / (Sample volume, 2-L). Actual QLs will be reported with the data.
[a] Bolded PAHs represent the EPA 16 PAH priority pollutants.
[b] Total PAH = sum of the detected PAHs; in cases where an individual PAH is not detected, 0.0 will be used in the summation.

* Project Action Human Health (HH) Goals from RIDEM Human Health Criteria for Class A waters (Water and Fish Consumption); Project Action Aquatic Life (AL) Goals from RIDEM Aquatic Life Criteria for Freshwater Chronic. These values are provided for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: Metals
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-42 (ICP/MS); L-44 (ICP/AES); L-45 (GFAA); L39 (CVAF) (multiple analysis methods may be used to optimize detection limits and reduce interferences)

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (µg/L)	Project Action AL Goal * (µg/L)	Analytical Method[1]		Achievable Laboratory Limits (µg/L)	
				MDLs[2] (µg/L)	Method QLs[2] (µg/L)	MDLs[3]	QLs[3]
Aluminum	7429-90-5	Not available	87	45	180	10	40
Antimony	7440-36-0	14	10	0.0097	0.0388	0.01	0.04
Arsenic	7440-38-2	50	190	N/A	N/A	0.04	.16
Barium	7440-39-3	Not available	Not available	2.3	9.2	0.072	0.288
Beryllium	7440-41-7	As above	0.17	0.3	1.2	0.053	0.212
Cadmium	7440-43-9	As above	(b)	0.025	0.1	0.015	0.06
Calcium (a)	7440-70-2	As Above	Not available	30	120	3	12
Chromium	7440-47-3	As above	10 (Cr VI)	6.1	24.4	3	12
Cobalt	7440-48-4	As above	Not available	N/A	N/A	0.004	0.016
Copper	7440-50-8	1300	(b)	5.4	21.6	0.81	3.24
Iron	7439-89-6	Not available	Not available	6.2	24.8	3.5	14
Lead	7439-92-1	As above	(b)	0.015	0.06	0.005	0.02
Magnesium (a)	7439-95-4	As above	Not available	30	120	10	40
Manganese	7439-96-5	As above	As above	1.4	5.6	0.2	0.8
Mercury	7439-97-6	0.14	0.0122	0.0002	0.0008	0.0002	0.0008
Molybdenum	13939-06-5	Not available	Not available	12	48	3.6	14.4
Nickel	7440-02-0	610	(b)	15	60	3.57	14.3
Selenium	7782-49-2	Not available	5	3	12	0.1	0.4
Silver	7440-22-4	As above	1.9 (acute)	7	28	0.67	2.68
Thallium	7440-28-0	1.7	1	0.0079	0.0316	0.004	0.016
Vanadium	7440-62-2	Not available	Not available	7.5	30	2	8
Zinc	7440-66-6	As above	(b)	2	8	1.2	4.8

[1] Methods 200.7; 1638; 1631; SW7742, and SM2340-B
[2] Analytical method MDLs and QLs documented in validated methods. QLs are usually 3-10 times higher than the MDLs.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. The MDL values are from a seven replicate study based on an average sample size of 500-mL. QLs are based on 4 × the achievable laboratory MDL.
(a) Determined to calculate hardness.
(b) Project HH or AL Goal depends upon hardness; see RIDEM Table 2.

* Project Action Human Health (HH) Goals from RIDEM Human Health Criteria for Class A waters (Water and Fish Consumption); Project Action Aquatic Life (AL) Goals from RIDEM Aquatic Life Criteria for Freshwater Chronic. These values are provided for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: Hardness
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-42 (ICP/MS)

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (mg/L)	Project Action AL Goal * (mg/L)	Analytical Method[1] (mg/L)		Achievable Laboratory Limits (mg/L)	
				MDLs[2]	Method QLs[2]	MDLs[3]	QLs[3]
Hardness	NA	Not available	Not available	1	4	None available	None available

[1] Method SM2340-B
[2] Analytical method MDLs and QLs documented in validated methods. These limits are based on a sample size of 500-mL. QLs are usually 3-10 times higher than the MDLs.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. The MDL values are from a seven replicate study based on an average sample size of 500-mL. QLs are based on 4 × the achievable laboratory MDL.

* Project Action Human Health (HH) Goals from RIDEM Human Health Criteria for Class A waters (Water and Fish Consumption); Project Action Aquatic Life (AL) Goals from RIDEM Aquatic Life Criteria for Freshwater Chronic. These values are provided for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form):SW
Analytical Parameter: SVOCs (phthalates and phenols)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-61

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (µg/L)	Project Action AL Goal * (µg/L)	Analytical Method[1] (µg/L)		Achievable Laboratory Limits (µg/L)	
				MDLs[2]	Method Estimated QLs[2]	MDLs[3]	QLs[3]
2,4,5-Trichlorophenol	95-95-4	Not available	0.51	Not Provided	10	3	50
2,4-Dinitrophenol	51-28-5	70	0.69	As above	50	23	50
2-Nitrophenol	88-75-5	Not available	Not available	As above	10	3	10
4-Methylphenol	106-44-5	As above	As above	As above	10	2	10
4-Nitrophenol	100-02-7	As above	As above	As above	50	4	50
Bis (2-ethylhexyl)phthalate	117-81-7	18	12	As above	10	2	10
Butyl benzyl phthalate	85-68-7	3000	1.9	As above	10	2	10
Carbazole	86-74-8	Not available	Not available	As above	Not Provided	3	10
di-n-Butyl phthalate	84-74-2	2700	As above	As above	10	4	10
di-n-Octyl phthalate	117-84-0	Not available	As above	As above	10	3	10
Pentachlorophenol	87-86-5	2.8	(b)	As above	50	2	50
Phenol	108-95-2	21000	5.6	As above	10	2	10

[1]Method 8270C.
[2] Analytical method MDLs and QLs documented in validated methods. QLs are usually 3-10 times higher than the MDLs.
[3]Achievable MDL and QL values determined following 40CFR Part 136.
(b) Project HH or AL Goal depends upon hardness; see RIDEM Table 2.

* Project Action Human Health (HH) Goals from RIDEM Human Health Criteria for Class A waters (Water and Fish Consumption); Project Action Aquatic Life (AL) Goals from RIDEM Aquatic Life Criteria for Freshwater Chronic. These values are provided for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: VOC
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-60

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (µg/L)	Project Action AL Goal * (µg/L)	Analytical Method[1] (µg/L)		Achievable Laboratory Limits (µg/L)	
				MDLs[2]	Method QLs[2]	MDLs[3]	QLs[3]
1,1,1,2-Tetrachloroethane	630-20-6	Not available	22	0.05	1	.3	1
1,1,1-Trichloroethane	71-55-6	As above	Not available	0.04	1	.3	1
1,1,2,2-Tetrachloroethane	79-34-5	1.7	10	0.2	1	.4	1
1,1,2-Trichloroethane	79-00-5	6.0	20	0.10	1	.4	1
1,1-Dichloroethane	75-34-3	Not available	Not available	0.04	1	.3	1
1,1-Dichloroethene	75-35-4	As above	As above	0.12	1	.4	1
1,1-Dichloropropene	563-58-6	As above	As above	0.10	1	.4	1
1,2,3-Trichlorobenzene	87-61-6	As above	As above	0.03	1	.5	1
1,2,3-Trichloropropane	96-18-4	As above	As above	0.32	1	.4	1
1,2,4-Trichlorobenzene	120-82-1	As above	1.7	0.04	1	.4	1
1,2,4-Trimethylbenzene	95-63-6	As above	Not available	0.09	1	.4	1
1,2-Dibromo-3-Chloropropane	106-43-4	As above	As above	0.50	1	.4	1
1,2-Dibromoethane	106-93-4	As above	As above	0.10	1	.2	1
1,2-Dichlorobenzene	95-50-1	2700	1.8	0.05	1	.4	1
1,2-Dichloroethane	107-06-2	3.8	131	0.02	1	.3	1
1,2-Dichloropropane	78-87-5	5.2	58	0.04	1	.3	1
1,3,5-Trimethylbenzene	108-67-8	Not available	Not available	0.05	1	.4	1
1,3-Dichlorobenzene	541-73-1	400	8.7	0.12	1	.3	1
1,3-Dichloropropane	142-28-9	Not available	6.7	0.04	1	.3	1
1,4-Dichlorobenzene	106-46-7	400	1.2	0.03	1	.3	1
2,2-Dichloropropane	594-20-7	Not available	Not available	0.08	1	.4	1
2-Chlorotoluene	74-87-3	As above	As above	0.08	1	.4	1
4-Chlorotoluene	95-49-8	As above	As above	0.06	1	.3	1
Benzene	71-43-2	12	5.9	0.03	1	.3	1
Bromobenzene	108-86-1	Not available	Not available	0.11	1	.4	1
Bromochloromethane	74-97-5	As above	As above	0.09	1	.4	1
Bromodichloromethane	75-27-4	2.7	As above	0.03	1	.3	1
Bromoform	75-25-2	43	33	0.20	1	.3	1
Bromomethane	74-83-9	48	Not available	0.03	1	.4	1

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Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: VOC
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-60

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (µg/L)	Project Action AL Goal * (µg/L)	Analytical Method[1] (µg/L)		Achievable Laboratory Limits (µg/L)	
				MDLs[2]	Method QLs[2]	MDLs[3]	QLs[3]
Carbon tertachloride	56-23-5	2.5	30	0.02	1	.4	1
Chlorobenzene	108-90-7	680	18	0.03	1	.3	1
Chloroethane	124-48-1	Not available	Not available	0.10	1	.3	1
Chloroform	75-00-3	57	32	0.03	1	.3	1
Chloromethane	67-66-3	Not available	Not available	0.13	1	.4	1
cis-1,2-Dichloroethene	156-59-2	As above	As above	0.12	1	.3	1
cis-1,3-Dichloropropene	10061-01-5	Not available	Not available	Not Provided	1	.3	1
Dibromochloromethane	96-12-8	4.1	As above	0.05	1	.3	1
Dibromomethane	74-95-3	Not available	As above	0.24	1	.4	1
Dichlorodifluoromethane	75-71-8	As above	As above	0.10	1	.4	1
Ethylbenzene	100-41-4	3100	36	0.03	1	.3	1
Hexachlorobutadiene	87-68-3	4.4	Not available	0.10	1	.5	1
Isopropylbenzene	98-82-8	Not available	As above	0.15	1	.3	1
m&p-Xylene	108-38-3 106-42-3	As above	As above	0.13 0.05	1	.5	1
Methylene Chloride	75-09-2	47	214	0.03	1	.5	1
Naphthalene	91-20-3	Not available	2.6	0.04	1	.4	1
n-Butylbenzene	104-51-8	As above	Not available	0.11	1	.3	1
n-Propylbenzene	103-65-1	As above	As above	0.04	1	.4	1
o-Xylene	95-47-6	As above	As above	0.11	1	.3	1
p-Isopropyltoluene	99-87-6	As above	As above	0.12	1	.3	1
sec-Butylbenzene	135-98-8	As above	As above	0.13	1	.4	1
Styrene	100-42-5	As above	As above	0.04	1	.3	1
tert-Butylbenzene	98-06-6	As above	As above	0.14	1	.3	1
Tetrachloroethene	127-18-4	As above	As above	0.14	1	.5	1
Toluene	108-88-3	6800	14	0.11	1	.3	1
Total Volatile Organics	NA	Not available	Not available	NA	NA	NA	NA
Total Xylenes	NA	As above	As above	NA	NA	.5	1
trans-1,2-Dichloroethene	156-60-5	As above	As above	0.06	1	.3	1
trans-1,3-Dichloropropene	10061-02-6	As above	As above	Not Provided	1	.3	1

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: VOC
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-60

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action HH Goal* (µg/L)	Project Action AL Goal * (µg/L)	Analytical Method[1] (µg/L)		Achievable Laboratory Limits (µg/L)	
				MDLs[2]	Method QLs[2]	MDLs[3]	QLs[3]
Trichloroethene	79-01-6	Not available	Not available	0.19	1	.3	1
Trichlorofluoromethane	75-69-4	As above	As above	0.08	1	.4	1
Vinyl Chloride	75-01-4	20	As above	0.17	1	.4	1

[1] Method 8260B
[2] Analytical method MDLs and QLs documented in validated methods. QLs are usually 3-10 times higher than the MDLs.
[3] Achievable MDL and QL values determined following 40CFR Part 136.

* Project Action Human Health (HH) Goals from RIDEM Human Health Criteria for Class A waters (Water and Fish Consumption); Project Action Aquatic Life (AL) Goals from RIDEM Aquatic Life Criteria for Freshwater Chronic. These values are provided for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

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Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: Dissolved inorganic nutrients (DIN)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-62

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action Limit (Units)	Project Quant Limit (Units))	Analytical Method[1]		Achievable Laboratory Limits	
				MDLs	Method QLs	MDLs[2]	QLs
Dissolved ammonia	Not applicable	Not available	Not available	Not available	Not available	0.003 mg N/L	Not applicable
Dissolved inorganic nitrate	As above	As above	As above	As above	As above	0.0007 mg N/L	As above
Dissolved inorganic nitrite	As above	As above	As above	As above	As above	0.0007 mg N/L	As above
Dissolved inorganic phosphorus	As above	As above	As above	As above	As above	0.0007 mg P/L	As above

[1] EPA Methods 353.2 (Nitrate and Nitrite) and 365.1 (Phosphate).
[2] Achievable MDLs are limits that an individual laboratory can achieve when performing a specific analytical method. The MDL values are three times the standard deviation of seven replicates of low-level samples.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: Total nitrogen and phosphorus (TN and TP)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-62

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action Limit (Units)	Project Quantitation Limit (Units)	Analytical Method[1]		Achievable Laboratory Limits	
				MDLs	Method QLs	MDLs[2]	QLs
Total nitrogen	Not applicable	Not available	Not available	Not available	Not available	0.0200 mg/L	Not applicable
Total phosphorus	As above	As above	As above	As above	As above	0.0010 mg/L	As above

[1] No applicable EPA method for analysis of nutrients.
[2] Achievable MDLs are limits that an individual laboratory can achieve when performing a specific analytical method. The MDL values are three times the standard deviation of seven replicates of low-level samples.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: Total dissolved nitrogen and phosphorus (TDN and TDP)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-62

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action Limit (Units)	Project Quantitation Limit (Units)	Analytical Method[1]		Achievable Laboratory Limits	
				MDLs	Method QLs	MDLs[2]	QLs
Total dissolved nitrogen	Not applicable	Not available	Not available	Not available	Not available	0.0200 mg/L	Not applicable
Total dissolved phosphorus	As above	As above	As above	As above	As above	0.0010 mg/L	As above

[1] No applicable EPA method for analysis of nutrients.
[2] Achievable MDLs are limits that an individual laboratory can achieve when performing a specific analytical method. The MDL values are three times the standard deviation of seven replicates of low-level samples.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: Total and dissolved organic carbon (TOC and DOC)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-62

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action Limit (Units)	Project Quantitation Limit (Units)	Analytical Method[1]		Achievable Laboratory Limits	
				MDLs	Method QLs	MDLs[2]	QLs
Total organic carbon	Not applicable	Not available	Not available	Not available	Not available	Not available	Not available
Dissolved organic carbon	As above	As above	As above	As above	As above	0.2400 mg/L	As above

[1] No applicable EPA method for analysis of nutrients.
[2] Achievable MDLs are limits that an individual laboratory can achieve when performing a specific analytical method. The MDL values are three times the standard deviation of seven replicates of low-level samples.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

EPA-NE QAPP Worksheet #9b - Rev. 10/99 (continued)

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: Total suspended solids (TSS)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP[1]: L-62

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action Limit (Units)	Project Quantitation Limit (Units)	Analytical Method[1]		Achievable Laboratory Limits	
				MDLs	Method QLs	MDLs[2]	QLs
Total suspended solids	Not applicable	Not available	Not available	Not available	Not available	2.4 mg/L	Not applicable

[1] EPA Method 160.2.
[2] Achievable MDLs are limits that an individual laboratory can achieve when performing a specific analytical method. The MDL values are three times the standard deviation of seven replicates of low-level samples.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

Medium/Matrix: Water
Region I Matrix Code (from EPA-NE DQO Summary Form): SW
Analytical Parameter: Biochemical Oxygen Demand (BOD)
Concentration Level: Low
Field Analytical or Fixed Laboratory Method/SOP: L-63

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Project Action Limit (Units)	Project Quantitation Limit (Units)	Analytical Method[1]		Achievable Laboratory Limits	
				MDLs	Method QLs	MDLs	QLs
Biochemical Oxygen Demand	NA	Not available	Not available	2.0 mg/L	Not available	Not available	Not available

[1] EPA Method 405.1.

Note – Upper concentration levels (UCLs) for contaminants in groundwater are not groundwater standards and are not to be used as remedial action limits.

EPA-NE QAPP Worksheet #9c- Rev. 10/99

Field and Quality Control Sample Summary Table

Medium/ Matrix	Analytical Parameter	Conc. Level	Analytical Method/ SOP Reference[1]	No. of Sampling Locations[2]	No. of Field Dup Pairs	Organic		Inorganic		No. of Trip Blanks	No. of Bottle Blanks	No. of Equip. Blanks[3]	No. of SRM or PE Samples[4]	Total No. of Samples to Lab[5]
						No. of MS	No. of MSD	No. of MS	No. of MSD					
Tissue *	Moisture Content [a]	Low	NS&T/L-11	4-6 (fish) 3-4 (diet) 3 (swallow) NA (ELS-egg) 2 (ELS-fish)	0	0	0	0	0	0	0	0	0	284
Tissue *	Lipid Content [a]	Low	NS&T/L-11	4-6 (fish) 3-4 (diet) 3 (swallow) NA (ELS-egg) 2 (ELS-fish)	0	0	0	0	0	0	0	0	0	284
Tissue *	Pest/PCB[a]	Low	NS&T/L-9	4-6 (fish) 3-4 (diet) 3 (swallow)	0	1 MS/MSD set per analytical batch [d], by tissue type		0	0	0	0	0	1 SRM per analytical batch	257
Tissue *	SVOC (PAH)[a]	Low	NS&T/L-10	4-6 (fish)	0	1 MS/MSD set per analytical batch [d], by tissue type		0	0	0	0	0	1 SRM per analytical batch	166
Tissue *	TICs [a]	Low	NS&T/L-10	4-6 (fish)	0	0	0	0	0	0	0	0	0	166
Tissue *	Dioxin/ Furan/HCX /TCX	Low	1613B/L-23	4-6 (fish) 3-4 (diet) 3 (swallow) NA (ELS-egg) 2 (ELS-fish)	0	1 MS/MSD set per analytical batch [d], by tissue type		0	0	0	0	0	1 SRM per analytical batch	284
Tissue *	100+ PCB Congeners	Low	1668A/ L-32	4-6 (fish) 3-4 (diet) 3 (swallow)	0	1 MS/MSD set per analytical batch [d], by tissue type		0	0	0	0	0	1 SRM per analytical batch	54 [e]

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Field and Quality Control Sample Summary Table

Medium/ Matrix	Analytical Parameter	Conc. Level	Analytical Method/ SOP Reference[1]	No. of Sampling Locations[2]	No. of Field Dup Pairs	Organic		Inorganic		No. of Trip Blanks	No. of Bottle Blanks	No. of Equip. Blanks[3]	No. of SRM or PE Samples[4]	Total No. of Samples to Lab[5]
						No. of MS	No. of MSD	No. of MS	No. of MSD					
Tissue *	12 WHO PCBs	Low	1668A/ L-32	NA (ELS-egg) 2 (ELS-fish)	0	1 MS/MSD set per analytical batch [d], by tissue type		0	0	0	0	0	1 SRM per analytical batch	28
Tissue *	Metals	Low	L-41, 42, 44, 45	4-6 (fish) 3-4 (diet) 3 (swallow)	0	0	0	1 MS/MSD set per analytical batch [d], by tissue type		0	0	0	1 SRM per analytical batch	218
Tissue *	MeHg	Low	NA/L-40	4-6 (fish) 3-4 (diet) 3 (swallow)	0	0	0	1 MS/MSD set per analytical batch [d], by tissue type		0	0	0	1 SRM per analytical batch	218
Sediment	Moisture Content[a]	Low	NS&T/L-13	4	1	0	0	0	0	0	0	0	0	20
Sediment	Pest/PCB[a]	Low	NS&T/L-9	4	1	1 MS/MSD set per analytical batch [d]		0	0	0	0	1	1 SRM per analytical batch	21
Sediment	SVOC (PAH)[a]	Low	NS&T/L-10	4	1	1 MS/MSD set per analytical batch [d]		0	0	0	0	1	1 SRM per analytical batch	10
Sediment	Dioxin/ Furan/HCX /TCX	Low	1613B/L-23	4	1	1 MS/MSD set per analytical batch [d]		0	0	0	0	0	1 SRM per analytical batch	12
Sediment	100+ PCB Congeners	Low	1668A/ L-32	4	1	1 MS/MSD set per analytical batch [d]		0	0	0	0	0	1 SRM per analytical batch	3 [e]
Sediment	Metals (w/ SEM)	Low	L-41, 42, 44, 45	4	1	0	0	1 MS/MSD set per analytical batch [d]		0	0	1	1 SRM per analytical batch	21
Sediment	MeHg	Low	NA/L-40	4	1	0	0	1 MS/MSD set per analytical batch [d]		0	0	0	0	20
Sediment	AVS	Low	1638, 1640/L-42	4	1	0	0	0	0	0	0	0	0	20

EPA-NE QAPP Worksheet #9c- Rev. 10/99 (continued)

Field and Quality Control Sample Summary Table

Medium/ Matrix	Analytical Parameter	Conc. Level	Analytical Method/ SOP Reference[1]	No. of Sampling Locations[2]	No. of Field Dup Pairs	Organic		Inorganic		No. of Trip Blanks	No. of Bottle Blanks	No. of Equip. Blanks[3]	No. of SRM or PE Samples[4]	Total No. of Samples to Lab[5]
						No. of MS	No. of MSD	No. of MS	No. of MSD					
Sediment	Grain Size	Low	ASTM D422/ L-46	4	1	0	0	0	0	0	0	0	0	20
Sediment	TOC	Low	9060/L-49	4	1	0	0	0	0	0	0	0	1 SRM per analytical batch	20
Sediment	SVOC (Phenol/ Phthalates)[b]	Low	8270C/L-61	4	1	1 MS/MSD set per analytical batch [d]		0	0	0	0	1	1 PE per analytical batch	11
Sediment	Bioassay Testing	NA	Multiple – see Attachment F	4	0	0	0	0	0	0	0	0	0	8
Soil	Moisture Content[a]	Low	NS&T/L-13	4	1	0	0	0	0	0	0	0	0	12
Soil	Pest/PCB[a]	Low	NS&T/L-9	4	1	1 MS/MSD set per analytical batch [d]		0	0	0	0	1	1 SRM per analytical batch	13
Soil	SVOC (PAH)[a]	Low	NS&T/L-10	4	1	1 MS/MSD set per analytical batch [d]		0	0	0	0	1	1 SRM per analytical batch	13
Soil	Dioxin/ Furan/HCX /TCX	Low	1613B/L-23	4	1	1 MS/MSD set per analytical batch [d]		0	0	0	0	0	1 SRM per analytical batch	12
Soil	100+ PCB Congeners	Low	1668A/ L-32	4	1	1 MS/MSD set per analytical batch [d]		0	0	0	0	0	1 SRM per analytical batch	3 [e]
Soil	Metals	Low	L-41, 42, 44, 45	4	1	0	0	1 MS/MSD set per analytical batch [d]		0	0	1	1 SRM per analytical batch	13
Soil	MeHg	Low	NA/L-40	4	1	0	0	0	0	0	0	0	0	12
Soil	Grain Size	Low	ASTM D422/L-46	4	1	0	0	0	0	0	0	0	0	12

EPA-NE QAPP Worksheet #9c- Rev. 10/99 (continued)

Field and Quality Control Sample Summary Table

Medium/ Matrix	Analytical Parameter	Conc. Level	Analytical Method/ SOP Reference[1]	No. of Sampling Locations[2]	No. of Field Dup Pairs	Organic		Inorganic		No. of Trip Blanks	No. of Bottle Blanks	No. of Equip. Blanks[3]	No. of SRM or PE Samples[4]	Total No. of Samples to Lab[5]
						No. of MS	No. of MSD	No. of MS	No. of MSD					
Soil	TOC	Low	9060/L-49	4	1	0	0	0	0	0	0	0	1 SRM per analytical batch	12
Soil	SVOC (Phenol/ Phthalates)[b]	Low	8270C/L-61	4	1	1 MS/MSD set per analytical batch [d]		0	0	0	0	1	1 PE per analytical batch	14
Water	Pest/PCB[a]	Low	NS&T/L-9	4	1	1	1	0	0	0	0	1	1 PE per analytical batch	15
Water	SVOC (PAH)[a]	Low	NS&T/L-10	4	1	1	1	0	0	0	0	1	1 PE per analytical batch	15
Water	Metals	Low	L-39, 42, 44, 45	4	1	0	0	1	1	0	0	1	0	14
Water	Hardness	Low	SM2340-B/L-42	4	1	0	0	0	0	0	0	0	0	11
Water	SVOC (Phenol/ Phthalates)[b]	Low	8270C/L-61	4	1	1	1	0	0	0	0	1	1 PE per analytical batch	14
Water	VOC[c]	Low	8260B/ L-60	4	1	1	1	0	0	1	0	1	1 PE per analytical batch	68[c]
Water	DIN	Low	L-62	4	1	0	0	0	0	0	0	1	0	12
Water	TN/TP	Low	L-62	4	1	0	0	0	0	0	0	1	0	12
Water	TDN & TDP	Low	L-62	4	1	0	0	0	0	0	0	1	0	12
Water	TOC/DOC	Low	L-62	4	1	0	0	0	0	0	0	1	0	12

EPA-NE QAPP Worksheet #9c- Rev. 10/99 (continued)

Field and Quality Control Sample Summary Table

Medium/ Matrix	Analytical Parameter	Conc. Level	Analytical Method/ SOP Reference[1]	No. of Sampling Locations[2]	No. of Field Dup Pairs	Organic		Inorganic		No. of Trip Blanks	No. of Bottle Blanks	No. of Equip. Blanks[3]	No. of SRM or PE Samples[4]	Total No. of Samples to Lab[5]
						No. of MS	No. of MSD	No. of MS	No. of MSD					
Water	TSS	Low	L-62	4	1	0	0	0	0	0	0	1	0	12
Water	BOD	Low	L-2	4	1	0	0	0	0	0	0	1	0	12

[1] Complete SOP references in EPA-NE QAPP Worksheet #20.
[2] Number reported here represents the number of sampling locations – not the total number of samples that will be collected. Multiple samples will be collected at each sampling location; see EPA-NE QAPP Worksheets #9a and #12b.
[3] Rinsate blank only.
[4] SRM samples will not be collected in the field – instead these are fixed laboratory analytical QC samples supplied by a certified agency and prepared in the laboratory to demonstrate comparability. In cases where an SRM does not exist or is not available for a specific analytical parameter/media – then a PE sample will be provided by NAE and shipped to the participating laboratory along with the authentic samples. The following PE samples are available for those parameters/media without existing SRMs – PCB/Pesticides in water, SVOCs (PAHs, Phenols, Phthalates) in water, VOCs in water, and SVOCs (Phenols, Phthalates) in sediment/soil.
[5] Total number of samples to the lab only represents total numbers of samples **collected in the field and shipped to the participating lab**. This includes authentic samples, field QC samples (*e.g.*, field duplicates, PE samples, and extra water for preparation of MS/MSD). Total number of samples to the lab does **not** include fixed laboratory QC samples (*e.g.*, MS/MSD) for tissue, sediment, and soil. For these sample types, aliquots of sample will be used from an authentic sample to prepare the fixed laboratory QC sample – separate and distinct samples will not be collected to satisfy the fixed laboratory QC sample requirements. Fixed laboratory QC sample (*e.g.*, MS/MSD) types and frequency are defined in EPA-NE QAPP Worksheet #11b or 24.
[a] Analysis of moisture content, lipid content (tissues only), Pest/PCB, and SVOC (PAHs) w/TIC will be performed from one single sample.
[b] SVOCs – phenols and phthalates.
[c] Collect 4 25-mL vials for each individual sample.
[d] Analytical batch contains 20 or fewer authentic samples.
[e] Only 20% of the field samples collected will be analyzed for the extended PCB congener list.

* ***Note – Tissue samples collected in the field will be shipped to the fixed laboratory for processing (homogenization). Processed tissue samples will then be sub-sampled for the required parameters identified above. See EPA-NE QAPP Worksheet #9a (Tissue Analysis Tasks) for details regarding tissue processing and sub-sampling.***

EPA-NE QAPP Worksheet #9d- Rev. 10/99

Analytical Services Table

Medium/ Matrix	Analytical Parameter	Concentration Level	Analytical Method/SOP[1]	Data Package Turnaround Time	Laboratory/Organization (Name and Address: Contact Person and Telephone Number)	Backup Laboratory/ Organization (Name and Address: Contact Person and Telephone Number)
Tissue Sediment Soil	Moisture Content	Low	NS&T/ L-11 (Tissue), L-13 (Sed/Soil)	60 days	Deirdre Dahlen Battelle Duxbury 397 Washington Street Duxbury, MA 02332 (781-934-0571)	Backup balances available at Battelle Duxbury
Tissue	Lipid Content	Low	NS&T/ L-11	60 days	Deirdre Dahlen Battelle Duxbury 397 Washington Street Duxbury, MA 02332 (781-934-0571)	Backup balances available at Battelle Duxbury
Tissue Sediment Soil Water	Pesticide/ PCB Aroclors	Low	NS&T/L-9	105 days	Deirdre Dahlen Battelle Duxbury 397 Washington Street Duxbury, MA 02332 (781-934-0571)	Backup GC/ECD systems available at Battelle Duxbury
Tissue Sediment Soil Water	SVOC (PAHs)	Low	NS&T/L-10	105 days	Deirdre Dahlen Battelle Duxbury 397 Washington Street Duxbury, MA 02332 (781-934-0571)	Backup GC/MS systems available at Battelle Duxbury
Tissue Sediment Soil	Dioxin/ Furan/ HCX/TCX	Low	1613B/L-23	105 days	Karen Tracy Battelle Columbus 505 King Avenue Columbus, OH 43201 (614) 424-4028	Backup GC/HRMS system available at Battelle Columbus
Tissue Sediment Soil	100+ PCBs	Low	1668A/L-32	105 days	Karen Tracy Battelle Columbus 505 King Avenue Columbus, OH 43201 (614) 424-4028	Backup GC/HRMS system available at Battelle Columbus
Tissue for ELS	Dioxin/ Furan/ HCX/TCX	Low	1613B/L-32	105 days	Karen Tracy Battelle Columbus 505 King Avenue Columbus, OH 43201 (614) 424-4028	Backup GC/HRMS system available at Battelle Columbus
Tissue for ELS	12 WHO PCBs	Low	1668A/L-23	60 days	Karen Tracy Battelle Columbus 505 King Avenue Columbus, OH 43201 (614) 424-4028	Backup GC/HRMS system available at Battelle Columbus
Tissue	Metals	Low	L-41, 42, 44, 45	90 days	Linda Bingler Battelle MSL 1529 Sequim Bay Rd. Sequim, WA 98382 (360) 681-3604	Backup ICP/MS, GFAA At MSL

EPA-NE QAPP Worksheet #9d- Rev. 10/99 (continued)

Analytical Services Table

Medium/ Matrix	Analytical Parameter	Concentration Level	Analytical Method/SOP[1]	Data Package Turnaround Time	Laboratory/Organization (Name and Address: Contact Person and Telephone Number)	Backup Laboratory/ Organization (Name and Address: Contact Person and Telephone Number)
Tissue	MeHg	Low	NA/L-40	90 days	Linda Bingler Battelle MSL 1529 Sequim Bay Rd. Sequim, WA 98382 (360) 681-3604	Backup CVAA System at MSL
Sediment/ Soil Water	Metals	Low	L-41, 42, 44, 45	60 days	Linda Bingler Battelle MSL 1529 Sequim Bay Rd. Sequim, WA 98382 (360) 681-3604	Backup ICP/MS, GFAA At MSL
Sediment/ Soil	MeHg	Low	NA/L-40	60 days	Linda Bingler Battelle MSL 1529 Sequim Bay Rd. Sequim, WA 98382 (360) 681-3604	Backup CVAA System at MSL
Sediment	AVS/SEM	Low	L-41, 42, 44, 45	60 days	Linda Bingler Battelle MSL 1529 Sequim Bay Rd. Sequim, WA 98382 (360) 681-3604	Backup ICP/MS, GFAA At MSL
Water	Hardness	Low	SM2340-B/ L42	60 days	Linda Bingler Battelle MSL 1529 Sequim Bay Rd. Sequim, WA 98382 (360) 681-3604	Backup ICP/MS At MSL
Sediment /Soil	Grain Size	Low	ASTM D422/ L-46	45 days	Ken Davis Applied Marine Sciences 502 North Highway 3 League City, TX 77573 (281) 554-7272	GeoPlan Associates Peter Rosen 30 Mann St. Hingham, MA 02043 (616) 740-1340
Sediment/ Soil	TOC	Low	9060/L-49	45 days	Ken Davis Applied Marine Sciences 502 North Highway 3 League City, TX 77573 (281) 554-7272	GeoPlan Associates Peter Rosen 30 Mann St. Hingham, MA 02043 (616) 740-1340
Water Sediment Soil	SVOC (Phenols/ Phthalates)	Low	8270C/L-61	45 days	Tara Martz STL Baltimore 19 Loveton Circle Sparks, MD 21152 (410) 771-4920	Backup GC/MS systems available at STL Baltimore and STL Maryland
Water	VOC	Low	8260B/L-60	45 days	Tara Martz STL Baltimore 19 Loveton Circle Sparks, MD 21152 (410) 771-4920	Backup GC/MS sitemaps available at STL Baltimore and STL Maryland
Water	BOD	Low	L-63	45 days	Tara Martz STL Baltimore 19 Loveton Circle Sparks, MD 21152 (410) 771-4920	Backup YSI DO Meter Model 54 or 57 available at STL Baltimore

EPA-NE QAPP Worksheet #9d- Rev. 10/99 (continued)

Analytical Services Table

Medium/ Matrix	Analytical Parameter	Concentration Level	Analytical Method/SOP[1]	Data Package Turnaround Time	Laboratory/Organization (Name and Address: Contact Person and Telephone Number)	Backup Laboratory/ Organization (Name and Address: Contact Person and Telephone Number)
Water	DIN	Low	L-62	45 days	Carl Zimmerman University of Maryland Center for Environmental Science Chesapeake Biological Laboratory (CBL) Box 38 Solomons, MD 20688 (410) 326-7252	Backup Technicon Autoanalyzer II available at CBL
Water	TN/TP	Low	L-62	45 days	Carl Zimmerman CBL Box 38 Solomons, MD 20688 (410) 326-7252	Backup Technicon Autoanalyzer II available at CBL
Water	TDN and TDP	Low	L-62	45 days	Carl Zimmerman CBL Box 38 Solomons, MD 20688 (410) 326-7252	Backup Technicon Autoanalyzer II available at CBL
Water	TOC/DOC	Low	L-62	45 days	Carl Zimmerman CBL Box 38 Solomons, MD 20688 (410) 326-7252	Backup Shimadzu 5000 Total Carbon Analyzer at CBL
Water	TSS	Low	L-62	45 days	Carl Zimmerman CBL Box 38 Solomons, MD 20688 (410) 326-7252	Backup Mettler AE100 at CBL
Tissue (Catfish Eggs)	ELS Toxicity Test (a)	NA	Multiple – Worksheet #20 and Attachment E	150 days (b)	Heida Diefenderfer Battelle MSL 1529 Sequim Bay Rd. Sequim, WA 98382 (360) 681-3619	NA
Sediment	Bioassay Toxicity Test (a)	NA	Multiple – Worksheet #20 and Attachment F	90 days	Dennis McCauley Great Lakes Environmental Center (GLEC) 739 Hastings St. Traverse City, MI 49684 (231) 941-2230	Battelle Marine Sciences Laboratory Heida Diefenderfer 1529 Sequim Bay Rd. Sequim, WA 98382 (360) 681-3619

[1] Specify appropriate reference number/letter from the Field Analytical Method/SOP Reference Table (EPA-NE QAPP Worksheet #17) and from the Fixed Laboratory Method/SOP Reference Table (EPA-NE QAPP Worksheet #20).

(a) Not an analytical parameter.

(b) Final report will not be submitted until final, validated chemical analysis results are received, evaluated and incorporated into the report.

