DATA REPORT

PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENT CHEMISTRY, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE FOR PCB-CONTAMINATED SEDIMENTS FROM THE UPPER HUDSON RIVER, NEW YORK

HUDSON RIVER NATURAL RESOURCE DAMAGE ASSESSMENT

HUDSON RIVER NATURAL RESOURCE TRUSTEES

STATE OF NEW YORK

U.S. DEPARTMENT OF COMMERCE

U.S. DEPARTMENT OF THE INTERIOR

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HUDSON RIVER

DATA REPORT: PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENTS, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE

EXECUTIVE SUMMARY

Natural resources of the Hudson River have been contaminated through past and ongoing discharges of polychlorinated biphenyls (PCBs). The Hudson River Natural Resource Trustees – New York State, the U.S. Department of Commerce, and the U.S. Department of the Interior – are conducting a natural resource damage assessment to assess and restore those natural resources injured by PCBs.

On behalf of the Trustees, beginning in 2008, Principal Investigators conducted a sediment toxicity pilot study, according to a Trustee-approved work plan, and prepared a data report documenting the results of the preliminary investigation.

Two major conclusions from the pilot study are:

- PCBs are prevalent in sediments throughout the study area; and,
- Exposure to UHR sediments resulted in toxicity to both midge and amphipods, with the reproduction endpoints being the most sensitive.

HUDSON RIVER

DATA REPORT: PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENTS, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE

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Appendix A: "Data Report, Pilot Study for the Characterization of Sediment Chemistry, Sediment Toxicity, and Benthic Invertebrate Community Structure for PCB-Contaminated Sediments from the Upper Hudson River, New York"; this includes the following:

Appendix 1: Work Plan for the Pilot Study on the Effects of PCB-Contaminated Sediments on Benthic Invertebrates in the Upper Hudson River, New York

Appendix 2: Data Validation Report: Benthic Pilot Study Sediment Data

Appendix 3: Hudson River Saratoga and Washington County, NY: Benthic Macroinvertebrate Community Analysis

Appendix 4: Upper Hudson River Pilot Study: Raw Toxicity Test Results

HUDSON RIVER

DATA REPORT: PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENTS, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE

1.0 BACKGROUND

Past and continuing discharges of polychlorinated biphenyls (PCBs) have contaminated the natural resources of the Hudson River. The Hudson River Natural Resource Trustees – New York State, the U.S. Department of Commerce, and the U.S. Department of the Interior – are conducting a natural resource damage assessment (NRDA) to assess and restore those natural resources injured by PCBs (Hudson River Trustee Council (HRTC) 2002).

The Hudson River provides habitat for a range of organisms that live in or on the river bottom. These sediment-dwelling organisms —or benthic macroinvertebrates — live in direct contact with the aquatic sediments that are contaminated with PCBs. The presence of elevated concentrations of PCBs in sediments could be harmful to these organisms, which are important elements of aquatic ecosystems and are often used as indicators of the health of such systems. In addition, PCBs can accumulate in the tissues of benthic macroinvertebrates, thereby placing consumers of these organisms, such as birds and fish, at risk of adverse health effects.

2.0 INTRODUCTION

In the Hudson River NRDA Plan (HRTC 2002), it was noted that:

> "The Trustees may perform an investigation to determine whether the concentrations of PCBs in Hudson River sediments are sufficient to cause injury to other natural resources, such as biota, that are exposed to those sediments. This evaluation could be primarily focused on evaluating injury to sediment-dwelling biota due to exposure to PCB-contaminated sediments and associated water in the Hudson River."

In 2008, the Trustees determined that it was appropriate to proceed with a preliminary investigation of the toxicity of Hudson River sediments to sediment-dwelling biota and selected Principal Investigators (PIs) to conduct such a study. The PIs developed a work plan for such an investigation, which was subsequently approved by the Trustees. In September 2008, the Trustees released to the public a Fact Sheet, entitled, "Sediment Toxicity Pilot Study for the Hudson River NRDA" (Hudson River Natural Resource Trustees 2008).

3.0 OBJECTIVE OF THE PILOT STUDY

The objective of the sediment toxicity pilot study was to determine if PCB-contaminated sediments from the Hudson River are toxic to sediment-dwelling organisms. Sediment-dwelling organisms may be exposed to PCBs that are bound to sediment particles, as well as any PCBs that are dissolved in the water in and around the sediment. Sediment toxicity tests measure the effects of sediment-associated PCBs on benthic macroinvertebrates by exposing test organisms to PCBs in the same way they are exposed in the environment. The study also evaluated the composition and structure of the benthic macroinvertebrate community and assessed the bioavailability of PCBs. The combination of sediment toxicity, benthic community, and bioavailability data provide multiple means of measuring potential effects of PCBs.

During late September and early October 2008, sediment was collected from the Hudson River between the former Fort Edward Dam and the Thompson Island Dam. Samples representing a range of PCB concentrations were sent to a toxicity testing laboratory where test organisms were placed in exposure chambers containing the Hudson River sediment. These organisms were monitored over several weeks for survival, growth, and reproduction. The study also evaluated the structure of the benthic macroinvertebrate community.

The purpose of this work was to inform the Trustees regarding injury to sediments and sediment-dwelling organisms exposed to PCB-contaminated sediments, as defined in regulations written by the U.S. Department of the Interior (Title 43 of the Code of Federal Regulations Part 11, Natural Resource Damage Assessment). This work will also be used to help determine whether future studies will be performed, and if so, to help in their design.

4.0 METHODS AND RESULTS OF THE PILOT STUDY

On behalf of the Trustees, beginning in 2008, the PIs conducted a sediment toxicity pilot study, according to the Trustee-approved work plan (Hudson River Natural Resource Trustees 2009; Appendix 1 to Appendix A of this report). The PIs subsequently prepared a data report documenting the results of the preliminary investigation (Appendix A).

5.0 QUALITY ASSURANCE / QUALITY CONTROL

This study was conducted in accordance with Quality Assurance Management Plans for the Trustees' Hudson River NRDA (Hudson River Natural Resources Trustees 2002; Hudson River Natural Resource Trustees 2005). Strict Chain of Custody procedures were used throughout the study.

6.0 CONCLUSIONS OF THE PILOT STUDY

Two major conclusions from the pilot study are:

- PCBs are prevalent in sediments throughout the study area; and,
- Exposure to UHR sediments resulted in toxicity to both midge and amphipods, with the reproduction endpoints being the most sensitive.

These and other conclusions are discussed fully in Appendix A.

7.0 REFERENCES

Hudson River Trustee Council. 2002. Hudson River Natural Resource Damage Assessment Plan. September 2002. U.S. Department of Commerce, Silver Spring, MD.

Hudson River Natural Resource Trustees. 2002. Analytical Quality Assurance Plan. Version 1.0. Hudson River Natural Resource Damage Assessment. Public Release Version. 9 July 2002. U.S. Department of Commerce, Silver Spring, MD.

Hudson River Natural Resource Trustees. 2005. Analytical Quality Assurance Plan. Version 2.0. Hudson River Natural Resource Damage Assessment. Public Release Version. 1 September 2008. U.S. Department of Commerce, Silver Spring, MD.

Hudson River Natural Resource Trustees. 2008. Sediment Toxicity Pilot Study for the Hudson River NRDA. Fact Sheet. Hudson River Natural Resource Damage Assessment. September 2008. U.S. Department of Commerce, Silver Spring, MD.

Hudson River Natural Resource Trustees. 2009. Work Plan for the Pilot Study on the Effects of PCB-Contaminated Sediments on Benthic Invertebrates in the Upper Hudson River, New York. Version 4.0. Prepared for: National Oceanic and Atmospheric Administration, Damage Assessment, Remediation, and Restoration Program, Silver Spring, MD.

HUDSON RIVER

DATA REPORT: PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENTS, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE

Appendix A

Pilot Study for the Characterization of Sediment Chemistry, Sediment Toxicity, and Benthic Invertebrate Community Structure for PCB-Contaminated Sediments from the Upper Hudson River, New York

Data Report

HUDSON RIVER

DATA REPORT: PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENTS, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE

PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENT CHEMISTRY, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE FOR PCB-CONTAMINATED SEDIMENTS FROM THE UPPER HUDSON RIVER, NEW YORK

DATA REPORT

HUDSON RIVER NATURAL RESOURCE DAMAGE ASSESSMENT

PREPARED FOR:

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
DAMAGE ASSESSMENT, REMEDIATION, AND RESTORATION PROGRAM
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MAY 2016

PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENT CHEMISTRY, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE FOR PCB-CONTAMINATED SEDIMENTS FROM THE UPPER HUDSON RIVER, NEW YORK—DATA REPORT

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Appendix 4 Upper Hudson River Pilot Study: Raw Toxicity Test Results

List of Acronyms

AVS	acid volatile sulfide
BICS	benthic invertebrate community structure
BSAF	biota-sediment accumulation factor
CERC	Columbia Environmental Research Center
cm	centimeters
COC	contaminant of concern
COPC	chemical of potential concern
-d	day
DW	dry weight
EDD	electronic data deliverable
EPT	Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies)
ESB-TU_{FCV}	equilibrium partitioning sediment benchmark toxic units final chronic value
f_{OC}	fraction organic carbon
GIS	geographic information system
HRGC/HRMS	high-resolution gas chromatography/high resolution mass spectrometry
ICP-MS	inductively coupled plasma mass spectrometry
L	liter
LRMS-SIM	low resolution mass spectrometer selective ion monitoring
MS	Microsoft
LMW-PAH	low-molecular-weight polycyclic aromatic hydrocarbon
mL	milliliters
mm	millimeters
NRDA	natural resource damage assessment
OC	organic carbon
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEC-Q	probable effect concentration-quotient
PMA	percent model affinity
QA/QC	quality assurance/quality control
SEM	simultaneously extracted metal
SOP	standard operating procedure

LIST OF ACRONYMS (CONTINUED)

SPME	solid-phase microextraction
TOC	total organic carbon
Trustees	Hudson River Natural Resource Trustees
UHR	Upper Hudson River
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

EXECUTIVE SUMMARY

The Hudson River Natural Resource Trustees (Trustees) include the New York State Department of Environmental Conservation, the U.S. Department of the Interior through the U.S. Fish and Wildlife Service and the National Park Service, and the U.S. Department of Commerce through the National Oceanic and Atmospheric Administration. Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, the Trustees have the authority to assess damages to natural resources resulting from releases of hazardous substances. The Trustees also have the authority to restore or acquire the equivalent of such injured resources.

In 2008, the Trustees conducted a pilot study to evaluate the effects on sediment-dwelling organisms associated with exposure to polychlorinated biphenyls (PCBs) in Hudson River sediments (Hudson River Natural Resource Trustees 2008; MacDonald *et al.* 2009a). The Trustees conducted this pilot study as part of their ongoing natural resource damage assessment (NRDA) of the Hudson River. The objective of the sediment toxicity pilot study was to determine if PCB-contaminated sediments from the Hudson River were toxic to sediment-dwelling organisms. Objectives included evaluation of toxicity of Hudson River sediments to the amphipod *Hyalella azteca* and the midge *Chironomus dilutus*, as well as evaluation of the Hudson River benthic macroinvertebrate community structure. Assessing the bioavailability of PCBs in Hudson River sediments was initially proposed as an objective but was eliminated prior to implementation of the Work Plan due to funding limitations. The pilot study investigation involved collection of a total of 43 sediment samples from the Upper Hudson River (UHR) study area, primarily between Rogers Island and Griffin Island (three of the samples were from an upstream reference area). These sediment samples were initially analyzed to characterize total PCB and total organic carbon concentrations. Using these data, a subset of the samples was selected for further chemical characterization (12 samples), toxicity testing (12 samples), and benthic invertebrate community structure assessment (14 samples).

Among the 40 sediment samples collected downstream of Fort Edward in 2008, total PCB concentrations ranged from 185 to 1,210,000 μg/kg dry weight (DW; or 219 to 242,000 μg/kg DW @ 1% OC). By comparison, total PCB concentrations ranged from 5.4 to 1,430 μg/kg DW (or 56.8 to 215 μg/kg DW @ 1% OC) for the three sediment samples collected within the upstream reference area. Twenty-three metals, five individual simultaneously extracted metals, acid volatile sulfides, 45 individual polycyclic aromatic hydrocarbons (PAHs) and PAH mixtures, and 16 organochlorine pesticides were also detected in sediments from the UHR.

Splits of the 12 sediment samples selected for chemical characterization were used to evaluate toxicity to benthic invertebrates associated with exposure to UHR sediments. More specifically, two long-term toxicity tests were conducted to evaluate effects on benthic invertebrates exposed to PCB-contaminated sediment, including a 42-day (d) sediment toxicity test with the amphipod, *H. azteca*, and a ~53-d sediment toxicity test with the midge, *C. dilutus*. Endpoints measured in the *H. azteca* toxicity test included survival, length, weight, biomass, and reproduction. Endpoints measured in the *C. dilutus* toxicity test included larval survival, weight, and biomass, and adult emergence and reproduction. The results of this assessment showed that sediments from the UHR were toxic to benthic invertebrates. For amphipods (*H. azteca*), 10 of the 12 sediment samples were identified to be toxic to one or more of the endpoints measured. Similarly, 10 of the 12 sediment samples from the UHR were identified as toxic to midge (*C. dilutus*; based on the observed responses for one or more of the endpoints measured). For both species, the reproductive endpoints were the most responsive in exposures with UHR sediments.

Benthic invertebrate community structure was evaluated in a total of 70 samples obtained from the UHR (i.e., five replicate samples were obtained from each of 14 sampling locations). These samples were selected to match the sediment samples that were selected for toxicity testing and chemical characterization. The abundance of benthic invertebrates ranged from 5 to 349 among the 70 replicate samples that were evaluated. A total of 96 unique taxa were identified in these samples, with nine taxa comprising 67% of the total abundance of benthic invertebrates. The benthic invertebrate community was dominated by two taxonomic groups, including tubificid worms (which accounted for 28% of the individuals counted) and midge (which accounted for 44% of the individuals counted).

This data report summarizes the results of the pilot study. Interpretations of these results are not included in this report, however. The Trustees may include interpretations of the pilot study results in other documents prepared to support the NRDA or elsewhere.

1.0 INTRODUCTION

The Hudson River Natural Resource Trustees (Trustees) include the New York State Department of Environmental Conservation, the U.S. Department of the Interior through the U.S. Fish and Wildlife Service and the National Park Service, and the U.S. Department of Commerce through the National Oceanic and Atmospheric Administration. Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, the Trustees have the authority to assess damages to natural resources resulting from releases of hazardous substances. The Trustees also have the authority to restore or acquire the equivalent of such injured resources.

Bed sediments in the Hudson River are contaminated by polychlorinated biphenyls (PCBs). The presence of elevated levels of PCBs in aquatic sediments represents a potential environmental concern for several reasons. First, bed sediments provide essential habitats for communities of benthic and epibenthic organisms utilizing aquatic habitats in the upper Hudson River. The presence of elevated concentrations of PCBs in sediments is known to be harmful to sediment-dwelling organisms (MacDonald *et al.* 2000a, 2000b; Ingersoll *et al.* 2014), which are essential elements of freshwater ecosystems. Second, PCBs can accumulate in the tissues of aquatic organisms and, as a result, pose potential hazards to those higher trophic-level species that consume fish and other aquatic organisms, including humans and wildlife.

To address concerns regarding the hazards that contaminated sediments pose to benthic invertebrates, the Hudson River Trustees conducted a pilot study in 2008. The pilot study was intended to provide preliminary information on the effects on benthic invertebrates associated with exposure to PCB-contaminated sediments from the upper Hudson River (UHR). By targeting sediments spanning a broad range of PCB concentrations, the study was also designed to explore relationships between sediment chemistry and sediment toxicity for upper Hudson River sediments. This document was prepared to report:

- Data on the concentrations of PCBs and other chemicals of potential concern (COPCs) in surficial sediments collected during the 2008 pilot study;
- Data on the responses of two indicator species of benthic invertebrates (the amphipod, *Hyalella azteca*, and the midge, *Chironomus dilutus*) exposed to PCB-contaminated sediments collected during the 2008 pilot study; and
- Data on the structure of the benthic macroinvertebrate communities that were sampled during the 2008 pilot study.

The Trustees may issue additional reports that interpret the results of the 2008 pilot study. However, such data interpretations are beyond the scope of this data report.

2.0 MATERIALS AND METHODS

2.1 STUDY AREA

The UHR extends from the headwaters to the Federal Dam at Troy, a distance of about 255 km. The 2008 pilot study was conducted within the portion of the UHR between Rogers Island (latitude 43.263070°, longitude -73.586027°) and Griffin Island (latitude 43.2070838°, longitude -73.581715°; Figures 1 and 2). This principal study area has been considered to be among the most contaminated reaches of the Hudson River with respect to sediment-associated PCBs. In addition, a reference area located upstream of Fort Edward was included in the study design (Figures 1 and 2).