EPA-NE QAPP Worksheet #10- Rev. 10/99

Project Schedule Timeline Table

Activities	Dates (MM/DD/YY) [a]		Deliverable	Deliverable Due Date
	Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Task 8 QAPP Preparation				
Draft	03/19/2001	04/23/2001	QAPP	04/23/2001
NAE and EPA Review	04/23/2001	05/15/2001		
Final	05/16/2001	05/23/2001		05/23/2001
Task 19 Early Life Stage[1]				
Literature review and Project Planning	05/17/2001	07/06/2001	Report	TBD
Preliminary Test	05/16/2001	06/19/2001		
Receipt of ELS fish contaminant data	06/08/2001	06/08/2001		
Determine constituents of Chemical Mixture	06/08/2001	06/12/2001		
Range Finding Test	06/28/2001	07/23/2001		
Coordinate with EPA to Determine Concentration Series for Definitive Test	07/24/2001	07/30/2001		
Definitive Testing/Reference Toxicant Test	07/31/2001	09/10/2001		
Ship Eggs for Analysis	08/09/2001	08/09/2001		
Evaluating Tox Testing and QA	09/13/2001	10/10/2001		
Chemistry Data Analysis and QA Audits	03/14/2002	04/10/2002		
Prepare Draft Report	04/11/2002	05/18/2002		
EPA Review and Comment	05/09/2002	05/29/2002		
Finalize Report	05/30/2002	06/12/2002		
Task 20 Toxicity Testing[1]				
System Setup	06/29/2001	06/25/2001	Report	TBD
Sample Receipt	07/06/2001	07/06/2001		
C. tentans Test	07/09/2001	09/06/2001		
H. azteca Test	07/09/2001	08/17/2001		
Data Summation	09/07/2001	09/20/2001		
QA/QC Review	09/21/2001	09/24/2001		
Draft Report Preparation	09/25/2001	10/01/2001		
Draft Report External Review	10/02/2001	10/15/2001		
Final Report	10/16/2001	10/22/2001		
Task 21 Field Sampling[1]				
Fish	06/08/2001	06/20/2001	Report	TBD
Bioassay Sediment	07/02/2001	07/05/2001		
Crayfish and Sediment	06/21/2001	06/25/2001		
Surface Water	06/26/2001	06/28/2001		
Aquatic Macroinvertebrate (RBP)	06/26/2001	06/29/2001		
Earthworms and Floodplain Soil	07/06/2001	07/10/2001		
Floodplain Soil and Fauna	07/06/2001	07/10/2001		
Emerging Insect	06/27/2001	07/10/2001		
Emerging Macroinvertebrates	06/27/2001	07/10/2001		
Task 22 Sample Analysis[1]				
HHRA - Fish Tissue Chemistry			Report and Data Package	TBD
Sample Receipt	06/11/2001	06/21/2001		
Decision Meeting	06/22/2001	06/22/2001		
Tissue Processing	06/25/2001	07/16/2001		
Sample Receipt at Participating Labs	06/29/2001	07/17/2001		
PCB/Pesticide, SVOC (PAHs), TICs, Lipid, and Moisture	07/02/2001	11/06/2001		
Dioxin/Furan, HCX, TCX, and PCB Congener	07/02/2001	11/06/2001		
Metals and MeHg	07/02/2001	10/18/2001		

EPA-NE QAPP Worksheet #10- Rev. 10/99 (continued)

Project Schedule Timeline Table

Activities	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
	Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Task 22 Sample Analysis (cont.) [1]				
HHRA - Fish Tissue Chemistry				
Tier II Independent Validation	10/26/2001	12/19/2001		
Tier III Independent Validation	11/21/2001	02/19/2002		
Letter Data Report	11/07/2001	11/13/2001		
Letter Data Report - Revised *	02/21/2002	02/27/2002		
ELS - Fish Tissue Chemistry				
Sample Receipt	04/10/2001	04/10/2001	Report and Data Package (note – final sample compositing approach decided 04/19/2001)	
Tissue Processing	04/11/2001	04/19/2001		
Sample Receipt	04/13/2001	04/13/2001		
Dioxin/Furan, HCX, TCX, and PCB Congener	04/20/2001	06/07/2001		
Chemical Mixture Prep	06/13/2001	06/21/2001		
Ship Mixture to Battelle MSL	06/21/2001	06/21/2001		
Tier II Independent Validation	NA	NA		
Tier III Independent Validation	06/13/2001	09/18/2001		
Letter Data Report	06/11/2001	06/15/2001		
Letter Data Report - Revised	09/20/2001	09/26/2001		
ELS - Eggs				
Sample Receipt	08/10/2001	08/10/2001	Report and Data Package	TBD
Dioxin/Furan, HCX, TCX, and PCB Congener	08/13/2001	11/29/2001		
Lipid and Moisture	08/13/2001	08/30/2001		
Tier II Independent Validation	NA	NA		
Tier III Independent Validation	11/30/2001	03/12/2002		
Letter Data Report	11/30/2001	12/06/2001		
Letter Data Report - Revised	03/13/2002	03/19/2002		
ERA - Tissue Chemistry				
Sample Receipt	06/11/2001	06/21/2001	Report and Data Package	TBD
Tissue Processing	06/29/2001	07/20/2001		
Sample Receipt at Participating Labs	07/09/2001	07/23/2001		
PCB/Pesticide, Lipid, and Moisture	07/10/2001	10/29/2001		
Dioxin/Furan, HCX, TCX, and PCB Congener	07/10/2001	10/29/2001		
Metals and MeHg	07/10/2001	10/09/2001		
Tier II Independent Validation	10/17/2001	12/11/2001		
Tier III Independent Validation	11/13/2001	02/11/2002		
Letter Data Report	10/30/2001	11/05/2001		
Letter Data Report - Revised *	02/13/2002	02/19/2002		

EPA-NE QAPP Worksheet #10- Rev. 10/99 (continued)

Project Schedule Timeline Table

Activities	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
	Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Task 22 Sample Analysis (cont.) [1]				
Sediment Chemistry				
Sample Receipt	06/26/2001	06/27/2001	Report and Data Package	TBD
PCB/Pesticide, SVOC (PAHs), Moisture	06/28/2001	10/19/2001		
Dioxin/Furan, HCX, TCX, and PCB Congeners	06/28/2001	10/19/2001		
Metals, MeHg, and AVS/SEM	06/28/2001	08/29/2001		
Grain Size and TOC	06/28/2001	08/14/2001		
SVOC (Phenols/Phthalates)	06/28/2001	08/14/2001		
Tier II Independent Validation	08/16/2001	11/29/2001		
Tier III Independent Validation	11/05/2001	02/01/2002		
Letter Data Report	10/22/2001	10/26/2001		
Letter Data Report - Revised *	02/05/2002	02/11/2002		
Soil Chemistry				
Sample Receipt	07/12/2001	07/17/2001	Report and Data Package	TBD
PCB/Pesticide, SVOC (PAHs), Moisture	07/18/2001	11/07/2001		
Dioxin/Furan, HCX, TCX, and PCB Congeners	07/18/2001	11/07/2001		
Metals and MeHg	07/18/2001	11/06/2001		
Grain Size and TOC	07/18/2001	08/30/2001		
SVOC (Phenols/Phthalates)	07/18/2001	08/30/2001		
Tier II Independent Validation	08/17/2001	12/18/2001		
Tier III Independent Validation	11/14/2001	02/20/2002		
Letter Data Report	11/08/2001	11/14/2001		
Letter Data Report - Revised *	02/22/2002	02/28/2002		
Water Chemistry				
Sample Receipt	06/22/2001	06/26/2001	Report and Data Package	TBD
PCB/Pesticide, SVOC (PAHs), Moisture	06/28/2001	10/19/2001		
Metals and Hardness	06/28/2001	08/27/2001		
SVOC (Phenols/Phthalates), VOC, and BOD	06/28/2001	08/10/2001		
Nutrients	06/27/2001	08/10/2001		
Tier II Independent Validation	08/07/2001	11/29/2001		
Tier III Independent Validation	NA	NA		
Letter Data Report	10/22/2001	10/26/2001		
Letter Data Report - Revised *	12/03/2001	12/07/2001		

[1] Participating laboratories will be responsible for sample custody and data quality control through validation process.
TBD – To be determined.
*Revised reports include **third party validated** chemistry results. If no changes to the data resulted from the third party validation, then a revised data report will not be submitted.
[a] If due date falls on a weekend then the deliverable will be submitted on the following Monday.

EPA-NE QAPP Worksheet #11a- Rev. 10/99

Project Quality Objectives/Decision Statements

Project Quality Objectives:
The project quality objectives for chemical testing is to generate data of a quality to be used for human health (HHRA) and ecological risk assessments (ERA). The project quality objectives for toxicity testing is to generate data of a quality to be used for ERA. The data needed for HHRA and ERA must be definitive data of very high quality (tight measurement performance criteria). Sensitivity requirements have not been defined.

Project quality objectives and measurement performance criteria for chemical testing are defined below. Details related to QC performance for toxicity testing is provided in Attachments E (ELS testing) and F (bioassay testing).

Measurement Performance Criteria:
Method performance criteria (MPC) chosen to ensure that the definitive data will be of high quality are defined by analysis parameter in EPA-NE QAPP Worksheet #11b. MPC for toxicity testing are defined in Attachments E (catfish ELS) and F (sediment bioassay).

Data quality may be defined in terms of accuracy, precision, representativeness, completeness, comparability, and sensitivity.

- *Accuracy* is the agreement between an observed value and an accepted value. Analytical accuracy is monitored for analytical chemistry measurements as specified in EPA Worksheet #11b (Attachment A).

  Applicable samples: LCS, MS, MSD, SRM, SIS (each sample).
  Applicable analyses:

  ⇒ Pesticide/PCB Aroclors (verify PCB congeners not Aroclors for SRM, No MS/MSD for Aroclors)
  ⇒ SVOCs (PAHs)
  ⇒ Dioxin/Furan
  ⇒ 100+ PCBs or 12 WHO PCBs
  ⇒ Metals (No SIS)
  ⇒ MeHg (No LCS for tissue; No SRM in sediment; SIS not applicable)
  ⇒ AVS (LCS only)
  ⇒ SEM (No LCS)
  ⇒ TOC (SRM only)
  ⇒ SVOCs (Phenols and phthalates – no SRM)
  ⇒ VOCs (No SRM)
  ⇒ DIN, TN/TP, TDN/TDP, TOC/DOC, TSS (MS and SRM only)

EPA-NE QAPP Worksheet #11a- Rev. 10/99 (continued)

Project Quality Objectives/Decision Statements

- *Precision* is defined as the degree of reproducibility among individual measurements of the same property, obtained under similar conditions. Measures of analytical precision will be determined in all phases of the program.

  Applicable samples: MS/MSD, DUP.
  Applicable analyses:

  ⇒ Moisture Content (DUP only)
  ⇒ Lipid Content (DUP only)
  ⇒ Pesticide/PCB Aroclors (No MS/MSD for Aroclors)
  ⇒ SVOCs (PAHs)
  ⇒ TIC (DUP only)
  ⇒ Dioxin/Furan/HCX/ TCX (DUP only for HCX/TCX)
  ⇒ 100+ PCBs or 12 WHO PCBs
  ⇒ Metals
  ⇒ MeHg
  ⇒ AVS (DUP only)
  ⇒ SEM
  ⇒ Hardness (DUP only)
  ⇒ Grain Size (DUP only)
  ⇒ TOC (DUP only)
  ⇒ SVOCs (Phenols and phthalates)
  ⇒ VOCs
  ⇒ DIN, TN/TP, TDN/TDP, TOC/DOC, TSS (MS and Dup only)
  ⇒ BOD (Dup only)

- *Representativeness* is the degree to which data accurately and precisely represent a characteristic of a population. Representativeness is addressed primarily in the sample design, through the selection of sampling sites and procedures that reflect the project goals and environment being sampled. It is ensured by the proper handling, homogenizing, compositing, and storage of samples and analysis within the specified holding times so that the material analyzed reflects the material collected as accurately as possible.

  Applicable analyses: Moisture content, Lipid content, Pesticides/PCB Aroclors, SVOCs (PAHs, phenols, phthalates), Dioxins/Furans/HCX/TCX, PCB congeners, Metals, MeHg, AVS/SEM, Hardness, Grain size, TOC, VOC, DIN, TN/TP, TDN/TDP, TOC/DOC, TSS, BOD.

- *Completeness* is defined as the amount of data collected as compared to the amount that is needed to make valid decisions. 100% completeness is targeted for all analyses. Study objectives will not be compromised if 95% of the analytes are reported.

  Applicable analyses: Moisture content, Lipid content, Pesticides/PCB Aroclors, SVOCs (PAHs, phenols, phthalates), Dioxins/Furans/HCX/TCX, PCB congeners, Metals, MeHg, AVS/SEM, Hardness, Grain size, TOC, VOC, DIN, TN/TP, TDN/TDP, TOC/DOC, TSS, BOD.

EPA-NE QAPP Worksheet #11a- Rev. 10/99 (continued)

Project Quality Objectives/Decision Statements

- *Comparability* is the measure of the confidence with which one data set can be compared to another. Comparability can be measured using split samples, comparing data to historical, or as will be done for this project – by using established laboratory methods that are comparable to other low-level methods and by analyzing Standard Reference Material (SRM) samples, as available. Using SRMs from batch to batch of samples throughout this project shows how data compares at the concentration of the SRM.

  Applicable samples: SRM (*note – SRMs not available for water matrix; PEs will be used as available see EPA-NE QAPP Worksheet #22a*).
  Applicable analyses:

  ⇒ Pesticide/ PCB Aroclors (verify PCB congeners not Aroclors for SRM)
  ⇒ SVOCs (PAHs)
  ⇒ Dioxin/Furan/HCX/ TCX (DUP only for HCX/TCX)
  ⇒ 100+ PCBs or 12 WHO PCBs
  ⇒ Metals
  ⇒ MeHg (only in tissue)
  ⇒ SEM
  ⇒ TOC

- *Sensitivity* is the capability of methodology or instrumentation to discriminate among measurement responses for quantitative differences or a parameter of interest. Sensitivity expressed as the detection limits is presented in (EPA Worksheet #9b).

  Applicable analyses: Moisture content, Lipid content, Pesticides/PCB Aroclors, SVOCs (PAHs, phenols, phthalates), Dioxins/Furans/HCX/TCX, PCB congeners, Metals, MeHg, AVS/SEM, Hardness, Grain size, TOC, VOC, DIN, TN/TP, TDN/TDP, TOC/DOC, TSS, BOD.

- *Quantitation Limits*. Project-required limits of quantitation were not specified in the Statement of Work and are not available.

All deviations from protocols described in this QAPP will be documented and approved by the Project Manager and discussed in the final report. All data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results.

Affected samples may be reanalyzed at the Project Manager's discretion. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a, Data Verification and Validation Tasks), and the rationale for accepting the analysis will be thoroughly documented.

The calculation of quality control statistics is described in Battelle SOP 7-029 and are summarized in EPA-NE QAPP Worksheet #30 (Attachment A).

EPA-NE QAPP Worksheet #11b - Rev. 10/99

Measurement Performance Criteria Table

Medium/ Matrix	Tissue[a]/ Sediment/ Soil/Water
Analytical Parameter	Pesticide/PCBs and SVOCs (PAHs)
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1 through S-7	NS&T/L-9 (Pest/PCBs) & NS&T/L-10 (SVOCs – PAHs)	Accuracy	< QL, or associated samples >10× blank values	Blank	A
			PD≤30% from a range of certified values (using surrogate corrected data; certified concentration in SRM must be >3× QL)	Standard Reference Material *(no applicable SRM for water; PE sample prepared instead – see Worksheet #22a)*	A
			90% of analytes meet the following: 40-120% R (Concentration of spiked analytes in MS/MSD must be >5× background concentrations to be used for data quality assessment)	Laboratory Control Sample; Matrix Spike/Spike Duplicate	A
			40-125% R	Surrogates	A
		Precision	RPD≤30% for at least 90% of analytes (for analytes detected at level >3× QL)	Laboratory (Analytical) Sample Duplicates	A
			RPD≤30% for at least 90% of analytes (Using R data; Concentration of spiked analytes in MS/MSD must be >5× background concentrations to be used for data quality assessment)	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

QL = Quantitation Limit; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference
[a] See EPA-NE QAPP Worksheet #9a for tissue types.
[1] Reference SOP Number from EPA-NE QAPP Worksheet #13.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

EPA-NE QAPP Worksheet #11b - Rev. 10/99

Measurement Performance Criteria Table

Medium/ Matrix	Tissue[a], Sediment and Soil
Analytical Parameter	Dioxin/Furan/ HCX/TCX[b]
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Note – no second source of HCX or TCX;; therefore, LCS/MS/MSD QC samples will not be fortified with HCX and TCX

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1 through S-7	1613B/ L-23	Accuracy	<5× MDL, or associated samples >10× blank values	Blank	A
			PD≤30% from certified values (for certified values >5× MDL)	Standard Reference Material	A
			Within Method 1613 Table 6 OPR requirements for LCS 50-120% R for MS/MSD (Analyte concentration in MS/MSD must be >5× background concentration to be used for data quality assessment)	Laboratory Control Sample; Matrix Spike/Spike Duplicate	A
			25-150% R	Internal Standards	A
		Precision	RPD≤30% (for analytes detected at level >10x MDL)	Laboratory (Analytical) Sample Duplicates	A
			RPD≤30% (Using R data; Concentration of spiked analytes in MS/MSD must be >5× background concentrations to be used for data quality assessment)	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

MDL = Method Detection Limit; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference

[a] See EPA-NE QAPP Worksheet #9a for tissue types.

[b] MPC criteria (*i.e.*, SRM, LCS, MS/MSD, SIS) is not applicable to HCX or TCX analysis. There is no second source standard available to fortify LCS, MS, or MSD samples with.

[1] Reference SOP Number from EPA-NE QAPP Worksheet #13.

[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.

[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability)

EPA-NE QAPP Worksheet #11b - Rev. 10/99
Measurement Performance Criteria Table

Medium/ Matrix	Tissue[a] / Sediment/Soil
Analytical Parameter	PCB Congeners
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	**Analytical Method/SOP[2]**	**Data Quality Indicators (DQIs)[3]**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
S-1 through S-7	1668A/ L-32	Accuracy	< 5× EML, or associated samples >10× blank values	Blank	A
			PD≤30% from certified values (for certified values >3× EML)	Standard Reference Material	A
			Method 1668A, Table 6, "OPR" requirements for LCS 50-150% R for MS/MSD for at least 90% of congeners (Concentration of spiked analytes in MS/MSD must be >5× background concentrations to be used for data quality assessment)	Laboratory Control Sample; Matrix Spike/Spike Duplicate	A
			25-150% R	Internal Standards	A
		Precision	RPD≤30% for at least 90% of analytes (for analytes detected at level >3× EML)	Laboratory (Analytical) Sample Duplicates	A
			RPD≤30% for at least 90% of analytes (Using R data; Concentration of spiked analytes in MS/MSD must be >5× background concentrations to be used for data quality assessment)	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

EML = Estimated Minimum Level; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference.
[a] See EPA-NE QAPP Worksheet #9a for tissue types.
[1] Reference SOP Number from EPA-NE QAPP Worksheet #13.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Tissue[a] Sediment/Soil Water
Analytical Parameter	Metals
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	**Analytical Method/SOP[2]**	**Data Quality Indicators (DQIs)[3]**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
S-1 through S-7	Varies: 1631/L-39 245.5/L-41 1640, 1638/ L-42 SW6010B, 200.7/L-44 200.9/L-45	Accuracy	<5× MDL, or associated samples >10× blank values	Blank	A
			PD ≤ 25% from certified values (for certified values >5× MDL)	Standard Reference Material	A
			70-130 % R (Analyte concentration in MS/MSD must be >5× background concentration to be used for data quality assessment)	Laboratory Control Sample; Matrix Spike/Spike Duplicate	A
			Not applicable	Surrogates	A
		Precision	RPD ≤ 30% (for analytes detected at level > 10× MDL)	Laboratory (Analytical) Sample Duplicates	A
			RPD≤30% (Using R data; Concentration of spiked analytes in MS/MSD must be >5× background concentrations to be used for data quality assessment)	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

MDL = Method Detection Limit; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference.
[a] See EPA-NE QAPP Worksheet #9a for tissue types.
[1] Reference SOP Number from EPA-NE QAPP Worksheet #13.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Tissue[a] Sediment/Soil
Analytical Parameter	MeHg
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1 through S-7	Bloom (1989)/L-40	Accuracy	<5× MDL, or associated samples >10× blank values	Blank	A
			PD ≤ 25% from certified values (for certified values >5× MDL)	Standard Reference Material (*note – no SRM in sediment/soil available)*	A
			70-130 % R (Analyte concentration in MS/MSD must be >5× background concentration to be used for data quality assessment)	Laboratory Control Sample; Matrix Spike/Spike Duplicate (*note – no LCS for tissue)*	A
			Not applicable	Surrogates	A
		Precision	RPD ≤ 30% (for analytes detected at level > 10× MDL)	Laboratory (Analytical) Sample Duplicates	A
			RPD≤30% (Using R data; Concentration of spiked analytes in MS/MSD must be >5× background concentrations to be used for data quality assessment)	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

MDL = Method Detection Limit; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference.
[a] See EPA-NE QAPP Worksheet #9a for tissue types.
[1] Reference SOP Number from EPA-NE QAPP Worksheet #13.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Sediment
Analytical Parameter	AVS
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	1638, 1640/ L-42	Accuracy	<5× MDL, or associated samples >10× blank values	Blank	A
			Not applicable – *No SRM for AVS in sediment available*	Standard Reference Material	A
			70-130 % R	Laboratory Control Sample *(Not applicable for Matrix Spike/Spike Duplicate)*	A
			Not applicable	Surrogates	A
		Precision	RPD ≤ 30% (for analytes detected at level > 10× MDL)	Laboratory (Analytical) Sample Duplicates	A
			Not applicable	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

MDL = Method Detection Limit; R = Recovery; RPD = Relative Percent Difference.
[1]Reference SOP Number from EPA-NE QAPP Worksheet #13.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Sediment
Analytical Parameter	SEM metals
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	1638, 1640/ L-42	Accuracy	<5× MDL, or associated samples >10× blank values	Blank	A
			PD ≤ 25% from certified values (for certified values >5× MDL)	Standard Reference Material	A
			70-130 % R (Analyte concentration in MS/MSD must be >5× background concentration to be used for data quality assessment)	Matrix Spike/Spike Duplicate *(Not applicable for Laboratory Control Sample)*	A
			Not applicable	Surrogates	A
		Precision	RPD ≤ 30% (for analytes detected at level > 10× MDL)	Laboratory (Analytical) Sample Duplicates	A
			RPD≤30% (Using R data; Concentration of spiked analytes in MS/MSD must be >5× background concentrations to be used for data quality assessment)	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

MDL = Method Detection Limit; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference.
[1]Reference SOP Number from EPA-NE QAPP Worksheet #13.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Water
Analytical Parameter	Hardness
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	1638, 1640/ L-42	Accuracy	<5× MDL, or associated samples >10× blank values	Blank	A
			Not applicable – *No SRM for hardness in water available*	Standard Reference Material	A
			Not applicable	Laboratory Control Sample; Matrix Spike/Spike Duplicate	A
			Not applicable	Surrogates	A
		Precision	RPD ≤ 30% (for analytes detected at level >10× MDL)	Laboratory (Analytical) Sample Duplicates	A
			Not applicable	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

MDL = Method Detection Limit; RPD = Relative Percent Difference.
[1]Reference SOP Number from EPA-NE QAPP Worksheet #13.
[2]Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.
[3]Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Sediment/Soil
Analytical Parameter	Grain Size
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	ASTM D422/ L-46	Accuracy	Not applicable	Blank	A
			Not applicable – *No SRM for grain size in sediment/soil available*	Standard Reference Material	A
			Not applicable	Laboratory Control Sample; Matrix Spike/Spike Duplicate	A
			Not applicable	Surrogates	A
		Precision	RPD $\leq$ 25% (for analytes detected at level > 10× MDL)	Laboratory (Analytical) Sample Duplicates	A
			Not applicable	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

MDL = Method Detection Limit; RPD = Relative Percent Difference.
[1]Reference SOP Number from EPA-NE QAPP Worksheet #13.
[2]Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.
[3]Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Sediment/Soil
Analytical Parameter	TOC
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	9060/ L-49	Accuracy	<10× MDL (with signal:noise >10:1)	Blank	A
			PD ≤ 5%	Standard Reference Material	A
			Not applicable	Laboratory Control Sample; Matrix Spike/Spike Duplicate	A
			Not applicable	Surrogates	A
		Precision	RPD ≤ 25% (for analytes detected at level > 10× MDL)	Laboratory (Analytical) Sample Duplicates	A
			Not applicable	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

MDL = Method Detection Limit; RPD = Relative Percent Difference.
[1]Reference SOP Number from EPA-NE QAPP Worksheet #13.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Sediment/Soil Water
Analytical Parameter	SVOC (phenols and phthalates)
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Note – All target analytes will be fortified into the LCS/MS/MSD and recovery results reported – but only "control analytes" will be evaluated against the MPC. Control analytes for this analysis are identified on EPA-NE QAPP Worksheet #24b.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	8270C/L-61	Accuracy	≤ QL, except bis-2-ethylhexylphthalate is ≤ 5× QL	Blank	A
			Not applicable – *No SRM for water; PE sample prepared instead – see Worksheet #22a*	Standard Reference Material	A
			Varies – see EPA-NE QAPP Worksheet #24b	Laboratory Control Sample; Matrix Spike/Matrix Spike Duplicate	A
			Varies – see EPA-NE QAPP Worksheet #24b	Surrogates	A
		Precision	Varies – see EPA-NE QAPP Worksheet #24b	Laboratory (Analytical) Sample Duplicates	A
			Varies – see EPA-NE QAPP Worksheet #24b	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

QL = Quantitation Limit (also referred to as Reporting Limit (RL)); R = Recovery.
[1] Sampling was the responsibility of EPA-NE and is not discussed in this QAPP.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20 .
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Water
Analytical Parameter	VOC
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Note – All target analytes will be fortified into the LCS/MS/MSD and recovery results reported – but only "control analytes" will be evaluated against the MPC. Control analytes for this analysis are identified on EPA-NE QAPP Worksheet #24b.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	8260B/L-60	Accuracy	<QL, methylene chloride and acetone must be < 5x QL	Blank	A
			Not applicable – *No SRM for water; PE sample prepared instead – see Worksheet #22a*	Standard Reference Material	A
			Varies – see EPA-NE QAPP Worksheet #24b	Laboratory Control Sample; Matrix Spike/Matrix Spike Duplicate	A
			Varies – see EPA-NE QAPP Worksheet #24b	Surrogates	A
		Precision	Varies – see EPA-NE QAPP Worksheet #24b	Laboratory (Analytical) Sample Duplicates	A
			Varies – see EPA-NE QAPP Worksheet #24b	MS/MSD	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses), follow defined SOPs	A

QL = Quantitation Limit (also referred to as Reporting Limit (RL)); R = Recovery.
[1] Sampling was the responsibility of EPA-NE and is not discussed in this QAPP.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Water
Analytical Parameter	DIN
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	NA/L-62	Accuracy	<5× MDL	Procedural Blank	A
			PD ≤15%	Standard Reference Material	A
			85 – 115% R	Matrix Spike	A
			Not applicable	Surrogates	A
		Precision	≤10% RPD	Laboratory (Analytical) Sample Duplicates	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses, follow defined SOPs)	A

MDL = Method Detection Limit; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference.
[1] Sampling was the responsibility of EPA-NE and is not discussed in this QAPP.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Water
Analytical Parameter	TN/TP
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	NA/L-62	Accuracy	<5× MDL	Procedural Blank	A
			PD ≤15%	Standard Reference Material	A
			85 – 115% R	Matrix Spike	A
			Not applicable	Surrogates	A
		Precision	≤10% RPD	Laboratory (Analytical) Sample Duplicates	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses, follow defined SOPs)	A

MDL = Method Detection Limit; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference.

[1] Sampling was the responsibility of EPA-NE and is not discussed in this QAPP.

[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.

[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Water
Analytical Parameter	TDN/TDP
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	NA/L-62	Accuracy	<5× MDL	Procedural Blank	A
			PD ≤15%	Standard Reference Material	A
			85 – 115% R	Matrix Spike	A
			Not applicable	Surrogates	A
		Precision	≤10% RPD	Laboratory (Analytical) Sample Duplicates	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses, follow defined SOPs)	A

MDL = Method Detection Limit; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference.

[1] Sampling was the responsibility of EPA-NE and is not discussed in this QAPP.

[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.

[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Water
Analytical Parameter	TOC/DOC
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	NA/L-62	Accuracy	<5× MDL	Procedural Blank	A
			PD ≤15%	Standard Reference Material	A
			85 – 115% R	Matrix Spike	A
			Not applicable	Surrogates	A
		Precision	≤10% RPD	Laboratory (Analytical) Sample Duplicates	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses, follow defined SOPs)	A

MDL = Method Detection Limit; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference.

[1] Sampling was the responsibility of EPA-NE and is not discussed in this QAPP.

[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20.

[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Water
Analytical Parameter	TSS
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	**Analytical Method/SOP[2]**	**Data Quality Indicators (DQIs)[3]**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
S-1	NA/L-62	Accuracy	<5× MDL	Procedural Blank	A
			Not applicable – *No SRM for TSS in water available*	Standard Reference Material	A
			Not applicable	Matrix Spike	A
			Not applicable	Surrogates	A
		Precision	≤10% RPD	Laboratory (Analytical) Sample Duplicates	A
		Comparability	Not applicable	Intercomparison exercises (*e.g.*, SRM analyses, follow defined SOPs)	A

MDL = Method Detection Limit; RPD = Relative Percent Difference.
[1] Sampling was the responsibility of EPA-NE and is not discussed in this QAPP.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20 .
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Measurement Performance Criteria Table

Medium/ Matrix	Water
Analytical Parameter	BOD
Concentration Level	Low

QC results are evaluated against the measurement performance criteria (MPC) and all data that do not meet the listed MPCs will be submitted to the Project Manager for review and assessment of the potential impact of the results. Affected samples may be reanalyzed. Data that are accepted outside these criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rational for accepting the analysis thoroughly documented in the QA/QC narrative.

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)[3]	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
S-1	NA/L-63	Accuracy	<0.2 mg/L O_2	Procedural Blank	A
			Not applicable – *No SRM for BOD in water available*	Standard Reference Material	A
			200 ± 37 mg/L O_2	Laboratory Control Sample	A
			Not applicable	Surrogates	A
		Precision	≤30% RPD	Laboratory (Analytical) Sample Duplicates	A
		Comparability	See SRM above	Intercomparison exercises (*e.g.*, SRM analyses, follow defined SOPs)	A

RPD = Relative Percent Difference.
[1] Sampling was the responsibility of EPA-NE and is not discussed in this QAPP.
[2] Reference analytical method/SOP Number from EPA-NE QAPP Worksheet #20 .
[3] Data Quality Indicators (a.k.a. PARCC parameters, *i.e.*, precision, accuracy/bias, sensitivity, data completeness, comparability).

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Sampling Design and Rational

Note – methods for field sampling design and rationale presented here are direct excerpts from Harding ESE's Field Sampling Plan (FSP); all references to tables, figures, and appendices apply to the FSP – not actual tables, figures, or appendices included in this QAPP.

1.1 Field Sampling Activities

The field sampling activities consist of the following subtasks:

- Mobilization/Demobilization
- Biota Tissue Sampling
- Field Population and Community Studies
- Sediment Sampling
- Surface Water Sampling
- Floodplain Soil Sampling
- Investigation Derived Waste (IDW) characterization and disposal

Each of these subtasks and the specific data collection activities are described in the following subsections.

1.1.1 Mobilization/Demobilization

This section describes the mobilization of both Harding ESE personnel and Harding ESE subcontractor personnel.

Harding ESE Mobilization/Demobilization

Prior to beginning any fieldwork, all field team members will review the Statement of Work (SOW), Work Plan, this Field Sampling Plan (FSP), the Health and Safety Plan (HASP), and all applicable Standard Operating Procedures (SOPs) identified in Section 2.2 and provided in the appendices of this FSP. In addition, the Project Manager, Office Health and Safety Manager, SSO, FOL, and field scientists will hold a field team orientation meeting prior to beginning the fieldwork to familiarize personnel with the scope of the field activities. All field team members (as listed above), will receive a copy of the FSP prior to the orientation meeting. A record of the fieldwork orientation meeting will be maintained in the project file.

Equipment mobilization may include, but not necessarily limited to, transporting and preparing the following equipment:

- Sampling and shipping equipment
- Health and safety equipment
- Decontamination equipment
- Subcontractor equipment (to be conducted by the subcontractor).

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Sampling Design and Rational

The FOL will coordinate the Harding ESE mobilization. The FOL will also coordinate any equipment purchases necessary to conduct the field investigation. The equipment of the sampling and health and safety activities will be transported to the site as needed.

Subcontractor Mobilization/Demobilization

Subcontractors will be procured for field data collection, analysis of biological field data, and IDW characterization and disposal. Once the procurement process has been completed, a "Notice to Proceed" will be issued to the selected subcontractors to initiate mobilization for each service.

The IDW disposal subcontractor will be responsible for mobilizing and demobilizing the equipment and personnel necessary to perform the work outline in the specification, including obtaining utility clearance and any other permits required by federal, state, and local authorities.

1.1.2 Biota Tissue Sampling

Biota samples will be collected from several exposure areas (Table 1) for evaluating human health risks associated with eating fish and other biota from the four reaches of the site (Allendale, Lymansville, Manton, and Dyerville Ponds). In addition, biota samples will be collected from the reference areas (Greystone Mill Pond and Assapumpsett Brook). These biota samples will also be used to evaluate potential risks to ecological receptors that ingest fish that have bioaccumulated site-related compounds in their tissue. The tissue data will be used directly in the BERA to estimate both direct effects to the sampled organisms (using critical body residues [CBR] data) and potential bioaccumulation risks to consumer species.

Three target biota species will be collected. The specific species collected for tissue analysis to support the HHRA and the BERA are based on human consumption patterns, availability of species in the collection areas, and the need to represent different trophic levels in the ecological risk assessment. Analytical results for these three species will be used to estimate exposures in both the human health and ecological risk assessments. The objectives of the human health and ecological risk assessments indicate that two of the target species would be the American eel and either a frog or turtle species (Harding ESE, 2000). The third species will be a finfish such as bass or sunfish. When the fish survey and collection activities are implemented, if the target species are not available a decision tree will be employed to modify the identified target species based on the actual availability of species in this reach of the river. If, prior to the implementation of fish survey/collection activities, information is obtained that turtles are not consumed in the area, another species will be selected based on that new information.

A contingency plan will be implemented in the field during the fish survey/collection activities to adjust one or more of the target species if (a) one or more of the target species are not present in sufficient quantity in the collection areas, or (b) newly obtained fish consumption information indicates that another species is a more important component of the local diet of human receptors. Prior to initiation of field collection activities, Harding ESE will conduct extensive literature and internet searches to identify consumption patterns, species caught and eaten, potentially exposed populations, angling locations, and food preparation methods for biota. This information will be used to finalize the three target species for the biota consumption risk assessment and provide the basis for development of a contingency plan

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Sampling Design and Rational

should the preferred target species not be available in the field. The "preferred" species, as identified in Table 2, will be targeted during field activities. Table 2 also summarizes the more common species that are believed to occur in the Woonasquatucket River watershed (RIDFW, 1995), including bluegill and pumpkinseed sunfish, white sucker, large mouth bass, tessellated darter, American eel, fall fish, chain and redfin pickerel, creek chubsucker, yellow bullhead, rainbow trout, and golden shiner. The collection of biota for tissue analysis to support the risk assessments will be implemented simultaneously with the fish population and community survey (described in Section 2.2.3.4) that will be completed as part of this FSP. When field activities are implemented, if the target species are not sufficiently available, identified "alternative" species will be selected based on the actual availability of species observed in the river. In addition, if, prior to data collection activities, information is obtained that turtles or frogs are not consumed in the area, or that these taxonomic groups are not abundant within the study area, an alternate fish species will be selected.

It is assumed that the fillet samples will need to be analyzed for one of the three biota species sampled to support the HHRA depending on how the selected species are consumed. If that species is appropriate for evaluating ecological risks, the offal from the fillet samples will also be analyzed and the results from the fillet and offal analyses will be used to estimate the whole body tissue concentrations of those samples. Otherwise, an alternate species will be selected to support the BERA.

In addition to the three tissue types that will be collected to support both the HHRA and BERA, additional tissue samples will be collected specific to the evaluation of ecological risks at the site. These additional tissues include crayfish, emerging macroinvertebrates, earthworms, and various samples collected as part of a swallow population study. The swallow study is not included in this FSP and will be overseen directly by USEPA. Sections 2.2.2.4 through 2.2.2.6 describe the field sampling program for collection of crayfish, emerging macroinvertebrate, and earthworm tissue, respectively.

Fish

The detailed technical approach to fish collection is provided in Appendix A of the FSP (Harding 2001b), which includes procedures for conducting the fish community studies (*i.e.*, IBI and ichthyoplankton surveys) as well. Figure 1 depicts the general sampling areas where fish tissue samples will be collected.

Table 1 provides a summary of the number of tissue samples to be collected by exposure/ reference area and the required analyses for those samples. Ten samples of each of the three target biota species will be collected from the Allendale and Lymansville reaches. In the Manton and Dyerville reaches, 3 samples of one species from each reach will be collected. In each reference areas (Greystone Mill Pond and Assapumpsett Brook), 10 samples of each of the three target biota species will be collected. Both muscle (fillet) and offal tissues will be sampled in one of the target fish species, based on typical cooking preparation methods. A total of 166 biota tissue samples will be collected and evaluated in both the human health and ecological risk assessments.

Fish samples will be analyzed for SVOCs (PAHs), TICs, PCBs/pesticides, metals, methylmercury, dioxins/furans (including HCX), percent lipids, and percent moisture (Tables A-1 and A-2). A full PCB congener analysis will be conducted on 20 percent of the fish samples.

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Sampling Design and Rational

Turtles/Frogs

Turtles have been identified as a target species to evaluate consumption exposures in the HHRA. However, as described in Section 2.2.2, the selection of which specific taxonomic groups are included in the tissue sampling program will depend on a review of additional data concerning human consumption patterns in the area and the available of adequate number of individuals. As an alternate, a frog species (*e.g.*, bullfrog) or a third fish species (in addition to the two described in Section 2.2.2.1) may be substituted (Table A-2).

A total of 10 samples of turtles or frogs would be collected from Allendale Pond, Lymansville Pond, upstream of the CMS site in the Woonasquatucket River and/or in Greystone Mill Pond, and in Assapumpsett Pond. In addition, a duplicate sample will be collected in each of the four areas and a MS/MSD sample collected from both Allendale Pond and Lymansville Pond. Each turtle sample would consist of an individual organism, however, approximately 11-12 frogs would be composited per sample to achieve the required 115 gram sample weight.

If required, specific guidelines for collecting turtles and frogs are provided in Appendices B and C, respectively.

Turtle (or frog) samples will be analyzed for SVOCs (PAHs), TICs, PCBs/pesticides, metals, methylmercury, dioxins/furans (including HCX), percent lipids, and percent moisture (Tables B-1 and C-1). A full PCB congener analysis will be conducted on 20 percent of the samples.

Crayfish

Crayfish will be collected in several exposure areas downgradient of the site (Figures 2a and 2b). A total of 11 crayfish samples will be collected from Allendale Pond (3), Lymansville Pond (4), Greystone Mill Pond (3) and Assapumpsett Brook (1) (Table 3) using a combination of dipnets and baited traps. It is anticipated that personnel wearing hip length boots can access most locations. At crayfish sampling locations determined to be inaccessible by wading (*i.e.*, water depths greater than two feet or removed from access points), an open workboat will be used to collect the crayfish samples. Crayfish samples will be collected following the guidance provided in Appendix D of the FSP (Harding, 2001b).

Table D-1 presents the sampling design and analytical requirements for the crayfish samples. Each composite sample will be analyzed for PCBs/pesticides, metals (including methylmercury), dioxins and furans (including HCX), percent lipids, and percent moisture. In addition, a full PCB congener analysis will be conducted for 20 percent of the samples.

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Emerging Macroinvertebrates

Five box-type floating emergence traps will be deployed in each of the following areas: Allendale Pond, Lymansville Pond, and Greystone Mill Pond in the general vicinity of the swallow population study nest boxes. The location of the emergence traps were selected based on available sediment chemistry and sampling locations are presented in Table 4. The traps will be used to collect tissue data and to characterize the emerging insect community structure. Sampling will occur immediately following the tree swallow population study to avoid depressing available forage during this critical forage period. Each trap will consist of a 2-meter square structure supporting a conical nylon net. The traps will be inserted in closed foam strips to provide flotation and attached leads allow the traps to be anchored in place. Emerging insects will be sampled every two days using an insect vac and the samples will be chilled to facilitate taxonomic classification, enumeration and preparation of composited tissue samples. These data will be used to supplement data on the macroinvertebrate community productivity as well as to provide tissue analytical data to assess direct effects to macroinvertebrates and to assess contaminant dose exposures to insectivorous birds (*e.g.*, tree swallows) and mammals (*e.g.*, little brown bat).

Appendix E of the FSP (Harding, 2001b) provides the specific guidelines for implementing this field study.

Table E-1 presents the sampling design and analytical requirements for the crayfish samples. Each composite sample will be analyzed for PCBs/pesticides, metals (including methylmercury), dioxins and furans (including HCX), percent lipids, and percent moisture. In addition, a full PCB congener analysis will be conducted for 20 percent of the samples.

Earthworms

Floodplain invertebrates are directly exposed to COPCs in floodplain soil. These invertebrates provide a forage base for higher trophic level predators; therefore, tissue sampling will be completed to evaluate potential food chain risks to semi-aquatic wildlife receptors that forage in floodplain environments. Earthworms, which typically inhabit floodplain soil, will be the focus of this assessment

Depending on the availability of adequate tissue mass to conduct the selected chemical analyses, earthworms will be collected at a range of locations where historical data indicate that a concentration range of bioaccumulating compounds are located. Figures 3a and 3b present the sampling locations selected for the collection of earthworm tissue. As indicated in Table 1, a total of 11 earthworm samples will be collected from Allendale Pond (3), Lymansville Pond (4), Greystone Mill Pond (3) and Assapumpsett Brook (1). Specific sampling locations and rationale for each selected location are presented in Table 5.

Table F-1 presents the sampling design and analytical requirements for the crayfish samples. Each composite sample will be analyzed for PCBs/pesticides, metals (including methylmercury), dioxins and furans (including HCX), percent lipids, and percent moisture. In addition, a full PCB congener analysis will be conducted for 20 percent of the samples.

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A composite soil sample will also be collected at each of the earthworm tissue sampling locations and analyzed for the same chemical parameters listed for the earthworm tissue as well as additional parameters necessary to evaluate community level effects to the soil fauna (see Section 2.2.6).

Swallow Nestlings, Stomach Contents, Liver, and Eggs

Field activities associated with the collection of swallow tissue samples are not included in this work assignment.

1.1.3 Field Population and Community Studies

Several surveys will be completed to evaluate the impacts that site-related COPCs may have on invertebrates, fish, and avian populations and/or communities. Population- and community-level studies are focused on evaluating relative population abundance, species richness, and/or reproductive success. The following sections describe the surveys that will be completed for various ecological receptor groups.

Aquatic Macroinvertebrates

The aquatic macroinvertebrate communities in lotic (*i.e.*, riverine) environments downstream of the Site will be surveyed following the multi-habitat approach outlined in Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers, 2nd Edition (Barbour *et al.*, 1999). Appendix G of the FSP (Harding, 2001b) presents the specific guidelines that will be employed in the field study.

These data will be used to determine the level of macroinvertebrate community impairment relative to the upstream and reference sampling locations (*i.e.*, below Greystone Mill Pond and Assapumpsett Pond, respectively). The specific focus of this study is to evaluate the potential effects of discharging groundwater in the reach adjacent to the Site and to assess the potential role that surface water COPCs and nutrients may have on this community. The Smithfield Waste Water Treatment Plant (WWTP) located between Greystone Mill Pond and the Site is a known source of nutrients to the Woonasquatucket River (Louis Berger Group, Inc., 2000). Macroinvertebrate sampling areas are targeted to allow discrimination of the effects of the WWTP and groundwater discharge from the Site. Three sampling areas are situated in the reach below Greystone Mill Pond (above, adjacent to, and downstream of the WWTP). Similarly three locations will be sampled in the lotic reach from Route 44 to the lotic/lentic transition area above Allendale Pond. Two samples will be collected in the riverine section of the river below Allendale Pond to assess community recovery and two locations in Assapumpsett Brook to characterize background conditions. Table 6 provides a description and rationale for each selected sampling locations.

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Surface water samples will be collected at each of the 10 macroinvertebrate community sampling areas and will be used in conjunction with existing sediment data to evaluate the nature of potential stressors to the macroinvertebrate community (see Section 2.2.5). In addition, groundwater analytical data collected as part of the ongoing Groundwater Remedial Investigation and existing vapor diffusion sampler (VDS) data will be evaluated.

Emerging Adult Macroinvertebrates

The abundance and species richness of the insect fauna collected in the emergence traps deployed in Allendale Pond, Lymansville Pond, and Greystone Mill Pond will be determined to assess potential impacts of sediment contamination on the macroinvertebrate community. Emerging insects will be sampled following the completion of the swallow study to avoid affecting any depression of available forage to nestling swallows. Sample results will be tabulated and total abundance, abundance of dominant taxa, and species richness estimates will be plotted. The null hypothesis that there are no statistical differences in these metrics between the two study areas and the reference area will be tested.

Floodplain Soil Fauna

The potential effects of certain COPCs detected in floodplain soils (including SVOCs, pesticides, and metals) on the soil faunal community will be assessed. Three samples will be collected from floodplain sediments/soils from Greystone Mill Pond and Allendale Pond, four locations from Lymansville Pond floodplains, and one sample from Assapumpsett Pond. At each of the 11 biological stations, a standard size plot (1 meter by 1 meter by 0.5 meter) will be established to demarcate an area for habitat characterization and earthworm collection. The soil infauna in 5 replicate subsamples from each sample plot will be categorized and enumerated and all earthworms within the plot then collected for subsequent tissue sampling along with a composited soil sample for chemical analysis. The substrate and overlying vegetation will be characterized, and macroscopic soil organisms will be collected by soil sieving (Southwood, 1978). A similar effort will be conducted in a comparable reference area of suitable habitat. The following information will be documented:

- relative abundance of other macroscopic life (*e.g.*, larvae or adult forms of invertebrates);
- earthworms weight and total number;
- evidence of cocoons;
- topography of sample area;
- dominant vegetation in area; and,
- soil classification.

Results will be compared to identify potential differences among sampling locations (relative to reference areas) that may be related to contaminant exposure. Biomass and total earthworm abundance data will be compared within each soil classification category and examined for correlations with patterns of contaminant concentrations. Depending upon the number of identified soil categories, the earthworm data may be statistically evaluated (*e.g.*, Kruskall-Wallace) although the number of sample locations will limit statistical power.

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Fish Community Study

A fish population and community survey will be completed in lotic and lentic (*i.e.*, pond) environments downstream of the Site following the framework of the Index of Biotic Integrity (IBI), as outlined in Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers, 2nd Edition (Barbour *et al.*, 1999). The survey will be conducted concurrently with fish tissue sampling activities and the results will inform the selection of specific species for tissue analysis (see Section 2.2.2). Fish will be collected using the techniques outlined in Attachment A, including electroshocking and nets, and placed in live wells prior to collection population data and possible preparation for tissue analysis. Animals that are not selected for tissue analysis will be returned to the approximate location of capture. Species will be identified, enumerated, length-weight relationships and condition indices will be measured, and any observations of gross morphological abnormalities (*e.g.*, lesions, and deformities) and the presence of ectoparasites will be noted. Fish scales will be collected to provide age data to evaluate the demographic structure of the fish populations in the study area relative to the reference areas. Fish scale analysis procedures are described in the FSP.

Fish Ichthyoplankton Survey

Ichthyoplankton surveys will be conducted to obtain community measures of species richness and relative abundance that will be used in the effects assessment of the BERA. These surveys will be conducted during three discrete sampling events to be conducted in April, May, and June of 2001 in (Figure 4). Each pond will be segregated into a number of discrete sampling areas depending on size and data requirements: Allendale Pond (3), Lymansville Pond (4), Greystone Mill Pond (3), and Assapumpsett Pond (1) and three replicate samples will be collected from each segment. Due to variability in site the subcontractor in the field will determine conditions (*e.g.*, shallow water depth, presence of snags), selection of the specific sampling methodology.

Surveys will be conducted following the standard operating procedure provided in Appendix A of the FSP (Harding, 2001b), which are summarized in the following guidelines:

- Prior to sampling, the subcontractor will evaluate the physical conditions of each sampling area and determine appropriate type of tow, gear, and deployment). The towpath for each replicate sample will also be determined.
- The volume of water collected per tow will be measured and the subcontractor will ensure that the volumes collected are consistent across all survey samples. It is anticipated that each tow will be approximately 5 minutes in duration; however this may be adjusted following review of site conditions.
- At the completion of the tow, the sample will be transferred to a collection bucket and then to a sample storage container, and sufficient preservative added to ensure that the samples will not deteriorate. Sample identification (see Section 2.3.4) labels will be placed both inside and attached to the outside of the sample container.

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- The type of tow, specific gear, and how deployed will be recorded on the sample data form along with date and time sampled, sample identifier, description of tow path, average water depth, and any relevant observations.
- Collect three replicate samples from within the sampling area segment, repeat the last two steps and then move to the next segment or sampling area.

Laboratory analytical procedures will be documented in the QAPP.

Swallow Population Study

Field activities associated with the swallow population study are not included in this work assignment.

Frog Chorus Survey

Field activities associated with the frog chorus survey are not included in this work assignment.

Wildlife Survey and Habitat Characterization

Field surveys will be conducted to identify potential wildlife communities that may be present in the study area. Specifically, field surveys will be used to document the occurrence of individual wildlife species, groups of species, and the various habitats. Taxonomic checklists for each major group of wildlife receptors will be used to document the receptors identified during the conduct of the field survey. Information regarding the presence of rare, threatened, or endangered species that may occur in the study area will be obtained from federal and state resource agencies, including USFWS, RIDFW, and the Natural Heritage Program.

Two field technicians will participate in the wildlife surveys over a two-day period. The methods used for wildlife surveys will be reconnaissance-level, habitat-based assessment surveys. They will consist of traveling through the four exposure areas, as well as the upgradient and reference areas, and recording all wildlife species or signs of species that are observed. General statements will be made regarding relative abundance of certain species and the habitats they use within the study area. The presence of specific microhabitats (*e.g.*, undercut riverbanks, downed logs), when encountered, will be documented.

In general, information concerning riverbed substrate, flow rates, water depth, river width, presence and types of macrophytes, local land use, and other features (*e.g.*, riffle/run habitat) will be obtained during a complete transverse of the study area. The adjacent floodplain and upland plant communities will be described floristically and photo-documented. This initial characterization of the ecological communities present within the study area will include both plant and animal communities. Species groups for which initial baseline information is needed include mammals, reptiles and amphibians, birds, and plant communities. The presence of endangered or threatened species and/or their habitats within the study area will also be noted. Incidental observations of foraging or breeding piscivorous, insectivorous, and omnivorous wildlife will be recorded.

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Mammals. Field surveys will be conducted to identify potential mammal communities that may be present in the study area. Visual observations will be used to document the occurrence of individual mammal species, groups of species, and the various habitats. The surveys will consist of traveling through the four exposure areas, as well as the upgradient and reference areas, and recording all wildlife species or signs of species (*e.g.*, tracks, and scat) that are observed. All occurrences of mammal observations or signs will be recorded whenever traveling in or through the study area. Information on location, species, type of observation, habitat, and activity will be recorded. All observations of mammals will be tabulated by taxon and exposure area.

Reptiles and Amphibians. Field surveys will be conducted to identify the reptile and amphibian species using the riverine, wetland, and upland habitats within the study area. Reconnaissance-level surveys of the reptile and amphibian communities will be conducted using visual encounter surveys, which consist of recording all observations of reptiles and amphibians that occur while traversing the study area. Over the two-day survey effort, it is not required that the reptile and amphibian survey be conducted at a certain time of the day. Field surveys of reptiles and amphibians will be ongoing throughout both days. Information on location, species, habitat will be recorded in the field logbook. All observations of reptiles and amphibians will be tabulated by taxon and exposure area. Although not a component of this Field Sampling Plan, a frog chorus survey will also be conducted in mid-April, and this information will also be considered in this evaluation.

Birds. Field surveys will be conducted to determine the avian community using the study area. Field surveys consist of general observations of habitat types available within the study area and the visual and auditory observations of birds. When birds are observed, information on numbers of each species, location, habitat type, brood sizes (if applicable), age, and activity will be recorded. Over the two-day survey period, bird observation efforts will occur during typical bird foraging times (the early morning hours [1/2 hour before sunrise to up to four hours after sunrise] and/or dusk). All observations of avifauna will be tabulated by taxon and exposure area.

Plant Communities. Surveys of the plant and natural communities that occur in the study area will be conducted during the two-day survey effort. Species identified during the survey will be documented through voucher specimen and/or photographs. Information concerning location, habitat, phenology, and population size will be collected. Over the two-day survey effort, it is not required that the plant community survey be conducted at a certain time of the day. The survey will occur throughout both days. All observations of plants will be tabulated by taxon and exposure area.

This field survey information will be used to prepare a habitat-based physiognomic map for the study area following the classification systems provided in USFWS (1979) and SAF (1980).

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1.1.4 Sediment Sampling

Additional sediment samples will be collected to support the evaluation of potential bioaccumulation into crayfish tissue and to conduct laboratory bioassays.

It is anticipated that personnel in hip length boots can access most locations. At sediment sampling locations determined to be inaccessible by wading (*i.e.*, water depth greater than two feet or removed from access points), an open workboat will be used to collect the samples.

Sediment samples will be collected following the general guidance of Appendix H of the FSP (Harding, 2001b) and the following guidelines:

- Most aquatic sediment samples will be collected using either an Ekman dredge (shallow areas) or Ponar dredge (deep areas). All sampling devices will be decontaminated prior to use as specified in Section 2.5.
- AVS/SEM samples will be collected from an undisturbed portion of one of the early grabs at each sampling station immediately after the dredge is opened. Care will also be taken during the sample container filling to ensure that the sediment matrix disturbance is minimized (no mixing or blending). AVS/SEM sample containers will be completely filled, leaving no headspace. After filling the AVS/SEM containers, any remaining sediment will be placed into a decontaminated stainless steel mixing bowl.
- Subsequent grabs collected for additional volume for the composite sample will be placed into the stainless steel mixing bowl and a sediment description will be recorded on the field data collection form. A separate stainless steel bowl will be used for each individual sample depth interval.
- The sample will then be thoroughly homogenized by hand mixing using a decontaminated scoop or large mixing spoon. After mixing, the sample will be transferred to the appropriate sample containers.
- The type of sediment sampling device used, penetration depth of the sampler, sample recovery, water depth, sediment description, date and time, sampler names, etc. will be recorded on the sample data form (Appendix H of the FSP).

All sampling stations will be surveyed during the sampling program using GPS (Global Positioning System) survey equipment. In addition, a wooden stake at the shoreline edge will identify stations. The stake will be labeled with the sample identification number and this information will be recorded in the field logbook.

Crayfish

Surface aquatic sediment composite samples will be collected from a depth interval of 0 to 0.5 feet below ground surface (bgs) at 11 identified locations where crayfish as likely to occur (see Figures 2a and 2b). Table 3 presents a summary of the sampling locations within each of the areas where crayfish will be collected.

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Appendix H of the FSP (Harding, 2001b) provides the specific guidance on collecting bioassay sediments (and see Section 2.2.4). Sediment for the laboratory bioassays will be collected using a gravity corer, Ekman and/or Ponar dredge depending on substrate characteristics and water depth.

Sediment samples will be analyzed for PCBs/pesticides, metals (including methylmercury), dioxins/furans (including HCX), TOC, AVS/SEM, grain size, and percent moisture. In addition, a full PCB congener analysis will be conducted for 20 percent of the samples.

Sediment Bioassays

A total of 8 sediment samples will be collected to conduct the laboratory bioassays: 3 samples from both Allendale and Lymansville Ponds and a sample from the Greystone Mill Pond and Assapumpsett Pond. Sample locations are depicted in Figures 2a and 2b and were selected based on the rationale provided in Table 7. Sampling locations were selected to provide a range of exposures to the likely sediment stressors allowing evaluation of patterns of contaminant concentration and observed biological response.

Appendix H of the FSP (Harding, 2001b) provides the specific guidance on collecting bioassay sediments (and see Section 2.2.4). Sediment for the laboratory bioassays will be collected using a gravity corer, Ekman and/or Ponar dredge depending on substrate characteristics and water depth. Approximately Sediment samples will be kept on ice (2-4°C) until test commencement. The laboratory bioassay protocols that will be following are provided in the QAPP.

Bioassay sediment samples will be analyzed for SVOCs, PCB/pesticides, metals (including methylmercury), TOC, AVS/SEM, grain size and percent moisture.

1.1.5 Surface Water Sampling

A surface water sample will be collected from each of the 10 sampling areas associated with the aquatic macroinvertebrate community study sampling areas. Sampling locations are presented in Figures 2a and 2b. Surface water grab samples are to be collected from stations, co-located with the macroinvertebrate community study. Of these, five will be "reference" locations, three up-stream in the Woonasquatucket River associated with the Smithfield Waste Water Treatment Plant and two in Assapumpsett Brook below the outfall from Assapumpsett Pond. Three samples will be collected in the vicinity of the site and two samples will be collected in the lotic portion of the river below Allendale Pond. Surface water samples will be collected before the aquatic macroinvertebrate community study is conducted and will begin in the most downstream location and proceed upriver. Water samples will be collected using a direct-dip technique as the samples will all be collected in shallow areas. Surface water samples will be collected following the procedures provided in Appendix H of the FSP (Harding, 2001b) and the following guidelines:

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- Measure depth of water at the station, being careful not to disturb the riverbed sediment. When possible and when depths appear consistent, the water depth measurement will be obtained slightly downstream of the planned surface sample location to avoid disturbing the sediments. Contamination from sediment mixing will be minimized in the event sediment area accidentally disturbed during this depth measurement.
- All sampling devices will be decontaminated prior to first used at each station following the procedures specified in Section 2.5.
- The sample collection jar will be held by hand or attached to the end of a pole. The sample collection bottle will be inverted and lowered to the desired depth (one foot above the bottom sediments) and then slowly turned upright to a 45-degree angle with the mouth of the bottle facing upstream. Fill the sample collection bottle.
- Retrieve the sampler and fill the appropriate sample containers
- Record the pH, specific conductivity, temperature, salinity, turbidity, dissolved oxygen (DO), sampling device used, date and time, name of samplers, etc. of the sample on the field data sheets (Appendix H of the FSP).
- Preserve total metal samples.
- Stake and GPS survey sample station (as presented below).
- Decontaminate the sampler device before reuse (refer to Section 2.5).

The surface water samples will be analyzed for VOCs, SVOCs, PCB/pesticides, metals, hardness and nutrients (Table 1).

All sampling stations will be surveyed during the sampling program using GPS (Global Positioning System) survey equipment. In addition, a wooden stake at the shoreline edge will identify stations. The stake will be labeled with the sample identification number and this information will be recorded in the field logbook.

1.1.6 Floodplain Soil Sampling

A total of 11 composited floodplain soil samples will be collected to support the evaluation of earthworm tissue analytical results and the soil fauna community study.

Appendix H of the FSP (Harding, 2001b) provides general guidance on the collection of floodplain soil samples. Table 5 provides the rationale for sample location selection.

Floodplain soil samples will be analyzed for SVOCs, PCB/pesticides, metals (including methylmercury), dioxins/furans (including HCX), TOC, grain size, and percent moisture. In addition, a full PCB congener analysis will be conducted for 20 percent of the samples.

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table

Sampling Location [1]	Location ID Number	Medium/ Matrix	Depth (Units)	Analytical Parameter	Conc Level	No. of Samples (Identify field duplicates and replicates)	Sampling SOP[3]	Analytical Method/ SOP[3]	Minimum Sample Volume [4]	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Greystone Mill Pond [2]	GMP	Fish – Demersal Piscivorous (a) Frog/Turtle	NA	See footnote b – Moisture, Lipid, PCB Aroclor/Pest, SVOC (PAH) w/ TIC, Dioxin/Furan/HCX/ TCX, PCB (c), Metals, MeHg	Low	10 each type	S-1 thru S-7	Moisture/ Lipid L-11; PCB Aroclor/Pest L-9; SVOC (PAH) L-10; D/F/HCX/TCX L-23; PCBs L-32; Metals L-41, L-42, L-44, L-45; MeHg L-40	See footnote d ~ 95 g wet	Parchment or waxed paper and plastic bag	frozen (-20°C)	Organics: 1-year Metals: 6-mo Hg, MeHg: 28-d
Assapumsett Brook [2]	RAB					10 each type						
Allendale Reach	APC, APB					10 each type						
Lymansville Pond	LPX					10 each type						
Manton Pond	MAP	Fish – Piscivorous (a)	NA	See footnote b – Moisture, Lipid, PCB Aroclor/Pest, SVOC (PAH), Dioxin/Furan/HCX/ TCX, PCB (c), Metals, MeHg	Low	3	S-1 thru S-7	Moisture/ Lipid L-11; PCB Aroclor/Pest L-9; SVOC (PAH) L-10; D/F/HCX/TCX L-23; PCBs L-32; Metals L-41, L-42, L-44, L-45; MeHg L-40	See footnote d ~ 95 g wet	Parchment or waxed paper and plastic bag	frozen (-20°C)	Organics: 1-year Metals: 6-mo Hg, MeHg: 28-d
Dyerville Pond	DYP					3						
Greystone Mill Pond [2]	GMP	Crayfish	NA	See footnote b – Moisture, Lipid, PCB Aroclor/Pest, Dioxin/Furan/HCX/ TCX, PCB (c), Metals, MeHg	Low	3	S-1 thru S-7	Moisture/ Lipid L-11; PCB Aroclor/Pest L-9; D/F/HCX/TCX L-23; PCBs L-32; Metals L-41, L-42, L-44, L-45; MeHg L-40	See footnote d ~ 95 g wet	125 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year Metals: 6-mo Hg, MeHg: 28-d
Assapumsett Brook [2]	RAB					1						
Allendale Reach	APC, APB					3						
Lymansville Pond	LPX					4						
Greystone Mill Pond [2]	GMP	Emerging Insects	NA	See footnote b – Moisture, Lipid, PCB Aroclor/Pest, Dioxin/Furan/HCX/ TCX, PCB (c), Metals, MeHg	Low	5	S-1 thru S-7	Moisture/ Lipid L-11; PCB Aroclor/Pest L-9; D/F/HCX/TCX L-23; PCBs L-32; Metals L-41, L-42, L-44, L-45; MeHg L-40	See footnote d ~ 95 g wet	125 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year Metals: 6-mo Hg, MeHg: 28-d
Allendale Reach	APC, APB					5						
Lymansville Pond	LPX					5						

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table

Sampling Location [1]	Location ID Number	Medium/ Matrix	Depth (Units)	Analytical Parameter	Conc Level	No. of Samples (Identify field duplicates and replicates)	Sampling SOP[3]	Analytical Method/ SOP[3]	Minimum Sample Volume [4]	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Greystone Mill Pond [2]	GMP	Earthworms	NA	See footnote b – Moisture, Lipid, PCB Aroclor/Pest, Dioxin/Furan/HCX/ TCX, PCB (c), Metals, MeHg	Low	3	S-1 thru S-7	Moisture/ Lipid L-11; PCB Aroclor/Pest L-9; D/F/HCX/TCX L-23; PCBs L-32; Metals L-41, L-42, L-44, L-45; MeHg L-40;	See footnote d ~ 95 g wet	125 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year Metals: 6-mo Hg, MeHg: 28-d
Assapumsett Brook [2]	RAB					1						
Allendale Reach	APC, APB					3						
Lymansville Pond	LPX					4						
Greystone Mill Pond [2]	GMP	Swallow Eggs (collected by USGS)	NA	See footnote b – Moisture, Lipid, PCB Aroclor/Pest, Dioxin/Furan/HCX/ TCX, PCB (c)	Low	5	NA	Moisture/Lipid L-11; PCB Aroclor/Pest L-9; D/F/HCX/TCX L-23; PCBs L-32	See footnote d ~ 80 g wet	125 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year
Allendale Reach	APC, APB					5						
Lymansville Pond	LPX					5						
Greystone Mill Pond [2]	GMP	Swallow Nestling (collected by USGS)	NA	See footnote b – Moisture, Lipid, PCB Aroclor/Pest, Dioxin/Furan/HCX/ TCX, PCB (c)	Low	5	NA	Moisture/Lipid L-11; PCB Aroclor/Pest L-9; D/F/HCX/TCX L-23; PCBs L-32	See footnote d ~ 80 g wet	125 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year
Allendale Reach	APC, APB					5						
Lymansville Pond	LPX					5						
Greystone Mill Pond [2]	GMP	Swallow Stomach Contents (collected by USGS)	NA	See footnote b – Moisture, Lipid, PCB Aroclor/Pest, Dioxin/Furan/HCX/ TCX, PCB (c)	Low	3	NA	Moisture/Lipid L-11; PCB Aroclor/Pest L-9; D/F/HCX/TCX L-23; PCBs L-32	See footnote d ~ 80 g wet	125 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year
Allendale Reach	APC, APB					3						
Lymansville Pond	LPX					3						
Greystone Mill Pond [2]	GMP	Swallow Liver (collected by USGS)	NA	See footnote b – Moisture, Lipid, PCB Aroclor/Pest, Dioxin/Furan/HCX/ TCX, PCB (c), Metals, MeHg	Low	5	NA	Moisture/ Lipid L-11; PCB Aroclor/Pest L-9; D/F/HCX/TCX L-23; PCBs L-32; Metals L-41, L-42, L-44, L-45; MeHg L-40	See footnote d ~ 95 g wet	125 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year
Allendale Reach	APC, APB					5						
Lymansville Pond	LPX					5						

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table

Sampling Location [1]	Location ID Number	Medium/ Matrix	Depth (Units)	Analytical Parameter	Conc Level	No. of Samples (Identify field duplicates and replicates)		Sampling SOP[3]	Analytical Method/ SOP[3]	Minimum Sample Volume [4]	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
NA	NA	Eggs – ELS (provided by Battelle MS)	NA	Moisture, Lipid	Low	21		NA	Moisture/Lipid L-11	15 g wet	125 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year
				Dioxin/Furan/HCX/ TCX, 12 WHO PCB		21			D/F/HCX/TCX L-23; 12 WHO PCBs L-32	15 g wet	125 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year
Allendale Reach	APC, APB	Fish – ELS (collected by USACE NAE)	NA	Moisture, Lipid, Dioxin/Furan/HCX/ TCX, 12 WHO PCB	Low	3 composites		NA	Moisture/Lipid L-11; D/F/HCX/TCX L-23; 12 WHO PCBs L-32	60 to 100 g wet	125 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year
Lymansville Pond	LPX					2 fish 1 egg from spawning fish							
Greystone Mill Pond [2]	GMP	Sediment (Invert. Bioassay locations)	Top 0 to 6 inches	Moisture, PCB Aroclor/Pest, SVOC (PAH)	Low	1	QC: 1 DU 1 RB (e)	S-1	Moisture L-13; PCB Aroclor/Pest L-9; SVOC (PAH) L-10	½ full	250 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year (EPA, 1992)
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					3							
Greystone Mill Pond [2]	GMP	Sediment (Invert. Bioassay locations)	Top 0 to 6 inches	Metals	Low	1	QC: 1 DU 1 RB (e)	S-1	L-41, L-42, L-45	¾ full	125 mL spex jar	frozen (-20°C)	Metals: 6-mo Hg: 28-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					3							
Greystone Mill Pond [2]	GMP	Sediment (Invert. Bioassay locations)	Top 0 to 6 inches	AVS/SEM	Low	1	QC: 1 DU (e)	S-1	L-41, L-42	Full (no headspace)	125 mL spex jar (alternatively use Syringe; (no headspace; sealed w/ Parafilm in Ziploc bag.)	cold (4°C)	14-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					3							

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table

Sampling Location [1]	Location ID Number	Medium/ Matrix	Depth (Units)	Analytical Parameter	Conc Level	No. of Samples (Identify field duplicates and replicates)		Sampling SOP[3]	Analytical Method/ SOP[3]	Minimum Sample Volume [4]	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Greystone Mill Pond [2]	GMP	Sediment (Invert. Bioassay locations)	Top 0 to 6 inches	MeHg	Low	1	QC: 1 DU (e)	S-1	L-40	½ full	125 mL spex jar	cold (4°C)	28-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					3							
Greystone Mill Pond [2]	GMP	Sediment (Invert. Bioassay locations)	Top 0 to 6 inches	Grain Size; TOC	Low	1	QC: 1 DU (e)	S-1	Grain Size L-46; TOC L-49	½ full	500 mL pre-cleaned glass jar	cold (4°C)	28-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					3							
Greystone Mill Pond [2]	GMP	Sediment (Invert. Bioassay locations)	Top 0 to 6 inches	SVOCs (phenols/phthalates)	Low	1	QC: 1 DU 1 RB (e) 1 PE (f)	S-1	SVOCs L-61	¾ full	250 mL pre-cleaned glass jar	cold (4°C)	14-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					3							
Greystone Mill Pond [2]	GMP	Sediment (Crayfish locations)	Top 0 to 6 inches	Moisture, PCB Aroclor/Pest	Low	3	QC: 1 DU 1 RB (e)	S-1	Moisture L-13; PCB Aroclor/Pest L-9	½ full	250 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year (EPA, 1992)
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table

Sampling Location [1]	Location ID Number	Medium/ Matrix	Depth (Units)	Analytical Parameter	Conc Level	No. of Samples (Identify field duplicates and replicates)		Sampling SOP[3]	Analytical Method/ SOP[3]	Minimum Sample Volume [4]	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Greystone Mill Pond [2]	GMP	Sediment (Crayfish locations)	Top 0 to 6 inches	Dioxin/Furan/HCX/ TCX, PCB (c)	Low	3	QC: 1 DU (e)	S-1	D/F/HCX/TCX L-23; PCB Congeners L-32	½ full	125 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							
Greystone Mill Pond [2]	GMP	Sediment (Crayfish locations)	Top 0 to 6 inches	Metals	Low	3	QC: 1 DU 1 RB (e)	S-1	L-41, L-42, L-45	¾ full	125 mL spex jar	frozen (-20°C)	Metals: 6-mo Hg: 28-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							
Greystone Mill Pond [2]	GMP	Sediment (Crayfish locations)	Top 0 to 6 inches	AVS/SEM	Low	3	QC: 1 DU (e)	S-1	L-41, L-42	Full (no headspace)	125 mL spex jar (alternatively use Syringe; (no headspace; sealed w/ Parafilm in Ziploc bag.)	cold (4°C)	14-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							
Greystone Mill Pond [2]	GMP	Sediment (Crayfish locations)	Top 0 to 6 inches	MeHg	Low	3	QC: 1 DU (e)	S-1	L-40	½ full	125 mL spex jar	cold (4°C)	28-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table

Sampling Location [1]	Location ID Number	Medium/ Matrix	Depth (Units)	Analytical Parameter	Conc Level	No. of Samples (Identify field duplicates and replicates)		Sampling SOP[3]	Analytical Method/ SOP[3]	Minimum Sample Volume [4]	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Greystone Mill Pond [2]	GMP	Sediment (Crayfish locations)	Top 0 to 6 inches	Grain Size; TOC	Low	3	QC: 1 DU (e)	S-1	Grain Size L-46; TOC L-49	½ full	500 mL pre-cleaned glass jar	cold (4°C)	28-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							
Greystone Mill Pond [2]	GMP	Sediment (Crayfish locations)	Top 0 to 6 inches	SVOCs (phenols/phthalates)	Low	3	QC: 1 DU 1 RB (e) 1 PE (f)	S-1	SVOCs L-61	¾ full	250 mL pre-cleaned glass jar	cold (4°C)	14-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							
Greystone Mill Pond [2]	GMP	Floodplain Soil	Top 0 to 6 inches	Moisture, PCB Aroclor/Pest, SVOC (PAH)	Low	3	QC: 1 DU 1 RB	S-1	Moisture L-13; PCB Aroclor/Pest L-9; SVOC (PAH) L-10;	½ full	250 mL pre-cleaned glass jar	frozen (-20°C)	Organics: 1-year (EPA, 1992)
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							
Greystone Mill Pond [2]	GMP	Floodplain Soil	Top 0 to 6 inches	Dioxin/Furan/HCX/ TCX, PCB (c)	Low	3	QC: 1 DU	S-1	D/F/HCX/TCX L-23; PCB Congeners L-32	½ full	125 mL pre-cleaned jar	frozen (-20°C)	Organics: 1-year
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table

Sampling Location [1]	Location ID Number	Medium/ Matrix	Depth (Units)	Analytical Parameter	Conc Level	No. of Samples (Identify field duplicates and replicates)		Sampling SOP[3]	Analytical Method/ SOP[3]	Minimum Sample Volume [4]	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Greystone Mill Pond [2]	GMP	Floodplain Soil	Top 0 to 6 inches	Metals	Low	3	QC: 1 DU 1 RB	S-1	Metals L-41, L-42, L-45	¾ full	125 mL spex jar	frozen (-20°C)	Metals: 6-mo Hg: 28-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							
Greystone Mill Pond [2]	GMP	Floodplain Soil	Top 0 to 6 inches	MeHg	Low	3	QC: 1 DU	S-1	MeHg L-40	½ full	125 mL spex jar	cold (4°C)	28-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							
Greystone Mill Pond [2]	GMP	Floodplain Soil	Top 0 to 6 inches	Grain Size; TOC	Low	3	QC: 1 DU	S-1	Grain Size L-46; TOC L-49	½ full	500 mL pre-cleaned glass jar	cold (4°C)	28-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							
Greystone Mill Pond [2]	GMP	Floodplain Soil	Top 0 to 6 inches	SVOCs (phenols/phthalates)	Low	3	QC: 1 DU 1 RB 1 PE (f)	S-1	SVOCs L-61	¾ full	250 mL pre-cleaned glass jar	cold (4°C)	14-d
Assapumsett Brook [2]	RAB					1							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					4							

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table

Sampling Location [1]	Location ID Number	Medium/ Matrix	Depth (Units)	Analytical Parameter	Conc Level	No. of Samples (Identify field duplicates and replicates)		Sampling SOP[3]	Analytical Method/ SOP[3]	Minimum Sample Volume [4]	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Greystone Mill Pond [2]	GMP	Surface Water	1-ft above bottom seds	PCB Aroclor/Pest, SVOC (PAH)	Low	3	QC: 1 DU 1 MS 1 MSD 1 RB 1 PE	S-1	PCB Aroclor/Pest L-9; SVOC (PAH) L-10	Full (w/ ½ inch headspace)	2 L pre-cleaned glass bottle	cold (4°C)	7-d
Assapumsett Brook [2]	RAB					2							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					2							
Greystone Mill Pond [2]	GMP	Surface Water	1-ft above bottom seds	Metals, Hardness	Low	3	Hardness QC: 1 DU Metals QC: 1 DUP 1 MS 1 MSD 1 RB	S-1	Metals L-41, L-42, L-45; Hardness L-42	Full (w/ ½ inch headspace)	500 mL pre-cleaned Polyethylene bottle	cold (4°C)	Metals: 6-mo
Assapumsett Brook [2]	RAB					2							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					2							
Greystone Mill Pond [2]	GMP	Surface Water	1-ft above bottom seds	Hg	Low	3	QC: 1 DU 1 MS 1 MSD 1 RB	S-1	L-39	Full (w/ ½ inch headspace)	500 mL -pre-cleaned Teflon bottle	cold (4°C)	28-d
Assapumsett Brook [2]	RAB					2							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					2							
Greystone Mill Pond [2]	GMP	Surface Water	1-ft above bottom seds	SVOCs (phenols/phthalates)		3	QC: 1 DU 1 MS 1 MSD 1 RB 1 PE	S-1	L-61	Full (w/ ½ inch headspace)	2 L pre-cleaned glass bottle	cold (4°C)	7-d
Assapumsett Brook [2]	RAB					2							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					2							

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table

Sampling Location [1]	Location ID Number	Medium/ Matrix	Depth (Units)	Analytical Parameter	Conc Level	No. of Samples (Identify field duplicates and replicates)		Sampling SOP[3]	Analytical Method/ SOP[3]	Minimum Sample Volume [4]	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Greystone Mill Pond [2]	GMP	Surface Water	1-ft above bottom seds	VOC	Low	3	QC: 1 DU 1 DUP 1 MS 1 MSD 1 RB 1 TB	S-1	L-60	Full	4 x 25-mL glass VOA vial per sample	cold (4°C)	14-d
Assapumsett Brook [2]	RAB					2							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					2							
Greystone Mill Pond [2]	GMP	Surface Water	1-ft above bottom seds	DIN; TN/TP; TDN/TDP; TOC/DOC; TSS	Low	3	QC: 1 DU 1 RB	S-1	L-62	Full	2 L acid-rinsed plastic jug	cold (4°C), dark	24 hours/28-d
Assapumsett Brook [2]	RAB					2							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					2							
Greystone Mill Pond [2]	GMP	Surface Water	1-ft above bottom seds	BOD	Low	3	QC: 1 DU 1 RB	S-1	L-63	Full	One 1-L unpreserved plastic bottle per sample	cold (4°C), dark	48 hours
Assapumsett Brook [2]	RAB					2							
Allendale Reach	APC, APB					3							
Lymansville Pond	LPX					2							

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table

Sampling Location [1]	Location ID Number	Medium/ Matrix	Depth (Units)	Analytical Parameter	Conc Level	No. of Samples (Identify field duplicates and replicates)	Sampling SOP[3]	Analytical Method/ SOP[3]	Minimum Sample Volume [4]	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Greystone Mill Pond [2]	GMP	Bulk sediment	1-ft above bottom seds	Bioassay Testing	NA	1	S-1	Whole Sediment Toxicity Testing Against *Hyalella azteca* (Amphipod) and *Chironomus tentans* (Diptera) that Measure the Effects of Sediment-Associated Contaminants on Survival, Growth and Reproduction See Attachment F	1 gallon	4-L jar	cold (4°C)	8 weeks
Assapumsett Brook [2]	RAB					1						
Allendale Reach	APC, APB					3						
Lymansville Pond	LPX					3						

DU = Field Duplicate; DUP = Laboratory (Analytical) Duplicate; MS = Matrix Spike; MSD = Matrix Spike Duplicate; RB = Rinsate Blank; PE = Performance Evaluation; TB = Trip Blank

[1] All field sampling locations are critical.

[2] Background sampling location(s).

[3] See the Project Sampling SOP Reference Table (EPA-NE QAPP Worksheet #13), Field Analytical Method/SOP Reference Table (EPA-NE QAPP Worksheet #17), and Fixed Laboratory Method/SOP Reference Table (EPA-NE QAPP Worksheet #20).

[4] Sample volume listed for sediment and soil (all parameters) and water (nutrients only) is sufficient to allow extra material for preparation of Fixed Laboratory quality control (QC) samples. See footnote d for supplemental sample volume requirements for all tissue samples. For waters – additional samples will be collected in the field to satisfy Fixed Laboratory QC sample requirements, and in addition 1 field duplicate (FDUP) and 1 rinsate blank (RB) will be collected for all parameters. For VOCs – one trip blank will also be collected. Supplemental QC samples identified above.

(a) Fish piscivorous samples from GMP, RAB, APC/APB, and LPX may be processed and analyzed at the Fixed Laboratory as fillet and offal samples; whereas fish piscovorous samples from MAP and DYP may be processed and analyzed as whole body samples.

(b) One or more individual fish will be collected from each sampling location. Fish will be stored on ice and shipped to the Fixed Laboratory for storage (frozen). Upon completion of all fish sampling, an inventory of fish collected will be reviewed by the project team and a decision made as to how samples will be distributed for analysis – whole body, fillet, and offal. Tissue samples will be processed (dissection, homogenization), sub-sampled for the required analytical parameters, and sub-samples shipped to the participating laboratories. Directions regarding sample containers, mass requirements, and shipping addresses of the participating laboratories is provided in EPA-NE QAPP Worksheet #9a, under Tissue Analysis Tasks.

(c) 20% of all samples –except fish and eggs from ELS study – will be analyzed for PCB congeners (extended list of >100 congeners, of which the 12 WHO PCBs are a subset).

(d) Amount of wet tissue listed is sufficient for all required analyses and includes additional material for potential re-extraction/archival. Amount of wet tissue listed does **not** include sample material needed to satisfy Fixed Laboratory QC sample requirements. Fixed Laboratory QC samples will include one sample duplicate, one matrix spike, and one matrix spike duplicate with each set of 20 or fewer authentic samples by matrix and by sample type (*e.g.*, fish vs. earthworm). Samples with more mass available (relative to all samples) will be identified as part of the inventory process and these samples will be targeted to satisfy Fixed Laboratory QC sample preparation requirements. See EPA-NE QAPP Worksheet #9a under Tissue Analysis Tasks (Tissue Processing) for QC sample volume requirements.

(e) A total of 1 field duplicate (DU) and 1 rinsate blank (RB) will be collected with each set of 20 sediment (combined from crayfish and bioassay locations), soil, and water samples collected. RBs analyzed for select parameters only.

(f) PE samples supplied by NAE and shipped to participating laboratories (along with authentic samples) for select analyses – see EPA-NE QAPP Worksheet #22a.

EPA-NE QAPP Worksheet #13 Rev. 10/99

Project Sampling SOP Reference Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Identification	Modified for Project Work Y or N	Comments[1]
S-1	Collection of Surface Water, Aquatic Sediment, and Floodplain Soil/Sediment, 2001	Harding ESE	Petite Ponar grab sampler, bucket auger, gravity corer, shovel	N	FSP Appendix G
S-2	Field Sampling and Analysis Plan for Fish Collection and Processing, 2001	Harding ESE	backpack electroshocker	N	FSP Appendix A
S-3	Field Sampling and Analysis Plan for Turtle Collection and Processing	Harding ESE	Dip nets	N	FSP Appendix B
S-4	Field Sampling and Analysis Plan for Frog Collection and Processing	Harding ESE	Dip nets	N	FSP Appendix C
S-5	Field Sampling and Analysis Plan for Crayfish Collection and Processing	Harding ESE	Hoop nets	N	FSP Appendix D
S-6	Aquatic Macroinvertebrate Collection and Processing and Community Evaluation	Harding ESE	Sieve buckets, petite ponar grab sampler	N	FSP Appendix E
S-7	Field Sampling and Analysis Plan for Soil Invertebrates Collection and Processing	Harding ESE	shovel	N	FSP Appendix F

[1] Sampling SOPs provided in Appendices A through G of Field Sampling Plan (Harding, 2001b).