2.2 STUDY DESIGN

The pilot study was designed to provide preliminary data and information for evaluating the effects on benthic invertebrates associated with exposure to PCB-contaminated sediments from the UHR. To support the design of the investigation, historical data on the concentrations of PCBs in UHR sediments were acquired, assembled, reviewed, and collated. Subsequently, these sediment chemistry data were mapped to evaluate the distribution of PCBs in surficial sediments in the UHR. This information was used to identify a total of 43 sediment sampling locations that were expected to provide a broad gradient in sediment PCB concentrations, with total PCB concentrations expected to range from < 1,000 to 100,000 μg/kg DW @ 1% organic carbon (OC) at these locations (based on historical data; MacDonald *et al.* 2009a; attached as Appendix 1). At each of these locations (Figure 2), sediment samples were collected in October 2008 and submitted for chemical analysis to determine the concentrations of total PCBs and total organic carbon (TOC). The results of these preliminary chemical analyses were used to select a subset of sediment samples for further chemical characterization (12 samples), toxicity testing (12 samples), and benthic invertebrate community structure (BICS) analysis (14 samples). These sediment samples were selected to obtain at least two samples in each of six concentration ranges for total PCBs, including:

- <1,000 μg/kg dry weight (DW) @ 1% OC;
- 1,000 - <5,000 μg/kg DW @ 1% OC;
- 5,000 - <10,000 μg/kg DW @ 1% OC;
- 10,000 - <20,000 μg/kg DW @ 1% OC;
- 20,000 - <50,000 μg/kg DW @ 1% OC; and
- 50,000 - <100,000 μg/kg DW @ 1% OC.

These concentration ranges were selected because they bracket the range of PCB concentrations within which PCBs have been found to be toxic in previous studies. More specifically, the results of spiked-sediment toxicity tests indicate that PCBs are likely to be acutely toxic at concentrations ranging from 29,000 to 64,000 μg/kg DW @ 1% OC (Swartz *et al.* 1988; DiPinto *et al.* 1993). The results of sediment-spiking studies also show that sublethal effects on sediment-dwelling organisms have been observed at total PCB concentrations as low as 1,000 μg/kg DW @ 1% OC (DiPinto *et al.* 1993). By comparison, chronic equilibrium-partitioning-based sediment quality benchmarks range from 2,100 to 53,000 μg/kg DW @ 1% OC (Fuchsman *et al.* 2006). Consensus-based sediment quality guidelines that correspond to chronic effects thresholds range from 400 to 1,700 μg/kg DW @ 1% OC (MacDonald *et al.* 2000a). Overall, the information from previous investigations suggests the effects thresholds for PCBs range from 400 to 64,000 μg/kg DW @ 1% OC, when effects on benthic invertebrates are considered.

Three sediment samples were also collected from a reference area located upstream of Ft. Edward to increase the likelihood that at least two samples would be obtained with total PCB concentrations in the <1,000 μg/kg DW @ 1% OC range (MacDonald *et al.* 2009a). However, the preliminary chemical analysis showed that three samples from the area between Rogers Island and Griffin Island (i.e., downstream of Fort Edward) had total PCB concentrations of <1,000 μg/kg DW @ 1% OC. As the physical characteristics of low chemistry samples from the principal study area were likely to be more similar to high chemistry sediment samples, none of the reference sediment samples were selected for further evaluation in the 2008 pilot study. More detailed information on the study design is provided in MacDonald *et al.* (2009a).

2.3 SAMPLE COLLECTION, HANDLING, AND PREPARATION

The historical data on the concentrations of sediment-associated PCBs in the UHR study area were used to identify 42 primary sediment sampling locations and 18 alternate sediment sampling locations in the

principal study area. An upstream reference area was also identified. Based on the historical data, seven primary stations were identified for each of the six ranges of PCBs identified in Section 2.2 (MacDonald *et al.* 2009a). At each of these stations, multiple sediment samples were to be collected to support chemical characterization, toxicity testing, and benthic invertebrate community structure assessments. The alternate sampling stations (three per total PCB concentration range) were identified as backups in case it was not possible to collect sediment samples at one or more of the primary stations (MacDonald *et al.* 2009a). Between September 29 and October 6, 2008, sediment samples were collected at a total of 40 stations in the UHR downstream of Fort Edward, including 29 of the primary sediment sampling locations, nine of the alternate sediment sampling locations, and two additional sampling stations not identified in the original Work Plan (MacDonald *et al.* 2009a; Figure 2). The samples collected from stations not identified in the Work Plan were collected because the field supervisor thought that those locations were likely to yield samples with PCB levels within the desired concentration range (MacDonald *et al.* 2009a). In addition, three upstream reference locations were accessed on October 6, 2008 to obtain sediment samples (Figure 2; MacDonald *et al.* 2009a). At each of the 43 sampling stations, five replicate sediment samples for BICS analysis, one small-volume (about 2 liters; L) unsieved-sediment sample, and one large-volume (about 20 L) sieved-sediment sample were collected.

All sediment samples were obtained using a van Veen grab sampler mounted on an aluminum work boat. At each location, the dredge sampler was deployed five times to obtain the required volume of sediment for each type of sample. Upon retrieval, a 10-centimeter (cm) diameter pre-cleaned Lexan core tube was inserted into the sediment contained within the sampler to obtain a sample for BICS analysis. Subsequently, about 400 milliliters (mL) of material was removed from each grab sample for archiving (i.e., the unsieved sediment sample). Next, the top 10 cm of the material remaining within the sampler was transferred to a sieve bucket [2.00 millimeter (mm) diameter sieve] to facilitate removal of any gravel or cobbles present (i.e., to prepare the sieved sediment sample). This procedure was repeated five times at each sampling location to obtain the required number of samples and/or volume of sediment for each sample type. Figure 3 provides a flow diagram depicting the steps involved in collecting a sediment sample. To expedite preparation of the sieved sediment samples, river water from the sampling location was added to the sample, as required, during the sieving process (i.e., up to 2 L/sample). Sieving is an accepted method for manipulating sediments (USEPA 2000; ASTM 2014), but can alter sediment chemistry and bioavailability of contaminants. The influence of decanting water from the sediment container on sediment chemistry or sediment toxicity was not explicitly evaluated in this study. However, it is possible that the decanting process resulted in some loss of COPCs, including lower chlorinated PCBs, which could have influenced the toxicity of the sediment samples.

Sediment samples for BICS analysis were processed in the field. More specifically, each of the samples collected during the sampling program (i.e., five replicate samples collected at 43 locations using a van Veen grab sampler) were wet-sieved to 0.425 mm to isolate benthic macroinvertebrates from the sediment. Following washing with river water, the material retained on the sieve was transferred to a 500 mL polyethylene container and preserved in a formalin and ethanol mixture. All benthic macroinvertebrate samples processed during the day were transported to the Watershed Assessment Associates, LLC laboratory for storage and/or analysis.

The sieved-sediment sample (using a 2.00 mm diameter sieve) was used to support chemical characterization and toxicity testing at each location. Following its collection (in two to three 20 L buckets), the sieved-sediment sample was held overnight (at 4°C) to facilitate settling of fine particulates, decanted, transferred to a 50 L container, and homogenized using a stainless-steel auger/drill for about 10-20 minutes. Subsequently, sub-samples were obtained for preliminary chemical characterization, full chemical characterization, and toxicity testing. All sediment samples were held in a reefer truck on-site at approximately 4°C until the completion of the sampling program, at which time they were transported to the various laboratories for chemical analysis and/or toxicity testing. Pore-water samples were collected by centrifugation of whole sediment at 5,200 revolutions per minute (7,000 times relative centrifugal force) for

15 min at 4°C at the start of the toxicity exposures. Pore water samples were analyzed to determine the concentrations of conventional variables, major cations, major anions, dissolved metals, and dissolved organic carbon. MacDonald *et al.* (2009a) provides additional information on the procedures that were used to collect and process the sediment samples that were collected from the Hudson River. Chain-of-custody forms were completed.

2.4 Chemical Analyses of Sediments

Chemical analysis of the sediment samples collected during the sampling program was conducted at various analytical laboratories. Upon receipt at the laboratory, sediment samples were held at 4°C in the dark prior to analysis. As a first step, all 43 sediment samples were analyzed to determine the concentrations of total PCBs [by analysis of homologs by low resolution-mass spectrometer-selected ion monitoring (LRMS-SIM; modified EPA Method 8270) and TOC (using EPA Method 9060)]. The results of these preliminary chemical analyses were used to inform the selection of the samples that would undergo more comprehensive chemical characterization, toxicity testing, and BICS assessment. Funding for the 2008 pilot study was sufficient to support further characterization of 12 of the 43 sediment samples that were collected in the UHR. Ten of the samples that were collected were used directly for further chemical analysis and toxicity testing. In addition, four sediment samples were used to create two composite sediment samples for chemical characterization and toxicity testing. These two composite sediments were prepared by combining the material obtained from four sampling stations, with sediment from Station UHR-SVS-29 and Station UHR-SVS-36 combined and sediment from Station UHR-SVS-16 and Station UHR-SVS-37 combined. The two composite sediment samples were prepared to obtain total PCB concentrations that were not reflected in the unique sediment samples that were obtained from the study area. Sediment samples from a total of 14 stations were selected for conducting BICS analysis (i.e., the samples collected at the 10 stations selected initially for toxicity testing plus the samples from the four stations selected for creating the two composite sediment samples). Samples from Stations UHR-SVS-29, UHR-SVS-36, UHR-SVS-16, and UHR-SVS-37 were analyzed separately for BICS because the process of combining sediments would have resulted in substantial uncertainty in the BICS results.

Blending sediment samples with relatively higher and lower PCB concentrations provided a basis for testing additional materials with intermediate concentrations of PCBs. Sediment from Station UHR-SVS-29 and Station UHR-SVS-36 was combined at a 1:2 ratio by mass. Sediment from Station UHR-SVS-16 and Station UHR-SVS-37 was combined at a 1:1 ratio by mass. Prior to sub-sampling the sediments used to create the sample composites, the original sediment samples were homogenized for about 10 minutes using a stainless steel auger attached to a hand-held drill. The blended sediment samples were held for at least seven days to allow the materials to equilibrate based on guidance provided in USEPA (2000) and in ASTM (2014).

The sediment samples selected for further chemical characterization were submitted for analysis of metals, mercury, parent and alkylated polycyclic aromatic hydrocarbons (PAHs), and semi-volatile organic compounds. Total recoverable metals were analyzed in whole sediments using inductively-coupled plasma-mass spectrometry (ICP-MS; EPA Method 3050/6020A and EPA Method 7474). Simultaneously extracted metal (SEM) and acid volatile sulfide (AVS) concentrations were quantified using the procedures outlined in USEPA (1991; Alpha Analytical SOP M-008). Total mercury was analyzed using EPA Method SW7474-CVAF. PAHs were measured using EPA Method 8270 modified. Organochlorine pesticides and toxaphene were measured using high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS; AXYS Analytical Lab SOP - MLA-028). Grain size was measured using ASTM method D422. In the two composite sediment samples, PCBs were measured using low resolution-mass spectrometer-selective ion monitoring (LRMS-SIM; modified EPA Method 8270) and TOC was measured using EPA Method 9060 (i.e., because the composite samples had not been run in the preliminary chemical analysis).

2.4.1 Calculation of Total Concentrations of PAHs, DDTs, and PCBs

To support subsequent interpretation of the sediment chemistry data, the total concentrations of several chemical classes were determined for each of the sediment samples that underwent further chemical characterization. More specifically, the concentrations of total PAHs were calculated by summing the concentrations of the following 13 PAHs: 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene, benz(a)anthracene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, fluoranthene, and pyrene. For DDTs, the concentrations of p,p'-DDD and o,p'-DDD, p,p'-DDE and o,p'-DDE, and p,p'-DDT and o,p'-DDT were summed to calculate the concentrations of sum DDD, sum DDE, and sum DDT, respectively. Total DDTs were calculated by summing the concentrations of sum DDD, sum DDE, and sum DDT.

For all samples collected, the concentrations of total PCBs were calculated as the sum of the concentrations of the ten individual homolog groups (i.e., mono-, di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona-, and deca-chlorobiphenyls). Total PCBs were also reported on an OC-normalized basis (at 1% OC) by dividing the total PCBs concentration by the percent TOC in the sample. Reporting total PCBs in DW and at 1% OC provides a basis for evaluating the bioavailability of PCBs because studies have shown that OC-normalization can be used to support predictions of accumulation of PCBs in benthic invertebrate tissues (Ingersoll *et al.* 2014). The OC-normalized total PCB concentrations can also be used in the interpretation of toxicity data (i.e., by evaluating relationships between chemistry and toxicity). Although the use of solid-phase microextraction (SPME) was considered as part of the Work Plan (MacDonald *et al.* 2009a), insufficient resources were available to pursue this option. For a more in depth discussion on the bioavailability of PCBs, see Burkhard *et al.* (2013).

2.4.2 Calculation of Additional Sediment Chemistry Metrics

The underlying sediment chemistry data were used to calculate several additional sediment chemistry metrics that may be relevant for evaluating relationships between sediment chemistry and sediment toxicity, including:

- Sum equilibrium partitioning sediment benchmarks for PAHs ($\sum$ESB-TU$_{FCV}$; USEPA 2003);
- Sum simultaneously extracted metal minus acid volatile sulfide ($\sum$SEM-AVS; USEPA 2005);
- ($\sum$SEM-AVS)/fraction OC (f_{OC}; USEPA 2005);
- Mean probable effect concentration-quotients for metals (PEC-Q$_{METALS}$; MacDonald *et al.* 2000b);
- Mean PEC-Q$_{METALS(1\%OC)}$ (MacDonald *et al.* 2000b); and
- Mean PEC-Q (MacDonald *et al.* 2000b).

2.5 TOXICITY TESTING

Whole-sediment toxicity tests were conducted to evaluate the effects on the survival, growth, and reproduction of benthic invertebrates associated with exposure to PCB-contaminated sediments from the UHR. More specifically, 42-d whole-sediment toxicity tests with the epibenthic amphipod, *H. azteca,* were conducted on 12 sediment samples (endpoints: survival, length, weight, biomass, and neonate production; USEPA 2000; ASTM 2014). In addition, toxicity to the midge, *C. dilutus*, was evaluated in ~53-d exposures to sediments from the UHR (endpoints: survival, ash-free dry weight, biomass, emergence, fecundity, hatching success, and larvae production; USEPA 2000; ASTM 2014). For all endpoints, the toxicity of each sediment sample was evaluated by comparison to negative control results (West Bearskin Lake sediment; see Section 2.5.2.7). West Bearskin Lake sediment fits the recommendations for control sediment (USEPA

2000; ASTM 2014) and is the standard control material that has been used repeatedly in the Columbia Environmental Research Center (CERC) laboratory, where the toxicity tests were performed. Classifying sediments as toxic by comparison to a control is consistent with guidance provided in USEPA (2000) and ASTM (2014).

Test conditions for conducting the toxicity tests are summarized in Table 1, schedules for conducting the toxicity tests are summarized in Tables 2 and 3, and test acceptability requirements are summarized in Tables 4 and 5.

2.5.1 Endpoints Measured in Toxicity Tests

Long-term toxicity tests with amphipods (*H. azteca*) and midge (*C. dilutus*) were conducted to evaluate the toxicity of sediment samples from the UHR. The following endpoints were measured in the 42-d sediment toxicity tests with amphipods, *H. azteca:*

- Survival (%; Day 28);
- Length (mm; Day 28);
- Weight (mg; Day 28);
- Biomass (mg; Day 28);
- Survival (%; Day 35);
- Survival (%; Day 42);
- Length (mm; Day 42);
- Weight (mg; Day 42);
- Biomass (mg; Day 42);
- Number of young (Day 42);
- Number of young per female (Day 42); and
- Number of young per female (normalized to 42-d survival).

The following endpoints were measured in the ~53-d sediment toxicity tests with midge, *C. dilutus*:

- Survival (%; Day 13);
- Ash-free dry weight (mg; Day 13);
- Biomass (mg; Day 13);
- Emergence (%);
- 20th percentile emergence time (days);
- Median emergence time (days);
- Emerged females (%);
- Number of egg cases;
- Paired females laying an egg case (%);
- Number of eggs per case;
- Number of larvae per paired female;
- Number of larvae per case;

- Total fecundity;
- Total number of larvae produced;
- Hatching success (%);
- Intrinsic rate of natural increase (days); and
- Adult time to death (days).

The toxicity endpoints evaluated were consistent with guidance provided in USEPA (2000) and in ASTM (2014). A description of the methods that were used to calculate each endpoint is provided in Table 6. Reproduction was included as an endpoint of interest based on the mode of action of PCBs in other aquatic organisms (i.e., fish) and in wildlife (i.e., birds and mammals).

2.5.2 Data Treatment

A number of data treatment methods were applied to the sediment toxicity data generated for the pilot study, including estimation of amphipod weight, and calculation of amphipod and midge biomass, of amphipod reproduction, of midge fecundity, and of midge intrinsic rate of natural increase (see Table 6). In addition, the procedures used to control-normalize response rates and designate toxicity to amphipods and midge are described. These toxicity test data treatment methods are described in the following sections.

2.5.2.1 Estimation of Amphipod Weight

The weight (mg) of surviving amphipods, *H. azteca*, was estimated using data on the length of individual organisms, in conjunction with the following equation (Kemble *et al.* 2013):

$$\textit{Dry weight} = ([0.1770 \times (\textit{length})] - 0.0292)^3$$

This approach to estimating weight of amphipods from length is consistent with the guidance provided in USEPA (2000) and in ASTM (2014).

2.5.2.2 Calculation of the Amphipod and Midge Biomass

The biomass of amphipods and midge was calculated using the following formula:

$$Biomass = \sum_{=1} \left(n_r \times S_r \times \overline{G}_r \right) / r$$

Where:

r	=	Replicate number;
n_r	=	Number of organisms in a replicate
S_r	=	Proportion of surviving organisms in a replicate at the end of the toxicity test;
$\overline{G}_r$	=	Average individual organism weight in a replicate.