EPA-NE QAPP Worksheet #14 Rev. 10/99

Field Sampling Equipment Calibration Table

Equipment	Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference*
Petite Ponar grab sampler	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	S-1
Bucket auger	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	S-1
backpack electroshocker	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	S-2
Dip Net	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	S-3,4
0.5 m Hoop Net	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	S-5
Sieve bucket	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	S-6
Shovel	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	S-1, 7
Gravity corer	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	S-1
Ekman Sampler	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	S-1

* Specify appropriate reference letter/number from the Project Sampling SOP Reference Table (EPA-NE QAPP Worksheet #13).

EPA-NE QAPP Worksheet #15 Rev. 10/99

Field Equipment Maintenance, Testing and Inspection Table

Sampling Equipment/ Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	SOP Reference
Petite Ponar grab sampler	NA	Operation	Visual inspection	Don Mason	Prior to use	Ponar is operable	Repair	S-1
Bucket auger	NA	Operation	Visual inspection	Don Mason	Prior to use	auger is operable	Repair	S-1
backpack electroshocker	NA	Operation	Electrical circuit inspection	Chuck Porembski	Prior to use	Backpack is operable	Repair	S-2
Dip Net	NA	NA	Visual inspection		Prior to use	Net is intact	Use replacement device	S-3,4
0.5 m Hoop Net	NA	NA	Visual inspection		Prior to use	Net is intact	Use replacement device	S-5
Shovel	NA	NA	Visual inspection		Prior to use	Shovel is intact	Use replacement device	S-1, 7
Sieve bucket	NA	NA	Visual inspection		Prior to use	Sieve is intact	Use replacement device	S-6
Gravity corer	NA	NA	Visual inspection		Prior to use	Corer is intact	Use replacement device	S-1
Ekman Sampler	NA	NA	Visual inspection		Prior to use	Sampler is intact	Use replacement device	S-1

NA = Not applicable.

EPA-NE QAPP Worksheet #16 Rev. 10/99

Sample Handling, Tracking and Custody Requirements

SAMPLE COLLECTION, PACKAGING AND SHIPMENT
Sample Collection: Bob Davis, USACE NAE – Fish in support of ELS study Norm Richardson, Harding ESE – Fish, frog, turtle, crayfish, emerging insects, earthworm, sediment, water, and floodplain soil CM & TW Custer, USGS – Tree swallow samples RM Karls, T Smith, H Robinson, S Blanton, Battelle MSL – ELS study samples (eggs)
Sample Packing: Bob Davis, USACE NAE – Fish in support of ELS study Norm Richardson, Harding ESE – Fish, frog, turtle, crayfish, emerging insects, earthworm, sediment, water, and floodplain soil CM & TW Custer, USGS – Tree swallow samples RM Karls, T Smith, H Robinson, S Blanton, Battelle MSL – ELS study samples (eggs)
Coordination of Shipment: Bob Davis, USACE NAE and Chris Gagnon, Battelle Duxbury – Fish in support of ELS study Norm Richardson, Harding ESE – Fish, frog, turtle, crayfish, emerging insects, earthworm, sediment, water, and floodplain soil CM & TW Custer, USGS – Tree Swallow Susan Blanton, Battelle MSL – ELS study samples
Type of Shipment (Courier): Federal Express (and hand deliveries – fish samples in support of ELS study)
SAMPLE RECEIPT AND ANALYSIS
Responsible Organization: Battelle Duxbury (receive samples for moisture content, lipid content, pesticide/PCB Aroclors, and SVOCs (PAHs) analyses; tissue samples also analyzed for TICs Battelle Columbus (receive samples for Dioxin/Furan/HCX/TCX analysis and 100+ PCBs and/or 12 WHO PCBs analysis) Battelle MSL (receive tissue samples for processing, receive samples for metals, MeHg, AVS/SEM, and hardness analyses) Battelle MSL (receive embryos, test solution) Applied Marine Sciences (receive sediment and soil samples for TOC and Grain Size analyses) STL Baltimore (received samples for SVOC (phenols/phthalates), VOC and BOD analyses) Chesapeake Biological Laboratory (receive water samples for nutrient, TSS analyses) Great Lakes Environmental Center (GLEC) (receive bulk sediment samples for bioassay testing)
Sample Receipt: James Hatch, Sample Custodian Battelle Duxbury Henry Pham, Sample Custodian Battelle Columbus Carolynn Suslick, Sample Custodian Battelle MSL (Metals) Rhonda Karls, Sample Custodian Battelle MSL (ELS testing) Ken Davis, Sample Custodian Applied Marine Sciences, Inc Cathy Hershey, Sample Custodian STL Baltimore Carl Zimmermann, Senior Faculty Research Assistant CBL Pam Smith, GLEC

EPA-NE QAPP Worksheet #16 Rev. 10/99 (continued)

Sample Handling, Tracking and Custody Requirements

Sample Custody and Storage: James Hatch, Sample Custodian Battelle Duxbury Henry Pham Sample Custodian Battelle Columbus Carolynn Suslick, Sample Custodian Battelle MSL (Metals) Rhonda Karls, Sample Custodian Battelle MSL (ELS Testing) Ken Davis, Sample Custodian Applied Marine Sciences, Inc Cathy Hershey, Sample Custodian STL Baltimore Carl Zimmermann, Senior Faculty Research Assistant CBL; Kim Blodnikar, Faculty Research Assistant, CBL Pam Smith, GLEC
Sample Preparation: Roxanne Brackett, Moisture, Lipid, SVOCs (PAHs) and Pesticide/PCB Aroclors at Battelle Duxbury Mark Misita, Henry Pham and Susan Winnard (assisted by Wesley Baxter), Dioxin/Furan/HCX/TCX and PCBs at Battelle Columbus Chuck Apts and Jordana Wood, Metals at Battelle MSL Mary Ann Deuth, MeHg at Battelle MSL Tim Fortman, Mary Ann Deuth, and Chuck Apts, AVS/SEM at Battelle MSL Susan Blanton, ELS Test Solution at Battelle MSL Ken Davis, TOC and Grain Size Applied Marine Sciences Jonathan Haupt , SVOC (phenols/phthalate) and BOD at STL Baltimore Nancy Kaumeyer, DOC/TOC at CBL Kim Blodnikar, TN/TP and TDN/TDP at CBL Carolyn Keefe, DIN at CBL Kathy Wood, Ammonium at CBL Cheryl Clark, TSS at CBL Jim Stricko, GLEC
Sample Determinative Analysis: Dan Bardon, SVOCs (PAHs) at Battelle Duxbury Jonathan Thorn, Chlorinated Pesticide /PCB Aroclors at Battelle Duxbury Joe Tabor (assisted by Mark Misita), Dioxin/Furan/HCX/TCX and PCBs at Battelle Columbus Linda Bingler, Metals at Battelle MSL Mary Ann Deuth, AVS/SEM and MeHg at Battelle MSL Tim Fortman and Chuck Apts, AVS/SEM at Battelle MSL Ken Davis, TOC and Grain Size Applied Marine Sciences Craig Schenning, VOC, SVOC (phenols/phthalates), and BOD at STL Baltimore Nancy Kaumeyer, DOC/TOC at CBL Kim Blodnikar, TN/TP and TDN/TDP at CBL Carolyn Keefe, DIN at CBL Kathy Wood, Ammonium at CBL Cheryl Clark, TSS at CBL Mailee Woods, Angela Millard, and Don McNew, Organism weighing and water quality analysis at GLEC
SAMPLE ARCHIVAL
Field Sample Storage (No. of days from sample collection): Varies by parameter and matrix for chemical analyses – see Worksheet #9a; 8 weeks if held chilled for sediment bioassay testing
Sample Extract/Digestate Storage (No. of days from extraction/digestion): varies by parameter and matrix for chemical analysis– see Worksheet #9a
SAMPLE DISPOSAL
Responsible Organization: Each participating laboratory is responsible for disposal of samples received for required analyses; Sediments used for bioassay testing will be returned to Battelle for disposal.
Responsible Personnel: Sample Custodian

EPA-NE QAPP Worksheet #17 - Rev. 10/99

Field Analytical Method/SOP Reference Table

Reference Number	Title, Revision Date and/or Number	Definitive or Screening Data	Region I NESTS Method Code	Originating Organization	Analytical Parameter	Instrument	Organization Performing Field Analysis	Modified for Project Work Y or N
F-1	Maintenance and Calibration of Measuring and Test Equipment	Screening		Harding ESE	pH, specific conductivity, temperature, redox potential, dissolved oxygen, turbidity	Horiba U-10 or U-22 Water Quality Meter	Harding ESE	N

Field SOP for water quality measurement analyses included in Harding ESE's Field Sampling Plan.

EPA-NE QAPP Worksheet #18 - Rev. 10/99

Field Analytical Instrument Calibration Table

Instrument	Activity	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	Method/SOP Reference
Horiba U-10 or U-22 Water Quality Meter	Screening of water quality parameters, including pH, dissolved oxygen, specific conductivity, oxidation/reduction potential, turbidity, and temperature	Daily, prior to sampling	Measurements within 10% of calibration standard	Instrument calibration with standard solution	Charles Lyman	F-1

EPA-NE QAPP Worksheet #19 - Rev. 10/99

Field Analytical Instrument/Equipment Maintenance, Testing and Inspection Table

Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	Method/ SOP Reference
Horiba U-10 or U-22 Water Quality Meter	N/A	N/A	Visual inspection	Charles Lyman	Daily	Equipment in working order	Replacement device obtained	F-1

EPA-NE QAPP Worksheet #20 Rev. 10/99

Fixed Laboratory Analytical Method/SOP Reference Table

Ref Number	Fixed Laboratory Performing Analysis	Title, Revision Date and/or Number	Definitive[1] or Screening Data	Region I NESTS Method Code*	Analytical Parameter	Instrmt	Mod for Project Work Y or N
L-1	Battelle Duxbury	Use of the Cahn Model 25 and Cahn Model 28 Electrobalances (SOP 3-004)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-2	Battelle Duxbury	Operation and Maintenance of Hewlett-Packard 5970B, 5972A and 5973A Gas Chromatograph/Mass Selective Detector (GC/MSD) using Hewlett-Packard Software (SOP 3-092)	Definitive	NA	SVOC (PAHs)	GC/MS	N
L-3	Battelle Duxbury	Operation and Maintenance of Gas Chromatographs (SOP 3-116)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-4	Battelle Duxbury	Analytical Instrument Data Acquisition Using the Labsystems X-Chrome Data System (SOP 3-132)	Definitive	NA	Pest/PCB	GC/ECD	N
L-5	Battelle Duxbury	Use of Electronic Balances (SOP 3-160)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-6	Battelle Duxbury	Quality Assurance Facilities Inspections (SOP 4-009)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-7	Battelle Duxbury	Quality Assurance Audits of Reported Data (SOP 4-015)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-8	Battelle Duxbury	Non-Conformance and Corrective Action (SOP 4-035)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-9	Battelle Duxbury	Identification and Quantification of Polychlorinated Biphenyls (By Congener and Aroclor) and Chlorinated Pesticides by Gas Chromatography/Electron Capture Detection (SOP 5-128)	Definitive	NS&T Methods	Pest/PCB	GC/ECD	N
L-10	Battelle Duxbury	Identification and Quantification of Polynuclear Aromatic Hydrocarbons by Gas Chromatography/Mass Spectrometry (SOP 5-157)	Definitive	NS&T Methods	SVOCs (PAH), w/TIC (for tissue samples)	GC/MS	N
L-11	Battelle Duxbury	Tissue Extraction for Trace Level Semivolatile Organic Contaminants (Draft SOP 5-190)	Definitive	NA	SVOC (PAHs); Pest/PCB; Lipid; Moisture	GC/MS and GC/ECD	N

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Fixed Laboratory Analytical Method/SOP Reference Table

Ref Number	Fixed Laboratory Performing Analysis	Title, Revision Date and/or Number	Definitive[1] or Screening Data	Region I NESTS Method Code*	Analytical Parameter	Instrmt	Mod for Project Work Y or N
L-12	Battelle Duxbury	HPLC Cleanup of Samples for Semivolatile Organic Pollutants (SOP 5-191)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-13	Battelle Duxbury	Soil/Sediment Extraction for Trace Level Semi-Volatile Organic Contaminant Analysis (SOP 5-192)	Definitive	NA	SVOC (PAHs), Pest/PCB, Moisture	GC/MS and GC/ECD	N
L-14	Battelle Duxbury	Water Extraction for Trace Level Semi-Volatile Organic Contaminant Analysis (SOP 5-200)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-15	Battelle Duxbury	Cleaning of Organic Chemistry Labware (SOP 5-216)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-16	Battelle Duxbury	Chemistry Laboratory Sample Identification (SOP 6-007)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-17	Battelle Duxbury	Sample Receipt, Custody and Handling (SOP 6-010)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-18	Battelle Duxbury	Documentation Procedures in the Gas Chromatography/Mass Spectrometry (GC/MS) Facility (SOP 6-011)	Definitive	NA	SVOC (PAHs)	GC/MS	N
L-19	Battelle Duxbury	Data Recording (SOP 6-017)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-20	Battelle Duxbury	Laboratory Verification and Validation of Analytical Data (SOP 6-027)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-21	Battelle Duxbury	Preparation of Analytical Control Charts (SOP 7-028)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-22	Battelle Duxbury	Preparation, Analysis, and Reporting Quality Control Data in the Chemistry Laboratory (SOP 7-029)	Definitive	NA	SVOC (PAHs) and Pest/PCB	GC/MS and GC/ECD	N
L-23	Battelle Columbus	The Analysis of Polychlorinated Dibenzo-p-dioxin/Polychlorinated Dibenzofuran (PCDD/PCDF) Using High Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS) Using Modified Method 8290 (ASAT.II-001-02)	Definitive	NA	Dioxin/ Furan/ HCX/TCX	GC/ HRMS	N

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Fixed Laboratory Analytical Method/SOP Reference Table

Ref Number	Fixed Laboratory Performing Analysis	Title, Revision Date and/or Number	Definitive[1] or Screening Data	Region I NESTS Method Code*	Analytical Parameter	Instrmt	Mod for Project Work Y or N
L-24	Battelle Columbus	Polychlorinated Dibenzo-p-dioxin/Polychlorinated Dibenzofuran (PCDD/PCDF) Sample Preparation Using Modified Methods 8290 (ASAT-II-002-02)	Definitive	NA	Dioxin/ Furan/ HCX/TCX	GC/ HRMS	Y (a)
L-25	Battelle Columbus	Internal QA Inspection and Corrective Action Procedures for Polychlorinated Dibenzo-p-dioxin/Polychlorinated Dibenzofuran (PCDD/PCDF) and Related Compounds Analytical Programs (ASAT.II-003-00)	Definitive	NA	Dioxin/ Furan/ HCX/TCX	GC/ HRMS	N
L-26	Battelle Columbus	Polychlorinated Dibenzo-p-dioxin/Polychlorinated Dibenzofuran (PCDD/PCDF) Desiccating Agent And Adsorbent Preparation and Storage (ASAT.II-005-00)	Definitive	NA	Dioxin/ Furan/ HCX/TCX	GC/ HRMS	N
L-27	Battelle Columbus	Polychlorinated Dibenzo-p-dioxin/Polychlorinated Dibenzofuran (PCDD/PCDF) Standards and Reagents Preparation and Storage for Modified Method 8290 Analysis (ASAT.II-006-00)	Definitive	NA	Dioxin/ Furan/HCX/ TCX	GC/ HRMS	N
L-28	Battelle Columbus	Chain of Custody for Dioxin/Furan Analysis (ASAT.II-007-00)	Definitive	NA	Dioxin/ Furan/HCX/ TCX And PCBs	GC/ HRMS	N
L-29	Battelle Columbus	Standard Operating Procedure for Dioxin/Furan Technical Data Review (ASAT.II-010-00)	Definitive	NA	Dioxin/ Furan/HCX/ TCX	GC/ HRMS	N
L-30	Battelle Columbus	Standard Operating Procedure for using Electronic and Mechanical Balances (ASAT.II-011-00)	Definitive	NA	Dioxin/ Furan/HCX/ TCX And PCBs	GC/ HRMS	N
L-31	Battelle Columbus	Standard Operating Procedure (SOP) for the Use of Refrigerators and Freezers used for Dioxin-Related Projects (ASAT.II-012-00)	Definitive	NA	Dioxin/ Furan/HCX/ TCX And PCBs	GC/ HRMS	N
L-32	Battelle Columbus	PCB Analysis Using Modified Method 1668, Revision A - Draft (ASAT.II-009-00)	Definitive	NA	PCBs	GC/ HRMS	N

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Fixed Laboratory Analytical Method/SOP Reference Table

Ref Number	Fixed Laboratory Performing Analysis	Title, Revision Date and/or Number	Definitive[1] or Screening Data	Region I NESTS Method Code*	Analytical Parameter	Instrmt	Mod for Project Work Y or N
L-33	Battelle Columbus	Standard Operating Procedure (SOP) for the Use and Calibration of Digital and Glass Thermometers (ASAT.II-013-00)	Definitive	NA	Dioxin/ Furan/HCX/ TCX and PCBs	GC/ HRMS	N
L-34	Battelle Marine Sciences Laboratory (MSL)	Sample Chain-of-Custody (MSL-A-002-02)	Definitive	NA	Metals ELS Testing	ICP/MS, GFAA ICP/AES, CVAA, CVAF	N
L-35	Battelle MSL	Percent Dry Weight and Homogenizing Dry Sediment, Soil, and Tissue (MSL-C-003-02)	Definitive	NA	Moisture Content ELS Testing	Analytical balance	N
L-36	Battelle MSL	Glassware and Equipment Cleaning Procedures (MSL-C-011-01)	Definitive	NA	Metals ELS Testing	ICP/MS, GFAA ICP/AES, CVAA, CVAF	N
L-37	Battelle MSL	Sediment Evaporation Digestion (MSL-I-004-03)	Definitive	NA	Metals	ICP/MS, GFAA ICP/AES, CVAA, CVAF	N
L-38	Battelle MSL	Mixed Acid Sediment Digestion (MSL-I-006-01)	Definitive	NA	Metals	ICP/MS, GFAA ICP/AES, CVAA, CVAF	N
L-39	Battelle MSL	Total Mercury in Aqueous Samples by Cold Vapor Atomic Fluorescence (MSL-I-013-02)	Definitive	NA	Hg	CVAF	N
L-40	Battelle MSL	MethylMercury in Tissues and Sediments by Cold Vapor Atomic Fluorescence (MSL-I-015-05)	Definitive	NA	MeHg	CVAF	N
L-41	Battelle MSL	Total Mercury in Tissues and Sediments by Cold Vapor Atomic Absorption (CVAA) (MSL-I-016-03)	Definitive	NA	Hg	CVAA	N
L-42	Battelle MSL	Determination of Elements in Aqueous and Digestate Samples by ICP/MS (MSL-I-022-04)	Definitive	NA	Metals	ICP/MS	N

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Fixed Laboratory Analytical Method/SOP Reference Table

Ref Number	Fixed Laboratory Performing Analysis	Title, Revision Date and/or Number	Definitive[1] or Screening Data	Region I NESTS Method Code*	Analytical Parameter	Instrmt	Mod for Project Work Y or N
L-43	Battelle MSL	Mixed Acid Tissue Digestion (MSL-I-024-02)	Definitive	NA	Metals	ICP/MS, GFAA ICP/AES, CVAA, CVAF	N
L-44	Battelle MSL	Determination of Metals in Aqueous and Digestate Samples by ICP/AES (MSL-I-027-03)	Definitive	NA	Metals	ICP/AES	N
L-45	Battelle MSL	Determination of Metals in Aqueous and Digestate Samples by GFAA (MSL-I-029-03)	Definitive	NA	Metals	GFAA	N
L-46	Applied Marine Sciences, Inc. (AMS)	Wet Preparation of Soil Samples for the Quantitative Determination of Particle Size Analysis (Sieve and Hydrometer Method) (SOP 2103)	Definitive	NA	Grain Size	Analytical balance/ drying oven	N
L-47	AMS	Laboratory Determination of Moisture Content of Soils (SOP 2301)	Definitive	NA	Water Content	Analytical balance/ drying oven	N
L-48	AMS	No internal SOP – follow Method ASTM D2487	Definitive	NA	Classification	NA	N
L-49	AMS	Total Organic Carbon Content of Sediments by Coulometric Detection (SOP 2201)	Definitive	NA	TOC	Analytical balance/ CO_2 coulometer	N
L-50	STL Baltimore	Sample Log-in Procedures (STL-SOP-035)	Definitive	NA	NA	NA	N
L-51	STL Baltimore	Procedures for Glassware Cleaning (STL-SOP-062)	Definitive	NA	NA	NA	N
L-52	STL Baltimore	Technical Training Requirements (STL-SOP-180)	Definitive	NA	NA	NA	N
L-53	STL Baltimore	Employee Orientation and Training Program (STL-SOP-293)	Definitive	NA	NA	NA	N
L-54	STL Baltimore	Internal Audit Program (STL-SOP-296)	Definitive	NA	SVOC (phenols & phthalates), and VOC	GC/MS	N

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Fixed Laboratory Analytical Method/SOP Reference Table

Ref Number	Fixed Laboratory Performing Analysis	Title, Revision Date and/or Number	Definitive[1] or Screening Data	Region I NESTS Method Code*	Analytical Parameter	Instrmt	Mod for Project Work Y or N
L-55	STL Baltimore	Continuous Liquid-Liquid Extraction (STL-M-3520C)	Definitive	NA	SVOC (phenols & phthalates)	GC/MS	N
L-56	STL Baltimore	Soxhlet Extraction (STL-M-3540C)	Definitive	NA	SVOC (phenols & phthalates)	GC/MS	N
L-57	STL Baltimore	Gel-Permeation Cleanup (STL-M-3640A)	Definitive	NA	SVOC (phenols & phthalates)	GC/MS	N
L-58	STL Baltimore	Sample Preparation and for the Analysis of Volatile Organics by a Purge and Trap Procedure in Water Samples (STL-M-5030B)	Definitive	NA	VOC	Purge and Trap Device GC/MS	N
L-59	L-59 was the SOP for Dalapon Analysis. Dalapon has been deleted as a required parameter in the Final QAPP. L-59 designation not used.						
L-60	STL Baltimore	Determination of Volatile Organics Compounds in Water, Waste, Soil and Sediment Samples by Gas Chromatography/ Mass Spectrometry (STL-M-8260B)	Definitive	NA	VOC	GC/MS	N
L-61	STL Baltimore	Semivolatile Organic Compounds By Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Column Technique (STL-M-8270C)	Definitive	NA	SVOC (phenol & phthalate)	GC/MS	N
L-62	University of Maryland Center for Environmental Science Chesapeake Biological Laboratory	Nutrient Analytical Services Laboratory Standard Operating Procedures Technical Report Series No. 158-97 (D'Elia, *et al.*, 1997)	Definitive	NA	DIN, TN/TP, TDN/TDP, TOC/DOC, TSS	Technicon Autoanalyzer II; TrAAcs-800 Analyzer; Shimadzu TOC 5000; Mettler AE100	N
L-63	STL Baltimore	Biochemical Oxygen Demand (5 Day) Carbonaceous Biochemical Oxygen Demand (5 Day)	Definitive	NA	BOD	YSI DO Meter Model 54 or 57	N

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Fixed Laboratory Analytical Method/SOP Reference Table

Ref Number	Fixed Laboratory Performing Analysis	Title, Revision Date and/or Number	Definitive[1] or Screening Data	Region I NESTS Method Code*	Analytical Parameter	Instrmt	Mod for Project Work Y or N
L-64	Battelle MSL	Quality Assurance Inspections of MSL System and Study Activities (MSL-Q-002)	Definitive	NA	ELS testing	NA	N
L-65	Battelle MSL	Quality Assurance Audits of Reports (MSL-Q-003)	Definitive	NA	ELS testing	NA	N
L-66	Battelle MSL	Quality of Testing Water and Feed (MSL-Q-004)	Definitive	NA	ELS testing	NA	N
L-67	Battelle MSL	Quality Assurance Data Audits (MSL-Q-005)	Definitive	NA	ELS testing	NA	N
L-68	Battelle MSL	Method Development, Validation, and Implementation (MSL-Q-009)	Definitive	NA	ELS testing	NA	N
L-69	Battelle MSL	Sample Log-in Procedure (MSL-A-001)	Definitive	NA	ELS testing	NA	N
L-70	Battelle MSL	Deviations from Established Requirements (MSL-A-005)	Definitive	NA	ELS testing	NA	N
L-71	Battelle MSL	Marine Sciences Laboratory Training (MSL-A-006)	Definitive	NA	ELS testing	NA	N
L-72	Battelle MSL	Control of Standards, Reagents, Solutions, Test/Control Articles and Specimens (MSL-A-008)	Definitive	NA	ELS testing	NA	N
L-73	Battelle MSL	Document Control (MSL-A-010)	Definitive	NA	ELS testing	NA	N
L-74	Battelle MSL	Procurement (MSL-A-012)	Definitive	NA	ELS testing	NA	N
L-75	Battelle MSL	Sample Container Requests (MSL-A-014)	Definitive	NA	ELS testing	NA	N
L-76	Battelle MSL	Recording Data on Data Sheets and Laboratory Notebooks (MSL-D-001)	Definitive	NA	ELS testing	NA	N
L-77	Battelle MSL	Data Reporting, Reduction, Back Up, and Archiving (MSL-D-004)	Definitive	NA	ELS testing	NA	N
L-78	Battelle MSL	Stock and Standard Preparation (MSL-M-056)	Definitive	NA	ELS testing	NA	N
L-79	Battelle MSL	Use of Laboratory Refrigerators and Freezers (MSL-I-026)	Definitive	NA	ELS testing	NA	N
L-80	Battelle MSL	Use and Performance Checks and Balances (MSL-C-009)	Definitive	NA	ELS testing	NA	N
L-81	Battelle MSL	Calibration and Use of Pipettes (MSL-C-010)	Definitive	NA	ELS testing	NA	N
L-82	Battelle MSL	Maintenance of the Deioinized Water System (MSL-C-016)	Definitive	NA	ELS testing	NA	N
L-83	Battelle MSL	Calibration and Use of pH Meters (MSL-M-045)	Definitive	NA	ELS testing	NA	N

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Fixed Laboratory Analytical Method/SOP Reference Table

Ref Number	Fixed Laboratory Performing Analysis	Title, Revision Date and/or Number	Definitive[1] or Screening Data	Region I NESTS Method Code*	Analytical Parameter	Instrmt	Mod for Project Work Y or N
L-84	Battelle MSL	Calibration and Use of Dissolved Oxygen Meters (MSL-M-046)	Definitive	NA	ELS testing	NA	N
L-85	Battelle MSL	Calibration and Use of Thermometers (MSL-W-003)	Definitive	NA	ELS testing	NA	N
L-86	Battelle MSL	Calibration and Use of Refractometers (MSL-M-048)	Definitive	NA	ELS testing	NA	N
L-87	Battelle MSL	Determination of Ammonia (MSL-W-007)	Definitive	NA	ELS testing	NA	N
L-88	Battelle MSL	Routine Water Quality Measures for Toxicity Tests (MSL-W-008)	Definitive	NA	ELS testing	NA	N
L-90	Battelle MSL	Determination of Soluble Sulfide in Aqueous Samples (MSL-W-009)	Definitive	NA	ELS testing	NA	N
L-91	Battelle MSL	Water and Tissue Sample Collection (MST-T-001)	Definitive	NA	ELS testing	NA	N
L-92	Battelle MSL	Animal Receipt, Acclimation, and Holding (MSL-T-002)	Definitive	NA	ELS testing	NA	N
L-93	Battelle MSL	Test Organism Observations (MSL-T-003)	Definitive	NA	ELS testing	NA	N
L-94	Battelle MSL	Receipt, Holding and/or Testing of Fish (MSL-T-032)	Definitive	NA	ELS testing	NA	N
L-95	Battelle MSL	Reference Toxicant Stock Solution Preparation (MSL-T-034)	Definitive	NA	ELS testing	NA	N
L-96	Battelle MSL	Dry Weight Measurements (MSL-T-036)	Definitive	NA	ELS testing	NA	N
L-97	Battelle MSL	Seawater and Freshwater System Maintenance (MSL-F-001)	Definitive	NA	ELS testing	NA	N
L-98	Battelle Columbus	Polychlorinated Dibenzo-p-Dioxin/Polychlorinated Dibenzofuran (PCDD/PCDF) Sample Container Preparation and Shipment (ASAT.II-004-00)	Definitive	NA	Dioxin/Furan/ HCX/TCX	NA	N
L-99	AMS	Guidelines for Sample Receipt, Login, and Storage (SOP 1301)	Definitive	NA	Grain Size, TOC	NA	N
L-100	Great Lakes Environmental Center (GLEC)	Sample Receipt, Custody, and Handling	Definitive	NA	Bioassay testing	NA	N
L-101	GLEC Traverse City	Storage and Handling of Test Materials (GLEC I-001-00)	Definitive	NA	Bioassay testing	NA	N

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Fixed Laboratory Analytical Method/SOP Reference Table

Ref Number	Fixed Laboratory Performing Analysis	Title, Revision Date and/or Number	Definitive[1] or Screening Data	Region I NESTS Method Code*	Analytical Parameter	Instrmt	Mod for Project Work Y or N
L-102	GLEC Traverse City	Not an internal SOP – Standard Method for: Whole Sediment Toxicity Testing Against *Hyalella azteca* (Amphipod) and *Chironomus tentans* (Diptera) that Measure the Effects of Sediment-Associated Contaminants on Survival, Growth and Reproduction	Definitive	NA	Bioassay testing	NA	Y (a)
L-103	GLEC Traverse City	Manual Cleaning of Glassware and Equipment Used in Toxicity Tests (GLEC II-001-00)	Definitive	NA	Bioassay testing	NA	N
L-104	GLEC Traverse City	Use of Analytical Balances (GLEC II-034-00)	Definitive	NA	Bioassay testing	NA	N
L-105	GLEC Traverse City	Use of Conductivity Meters (GLEC II-031-00)	Definitive	NA	Conductivity	NA	N
L-106	GLEC Traverse City	Measurement of dissolved oxygen in water samples (GLEC II-013-00)	Definitive	NA	Dissolved Oxygen	NA	N
L-107	GLEC Traverse City	Determination of Hardness of a Water Sample (GLEC II-015-00)	Definitive	NA	Total Hardness	NA	N
L-108	GLEC Traverse City	Determination of Alkalinity of a Water Sample (GLEC II-007-00)	Definitive	NA	Alkalinity	NA	N
L-109	GLEC Traverse City	Measurement of Total Ammonia in Water Samples (GLEC II-032-00)	Definitive	NA	Ammonia	NA	N
L-110	GLEC Traverse City	Measurement of pH in Water Samples (GLEC II-033-00)	Definitive	NA	pH	NA	N

[1] SOPs listed here either directly or indirectly relate to the generation of definitive data.
(a) Planned modifications to SOP discussed in EPA-NE QAPP Worksheet #9a.

EPA-NE QAPP Worksheet #21 Rev. 10/99

Fixed Laboratory Instrument Maintenance and Calibration Table

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[1]	Method/ SOP Ref[a]
Analytical balance	Moisture Content	Daily performance check (or with each use).	1×/daily using two Class "S" weights bracketing expected weight range	within 0.01 g of value	Calibration and service performed as needed or at regular intervals by professional metrology technician.	Roxanne Bracket (Sample Preparation Task Leader)	L-1
Analytical balance	Lipid Content	Daily performance check (or with each use).	1×/daily using two Class "S" weights bracketing expected weight range	within 0.0001 g of value	Calibration and service performed as needed or at regular intervals by professional metrology technician.	Roxanne Bracket (Sample Preparation Task Leader)	L-1
GC/ECD	Pest/PCB Analysis	Change injection port liner; check for leaks	IC: prior to analytical run; CC: every 10 samples	IC: RSD≤25% mean RSD≤15% CC: PD from initial ≤25%; mean PD≤15%	Remedial maintenance, new initial calibration, or reanalyze samples. Document and justify	Jonathan Thorn (GC/ECD Analyst)	L-9
GC/MS	SVOCs (PAHs) Analysis	Change injection port liner; tune MSD; check for leaks	IC: prior to analytical run; CC: every 10 samples	IC: RSD≤25% mean RSD≤15% CC: PD from initial ≤25%; mean PD≤15%	Remedial maintenance, new initial calibration, or reanalyze samples. Document and justify	Dan Bardon (GC/MS Analyst)	L-10
GC/HRMS	Dioxin/ Furan/ HCX/TCX Analysis	Column if needed; clip retention gap if needed; tune HRMS; check for leaks; analyze calibration point 3, window set, and column performance check	IC:minimum every 6 months; CC: every 12 hours	IC: RSD≤25% for native compounds and RSD≤35% for labeled compounds CC: Within limits of Method 1613B, Table 6 "VER" requirements	Remedial maintenance, new initial calibration, reanalyze samples or use of CC response factors in calculations. Document and justify	Joe Tabor (GC/HRMS Analyst) or Task Leader	L-23

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Fixed Laboratory Instrument Maintenance and Calibration Table

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[1]	Method/ SOP Ref[a]
GC/HRMS	PCB Analysis	Column if needed; clip retention gap if needed; tune HRMS; check for leaks; analyze single point 209 PCB standard once per 24 hour analysis period for column performance; analyze calibration point 3	5 Pt-IC: minimum every 6 months Single-Pt 209 IC: Minimally with every 5- Pt IC CC: every 12 hours	5 Pt-IC: RSD≤20% for compounds determined by isotope dilution and RSD≤35% compounds determined by internal standard Single-Pt 209 IC:±35% of 5Pt-IC RF for non-coeluting congeners which are also in the 5 PT-IC CC: Within limits of Method 1668A, Table 6 "VER" requirements	Remedial maintenance, new initial calibration, reanalyze samples or use of CC response factors in calculations. Document and justify	Joe Tabor (GC/HRMS Analyst) or Task Leader	L-32
Freeze Dryer	Freeze Drying	Performance check (seals, vacuum pump operation, temperature) with each use	NA	NA	Maintenance or repair as needed	Deborah Coffey QA Officer	L-35
Analytical balance	Moisture Content	Daily performance check (or with each use).	1×/daily using two Class "S" weights bracketing expected weight range	within 0.001 g of value	Calibration and service performed as needed or at regular intervals by professional metrology technician.	Deborah Coffey QA Officer	L-35
ICP/MS	Metals Analysis	Daily sensitivity and stability checks	IC: prior to analytical run; CC: every 10 samples	IC: r ≤ 0.99 CC: PD from true value ≤ 25% Mean PD ≤ 15%	Remedial Maintenance new IC or reanalyze Document and justify	Chuck Apts Metals Analyst	L-42
ICP/AES	As above	As above	As above	As above	As above	Jordana Wood Metals Analyst	L-44
GFAA	As above	As above	As above	As above	As above	Jordana Wood Metals Analyst	L-45

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Fixed Laboratory Instrument Maintenance and Calibration Table

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[1]	Method/ SOP Ref*
CVAA	Hg Analysis	As above	As above	As above	As above	Mary Ann Deuth Hg Analyst	L-41
CVAF	Hg, MeHg Analysis	As above	As above	As above	As above	Mary Ann Deuth Hg Analyst	L-40
Drying oven/analytical balance	Grain Size Determination	Temperature monitoring and calibrated, with annual maintenance	2x/daily (drying oven) daily (balance)	Within 0.001g of value (balance)	Re-weigh/re-calibrate/service call	Ken Davis	L-46
As above	Water Content Determination	As above	As above	As above	As above	Ken Davis	L-47
CO_2 Coulometer and balance	TOC Analysis	Chem scrubbers changed daily	Weekly (3 level)	5% LB<10× DL	Replace ports/reagents	Ken Davis	L-49
GC/MS	SVOC (phenols & phthalates)	Tuning, ICV standards CCV standards	Beginning of each sequence; calibration verified every 12 hours/20 samples and at end of sequence (all or most frequent)	ICV and CCV standards are with in 20 % of initial calibration	Re-calibrate Check Standard Solution Call maintenance as needed	Craig Schenning	L-61
GC/MS	VOC	Tuning, ICV samples, Reagent Blanks, Preventative purging in-between all samples	Once per sequence	Whenever potentially interfering peaks become available	Re-calibrate Instrument; Change purge gas source and regenerate molecular sieve gas filter	Craig Schenning	L-60
Purge & Trap Device	VOC	Reagent blanks run prior to samples	Beginning of each sequence	< QL	Bake-out and purge system	Craig Schenning	L-60
YSI DO Meter Model 54 or 57	BOD	Probe cleaned with each use	IC: prior to analytical run	± 0.1 mg/L	Recalibrate, change probe membrane, and recalibrate	Michelle MacKaney	L-63

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Fixed Laboratory Instrument Maintenance and Calibration Table

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[1]	Method/ SOP Ref*
Technicon II Autoanalyzer	DIN (except ammonium); TN/TP; TDN/TDP	Performance checks following manufacturer's instructions	IC: prior to analytical run; CC: every 20 samples	IC: RSD = 85%-115%; CC: PD from true value ≤ 15%	Investigate, recalibrate	Carl Zimmermann Senior Faculty Research Assistant	L-62
Technicon TrAAcs-800 Nutrient Analyzer	Ammonium	Performance checks following manufacturer's instructions	IC: prior to analytical run; CC: every 20 samples	IC: RSD = 85%-115%; CC: PD from true value ≤ 15%	Investigate, recalibrate	Carl Zimmermann Senior Faculty Research Assistant	L-62
Shimadzu 5000 Carbon Autoanalyzer	DOC	Change catalyst reduction tube and vacuum pump oil as needed	IC: prior to analytical run; CC: every 20 samples	IC: r ≤ 0.995; CC: PD from initial ≤ 15%	Investigate, recalibrate	Carl Zimmermann Senior Faculty Research Assistant	L-62
Mettler AE100	TSS	Daily performance check (or with each use).	IC: Annually; CC: Daily	IC: Professionally calibrated to agree with NIST traceable calibration weights; CC: PD <1% from reference weight	Professional Service requested for PD >5%	Carl Zimmermann Senior Faculty Research Assistant	L-62
YSI Sonde	Water quality (DO, pH, temperature, and conductivity)	Monthly cleaning, daily inspection (membranes, etc.)	Daily	DO: ± 2% pH: ± 0.2 units Temp: ± 0.15 C cond: ± 2%	Recalibrate, contact Wet Lab Facility Manager	Deborah Coffey QA Officer	L-88
pH meter	pH analysis	To be determined	Daily	± 5% and temperature ± 1°C	Recalibrate, add filling solution to probe, change or recondition probe, and recalibrate	Deborah Coffey QA Officer	L-83
Dissolved oxygen meter	Dissolved oxygen analysis	Test in saturated deionized water-	Daily	± 1% of full scale at calibration temperature	Recalibrate, change probe membrane, and recalibrate	Deborah Coffey QA Officer	L-84
Refractometer	Salinity analysis	Calibrate with deionized water (0/00) and standard seawater (34 0/00)	Monthly	± 1 ppt	Recalibrate; Replace instrument	Deborah Coffey QA Officer	L-86
Digital thermometer	Temperature analysis	Calibrate vs. NIST-traceable thermometer; Avoid bending thermocouples	Every 6 months	± 1 °C	Return for factory calibration	Deborah Coffey QA Officer	L-85

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Fixed Laboratory Instrument Maintenance and Calibration Table

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[1]	Method/ SOP Ref*
Ammonia meter	Ammonia analysis	3-pt linear calibration	Daily and 1 pt every 10 samples	Slope between –54 and –60 MeV/decade at 20-25 °C after 2-point calibration	Recalibrate. Replace probe.	Deborah Coffey QA Officer	L-87
Sulfide meter	Sulfide analysis	Titration of weekly working standard, calibration using 3pt. curve	Daily and 1 pt after calibration (ICV)and every 10 samples (CCV)	± 20% of expected value for ICV/CCVs	Recalibrate, re-measure affected samples.	Deborah Coffey QA Officer	L-90
Analytical balance	Mass – catfish eggs and fry	Clean; verify calibration with 2 weights that bracket the expected sample weights; professional calibration	Daily verification, as needed, using NIST-traceable weights; professional calibration annually	Within ± 1% of expected value at each weight range; Last readable decimal place	Level, re-test, remove from service until professional calibration check	Deborah Coffey QA Officer	L-80
Pipettes	Chemical mixture dilution series and reference toxicant solution preparation	Inspect for cracks, broken tips, etc. Gravimetric verification of delivery	Once per year	1 or 2% error from expected based on pipette type and use	Clean and re-test, if problem persists, remove from service	Deborah Coffey QA Officer	L-81
pH meter	pH analysis	Daily inspection, weekly renewal of filling solution, and monthly cleaning	Daily	± 5% and temperature ± 1°C	Recalibrate, add filling solution to probe, change or recondition probe, and recalibrate	Robin Silva-Wilkenson QA Officer	L-105
Dissolved oxygen meter	Dissolved oxygen analysis	Test in saturated deionized water-	Daily	± 1% of full scale at calibration temperature	Recalibrate, change probe membrane, and recalibrate	Robin Silva-Wilkenson QA Officer	L-106
Digital thermometer	Temperature analysis	Calibrate vs. NIST-traceable thermometer; Avoid bending thermocouples	Every 6 months	± 1 °C	Return for factory calibration	Robin Silva-Wilkenson QA Officer	In draft
Ammonia meter	Ammonia analysis	5-pt linear calibration	Daily	Slope between –54 and –60 MeV/decade at 20-25 °C after 2-point calibration	Recalibrate, replace membrane, refill probe, or replace probe.	Robin Silva-Wilkenson QA Officer	L-110

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Fixed Laboratory Instrument Maintenance and Calibration Table

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA[1]	Method/ SOP Ref*
Analytical balance	Mass – dried test organisms	Clean; verify calibration with 2 weights that bracket the expected sample weights; professional calibration	Daily verification, as needed, using Autocalibration; professional calibration annually	Within ± 1% of expected value at each weight range; Last readable decimal place	Level, re-test, remove from service until professional calibration check	Robin Silva-Wilkenson QA Officer	L-104

IC = Initial Calibration; CC = Continuing Calibration; RSD = Relative Standard Deviation; PD = Percent Difference; LB = Lab Blank; DL = Detection Limit; QL = Quantitation Limit (also referred to as RL); ICV = Initial Calibration Verification; CCV = Continuing Calibration Verification; DO = Dissolved Oxygen.