Any time the number of organisms in a replicate (n_r) exceeded the target number (n=10 for amphipod and n=12 for midge), the number of organisms included in the biomass calculation was truncated to the target.

2.5.2.3 Calculation of Reproductive Endpoints for Amphipods

For those endpoints measuring the reproductive success of *H. azteca*, only those replicates containing two or more adult females were used to calculate the reproduction response endpoints. Replicates with fewer than two females were not included in the analyses due to the high variability in reproduction that has been

observed in previous studies in replicates with fewer than two females (unpublished data). See Table 6 for descriptions of the methods that were used to calculate each reproductive endpoint.

2.5.2.4 Calculation of Fecundity Endpoints for Midge

Two fecundity endpoints were calculated for midge: total fecundity, which is defined as the number of eggs produced per female; and total number of larvae produced. The endpoints were calculated as follows:

Total fecundity = # *egg cases* x # *eggs per case*

Total number of larvae produced = # *egg cases* x # *larvae per case*

See Table 6 for a description of the methods that were used to calculate these endpoints.

2.5.2.5 Calculation of the Intrinsic Rate of Natural Increase for Midge

Intrinsic rate of natural increase for the midge, *C. dilutus*, was calculated using methods outlined in Sibley *et. al.* (1996). More specifically, the following formula was used to calculate intrinsic rate of natural increase for midge:

$$\text{Intrinsic rate of natural increase} = \frac{\text{In}(R_0)}{T}$$

Where:

R_0 = Sum of progeny produced by a female over all breeding events in a life cycle;

T = Mean generation time

Also see Table 6 for a description of the calculation methods for this endpoint.

2.5.2.6 Control-Normalization of Sediment Toxicity Data

Sediment toxicity data are typically normalized to the control mean replicate response in order to account for variability in the test response data due to potential differences in organism health, test procedures, and test conditions between test batches. Such normalization procedures facilitate comparison of toxicity data generated in multiple batches of toxicity tests. In this evaluation, each treatment mean replicate response was normalized to the mean response observed in the control treatment for that endpoint as follows:

$$\text{Normalized Response} = \frac{\text{Mean Treatment Value}}{\text{Mean Control Value}} \times 100$$

2.5.2.7 Designation of Toxicity to Amphipods and Midge

Toxicity of UHR sediments to benthic invertebrates (i.e., amphipods and midge) was evaluated on an endpoint-by-endpoint basis. As the objective of the analysis was to assess the toxicity of each sediment sample relative to the control treatment, a pairwise-comparison approach (i.e., controlling for the comparison-wise error) was used (ASTM 2014). The mean response for each treatment was compared to the mean response in the control treatment using an unpaired *t*-test (one-sided; $\alpha = 0.05$). In conjunction with the statistical test, a minimum reduction of 10% relative to the control (i.e., resulting in control-adjusted response < 90%) was used to designate samples as toxic, consistent with other sediment quality assessments conducted by the U.S. Geological Survey (USGS) and others (e.g., Ingersoll *et al.* 2014). Therefore, a sediment sample was designated as toxic for a given endpoint if both the control-adjusted response was less than 90%, and the mean response was significantly lower than the control ($\alpha = 0.05$). For the midge time to emergence endpoint, the test was designed to identify sediment samples with a mean response significantly greater than the control ($\alpha = 0.05$). Those stations where the test responses were not significantly different from control responses or did not have an effect size of greater than 10% were designated as not toxic for that endpoint.

2.6 BENTHIC INVERTEBRATE COMMUNITY STRUCTURE ANALYSIS

The effects of contaminated sediments on benthic invertebrates were also evaluated using information on BICS. More specifically, ten key indicators of BICS, including taxa richness, biotic index, percent model affinity, species diversity, dominance-3, biological assessment profile, abundance of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies; EPT taxa), abundance of pollution indicator species, abundance of pollution sensitive species, and total abundance were used to evaluate BICS for 14 sediment samples obtained from the UHR study area (Table 7). These metrics were selected because they are consistent with those that are typically used by New York State Department of Environmental Conservation for assessing the status of benthic invertebrate communities in riverine ecosystems within the state (Bode *et al.* 1990). For more information on the metrics and methods used for the BICS analyses, see Watershed Assessment Associates, LLC (2010; attached as Appendix 3). An evaluation of morphological deformities of *Chironomus* sp. could not be completed because not enough *Chironomus* sp. larvae were obtained from the samples collected in the study area (Watershed Assessment Associates, LLC 2010).

As indicated previously, two composite sediment samples were prepared to facilitate toxicity testing using a more complete distribution of sediment-associated PCB concentrations (i.e., UHR-SVS-16/37 and UHR-SVS -29/36). As it was not possible to measure BICS directly for these composite sediment samples, an alternate approach was used to generate the requisite information. Specifically, the weighted average was calculated for each BICS metric for the two composite sediment samples (i.e., based on the mass of the sediment from each sample used to create the composite sample). These estimates of BICS for the composite samples were used for subsequent evaluations of the data. The weighted average for each BICS metric was calculated using the following weights:

- BICS metrics for UHR-SVS-16 and UHR-SVS-37 were averaged at a 1:1 ratio; and
- BICS metrics for UHR-SVS-29 and UHR-SVS-36 were averaged at a 1:2 ratio.

2.7 DATA VALIDATION AND COMPILATION

All of the data generated during the course of the pilot study were evaluated to determine their utility in assessing injury to the benthic invertebrate community in the Hudson River. In the first step of this process, all of the sediment chemistry data were validated by an independent data validator in accordance with USEPA (2008; 2010; 2014a; 2014b). The sediment toxicity data and BICS data were evaluated relative to the performance criteria for measurement data specified in the project workplan (MacDonald *et al.* 2009a). Next, a relational project database was developed in Microsoft (MS)[1] Access format to support data compilation. All of the sediment chemistry, pore-water chemistry, benthic community, and sediment toxicity data compiled in the database were georeferenced to facilitate mapping and spatial analysis using geographic information system (GIS)-based applications. In the final step of the data compilation process, all of the data contained in the database were audited to ensure data quality.

An MS Access relational database was developed to support compilation of the data collected during the pilot study, including:

- Preliminary sediment chemistry data (generated by Alpha Analytical);
- Supplemental sediment chemistry data (generated by Alpha Analytical and Axys Analytical Services, as verified, qualified and compiled by the Quality Assurance Coordinator);
- Pore-water chemistry data (generated by CERC, USGS);
- Sediment toxicity data (generated by CERC, USGS); and

[1] Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

- Benthic invertebrate community structure data (generated by Watershed Assessment Associates, LLC).

The preliminary sediment chemistry data (including PCBs as homologs, TOC, and percent moisture) for the 43 sediment samples collected during the pilot study were translated from Microsoft (MS) Excel format into the project database in MS Access. In addition, the supplemental sediment chemistry data (including metals, SEM, AVS, PAHs, organochlorine pesticides, and grain size) for the 12 sediment samples selected for toxicity testing were compiled into MS Access format (see Appendix 2). The electronic data deliverables (EDDs) for the supplemental sediment chemistry data were then validated against original laboratory reports (Appendix 2). These additional sediment chemistry data were evaluated using performance criteria for measurement data documented in the project Work Plan (MacDonald *et al.* 2009a), the Hudson River Natural Resource Damage Assessment (NRDA) Analytical Quality Assurance Plan (HRTC 2005), and/or the National Functional Guidelines for Organic and/or Inorganic Data Review (USEPA 2008; 2010). Qualifier codes (e.g., to denote less than detected results) were assigned to the supplemental sediment chemistry data. These qualifier codes were recorded in the project database for each of the original sediment samples and considered prior to use of the data. Both the preliminary sediment chemistry data and the expanded chemistry data were compiled into the project database.

Pore-water chemistry data for the 12 samples selected for toxicological testing were received from CERC in MS Excel format. These data were translated into the MS Access database.

Whole-sediment toxicity data for the 12 samples selected for toxicological testing were received from CERC in MS Excel format. Toxicity data included results of 42-d toxicity tests with amphipod and of ~53-d toxicity tests with midge. The mean and standard error of the response data were compiled for each endpoint for each sediment sample. In addition, the raw replicate data for each endpoint for each whole-sediment sample were obtained from CERC, cross-checked, and translated into the MS Access database.

BICS data were provided by Watershed Assessment Associates, LLC (2010) for a total of 14 sediment samples, including 10 of the individual samples selected for toxicological characterization and the four additional samples that were used to create the two composite samples for toxicological characterization. Results for the ten BICS metrics for the five replicate samples from each of the 14 stations (a total of 70 samples) were translated into MS Access format and compiled in the project database. In addition, the mean and standard error for each BICS metric were compiled for each sample in the project database.

2.8 Data Verification and Auditing

Data verification and auditing were conducted to ensure that the underlying data used to prepare data summaries were accurate and complete. Following translation into the project database, data were verified to ensure that errors had not occurred during data translation. Data verification involved comparison of the data in the database to the data contained in the translated MS Excel sheets and to the original data provided by each laboratory. Data verification initially involved 10% number-for-number checks against source data, increasing to 100% number-for-number checks if significant errors were detected in the initial verification step. For the 10% check, the values for a randomly selected set of records were verified against the original data. Discrepancies in the data (i.e., minor differences in sample names and values) were rectified using the source reports and laboratory bench-sheets, and, in some cases, communication with the analytical laboratory that generated the data. Additional steps taken to verify the compiled data included cross-checking the complete list and number of samples in the database against the originally supplied data sets, checking unit consistency (e.g., sediment measurements in DW basis), ensuring spatial data were all expressed in the same coordinate system, checking mean toxicity endpoint response data against individual replicate data, and ensuring that matching whole-sediment chemistry, pore-water chemistry, whole-sediment toxicity, and BICS data were correctly identified in the database.

Database auditing was conducted to further ensure data quality in the project database. The auditing process involved analyses of outliers (i.e., to identify inconsistencies with units) and completeness (i.e., to identify missing samples or missing data), examination of data qualifier fields (i.e., to exclude any data not meeting the performance criteria for measurement data), and checking of sample identification numbers (i.e., to ensure that data were not duplicated or missing). Anomalous data points that appeared to fall out from the trend of the majority of the data were identified based on reviews of summary tables (i.e., maximum and minimum values per analyte, and hazard quotients). If the identified issue was not resolved at that stage of the process, the data were checked against the original data. In some cases, this process necessitated communication with the originating laboratory in order to resolve data quality issues. Statistical analyses of resultant data were conducted to review data distributions, to calculate summary statistics, and to determine the variability in the observations. Implementation of this ongoing iterative process throughout the data analysis phase helped to ensure overall completeness and accuracy of the database.

2.9 DATA TREATMENT PROCEDURES

To support the compilation and subsequent analysis of the information on environmental quality conditions, a GIS-compatible, relational project database was developed in MS Access format. All of the data compiled in the database were georeferenced to facilitate mapping and spatial analysis using GIS-based applications (i.e., Environmental Systems Research Institute's ArcMap and Spatial Analyst programs). The database structure made it possible to retrieve data in several ways, including by sample, by data type (i.e., chemistry vs. toxicity vs. BICS), and by toxicity designation. As such, the database facilitated a variety of data analyses. Analysis of the data compiled for the UHR necessitated a number of decisions regarding the treatment of various types of information. The data treatment procedures used in this evaluation are described below.

Spatial data were obtained in various coordinate systems. To ensure the data were accurately presented, some data were re-projected to a uniform coordinate system (i.e., NAD 1983).

As part of the pilot study, additional samples were collected and/or analyzed as part of the quality assurance program. While no field replicate samples were collected (i.e., no information is available to evaluate the small-scale spatial variability in sediment quality conditions), there was one laboratory split sample in the project database: pore water for UHR-SVS-16/37. The laboratory split samples were treated as duplicates and averaged to support subsequent data analysis, unless all duplicate measurements were less than detection limit. In this case, the maximum detection limit was used in the data analysis.

As part of the preliminary sediment chemistry analysis, a second analytical run was performed at a higher dilution for several samples (i.e., when the initial analytical run at a lower dilution resulted in estimated values due to interference with the chemical analysis). For those samples with results from two analytical runs, only the results from the second run were considered in this evaluation. This data treatment decision eliminated the use of estimated PCB concentration measurements (for individual homolog groups and total PCBs) from the evaluation. There were two TOC measurements for each sediment sample measured as part of the preliminary sediment chemistry analysis. The average of the two measurements was used to characterize TOC levels for each sample.

The treatment of contaminant concentrations that are not quantified because they are less than detection limit can influence the preliminary screen of COPCs, the detailed screen of contaminants of concern (COCs), and the development of concentration-response relationships. A number of investigators have evaluated the implications of applying various procedures for estimating the concentrations of COCs from less than detection limit data (Gaskin *et al.* 1990; Porter and Ward 1991; El-Shaawari and Esterby 1992; Clarke and Brandon 1994). While there is no consensus on which data censoring methods should be used in various applications, the simplest methods tend to be used most frequently, including deletion of non-detect values or substitution of a constant, such as zero, the detection limit, or one-half the detection limit for the less than detect value (USACE 1995).

To address the need for guidelines for statistical treatment of less than detection limit data, the U.S. Army Corps of Engineers (USACE 1995) conducted a simulation study to assess the performance of ten methods for censoring data. The results of that investigation indicated that no single data censoring method works best in all situations. Accordingly, USACE (1995) recommended a variety of methods depending on the proportion of the data that requires censoring, the distribution and variance of the data, and the type of data transformation. For data sets for which a low to moderate proportion of the data require censoring, substitution of the detection limit is generally the preferred method (i.e., to optimize statistical power and control type I error rates). However, as the proportion of the data that requires censoring and the coefficient of variation of the data increases, statistical power is better maintained by substituting one-half the detection limit for the less than detection limit data, particularly for log-normally distributed and transformed data. Substitution of zero or other constants was also recommended for a variety of circumstances. Overall, it was concluded that simple substitution methods work best to maintain power and control error rates in statistical comparisons of chemical concentration data (USACE 1995).

In this analysis, decisions regarding the treatment of less than detection limit data were made by considering the recommendations that have emerged from previous investigations in the context of their potential effects on the results of this assessment. Including all of the pore water and sediment data that were compiled in the project database, 16% of the data were less than detection limits and required censoring prior to data analysis. Consistent with the guidance developed by USACE (1995), one-half of the detection limit was substituted for all less than detection limit data in all analyses.

3.0 RESULTS

Four types of data were generated to support the preliminary evaluation of the effects on benthic invertebrates associated with exposure to UHF sediments, including sediment chemistry data, pore-water chemistry data, sediment toxicity data, and BICS data. The results that were obtained for the 2008 pilot study are presented in the following sections of this document.

3.1 SEDIMENT AND PORE-WATER CHEMISTRY

The results of the chemical analyses of sediment samples from the UHR indicated that the concentrations of total PCBs ranged from 185 to 1,210,000 μg/kg DW among the 40 sediment samples that were collected downstream of the GE facility at Fort Edward (Table 8). When expressed on an OC-normalized basis, PCB concentrations ranged from 219 to 242,000 μg/kg DW @ 1% OC in these sediment samples (Table 8). By comparison, the concentrations of total PCBs ranged from 5.4 to 1,430 μg/kg DW (or 56.8 to 215 μg/kg DW @ 1% OC) in the three sediment samples that were collected within the upstream reference area. Based on these results, ten samples were selected for further chemical and toxicological characterization. In addition, four sediment samples were selected for use in creating two composite samples with total PCB concentrations predicted to be in the 50,000-100,000 μg/kg DW total PCBs @ 1% OC range. The chemical characteristics of these 12 samples (10 individual and two composite samples) are summarized in Table 9.

The results of chemical analysis of the ten selected sediment samples and the two composite samples indicate that sediments from the UHR contain a variety of COPCs in addition to PCBs. The additional COPCs that were detected in one or more UHR sediment samples included 23 metals, five individual SEMs, AVS, 45 individual PAHs and PAH mixtures (parent and alkylated PAHs), and 16 organochlorine pesticides (Table 10). The available pore-water chemistry data are presented in Table 11. Information on the quality assurance/quality control (QA/QC) results associated with the sediment sample analyses can be found in Appendix 2.

Sediment samples from the UHR were sieved in the field prior to further processing. In many cases, river water from the sampling station was added to the samples to facilitate the sieving process and excess water was decanted from the sample prior to homogenization. The results of a study conducted at another site showed that decant water from sieved sediment samples contained substantial quantities of mono-, di-, and tri-chlorinated biphenyls, indicating that at least some of the lower chlorinated PCB homolog groups may have been lost when the UHR samples were decanted in the field (MacDonald *et al.* 2009b). In addition, there was a larger proportion of the more toxic mono- and di-chlorinated biphenyls in sediment samples previously collected from the UHR (GE 2002; 2003; 2004) than in sediment samples collected in 2008 (Figure 4). Therefore, these samples likely showed less toxicity than they would have if they were not wet-sieved and water was not decanted from the samples during processing.

3.2 SEDIMENT TOXICITY

The toxicity of UHR sediments was evaluated in 42-d sediment toxicity tests with the amphipod, *H. azteca*, and in ~53-d sediment toxicity tests with the midge, *C. dilutus*. The survival, growth, and reproduction of amphipods and midge in the control treatments are presented in Tables 12 and 13. Comparison of these results to the test acceptability requirements outlined in USEPA (2000) and ASTM (2014; and summarized in Tables 4 and 5) indicate that the tests conducted with both species are valid. The water quality characteristics were in the range of historical conditions at the toxicity testing laboratory (Appendix 4). In addition, water quality during the laboratory toxicity testing was within acceptable limits, as described by USEPA (2000) and ASTM (2014). The levels of ammonia in pore water obtained by centrifugation were below the lowest observed effect levels reported for chronic water-only testing with *H. azteca* or *C. dilutus* by Ingersoll *et al.* (2009; Table 11). Therefore, neither overlying water quality nor pore-water quality for conventional variables would be expected to substantially influence sediment toxicity. Hence, the sediment toxicity data were considered to be applicable for assessing the effects on benthic invertebrates associated with exposure to UHR sediments. The raw toxicity test results for each test are provided in Appendix 4.

The results of the 42-d toxicity tests showed that exposure to UHR sediments adversely affected the survival, growth, and/or reproduction of amphipods. More specifically, exposure to sediments from the UHR for 28 days resulted in significant and marked effects on amphipod survival (on day 42 of the test; Note organisms are transferred to beakers containing control water only on day 28) for two of the sediment samples tested (i.e., UHR-SVS-24 and UHR-SVS-31; Table 12). Significant adverse effects on biomass were observed in amphipods exposed to two sediment samples from the UHR: sample UHR-SVS-24 and sample UHR-SVS-16/37 (Table 12). Two endpoints were used to evaluate effects on amphipod reproduction associated with exposure to UHR sediments, including number of neonates per female (measured on day 42) and number of neonates per female (normalized to 42-d survival). The results of the 42-d toxicity tests demonstrated that adverse effects on reproduction were associated with exposure to eight of the 12 sediment samples from the UHR when the number of neonates (young) per female (i.e., UHR-SVS-04, -13, -16/37, -19, -24, -26, -29/36, and -38) or the number of neonates (young) per female normalized to 42-d survival (i.e., UHR-SVS-13, -16/37, -19, -24, -26, -29/36, -38, and -124) was considered (Table 12). Of the 12 samples tested, 10 were designated as toxic to amphipods when any toxicity test endpoint was considered.

The results of the ~53-d toxicity tests showed that the survival, growth, or reproduction of midge were adversely affected by exposure to UHR sediments. While 13-d survival was not adversely affected by exposure to UHR sediments, both weight and biomass were significantly reduced in midge exposed to sample UHR-SVS-16/37 (Table 13). Three sediment samples from the UHR were designated as toxic to midge when emergence was considered (i.e., UHR-SVS-04, -16/37, and -124), with a significant delay in the onset of emergence observed for sample UHR-SVS-16/37 (Table 13). A total of nine endpoints were measured to evaluate the effects on reproduction associated with exposure to UHR sediments (Table 13). Of

these, the total number of egg cases was the most sensitive endpoint, with eight of the 12 sediment samples designated as toxic to midge based on this endpoint (Table 13). Toxicity was observed in 10 of the 12 sediment samples from the UHR when any endpoint was considered (Table 13).

3.3 BENTHIC INVERTEBRATE COMMUNITY STRUCTURE

A total of 70 individual sediment samples (i.e., five replicate samples collected at 14 stations) were processed to isolate benthic macroinvertebrates from UHR sediments. All benthic macroinvertebrates were identified to the lowest possible taxonomic level. Based on the results of an independent re-analysis of 10% of these samples, taxonomic precision and accuracy were considered to be within acceptable limits for both percent difference in enumeration and percent taxonomic disagreement (Watershed Assessment Associates, LLC 2010).

In total, 3,823 individuals were isolated from sediment samples from the UHR, with the abundance of macroinvertebrates ranging from 5 to 349 in the sample replicates (Table 14). A total of 96 unique taxa were identified, with nine taxa comprising 67% of the total taxa abundance. Tubificid worms (28%) and midge (total Chironomidae = 44%) were the most abundant taxonomic groups that occurred in the sediment samples from the UHR. Ten metrics were used to describe the structure of benthic invertebrate communities inhabiting sediments from the UHR, including taxa richness, species diversity, EPT taxa abundance, abundance of pollution sensitive species, abundance of pollution tolerant taxa, biotic index, dominance-3, percent model affinity, biological assessment profile, and total abundance (Table 7). The results obtained for each of the five replicate samples collected at the 14 stations are presented in Table 14, while means and standard errors calculated for each metric by station are presented in Table 15.

The results of the BICS evaluation indicate that significant differences were observed among stations for numerous metrics. For example, the samples collected at Station UHR-SVS-36 had significantly higher taxa richness than the samples collected at the other stations. Similarly, biotic index was significantly lower for Station UHR-SVS-37 compared to all of the other stations. Based on percent model affinity (PMA), Stations UHR-SVS-26 and UHR-SVS-29 had the most impaired benthic communities. Station UHR-SVS-04 had a benthic community that most closely resembled the reference community for New York State, based on PMA (i.e., 70.8%). Further information on the results of the BICS analyses can be found in Watershed Assessment Associates, LLC (2010; Appendix 3).

4.0 UNCERTAINTY ASSESSMENT

The sediment samples evaluated in the 2008 pilot study were collected and analyzed using commonly applied methods. All of the chemistry, toxicity, and BICS data met the performance and test acceptability criteria. However, there are uncertainties that have the potential to influence interpretation of the results of this study, including:

- Comprehensive chemistry analyses, toxicity testing, and BICS analyses were not performed on sediment samples obtained from a reference area. As a consequence, the resultant data cannot be evaluated using a reference envelope approach, which is commonly used in this type of assessment;
- Habitat-related variables (such as overlying water quality, water velocity, etc.) were not measured at the locations where sediment samples were collected. As a result, interpretation of the BICS data may have more uncertainty;
- The sediment samples were wet-sieved in the field and then transported to the field laboratory, where the fine sediments in the overlying water were left to settle. After settling overnight, the overlying water was decanted from the sediment samples. This sample processing method may have

altered the concentrations of total PCBs and other contaminants. The results of a study conducted at another site showed that decant water from sieved sediment samples contained substantial quantities of mono-, di-, and tri-chlorinated biphenyls, indicating that at least some of the lower chlorinated PCB homolog groups may have been lost when the UHR samples were decanted in the field (MacDonald *et al.* 2009b). Results shown in Figure 4 indicate that there was a smaller proportion of mono- and di-chlorinated biphenyls in samples collected in 2008 compared to samples collected previously in the UHR (GE 2002; 2003; 2004). As the lower chlorinated biphenyls are the more toxic homologs, these procedures may have affected the toxicity of the sediment samples; and

- The PCB concentration gradient selected for targeting sediment sample collection did not bracket the highest concentrations in the UHR study area. If samples had been collected with higher total PCB concentrations, the frequency and/or magnitude of effects on benthic invertebrates could have been higher than those observed in the 2008 pilot study.

5.0 SUMMARY AND RECOMMENDATIONS

5.1 SUMMARY

As part of the Hudson River NRDA, the Trustees conducted a pilot study to evaluate the effects of PCB exposure on benthic invertebrates. Three lines of evidence were examined to determine if benthic invertebrates are likely to be adversely affected by exposure to UHR sediments, including whole-sediment chemistry, whole-sediment toxicity, and BICS.

For the 40 sediment samples collected downstream of Fort Edward in 2008, the concentrations of total PCBs ranged from 185 to 1,210,000 μg/kg DW or from 219 to 242,000 μg/kg DW @ 1% OC (Table 8). By comparison, total PCB concentrations in the three upstream sediment samples collected in the reference area ranged from 5.4 to 1430 μg/kg DW or 56.8 to 215 μg/kg DW @ 1% OC. Metals, PAHs, and organochlorine pesticides were also detected in the 12 UHR sediment samples selected for evaluation of sediment toxicity.

Long-term toxicity tests measuring survival, growth, biomass, emergence, and/or reproduction were conducted using two species of benthic invertebrates, the amphipod, *H. azteca*, and the midge, *C. dilutus*. The results of these toxicity tests indicated that UHR sediments were frequently toxic to both of the benthic invertebrate species tested. For amphipods (*H. azteca*), up to 10 of the 12 sediment samples were observed to be toxic in 42-d exposures, depending on the endpoint considered. Similarly, up to10 of the sediment samples from the UHR were found to be toxic to midge (*C. dilutus*) in ~53-d exposures (depending on the endpoint evaluated). When both species are considered together, all of the samples were designated as toxic when any endpoint was considered.

Benthic invertebrate community structure was evaluated for 14 sediment samples from the UHR (i.e., the 10 samples used directly for toxicity testing and the four samples used to create the two composite sediment samples). Of the endpoints measured, total abundance exhibited the highest variability among stations; the other nine endpoints were less variable among sediment samples (Watershed Assessment Associates, LLC 2010).

The results of the 2008 pilot study provide important information for designing more comprehensive studies to evaluate the effects on benthic invertebrates associated with exposure to UHR sediments. The major conclusions from this study include:

- PCBs are prevalent in sediments throughout the study area. Within-study area variability in PCB concentrations makes it possible to collect sediment samples that provide a broad concentration gradient. Other contaminants, while present, occur at lower concentrations compared to PCBs.

Chemistry metrics such as ∑SEM-AVS, ∑ESB-TU, and mean PEC-Q suggest that other COPCs occur at concentrations that are unlikely to cause sediment toxicity;

- Exposure to UHR sediments resulted in toxicity to both midge and amphipods, with the reproduction endpoints being the most sensitive; and
- BICS may provide useful information for evaluating effects on benthic invertebrates utilizing habitats in the UHR. However, further data analysis and interpretation is required before the results of the pilot study can be used to inform the design of subsequent investigations.

5.2 RECOMMENDATIONS

This pilot study provides useful information for designing studies to evaluate injury to sediments and sediment-dwelling organisms exposed to PCB-contaminated sediments. The principal recommendations that emerged from the pilot study included:

- The pilot study included detailed chemical characterization, toxicity testing, and BICS analysis on up to 14 sediment samples from the UHR. As the focus of this study was on developing relationships between sediment chemistry and sediment toxicity, reference site samples were not included in the detailed evaluation. Subsequent investigations should include evaluation of reference samples to facilitate determination of sediment quality conditions in the UHR (to support interpretation of the toxicity testing results using a reference envelope approach) and to provide additional perspective for interpreting the BICS data. In addition, detailed evaluation of reference sediment samples will be useful for documenting baseline conditions in the study area;
- The procedures used to sieve sediment samples from the UHR resulted in losses of some of the most water soluble and toxic PCB congeners represented in the lower chlorinated homolog groups (i.e., mono- and di-chlorinated biphenyls; Figure 4). Therefore, these sediment samples may not have been as toxic to *H. azteca* and *C. dilutus* as would have been the case had the samples been handled differently. To ensure that the particle size classes evaluated in the chemical analyses match those evaluated in the toxicity tests, sieving to < 2.00 mm is still recommended. However, water additions to facilitate sieving should be minimized and sieved sediment samples should not be decanted prior to homogenization and further processing. It may be useful to evaluate total PCB concentrations (by homolog group) in the archived unsieved sediment samples collected in 2008 to determine if changes in homolog composition occurred as a result of sample preparation methods that were used. However, more relevant information would likely be obtained by conducting a site-specific sediment sieving study in the UHR (e.g., as per MacDonald *et al.* 2009b);
- Whole-sediment chemistry data provide relevant information for evaluating exposure of benthic invertebrates to PCBs and other COPCs. However, these receptors can also be exposed to COPCs in pore water. For this reason, further evaluations of sediment toxicity should include additional measures of exposure to COPCs, including pore-water chemistry (i.e., using SPME samplers). Pore-water chemistry is likely to provide additional information for evaluating the bioavailability of PCBs in sediment (Ingersoll *et al.* 2014);
- Both species tested in the pilot study exhibited sensitivity to the COPCs present in UHR sediments. Based on the number of samples that showed toxicity to any endpoint, the pilot toxicity data do not provide a conclusive basis for determining which species is more sensitive to PCBs and the other COPCs that occurred at elevated concentrations. Therefore, further investigations into the toxicity of Hudson River sediments should include long-term toxicity tests with both species, as well as an analysis of the relative sensitivity of various endpoints between the two species (see Ingersoll *et al.* 2014 for examples of relative endpoint sensitivity analyses);

- The BICS data indicate that there are some differences in the abundance of benthic invertebrates and in the structure of benthic invertebrate communities among sampling stations in the UHR. However, the available data do not provide a comprehensive basis for evaluating the effects of PCB-contaminated sediments on benthic invertebrates. *In situ* benthic communities can be adversely affected by exposure to contaminated sediments and a variety of other conditions (e.g., water quality, grain size, TOC content). In fact, abiotic factors have the potential to affect the benthic invertebrate community in ways that obscure the effects of contaminants (USEPA 1994). Therefore, future investigations of BICS should measure additional habitat-related variables and include evaluation of reference conditions using data collected at upstream locations with comparable habitat characteristics; and
- Bioaccumulation testing was not conducted as part of the pilot study of the UHR. However, such data can provide essential information for better understanding the bioavailability of PCBs and other COPCs in sediments (Ingersoll *et al.* 2014). Therefore, it is recommended that 28-d bioaccumulation tests with the oligochaete, *Lumbriculus variegatus*, be conducted on a subset of the sediment samples that are collected in further investigations. Such bioaccumulation tests should be conducted on sediment samples that have a broad range of PCB concentrations because bioaccumulation rates (as measured using biota-sediment accumulation factors; BSAFs) can change with increasing PCB concentrations (Burkhard *et al.* 2013).

4.0 REFERENCES

ASTM International. 2014. Standard test method for measuring the toxicity of sediment-associated contaminants with freshwater invertebrates [ASTM E1706-05 (2010)]. Annual Book of ASTM Standards Volume 11.06. West Conshohocken, Pennsylvania.

Bode, R.W., M.A. Novak, L.A. Abele. 1990. Biological impairment criteria for flowing waters in New York State. Stream Biomonitoring Unit, Division of Water, New York State Department of Environmental Conservation. Albany, New York.

Burkhard, L.P., D.R. Mount, T.L. Highland, J.R. Hockett, T. Norberg-King, N. Billa, S.B. Hawthorne, D.J. Miller, and C.B. Grabanski. 2013. Evaluation of PCB bioaccumulation by *Lumbriculus variegatus* in field-collected sediments. Environmental Toxicology and Chemistry 32(7): 1495-1503.

Clarke, J.U. and D.L. Brandon. 1994. Less than detection limit data - A problem for statistical analysis and decision making in dredged material disposal evaluations. Environmental Effects of Dredging Volume D-94-1. Waterways Experiment Station. US Army Corps of Engineers. Vicksburg, Mississippi.

DiPinto, L.M., B.C. Coull, and G.T. Chandler. 1993. Lethal and sublethal effects of the sediment-associated PCB Aroclor 1254 on a meiobenthic copepod. Environmental Toxicology and Chemistry 12: 1909-1918.

El-Shaawari, A.H., and S.R. Esterby. 1992. Replacement of censored observations by a constant: An evaluation. Water Research 26(6):835-844. (As cited in USACE 1995).

Fuchsman, P.C., T.R. Barber, J.C. Lawton, and K.B. Leigh. 2006. An evaluation of cause-effect relationships between polychlorinated biphenyl concentrations and sediment toxicity to benthic invertebrates. Environmental Toxicology and Chemistry 25(10): 2601-2612.

Gaskin, J.E., T. Dafoe, and P. Brooksbank. 1990. Estimation of analytical values from sub-detection limit measurements for water quality parameters. Analyst 115:507-510. (As cited in USACE 1995).

GE (General Electric). 2002. Whole-sediment chemistry data for the upper Hudson River, New York. *In:* NOAA Hudson River Watershed Database and Mapping tools (http://response.restoration.noaa.gov/cpr/watershed/watershedtools.html). Office of Response and Restoration. NOAA's National Ocean Service.

GE (General Electric). 2003. Whole-sediment chemistry data for the upper Hudson River, New York. *In:* NOAA Hudson River Watershed Database and Mapping tools (http://response.restoration.noaa.gov/cpr/watershed/watershedtools.html). Office of Response and Restoration. NOAA's National Ocean Service.

GE (General Electric). 2004. Whole-sediment chemistry data for the upper Hudson River, New York. *In:* NOAA Hudson River Watershed Database and Mapping tools (http://response.restoration.noaa.gov/cpr/watershed/watershedtools.html). Office of Response and Restoration. NOAA's National Ocean Service.

Hilsenhoff, W.L. 1987. An improved biotic index of organic stream pollution. Great Lakes Entomology 20:31-39. (As cited in Watershed Assessment Associates 2010).

HRTC (Hudson River Trustee Council). 2005. Analytical quality assurance plan. Hudson River Natural Resource Damage Assessment. Prepared by the Hudson River Natural Resource Trustees (State of New York; U.S. Department of Commerce, and the U.S. Department of the Interior). Available from the National Oceanic and Atmospheric Administration. Silver Spring, Maryland.

Hudson River Natural Resource Trustees. 2008. Sediment toxicity pilot study for the Hudson River NRDA. Hudson River Natural Resource Damage Assessment. National Oceanic and Atmospheric Administration, Silver Spring, MD. United States Fish and Wildlife Service, Cortland, NY. New York State Department of Environmental Conservation, Albany, NY.