[1] If specified project personnel not available; alternate and equally trained staff will perform task/corrective action

* Specify appropriate reference letter/number from Fixed Laboratory Method/SOP Reference Table (EPA-NE QAPP Worksheet #20).

EPA-NE QAPP Worksheet #22a Rev. 10/99

Field Sampling QC Table

Sampling SOP	S-1 thru S-7
Medium/Matrix	Tissue[a]
Analytical Parameter [b]	Moisture, Lipid, PCB Aroclor/Pest, SVOC (PAH), D/F/HCX/TCX, PCBs, Metals, MeHg
Concentration Level	Low
Analytical Method/ SOP Reference	Moisture – NS&T/L-11; PCBAroclor/Pest – NS&T/L-9; SVOC (PAH) – NS&T/L-10; D/F/HCX/TCX –1613B/L-23; PCBs –1668A/L-32); Metals – 1631/L-39; 245.5/L-41; 1640, 1638/L-42; SW6010B, 200.7/L-44; and 200.9/ L-45; MeHg – Bloom (1989)/L-40
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	3 to 6

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	NA	NA	NA	NA	NA	NA
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with lab water – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	Samples will be visually examined upon receipt to see if frozen < 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	NA	NA	NA	NA	NA	NA
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory	NA	NA	NA	NA	NA	NA
Other:	NA	NA	NA	NA	NA	NA

[a] See EPA-NE QAPP Worksheet #9a for tissue types.
[b] Whole samples will be shipped directly to Battelle MSL for tissue processing. Once tissue processing is complete, sub-samples will be shipped frozen to participating laboratories. Participating laboratories will be responsible for monitoring sample receipt condition upon receipt, as described above. Sample and cooler conditions will be documented in the project file.

EPA-NE QAPP Worksheet #22a Rev. 10/99

Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Sediment/Soil
Analytical Parameter	PCB Aroclor/Pest and SVOC (PAH)
Concentration Level	Low
Analytical Method/ SOP Reference	NS&T/L-9 (GC/ECD); L-10 (GC/MS)
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/ECD Analyst GC/MS Analyst	Accuracy	< QL, or associated samples >10× blank values
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with clean sand – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/ECD Analyst GC/MS Analyst	Precision	Guidance Limits Only: RPD ≤50% for at least 90% of analytes (for analytes detected at level >3× QL)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory	NA	NA	NA	NA	NA	NA
Other:	NA	NA	NA	NA	NA	NA

QL = Quantitation Limit; RPD = Relative Percent Difference

EPA-NE QAPP Worksheet #22a Rev. 10/99

Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Sediment/Soil
Analytical Parameter	Dioxin/Furan/ HCX/TCX and PCBs
Concentration Level	Low
Analytical Method/ SOP Reference	1668B/L-23 1613A/L-32
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	NA	NA	NA	NA	NA	NA
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with clean sand – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/HRMS Analyst	Precision	Guidance Limits Only: RPD ≤50% (for D/F/HCX/TCX >10× MDL; for PCBs >3× EML)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory	NA	NA	NA	NA	NA	NA
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; MDL = Method Detection Limit; EML = Estimated Minimum Level

EPA-NE QAPP Worksheet #22a Rev. 10/99

Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Sediment/Soil
Analytical Parameter	Metals
Concentration Level	Low
Analytical Method/ SOP Reference	1631/L-39; 245.5/L-41; 1640, 1638/L-42; SW6010B, 200.7/L-44; and 200.9/ L-45
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	Metals Analyst	Accuracy	< 5× MDL, or associated samples >10× blank values
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with clean sand – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	Metals Analyst	Precision	Guidance Limits Only: RPD ≤ 50% (for analytes detected at level > 10× MDL)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory	NA	NA	NA	NA	NA	NA
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; MDL = Method Detection Limit

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Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Sediment/Soil
Analytical Parameter	MeHg
Concentration Level	Low
Analytical Method/ SOP Reference	Bloom (1989)/L-40
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	NA	NA	NA	NA	NA	NA
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with clean sand – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	Metals Analyst	Precision	Guidance Limits Only: RPD ≤ 50% (for analytes detected at level > 10× MDL)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory	NA	NA	NA	NA	NA	NA
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; MDL = Method Detection Limit

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Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Sediment
Analytical Parameter	AVS/SEM
Concentration Level	Low
Analytical Method/ SOP Reference	245.5/L-41; 1640, 1638/L-42
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	NA	NA	NA	NA	NA	NA
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with clean sand – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	Metals Analyst	Precision	Guidance Limits Only: RPD ≤ 50% (for analytes detected at level > 10× MDL)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory	NA	NA	NA	NA	NA	NA
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; MDL = Method Detection Limit

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Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Sediment/Soil
Analytical Parameter	Grain Size and TOC
Concentration Level	Low
Analytical Method/ SOP Reference	ASTM D422/L-46 9060/L-49
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	NA	NA	NA	NA	NA	NA
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with clean sand – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	Ken Davis	Precision	Guidance Limits Only: RPD ≤ 50% (for values >10× MDL)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory	NA	NA	NA	NA	NA	NA
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; MDL = Method Detection Limit

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Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Sediment/Soil
Analytical Parameter	SVOCs (phenols/ phthalates)
Concentration Level	Low
Analytical Method/ SOP Reference	8151A/L-59 and 8270C/ L-61
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/ECD Analyst GC/MS Analyst	Accuracy	SVOCs: All target compounds must be < QL except B2EHP ≤ 5× QL
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with clean sand – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/ECD Analyst GC/MS Analyst	Precision	Guidance Limits Only: RPD ≤ 50% (for analytes detected at level > 10× MDL)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory*	1 per 20 *(SVOCs only)*	NA	NA	GC/ECD Analyst	Accuracy	Not applicable – Report values; EPA will evaluate
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; QL = Quantiation Limit; MDL = Method Detection Limit
* It is the responsibility of USACE to provide PE samples to the Field Team in a timely manner to include with sample shipments to the Laboratory.

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Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Water
Analytical Parameter	PCB Aroclor/Pest and SVOC (PAH)
Concentration Level	Low
Analytical Method/ SOP Reference	NS&T/L-9 (GC/ECD); L-10 (GC/MS)
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/ECD Analyst GC/MS Analyst	Accuracy	< QL, or associated samples >10× blank values
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with lab water – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/ECD Analyst GC/MS Analyst	Precision	Guidance Limits Only: RPD ≤50% for at least 90% of analytes (for analytes detected at level >3× QL)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory*	1 per 20	NA	NA	GC/ECD Analyst GC/MS Analyst	Accuracy	Not applicable – Report values; EPA will evaluate
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; QL = Quantiation Limit
* It is the responsibility of USACE to provide PE samples to the Field Team in a timely manner to include with sample shipments to the Laboratory.

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Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Water
Analytical Parameter	Metals and Hardness
Concentration Level	Low
Analytical Method/ SOP Reference	1631/L-39; 245.5/L-41; 1640, 1638/L-42; SW6010B, 200.7/L-44; and 200.9/ L-45
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	1 per 20 *(Metals only)*	NA	Inform Project Manager; Document in QA/QC Narrative	Metals Analyst	Accuracy	<5× MDL, or associated samples >10× blank values
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with lab water – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	Metals Analyst	Precision	Guidance Limits Only: RPD ≤ 50% (for analytes detected at level > 10× MDL)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory	NA	NA	NA	NA	NA	NA
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; MDL = Method Detection Limit

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Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Water
Analytical Parameter	Hg
Concentration Level	Low
Analytical Method/ SOP Reference	1631/L-39
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	Metals Analyst	Accuracy	<5× MDL, or associated samples >10× blank values
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with lab water – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	Metals Analyst	Precision	Guidance Limits Only: RPD ≤ 50% (for analytes detected at level > 10× MDL)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory	NA	NA	NA	NA	NA	NA
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; MDL = Method Detection Limit

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Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Water
Analytical Parameter	SVOC (phenols/ phthalates)
Concentration Level	Low
Analytical Method/ SOP Reference	8270C/ L-61
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/MS Analyst	Accuracy	All target compounds must be < QL except B2EHP ≤ 5× QL
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with lab water – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/MS Analyst	Precision	Guidance Limits Only: RPD ≤ 50% (for analytes detected at level > 10× MDL)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory*	1 per 20	NA	NA	GC/MS Analyst	Accuracy	Not applicable – Report values; EPA will evaluate
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; QL = Quantiation Limit; MDL = Method Detection Limit
* It is the responsibility of USACE to provide PE samples to the Field Team in a timely manner to include with sample shipments to the Laboratory.

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Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Water
Analytical Parameter	VOC
Concentration Level	Low
Analytical Method/ SOP Reference	8260B/L-60
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/MS VOA Analyst	Accuracy	<QL, or associated samples >10× blank values *(except common lab contaminants B2EHP <5× QL)*
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/MS VOA Analyst	Accuracy	<QL, or associated samples >10× blank values *(except common lab contaminants B2EHP <5× QL)*
Cooler Temperature Blanks	1 per cooler (bottle with lab water – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	GC/MS VOA Analyst	Precision	Guidance Limits Only: RPD ≤ 50% (for analytes detected at level > 10× MDL)
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory*	1 per 20	NA	NA	GC/MS Analyst	Accuracy	Not applicable – Report values; EPA will evaluate
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; QL = Quantiation Limit; MDL = Method Detection Limit
* It is the responsibility of USACE to provide PE samples to the Field Team in a timely manner to include with sample shipments to the Laboratory.

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Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Water
Analytical Parameter	DIN, TN/TP, TDN/TDP, TOC/DOC, TSS
Concentration Level	Low
Analytical Method/ SOP Reference	L-62
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	Nutrient Analyst	Accuracy	<5× MDL
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with lab water – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	Nutrients Analyst	Precision	Guidance Limits Only: RPD ≤ 50%
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory	NA	NA	NA	NA	NA	NA
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; MDL = Method Detection Limit

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Field Sampling QC Table

Sampling SOP	S-1
Medium/Matrix	Water
Analytical Parameter	BOD
Concentration Level	Low
Analytical Method/ SOP Reference	L-63
Sampler's Name	Charles Lyman
Field Sampling Organization	Harding ESE
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (see EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Unacceptable Field QC sample results are not a true measure of Fixed Laboratory accuracy and precision performance.

Field QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blanks/ Rinsate Blanks	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	BOD Analyst	Accuracy	<5× MDL <0.2 mg/L 0_2
Bottle Blanks	NA	NA	NA	NA	NA	NA
Trip Blanks	NA	NA	NA	NA	NA	NA
Cooler Temperature Blanks	1 per cooler (bottle with lab water – not a sample)	NA	Inform Project Manager; Document in QA/QC Narrative	Laboratory Sample Custodian	NA	< 6 °C
Field Duplicate Pairs (Duplicate Subsamples)	1 per 20	NA	Inform Project Manager; Document in QA/QC Narrative	BOD Analyst	Precision	Guidance Limits Only: RPD ≤ 50%
Collocated Samples	NA	NA	NA	NA	NA	NA
Field Splits	NA	NA	NA	NA	NA	NA
PES sent to Laboratory	NA	NA	NA	NA	NA	NA
Other:	NA	NA	NA	NA	NA	NA

RPD = Relative Percent Difference; MDL = Method Detection Limit

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Sampling SOP: S-1
Analytical Method/SOP: L-9 (Sediment, Soil, and Water); Pesticides/PCB Aroclors

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
4,4'-DDD	RPD≤ 50% for 90% of analytes, for values >3× QL	< QL, or associated samples >10× blank values
4,4'-DDE	As above	As above
4,4'-DDT	As above	As above
Aldrin	As above	As above
alpha-BHC	As above	As above
alpha-Chlordane	As above	As above
beta-BHC	As above	As above
delta-BHC	As above	As above
Dieldrin	As above	As above
Endosulfan I	As above	As above
Endosulfan II	As above	As above
Endosulfan Sulfate	As above	As above
Endrin	As above	As above
Endrin Aldehyde	As above	As above
Endrin Ketone	As above	As above
gamma-BHC	As above	As above
gamma-Chlordane	As above	As above
Heptachlor	As above	As above
Heptachlor Epoxide	As above	As above
Methoxychlor	As above	As above
Technical chlordane	As above	As above
Toxaphene	As above	As above
Aroclor-1016	As above	As above
Aroclor-1221	As above	As above
Aroclor-1232	As above	As above
Aroclor-1242	As above	As above
Aroclor-1248	As above	As above
Aroclor-1254	As above	As above
Aroclor-1260	As above	As above
Aroclor-1268	As above	As above
Aroclor, Total	As above	As above

RPD = Relative Percent Difference; QL = Quantitation Limit

(a) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

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Sampling SOP: S-1
Analytical Method/SOP: L-10 (Sediment, Soil, and Water); SVOCs (PAHs)

Fixed Laboratory Analytical QC Sample Table cont.

Analyte (a)	*Guidance QC Limits Only (b)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
Biphenyl	RPD≤ 50% for 90% of analytes, for values >3× QL	< QL, or associated samples >10× blank values
2-Methylnaphthalene	As above	As above
Acenaphthene	As above	As above
Acenaphthylene	As above	As above
Benzaldehyde	As above	As above
Anthracene	As above	As above
Benz[a]anthracene	As above	As above
Benzo[a]pyrene	As above	As above
Benzo[b]fluoranthene	As above	As above
Benzo[g,h,i]perylene	As above	As above
Benzo[k]fluoranthene	As above	As above
Chrysene	As above	As above
Dibenz[a,h]anthracene	As above	As above
Dibenzofuran	As above	As above
Fluoranthene	As above	As above
Fluorene	As above	As above
Indeno[1,2,3-cd]pyrene	As above	As above
Naphthalene	As above	As above
Phenanthrene	As above	As above
Pyrene	As above	As above
Total PAH	As above	As above

RPD = Relative Percent Difference; QL = Quantitation Limit
(a) EPA priority pollutant PAH.
(b) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

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Sampling SOP: S-1
Analytical Method/SOP: L-23 (Sediment and Soil); Dioxins/Furans/HCX/TCX

Fixed Laboratory Analytical QC Sample Table cont.

Analyte (a)	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
2,3,7,8-Tetrachlorodibenzo-p-dioxin	RPD≤ 50% for values >10× MDL	Not applicable (no rinsate blank will be collected or analyzed)
2,3,7,8-Tetrachlorodibenzofuran	As above	As above
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	As above	As above
1,2,3,7,8-Pentachlorodibenzofuran	As above	As above
2,3,4,7,8-Pentachlorodibenzofuran	As above	As above
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	As above	As above
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	As above	As above
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	As above	As above
1,2,3,4,7,8-Hexachlorodibenzofuran	As above	As above
1,2,3,6,7,8-Hexachlorodibenzofuran	As above	As above
1,2,3,7,8,9-Hexachlorodibenzofuran	As above	As above
2,3,4,6,7,8-Hexachlorodibenzofuran	As above	As above
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	As above	As above
1,2,3,4,6,7,8-Heptachlorodibenzofuran	As above	As above
1,2,3,4,7,8,9-Heptachlorodibenzofuran	As above	As above
Octachlorodibenzo-p-dioxin	As above	As above
Octachlorodibenzofuran	As above	As above
1,2,4,5,7,8-Hexachloro-9-Xanthene (HCX)	As above	As above
2,3,6,7-Tetrachloroxanthene (TCX)	As above	As above
Total HpCDD	As above	As above
Total HpCDF	As above	As above
Total HxCDD	As above	As above
Total HxCDF	As above	As above
Total PeCDD	As above	As above
Total PeCDF	As above	As above
Total TCDD	As above	As above
Total TCDF	As above	As above

RPD = Relative Percent Difference; MDL = Method Detection Limit

(a) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

EPA-NE QAPP Worksheet #22b - Rev. 10/99

Sampling SOP: S-1
Analytical Method/SOP: L-32 (Sediment and Soil); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte (a)	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
PCB1	RPD≤ 50% For 90% of analytes for values >3× EML	Not applicable (no rinsate blank will be collected or analyzed)
PCB3	As above	As above
PCB4	As above	As above
PCB5	As above	As above
PCB6	As above	As above
PCB7	As above	As above
PCB8	As above	As above
PCB9	As above	As above
PCB10	As above	As above
PCB12	As above	As above
PCB13	As above	As above
PCB16	As above	As above
PCB17	As above	As above
PCB18 (30)	As above	As above
PCB19	As above	As above
PCB20/21/**28**/33	As above	As above
PCB22	As above	As above
PCB24/27	As above	As above
PCB25	As above	As above
PCB26/29	As above	As above
PCB31	As above	As above
PCB32	As above	As above
PCB40/41/71	As above	As above
PCB42	As above	As above
PCB43/**52**	As above	As above
PCB44/47 (65)	As above	As above
PCB45/51	As above	As above
PCB46	As above	As above
PCB48	As above	As above
PCB49 (69)	As above	As above
PCB53 (50)	As above	As above
PCB56	As above	As above
PCB59/75 (62)	As above	As above

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Sampling SOP: S-1
Analytical Method/SOP: L-32 (Sediment and Soil); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte (a)	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
PCB60	RPD≤ 50% For 90% of analytes for values >3× EML	Not applicable (no rinsate blank will be collected or analyzed)
PCB63	As above	As above
PCB64	As above	As above
PCB66	As above	As above
PCB70/74/76 (61)	As above	As above
PCB77	As above	As above
PCB81	As above	As above
PCB82	As above	As above
PCB83/99	As above	As above
PCB84	As above	As above
PCB85 (116/117)	As above	As above
PCB87/97/119 (86/125/108)	As above	As above
PCB89	As above	As above
PCB90/**101** (113)	As above	As above
PCB91 (88)	As above	As above
PCB92	As above	As above
PCB95/100 (93/102/98)	As above	As above
PCB105	As above	As above
PCB107	As above	As above
PCB110/115	As above	As above
PCB114	As above	As above
PCB118	As above	As above
PCB123 (106/109)	As above	As above
PCB124	As above	As above
PCB126	As above	As above
PCB128 (166)	As above	As above
PCB129/**138**/160/163	As above	As above
PCB130	As above	As above
PCB131	As above	As above
PCB132	As above	As above
PCB134 (143)	As above	As above
PCB135/151 (154)	As above	As above

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Sampling SOP: S-1
Analytical Method/SOP: L-32 (Sediment and Soil); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte (a)	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
PCB136	RPD≤ 50% For 90% of analytes for values >3× EML	Not applicable (no rinsate blank will be collected or analyzed)
PCB137 (164)	As above	As above
PCB141	As above	As above
PCB144	As above	As above
PCB146 (161)	As above	As above
PCB149 (147)	As above	As above
PCB153 (168)	As above	As above
PCB156/157	As above	As above
PCB158	As above	As above
PCB167	As above	As above
PCB169	As above	As above
PCB170	As above	As above
PCB171/173	As above	As above
PCB172	As above	As above
PCB174	As above	As above
PCB175	As above	As above
PCB176	As above	As above
PCB177	As above	As above
PCB178	As above	As above
PCB180/193	As above	As above
PCB182	As above	As above
PCB183	As above	As above
PCB184	As above	As above
PCB185	As above	As above
PCB187	As above	As above
PCB189	As above	As above
PCB190	As above	As above
PCB191	As above	As above
PCB194	As above	As above
PCB195	As above	As above
PCB196	As above	As above
PCB197	As above	As above
PCB198/199	As above	As above

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Sampling SOP: S-1
Analytical Method/SOP: L-32 (Sediment and Soil); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte (a)	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
PCB200	RPD≤ 50% For 90% of analytes for values >3× EML	Not applicable (no rinsate blank will be collected or analyzed)
PCB201	As above	As above
PCB203	As above	As above
PCB205	As above	As above
PCB206	As above	As above
PCB207	As above	As above
PCB209	As above	As above

RPD = Relative Percent Difference; EML = Estimated Minimum Level

(a) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

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Sampling SOP: S-1
Analytical Method/SOP: L-42 (ICP/MS); L-44 (ICP/AES); L-45 (GFAA); L-41 (CVAA) (multiple analysis methods may be used to optimize detection limits and reduce interferences) (Sediment, Soil, and Water); Metals

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
Aluminum	RPD≤ 50% for values >10× MDL	< 5× MDL, or associated samples >10× blank values
Antimony	As above	As above
Arsenic	As above	As above
Barium	As above	As above
Beryllium	As above	As above
Cadmium	As above	As above
Calcium (b)	As above	As above
Chromium	As above	As above
Cobalt	As above	As above
Copper	As above	As above
Iron	As above	As above
Lead	As above	As above
Magnesium (b)	As above	As above
Manganese	As above	As above
Mercury	As above	As above
Molybdenum	As above	As above
Nickel	As above	As above
Selenium	As above	As above
Silver	As above	As above
Thallium	As above	As above
Vanadium	As above	As above
Zinc	As above	As above
Hardness	As above	As above

RPD = Relative Percent Difference; MDL = Method Detection Limit
(a) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.
(b) Measured in waters only to determine hardness.

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Sampling SOP: S-1
Analytical Method/SOP: Bloom (1989)/L-40 (Sediment and Soil); MeHg

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
MeHg	RPD≤ 50% for values >10× MDL	Not applicable (no rinsate blank will be collected or analyzed)

RPD = Relative Percent Difference; MDL = Method Detection Limit

(a) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

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Sampling SOP: S-1
Analytical Method/SOP: L-42 (ICP/MS); L-41 (CVAA) (Sediment); AVS/SEM

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
AVS	RPD≤ 50% for values >10× MDL	Not applicable (no rinsate blank will be collected or analyzed)
SEM-Cadmium	As above	As above
SEM-Copper	As above	As above
SEM-Lead	As above	As above
SEM-Mercury	As above	As above
SEM-Nickel	As above	As above
SEM-Zinc	As above	As above

RPD = Relative Percent Difference; MDL = Method Detection Limit

(a) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

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Sampling SOP: S-1
Analytical Method/SOP: L-46 (Sediment and Soil); Grain Size

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
% gravel	RPD≤ 50% for values >10× MDL	Not applicable (no rinsate blank will be collected or analyzed)
% coarse sand	As above	As above
% medium sand	As above	As above
% fine sand	As above	As above
% clay	As above	As above
Grain size distribution curve	As above	As above

RPD = Relative Percent Difference; MDL = Method Detection Limit

(b) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

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Sampling SOP: S-1
Analytical Method/SOP: L-49 (Sediment); TOC

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
TOC	RPD≤ 50% for values >10× MDL	Not applicable (no rinsate blank will be collected or analyzed)

RPD = Relative Percent Difference; MDL = Method Detection Limit

(a) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

EPA-NE QAPP Worksheet #22b - Rev. 10/99

Sampling SOP: S-1
Analytical Method/SOP: L-61 (Sediment, Soil, and Water); SVOCs (Phenols and Phthalates)

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
2,4,5-Trichlorophenol	≤ 50% RPD	All target compounds < QL except B2EHP ≤ 5× QL
2,4-Dinitrophenol	≤ 72% RPD	As above
2-Nitrophenol	≤ 50% RPD	As above
4-Methylphenol	≤ 50% RPD	As above
4-Nitrophenol (control analyte)	**≤ 67% RPD**	As above
Bis(2-Ethylhexyl)phthalate	≤ 50% RPD	As above
Butylbenzylphtalate	≤ 50% RPD	As above
Carbazole	≤ 50% RPD	As above
Di-n-Butylphthalate	≤ 50% RPD	As above
Di-n-Octylphthalate	≤ 50% RPD	As above
Pentachlorophenol (control analyte)	**≤ 50% RPD**	As above
Phenol	≤ 50% RPD	As above

RPD = Relative Percent Difference; QL = Quantitation Limit

(a) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

Note – Only control analytes (identified above) can be evaluated against Guidance Limits for field duplicates

EPA-NE QAPP Worksheet #22b - Rev. 10/99

Sampling SOP: S-1
Analytical Method/SOP: L-60 (Water); VOC

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
1,1,1,2-Tertrachloroethane	RPD≤ 50% for values >10× MDL	<QL, or associated samples >10× blank values (except common lab contaminants B2EHP *<5×QL)*
1,1,1-Trichloroethane	As above	As above
1,1,2,2-Tertrachlloroethane	As above	As above
1,1,2-Trichloroethane	As above	As above
1,1-Dichloroethhane	As above	As above
1,1-Dichloroethene (control analyte)	**As above (may be upwards of 54% RPD)**	As above
1,1-Dichloropropene	RPD≤ 50% for values >10× MDL	As above
1,2,3-Trichlorobenzene	As above	As above
1,2,3-Trichloropropane	As above	As above
1,2,4-Trichlorobenzene	As above	As above
1,2,4-Trimethylbenzene	As above	As above
1,2-Dibromo-3-chloropropane	As above	As above
1,2-Dibromoethane	As above	As above
1,2-Dichlorobenzene	As above	As above
1,2-Dichloroethane	As above	As above
1,2-Dichloropropane	As above	As above
1,3,5-Trimethylbenzene	As above	As above
1,3-Dichlorobenzene	As above	As above
1,3-Dichloropropane	As above	As above
1,4-Dichlorobenzene	As above	As above
2,2-Dichloropropane	As above	As above
2-Chlorotoluene	As above	As above
4-Clorotoluene	As above	As above
Benzene (control analyte)	As above	As above
Bromobenzene	As above	As above
Bromochloromethane	As above	As above
Bromodichloromethane	As above	As above
Bromoform	As above	As above
Bromomethane	As above	As above
Carbon Tetrachloride	As above	As above
Chlorobenzene (control analyte)	As above	As above
Chloroethane	As above	As above
Chloroform	As above	As above
Chloromethane	As above	As above

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Sampling SOP: S-1
Analytical Method/SOP: L-60 (Water); VOC

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
cis-1,2-Dichloroethene	RPD≤ 50% for values >10× MDL	<QL, or associated samples >10× blank values (except common lab contaminants B2EHP *<5×QL)*
cis-1,3-Dichloropropene	As above	As above
Dibromochloromethane	As above	As above
Dibromomethane	As above	As above
Dichlorodifluoromethane	**As above (may be upwards of 67% RPD)**	As above
Ethylbenzene	RPD≤ 50% for values >10× MDL	As above
Hexachlorobutadiene	As above	As above
Isopropylbenzene	As above	As above
m&p-Xylene	As above	As above
Methylene Chloride	As above	As above
Naphthalene	As above	As above
n-Butylbenzene	As above	As above
n-Propylbenzene	As above	As above
o-Xylene	As above	As above
p-Isopropyltoluene	As above	As above
sec-Butylbenzene	As above	As above
Styrene	As above	As above
tert-Butylbenzene	As above	As above
Tetrachloroethene	As above	As above
Toluene (control analyte)	As above	As above
Total Volatile Organics	Not applicable	As above
Total Xylenes	As above	As above
trans-1,2-Dichloroethene	RPD≤ 50% for values >10× MDL	As above
Trans-1,3-Dichloropropene	As above	As above
Trichloroethene (control analyte)	As above	As above
Trichlorofluoromethane	As above	As above
Vinyl Chloride	As above	As above

RPD = Relative Percent Difference; QL = Quantitation Limit

(a) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

Note – Only control analytes (identified above) can be evaluated against Guidance Limits for field duplicates.

EPA-NE QAPP Worksheet #22b - Rev. 10/99

Sampling SOP: S-1
Analytical Method/SOP: L-62 (Water) for Dissolved Inorganic Nutrients, Total Nitrogen and Total Phosphorus, Total Dissolved Nitrogen and Phosphorus, Total and Dissolved Organic Carbon, and Total Suspended Solids.

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
Dissolved ammonia	RPD ≤ 50%	< 5× MDL
Dissolved inorganic nitrate	As above	As above
Dissolved inorganic nitrite	As above	As above
Dissolved inorganic phosphorus	As above	As above
Total nitrogen	As above	As above
Total phosphorus	As above	As above
Total dissolved nitrogen	As above	As above
Total dissolved phosphorus	As above	As above
Total organic carbon	As above	As above
Dissolved organic carbon	As above	As above

RPD = Relative Percent Difference; MDL = Method Detection Limit

(a) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

EPA-NE QAPP Worksheet #22b - Rev. 10/99

Sampling SOP: S-1
Analytical Method/SOP: L-63 (Water) for Biochemical Oxygen Demand

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	*Guidance QC Limits Only (a)*	
	Field Precision as Measured by: Duplicate Subsamples or Collocated Samples	**Field Accuracy/Bias (Contamination)**
Biological Oxygen Demand	≤50% RPD	<0.2 mg/L 0_2

RPD = Relative Percent Difference; MDL = Method Detection Limit

(a) QC limits provided are for guidance only. There is no applicable MPC for field duplicates. The only applicable corrective action that can be taken in cases where the RPD between field duplicates or concentrations of target compounds in the rinsate blank exceed the QC limits is to 1) Notify the Project Manager and 2) document exceedences in the QA/QC narrative. Exceedences from these QC limits are not a true measure of Fixed Laboratory data quality.

EPA-NE QAPP Worksheet #24a - Rev. 10/99

Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Tissue[a]/ Sediment/ Soil/Water
Sampling SOP	S-1 thru S-7
Analytical Parameter	Pest/PCBs
Concentration Level	Low
Analytical Method/ SOP Reference	NS&T/L-9 (GC/ECD)
Laboratory Name	Battelle Duxbury
No. of Sample Locations	3-6 (tissue) 4 (sed/soil) 4 (water)

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – Two LCSs will be prepared with each set of samples. The first LCS will be fortified with PCB congeners; the second LCS will be fortified with Aroclor 1016 and Aroclor 1260. Aroclors will not be fortified into the MS/MSD.

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/sample set	NA	Reextract and/or reanalyze; document corrective actions	GC/ECD Analyst	Accuracy	< QL, or associated samples >10× blank values
Reagent Blank	1/lot purchase	NA	Review findings with laboratory manager; check different lot	GC/ECD Analyst	Accuracy	Review findings with laboratory manager; check different lot
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA (as required)	NA	NA	NA	NA	NA
Laboratory Duplicate	1/ sample set	NA	Review with Project Manager; re-analyze or justify in project records	GC/ECD Analyst	Precision	RPD≤30% for at least 90% of analytes (for analytes detected at level >3× QL)
Laboratory Matrix Spike/Matrix Spike Duplicate	1/sample set	NA	Reextract, reanalyze or justification documented	GC/ECD Analyst	Accuracy/ Precision	90% of analytes meet the following: 40-120% R RPD≤30% for at least 90% of analytes (Concentration of spiked analytes in MS/MSD must be >5× background concentrations to be used for data quality assessment)

EPA-NE QAPP Worksheet #24a (continued)

Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Tissue[a] / Sediment/ Soil/Water
Sampling SOP	S-1 thru S-7
Analytical Parameter	Pest/PCBs
Concentration Level	Low
Analytical Method/ SOP Reference	NS&T/L-9 (GC/ECD)
Laboratory Name	Battelle Duxbury
No. of Sample Locations	3-6 (tissue) 4 (sed/soil) 4 (water)

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives

Note – Two LCSs will be prepared with each set of samples. The first LCS will be fortified with PCB congeners; the second LCS will be fortified with Aroclor 1016 and Aroclor 1260. Aroclors will not be fortified into the MS/MSD.

Laboratory QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
LCS	2/sample set	NA	Review with Project Manager; re-analyze or justify in project records	GC/ECD Analyst	Accuracy	90% of analytes meet the following: 40-120% R
LFB	NA	NA	NA	NA	NA	NA
Surrogates	4 per sample (2 reported)	NA	Reextract, reanalyze or justification documented	GC/ECD Analyst	Accuracy	40-125% R
Internal Standards (ISs)	3 per sample (2 used for quant.)	NA	NA	NA	NA	NA
Other: SRM	1/sample set *(no applicable SRM for waters; PE sample analyzed – see Worksheet #22a)*	NA	Reextract, reanalyze or justification documented	GC/ECD Analyst	Accuracy, Comparability	PD≤30% from a range of certified values[b] (using surrogate corrected data; certified concentration in SRM must be >3× QL)
ICS	1/ sample set	NA	Internal QC check only	GC/ECD Analyst	Precision	PD≤15% from true values

QL = Quantitation Limit; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference; ICS = Independent Control Sample

[a] See EPA-NE QAPP Worksheet #9a for tissue types.

[b] If detected value falls within the *range of certified values*, then the PD is reported as 0.0. However, if the detected value falls outside the range of certified values, then the PD is determined from either the upper or lower limit of the range. See Battelle SOP 7-029.

EPA-NE QAPP Worksheet #24a - Rev. 10/99

Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Tissue[a] / Sediment/ Soil/Water
Sampling SOP	S-1 thru S-7
Analytical Parameter	SVOCs (PAHs)
Concentration Level	Low
Analytical Method/ SOP Reference	NS&T/L-10 (GC/MS)
Laboratory Name	Battelle Duxbury
No. of Sample Locations	4-6 (tissue) 4 (sed/soil) 4 (water)

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/sample set	NA	Reextract and/or reanalyze; document corrective actions	GC/MS Analyst	Accuracy	< QL, or associated samples >10× blank values
Reagent Blank	1/lot purchase	NA	Review findings with laboratory manager; check different lot	GC/MS Analyst	Accuracy	Review findings with laboratory manager; check different lot
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA (as required)	NA	NA	NA	NA	NA
Laboratory Duplicate	1/ sample set	NA	Review with Project Manager; re-analyze or justify in project records	GC/MS Analyst	Precision	RPD≤30% for at least 90% of analytes (for analytes detected at level >3× QL)
Laboratory Matrix Spike/Matrix Spike Duplicate	1/sample set	NA	Reextract, reanalyze or justification documented	GC/MS Analyst	Accuracy/ Precision	90% of analytes meet the following: 40-120% R RPD≤30% for at least 90% of analytes (Concentration of spiked analytes in MS/MSD must be >5× background concentrations to be used for data quality assessment)

EPA-NE QAPP Worksheet #24a (continued)

Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Tissue[a] / Sediment/ Soil/Water
Sampling SOP	S-1 thru S-7
Analytical Parameter	SVOCs (PAHs)
Concentration Level	Low
Analytical Method/ SOP Reference	NS&T/L-10 (GC/MS)
Laboratory Name	Battelle Duxbury
No. of Sample Locations	4-6 (tissue) 4 (sed/soil) 4 (water)

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
LCS	1/sample set	NA	Review with Project Manager; re-analyze or justify in project records	GC/MS Analyst	Accuracy	90% of analytes meet the following: 40-120% R
LFB	NA	NA	NA	NA	NA	NA
Surrogates	3 per sample	NA	Reextract, reanalyze or justification documented	GC/MS Analyst	Accuracy	40-125% R
Internal Standards (ISs)	3 per sample (1 used for quant.)	NA	NA	NA	NA	NA
Other: SRM	1/sample set *(no applicable SRM for waters; PE sample analyzed – see Worksheet #22a)*	NA	Reextract, reanalyze or justification documented	GC/MS Analyst	Accuracy, Comparability	PD≤30% from a range of certified values [b] (using surrogate corrected data; certified concentration in SRM must be >3× QL)
ICS	1/ sample set	NA	Internal QC check only	GC/MS Analyst	Precision	PD≤15% from true values

QL = Quantitation Limit; PD = Percent Difference; R = Recovery; RPD = Relative Percent Difference; ICS = Independent Control Sample

[a] See EPA-NE QAPP Worksheet #9a for tissue types.

[b] If detected value falls within the *range of certified values*, then the PD is reported as 0.0. However, if the detected value falls outside the range of certified values, then the PD is determined from either the upper or lower limit of the range. See Battelle SOP 7-029.

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Tissue[a], Sediment, Soil
Sampling SOP	S-1 thru S-7
Analytical Parameter	Dioxin/ Furan/HCX/ TCX
Concentration Level	Low
Analytical Method/ SOP Reference	1613B/L-23
Laboratory Name	Battelle Columbus
No. of Sample Locations	3-6 (tissue) 4 (sed/soil)

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – no second source of HCX or TCX; therefore, LCS/MS/MSD QC samples will not be fortified with HCX and TCX

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/sample set	NA	Reextract, reanalyze, or justify	GC/HRMS Analyst	Accuracy	<5× MDL, or associated samples >10× blank values
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA	NA	NA	NA	NA	NA
Laboratory Duplicate	1/ sample set	NA	Review with Laboratory Manager; re-analyze or justify in project records	Task Leader	Precision	RPD≤30% (for analytes detected at level >10× MDL)
Laboratory Matrix Spike/Matrix Spike Duplicate	1/sample set	NA	Review with Laboratory Manager; re-analyze or justify in project records	Task Leader	Accuracy/ Precision	50-120% R RPD≤30% (Analyte concentration in MS/MSD must be >5× background concentration to be used for data quality assessment)
LCS	1 /sample set	Method 1613B, Table 6, "OPR" requirements	Review with Laboratory Manager; re-analyze or justify in project records NA	Task Leader	Accuracy	Method 1613B, Table 6, "OPR" requirements
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	15 per sample	NA	Review with Laboratory Manager; re-analyze or justify in project records	GC/HRMS Analyst/ Preparation Analyst	Accuracy	25 – 150% R
Other: SRM	1/sample set	NA	Reextract, reanalyze or justification documented	Task Leader	Accuracy, Comparability	PD≤30% from certified values (for cert. Analytes >5× MDL)

MDL = Method Detection Limit; R = Recovery; RPD = Relative Percent Difference; OPR = Ongoing Precision and Recovery; PD = Percent Difference.

[a] See EPA-NE QAPP Worksheet #9a for tissue types.