Ingersoll, C.G., E.L. Brunson, F.J. Dwyer, D.K. Hardesty, and N.E. Kemble. 1998. Use of sublethal endpoints in sediment toxicity tests with the amphipod *Hyalella azteca*. Environmental Toxicology and Chemistry 17:1508-1523.

Ingersoll, C.G., D.D. MacDonald, N. Wang, J.L. Crane, L.J. Field, P.S. Haverland, N.E. Kemble, R. Lindskoog, C. Severn, and D.E. Smorong. 2001. Predictions of sediment toxicity using consensus-based freshwater sediment quality guidelines. Archives of Environmental Contamination and Toxicology 41:8-21.

Ingersoll, C.G., N.E. Kemble, J.L. Kunz, W.G. Brumbaugh, D.D. MacDonald, and D. Smorong. 2009. Toxicity of sediment cores collected from the Ashtabula River in northeastern Ohio, USA to the amphipod *Hyalella azteca*. Archives of Environmental Contamination and Toxicology 57:315-329 (and an erratum Archives of Environmental Contamination and Toxicology 57: 826-827).

Ingersoll, C.G., J.A. Steevens, and D.D. MacDonald (editors). 2014. Evaluation of toxicity to the amphipod, *Hyalella azteca*, and to the midge, *Chironomus dilutus*; and bioaccumulation by the oligochaete, *Lumbriculus variegatus*, with exposure to PCB-contaminated sediments from Anniston, Alabama: U.S. Geological Survey Scientific Investigations Report 2013-5125, 122 p, http://pubs.usgs.gov/sir/2013/5125.

Kemble, N.E., D.K. Hardesty, C.G. Ingersoll, J.L. Kunz, P.K. Sibley, D.L. Calhoun, R.J. Gilliom, K.M. Kuivila, L.H. Nowell, and P.W. Moran. 2013. Contaminants in stream sediments from seven U.S. metropolitan areas: II. Sediment toxicity to the amphipod *Hyalella azteca* and the midge *Chironomus dilutus*. Archives of Environmental Contamination and Toxicology 64:52-64.

MacDonald, D.D., L.M. DiPinto, J. Field, C.G. Ingersoll, E.R. Long, and R.C. Swartz. 2000a. Development and evaluation of consensus-based sediment effect concentrations for polychlorinated biphenyls. Environmental Toxicology and Chemistry 19:1403-1413.

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000b. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology 39:20-31.

MacDonald, D.D., C.G. Ingersoll, A. Jones, D.E. Smorong, M. Curry, and K. Lanahan. 2009a. Work Plan for the pilot study on the effects of PCB-contaminated sediments on benthic invertebrates in the Upper Hudson River, New York. Prepared for National Oceanic and Atmospheric Administration. Silver Spring, Maryland. Prepared by: MacDonald Environmental Sciences Ltd., Nanaimo, British Columbia and Industrial Economics Inc. Cambridge, Massachusetts.

MacDonald, D.D., J. Steevens, W. Lorentz, P. Tuttle, and S. Thoms. 2009b. Preliminary evaluation of the effects of wet and dry sieving on the concentrations and homolog distribution of PCBs in Choccolocco Creek samples. Prepared by MacDonald Environmental Sciences Ltd. Nanaimo, British Columbia.

Porter, P.S. and R.C. Ward. 1991. Estimating central tendency from uncensored trace level measurements. Water Resources Bulletin 27(4):687 -700. (As cited in USACE 1995).

Sibley, P.K., D.A. Benoit, and G.T. Ankley. 1996. The significance of growth in *Chironomus tentans* sediment toxicity tests: relationship to reproduction and demographic endpoints.

Swartz, R.C., P.F. Kemp, D.W. Schults, and J.O. Lamberson. 1988. Effects of mixtures of sediment contaminants on the marine infaunal amphipod, *Rhepoxynius abronius*. Environmental Toxicology and Chemistry 7: 1013-1020.

USACE (United States Army Corps of Engineers). 1995. Guidelines for statistical treatment of less than detection limit data in dredged sediment evaluations. EEDP-04-23. Waterways Experiment Station. Vicksburg, Mississippi.

USEPA (United States Environmental Protection Agency). 1991. Amendments to the water quality standards regulations that pertain to standards on Indian Reservations - Final Rule. Federal Register 56:64876-64896.

USEPA (United States Environmental Protection Agency). 1994. Assessment and Remediation of Contaminated Sediments (ARCS) Program Assessment Guidance Document. EPA 905-B94-002. Chicago, IL. Great Lakes National Program Office.

USEPA (United States Environmental Protection Agency). 2000. Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates: Second Edition EPA/600/R-99/064. Duluth, Minnesota.

USEPA (United States Environmental Protection Agency). 2003. Procedures for the derivation of equilibrium partitioning sediment benchmarks (ESBs) for the protection of benthic organisms: PAH Mixtures. EPA-600-R-02-013. Office of Research and Development. Washington, District of Columbia.

USEPA (United States Environmental Protection Agency). 2005. Procedures for the derivation of equilibrium partitioning sediment benchmarks (ESBs) for the protection of benthic organisms: metal mixtures (cadmium, copper, lead, nickel, silver, zinc). EPA-600-R-02-011. Office of Research and Development. Washington, District of Columbia. 121 pp.

USEPA (United States Environmental Protection Agency). 2008. USEPA Contract laboratory program: National function guidelines for Superfund organic methods data review (SOM01.2). EPA-540-R-08-01. OSWER 9240.1-48. Office of Superfund Remediation and Technology Innovation. Washington, District of Columbia.

USEPA (United States Environmental Protection Agency). 2010. USEPA Contract laboratory program: National functional guidelines for inorganic Superfund data review. USEPA 540/R-10/011. OSWER 9240.1-51. Office of Superfund Remediation and Technology Innovation. Washington, District of Columbia.

USEPA (United States Environmental Protection Agency). 2014a. National functional guidelines for organic Superfund data review. EPA-540-R-014-002. OSWER 93550.0-132. Office of Superfund Remediation and Technology Innovation. Washington, District of Columbia.

USEPA (United States Environmental Protection Agency). 2014b. National functional guidelines for inorganic Superfund data review. EPA-540-R-013-001. OSWER 9355.0-131. Office of Superfund Remediation and Technology Innovation. Washington, District of Columbia.

Watershed Assessment Associates, LLC. 2010. Hudson River Saratoga and Washington County, NY: Benthic Macroinvertebrate Community Analysis.

TABLES

TABLE 1.
TEST CONDITIONS FOR CONDUCTING A LONG-TERM SEDIMENT TOXICITY TEST WITH THE AMPHIPOD *HYALELLA AZTECA* AND THE MIDGE *CHIRONOMUS DILUTUS* [ADAPTED FROM TABLES A6.1 AND A7.1 IN ASTM 2014 (ANALOGOUS TABLES ARE INCLUDED IN USEPA 2000)].

Parameter	Conditions
1. Test type	Whole-sediment toxicity test with renewal of overlying water conducted with 12 field-collected sediment samples from the Hudson River and two West Bearskin sediment samples as a control sediment (about 3% total organic carbon; Ingersoll *et al.* 1998).
2. Temperature	23 ± 1°C.
3. Light quality	Wide-spectrum fluorescent lights.
4. Illuminance	About 200 lux.
5. Photoperiod	16L:8D.
6. Test chamber	300-mL high-form lipless beaker.
7. Sediment volume	100 mL (added to exposure beakers on Day -2).
8. Overlying water volume	175 mL.
9. Renewal of overlying water	2 volume additions/d.
10. Age of organisms	About 7-d-old organisms (archive 20 amphipods on Day 0 for length measurement and 4 replicates of 10 midge for starting ash-free dry weight).
11. Number of organisms/ chamber	*Amphipods:* 10.
	Midge: 12.
12. Number of replicate chambers/ treatment	Amphipods: 12 (4 on Day 28 for survival and growth and 8 on Day 42 for survival, growth, and reproduction).
	Midge: 16 (4 on Day 13 for survival and growth, 8 for emergence and reproduction, and 4 for auxiliary males [started late on Day 2]).
	Total number of replicates/treatment: 12+16=28.
	Volume of sediment/treatment: 0.1 L/chamber x 28 chambers = 2.8 L.
	Total number of chambers: 28x13=364+ 8 extra control = 372.
	Total number of exposure systems=372/48=7.8.
13. Feeding	*Amphipods:* Yeast, Cerophyl®, and trout-chow (YCT) food, fed 1.0 mL (1800 mg/ L stock) daily to each test chamber.
	Midge: Tetrafin® goldfish food, fed 1.5 mL daily to each test chamber (1.5 mL contains 6.0 mg of dry solids); starting Day -1.
14. Aeration	None, unless dissolved oxygen in overlying water drops below 2.5 mg/L.
15. Overlying water	Well water diluted with deionized water to a hardness of about 100 mg/L (as $CaCO_3$), alkalinity 85 mg/L (as $CaCO_3$), and pH about 7.8.
16. Test chamber cleaning	If screens become clogged during a test; gently brush the outside of the screen.
17. Overlying water quality	Hardness, alkalinity, conductivity, and ammonia at the beginning and end of a test and on the days that growth is subsampled.
	Temperature daily. Dissolved oxygen (DO) and pH three times/week. Concentrations of DO should be measured more often if DO has declined by more than 1 mg/L since previous measurement.

TABLE 1 CONTINUED
TEST CONDITIONS FOR CONDUCTING A LONG-TERM SEDIMENT TOXICITY TEST WITH THE AMPHIPOD *HYALELLA AZTECA* AND THE MIDGE *CHIRONOMUS DILUTUS* [ADAPTED FROM TABLES A6.1 AND A7.1 IN ASTM 2014 (ANALOGOUS TABLES ARE INCLUDED IN USEPA 2000)].

Parameter	Conditions
18. Chemistry sampling (Day -2)	Pore water (centrifugation at 4ºC for 15 minutes at 5,200 rpm; 0.5 L whole-sediment/treatment): Ammonia, pH, free sulfide (see Table 14 in MacDonald *et al.* (2009a) for additional detail).
19. Endpoints	Whole sediment: Total metals, simultaneously extracted metals, acid volatile sulfide, total organic carbon, grain size, percent moisture, PCBs, PAHs, OC pesticides, PCDD and PCDF, and solid-phase microextraction (SPME) sampling of PCBs (see Tables 12 and 14 in MacDonald *et al.* (2009a) for a complete listing of individual analytes).
	Amphipods: 28-d survival and growth (length, weight, total biomass) and 35-d reproduction, and 42-d survival, growth, and reproduction. *Midge:* 13-d survival and ash-free-dry weight, female and male emergence, adult mortality, the number of egg cases oviposited, the number of eggs produced, and the number of hatched eggs.
20. Test acceptability	*Amphipods:* Minimum mean control survival of 80% on Day 28. Additional performance-based criteria specifications are outlined in Table A6.3 of ASTM 2014).
	Midge: No test acceptability requirements have been established for long-term tests starting with 7-d-old larvae, For tests starting with <24-old-larvae, minimum average size of *C. dilutus* in the control sediment at 20 d must be at least 0.6 mg/surviving organism as dry weight or 0.48 mg/surviving organism as AFDW. Emergence should be greater than or equal to 50%. Experience has shown that pupae survival is typically >83% and adult survival is >96%. Time to death after emergence is <6.5 d for males and <5.1 d for females, The mean number of eggs/egg case should be greater than or equal to 800 and the percent hatch should be greater than or equal to 80%.

TABLE 2.
GENERAL ACTIVITY SCHEDULE FOR CONDUCTING A LONG-TERM SEDIMENT TOXICITY TEST WITH HYALELLA AZTECA [ADAPTED FROM TABLE A6.2 IN ASTM 2014 (AN ANALOGOUS TABLE IS INCLUDED IN USEPA 2000)].

Day	Activity
Pre-Test	
–2	Isolate amphipods from culture and feed and observe isolated amphipods, monitor water quality. Add sediment into each test chamber, place chambers into exposure system, and start renewing overlying water.
Sediment Test	
0	Measure total water quality (pH, temperature, dissolved oxygen, hardness, alkalinity, conductivity, ammonia). Transfer ten 7- to 8-day old amphipods into each test chamber. Release organisms under the surface of the water. Add 1.0 mL of YCT (1800 mg/L stock) into each test chamber. Archive 20 test organisms for length determination or archive 80 amphipods for dry weight determination. Observe behavior of test organisms.
1 to 27	Add 1.0 mL of YCT to each test beaker daily. Measure temperature daily, conductivity weekly, and dissolved oxygen (DO) and pH three times/week. Observe behavior of test organisms.
28	Measure temperature, dissolved oxygen, pH, hardness, alkalinity, conductivity and ammonia. End the sediment-exposure portion of the test by collecting the amphipods with a #40 mesh sieve (425-µm mesh; U.S. standard size sieve). Use four replicates for growth measurements: count survivors and preserve organisms in sucrose-formalin solution for growth measurements. Eight replicates for reproduction measurements: Place survivors in individual replicate water-only beakers and add 1.0 mL of YCT to each test beaker/d and 2 volume additions/d of overlying water.
Reproduction Phase	
29 to 35	Feed daily. Measure temperature daily, conductivity weekly, DO and pH three times a week. Measure hardness and alkalinity weekly. Observe behavior of test organisms.
35	Record the number of surviving adults and remove offspring. Return adults to their original individual beakers and add food.
36 to 41	Feed daily. Measure temperature daily, conductivity weekly, DO and pH three times a week. Measure hardness and alkalinity weekly. Observe behavior of test organisms.
41	Measure total water quality (pH, temperature, dissolved oxygen, hardness, alkalinity, conductivity, ammonia).
42	Record the number of surviving adults and offspring. Surviving adult amphipods on Day 42 are preserved in sucrose-formalin solution. The number of adult males in each beaker is determined from this archived sample. This information is used to calculate the number of young produced per female per replicate from Day 28 to Day 42.

TABLE 3.
GENERAL ACTIVITY SCHEDULE FOR CONDUCTING A LONG-TERM SEDIMENT TOXICITY TEST WITH *CHIRONOMUS DILUTUS* [ADAPTED FROM TABLE A7.2 IN ASTM 2014 (AN ANALOGOUS TABLE IS INCLUDED IN USEPA 2000 WITH 7-D-OLD LARVAE USED TO START THE EXPOSURES)]

Day	Activity
–10	Collect egg cases (a minimum of 6 to 8) and incubate at 23°C.
–9	Check egg cases for viability and development.
–2	1. Check cultures for hatch and development.
	2. Add 100 mL of homogenized test sediment to each replicate beaker and place in corresponding treatment holding tank. After sediment has settled for at least 1 h, add 1.5 mL Tetrafin slurry (4g/L solution) to each beaker. Overlying water renewal begins at this time.
0	1. Transfer larvae into exposure chambers by transferring larvae still in their culture tubes into the exposure chambers. Add 1.5 mL food to each test beaker with sediment before the larvae are added. Add 12 larvae to each replicate beaker (beakers are chosen by random block assignment).
	2. Measure temperature, pH, hardness, alkalinity, dissolved oxygen, conductivity and ammonia at start of test, and on day 13.
1–End	On a daily basis, add 1.5 mL food to each beaker. Measure temperature daily. Measure the pH and dissolved oxygen three times a week during the test. If the DO has declined more than 1 mg/L since previous reading, increase frequency of DO measurements and aerate if DO continues to be less than 2.5 mg/L.
-1	For auxiliary male production, start reproduction flask with culture adults.
0-2	Set up schedule for auxiliary male beakers (4 replicates/treatment) same as that described above for the beginning of the test (note on Day 2 because Day 3 would be a Saturday).
12	In preparation for weight determinations, ash weigh-pans at 550 °C for 2 h. Note that the weigh boats should be ashed before use to eliminate weighing errors due to the pan oxidizing during ashing of samples.
13	Randomly select four replicates from each treatment and sieve the sediment to recover larvae for growth and survival determinations. Pool all living larvae per replicate and dry the sample to a constant weight (e.g., 60°C for 24 h). Install emergence traps on each reproductive replicate beakers. Measure hardness, alkalinity, and conductivity.
14	The sample with dried larvae is brought to room temperature in a desiccator and weighed to the nearest 0.01 mg. The dried larvae in the pan are then ashed at 550°C for 2 h. The pan with the ashed larvae is then re-weighed and the tissue mass of the larvae determined as the difference between the weight of the dried larvae plus pan and the weight of the ashed larvae plus pan.
16–End	On a daily basis, record emergence of males and females, pupal, and adult mortality, and time to death for previously collected adults. Each day, transfer adults from each replicate to a corresponding reproduction/oviposition (R/O) chamber. Transfer each primary egg case from the R/O chamber to a corresponding 30 mL beaker to monitor incubation and hatch. Record each egg case oviposited, number of eggs produced (using either the ring or direct count methods), and number or hatched eggs. If it is difficult to estimate the number of eggs in an egg case, use a direct count to determine the number of eggs; however the hatchability data will not be obtained for this egg case.
23	Place emergence traps on auxiliary male replicate beakers.
27–End	Transfer males emerging from the auxiliary male replicates to individual inverted Petri dishes. The auxiliary males are used for mating with females from corresponding treatments from which most of the males had already emerged or in which no males emerged.
33–End	After 7 d of no recorded emergence in a given treatment, end the treatment by sieving the sediment to recover larvae, pupae, or pupal exuviae. When no emergence occurs in a test treatment, that treatment can be ended once emergence in the control sediment has ended using the 7-day criterion.

TABLE 4.
TEST ACCEPTABILITY REQUIREMENTS FOR A LONG-TERM SEDIMENT TOXICITY TEST WITH *HYALELLA AZTECA* [ADAPTED FROM TABLE A6.3 IN ASTM 2014 (ANALOGOUS TABLE IS INCLUDED IN USEPA 2000)].

Requirements:

A. It is recommended for conducting the 42-day test with H. azteca that the following performance criteria be met:

1. Age of *H. azteca* at the start of the test should be 7- to 8-day old. Starting a test with substantially younger or older organisms may compromise the reproductive endpoint.
2. Average survival of *H. azteca* in the control sediment on Day 28 should be greater than or equal to 80%.
3. Laboratories participating in round-robin testing (Section 17.6 of ASTM 2014) reported after 28-day sediment exposures in a control sediment (West Bearskin), survival >80% for >88% of the laboratories; length >3.2 mm/individual for >71% of the laboratories; and dry weight >0.15 mg/individual for 66% of the laboratories. Reproduction from Day 28 to Day 42 was >2 young/female for 71% of the laboratories participating in the round-robin testing. Reproduction was more variable within and among laboratories; hence, more replicates might be needed to establish statistical differences among treatments with this endpoint.
4. Hardness, alkalinity, and ammonia in the overlying water typically should not vary by more than 50% during the sediment exposure, and dissolved oxygen should be maintained above 2.5 mg/L in the overlying water.

B. Performance-based criteria for culturing H. azteca include the following:

1. It may be desirable for laboratories to periodically perform 96-h water-only reference-toxicity tests to assess the sensitivity of culture organisms (Section 11.16.2 of ASTM 2014). Data from these reference toxicity tests could be used to assess genetic strain or life-stage sensitivity of test organisms to select chemicals.
2. Laboratories should track parental survival in the cultures and record this information using control charts if known-age cultures are maintained. Records should also be kept on the frequency of restarting cultures and the age of brood organisms.
3. Laboratories should record the following water-quality characteristics of the cultures at least quarterly: pH, hardness, alkalinity, and ammonia. Dissolved oxygen in the cultures should be measured weekly. Temperature in the cultures should be recorded daily. If static cultures are used, it may be desirable to measure water quality more frequently.
4. Laboratories should characterize and monitor background contamination and nutrient quality of food if problems are observed in culturing or testing organisms.
5. Physiological measurements such as lipid content might provide useful information regarding the health of the cultures.

C. Additional requirements:

1. All organisms in a test must be from the same source.
2. Storage of sediments collected from the field should follow guidance outlined in Section 10.2 of ASTM (2014). Sediment toxicity tests will be started within 2 months of collection from the field.
3. All test chambers (and compartments) should be identical and should contain the same amount of sediment and overlying water.
4. Negative-control sediment and appropriate solvent controls must be included in a test. The concentration of solvent used must not adversely affect test organisms.
5. Test organisms must be cultured and tested at 23°C (±1 °C).
6. The mean of the daily test temperature must be within ± 1°C of 23°C. The instantaneous temperature must always be within ±3°C of 23°C.
7. Natural physico-chemical characteristics of test sediment collected from the field should be within the tolerance limits of the test organisms.

TABLE 5.

TEST ACCEPTABILITY REQUIREMENTS FOR A LONG-TERM SEDIMENT TOXICITY TEST WITH CHIRONOMUS DILUTUS ADAPTED FROM TABLE A7.3 IN ASTM 2014 (ANALOGOUS TABLE IS INCLUDED IN USEPA 2000)].

Note the requirements below are for tests started with <24-h old larvae. It is anticipated that similar requirements will be met for the test starting with 7-d-old larvae.

Requirements:

A. It is recommended for conducting a long-term test with C. dilutus that the following performance criteria be met:

1. Tests must be started with less than 1-day (<24 h) old larvae. Starting a test with substantially older organisms may compromise the emergence and reproductive endpoint.
2. Average survival of *C. dilutus* in the control sediment should be greater than or equal to 70% at Day 20 and greater than or equal to 65% at the end of the test.
3. Average size of C. dilutus in the control sediment at 20 d must be at least 0.6 mg/surviving organism as dry weights or 0.48 mg/surviving organism as AFDW. Emergence should be greater than or equal to 50%. Experience has shown that pupae survival is typically >83% and adult survival is >96%. Time to death after emergence is <6.5 d for males and <5.1 d for females. The mean number of eggs/egg case should be greater than or equal to 800 and the percent hatch should be greater than or equal to 80%. See Sections A7.1.3 and 17.6 in ASTM (2014) for a summary of performance in round robin testing.
4. Hardness, alkalinity and ammonia in the overlying water within a treatment typically should not vary by more than 50% during the test and dissolved oxygen should be maintained above 2.5 mg/L in the overlying water.

B. Performance-based criteria for culturing C. dilutus include the following:

1. It may be desirable for laboratories to periodically perform 96-h water-only reference-toxicity tests to assess the sensitivity of culture organisms (Section 11.16.2 of ASTM 2014). Data from these reference toxicity tests could be used to assess genetic strain or life-stage sensitivity of test organisms to select chemicals.
2. Laboratories should keep a record of time to first emergence for each culture and record this information using control charts. Records should also be kept on the frequency of restarting cultures.
3. Laboratories should record the following water-quality characteristics of the cultures at least quarterly: pH, hardness, alkalinity, and ammonia. Dissolved oxygen in the cultures should be measured weekly. Temperature in the cultures should be recorded dally. If static cultures are used, it may be desirable to measure water quality more frequently.
4. Laboratories should characterize and monitor background contamination and nutrient quality of food if problems are observed in culturing or testing organisms.
5. Physiological measurements such as lipid content might provide useful information regarding the health of the cultures.

C. Additional requirements:

1. All organisms in a test must be from the same source.
2. Storage of sediments collected from the field should follow guidance outlined in Section 10.2 of ASTM (2014). Sediment toxicity tests will be started within 2 months of collection from the field.
3. All test chambers (and compartments) should be identical and should contain the same amount of sediment and overlying water.
4. Negative-control sediment and appropriate solvent controls must be included in a test. The concentration of solvent used must not adversely affect test organisms.
5. Test organisms must be cultured and tested at 23°C (+1 °C).
6. The mean of the daily test temperature must be within ± 1°C of 23°C. The instantaneous temperature must always be within ±3°C of 23°C.
7. Natural physico-chemical characteristics of test sediment collected from the field should be within the tolerance limits of the test organisms.

TABLE 6.
ENDPOINT CALCULATION METHODS FOR *HYALELLA AZTECA* AND *CHIRONOMUS DILUTUS* CHRONIC TOXICITY TESTS

Species	Endpoint	Units	Calculation Method (Replicate Level)
H. azteca	28-d Survival	%	Divide the number of surviving organisms at day 28 by the number of organisms seeded at the start of the test; expressed as a percentage.
H. azteca	28-d Mean Individual Length	mm	Obtain the mean length of individual organisms within a replicate.
H. azteca	28-d Mean Individual Dry Weight	mg	1) Determine individual dry weight from individual length using the formula given in Section 2.5.2.1 of the text (Kemble *et al.* 2013). 2) Obtain the mean weight of individual organisms within a replicate.
H. azteca	28-d Total Biomass	mg	Multiply the replicate mean individual dry weight by the number of organisms recovered in the replicate.
H. azteca	35-d Survival	%	Divide the number of surviving organisms at day 35 by the number of organisms seeded at the start of the test; expressed as a percentage.
H. azteca	42-d Survival	%	Divide the number of surviving organisms at day 42 by the number of organisms seeded at the start of the test; expressed as a percentage.
H. azteca	42-d Mean Individual Length	mm	Obtain the mean length of individual organisms within a replicate.
H. azteca	42-d Mean Individual Dry Weight	mg	1) Determine individual dry weight from individual length using the formula given in Section 2.5.2.1 of the text (Kemble *et al.* 2013). 2) Obtain the mean weight of individual organisms within a replicate.
H. azteca	42-d Total Biomass	mg	Multiply the replicate mean individual dry weight by the number of organisms recovered in the replicate.
H. azteca	Total Number of Young Produced	n	Obtain the sum of the total number of young produced at day 35 and day 42.
H. azteca	42-d Mean Number of Young per Female	n	Divide the mean total number of young produced by the number of surviving females in the replicate at day 42.
H. azteca	42-d Mean Number of Young per Female (Normalized to 42-d Survival)	n	Multiply the replicate percent survival at day 42 by the replicate 42-d number of young per female.
C. dilutus	13-d Survival	%	Divide the number of surviving organisms at day 13 by the number of organisms seeded at the start of the test; expressed as a percentage.
C. dilutus	13-d Mean Individual Ash-free Dry Weight	mg	Divide total replicate ash-free biomass by number of surviving larvae.
C. dilutus	13-d Mean Total Ash-free Biomass	mg	Multiply the replicate mean individual ash-free dry weight by the number of surviving larvae recovered in the replicate.
C. dilutus	Emergence	%	Divide the number of emerged adults by the number of organisms seeded at the start of the test; expressed as a percentage.

TABLE 6 (CONTINUED).
ENDPOINT CALCULATION METHODS FOR *HYALELLA AZTECA* AND *CHIRONOMUS DILUTUS* CHRONIC TOXICITY TESTS

Species	Endpoint	Units	Calculation Method (Replicate Level)
C. dilutus	20th Percentile Emergence Time	Days	Determine the 20th percentile of the emergence time for all pupae within a replicate.
C. dilutus	Median Emergence Time	Days	Determine the median emergence time for all pupae within a replicate.
C. dilutus	Emerged Females	%	Divide the number of emerged adults that are female by the number of emerged adults in a replicate; expressed as a percentage.
C. dilutus	Total Number of Egg Cases	n	Total number of egg cases in a replicate.
C. dilutus	Paired Females Laying an Egg Case	%	Divide the total number of egg cases in a replicate by the number of paired females in the replicate; expressed as a percentage.
C. dilutus	Mean Number of Eggs per Case	n	Determine the mean number of eggs per recovered egg case in a replicate.
C. dilutus	Percent Hatch	%	Divide the total number of hatched eggs by the total number of eggs recovered within a replicate; expressed as a percentage.
C. dilutus	Mean Number of Larvae per Paired Female	n	Multiply the mean number of eggs per case in a replicate by the percent hatch in a replicate and by the percent of paired females laying an egg case in a replicate.
C. dilutus	Mean Number of Larvae per Case	n	Multiply the number of eggs per case by the percent hatch from that case and then take the mean of this result for all cases in a replicate.
C. dilutus	Mean Total Fecundity	n	Multiply the number of egg cases in a replicate by the mean number of eggs per case within a replicate.
C. dilutus	Mean Total Number of Larvae Produced	n	Multiply the number of egg cases in a replicate by the mean number of larvae per case within a replicate.
C. dilutus	Intrinsic Rate of Natural Increase	Days	Take the natural log of the sum of the progeny produced by a female over all breeding events in a life cycle and then divide the result by the mean generation time within a replicate. See Section 2.5.2.5 of the text for the formula.
C. dilutus	Adult Mean Time to Death	Days	Determine the mean number of days from emergence until death for all emergent adults within a replicate.

-d = day; n = number/count.

TABLE 7.

DESCRIPTION OF THE BENTHIC INVERTEBRATE COMMUNITY STRUCTURE METRICS CALCULATED FOR EACH REPLICATE SAMPLE (WATERSHED ASSESSMENT ASSOCIATES, LLC 2010).

Metric	Description
Total Individuals (# Individual)	Total number of individuals in the sample.
Abundance of pollution tolerant taxa (# Tolerant)	Number of taxa in sample that are tolerant of pollution.
Abundance of pollution sensitive taxa (# Intolerant)	Number of taxa in sample that are sensitive to pollution.
Abundance of EPT taxa (EPT Taxa)	Number of species in the sample in the generally more pollution intolerant orders Ephemeroptera, Plecoptera, and Trichoptera
Taxa Richness (TR)	Species richness is the total number of species or taxa found in the subsample. Higher species richness values are mostly associated with undisturbed sediment conditions.
Biotic Index (HBI)	Biotic Index, or the Hilsenhoff Biotic Index (Hilsenhoff 1987), is calculated by multiplying the number of individuals of each species or taxa by its assigned tolerance value, summing these products, and dividing the total number of individuals. Tolerance values range from intolerant (0) to tolerant (10). High biotic index values are suggestive of organically enriched conditioned, while low values indicate a naturally occurring, ambient communities.
Percent Model Affinity (PMA)	PMA is a measure of similarity to a model non-impacted community based on percent abundance of seven major groups. For ponar samples, the NYS model is 20% Oligochaeta, 15% Mollusca, 15% Crustacea, 20% Non-Chironomidae Insecta, 20% Chironomidae, and 10% Other. The lower the similarity value the greater the impact.
Species Diversity (SD)	Species diversity is the value that combines species richness and community balance or evenness. High species diversity values usually indicate diverse, well balanced communities, while low values indicate stress or impact.
Dominance-3 (DOM)	Dominance-3 is a measure of community balance, or how even the combined percent contribution of the three most numerous species are distributed. High dominance values indicate unbalanced communities strongly dominated by one or more very numerous species.
Biological Assessment Profile (BAP)	BAP is the assessed impact for each station. The BAP score is the mean value of the above 5 metrics (SR, BI, PMA, SD, DOM) after converting each metric score to a common scale of 0 - 10. The higher the BAP score the better the assessed impact category. There are four impact categories in NYS: non-impacted, and slightly, moderately, or severely impacted.

TABLE 8.

RESULTS OF THE PRELIMINARY CHEMICAL ANALYSES, SHOWING CONCENTRATIONS OF PCB HOMOLOGS, TOTAL PCBS, PERCENT MOISTURE, AND TOTAL ORGANIC CARBON (TOC) IN SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Station	Moisture (%)	TOC (%)	Polychlorinated Biphenyl (PCB) Homolog Group (µg/kg)										Total PCBs (µg/kg) [1]	Total PCBs$_{1\%OC}$ (µg/kg)
			Mono-CB	Di-CB	Tri-CB	Tetra-CB	Penta-CB	Hexa-CB	Hepta-CB	Octa-CB	Nona-CB	Deca-CB		
UHR-SVS-19	28.9	0.85	15.6	29.4	39.7	55.5	26.4	13	3.72	<1.21	<1.21	<1.21	185	219
UHR-SVS-06	43.4	1.2	59.8	69.6	77.8	91.1	43.1	16	8.7	4.85	<1.55	<1.55	373	311
UHR-SVS-04	38.6	0.95	100	101	86.4	92.3	42.3	15.8	7.99	3.44	<1.51	<1.51	451	475
UHR-SVS-117	34.6	0.78	171	373	416	366	130	41.3	8.35	5.67	3.31	<1.36	1520	1950
UHR-SVS-28	45	3.35	779	1280	1690	2290	949	289	50.1	15.8	10.4	<1.58	7350	2190
UHR-SVS-20	24.4	0.34	5.47	51.4	232	338	87.7	24.6	6.21	<1.16	<1.16	<1.16	747	2200
UHR-SVS-107	24.4	0.51	33.2	155	369	428	111	27.5	7.39	<2.43	<2.43	<2.43	1130	2220
UHR-SVS-123 ALT	29.1	0.74	198	480	504	468	172	44.8	12.2	8.85	<2.49	<2.49	1890	2550
UHR-SVS-112	25.6	0.76	304	738	508	270	104	41.3	9.83	4.36	4.02	<1.21	1980	2610
UHR-SVS-36	34.9	2.3	169	625	1300	2950	1250	334	64	23.1	12.7	<2.79	6730	2930
UHR-SVS-12	41.4	1.9	367	906	1430	1900	739	228	40.3	12.8	6.94	<1.52	5630	2960
UHR-SVS-103	28.6	0.91	386	760	671	568	207	59.7	14.7	12.4	8.6	<1.26	2690	2970
UHR-SVS-11	53.3	3.1	472	2230	3130	2700	811	222	33.3	38.1	<3.91	<3.91	9640	3110
UHR-SVS-23	15.8	0.73	31.6	183	555	792	522	197	27.1	4.72	<2.18	<2.18	2310	3160
UHR-SVS-17	54.1	2.95	1890	2300	1980	2310	889	236	51.4	23.5	15.7	<2.1	9700	3290
UHR-SVS-09	44.4	1.8	552	917	1440	1870	1070	593	100	27.5	15.4	1.94	6590	3660
UHR-SVS-25	36.3	1.5	249	865	1460	2230	866	230	39.9	21.1	12.2	<1.42	5970	3980
UHR-SVS-13	36.7	1.2	226	913	1490	1660	508	158	33.8	18.5	1.93	<1.46	5010	4180
UHR-SVS-124	32.9	0.82	389	927	1140	985	289	84.4	26	16.4	<2.86	<2.86	3860	4740
UHR-SVS-22	42.1	2.85	752	2800	4360	4040	1120	363	81.1	34	15.4	1.52	13600	4770
UHR-SVS-16	37.9	1.2	757	1480	1820	1670	541	160	36.2	21.1	5.88	<2.94	6490	5410
UHR-SVS-38	37.4	1.65	579	1950	2840	3000	1030	242	54.1	30.1	17.9	<5.66	9750	5910
UHR-SVS-42	30.7	1.55	230	1160	2550	3740	1290	281	59.8	20.9	24.9	<5.3	9360	6040
UHR-SVS-15	46.4	1.85	508	2500	3760	3660	1040	298	64.2	22.9	16.4	<3.49	11900	6430
UHR-SVS-35	29.8	1.6	458	2210	3980	3660	1100	268	55.6	35.5	20.8	<2.64	11800	7380
UHR-SVS-39	35.3	1.4	526	2120	2890	3580	1220	323	68.7	35.7	14	<5.39	10800	7710
UHR-SVS-108	42.1	1.35	628	1970	3180	3430	1070	343	60.6	25.3	3.53	<1.62	10700	7930
UHR-SVS-111	52.2	2.3	708	4000	5370	5320	2410	759	146	80.6	37.7	4.91	18800	8170
UHR-SVS-127	39.5	1.65	2810	4350	3430	2980	850	229	58.6	25.5	9.26	<5.65	14700	8910
UHR-SVS-02	21.5	0.33	1130	1100	474	331	116	35.9	12	6.73	3.82	<1.19	3210	9730