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Tissue[a], Sediment, Soil
Sampling SOP	S-1 thru S-7
Analytical Parameter	PCB congeners
Concentration Level	Low
Analytical Method/ SOP Reference	1668A/L-32
Laboratory Name	Battelle Columbus
No. of Sample Locations	3-6 (tissue) 4 (sed/soil)

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank	1/sample set	NA	Reextract, reanalyze, or justify	GC/HRMS Analyst	Accuracy	<5× EML, or associated samples >10× blank values
Reagent Blank	1/lot purchase	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA (as required)	NA	NA	NA	NA	NA
Laboratory Duplicate	1/ sample set	NA	Review with Laboratory Manager; re-analyze or justify in project records	Task Leader	Precision	RPD≤30% for 90% of analytes (for analytes detected at level >3× EML)
Laboratory Matrix Spike/Matrix Spike Duplicate	1/sample set	NA	Review with Laboratory Manager; re-analyze or justify in project records	Task Leader	Accuracy/ Precision	for 90% of congeners 50-150% R RPD≤30% (Analyte concentration in MS/MSD must be >5× background concentration to be used for data quality assessment)
LCS	1/sample set	Method 1668A, Table 6, "OPR" requirements	Review with Laboratory Manager; re-analyze or justify in project records NA	Task Leader	Accuracy	Method 1668A, Table 6, "OPR" requirements
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Tissue[a], Sediment, Soil
Sampling SOP	S-1 thru S-7
Analytical Parameter	PCB congeners
Concentration Level	Low
Analytical Method/ SOP Reference	1668A/L-32
Laboratory Name	Battelle Columbus
No. of Sample Locations	3-6 (tissue) 4 (sed/soil)

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Internal Standards (ISs)	27 per sample	25 – 150% R	Review with Laboratory Manager; re-analyze or justify in project records	GC/HRMS Analyst/ Preparation Analyst	Accuracy	25 – 150% R
Other: SRM	1/sample set	NA	Reextract, reanalyze or justification documented	Task Leader	Accuracy, Comparability	PD≤30% from certified values (for certified values >3× EML)

EML = Estimated Minimum Level; RPD = Relative Percent Difference; R = Recovery;
OPR = Ongoing Precision and Recovery.
[a] See EPA-NE QAPP Worksheet #9a for tissue types.

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Tissue[a], Sediment Soil, Water
Sampling SOP	S-1 thru S-7
Analytical Parameter	Metals
Concentration Level	Low
Analytical Method/ SOP Reference	1631/L-39; 245.5/L-41; 1640, 1638/L-42; SW6010B, 200.7/L-44; and 200.9/ L-45
Laboratory Name	Battelle MSL
No. of Sample Locations	3-6 (tissue) 4 (sed/soil) 4 (water)

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank	1/sample set	NA	Reextract, reanalyze, and or blank subtract; document corrective action	Metals Analyst	Accuracy	<5× MDL, or associated samples >10× blank values
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA (as required)	NA	NA	NA	NA	NA
Laboratory Duplicate	1/sample set	NA	Review with Project Manager; re-analyze or justify in project records	Metals Analyst	Precision	RPD ≤ 30% (for analytes detected at level > 10× MDL)
Laboratory Matrix Spike/Matrix Spike Duplicate	1 pair/sample set	NA	Reextract, reanalyze or justification documented	Metals Analyst	Accuracy/ Precision	70-130 % R RPD ≤ 30% (Analyte concentration in MS/MSD must be >5× background concentration to be used for data quality assessment)
LCS	1/sample set	NA	Review with Project Manager; re-analyze or justify in records	Metals Analyst	Accuracy	70-130% R
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	1/sample set	NA	Reextract, reanalyze or justification documented	Metals Analyst	Accuracy Comparability	PD ≤ 25% from certified values (for certified values >5× MDL)

MDL = Method Detection Limit; R = Recovery; RPD = Relative Percent Difference; PD = Percent Difference.
[a] See EPA-NE QAPP Worksheet #9a for tissue types.

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Tissue[a] Sediment Soil
Sampling SOP	S-1 thru S-7
Analytical Parameter	MeHg
Concentration Level	Low
Analytical Method/ SOP Reference	Bloom (1989)/L-40
Laboratory Name	Battelle MSL
No. of Sample Locations	3-6 (tissue) 4 (sed/soil)

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/sample set	NA	Reextract, reanalyze, and or blank subtract; document corrective action	Metals Analyst	Accuracy	<5× MDL, or associated samples >10× blank values
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA (as required)	NA	NA	NA	NA	NA
Laboratory Duplicate	1/sample set	NA	Review with Project Manager; re-analyze or justify in project records	Metals Analyst	Precision	RPD ≤ 30% (for analytes detected at level > 10× MDL)
Laboratory Matrix Spike/Matrix Spike Duplicate	1 pair/sample set	NA	Reextract, reanalyze or justification documented	Metals Analyst	Accuracy/ Precision	70-130 % R RPD ≤ 30% (Analyte concentration in MS/MSD must be >5× background concentration to be used for data quality assessment)
LCS	1/sample set *(no LCS for tissue)*	NA	Review with Project Manager; re-analyze or justify in records	Metals Analyst	Accuracy	70-130% R
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	1/sample set *Tissue Only*	NA	Reextract, reanalyze or justification documented	Metals Analyst	Accuracy Comparability	PD ≤ 25% from certified values (for certified values >5× MDL)

MDL = Method Detection Limit; R = Recovery; RPD = Relative Percent Difference; PD = Percent Difference.
[a] See EPA-NE QAPP Worksheet #9a for tissue types.

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Sediment
Sampling SOP	S-1
Analytical Parameter	AVS
Concentration Level	Low
Analytical Method/ SOP Reference	1638, 1640/L-42
Laboratory Name	Battelle MSL
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/sample set	NA	Reextract, reanalyze, and or blank subtract; document corrective action	Metals Analyst	Accuracy	<5× MDL, or associated samples >10× blank values
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA (as required)	NA	NA	NA	NA	NA
Laboratory Duplicate	1/sample set	NA	Review with Project Manager; re-analyze or justify in project records	Metals Analyst	Precision	RPD ≤ 30% (for analytes detected at level > 10× MDL)
Laboratory Matrix Spike/Matrix Spike Duplicate	NA	NA	NA	NA	NA	NA
LCS	1/sample set	NA	Review with Project Manager; re-analyze or justify in records	Metals Analyst	Accuracy	70-130% R
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	NA	NA	NA	NA	NA	Not applicable – *No SRM for AVS in sediment available*

MDL = Method Detection Limit; R = Recovery; RPD = Relative Percent Difference.

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Sediment
Sampling SOP	S-1
Analytical Parameter	SEM metals
Concentration Level	Low
Analytical Method/ SOP Reference	1638, 1640/L-42
Laboratory Name	Battelle MSL
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/sample set	NA	Reextract, reanalyze, and or blank subtract; document corrective action	Metals Analyst	Accuracy	<5× MDL, or associated samples >10× blank values
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA (as required)	NA	NA	NA	NA	NA
Laboratory Duplicate	1/sample set	NA	Review with Project Manager; re-analyze or justify in project records	Metals Analyst	Precision	RPD ≤ 30% (for analytes detected at level > 10× MDL)
Laboratory Matrix Spike/Matrix Spike Duplicate	1 pair/sample set	NA	Reextract, reanalyze or justification documented	Metals Analyst	Accuracy/ Precision	70-130 % R RPD ≤ 30% (Analyte concentration in MS/MSD must be >5× background concentration to be used for data quality assessment)
LCS	NA	NA	NA	NA	NA	NA
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	1/sample set	NA	Review with Project Manager; re-analyze or justify in project records	Metals Analyst	Accuracy Comparability	PD ≤ 25% from certified values (for certified values >5× MDL)

MDL = Method Detection Limit; R = Recovery; RPD = Relative Percent Difference; PD = Percent Difference.

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Water
Sampling SOP	S-1
Analytical Parameter	Hardness
Concentration Level	Low
Analytical Method/ SOP Reference	1638, 1640/L-42
Laboratory Name	Battelle MSL
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/sample set	NA	Reextract, reanalyze, and or blank subtract; document corrective action	Metals Analyst	Accuracy	<5× MDL, or associated samples >10× blank values
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA (as required)	NA	NA	NA	NA	NA
Laboratory Duplicate	1/sample set	NA	Review with Project Manager; re-analyze or justify in project records	Metals Analyst	Precision	RPD ≤ 30% (for analytes detected at level > 10× MDL)
Laboratory Matrix Spike/Matrix Spike Duplicate	NA	NA	NA	NA	NA	NA
LCS	NA	NA	NA	NA	NA	NA
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	NA	NA	NA	NA	NA	Not applicable – *No SRM for hardness in water available*

MDL = Method Detection Limit; R = Recovery; RPD = Relative Percent Difference.

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Sediment / Soil
Sampling SOP	S-1
Analytical Parameter	Grain Size
Concentration Level	Low
Analytical Method/ SOP Reference*	ASTM D422/L-46
Laboratory Name	Applied Marine Sciences, Inc.
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank	NA	NA	NA	NA	NA	NA
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA	NA	NA	NA	NA	NA
Laboratory Duplicate	1 per sample set	NA	Review with Project Manager; re-analyze or justify in project records	Ken Davis	Precision	RPD ≤25% (for values >10×MDL)
Laboratory Matrix Spike/Matrix Spike Duplicate	NA	NA	NA	NA	NA	NA
LCS	NA	NA	NA	NA	NA	NA
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	NA	NA	NA	NA	NA	Not applicable – *No SRM for grain size in sediment/soil available*

MDL = Method Detection Limit; RPD = Relative Percent Difference.

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Sediment / Soil
Sampling SOP	S-1
Analytical Parameter	TOC
Concentration Level	Low
Analytical Method/ SOP Reference*	9060/L-49
Laboratory Name	Applied Marine Sciences, Inc.
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank	NA	NA	NA	NA	NA	NA
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	1 per sample set	NA	Review with Project Manager; re-analyze or justify in project records	Ken Davis	Accuracy	<10× MDL with signal:noise > 10:1
Laboratory Duplicate	1/ sample set	NA	Review with Project Manager; re-analyze or justify in project records	Ken Davis	Precision	RPD≤25% (for values >10× MDL)
Laboratory Matrix Spike/Matrix Spike Duplicate	NA	NA	NA	NA	NA	NA
LCS	NA	NA	NA	NA	NA	NA
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	1 per sample set	NA	Review with Project Manager; re-analyze or justify in project records	Ken Davis	Accuracy	PD ≤ 5%

MDL = Method Detection Limit; RPD = Relative Percent Difference;

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Sediment/ Soil/Water
Sampling SOP	S-1
Analytical Parameter	SVOC (phenols/ phthalates)
Concentration Level	Low
Analytical Method/ SOP Reference*	8270C/ L-61
Laboratory Name	STL Baltimore
No. of Sample Locations	4 (each matrix)

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – All target analytes will be fortified into the LCS/MS/MSD and recovery results reported – but only "control analytes" will be evaluated against the MPC. Control analytes for this analysis are identified on EPA-NE QAPP Worksheet #24b.

Laboratory QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank	1 per batch	NA	Reanalyze, reprepare, or qualify data Document actions taken	Craig Schenning Organics Manager	Accuracy Precision	All target compounds must be < QL except bis-2-ethylhexylphthalate ≤ 5× QL
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA	NA	NA	NA	NA	NA
Laboratory Duplicate	1 per batch	NA	Reanalyze, reprepare, or qualify data Document actions taken	Craig Schenning Organics Manager	Precision	Varies – see EPA-NE QAPP Worksheet #24b *(note – no applicable MPC criteria if field duplicate analyzed)*
Laboratory Matrix Spike/Matrix Spike Duplicate	1 per batch	NA	Reanalyze, reprepare, or qualify data Document actions taken	Craig Schenning Organics Manager	Accuracy Precision	Varies – see EPA-NE QAPP Worksheet #24b
LCS	1 per batch	NA	Reanalyze, reprepare, or qualify data Document actions taken	Craig Schenning Organics Manager	Accuracy	Varies – see EPA-NE QAPP Worksheet #24b
LFB	NA	NA	NA	NA	NA	NA
Surrogates	6 per sample	NA	Reanalyze, reprepare, or qualify data Document actions taken	Craig Schenning Organics Manager	Accuracy	Varies – see EPA-NE QAPP Worksheet #24b
Internal Standards (ISs)	6 per sample	NA	NA	NA	NA	NA
Other: SRM	*PE sample analyzed – see Worksheet #22a*	NA	NA	NA	NA	Not applicable – *No SRM for phenols/phthalates in sediment/soil/water available*

QL = Quantitation Limit (also referred to as Reporting Limit, RL).

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Water
Sampling SOP	S-1
Analytical Parameter	VOC
Concentration Level	Low
Analytical Method/ SOP Reference*	8260B/L-60
Laboratory Name	STL Baltimore
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Note – All target analytes will be fortified into the LCS/MS/MSD and recovery results reported – but only "control analytes" will be evaluated against the MPC. Control analytes for this analysis are identified on EPA-NE QAPP Worksheet #24b.

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch	NA	Reanalyze, reprepare, or qualify data Document actions taken	Craig Schenning Organics Manager	Accuracy Precision	<QL, or associated samples >10× blank values *(except common lab contaminants (B2EHP <5×QL)*
Reagent Blank	1 prior to sample analysis	NA	Bake-out purge system	Craig Schenning Organics Manager	Accuracy Precision	<QL
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA (as required)	NA	NA	NA	NA	NA
Laboratory Duplicate	1 per batch	NA	Reanalyze, reprepare, or qualify data Document actions taken	Craig Schenning Organics Manager	Precision	Varies – see EPA-NE QAPP Worksheet #24b
Laboratory Matrix Spike/Matrix Spike Duplicate	1 per batch	NA	Reanalyze, reprepare, or qualify data Document actions taken	Craig Schenning Organics Manager	Accuracy Precision	Varies – see EPA-NE QAPP Worksheet #24b
LCS	1 per batch	NA	Reanalyze, reprepare, or qualify data Document actions taken	Craig Schenning Organics Manager	Accuracy	Varies – see EPA-NE QAPP Worksheet #24b
LFB	NA	NA	NA	NA	NA	NA
Surrogates	4 per sample	NA	Reanalyze, reprepare, or qualify data Document actions taken	Craig Schenning Organics Manager	Accuracy	Varies – see EPA-NE QAPP Worksheet #24b
Internal Standards (ISs)	4 per sample	NA	NA	NA	NA	NA
Other: SRM	*PE sample analyzed – see Worksheet #22a*	NA	NA	NA	NA	Not applicable – *No SRM for VOC in water available*

QL = Quantitation Limit (also referred to as Reporting Limit, RL).

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Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Water
Sampling SOP	S-1
Analytical Parameter	DIN
Concentration Level	Low
Analytical Method/ SOP Reference	L-62
Laboratory Name	CBL
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	TrAAcs-800 and Autoanalyzer Analyst	Accuracy	<5× MDL
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA	NA	NA	NA	NA	NA
Laboratory Duplicate	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	TrAAcs-800 and Autoanalyzer Analyst	Precision, Comparability	RPD ≤10%
Laboratory Matrix Spike	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	TrAAcs-800 and Autoanalyzer Analyst	Accuracy, Comparability	85 – 115% R
LCS	NA	NA	NA	NA	NA	NA
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	TrAAcs-800 and Autoanalyzer Analyst	Accuracy, Comparability	PD ≤15%

MDL = Method Detection Limit; R = Recovery; RPD = Relative Percent Difference; PD = Percent Difference.

EPA-NE QAPP Worksheet #24a - Rev. 10/99

Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Water
Sampling SOP	S-1
Analytical Parameter	TN/TP
Concentration Level	Low
Analytical Method/ SOP Reference*	L-62
Laboratory Name	CBL
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	TrAAcs-800 and Autoanalyzer Analyst	Accuracy	<5× MDL
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA	NA	NA	NA	NA	NA
Laboratory Duplicate	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	Technicon Autoanalyzer II Analyst	Precision, Comparability	RPD ≤10%
Laboratory Matrix Spike	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	Technicon Autoanalyzer II Analyst	Accuracy, Comparability	85 – 115% R
LCS	NA	NA	NA	NA	NA	NA
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	Technicon Autoanalyzer II Analyst	Accuracy, Comparability	PD ≤15%

MDL = Method Detection Limit; R = Recovery; RPD = Relative Percent Difference; PD = Percent Difference.

EPA-NE QAPP Worksheet #24a - Rev. 10/99

Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Water
Sampling SOP	S-1
Analytical Parameter	TDN/TDP
Concentration Level	Low
Analytical Method/ SOP Reference*	L-62
Laboratory Name	CBL
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	TrAAcs-800 and Autoanalyzer Analyst	Accuracy	<5× MDL
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA	NA	NA	NA	NA	NA
Laboratory Duplicate	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	Technicon Autoanalyzer II Analyst	Precision, Comparability	RPD ≤10%
Laboratory Matrix Spike	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	Technicon Autoanalyzer II Analyst	Accuracy, Comparability	85 – 115% R
LCS	NA	NA	NA	NA	NA	NA
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	Technicon Autoanalyzer II Analyst	Accuracy, Comparability	PD ≤15%

MDL = Method Detection Limit; R = Recovery; RPD = Relative Percent Difference; PD = Percent Difference.

EPA-NE QAPP Worksheet #24a (continued)

Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Water
Sampling SOP	S-1
Analytical Parameter	TSS
Concentration Level	Low
Analytical Method/ SOP Reference*	L-62
Laboratory Name	CBL
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	TrAAcs-800 and Autoanalyzer Analyst	Accuracy	<5× MDL
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA	NA	NA	NA	NA	NA
Laboratory Duplicate	1/10 samples	NA	Review with Laboratory Manager; re-analyze or justify in project records	Mettler Operator	Precision, Comparability	RPD ≤10%
Laboratory Matrix Spike	NA	NA	NA	NA	NA	NA
LCS	NA	NA	NA	NA	NA	NA
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	NA	NA	NA	NA	NA	Not applicable – *No SRM for TSS in water available*

MDL = Method Detection Limit; RPD = Relative Percent Difference.

EPA-NE QAPP Worksheet #24a - Rev. 10/99

Fixed Laboratory Analytical QC Sample Table

Medium/ Matrix	Water
Sampling SOP	S-1
Analytical Parameter	BOD
Concentration Level	Low
Analytical Method/ SOP Reference*	L-63
Laboratory Name	STL
No. of Sample Locations	4

Data that are accepted outside the measurement performance criteria will be flagged with the appropriate data qualifier (EPA-NE QAPP Worksheet #9a) and the rationale for accepting the analysis will be thoroughly documented in the QA/QC narratives.

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/10 samples	NA	Review with Project Manager; re-analyze or justify in project records	YSI Operator	Accuracy	<0.2 mg/L O_2
Reagent Blank	NA	NA	NA	NA	NA	NA
Storage Blank	NA	NA	NA	NA	NA	NA
Instrument Blank	NA	NA	NA	NA	NA	NA
Laboratory Duplicates	1/10 samples	NA	Review with Project Manager; re-analyze or justify in project records	YSI Operator	Precision	≤30% RPD
Laboratory Matrix Spike	NA	NA	NA	NA	NA	NA
LCS	1/10 samples	N	Review with Project Manager; re-analyze or justify in project records	YSI Operator	Accuracy	200 ± 37 mg/L O_2
LFB	NA	NA	NA	NA	NA	NA
Surrogates	NA	NA	NA	NA	NA	NA
Internal Standards (ISs)	NA	NA	NA	NA	NA	NA
Other: SRM	NA	NA	NA	NA	NA	Not applicable – *No SRM for BOD in water available*

RPD = Relative Percent Difference.

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1 through S-7
Analytical Method/SOP: L-9 (Tissue – see Worksheet #9a for tissue types); Pesticides/PCB Aroclors

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (wet weight – ng/g)	Analytical Precision	Analytical Accuracy/Bias	
		Replicate & MS/MSD	SRM	LCS/MS/MSD
4,4'-DDD	0.45	RPD≤ 30% (a,c)	PD ≤ 30% (b)	40-120% R (c)
4,4'-DDE	0.45	As above	As above	As above
4,4'-DDT	0.45	As above	As above	As above
Aldrin	0.45	As above	Not applicable	As above
alpha-BHC	0.45	As above	As above	As above
alpha-Chlordane	0.45	As above	PD ≤ 30%	As above
beta-BHC	0.45	As above	Not applicable	As above
delta-BHC	0.45	As above	As above	As above
Dieldrin	0.45	As above	As above	As above
Endosulfan I	0.45	As above	As above	As above
Endosulfan II	0.45	As above	As above	As above
Endosulfan Sulfate	0.45	As above	As above	As above
Endrin	0.45	As above	As above	As above
Endrin Aldehyde	0.45	As above	As above	As above (d)
Endrin Ketone	0.45	As above	As above	As above
gamma-BHC	0.45	As above	As above	As above
gamma-Chlordane	0.45	As above	As above	As above
Heptachlor	0.45	As above	Not applicable	As above
Heptachlor Epoxide	0.45	As above	As above	As above
Methoxychlor	0.45	As above	As above	As above
Technical chlordane	5.6	As above	As above	Not applicable
Toxaphene	5.6	As above	As above	As above
Aroclor-1016	5.6	As above	As above	LCS only: 40-120% R
Aroclor-1221	5.6	As above	As above	Not applicable
Aroclor-1232	5.6	As above	As above	As above
Aroclor-1242	5.6	As above	As above	As above
Aroclor-1248	5.6	As above	As above	As above
Aroclor-1254	5.6	As above	As above	As above
Aroclor-1260	5.6	As above	As above	LCS only: 40-120% R
Aroclor-1268	5.6	As above	As above	Not applicable
Aroclor, Total	Not applicable	As above	As above	As above
PCB Surrogates	As above	As above	As above	40 – 125% R

RPD = Relative Percent Difference; PD = Percent Difference; LCS = Laboratory Control Sample; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; R = Recovery; QL = Quantitation Limit

(a) Replicates: for 90% of analytes, for values >3× QL; MS/MSD: for 90% of analytes and see footnote (c)
(b) SRM: Using surrogate corrected data, for values >3× QL
(c) For 90% of analytes; concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment
(d) Problematic compound – inconsistent recovery from alumina column; low recoveries observed in the historical data.

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1 through S-7
Analytical Method/SOP: L-10 (Tissue– see Worksheet #9a for tissue types); SVOCs (PAHs)

Fixed Laboratory Analytical QC Sample Table cont.

Analyte[1]	Achievable Laboratory Sensitivity/ Quantitation Limits (wet weight – ng/g)	Analytical Precision	Analytical Accuracy/Bias	
		Replicate & MS/MSD	SRM	LCS/MS/MSD
Biphenyl	0.56	RPD ≤ 30% (a,c)	Not applicable	Not applicable
2-Methylnaphthalene	0.56	As above	As above	40-120% R (c)
Acenaphthene	0.56	As above	As above	As above
Acenaphthylene	0.56	As above	As above	As above
Anthracene	0.56	As above	PD ≤ 30% (b)	As above
Benz[a]anthracene	0.56	As above	As above	As above
Benzo[a]pyrene	0.56	As above	As above	As above
Benzo[b]fluoranthene	0.56	As above	As above	As above
Benzo[g,h,i]perylene	0.56	As above	As above	As above
Benzo[k]fluoranthene	0.56	As above	As above	As above
Chrysene	0.56	As above	As above	As above
Dibenz[a,h]anthracene	0.56	As above	Not applicable	As above
Dibenzofuran	0.56	As above	As above	Not applicable
Fluoranthene	0.56	As above	PD ≤ 30%	40-120% R
Fluorene	0.56	As above	Not applicable	As above
Indeno[1,2,3-cd]pyrene	0.56	As above	PD ≤ 30%	As above
Naphthalene	0.56	As above	As above	As above
Phenanthrene	0.56	As above	As above	As above
Pyrene	0.56	As above	As above	As above
Total PAH	Not applicable	As above	Not applicable	Not applicable
PAH Surrogates	As above	Not applicable	As above	40 – 125% R

RPD = Relative Percent Difference; PD = Percent Difference; LCS = Laboratory Control Sample; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; R = Recovery; QL = Quantitation Limit priority pollutants.

(a) Replicates: for 90% of analytes, for values >3× QL; MS/MSD: for 90% of analytes and see footnote (c)
(b) SRM: Using surrogate corrected data, for values >3× QL
(c) For 90% of analytes; concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1 through S-7
Analytical Method/SOP: L-23 (Tissue– see Worksheet #9a for tissue types); Dioxin/Furan/HCX/TCX

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits[1] (pg/g Wet Weight)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.5	RPD ≤ 30% (a,c)	PD ≤ 30% (b)	LCS: Within Method 1613 Table 6 OPR MS/MSD: 50 – 120% (c)
2,3,7,8-Tetrachlorodibenzofuran	0.5	As above	As above	As above
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	2.5	As above	As above	As above
1,2,3,7,8-Pentachlorodibenzofuran	2.5	As above	As above	As above
2,3,4,7,8-Pentachlorodibenzofuran	2.5	As above	As above	As above
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	2.5	As above	As above	As above
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	2.5	As above	As above	As above
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	2.5	As above	As above	As above
1,2,3,4,7,8-Hexachlorodibenzofuran	2.5	As above	As above	As above
1,2,3,6,7,8-Hexachlorodibenzofuran	2.5	As above	As above	As above
1,2,3,7,8,9-Hexachlorodibenzofuran	2.5	As above	As above	As above
2,3,4,6,7,8-Hexachlorodibenzofuran	2.5	As above	As above	As above
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	2.5	As above	As above	As above
1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.5	As above	As above	As above
1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.5	As above	As above	As above
Octachlorodibenzo-p-dioxin	5	As above	As above	As above
Octachlorodibenzofuran	5	As above	As above	As above
1,2,4,5,7,8-Hexachloro-9-Xanthene (HCX)	To be determined	As above	Not applicable	Not applicable
2,3,6,7-Tetrachloroxanthene (TCX)	Not applicable	As above	As above	As above
Total HpCDD	2.5	As above	As above	As above
Total HpCDF	2.5	As above	As above	As above
Total HxCDD	2.5	As above	As above	As above
Total HxCDF	2.5	As above	As above	As above
Total PeCDD	2.5	As above	As above	As above
Total PeCDF	2.5	As above	As above	As above
Total TCDD	0.5	As above	As above	As above
Total TCDF	0.5	As above	As above	As above
Dioxin/Furan Internal Standards	Not applicable	Not applicable	As above	25 – 150% R

RPD = Relative Percent Difference; PD = Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit

[1] Dependent on a 10-g sample and a 20 µL final volume.
(a) Replicates – for analytes detected at level >10× MDL; MS/MSD – see footnote (c)
(b) SRM; For certified values >5× MDL
(c) Concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1 through S-7
Analytical Method/SOP: L-32 (Tissue– see Worksheet #9a for tissue types); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Estimated Minimum Level (EML)[1] (pg/g Wet Weight)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	MS/MSD (LCS[2])
PCB1	20	RPD ≤ 30% (a,c)	Not applicable	Not applicable
PCB3	20	As above	As above	50 – 150% R (c)
PCB4	50	As above	As above	As above
PCB5	5	As above	As above	Not applicable
PCB6	5	As above	As above	As above
PCB7	5	As above	As above	As above
PCB8	50	As above	As above	As above
PCB9	5	As above	As above	As above
PCB10	5	As above	As above	As above
PCB12	10	As above	As above	As above
PCB13	10	As above	As above	As above
PCB16	10	As above	As above	As above
PCB17	20	As above	As above	As above
PCB18 (30)	50	As above	As above	As above
PCB19	10	As above	As above	50 – 150% R (c)
PCB20/21/**28**/33	50	As above	As above	Not applicable
PCB22	20	As above	As above	As above
PCB24/27	20	As above	As above	As above
PCB25	20	As above	As above	As above
PCB26/29	20	As above	As above	As above
PCB31	50	As above	As above	As above
PCB32	20	As above	As above	As above
PCB40/41/71	50	As above	As above	As above
PCB42	20	As above	As above	As above
PCB43/**52**	20	As above	As above	As above
PCB44/47 (65)	50	As above	As above	As above
PCB45/51	20	As above	As above	As above
PCB46	20	As above	As above	As above
PCB48	20	As above	As above	As above
PCB49 (69)	50	As above	As above	As above
PCB53 (50)	20	As above	As above	As above
PCB56	20	As above	As above	As above
PCB59/75 (62)	20	As above	As above	As above

EPA-NE QAPP Worksheet #24b - Rev. 10/99 (continued)

Sampling SOP: S-1 through S-7
Analytical Method/SOP: L-32 (Tissue– see Worksheet #9a for tissue types); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Estimated Minimum Level (EML)[1] (pg/g Wet Weight)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	MS/MSD (LCS[2])
PCB60	50	RPD ≤ 30% (a,c)	Not applicable	Not applicable
PCB63	50	As above	As above	As above
PCB64	20	As above	As above	As above
PCB66	50	As above	As above	As above
PCB70/74/76 (61)	50	As above	As above	As above
PCB77	50	As above	PD ≤ 30% (b)	50 – 150% R (c)
PCB81	50	As above	Not applicable	As above
PCB82	50	As above	As above	Not applicable
PCB83/99	50	As above	As above	As above
PCB84	50	As above	As above	As above
PCB85 (116/117)	20	As above	As above	As above
PCB87/97/119 (86/125/108)	50	As above	As above	As above
PCB89	50	As above	As above	As above
PCB90/**101** (113)	100	As above	As above	As above
PCB91 (88)	50	As above	As above	As above
PCB92	50	As above	As above	As above
PCB95/100 (93/102/98)	50	As above	As above	As above
PCB105	20	As above	PD ≤ 30% (b)	50 – 150% R (c)
PCB107	100	As above	Not applicable	Not applicable
PCB110/115	100	As above	As above	As above
PCB114	50	As above	As above	50 – 150% R (c)
PCB118	50	As above	PD ≤ 30% (b)	As above
PCB123 (106/109)	50	As above	Not applicable	Not applicable
PCB124	100	As above	As above	As above
PCB126	50	As above	PD ≤ 30% (b)	50 – 150% R (c)
PCB128 (166)	50	As above	Not applicable	Not applicable
PCB129/**138**/160/163	50	As above	As above	As above
PCB130	50	As above	As above	As above
PCB131	50	As above	As above	As above
PCB132	50	As above	As above	As above
PCB134 (143)	50	As above	As above	As above
PCB135/151 (154)	50	As above	As above	As above

EPA-NE QAPP Worksheet #24b - Rev. 10/99 (continued)

Sampling SOP: S-1 through S-7
Analytical Method/SOP: L-32 (Tissue– see Worksheet #9a for tissue types); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Estimated Minimum Level (EML)[1] (pg/g Wet Weight)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	MS/MSD (LCS[2])
PCB136	20	RPD ≤ 30% (a,c)	Not applicable	Not applicable
PCB137 (164)	100	As above	As above	As above
PCB141	20	As above	As above	As above
PCB144	50	As above	As above	As above
PCB146 (161)	100	As above	As above	As above
PCB149 (147)	50	As above	As above	As above
PCB153 (168)	50	As above	As above	As above
PCB156/157	50	As above	As above	50 – 150% R (c)
PCB158	20	As above	As above	Not applicable
PCB167	50	As above	As above	50 – 150% R (c)
PCB169	50	As above	PD ≤ 30% (b)	As above
PCB170	50	As above	Not applicable	Not applicable
PCB171/173	100	As above	As above	As above
PCB172	100	As above	As above	As above
PCB174	50	As above	As above	As above
PCB175	100	As above	As above	As above
PCB176	100	As above	As above	As above
PCB177	50	As above	As above	As above
PCB178	50	As above	As above	As above
PCB180/193	50	As above	As above	As above
PCB182	100	As above	As above	As above
PCB183	100	As above	As above	As above
PCB184	100	As above	As above	As above
PCB185	100	As above	As above	As above
PCB187	50	As above	As above	As above
PCB189	50	As above	As above	50 – 150% R (c)
PCB190	50	As above	As above	Not applicable
PCB191	100	As above	As above	As above
PCB194	50	As above	As above	As above
PCB195	100	As above	As above	As above
PCB196	100	As above	As above	As above
PCB197	100	As above	As above	As above
PCB198/199	20	As above	As above	As above

EPA-NE QAPP Worksheet #24b - Rev. 10/99 (continued)

Sampling SOP: S-1 through S-7
Analytical Method/SOP: L-32 (Tissue– see Worksheet #9a for tissue types); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Estimated Minimum Level (EML)[1] (pg/g Wet Weight)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	MS/MSD (LCS[2])
PCB200	100	RPD ≤ 30% (a,c)	Not applicable	Not applicable
PCB201	100	As above	As above	As above
PCB203	100	As above	As above	As above
PCB205	100	As above	As above	50 – 150% R (c)
PCB206	100	As above	As above	As above
PCB207	100	As above	As above	Not applicable
PCB209	50	As above	As above	50 – 150% R (c)
PCB Internal Standards	Not applicable	Not applicable	Not applicable	25 – 150% R

RPD = Relative Percent Difference; PD = Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit

[1] Dependent on a 10-g of 50% dry weight material and a 20 µL final volume.
[2] LCS – Within Method 1668A, Table 6 OPR requirements.
(a) Replicates – for 90% if analytes; for analytes detected at level >3× EML; MS/MSD – see footnote (c)
(b) SRM; For certified values >3× EML
(c) For 90% of analytes; concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment
/ Indicates co-elution with another target congener
( ) Indicates co-elution with a non-target congener

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1 through S-7
Analytical Method/SOP: L-42 (ICP/MS); L-44 (ICP/AES); L-45 (GFAA); L-41 (CVAA) (multiple analysis methods may be used to optimize detection limits and reduce interferences) (Tissue– see Worksheet #9a for tissue types); Metals

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (Dry Weight - µg/g)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
Aluminum	4	RPD ≤ 30% (a,c)	PD ≤ 25% (b)	70-130% R (c)
Antimony	0.12	As above	Not applicable	As above
Arsenic	0.12	As above	PD ≤ 25% (b)	As above
Barium	0.04	As above	Not applicable	As above
Beryllium	0.016	As above	As above	As above
Cadmium	0.712	As above	PD ≤ 25% (b)	As above
Chromium	0.96	As above	As above	As above
Cobalt	1.34	As above	As above	As above
Copper	0.26	As above	As above	As above
Iron	1.12	As above	As above	As above
Lead	0.08	As above	As above	As above
Manganese	0.064	As above	As above	As above
Mercury	0.008	As above	As above	As above
Molybdenum	1.152	As above	Not applicable	As above
Nickel	1.14	As above	PD ≤ 25% (b)	As above
Selenium	1.6	As above	As above	As above
Silver	0.22	As above	As above	As above
Thallium	0.08	As above	As above	As above
Vanadium	0.64	As above	Not applicable	As above
Zinc	0.384	As above	PD ≤ 25% (b)	As above

RPD = Relative Percent Difference; PD = Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit.

(a) Replicates – for analytes detected at level >10× MDL; MS/MSD – see footnote (c)

(b) SRM; For certified values >5× MDL

(c) Concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1 through S-7
Analytical Method/SOP: L-40 (CVAA) (Tissue– see Worksheet #9a for tissue types); Metals

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (Dry Weight - µg/g)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	MS/MSD (no LCS)
MeHg	0.01	RPD ≤ 30% (a,c)	PD ≤ 25% (b)	70-130% R (c)

RPD = Relative Percent Difference; PD = Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit.

(a) Replicates – for analytes detected at level >10× MDL; MS/MSD – see footnote (c)
(b) SRM; For certified values >5× MDL
(c) Concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1
Analytical Method/SOP: L-9 (Sediment); Pesticides/PCB Aroclors

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (dry weight – ng/g)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
4,4'-DDD	0.67	RPD≤ 30% (a,c)	Not applicable	40-120% R (c)
4,4'-DDE	0.67	As above	As above	As above
4,4'-DDT	0.67	As above	PD ≤ 30% (b)	As above
Aldrin	0.67	As above	Not applicable	As above
alpha-BHC	0.67	As above	As above	As above
alpha-Chlordane	0.67	As above	PD ≤ 30%	As above
beta-BHC	0.67	As above	Not applicable	As above
delta-BHC	0.67	As above	As above	As above
Dieldrin	0.67	As above	As above	As above
Endosulfan I	0.67	As above	As above	As above
Endosulfan II	0.67	As above	As above	As above
Endosulfan Sulfate	0.67	As above	As above	As above
Endrin	0.67	As above	As above	As above
Endrin Aldehyde	0.67	As above	As above	As above (d)
Endrin Ketone	0.67	As above	As above	As above
gamma-BHC	0.67	As above	As above	As above
gamma-Chlordane	0.67	As above	As above	As above
Heptachlor	0.67	As above	As above	As above
Heptachlor Epoxide	0.67	As above	As above	As above
Methoxychlor	0.67	As above	As above	As above
Technical chlordane	8.3	As above	As above	Not applicable
Toxaphene	8.3	As above	As above	As above
Aroclor-1016	8.3	As above	As above	LCS only: 40-120% R
Aroclor-1221	8.3	As above	As above	Not applicable
Aroclor-1232	8.3	As above	As above	As above
Aroclor-1242	8.3	As above	As above	As above
Aroclor-1248	8.3	As above	As above	As above
Aroclor-1254	8.3	As above	As above	As above
Aroclor-1260	8.3	As above	As above	LCS only: 40-120% R
Aroclor-1268	8.3	As above	As above	Not applicable
Aroclor, Total	Not applicable	As above	As above	As above
PCB Surrogates	As above	As above	As above	40 – 125% R

RPD = Relative Percent Difference; PD = Percent Difference; LCS = Laboratory Control Sample; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; R = Recovery; QL = Quantitation Limit

(a) Replicates: for 90% of analytes, for values >3× QL; MS/MSD: for 90% of analytes and see footnote (c)
(b) SRM: Using surrogate corrected data, for values >3× QL
(c) For 90% of analytes; concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment
(d) Problematic compound – inconsistent recovery from alumina column; low recoveries observed in the historical data.

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1
Analytical Method/SOP: L-9 (Soil); Pesticides/PCB Aroclors

Fixed Laboratory Analytical QC Sample Table cont

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (dry weight – ng/g)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
4,4'-DDD	0.53	RPD≤ 30% (a,c)	Not applicable	40-120% R (c)
4,4'-DDE	0.54	As above	As above	As above
4,4'-DDT	0.53	As above	PD ≤ 30% (b)	As above
Aldrin	0.53	As above	Not applicable	As above
alpha-BHC	0.53	As above	As above	As above
alpha-Chlordane	0.53	As above	PD ≤ 30%	As above
beta-BHC	0.53	As above	Not applicable	As above
delta-BHC	0.54	As above	As above	As above
Dieldrin	0.53	As above	As above	As above
Endosulfan I	0.53	As above	As above	As above
Endosulfan II	0.53	As above	As above	As above
Endosulfan Sulfate	0.53	As above	As above	As above
Endrin	0.53	As above	As above	As above
Endrin Aldehyde	0.53	As above	As above	As above (d)
Endrin Ketone	0.53	As above	As above	As above
gamma-BHC	0.53	As above	As above	As above
gamma-Chlordane	0.53	As above	As above	As above
Heptachlor	0.53	As above	As above	As above
Heptachlor Epoxide	0.53	As above	As above	As above
Methoxychlor	0.53	As above	As above	As above
Technical chlordane	6.7	As above	As above	Not applicable
Toxaphene	6.7	As above	As above	As above
Aroclor-1016	6.7	As above	As above	LCS only: 40-120% R
Aroclor-1221	6.7	As above	As above	Not applicable
Aroclor-1232	6.7	As above	As above	As above
Aroclor-1242	6.7	As above	As above	As above
Aroclor-1248	6.7	As above	As above	As above
Aroclor-1254	6.7	As above	As above	As above
Aroclor-1260	6.7	As above	As above	LCS only: 40-120% R
Aroclor-1268	6.7	As above	As above	Not applicable
Aroclor, Total	Not applicable	As above	As above	As above
PCB Surrogates	As above	As above	As above	40 – 125% R

RPD = Relative Percent Difference; PD = Percent Difference; LCS = Laboratory Control Sample; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; R = Recovery; QL = Quantitation Limit

(a) Replicates: for 90% of analytes, for values >3× QL; MS/MSD: for 90% of analytes and see footnote (c)
(b) SRM: Using surrogate corrected data, for values >3× QL
(c) For 90% of analytes; concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment
(d) Problematic compound – inconsistent recovery from alumina column; low recoveries observed in the historical data.