TABLE 8 (CONTINUED).
RESULTS OF THE PRELIMINARY CHEMICAL ANALYSES, SHOWING CONCENTRATIONS OF PCB HOMOLOGS, TOTAL PCBS, PERCENT MOISTURE, AND TOTAL ORGANIC CARBON (TOC) IN SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Station	Moisture (%)	TOC (%)	Polychlorinated Biphenyl (PCB) Homolog Group (µg/kg)										Total PCBs (µg/kg) [1]	Total PCBs$_{1\%OC}$ (µg/kg)
			Mono-CB	Di-CB	Tri-CB	Tetra-CB	Penta-CB	Hexa-CB	Hepta-CB	Octa-CB	Nona-CB	Deca-CB		
UHR-SVS-122	39.1	1.35	3870	5210	3000	2140	742	209	56.3	29	16.6	<3.03	15300	11300
UHR-SVS-26	32	1.4	5990	7510	3220	1860	734	377	180	70.5	77.6	<27.3	20000	14300
UHR-SVS-24	36.8	3.3	3160	12400	14800	11100	3980	1690	393	125	53.7	7.01	47700	14500
UHR-SVS-08	32.3	1.2	3720	7500	3770	1720	568	212	72	<13.5	<13.5	<13.5	17600	14700
UHR-SVS-31	33.7	2.3	24000	28500	12600	8230	3160	1080	640	<69.5	<69.5	<69.5	78300	34000
UHR-SVS-29	53	2.6	63200	102000	34800	14200	4420	2500	946	<161	<161	<161	222000	85400
UHR-SVS-37	61.9	4.6	204000	200000	58300	31000	12300	6220	2690	<466	<466	<466	515000	112000
UHR-SVS-40	75.5	4.5	186000	223000	73600	35700	11200	5310	2420	<750	<750	<750	538000	120000
UHR-SVS-41 ALT	73.1	6.3	409000	338000	108000	56700	20200	7690	3640	<713	<713	<713	944000	150000
UHR-SVS-07	69.8	5	571000	436000	111000	58100	20000	6700	2240	<1150	<1150	<1150	1210000	242000
Reference Sites														
UHR-SVS-REF-11	79.5	6.65	10.4	32.6	240	737	320	67.8	18.2	<4.37	<4.37	<4.37	1430	215
UHR-SVS-REF-13	21	0.1	<1.08	<1.08	<1.08	<1.08	<1.08	<1.08	<1.08	<1.08	<1.08	<1.08	5.4	56.8
UHR-SVS-REF-14	25.4	0.12	<1.15	2.12	<1.15	<1.15	<1.15	<1.15	<1.15	<1.15	<1.15	<1.15	7.3	60.8

TOC = total organic carbon; 1%OC = normalized to 1% organic cabon; CB = chlorobiphenyls.
[1] Total PCBs were calculated as the sum of the reported concentrations of individual homolog groups (i.e., mono-, di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona-, and deca-chlorobiphenyls).

Table 9

Comprehensive sediment chemistry data obtained for selected sediment samples[1] collected from the upper Hudson River in 2008.

Chemical Class/Chemical of Potential Concern	Station											
	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-31	UHR-SVS-29/36 [2]	UHR-SVS-16/37 [3]
Metals (mg/kg DW)												
Aluminum, total	4990	5640	3130	4680	4740	4460	5030	4310	4460	4830	5420	7010
Antimony, total	0.032	0.041	0.23	0.51	0.122	0.165	0.34	0.229	0.633	0.77	0.633	1.58
Arsenic, total	2.2	1.46	2.25	1.95	1.64	1.06	2.04	0.982	1.82	1.07	1.55	1.94
Barium, total	40.4	43	30.5	42.5	40.8	37	77.4	37	37.3	39.3	48.7	61.7
Beryllium, total	0.356	0.364	0.258	0.341	0.34	0.327	0.361	0.301	0.302	0.322	0.33	1.69
Cadmium, total	0.113	0.254	0.453	0.589	1.25	1.03	0.971	2.93	3.28	6.41	3.88	18.2
Calcium, total	1850	2360	1210	2190	2110	2170	2270	2040	1590	2100	2190	2000
Chromium, total	7.01	10.4	17.4	23.8	25.1	28.3	28.8	55.2	115	87.1	116	228
Cobalt, total	5.15	5.02	2.78	3.44	4.32	3.89	4.73	4.7	4.06	3.8	4.49	6.21
Copper, total	5.94	8.29	8.99	14.5	9.44	9.26	17.1	11	25.6	14.1	22.2	37.4
Iron, total	11200	10600	8720	11400	10800	9020	12800	8500	6980	7430	9970	10600
Lead, total	7.06	7.76	23.5	52.9	21.6	26	39.6	39.9	144	86.6	107	263
Magnesium, total	1480	1820	1230	1650	1660	1580	1910	1450	1250	1410	1600	1770
Manganese, total	226	146	51.2	90.4	99.9	93.2	117	160	59.4	64	115	137
Mercury, total	0.016	0.03	0.064	0.093	0.12	0.136	0.21	0.368	0.877	0.854	0.648	1.99
Nickel, total	6.89	8.75	5.6	6.92	7.6	6.84	10.1	7.61	9.67	7.69	9.46	12.4
Potassium, total	475	473	340	437	443	345	503	374	278	287	411	509
Selenium, total	0.264	0.37	0.248	0.374	0.371	0.293	0.59	0.305	0.45	0.392	0.4	0.796
Silver, total	0.043	0.078	0.065	0.169	0.14	0.17	0.191	0.176	0.305	0.141	0.276	0.442
Sodium, total	77.4	99	68.9	111	109	108	108	96.6	95.1	117	117	112
Thallium, total	<0.173	<0.216	<0.161	<0.209	0.528	<0.193	<0.2	<0.176	<0.177	<0.206	0.205	<0.238
Vanadium, total	10.5	11.1	7	10.6	10.2	9.88	11.2	8.83	14.7	14.7	17	26.7
Zinc, total	31	50.9	51.2	78.7	90.1	82.6	94.1	88.9	92.5	92.2	140	242
Simultaneously Extracted Metals (SEM; µmol/g)												
Acid volatile sulfides (AVS)	0.393	3.34	1.91	9.59	3.99	3.45	5.49	1.53	1.06	2.48	4.93	1.26
SEM (µmol/g; continued)												
SE cadmium	0.00077	0.00153	0.00278	0.00581	0.00511	0.00658	0.0131	0.017	0.0182	0.0254	0.0174	0.0296
SE copper	0.0492	0.0764	0.0457	0.068	0.0649	0.0608	0.1	0.0777	0.112	0.0549	0.155	0.0683
SE lead	0.0251	0.0253	0.0917	0.105	0.0751	0.102	0.151	0.156	0.597	0.338	0.422	0.401
SE nickel	0.0294	0.0372	0.0289	0.0263	0.0377	0.0364	0.0411	0.0516	0.0384	0.0329	0.0474	<0.0258
SE zinc	0.15	0.311	0.421	0.513	0.857	0.689	0.735	0.867	0.714	0.806	1.31	0.909
∑SEM-AVS [4]	0.139	- 2.89	- 1.32	- 8.87	- 2.95	- 2.56	- 4.45	0.361	- 0.42	- 1.22	2.98	0.161
(∑SEM-AVS)/f_{OC} [5]	- 16.4	- 304	- 174	- 739	- 362	- 155	- 270	25.8	- 12.7	- 53	302	11.6
SEM:AVS		0.135	0.31	0.075	0.26	0.259	0.19	0.764	1.4	0.507	0.396	1.11

TABLE 9 (CONTINUED)

COMPREHENSIVE SEDIMENT CHEMISTRY DATA OBTAINED FOR SELECTED SEDIMENT SAMPLES[1] COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Chemical Class/Chemical of Potential Concern	Station											
	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-31	UHR-SVS-29/36 [2]	UHR-SVS-16/37 [3]
Polycyclic Aromatic Hydrocarbons (PAHs; µg/kg DW)												
Parent PAHs												
Acenaphthene*,T	<2.4	2.64	8.65	12.2	17.1	10.6	56	7.41	126	12.4	12.1	20.6
Acenaphthylene*,T	4.77	4.64	13.3	24.6	16.5	19.6	34.7	23.4	145	21.4	42	62.2
Anthracene*,T	3.83	6.47	14	46.4	25.1	31.4	139	24.3	303	36.6	44	104
Benz(a)anthracene*,T	15	30.3	42.8	158	104	88.9	396	76.2	753	112	157	335
Benzo(a)pyrene*,T	<2.4	14.3	2.99	152	25.6	67.7	266	14	359	56.4	108	240
Benzo(b)fluoranthene*	16.4	33.8	33.6	147	99.5	90.2	339	94.3	588	108	155	296
Benzo(e)pyrene*	12.7	25	28.8	110	77.3	71.4	240	69.9	442	86.2	118	230
Benzo(g,h,i)perylene*	11.4	24	21.6	99.6	66.9	60.9	212	62.6	327	66.3	108	212
Benzo(k)fluoranthene*	16.8	32.5	37.2	130	103	88.4	280	80	583	108	134	290
Chrysene*,T	19	42.1	55.8	172	132	118	429	110	871	146	178	373
Dibenz(a,h)anthracene*,T	2.93	6.21	6.04	28.4	18.5	15.7	64.8	15.3	109	17.4	26.6	59.1
Dibenzofuran	<2.4	3.18	10.9	15.1	24.8	18.8	39.5	17.8	134	19.2	19.5	32.3
Dibenzothiophene	<2.4	3.13	9.58	10.8	13.6	12.3	47.1	9.79	133	16.2	13.3	27.9
Fluoranthene*,T	34.6	87.8	133	310	278	256	874	240	1870	360	338	712
Fluorene*,T	<2.4	5.34	16.6	18.9	22.5	18.8	67.1	16.1	231	21.9	19.9	38.6
Indeno(1,2,3-cd)pyrene*	11.5	24.4	20.9	105	69.9	59.3	217	60.8	337	63.6	107	213
Naphthalene*,T	4.06	6.44	27.6	29.7	53.3	38.8	63.7	44.1	289	27.6	51.5	74.4
Perylene*	<2.4	89.4	<1.78	68.9	17.4	29.8	89.6	10.7	99.7	22.6	50.4	91.1
Phenanthrene*,T	20.1	57.1	117	194	221	180	772	156	1660	244	201	381
Pyrene*,T	28.6	73.1	134	276	246	235	790	221	1740	301	326	661
Alkylated PAHs												
C1-Chrysenes*	9.02	26.8	35.3	86.3	57.2	50.8	202	50	513	72.1	95	206
C2-Chrysenes*	5.49	9.63	20.6	40.9	26.1	24.2	92.8	26.6	237	42.8	49.4	129
C3-Chrysenes*	6.7	<2.64	15.6	29.6	19	25.6	54.4	20.8	130	36.3	43.6	101
C4-Chrysenes*	<2.4	<2.64	8.83	16.2	<2.52	<2.78	27.2	15.4	54.4	26	26.4	62.7
C1-Dibenzothiophenes	<2.4	2.73	11.1	9.35	12.1	12	45.3	12.6	128	18.5	18.8	43.7
C2-Dibenzothiophenes	<2.4	3.73	15.9	12.4	15.1	13.2	46.1	19.6	146	22.5	28.2	74.5
C3-Dibenzothiophenes	<2.4	3.48	15.3	10.9	13.4	12.5	30.5	22.8	110	23.1	30.9	84.5
C4-Dibenzothiophenes	<2.4	<2.64	12.9	9.14	10.4	12.8	18.2	20.7	70.2	22.1	27.9	72.1

Table 9 (continued)

Comprehensive sediment chemistry data obtained for selected sediment samples[1] collected from the upper Hudson River in 2008.

Chemical Class/Chemical of Potential Concern	Station											
	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-31	UHR-SVS-29/36 [2]	UHR-SVS-16/37 [3]
Alkylated PAHs (continued)												
C1-Fluoranthenes/pyrenes*	17.2	36.4	92.9	171	135	116	460	121	1260	166	212	450
C2-Fluoranthenes/pyrenes	16.1	34.8	58.6	133	113	102	322	101	866	155	154	359
C3-Fluoranthenes/pyrenes	6.16	9.12	18.7	39.8	32.9	31	88.5	35.4	248	52.3	53.7	135
C4-Fluoranthenes/pyrenes	5.14	13.7	17.4	25.4	22.9	22.6	55	25.2	145	37.9	39	94.7
C1-Fluorenes*	<2.4	4.79	13	16.2	13.6	13.5	48.8	14	141	23.6	18	38.7
C2-Fluorenes*	3.43	6.72	13.2	14.3	16.7	22.3	42	22.1	147	36.4	33.9	79.5
C3-Fluorenes*	5.3	9.68	20.7	23.5	31.1	30.8	67.7	34.2	222	51.8	40.6	95.6
1-Methylnaphthalene	2.46	2.64	10.4	12.1	19.2	17.4	40	12.9	201	16.5	19.9	30.5
2-Methylnaphthalene [T]	2.43	3.16	18.7	18.2	29.4	25.7	55.3	22.7	336	22.4	30.8	51.6
C1-Naphthalenes*	3.56	3.77	18.9	19.7	31.8	28	61.8	23.2	349	25	33.1	53.6
C2-Naphthalenes*	5.41	5.92	25.8	25.1	34.3	34.3	71.7	29.8	394	38.8	44.3	83.2
C3-Naphthalenes*	6.04	8.92	24.8	27.6	30.9	34.5	70.6	33.8	270	47.3	52.1	121
C4-Naphthalenes*	4.66	6.89	23.2	25.8	27.1	33.5	63.7	54.1	221	131	111	306
C1-Phenanthrenes/ anthracenes*	10.1	19.7	56.8	77.4	77.1	75.2	313	73.8	726	98.9	101	231
C2-Phenanthrenes/ anthracenes*	5.58	13.6	43.7	52.6	48.9	46.9	170	56.8	468	80.9	88.2	223
C3-Phenanthrenes/ anthracenes*	4.81	9.65	32.9	36.3	37.3	48.3	91	63.7	299	130	95	225
C4-Phenanthrenes/ anthracenes*	6.12	17.7	42.7	36	46.6	54	68.1	69.6	185	137	94.4	243
Total PAHs [6]	139	340	590	1440	1190	1110	4010	971	8790	1380	1530	3110
$\sum$ESB-TU$_{FCV}$ [7]	0.472	0.101	0.222	0.298	0.373	0.173	0.584	0.197	0.705	0.172	0.442	0.664
Polychlorinated Biphenyls (PCBs; µg/kg DW)												
Sum PCB (monochlorobiphenyls)	15.6	100	304	226	389	579	2810	5990	3160	24000	14700	65000
Sum PCB (dichlorobiphenyls)	29.4	101	738	913	927	1950	4350	7510	12400	28500	25800	69500
Sum PCB (trichlorobiphenyls)	39.7	86.4	508	1490	1140	2840	3430	3220	14800	12600	9060	18900

TABLE 9 (CONTINUED)

COMPREHENSIVE SEDIMENT CHEMISTRY DATA OBTAINED FOR SELECTED SEDIMENT SAMPLES[1] COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Chemical Class/Chemical of Potential Concern	Station											
	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-31	UHR-SVS-29/36 [2]	UHR-SVS-16/37 [3]
PCBs (µg/kg DW; continued)												
Sum PCB (tetrachlorobiphenyls)	55.5	92.3	270	1660	985	3000	2980	1860	11100	8230	5980	10800
Sum PCB (pentachlorobiphenyls)	26.4	42.3	104	508	289	1030	850	734	3980	3160	2300	3380
Sum PCB (hexachlorobiphenyls)	13	15.8	41.3	158	84.4	242	229	377	1690	1080	872	1410
Sum PCB (heptachlorobiphenyls)	3.72	7.99	9.83	33.8	26	54.1	58.6	180	393	640	276	487
Sum PCB (octachlorobiphenyls)	<1.21	3.44	4.36	18.5	16.4	30.1	25.5	70.5	125	<69.5	222	409
Sum PCB (nonachlorobiphenyls)	<1.21	<1.51	4.02	1.93	<2.86	17.9	9.26	77.6	53.7	<69.5	179	<129
Sum PCB (decachlorobiphenyls)	<1.21	<1.51	<1.21	<1.46	<2.86	<5.66	<5.65	<27.3	7.01	<69.5	<55.3	<129
Total PCBs [8]	185	451	1980	5010	3860	9750	14700	20000	47700	78300	59400	170000
Total $PCBs_{1\%OC}$	219	475	2610	4180	4740	5910	8910	14300	14500	34000	60100	123000
Organochlorine Pesticides (µg/kg DW)												
Aldrin	<0.0019	<0.003	<0.0051	<0.0065	<0.009	<0.02	<0.0072	<0.0064	<0.0058	<0.0293	<0.0053	<0.0146
Chlordane, alpha-	<0.013	<0.067	<0.013	<0.04	<0.022	<0.031	<0.047	<0.032	<0.155	0.098	<0.071	<0.112
Chlordane, gamma-	<0.011	0.055	<0.006	0.022	<0.02	<0.029	<0.044	<0.028	0.149	<0.087	0.069	<0.133
Chlordane, technical grade	0.01	0.278	0.015	0.055	ND	ND	0.05	ND	0.373	0.245	0.173	ND
Dieldrin	<0.012	0.008	<0.004	0.007	<0.007	0.011	0.005	<0.009	<0.018	0.009	<0.014	0.065
o,p'-DDD	0.012	0.037	<0.04	0.053	<0.051	0.099	0.112	0.058	0.861	0.387	0.197	0.225
p,p'-DDD	0.039	0.145	0.165	0.223	0.206	0.354	0.303	0.178	0.948	0.726	0.465	0.725
Sum DDDs (o,p' + p,p')	0.051	0.182	0.185	0.276	0.232	0.453	0.415	0.236	1.81	1.11	0.662	0.95
o,p'-DDE	<0.0037	0.008	0.024	0.021	0.015	0.044	0.049	0.041	0.256	0.421	0.351	0.52
p,p'-DDE	0.069	0.348	0.13	0.455	0.261	0.37	0.981	0.362	1.12	1.25	1.24	2.15

Table 9 (continued)

Comprehensive sediment chemistry data obtained for selected sediment samples[1] collected from the upper Hudson River in 2008.