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1
Analytical Method/SOP: L-10 (Sediment); SVOCs (PAHs)

Fixed Laboratory Analytical QC Sample Table cont.

Analyte[1]	Achievable Laboratory Sensitivity/ Quantitation Limits (dry weight – ng/g)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
Biphenyl	0.83	RPD ≤ 30% (a,c)	Not applicable	Not applicable
2-Methylnaphthalene	0.83	As above	As above	40-120% R (c)
Acenaphthene	0.83	As above	As above	As above
Acenaphthylene	0.83	As above	As above	As above
Benzaldehyde	0.83	As above	As above	Not applicable
Anthracene	0.83	As above	PD ≤ 30% (b)	40-120% R (c)
Benz[a]anthracene	0.83	As above	As above	As above
Benzo[a]pyrene	0.83	As above	As above	As above
Benzo[b]fluoranthene	0.83	As above	As above	As above
Benzo[g,h,i]perylene	0.83	As above	As above	As above
Benzo[k]fluoranthene	0.83	As above	As above	As above
Chrysene	0.83	As above	As above	As above
Dibenz[a,h]anthracene	0.83	As above	As above	As above
Dibenzofuran	0.83	As above	Not applicable	Not applicable
Fluoranthene	0.83	As above	PD ≤ 30%	40-120% R
Fluorene	0.83	As above	Not applicable	As above
Indeno[1,2,3-cd]pyrene	0.83	As above	PD ≤ 30%	As above
Naphthalene	0.83	As above	As above	As above
Phenanthrene	0.83	As above	As above	As above
Pyrene	0.83	As above	As above	As above
Total PAH	Not applicable	As above	Not applicable	Not applicable
PAH Surrogates	As above	Not applicable	As above	40 – 125% R

RPD = Relative Percent Difference; PD = Percent Difference; LCS = Laboratory Control Sample; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; R = Recovery; QL = Quantitation Limit priority pollutants.

(a) Replicates: for 90% of analytes, for values >3× QL; MS/MSD: for 90% of analytes and see footnote (c)

(b) SRM: Using surrogate corrected data, for values >3× QL

(c) For 90% of analytes; concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1
Analytical Method/SOP: L-10 (Soil); SVOCs (PAHs)

Fixed Laboratory Analytical QC Sample Table cont.

Analyte[1]	Achievable Laboratory Sensitivity/ Quantitation Limits (dry weight – ng/g)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
Biphenyl	0.67	RPD ≤ 30% (a,c)	Not applicable	Not applicable
2-Methylnaphthalene	0.67	As above	As above	40-120% R (c)
Acenaphthene	0.67	As above	As above	As above
Acenaphthylene	0.67	As above	As above	As above
Benzaldehyde	0.67	As above	As above	Not applicable
Anthracene	0.67	As above	PD ≤ 30% (b)	40-120% R (c)
Benz[a]anthracene	0.67	As above	As above	As above
Benzo[a]pyrene	0.67	As above	As above	As above
Benzo[b]fluoranthene	0.67	As above	As above	As above
Benzo[g,h,i]perylene	0.67	As above	As above	As above
Benzo[k]fluoranthene	0.67	As above	As above	As above
Chrysene	0.67	As above	As above	As above
Dibenz[a,h]anthracene	0.67	As above	As above	As above
Dibenzofuran	0.67	As above	Not applicable	Not applicable
Fluoranthene	0.67	As above	PD ≤ 30%	40-120% R
Fluorene	0.67	As above	Not applicable	As above
Indeno[1,2,3-cd]pyrene	0.67	As above	PD ≤ 30%	As above
Naphthalene	0.67	As above	As above	As above
Phenanthrene	0.67	As above	As above	As above
Pyrene	0.67	As above	As above	As above
Total PAH	Not applicable	As above	Not applicable	Not applicable
PAH Surrogates	As above	Not applicable	As above	40 – 125% R

RPD = Relative Percent Difference; PD = Percent Difference; LCS = Laboratory Control Sample; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; R = Recovery; QL = Quantitation Limit priority pollutants.

(a) Replicates: for 90% of analytes, for values >3× QL; MS/MSD: for 90% of analytes and see footnote (c)
(b) SRM: Using surrogate corrected data, for values >3× QL
(c) For 90% of analytes; concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1
Analytical Method/SOP: L-23 (Sediment / Soil); Dioxin/Furan/HCX/TCX

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (pg/g Dry Weight)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1	RPD ≤ 30% (a,c)	PD ≤ 30% (b)	LCS: Within Method 1613B Table 6 OPR MS/MSD: 50 – 120% (c)
2,3,7,8-Tetrachlorodibenzofuran	1	As above	As above	As above
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	5	As above	As above	As above
1,2,3,7,8-Pentachlorodibenzofuran	5	As above	As above	As above
2,3,4,7,8-Pentachlorodibenzofuran	5	As above	As above	As above
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	5	As above	As above	As above
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	5	As above	As above	As above
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	5	As above	As above	As above
1,2,3,4,7,8-Hexachlorodibenzofuran	5	As above	As above	As above
1,2,3,6,7,8-Hexachlorodibenzofuran	5	As above	As above	As above
1,2,3,7,8,9-Hexachlorodibenzofuran	5	As above	As above	As above
2,3,4,6,7,8-Hexachlorodibenzofuran	5	As above	As above	As above
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	5	As above	As above	As above
1,2,3,4,6,7,8-Heptachlorodibenzofuran	5	As above	As above	As above
1,2,3,4,7,8,9-Heptachlorodibenzofuran	5	As above	As above	As above
Octachlorodibenzo-p-dioxin	10	As above	As above	As above
Octachlorodibenzofuran	10	As above	As above	As above
1,2,4,5,7,8-Hexachloro-9-Xanthene (HCX)	To be determined	As above	Not applicable	Not applicable
2,3,6,7-Tetrachloroxanthene (TCX)	Not applicable	As above	As above	As above
Total HpCDD	5	As above	As above	As above
Total HpCDF	5	As above	As above	As above
Total HxCDD	5	As above	As above	As above
Total HxCDF	5	As above	As above	As above
Total PeCDD	5	As above	As above	As above
Total PeCDF	5	As above	As above	As above
Total TCDD	1	As above	As above	As above
Total TCDF	1	As above	As above	As above
Dioxin/Furan Internal Standards	Not applicable	Not applicable	As above	25 – 150% R

RPD = Relative Percent Difference; PD = Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit;

(a) Replicates – for analytes detected at level >10× MDL; MS/MSD – see footnote (c)

(b) SRM; For certified values >5× MDL

(c) Concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

EPA-NE QAPP Worksheet #24b - Rev. 10/99

Sampling SOP: S-1
Analytical Method/SOP: L-32 (Sediment / Soil); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Estimated Minimum Level (EML)[1] (pg/g Dry Weight)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	MS/MSD (LCS[2])
PCB1	40	RPD ≤ 30% (a,c)	Not applicable	Not applicable
PCB3	40	As above	As above	50 – 150% R (c)
PCB4	100	As above	As above	As above
PCB5	10	As above	As above	Not applicable
PCB6	10	As above	As above	As above
PCB7	10	As above	As above	As above
PCB8	100	As above	PD ≤ 30% (b)	As above
PCB9	10	As above	Not applicable	As above
PCB10	10	As above	As above	As above
PCB12	20	As above	As above	As above
PCB13	20	As above	As above	As above
PCB16	20	As above	As above	As above
PCB17	40	As above	As above	As above
PCB18 (30)	100	As above	PD ≤ 30% (b)	As above
PCB19	20	As above	Not applicable	50 – 150% R (c)
PCB20/21/**28**/33	100	As above	PD ≤ 30% (b)	Not applicable
PCB22	40	As above	Not applicable	As above
PCB24/27	40	As above	As above	As above
PCB25	40	As above	As above	As above
PCB26/29	40	As above	As above	As above
PCB31	100	As above	PD ≤ 30% (b)	As above
PCB32	40	As above	Not applicable	As above
PCB40/41/71	100	As above	As above	As above
PCB42	40	As above	As above	As above
PCB43/**52**	40	As above	PD ≤ 30% (b)	As above
PCB44/47 (65)	100	As above	As above	As above
PCB45/51	40	As above	Not applicable	As above
PCB46	40	As above	As above	As above
PCB48	40	As above	As above	As above
PCB49 (69)	100	As above	PD ≤ 30% (b)	As above
PCB53 (50)	40	As above	Not applicable	As above
PCB56	40	As above	As above	As above
PCB59/75 (62)	40	As above	As above	As above

EPA-NE QAPP Worksheet #24b - Rev. 10/99 (continued)

Sampling SOP: S-1
Analytical Method/SOP: L-32 (Sediment / Soil); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Estimated Minimum Level (EML)[1] (pg/g Dry Weight)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	MS/MSD (LCS[2])
PCB60	100	RPD ≤ 30% (a,c)	Not applicable	As above
PCB63	100	As above	As above	As above
PCB64	40	As above	As above	As above
PCB66	100	As above	PD ≤ 30% (b)	As above
PCB70/74/76 (61)	100	As above	Not applicable	As above
PCB77	100	As above	As above	50 – 150% R (c)
PCB81	100	As above	As above	As above
PCB82	100	As above	As above	Not applicable
PCB83/99	100	As above	PD ≤ 30% (b)	As above
PCB84	100	As above	Not applicable	As above
PCB85 (116/117)	40	As above	As above	As above
PCB87/97/119 (86/125/108)	100	As above	PD ≤ 30% (b)	As above
PCB89	100	As above	Not applicable	As above
PCB90/**101** (113)	200	As above	PD ≤ 30% (b)	As above
PCB91 (88)	100	As above	Not applicable	As above
PCB92	100	As above	As above	As above
PCB95/100 (93/102/98)	100	As above	PD ≤ 30% (b)	As above
PCB105	40	As above	As above	50 – 150% R (c)
PCB107	200	As above	Not applicable	Not applicable
PCB110/115	200	As above	PD ≤ 30% (b)	As above
PCB114	100	As above	Not applicable	50 – 150% R (c)
PCB118	100	As above	PD ≤ 30% (b)	As above
PCB123 (106/109)	100	As above	Not applicable	Not applicable
PCB124	200	As above	As above	As above
PCB126	100	As above	As above	50 – 150% R (c)
PCB128 (166)	100	As above	PD ≤ 30% (b)	Not applicable
PCB129/**138**/160/163	100	As above	As above	As above
PCB130	100	As above	Not applicable	As above
PCB131	100	As above	As above	As above
PCB132	100	As above	As above	As above
PCB134 (143)	100	As above	As above	As above
PCB135/151 (154)	100	As above	PD ≤ 30% (b)	As above

EPA-NE QAPP Worksheet #24b - Rev. 10/99 (continued)

Sampling SOP: S-1
Analytical Method/SOP: L-32 (Sediment / Soil); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Estimated Minimum Level (EML)[1] (pg/g Dry Weight)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	MS/MSD (LCS[2])
PCB136	40	RPD ≤ 30% (a,c)	Not applicable	Not applicable
PCB137 (164)	200	As above	As above	As above
PCB141	40	As above	As above	As above
PCB144	100	As above	As above	As above
PCB146 (161)	200	As above	As above	As above
PCB149 (147)	100	As above	PD ≤ 30% (b)	As above
PCB153 (168)	100	As above	As above	As above
PCB156/157	100	As above	As above	50 – 150% R (c)
PCB158	40	As above	Not applicable	Not applicable
PCB167	100	As above	As above	50 – 150% R (c)
PCB169	100	As above	As above	As above
PCB170	100	As above	PD ≤ 30% (b)	Not applicable
PCB171/173	200	As above	Not applicable	As above
PCB172	200	As above	As above	As above
PCB174	100	As above	As above	As above
PCB175	200	As above	As above	As above
PCB176	200	As above	As above	As above
PCB177	100	As above	As above	As above
PCB178	100	As above	As above	As above
PCB180/193	100	As above	PD ≤ 30% (b)	As above
PCB182	200	As above	Not applicable	As above
PCB183	200	As above	PD ≤ 30% (b)	As above
PCB184	200	As above	Not applicable	As above
PCB185	200	As above	As above	As above
PCB187	100	As above	PD ≤ 30% (b)	As above
PCB189	100	As above	Not applicable	50 – 150% R c)
PCB190	100	As above	PD ≤ 30% (b)	Not applicable
PCB191	200	As above	Not applicable	As above
PCB194	100	As above	PD ≤ 30% (b)	As above
PCB195	200	As above	As above	As above
PCB196	200	As above	Not applicable	As above
PCB197	200	As above	As above	As above
PCB198/199	40	As above	As above	As above

EPA-NE QAPP Worksheet #24b - Rev. 10/99 (continued)

Sampling SOP: S-1
Analytical Method/SOP: L-32 (Sediment / Soil); PCB Congeners

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Estimated Minimum Level (EML)[1] (pg/g Dry Weight)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	MS/MSD (LCS[2])
PCB200	200	RPD ≤ 30% (a,c)	Not applicable	Not applicable
PCB201	200	As above	As above	As above
PCB203	200	As above	As above	As above
PCB205	200	As above	As above	50 – 150% R (c)
PCB206	200	As above	PD ≤ 30% (b)	As above
PCB207	200	As above	Not applicable	Not applicable
PCB209	100	As above	PD ≤ 30% (b)	50 – 150% R (c)
PCB Internal Standards	Not applicable	Not applicable	Not applicable	25 – 150% R

RPD = Relative Percent Difference; PD = Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit

[1] Dependent on a 10-g of 50% dry weight material and a 20 µL final volume.
[2] LCS – Within1668A, Table 6 OPR requirements.
(a) Replicates – for 90% analytes detected at level >3× EML; MS/MSD – see footnote (c)
(b) SRM; For certified values >3× EML
(c) For 90% of analytes; concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment
/ Indicates co-elution with another target congener
( ) Indicates co-elution with a non-target congener

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Sampling SOP: S-1
Analytical Method/SOP: L-42 (ICP/MS); L-44 (ICP/AES); L-45 (GFAA); L-41 (CVAA) (multiple analysis methods may be used to optimize detection limits and reduce interferences) (Sediment / Soil); Metals

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (Dry Weight - µg/g)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
Aluminum	4	RPD ≤ 30% (a,c)	PD ≤ 25% (b)	70-130% R (c)
Antimony	0.08	As above	As above	As above
Arsenic	2	As above	As above	As above
Barium	0.04	As above	As above	As above
Beryllium	0.016	As above	Not applicable	As above
Cadmium	0.71	As above	PD ≤ 25% (b)	As above
Chromium	0.96	As above	As above	As above
Cobalt	1.34	As above	As above	As above
Copper	0.388	As above	As above	As above
Iron	1.12	As above	As above	As above
Lead	0.4	As above	As above	As above
Manganese	0.064	As above	As above	As above
Mercury	0.008	As above	As above	As above
Molybdenum	1.6	As above	As above	As above
Nickel	3.12	As above	As above	As above
Selenium	1.06	As above	As above	As above
Silver	0.356	As above	As above	As above
Thallium	0.08	As above	As above	As above
Vanadium	1.08	As above	As above	As above
Zinc	0.384	As above	As above	As above

RPD = Relative Percent Difference; PD = Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit.

(a) Replicates – for analytes detected at level >10× MDL; MS/MSD – see footnote (c)
(b) SRM; For certified values >5× MDL
(c) Concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

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Sampling SOP: S-1
Analytical Method/SOP: L-40 (CVAA) (Sediment / Soil); Metals

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (Wet Weight - µg/g)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
MeHg	0.0002	RPD ≤ 30% (a,b)	Not applicable	70-130% R (b)

RPD = Relative Percent Difference; PD = Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit.

(a) Replicates – for analytes detected at level >10× MDL; MS/MSD – see footnote (b)

(b) Concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

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Sampling SOP: S-1
Analytical Method/SOP: L-42 (ICP/MS) (Sediment / Soil); Metals

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (Dry Weight - µg/g)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
AVS	2.428 (wet)	RPD ≤ 30% (a,c)	Not applicable	LCS only: 70-130% R
SEM-Cadmium	0.16	As above	PD ≤ 25% (b)	MS/MSD only: 70-130% R (c)
SEM-Copper	0.032	As above	As above	As above
SEM-Lead	0.08	As above	As above	As above
SEM-Mercury	0.08	As above	As above	As above
SEM-Nickel	0.4	As above	As above	As above
SEM-Zinc	0.8	As above	As above	As above

RPD = Relative Percent Difference; PD = Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit.

(a) Replicates – for analytes detected at level >10× MDL; MS/MSD – see footnote (c)

(b) SRM; For certified values >5× MDL

(c) Concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

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Sampling SOP: S-1
Analytical Method/SOP: L-46 (Sediment/Soil); Grain Size

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (Dry Weight – %)	Analytical Precision	Analytical Accuracy/Bias	
		(Laboratory Replicates Only)	SRM	LCS/MS/MSD
% gravel	0.01	RPD ≤ 25% (for values >10× MDL)	Not applicable	Not applicable
% coarse sand	As above	As above	As above	As above
% medium sand	As above	As above	As above	As above
% fine sand	As above	As above	As above	As above
% clay	As above	As above	As above	As above
Grain size distribution curve	As above	Not applicable	As above	As above

RPD = Relative Percent Difference; MDL = Method Detection Limit; SRM = Standard Reference Material; LCS = Laboratory Control Sample; MS = Matrix Spike; MSD = Matrix Spike Duplicate

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Sampling SOP: S-1
Analytical Method/SOP: L-49 (Sediment / Soil); TOC

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (Dry Weight – %)	Analytical Precision	Analytical Accuracy/Bias	
		(Laboratory Replicates Only)	SRM	LCS/MS/MSD
% TOC	0.01-0.001	RPD≤ 25% (for values >10× MDL)	PD ≤ 5%	Not applicable

RPD = Relative Percent Difference; MDL = Method Detection Limit; SRM = Standard Reference Material; LCS = Laboratory Control Sample; MS = Matrix Spike; MSD = Matrix Spike Duplicate

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Sampling SOP: S-1
Analytical Method/SOP: L-61 (Sediment / Soil); SVOCs (Phenols and Phthalates)

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (Dry Weight - ng/g)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD (a,b)	SRM	LCS/MS/MSD (b)
2,4,5-Trichlorophenol	1700	≤38% RPD	Not applicable	61-123% R
2,4-Dinitrophenol	1700	≤ 93% RPD	As above	27-179% R
2-Nitrophenol	330	≤ 34% RPD	As above	58-114% R
4-Methylphenol	330	≤ 40% RPD	As above	44-109% R
4-Nitrophenol (control analyte)	1700	**≤ 43% RPD**	As above	**60-130% R**
Bis(2-Ethylhexyl)phthalate	330	≤ 35% RPD	As above	65-122% R
Butylbenzylphtalate	330	≤ 41% RPD	As above	61-127% R
Carbazole	330	≤ 32% RPD	As above	59-111% R
Di-n-Butylphthalate	330	≤ 40% RPD	As above	55-120% R
Di-n-Octylphthalate	330	≤ 44% RPD	As above	57-129% R
Pentachlorophenol (control analyte)	1700	**≤ 44% RPD**	As above	**63-135% R**
Phenol	330	≤ 36% RPD	As above	49-107% R
2-Fluorophenol (surrogate)	Not applicable	Not applicable	Not applicable	43-109% R
Phenol-d5 (surrogate)	As above	As above	As above	46-102% R
Nitrobenzene-d5 (surrogate)	As above	As above	As above	43-107% R
2-Fluorobiphenyl (surrogate)	As above	As above	As above	53-110% R
2,4,6-Tribromophenol (surrogate)	As above	As above	As above	53-123% R
Terphenyl-d14 (surrogate)	As above	As above	As above	56-110% R

RPD = Relative Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit.

(a) Replicates – for analytes detected at level >10×MDL; MS/MSD – see footnote (b)

(b) Concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

Note – All target analytes will be fortified into the LCS/MS/MSD and recovery results reported – but only "control analytes" will be evaluated against the MPC. Control analytes for this analysis are identified above. Corrective action only taken when a control analyte fails to meet the MPC.

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Sampling SOP: S-1
Analytical Method/SOP: L-9 (Water); Pesticides/PCB Aroclors

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (ng/L)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
4,4'-DDD	4.0	RPD≤ 30% (a,b)	Not applicable	40-120% R (b)
4,4'-DDE	4.0	As above	As above	As above
4,4'-DDT	4.0	As above	As above	As above
Aldrin	4.0	As above	As above	As above
alpha-BHC	4.0	As above	As above	As above
alpha-Chlordane	4.0	As above	As above	As above
beta-BHC	4.0	As above	As above	As above
delta-BHC	4.0	As above	As above	As above
Dieldrin	4.0	As above	As above	As above
Endosulfan I	4.0	As above	As above	As above
Endosulfan II	4.0	As above	As above	As above
Endosulfan Sulfate	4.0	As above	As above	As above
Endrin	4.0	As above	As above	As above
Endrin Aldehyde	4.0	As above	As above	As above (c)
Endrin Ketone	4.0	As above	As above	As above
gamma-BHC	4.0	As above	As above	As above
gamma-Chlordane	4.0	As above	As above	As above
Heptachlor	4.0	As above	As above	As above
Heptachlor Epoxide	4.0	As above	As above	As above
Methoxychlor	4.0	As above	As above	As above
Technical chlordane	50	As above	As above	Not applicable
Toxaphene	50	As above	As above	As above
Aroclor-1016	50	As above	As above	LCS only: 40-120% R
Aroclor-1221	50	As above	As above	Not applicable
Aroclor-1232	50	As above	As above	As above
Aroclor-1242	50	As above	As above	As above
Aroclor-1248	50	As above	As above	As above
Aroclor-1254	50	As above	As above	As above
Aroclor-1260	50	As above	As above	LCS only: 40-120% R
Aroclor-1268	50	As above	As above	Not applicable
Aroclor, Total	Not applicable	As above	As above	As above
PCB Surrogates	As above	As above	As above	40 – 125% R

RPD = Relative Percent Difference; PD = Percent Difference; LCS = Laboratory Control Sample; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; R = Recovery; QL = Quantitation Limit

(b) Replicates: for 90% of analytes, for values >3× QL; MS/MSD: for 90% of analytes and see footnote (b)

(c) For 90% of analytes; concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

(d) Problematic compound – inconsistent recovery from alumina column; low recoveries observed in the historical data.

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Sampling SOP: S-1
Analytical Method/SOP: L-10 (Water); SVOCs (PAHs)

Fixed Laboratory Analytical QC Sample Table cont.

Analyte[1]	Achievable Laboratory Sensitivity/ Quantitation Limits (ng/L)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
Biphenyl	5	RPD ≤ 30% (a,b)	Not applicable	Not applicable
2-Methylnaphthalene	5	As above	As above	40-120% R (c)
Acenaphthene	5	As above	As above	As above
Acenaphthylene	5	As above	As above	As above
Benzaldehyde	5	As above	As above	Not applicable
Anthracene	5	As above	As above	40-120% R (c)
Benz[a]anthracene	5	As above	As above	As above
Benzo[a]pyrene	5	As above	As above	As above
Benzo[b]fluoranthene	5	As above	As above	As above
Benzo[g,h,i]perylene	5	As above	As above	As above
Benzo[k]fluoranthene	5	As above	As above	As above
Chrysene	5	As above	As above	As above
Dibenz[a,h]anthracene	5	As above	As above	As above
Dibenzofuran	5	As above	As above	Not applicable
Fluoranthene	5	As above	As above	40-120% R
Fluorene	5	As above	As above	As above
Indeno[1,2,3-cd]pyrene	5	As above	As above	As above
Naphthalene	5	As above	As above	As above
Phenanthrene	5	As above	As above	As above
Pyrene	5	As above	As above	As above
Total PAH	Not applicable	As above	Not applicable	Not applicable
PAH Surrogates	As above	Not applicable	As above	40 – 125% R

RPD = Relative Percent Difference; PD = Percent Difference; LCS = Laboratory Control Sample; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; R = Recovery; QL = Quantitation Limit priority pollutants.

(a) Replicates: for 90% of analytes, for values >3× QL; MS/MSD: for 90% of analytes and see footnote (b)

(b) For 90% of analytes; concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

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Sampling SOP: S-1
Analytical Method/SOP: L-42 (ICP/MS); L-44 (ICP/AES); L-45 (GFAA); L-41 (CVAA) (multiple analysis methods may be used to optimize detection limits and reduce interferences) (Water); Metals

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (µg/L)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
Aluminum	40	RPD ≤ 30% (a,c)	PD ≤ 25% (b)	70-130% R (c)
Antimony	0.04	As above	As above	As above
Arsenic	.16	As above	As above	As above
Barium	0.288	As above	As above	As above
Beryllium	0.212	As above	As above	As above
Cadmium	0.06	As above	As above	As above
Calcium (d)	12	As above	As above	As above
Chromium	12	As above	As above	As above
Cobalt	0.016	As above	As above	As above
Copper	3.24	As above	As above	As above
Iron	14	As above	As above	As above
Lead	0.02	As above	As above	As above
Magnesium (d)	40	As above	As above	As above
Manganese	0.8	As above	As above	As above
Mercury	0.0008	As above	As above	As above
Molybdenum	14.4	As above	As above	As above
Nickel	14.3	As above	As above	As above
Selenium	0.4	As above	As above	As above
Silver	2.68	As above	As above	As above
Thallium	0.016	As above	As above	As above
Vanadium	8	As above	As above	As above
Zinc	4.8	As above	As above	As above

RPD = Relative Percent Difference; PD = Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit.

(a) Replicates – for analytes detected at level >10× MDL; MS/MSD – see footnote (c)
(b) SRM; For certified values >5× MDL
(c) Concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment
(d) Measured to determine hardness.

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Sampling SOP: S-1
Analytical Method/SOP: L-42 (ICP/MS) (Water); Hardness

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (mg/L)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD	SRM	LCS/MS/MSD
Hardness	4	RPD ≤ 30% (a)	Not applicable	Not applicable

RPD = Relative Percent Difference; PD = Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; SRM = Standard Reference Material; MDL = Method Detection Limit.
(a) Replicates – for analytes detected at level >10× MDL

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Sampling SOP: S-1
Analytical Method/SOP: L-61 (Water); SVOCs (Phenols and Phthalates)

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (µg/L)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate & MS/MSD (a,b)	SRM	LCS/MS/MSD (b)
2,4,5-Trichlorophenol	50	≤29% RPD	Not applicable	71-112% R
2,4-Dinitrophenol	50	≤72% RPD	As above	52-154% R
2-Nitrophenol	10	≤26% RPD	As above	67-104% R
4-Methylphenol	10	≤31% RPD	As above	54-98% R
4-Nitrophenol (control analyte)	**50**	**≤67% RPD**	**As above**	**32-141% R**
Bis(2-Ethylhexyl)phthalate	10	≤27% RPD	As above	75-112% R
Butylbenzylphtalate	10	≤31% RPD	As above	2-116% R
Carbazole	10	≤25% RPD	As above	68-103% R
Di-n-Butylphthalate	10	≤30% RPD	As above	66-109% R
Di-n-Octylphthalate	10	≤34% RPD	As above	69-117% R
Pentachlorophenol (control analyte)	**50**	**≤40% RPD**	**As above**	**68-134% R**
Phenol	10	≤48% RPD	As above	35-113% R
2-Fluorophenol (surrogate)	Not applicable	Not applicable	Not applicable	46-110% R
Phenol-d5 (surrogate)	As above	As above	As above	32-112% R
Nitrobenzene-d5 (surrogate)	As above	As above	As above	59-100% R
2-Fluorobiphenyl (surrogate)	As above	As above	As above	68-96% R
2,4,6-Tribromophenol (surrogate)	As above	As above	As above	65-114% R
Terphenyl-d14 (surrogate)	As above	As above	As above	68-101% R

RPD = Relative Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; MDL = Method Detection Limit.

(a) Replicates – for analytes detected at level >10×MDL; MS/MSD – see footnote (b)

(b) Concentration of spiked analytes in MS/MSD must be >5× background concentration to be used for data quality assessment

Note – All target analytes will be fortified into the LCS/MS/MSD and recovery results reported – but only "control analytes" will be evaluated against the MPC. Control analytes for this analysis are identified above. Corrective action only taken when a control analyte fails to meet the MPC.

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Sampling SOP: S-1
Analytical Method/SOP: L-60 (Water); VOC

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (µg/L)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate and MS/MSD [1]	SRM	LCS/MS/MSD
1,1,1,2-Tertrachloroethane	1	22% RPD	Not applicable	103-134% R
1,1,1-Trichloroethane	1	21% RPD	As above	104-133% R
1,1,2,2-Tertrachlloroethane	1	24% RPD	As above	106-140% R
1,1,2-Trichloroethane	1	22% RPD	As above	29-99-130% R
1,1-Dichloroethhane	1	22% RPD	As above	96-127% R
1,1-Dichloroethene (control analyte)	**1**	**≤54% RPD**	As above	**71-160% R**
1,1-Dichloropropene	1	20% RPD	As above	97-124% R
1,2,3-Trichlorobenzene	1	16% RPD	As above	91-113% R
1,2,3-Trichloropropane	1	24% RPD	As above	91-124% R
1,2,4-Trichlorobenzene	1	16% RPD	As above	93-116% R
1,2,4-Trimethylbenzene	1	16% RPD	As above	93-115% R
1,2-Dibromo-3-chloropropane	1	31% RPD	As above	82-126% R
1,2-Dibromoethane	1	22% RPD	As above	102-132% R
1,2-Dichlorobenzene	1	15% RPD	As above	93-115% R
1,2-Dichloroethane	1	30% RPD	As above	93-136% R
1,2-Dichloropropane	1	16% RPD	As above	99-122% R
1,3,5-Trimethylbenzene	1	15% RPD	As above	93-114% R
1,3-Dichlorobenzene	1	25% RPD	As above	60-96% R
1,3-Dichloropropane	1	19% RPD	As above	101-128% R
1,4-Dichlorobenzene	1	16% RPD	As above	90-112% R
2,2-Dichloropropane	1	29% RPD	As above	88-128% R
2-Chlorotoluene	1	15% RPD	As above	93-114% R
4-Clorotoluene	1	20% RPD	As above	89-117% R
Benzene (control analyte)	**1**	**≤14% RPD**	As above	**98-120% R**
Bromobenzene	1	16% RPD	As above	95-118% R
Bromochloromethane	1	32% RPD	As above	93-138
Bromodichloromethane	1	23% RPD	As above	107-140% R
Bromoform	1	37% RPD	As above	99-151% R
Bromomethane	1	35% RPD	As above	83-132% R
Carbon Tetrachloride	1	35% RPD	As above	111-161% R
Chlorobenzene (control analyte)	**1**	**≤16% RPD**	As above	**91-116% R**
Chloroethane	1	29% RPD	As above	91-133% R
Chloroform	1	25% RPD	As above	96-132% R
Chloromethane	1	35% RPD	As above	86-135% R
cis-1,2-Dichloroethene	1	21% RPD	As above	98-128% R
cis-1,3-Dichloropropene	1	14% RPD	As above	104-124% R
Dibromochloromethane	1	22% RPD	As above	102-133% R
Dibromomethane	1	27% RPD	As above	97-136% R
Dichlorodifluoromethane	1	67% RPD	As above	22-118% R

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Sampling SOP: S-1
Analytical Method/SOP: L-60 (Water); VOC

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits (µg/L)	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicate and MS/MSD [1]	SRM	LCS/MS/MSD
Ethylbenzene	1	14% RPD	Not applicable	101-121% R
Hexachlorobutadiene	1	26% RPD	As above	93-130% R
Isopropylbenzene	1	15% RPD	As above	102-124% R
m&p-Xylene	1	16% RPD	As above	99-121% R
Methylene Chloride	1	17% RPD	As above	82-106% R
Naphthalene	1	26% RPD	As above	97-134% R
n-Butylbenzene	1	18% RPD	As above	95-121% R
n-Propylbenzene	1	15% RPD	As above	93-114% R
o-Xylene	1	17% RPD	As above	99-122% R
p-Isopropyltoluene	1	18% RPD	As above	96-120% R
sec-Butylbenzene	1	16% RPD	As above	99-123% R
Styrene	1	19% RPD	As above	100-126% R
tert-Butylbenzene	1	14% RPD	As above	89-109% R
Tetrachloroethene	1	21% RPD	As above	72-102% R
Toluene (control analyte)	**1**	**≤ 21% RPD**	As above	**90-124% R**
Total Volatile Organics	1	Not applicable	As above	Not applicable
Total Xylenes	1	16% RPD	As above	103-126% R
trans-1,2-Dichloroethene	1	21% RPD	As above	95=124% R
Trans-1,3-Dichloropropene	1	19% RPD	As above	97-124% R
Trichloroethene (control analyte)	**1**	**≤ 16% RPD**	As above	**92-117% R**
Trichlorofluoromethane	1	31% RPD	As above	92-136% R
Vinyl Chloride	1	36% RPD	As above	81-132% R
Dibromofluromethane (surrogate)	Not applicable	Not applicable	As above	84-116% R
1,2-Dichloroethane-d4 (surrogate)	As above	As above	As above	81-116% R
Toluene-d8 (surrogate)	As above	As above	As above	80-118% R
Bromofluorobenzene (surrogate)	As above	As above	As above	87-107% R

RPD = Relative Percent Difference; R = % Recovery; MS = Matrix Spike; MSD = Matrix Spike Duplicate; MDL = Method Detection Limit.
[1] Precision only applicable for values >10× MDL.

Note – All target analytes will be fortified into the LCS/MS/MSD and recovery results reported – but only "control analytes" will be evaluated against the MPC. Control analytes for this analysis are identified above. Corrective action only taken when a control analyte fails to meet the MPC.

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Sampling SOP: S-1
Analytical Method/SOP: L-62 (Water); Dissolved Inorganic Nutrients

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicates only	SRM	MS only
Dissolved ammonia	0.003 mg N/L	RPD ≤ 10%	PD ≤ 15%	85 – 115% R
Dissolved inorganic nitrate	0.0007 mg N/L	As above	As above	As above
Dissolved inorganic nitrite	0.0007 mg N/L	As above	As above	As above
Dissolved inorganic phosphorus	0.0007 mg P/L	As above	As above	As above

Sampling SOP: S-1
Analytical Method/SOP: L-62 (Water); Total Nitrogen and Total Phosphorus

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicates only	SRM	MS only
Total nitrogen	0.0200 mg/L	RPD ≤ 10%	PD ≤ 15%	85 – 115% R
Total phosphorus	0.0010 mg/L	As above	As above	As above

Sampling SOP: S-1
Analytical Method/SOP: L-62 (Water); Total Dissolved Nitrogen and Phosphorus

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicates only	SRM	MS only
Total dissolved nitrogen	0.0200 mg/L	RPD ≤ 10%	PD ≤ 15%	85 – 115% R
Total dissolved phosphorus	0.0010 mg/L	As above	As above	As above

RPD = Relative Percent Difference; MS = Matrix Spike; SRM = Standard Reference Material; R = Recovery; PD = Percent Difference

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Sampling SOP: S-1
Analytical Method/SOP: L-62 (Water); Total and Dissolved Organic Carbon

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicates only	SRM	MS only
Total organic carbon	0.2400 mg/L	RPD ≤10%	PD ≤ 15%	85 – 115% R
Dissolved organic carbon	0.2400 mg/L	As above	As above	As above

Sampling SOP: S-1
Analytical Method/SOP: L-62 (Water); Total Suspended Solids

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicates only	SRM	MS only
Total suspended solids	2.4 mg/L	RPD ≤10%	Not applicable	Not applicable

Sampling SOP: S-1
Analytical Method/SOP: L-63 (Water); Biochemical Oxygen Demand

Fixed Laboratory Analytical QC Sample Table cont.

Analyte	Achievable Laboratory Sensitivity/ Quantitation Limits	Analytical Precision	Analytical Accuracy/Bias	
		Laboratory Replicates only	SRM	LCS only
Biological Oxygen Demand	NA	≤30% RPD	Not applicable	200 ± 37 mg/L O_2

RPD = Relative Percent Difference; MS = Matrix Spike; SRM = Standard Reference Material; LCS = Laboratory Control Sample; R = Recovery; PD = Percent Difference

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Project Documentation and Records Table

Sample Collection Records	Field Analysis Records	Fixed Laboratory Records	Data Assessment Records	Other
Field Logs	N/A	Sample Receipt, Custody and Tracking Forms	Performance Audit Reports (sample preparation, chemical analysis)	
Custody Forms		Standard Preparation Logs (certificates of analysis, QC checks)	Lab-wide Systems Audit Reports	
Sample Labels		Equipment Calibration Logs	PE Sample Results	
Custody Seals		Sample Preparation Records	Corrective Action Forms	
Telephone Logs		GC/ECD, GC/MS and GC/HRMS Logbooks (acquisition, maintenance, tuning)	Control Charts	
		Calibration Reports	Telephone Logs and/or electronic mail	
		Sample Quantification Reports	Semi-Annual Animal Care Committee Review Reports (Battelle MSL)	
		Sample Chromatograms		
		Laboratory Logbooks (acquisition, maintenance)		
		Final Report Tables (authentic samples and QC results)		
		Data Validation Checklist[1]		
		Preliminary QC Checklist		
		Corrective Action Logs (miscellaneous documentation)		
		Study Records (*e.g.*, Data Package)		
		Sample Disposal Records		
		Telephone Logs and/or electronic mail		

[1] Example of Validation Checklist used at Battelle Duxbury and Columbus provided in Attachment D.

EPA-NE QAPP Worksheet #27a- Rev. 10/99

Assessment and Response Actions

Quality assurance encompasses all planned and systematic activities necessary to assure management that the products generated, and the services performed by Battelle meet the quality standards established in this QAPP. The primary mechanism for accomplishing this goal is audits. Audits refer to the formal assessment of conformance to the QA Program and its effectiveness. During an audit, the agreement with QA policy documents (*e.g.*, SOPs) is evaluated, deficiencies are identified, and corrective action is taken. Ideally, audits also serve to increase awareness and understanding of QA policies and procedures. Mr. Mark Guilmain will serve as Battelle Duxbury's QA Coordinator and is responsible for identifying areas for corrective action, coordinating the QA activities such as systems and data audits, and preparing reports to management for this project. QA Officers at participating laboratories will be responsible for coordinating and performing QA activities at participating laboratories. Identity and qualifications of auditors are presented in EPA-NE QAPP Worksheet #6. The following QA audits are planned for this project.

- A technical system (initiation) audit is conducted as part of the review of this QAPP to (1) ensure that the work assignment scope and all required elements are addressed adequately, (2) verify that all required SOPs are approved and current, and (3) to verify that all participants have the required qualifications and documented training to perform their assigned tasks.
- Performance audits are independent checks of routinely obtained data. One Certified or Standard Reference Material (CRM or SRM, respectively) will be incorporated into each batch of chemistry samples (as applicable) to assess the accuracy and precision with which target analytes of known concentration are recovered from a representative matrix. The acceptance criteria are discussed in EPA-NE QAPP Worksheet #11b.
- Systems audits at Battelle Duxbury are conducted at least quarterly by the Project QA Coordinator or his designee. The purpose of these audits is to evaluate facilities, equipment, and processes for conformance to Battelle standards. Battelle SOP 4-009 describes the procedures for conducting the audits. Specific laboratory activities (*e.g.*, sample custody, preparation of standard solutions, training records) may be targeted for review based on need and level of laboratory activity in addition to the general criteria specified in the inspection SOP. Data audits will conducted for all reported data. These audits will reconstruct representative data from each sample based on sample processing records, instrument calibration factors (*e.g.*, response factors) and output (*e.g.*, area counts), and sample manipulations and spiking. Samples will be tracked from receipt and processing through analysis and reporting to ensure that the reported data are accurate, complete, and traceable. Section 17 discusses the reporting of audit results to management and Section 16.2 describes corrective action procedures resulting from audit findings. A QA Statement submitted to the Project Manager with each deliverable describes the audit and review activities conducted to assess the deliverable accuracy, and any outstanding issues that could impact data quality.
- One on-site field audit to observe field activities for compliance to QAPP and SOPs. The field audit will include a review of field records for sample tracking, and documentation completeness and accuracy.

Data audits are also conducted as described in EPA-NA QAPP Worksheet #9a (Attachment A).

EPA-NE QAPP Worksheet #27b- Rev. 10/99

Project Assessment Table

Assessment Type	Frequency	Internal or External (1)	Organization Performing Assessment	Person(s) responsible for performing assessment, title and organizational affiliation	Person(s) responsible for responding to assessment findings, title and organizational affiliation	Person (s) responsible for identifying and implementing corrective actions (CA), title and organizational affiliation	Person (s) responsible for monitoring effectiveness of CA, title and organizational affiliation
Field Audit	Once during sample collection	Internal	Battelle Duxbury	Rosanna Buhl QA Officer Battelle Duxbury	Charles Lyman Field Operations Leader Harding ESE	Charles Lyman Field Operations Leader Harding ESE	Rosanna Buhl QA Officer Battelle Duxbury
Fixed Laboratory Data Package Audit	each data package	Internal and External	Battelle Duxbury	Mark Guilmain QA Coordinator Battelle Duxbury	GC/MS Analyst GC/ECD Analyst Battelle Duxbury	Robert Lizotte Laboratory Manager Battelle Duxbury	Mark Guilmain QA Coordinator Battelle Duxbury
Fixed Laboratory Data Package Audit	each data package	Internal and External	Battelle Columbus	Charles D. Lawrie QA Officer Battelle Columbus	Analysts (GC/HRMS, Sample Preparation) Battelle Columbus	Mary Schrock Laboratory Manager and/or Karen Tracy Task Leader Battelle Columbus	Charles D. Lawrie QA Officer Battelle Columbus
Fixed Laboratory Data Package Audit	each data package	Internal and External	Battelle MSL	Deborah Coffey QA Officer Battelle MSL	Analysts Battelle MSL	Linda Bingler Task Leader Battelle MSL	Deborah Coffey QA Officer Battelle MSL
Fixed Laboratory Data Package Audit	each data package	Internal and External	Applied Marine Sciences, Inc. (AMS)	Chuck Davis Senior Geotechnical Engineer/QC Manager AMS	Ken Davis Grain Size/TOC AMS	Ken Davis Task Leader AMS	Chuck Davis Senior Geotechnical Engineer/QC Manager AMS
Fixed Laboratory Data Package Audit	each data package	Internal and External	Severn Trent Laboratory	Mimi Uhlfelder QA Manager STL Baltimore	GC/MS Analyst STL Baltimore	Craig Schenning Organic Manager STL Baltimore	Mimi Uhlfelder QA Manager STL Baltimore
Fixed Laboratory Data Package Audit	each data package	Internal and External	CBL	Carl Zimmermann Senior Faculty Research Assistant CBL	Analysts (Technicon II, TrAAcs-800, and Shimadzu 5000) CBL	Carl Zimmermann Senior Faculty Research Assistant CBL	Carl Zimmermann Senior Faculty Research Assistant CBL
Fixed Laboratory Data Package Audit	each data package	Internal	Battelle MSL	Deborah Coffey QA Officer Battelle MSL	Catfish ELS Task Leader Battelle MSL	Heida Diefenderfer Task Leader Battelle MSL	Deborah Coffey QA Officer Battelle MSL
Fixed Laboratory Data Package Audit (a)	each data package	Internal	Great Lakes Environmental Center	Pam Smith Laboratory Coordinator GLEC	Dennis McCauley Bioassay Testing Task Leader GLEC	Dennis McCauley Bioassay Testing Task Leader GLEC	Robin Silva-Wilkinson QA Officer GLEC

[1]*Note* – All data packages will receive internal validation and audits. In addition, all HRMS data packages will receive an external (E) Tier III validation by EPA-NE; whereas all non-HRMS data packages (excluding toxicology testing) will receive an external (E) Tier II validation. Tier II validation will be conducted by Environmental Standards.

(a) Includes laboratory record books and standard data forms.

EPA-NE QAPP Worksheet #27c - Rev. 10/99

Project Assessment Plan

QAPP Title:	Centredale QAPP
Assessed Organization:	Harding ESE
Location of Assessment:	North Providence Rhode Island (On-site)
Dates of Assessment:	During sample collection activities (June 2001 sampling event)
Assessment Team Members:	Rosanna Buhl
Type of Assessment:	Field audit
Assessment Scope:	Observation of field activities for compliance to QAPP and SOPs. Review of field records for sample tracking, and documentation completeness and accuracy.
Documents to be Reviewed:	Field records including field log books, field equipment notebook, and custody forms.
Notification Date(s):	At completion of field audit (mid to late June, 2001)
Proposed Schedule:	One-day field inspection. Date to be determined based on the activities of the field team.
Assessment No.:	
Contract No.:	

EPA-NE QAPP Worksheet #27c - Rev. 10/99

Project Assessment Plan

QAPP Title:	Centredale QAPP
Assessed Organization:	Battelle Duxbury
Location of Assessment:	Battelle Duxbury, Duxbury, MA
Dates of Assessment:	Completion of analytical task
Assessment Team Members:	Rosanna Buhl, Mark Guilmain
Type of Assessment:	Data audit
Assessment Scope:	Audit data package for completeness and accuracy in accordance with Battelle SOP 4-015
Documents to be Reviewed:	SVOC (PAHs) and chlorinated pesticides/PCB Aroclors data packages (custody, sample processing data, GC/MS and GC/ECD data and calibrations, and final report tables)
Notification Date(s):	At completion of audit (multiple SDGs – audited between August and mid November, 2001)
Proposed Schedule:	Estimated mid to late November, 2001
Assessment No.:	
Contract No.:	

EPA-NE QAPP Worksheet #27c - Rev. 10/99

Project Assessment Plan

QAPP Title:	Centredale Manor QAPP
Assessed Organization:	Battelle Columbus
Location of Assessment:	Battelle Columbus, Columbus, OH
Dates of Assessment:	Completion of analytical task
Assessment Team Members:	Charles D. Lawrie
Type of Assessment:	Data audit
Assessment Scope:	Audit data package for completeness and accuracy
Documents to be Reviewed:	Dioxin/Furan/HCX/TCX and extended PCB congener data packages (custody, sample processing data, GC/HRMS data and calibrations, and final report tables)
Notification Date(s):	At completion of audit (multiple SDGs – audited between September and mid December, 2001)
Proposed Schedule:	Estimated mid to late December, 2001
Assessment No.:	
Contract No.:	

EPA-NE QAPP Worksheet #27c - Rev. 10/99

Project Assessment Plan

QAPP Title:	Centredale Manor QAPP
Assessed Organization:	Battelle Marine Sciences Laboratory (MSL)
Location of Assessment:	Battelle Marine Sciences Laboratory (MSL)
Dates of Assessment:	Completion of analytical task
Assessment Team Members:	Deborah Coffey
Type of Assessment:	Data audit
Assessment Scope:	Audit data package for completeness and accuracy
Documents to be Reviewed:	Metals, Hardness, MeHg and AVS/SEM data package (custody, sample processing data, instrument data and calibration records (if appropriate), final report tables
Notification Date(s):	At completion of audit (multiple SDGs – audited between August and mid October, 2001)
Proposed Schedule:	Estimated mid to late October, 2001
Assessment No.:	
Contract No.:	

EPA-NE QAPP Worksheet #27c - Rev. 10/99

Project Assessment Plan

QAPP Title:	Centredale Manor QAPP
Assessed Organization:	Applied Marine Sciences, Inc.
Location of Assessment:	Applied Marine Sciences, Inc. League City, TX
Dates of Assessment:	Completion of analytical task
Assessment Team Members:	Chuck Davis
Type of Assessment:	Data audit
Assessment Scope:	Audit data package for completeness and accuracy
Documents to be Reviewed:	Grain Size and TOC data package (custody, sample processing data, instrument data and calibration records (if appropriate), final report tables
Notification Date(s):	At completion of audit (mid to late August, 2001)
Proposed Schedule:	Estimated mid to late August, 2001
Assessment No.:	
Contract No.:	

EPA-NE QAPP Worksheet #27c - Rev. 10/99

Project Assessment Plan

QAPP Title:	Centredale Manor QAPP
Assessed Organization:	Severn Trent Laboratory
Location of Assessment:	Severn Trent Laboratory
Dates of Assessment:	Completion of analytical task
Assessment Team Members:	Mimi Uhlfelder
Type of Assessment:	Data audit
Assessment Scope:	Audit data package for completeness and accuracy
Documents to be Reviewed:	VOC, SVOC (phenols/phthalates), and BOD data packages (custody, sample processing data, instrument data and calibration, final report tables)
Notification Date(s):	At completion of audit (mid to late August, 2001)
Proposed Schedule:	Estimated mid to late August, 2001
Assessment No.:	
Contract No.:	

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Project Assessment Plan

QAPP Title:	Centredale QAPP
Assessed Organization:	Chesapeake Biological Laboratory
Location of Assessment:	Solomons, MD
Dates of Assessment:	Completion of analytical task
Assessment Team Members:	Carl Zimmermann
Type of Assessment:	Data audit
Assessment Scope:	Audit data package for completeness and accuracy.
Documents to be Reviewed:	Nutrient and TSS data packages (custody, sample processing data, instrument data and calibrations, and final report tables)
Notification Date(s):	At completion of audit (mid to late August, 2001)
Proposed Schedule:	Estimated mid to late August, 2001
Assessment No.:	
Contract No.:	

EPA-NE QAPP Worksheet #27c - Rev. 10/99

Project Assessment Plan

QAPP Title:	Centredale QAPP
Assessed Organization:	Battelle MSL
Location of Assessment:	Battelle MSL, Sequim, WA
Dates of Assessment:	Initiation and termination of toxicological test
Assessment Team Members:	Deborah Coffey
Type of Assessment:	Data audit
Assessment Scope:	Audit project notebook, tables and report for completeness and accuracy in accordance with standard operating procedures MSL-Q-003 and MSL-Q-005.
Documents to be Reviewed:	Catfish ELS project notebook, tables and report
Notification Date(s):	At completion of audit (November, 2001)
Proposed Schedule:	November, 2001
Assessment No.:	
Contract No.:	

EPA-NE QAPP Worksheet #27c - Rev. 10/99

Project Assessment Plan

QAPP Title:	Centredale QAPP
Assessed Organization:	Great Lakes Environmental Center (GLEC)
Location of Assessment:	GLEC, Traverse City, Michigan
Dates of Assessment:	During bioassay tests
Assessment Team Members:	Robin Silva-Wilkinson
Type of Assessment:	Data audit
Assessment Scope:	Audit data package for completeness and accuracy
Documents to be Reviewed:	Bioassay testing project notebook (logbooks, data forms, calibration/maintenance records, balances, data summaries)
Notification Date(s):	At completion of audit (September, 2001)
Proposed Schedule:	September, 2001
Assessment No.:	
Contract No.:	

EPA-NE QAPP Worksheet #28 - Rev. 10/99

QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation, Title and Organizational Affiliation	Report Recipients, Title and Organizational Affiliation
Field Audit	1 inspection of sample collection procedures	Prior to completion of June sampling event	Rosanna Buhl QA Officer Battelle Duxbury	Field Operations Leader Harding ESE
Data Audit	1/data package (Moisture; Lipid Content)	At end of analytical task	Mark Guilmain QA Coordinator Battelle Duxbury	Sample Preparation Task Leader Laboratory Manager, and Project Manager Battelle Duxbury
Data Audit	1/data package (SVOC – PAHs and Chlorinated Pesticides/PCB Aroclors)	At end of analytical task	Mark Guilmain QA Coordinator Battelle Duxbury	GC/MS Analyst, GC/ECD Analyst, Laboratory Manager, and Project Manager Battelle Duxbury
Data Audit	1/data package (Dioxin/Furan/HCX/TCX and PCBs)	At end of analytical task	Charles D. Lawrie QA Officer Battelle Columbus	Sample Preparation, HRGC/HRMS Analyst, Laboratory Manager, Task Leader Battelle Columbus
Data Audit	1/data package (Moisture, Metals, MeHg, AVS/SEM, Hardness)	At end of analytical task	Deborah Coffey QA Officer Battelle MSL	Linda Bingler Task Leader Battelle MSL
Data Audit	1/data package (Grain Size, TOC)	At end of analytical task	Chuck Davis Senior Geotechnical Engineer/QC Manager Applied Marine Sciences, Inc	Ken Davis Grain Size and TOC Task Leader Applied Marine Sciences
Data Audit	1/data package (VOC, SVOC – Phenols/Phthalates, BOD)	At end of analytical task	Mimi Uhlfelder QA Manager STL Baltimore	Organic Manager and Lab Manager STL Baltimore
QA Statement	1/data package (TN/TP; TDN/TDP; TOC/DOC; /TSS)	At end of analytical task	Carl Zimmermann Senior Faculty Research Assistant CBL	Sample Preparation, Instrument Analyst CBL
Data Audit	1/data package (Catfish ELS)	At end of toxicological test	Deborah Coffey QA Officer Battelle MSL	Heida Diefenderfer Catfish ELS Task Leader Battelle MSL
Data Audit	1/data package (Bioassay Testing)	At end of bioassay test	Robin Silva-Wilkinson QA Coordinator GLEC	Dennis McCauley Bioassay Testing Task Leader Battelle MSL

EPA-NE QAPP Worksheet #29a - Rev. 10/99

Data Verification Process

Verification Task	Description	I/E [1]	Responsible for Verification (Name, Organization)
QA Audit (Moisture, Lipid Content)	See Section 19.0 of this QAPP and EPA-NE QAPP Worksheet #9a	I	Roxanne Bracket (Sample Preparation) Deirdre Dahlen (Sample Analysis Task Leader) Mark Guilmain (QA Coordinator) Battelle Duxbury
QA Audit (SVOC – PAHs, Chlorinated Pesticides/PCB Aroclors)	As above	I	Roxanne Bracket (Sample Preparation) Dan Bardon (GC/MS Analyst) Jonathan Thorn (GC/ECD Analyst) Deirdre Dahlen (Sample Analysis Task Leader) Mark Guilmain (QA Coordinator) Battelle Duxbury
QA Audit (Dioxin/Furan/HCX/ TCX and PCBs)	As above	I	Mark Misita (Sample Preparation) Joe Tabor (HRMS Analyst) Karen Tracy (Task Leader) Mary Schrock (Laboratory Manager) Charles D. Lawrie (QA Officer) Battelle Columbus
QA Audit (Moisture, Metals, MeHg, AVS/SEM, Hardness)	As above	I	Linda Bingler Task Leader Deborah Coffey (QA Officer) Battelle MSL
QA Audit (Grain Size, TOC)	As above	I	Ken Davis (Task Leader) Chuck Davis (QC Manager) Applied Marine Sciences, Inc.
QA Audit (VOC, SVOC – Phenols/Phthalates, BOD)	As above	I	Craig Schenning (Organic Manager) Mimi Uhlfelder (QA Manager) STL Baltimore
QA Audit (TN/TP, TDN&TDP, TOC/DOC, TSS)	As above	I	Carl Zimmermann (Senior Faculty Research Assistant) CBL
QA Audit (Catfish ELS)	As above; Catfish ELS study Attachment E	I	Heida Diefenderfer (Catfish ELS Task Leader) Deborah Coffey (QA Officer) Battelle MSL
QA Audit (Bioassay Test)	As above; Bioassay Testing study Attachment F	I	Dennis McCauley (Bioassay Testing Task Leader) Robin Silva-Wilkinson (QA Coordinator) GLEC

[1]*Note* – All data packages will receive internal validation and audits. In addition, all HRMS data packages will receive an external (E) Tier III validation by EPA-NE; whereas all non-HRMS data packages (excluding toxicology testing) will receive an external (E) Tier II validation. Tier II validation will be conducted by Environmental Standards.

EPA-NE QAPP Worksheet #29b - Rev. 10/99

Data Validation Summary Table

Medium/ Matrix	Analytical Parameter	Conc Level	Validation Criteria[1]	Validation Criteria Modified[2]	Data Validation Tier Level (a)	Modified Tier Level Used[3]	Data Validator (Name, title and organizational affiliation)	Responsibility for Data Validations (Name, title and organizational affiliation)
Tissue / Sediment/ Soil	Percent Moisture	Low	see below Section 18 of this QAPP and EPA-NE QAPP Worksheet #9a	NA	NA	NA	Roxanne Brackett Sample Prep Task Leader Battelle Duxbury	Roxanne Brackett Sample Prep Task Leader Battelle Duxbury
Tissue	Lipid Content	Low	As above	NA	NA	NA	Roxanne Brackett Sample Prep Task Leader Battelle Duxbury	Roxanne Brackett Sample Prep Task Leader Battelle Duxbury
Tissue / Sediment/ Soil /Water	Pest/PCBs	Low	As above	NA	NA	NA	Jon Thorn GC/ECD Analyst Battelle Duxbury	Jon Thorn GC/ECD Analyst Battelle Duxbury
Tissue / Sediment/ Soil /Water	SVOCs (PAHs)	Low	As above	NA	NA	NA	Dan Bardon GC/MS Analyst Battelle Duxbury	Dan Bardon GC/MS Analyst Battelle Duxbury
Tissue/ Sediment/ Soil	Dioxin/ Furan/HCX/ TCX and PCBs	Low	As above	NA	NA	NA	Joe Tabor GC/HRMS Analyst Battelle Columbus	Joe Tabor GC/HRMS Analyst Battelle Columbus
Tissue/ Sediment/ Soil	Metals and MeHg	Low	As above	NA	NA	NA	Deborah Coffey Battelle MSL	Deborah Coffey Battelle MSL
Sediment	AVS/SEM	Low	As above	NA	NA	NA	Deborah Coffey Battelle MSL	Deborah Coffey Battelle MSL
Water	Metals and Hardness	Low	As above	NA	NA	NA	Deborah Coffey Battelle MSL	Deborah Coffey Battelle MSL
Sediment/ Soil	Grain Size and TOC	Low	As above	NA	NA	NA	Mike Seymour Grain Size/TOC Analyst Applied Marine Sciences, Inc. (AMS)	Mike Seymour Grain Size/TOC Analyst Applied Marine Sciences, Inc. (AMS)
Sediment/ Soil/Water	SVOC (phenols/ phthalates)	Low	As above	NA	NA	NA	Primary GC/MS Analyst STL Baltimore	Secondary GC/MS Analyst STL Baltimore
Water	VOC	Low	As above	NA	NA	NA	Primary GC/MS Analyst STL Baltimore	Secondary GC/MS Analyst STL Baltimore
Water	BOD	Low	As above	NA	NA	NA	Michelle MacKaney STL Baltimore	Michelle MacKaney STL Baltimore

EPA-NE QAPP Worksheet #29b - Rev. 10/99 (continued)

Data Validation Summary Table

Medium/ Matrix	Analytical Parameter	Conc Level	Validation Criteria[1]	Validation Criteria Modified[2]	Data Validation Tier Level (a)	Modified Tier Level Used[3]	Data Validator (Name, title and organizational affiliation)	Responsibility for Data Validations (Name, title and organizational affiliation)
Water	DIN	Low	see below Section 18 of this QAPP and EPA-NE QAPP Worksheet #9a	NA	NA	NA	Technicon II and TrAAcs-800 Analysts CBL	Technicon II and TrAAcs-800 Analysts CBL
Water	TN/TP	Low	As above	NA	NA	NA	Technicon II Analyst CBL	Technicon II Analyst CBL
Water	TDN/TDP	Low	As above	NA	NA	NA	Technicon II Analyst CBL	Technicon II Analyst CBL
Water	TOC/DOC	Low	As above	NA	NA	NA	Shimadzu 5000 Analyst CBL	Shimadzu 5000 Analyst CBL
Water	TSS	Low	As above	NA	NA	NA	TSS Analyst CBL	TSS Analyst CBL
Catfish Eggs	Catfish ELS Test	NA	≥ 65% hatch of fertilized eggs	NA	NA	NA	Heida Diefenderfer Catfish ELS Task Leader Battelle MSL	Heida Diefenderfer Catfish ELS Task Leader Battelle MSL
Sediment	Bioassay Test	NA	See Attachment F	NA	NA	NA	Dennis McCauley Bioassay Testing Task Leader GLEC	Dennis McCauley Bioassay Testing Task Leader GLEC

[1] If the most recent revision of the Region I, EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses will not be used to validate project data, then document this fact and, on EPA-NE QAPP Worksheet #29a, provide a detailed description of the alternate validation criteria and/or procedures that will be used.

[2] If the Region I validation criteria will be modified to meet project objectives, then document this fact and, on EPA-NE QAPP Worksheet #29a, provide a detailed description of the modified validation criteria that will be used.

[3] If a modified validation Tier will be used to validate project data, then document this fact and, on EPA-NE QAPP Worksheet #29a, provide a detailed description of the Tier modifications that will be used.

(a) Note – All data packages will receive internal validation and audits. In addition, all HRMS data packages will receive an external (E) Tier III validation by EPA-NE; whereas all non-HRMS data packages (excluding toxicology testing) will receive an external (E) Tier II validation. Tier II validation will be conducted by Environmental Standards.

EPA-NE QAPP Worksheet #29c - Rev. 10/99

Data Validation Modifications

Participating laboratories (*i.e.,* Battelle Columbus, Battelle MSL, AMS, STL, CBL and GLEC) will be responsible for performing data validation and verification of the data package. Data validation and verification procedures will follow internal laboratory SOPs and are further described in EPA-NE QAPP Worksheet #9a. The appropriate Task Leader will document and justify modifications to data validation/verification procedures, followed up by notification to the Project Manager/QA Officer for approval.

EPA-NE QAPP Worksheet #30 - Rev. 10/99

Data Usability Assessment

Data Usability Assessment

Data will be evaluated for usability as described in Figure 3 (EPA-NE QAPP Worksheet #30). Further details concerning procedures used to evaluate data for usability will be discussed in Harding's Data Management Plan

Calculation of Quality Control Data

The calculation of quality control statistics is described in Battelle SOP 7-029 and routine methods used to assess precision and accuracy are described below.

Accuracy —Accuracy is the closeness of agreement between an observed value and an accepted value. Accuracy of analyses is assessed through analysis of laboratory control samples (LCS), standard reference materials (SRM), matrix spikes (MS/MSD), surrogate internal standards (SIS), and method or procedural blanks.

Accuracy is quantified through the use of the following equations:

- Percent Recovery (R) in authentic samples (*e.g.*, matrix spikes)

$$R = [(C_s - C_u) \div S] \times 100$$

Where,
C_s = concentration of spiked sample
C_u = concentration in unspiked sample and
S = expected concentration of spike in sample

- Percent Recovery based on known concentrations (*e.g.*, surrogates)

$$R = (C_s \div C_c) \times 100$$

Where,
C_c = certified or true concentration and
C_s = concentration of sample

- Percent Difference (PD) based on known concentrations (*e.g.*, SRM)

$$PD = (|C_c - C_s| \div C_c) \times 100$$

Where,
C_c = certified or true concentration and
C_s = concentration of sample

EPA-NE QAPP Worksheet #30 - Rev. 10/99 (continued)

Data Usability Assessment

Precision—Precision is defined as the degree of reproducibility among individual measurements of the same property, obtained under similar conditions. Measure of analytical precision may be determined by the analysis of laboratory replicate and matrix spike duplicates. Laboratory replicates are prepared by homogenizing and splitting samples in the laboratory, and carrying the subsamples through the entire analytical process.

Precision is quantified through the use of the following mathematical formulae:

- For two samples, Relative Percent Difference (RPD)

$$RPD = [\,|A - B| \div (A + B)] \times 200$$

Where,
A and B are the concentrations (or percent recoveries) detected in the two samples.

Coefficient of Variation is quantified through the use of the following mathematical formula:

- For three samples, Coefficient of Variation (CV)

$$CV = (SD/Mean) \times 100$$

Where,
SD is the standard deviation of the sample concentrations and
Mean is the mean of the sample concentrations

Limits of Detection— Chlorinated pesticide/PCB Aroclor and LRMS analysis results will be reported relative to the quantitation limit (QL) for that compound. The QL is equivalent to a final extract concentration that is the same as the low calibration standard concentration.

QLs are calculated as:

$$QL = (\text{Concentration in Low Std.} \times \text{final extract volume} \times \text{dilution factors}) / \text{Sample size}$$

Dioxin/Furan/HCX/TCX results will be reported relative to the sample specific estimated detection limit (EDL) for that compound. The sample specific EDL is defined as the concentration of a given analyte required to produce a signal with a peak height of at least 2.5 times the background signal level.

EPA-NE QAPP Worksheet #30 - Rev. 10/99 (continued)

Data Usability Assessment

EDLs are calculated as:

$$EDL = (2.5 \times H_x \times Q_{is}) / (H_{is} \times W \times RF_n)$$

Where,

H_x = Sum of the height of the noise level for each quantitation ion for the unlabeled PCDDs/PCDFs.

H_{is} = Sum of the height of the noise level for each quantitation ion for the labeled internal standard.

W = Sample size, g wet weight

RF = Calculated mean relative response factor for each analyte

Q_{is} = Quantity, in pg, of the internal standard added to sample before extraction.

HRMS PCB results will be reported relative to the estimated minimum level (EML) specified in Method 1668, Revision A, Table 2

Metals, MeHg, and AVS/SEM results will be reported relative to the achievable laboratory MDLs reported in EPA-NE QAPP Worksheet #9b; hardness results will be reported relative to the analytical method MDL (EPA-NE QAPP Worksheet #9b).

SVOC (phenols/phthalates) and VOC results will be reported relative to the achievable laboratory QLs reported in EPA-NE QAPP Worksheet #9b.

All nutrient and TSS results will be reported relative to the Method Detection Limit (MDL) for that compound. With the exception of BOD, the MDL is equivalent to three times the standard deviation of seven replicates of low-level samples. MDLs used to evaluate BOD data are from EPA Method 405.1. MDLs for nutrients, TSS, and BOD are presented in EPA-NE QAPP Worksheet #9b.

All analytical results reported below the sample-specific detection limits are flagged as such.

EPA-NE QAPP Worksheet #30 - Rev. 10/99 (continued)

Data Usability Assessment

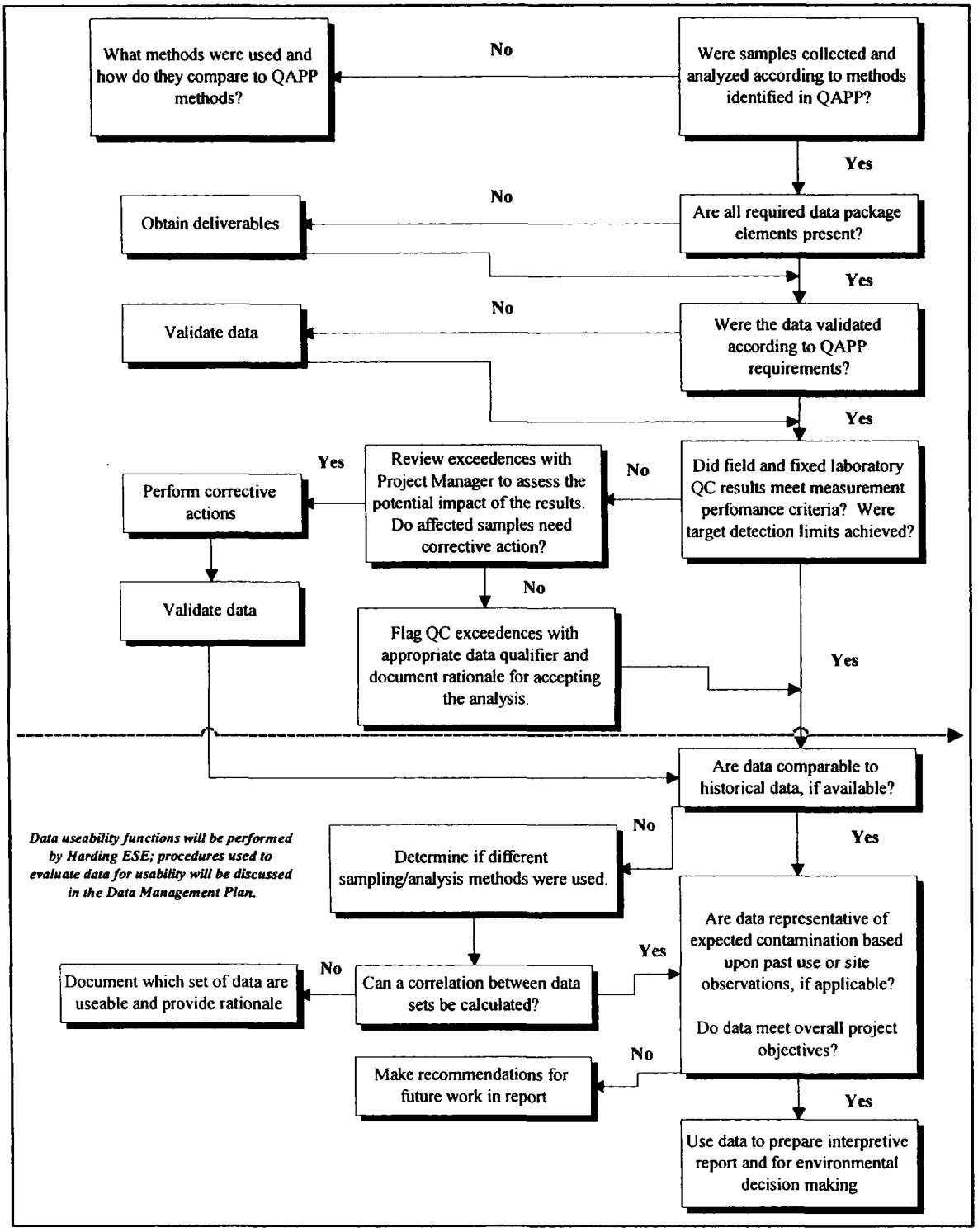

Figure 3. Preliminary Data Review Decision Tree.

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Table 1

Number of Samples and Required Parameters for Analytical Chemistry by Exposure Area

Field Sampling Plan for the Human Health and Ecological Risk Assessments
Centredale Manor Restoration Site
North Providence, Rhode Island

		Number of Authentic Samples							Field QC		Laboratory QC		Required Analyses														
		Reference Area [a]		*Exposure Area [a]*																							
Matrix	Type	Upstream/ Greystone Mill Pond	Assapumpsett Brook/Pond	Allendale Reach	Lymansville Reach	Manton Reach [b]	Dyerville Reach [b]	Total # Samples	Duplicate *	Rinsate Blank **	Duplicate	MS/MSD	VOCs	SVOCs	TICs	PCBs/ Pesticides	Metals	MeHg	Dioxins/ Furans (w/ HCX)	PCB congeners	Hardness	TOC	Lipid	AVS/ SEM	Grain Size	Percent Moisture	Nutrients [c]
Tissue	Fish - demersal	10 {2}	10 {2}	10 {2}	10 {2}			40	0	0	2	4	-	✓	✓	✓	✓	✓	✓	✓	-	-	✓	-	-	✓	-
	Fish - piscivorous (fillet) [c]	10 {2}	10 {2}	10 {2}	10 {2}	3	3	46	0	0	3	6	-	✓	✓	✓	✓	✓	✓	✓	-	-	✓	-	-	✓	-
	Fish - piscivorous (offal) [c]	10 {2}	10 {2}	10 {2}	10 {2}	3	3	46	0	0	3	6	-	✓	✓	✓	✓	✓	✓	✓	-	-	✓	-	-	✓	-
	Other - fish, frog or turtle	10 {2}	10 {2}	10 {2}	10 {2}			40	0	0	2	4	-	✓	✓	✓	✓	✓	✓	✓	-	-	✓	-	-	✓	-
	Subtotal - HHRA/ERA tissue	40 {8}	40 {8}	40 {8}	40 {8}	6	6	172	0	0	10	20															
Tissue	Crayfish	3 {1}	1	3 {1}	4 {1}	-	-	11	0	0	1	2	-	-	-	✓	✓	✓	✓	✓	-	-	✓	-	-	✓	-
	Emerging insects	5	-	5	5	-	-	15	0	0	1	2	-	-	-	✓	✓	✓	✓	✓	-	-	✓	-	-	✓	-
	Earthworms	3 {1}	1	3 {1}	4 {1}	-	-	11	0	0	1	2	-	-	-	✓	✓	✓	✓	✓	-	-	✓	-	-	✓	-
	Subtotal - ERA only tissue	11	2	11	13			37	0	0	3	6															
	Total Tissue	**51**	**42**	**51**	**53**	**6**	**6**	**209**	**0**	**0**	**13**	**26**															
Sediment	Crayfish locations	3 {1}	1	3 {1}	4	-	-	11	1	1	1	2	-	-	-	✓	✓	✓	✓	✓	-	✓	-	✓	✓	✓	-
Sediment	Invertebrate bioassay [e]	1	1	3	3	-	-	8	0	0	1	2	-	✓	-	✓	✓	✓	-	-	-	✓	-	✓	✓	✓	-
	Subtotal - Sediment	4	2	6	7			19	1	1	2	4															
Surface Water		3	2	3	2	-	-	10	0	1	1	2	✓	✓	-	✓	✓	-	-	-	✓	-	-	-	-	-	✓
Floodplain Soil		3 {1}	1	3 {1}	4	-	-	11	0	1	1	2	-	✓	-	✓	✓	✓	✓	✓	-	✓	-	-	✓	✓	-

Notes:
[a] - Number in brackets is the number of samples from each area which will be analyzed for PCB congeners (i.e., 20 percent of the total number of samples).
[b] - A total of three samples will be collected in the Manton and Dyerville reaches. Species selection will be determined based on the fish community survey and risk assessment objectives.
[c] - Nutrient analyses include Dissolved Inorganic Nitrogen (DIN), Total Dissolved Nitrogen (TDN), Total Dissolved Phosphorus (TDP), Total Phosphorus (TP), Total Nitrogen (TN), Total Suspended Solids (TSS), and Biological Oxygen Demand (BOD).
[d] - It is assumed that only one category of fish tissue will require analysis of separate tissue fraction to support the human health and ecological risk assessment.
[e] - Sediments will also be analyzed for the presence of ammonia prior to testing.

AVS/SEM - acid volatile sulfides/simultaneously extracted metals
ERA - ecological risk assessment
HCX - hexachloro(9H)xanthene
HHRA - human health risk assessment
PCB - polychlorinated biphenyls
SVOC - semivolatile organic compound
TIC - tentatively identified compound
TOC - total organic carbon
VOC - volatile organic compound

Table 2

Number of Samples and Minimum Sample Volume/Mass for Analytical Chemistry by Exposure Area

Field Sampling Plan for the Human Health and Ecological Risk Assessments
Centredale Manor Restoration Site
North Providence, Rhode Island

		Number of Authentic Samples							Field QC		Laboratory QC		Sample Volume/Mass Requirements/Sample											
		Reference Area [a]		*Exposure Area [b]*																				
Matrix	Type	Upstream/ Greystone Mill Pond	Assapumpsett Brook/Pond	Allendale Reach	Lymansville Reach	Manton Reach [c]	Dyerville Reach [c]	Total # Samples	Duplicate *	Rinsate Blank **	Duplicate	MS/MSD	VOCs	SVOCs	PCBs/ Pesticides/ SVOCs (as PAHs) w/ Lipid & Moisture	Metals, MeHg (including hardness)	Dioxins/ Furans (w/ HCX)	PCB congeners	TOC	AVS/ SEM	Grain Size	Nutrients [d]	Total Volume/ Mass per Sample	Units
Tissue	Fish - demersal	10	10(4)	10(1)	10(1)	-	-	40	0	0	2	4	-	n/a	60	20	20	20	-	-	-	-	120	grams (wet)
	Fish - piscivorous (fillet) [e]	10(2)	10(4)	10	10(2)	3(1)	3	46	0	0	3	6	-	n/a	60	20	20	20	-	-	-	-	120	grams (wet)
	Fish - piscivorous (offal) [e]	10(2)	10(4)	10	10(2)	3(1)	3	46	0	0	3	6	-	n/a	60	20	20	20	-	-	-	-	120	grams (wet)
	Other - fish, frog or turtle	10	10(4)	10(1)	10(1)	-	-	40	0	0	2	4	-	n/a	60	20	20	20	-	-	-	-	120	grams (wet)
	Subtotal - HHRA/ERA tissue	40(4)	40(16)	40(2)	40(6)	6(2)	6	172	0	0	10	20												
Tissue	Crayfish	3	1(2)	3	4(1)	-	-	11	0	0	1	2	-	-	60	20	20	20	-	-	-	-	120	grams (wet)
	Emerging insects	5(2)	-	5	5(1)	-	-	15	0	0	1	2	-	-	60	20	20	20	-	-	-	-	120	grams (wet)
	Earthworms	3	1(2)	3	4(1)	-	-	11	0	0	1	2	-	-	60	20	20	20	-	-	-	-	120	grams (wet)
	Subtotal - ERA only tissue	11(2)	2(4)	11	13(3)			37	0	0	3	6												
	Total Tissue	**51(6)**	**42(20)**	**51(2)**	**53(9)**	**6(2)**	**6**	**209**	**0**	**0**	**13**	**26**												
Sediment	Crayfish locations	3	1(2)	3	4(1)	-	-	11	1	1	1	2	-	-	100	20	30	30	10	20	200	-	410	grams (wet)
Sediment	Invertebrate bioassay [f]	1	1(2)	3	3(1)	-	-	8	0	0	1	2	-	100	100	20	-	-	10	20	200	-	450	grams (wet)
	Subtotal - Sediment	4	2(4)	6	7(2)			19	1	1	2	4												
Surface Water		3	2(2)	3	2(1)	-	-	10	0	1	1	2	2	2	2	1	-	-	-	-	-	3	10	liters
Floodplain Soil		3	1(2)	3	4(1)	-	-	11	0	1	1	2	-	100	100	20	30	30	10	-	200	-	490	grams (wet)

Notes:
[a] - Required MS/MSD samples (indicated in parentheses) will be collected from reference area sample locations
[b] - Required laboratory duplicates (indicated in parentheses) will be collected from exposure area sample locations.
[c] - A total of three samples will be collected in the Manton and Dyerville reaches. Species selection will be determined based on the fish community survey and risk assessment objectives.
[d] - Nutrient analyses include Dissolved Inorganic Nitrogen (DIN), Total Dissolved Nitrogen (TDN), Total Dissolved Phosphorus (TDP), Total Phosphorus (TP), Total Nitrogen (TN), Total Suspended Solids (TSS), and Biological Oxygen Demand (BOD).
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AVS/SEM - acid volatile sulfides/simultaneously extracted metals
ERA - ecological risk assessment
HCX - hexachloro(9H)xanthene
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MeHg - methylmercury
PCB - polychlorinated biphenyls
SVOC - semivolatile organic compound
TIC - tentatively identified compound
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VOC - volatile organic compound

FINAL FIELD SAMPLING PLAN

HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

CENTREDALE MANOR RESTORATION SUPERFUND PROJECT SITE NORTH PROVIDENCE, RHODE ISLAND

Submitted to:

Department of the Army
U.S. Army Corps of Engineers
New England Division

Contract No. DACW33-96-0005
Delivery Order No. 0059

June 1, 2001

Prepared by:

HARDING ESE, INC.
107 Audubon Road, Suite 301
Wakefield, MA 01880
(781) 245-6606

Under Contract to:

BATTELLE
397 Washington Street
Duxbury, MA 02332
(617) 934-0571

QUALITY ASSURANCE STATEMENT

Subcontractor: Harding ESE, Inc.

Delivery Order Title: Centredale / Woonasquatucket River

Delivery Order No.: 0059

Description of audit and review activities:

Presentation of the field sampling plan.

Description of outstanding issues or deficiencies which may affect data quality:

None identified.

Signature of QA Officer — Date: 6/5/01

Subcontractor Project Leader — Date: 6/1/2001