Chemical Class/Chemical of Potential Concern	Station											
	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-31	UHR-SVS-29/36 [2]	UHR-SVS-16/37 [3]
Organochlorine Pesticides (µg/kg DW; continued)												
Sum DDEs (o,p' + p,p')	0.0709	0.356	0.154	0.476	0.276	0.414	1.03	0.403	1.38	1.67	1.59	2.67
o,p'-DDT	0.01	0.017	<0.0286	0.045	<0.0302	0.033	0.065	<0.0292	<0.0992	<0.0594	0.033	<0.0703
p,p'-DDT	0.047	0.065	<0.0324	0.152	0.05	0.131	0.169	0.058	0.161	0.081	0.163	0.293
Sum DDTs (o,p' + p,p')	0.057	0.082	<0.0305	0.197	0.0651	0.164	0.234	0.0726	0.211	0.111	0.196	0.328
Total DDTs (Sum DDDs + Sum DDEs + Sum DDTs)	0.179	0.62	0.37	0.949	0.573	1.03	1.68	0.712	3.4	2.89	2.45	3.95
Endosulfan sulfate	<0.004	<0.0153	<0.003	0.012	<0.0112	0.019	0.022	0.013	<0.02	<0.0073	0.012	<0.017
Endosulfan-alpha	<0.02	<0.017	<0.014	<0.022	<0.02	<0.015	<0.04	<0.014	<0.022	<0.0054	<0.02	<0.021
Endosulfan-beta	<0.028	<0.043	<0.028	<0.064	<0.045	<0.033	<0.048	<0.038	<0.031	<0.03	<0.047	<0.038
Endrin	<0.0013	<0.004	<0.0014	<0.003	<0.0025	<0.005	<0.003	0.006	<0.004	<0.0018	<0.004	0.006
Endrin aldehyde	<0.0023	<0.0081	<0.003	<0.0048	<0.005	<0.003	<0.0039	<0.0033	<0.0021	<0.0026	<0.0022	<0.004
Endrin ketone	<0.0019	<0.0024	<0.0021	<0.0012	<0.0016	<0.0023	<0.0018	<0.0024	<0.038	<0.0024	<0.0022	<0.0043
Heptachlor	<0.0015	ND	<0.0041	<0.0122	<0.0045	<0.0062	<0.0069	<0.0056	<0.0044	<0.0068	<0.0045	<0.0094
Heptachlor epoxide	<0.001	<0.0013	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.002	<0.002	<0.0011
Hexachlorobenzene	0.017	<0.028	<0.125	0.165	0.232	0.29	0.606	0.178	0.685	0.869	0.58	0.56
Hexachlorocyclohexane-alpha	<0.0014	<0.002	<0.005	<0.003	<0.011	0.01	0.058	0.006	<0.041	<0.057	<0.03	0.033
Hexachlorocyclohexane-beta	<0.0016	0.002	<0.005	<0.0033	<0.005	<0.007	<0.01	<0.0041	<0.0214	<0.026	<0.016	<0.01
Hexachlorocyclohexane-gamma (Lindane)	<0.0015	<0.002	<0.0037	<0.005	<0.005	<0.0043	<0.006	<0.005	<0.0168	<0.0139	<0.016	<0.011
Methoxychlor	<0.029	<0.008	<0.035	<0.054	<0.064	<0.174	<0.165	<0.234	<0.0784	<0.167	<0.244	<0.322
Nonachlor, cis	<0.004	<0.028	<0.0116	<0.019	<0.0123	<0.0125	<0.02	<0.0118	<0.0149	<0.044	<0.029	<0.075
Nonachlor, trans	<0.016	0.056	<0.008	<0.015	<0.023	<0.014	<0.036	<0.017	<0.053	<0.031	<0.027	<0.033

TABLE 9 (CONTINUED)

COMPREHENSIVE SEDIMENT CHEMISTRY DATA OBTAINED FOR SELECTED SEDIMENT SAMPLES[1] COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Chemical Class/Chemical of Potential Concern	Station											
	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-31	UHR-SVS-29/36 [2]	UHR-SVS-16/37 [3]
Organochlorine Pesticides (µg/kg DW; continued)												
Oxychlordane	<0.0055	<0.0046	<0.0179	<0.0166	<0.0175	<0.0237	<0.021	<0.0238	<0.0183	<0.0724	<0.0177	<0.0571
Toxaphene	<0.0967	<0.114	<0.268	<0.766	<0.471	<0.236	<0.559	<0.248	<1.92	<1.16	<0.345	<0.284
Mean Quotients (no units)												
Mean PEC-Q [9]	0.115	0.256	1.02	2.55	1.97	4.88	7.37	9.96	23.8	38.8	29.5	84.3
Mean PEC-Q_{METALS} [10]	0.0653	0.0852	0.112	0.174	0.159	0.154	0.193	0.264	0.492	0.462	0.479	1.27
Mean PEC-$Q_{METALS(1\%OC)}$	0.0773	0.0897	0.147	0.145	0.195	0.0933	0.117	0.189	0.149	0.201	0.485	0.917
Conventionals												
Moisture (%)	25	33	22	32	30	32	34	29	32	33	35	43
Total organic carbon (%)	0.845	0.95	0.76	1.2	0.815	1.65	1.65	1.4	3.3	2.3	0.988	1.385
Clay-fine (%)	3.9	10.1	1.6	3.4	4.4	3	2.2	2.4	2.1	3.3	4.1	4.2
Silt-fine (%)	16.4	48	8.6	15.5	21	14.1	15.3	11.7	9.1	15.9	20	21.6
Fines (silt+clay; %)	20.3	58.1	10.2	18.9	25.4	17.1	17.5	14.1	11.2	19.2	24.1	25.8
Sand - fine (%)	68	40.4	56.5	67.1	72.8	79.9	66.1	80.5	75.8	78.5	71.3	65
Sand - medium (%)	11.6	0.8	33.3	13.7	1.7	3	16	5.2	12.7	2.1	4.6	9.2
Sand - coarse (%)	0.1	0.5	0	0.2	0.1	0	0.4	0.1	0.2	0.1	0	0

TABLE 9 (CONTINUED)

COMPREHENSIVE SEDIMENT CHEMISTRY DATA OBTAINED FOR SELECTED SEDIMENT SAMPLES[1] COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Notes:

DW = dry weight; ND = no data; OC = organic carbon; 1%OC = normalized to 1%OC; FCV = final chronic value; PEC = probable effect concentration.

1. These samples were selected based on the preliminary chemical analyses and were used in the toxicity testing. PCBs and TOC were run as part of the comprehensive analyses only for the composite samples, samples UHR-SVS-29/36 and UHR-SVS-16/37. The PCB and TOC results for the other samples are from the preliminary analyses (Table 7). The percent moisture results for all samples are from the comprehensive analyses.
2. UHR-SVS-29/36 consists of a 1:2 ratio (by weight) mixing of samples from stations UHR-SVS-29 and UHR-SVS-36.
3. UHR-SVS-16/37 consists of a 1:1 ratio (by weight) mixing of samples from stations UHR-SVS-16 and UHR-SVS-37.
4. ∑SEM-AVS = the sum of simultaneously extracted metals concentrations (i.e., SE-cadmium, SE-copper, SE-lead, SE-nickel, SE-zinc, and one-half of SE-silver) minus the acid volatile sulfides concentration.
5. ∑SEM-AVS)/f_{OC} = (∑SEM-AVS) divided by the fraction organic carbon.
6. Total PAHs were calculated as the sum of the 13 PAHs noted with a "T" in this table. Using these 13 PAHs results in total PAH estimates that are comparable to sediment quality guidelines.
7. ∑ESB-TU_{FCV} was calculated as the sum of the equilibrium partitioning sediment benchmark-toxic units for the 34 PAHs listed by USEPA (2003); these PAHs are noted with an * in this table.
8. Total PCBs were calculated as the sum of the reported concentrations of individual homolog groups (i.e., mono-, di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona-, and deca-chlorobiphenyls).
9. Mean PEC-Q was calculated based on the following metals: arsenic, cadmium, chromium, copper, nickel, lead, and zinc; total PAHs; and, total PCBs (Ingersoll et al. 2001).
10. Mean PEC-Q_{METALS} was calculated based on the following metals: arsenic, cadmium, chromium, copper, nickel, lead, zinc (Ingersoll et al. 2001).

TABLE 10
SUMMARY STATISTICS CALCULATED FROM THE SEDIMENT CHEMISTRY DATA OBTAINED FOR SELECTED SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Chemical Class/Chemical of Potential Concern	n	Detection Limit Range	% ND	Mean	SD	Geometric Mean	Min	Max	Distribution						
									5th	10th	25th	50th	75th	90th	95th
Metals (mg/kg DW)															
Aluminum, total	12	NA	0	4890	917	4810	3130	7010	3780	4330	4460	4790	5130	5620	6260
Antimony, total	12	NA	0	0.44	0.436	0.265	0.032	1.58	0.037	0.0491	0.154	0.285	0.633	0.756	1.13
Arsenic, total	12	NA	0	1.66	0.446	1.6	0.982	2.25	1.02	1.06	1.36	1.73	1.97	2.18	2.22
Barium, total	12	NA	0	44.6	12.9	43.3	30.5	77.4	34.1	37	37.2	40.6	44.4	60.4	68.8
Beryllium, total	12	NA	0	0.441	0.394	0.374	0.258	1.69	0.282	0.301	0.317	0.335	0.357	0.364	0.961
Cadmium, total	12	NA	0	3.28	5.06	1.36	0.113	18.2	0.191	0.274	0.555	1.14	3.43	6.16	11.7
Calcium, total	12	NA	0	2010	322	1980	1210	2360	1420	1620	1960	2110	2190	2260	2310
Chromium, total	12	NA	0	61.8	65.2	38	7.01	228	8.87	11.1	22.2	28.6	94.1	116	166
Cobalt, total	12	NA	0	4.38	0.89	4.3	2.78	6.21	3.14	3.48	3.87	4.41	4.8	5.14	5.63
Copper, total	12	NA	0	15.3	9.11	13.3	5.94	37.4	7.23	8.36	9.19	12.6	18.4	25.3	30.9
Iron, total	12	NA	0	9840	1730	9690	6980	12800	7230	7540	8670	10300	10900	11400	12000
Lead, total	12	NA	0	68.2	74.3	40.8	7.06	263	7.45	9.14	23	39.8	91.7	140	198
Magnesium, total	12	NA	0	1570	213	1550	1230	1910	1240	1270	1440	1590	1690	1820	1860
Manganese, total	12	NA	0	113	49.4	104	51.2	226	55.7	59.9	83.8	107	139	159	190
Mercury, total	12	NA	0	0.451	0.578	0.197	0.016	1.99	0.0237	0.0334	0.0858	0.173	0.7	0.875	1.38
Nickel, total	12	NA	0	8.29	1.86	8.11	5.6	12.4	6.28	6.85	6.91	7.65	9.51	10.1	11.1
Potassium, total	12	NA	0	406	80.5	398	278	509	283	292	344	424	474	500	506
Selenium, total	12	NA	0	0.404	0.154	0.383	0.248	0.796	0.257	0.267	0.302	0.373	0.413	0.576	0.683
Silver, total	12	NA	0	0.183	0.113	0.152	0.043	0.442	0.0551	0.0663	0.125	0.17	0.212	0.302	0.367
Sodium, total	12	NA	0	102	15.2	100	68.9	117	73.6	79.2	96.2	108	111	117	117
Thallium, total	12	<0.161-<0.238	83	0.142	0.126	0.119	<0.161	0.528	0.0838	0.0867	0.0884	0.102	0.111	0.196	0.35
Vanadium, total	12	NA	0	12.7	5.21	11.9	7	26.7	8.01	8.94	10.1	10.9	14.7	16.8	21.4

TABLE 10 (CONTINUED)
SUMMARY STATISTICS CALCULATED FROM THE SEDIMENT CHEMISTRY DATA OBTAINED FOR SELECTEDF SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Chemical Class/Chemical of Potential Concern	n	Detection Limit Range	% ND	Mean	SD	Geometric Mean	Min	Max	Distribution						
									5th	10th	25th	50th	75th	90th	95th
Metals (mg/kg DW) (continued)															
Zinc, total	12	NA	0	94.5	54	83.5	31	242	41.9	50.9	71.8	89.5	92.9	135	186
Simultaneously extracted metals (SEM; µmol/g)															
Acid volatile sulfides (AVS)	12	NA	0	3.29	2.54	2.44	0.393	9.59	0.76	1.08	1.46	2.91	4.23	5.43	7.34
SE cadmium	12	NA	0	0.012	0.00962	0.00754	0.0008	0.03	0.00119	0.0017	0.00453	0.0098	0.0176	0.0247	0.0273
SE copper	12	NA	0	0.078	0.0311	0.0731	0.0457	0.155	0.0476	0.0498	0.0593	0.0682	0.0833	0.111	0.131
SE lead	12	NA	0	0.207	0.185	0.135	0.0251	0.597	0.0252	0.0303	0.0876	0.128	0.354	0.42	0.501
SE nickel	12	<0.0258	8	0.035	0.0101	0.0333	<0.0258	0.052	0.0203	0.0266	0.0293	0.0368	0.0391	0.0468	0.0493
SE zinc	12	NA	0	0.69	0.308	0.609	0.15	1.31	0.239	0.322	0.49	0.725	0.86	0.905	1.09
∑SEM-AVS[1]	12	NA	0	-2.26	2.58	NC	-8.87	0.42	-6.44	-4.3	-2.96	-1.94	-0.306	0.131	0.278
(∑SEM-AVS)/f_{OC}[2]	12	NA	0	-198	218	NC	-739	12.7	-532	-356	-303	-165	-23.5	8.8	12.1
SEM:AVS	11	NA	0	0.491	0.427	0.35	0.075	1.4	0.105	0.135	0.225	0.31	0.636	1.11	1.26
Polycyclic Aromatic Hydrocarbons (PAHs; µg/kg DW)															
Parent PAHs															
Acenaphthene	12	<2.4	8	23.9	35.1	12.1	<2.4	126	1.99	3.12	8.34	12.2	18	52.5	87.5
Acenaphthylene	12	NA	0	34.3	38.4	22.3	4.64	145	4.71	5.62	15.7	22.4	36.5	60.2	99.5
Anthracene	12	NA	0	64.8	84.9	33.7	3.83	303	5.28	7.22	21.7	34	60.8	136	213
Benz(a)anthracene	12	NA	0	189	213	112	15	753	23.4	31.6	67.9	108	202	390	557
Benzo(a)pyrene	12	<2.4	8	109	120	41.5	<2.4	359	2.18	4.09	14.2	62.1	174	263	308
Benzo(b)fluoranthene	12	NA	0	167	166	107	16.4	588	25.9	33.6	76.1	104	190	335	451
Benzo(e)pyrene	12	NA	0	126	123	82.3	12.7	442	19.5	25.4	59.6	81.8	146	239	331
Benzo(g,h,i)perylene	12	NA	0	106	95.9	70.8	11.4	327	17	21.8	51.7	66.6	134	212	264
Benzo(k)fluoranthene	12	NA	0	157	160	102	16.8	583	25.4	33	69.3	106	171	289	422

TABLE 10 (CONTINUED)

SUMMARY STATISTICS CALCULATED FROM THE SEDIMENT CHEMISTRY DATA OBTAINED FOR SELECTEDF SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Chemical Class/Chemical of Potential Concern	n	Detection Limit Range	% ND	Mean	SD	Geometric Mean	Min	Max	Distribution						
									5th	10th	25th	50th	75th	90th	95th
Polycyclic Aromatic Hydrocarbons (PAHs; µg/kg DW) (continued)															
Chrysene	12	NA	0	220	239	138	19	871	31.7	43.5	96.5	139	227	423	628
Dibenz(a,h)anthracene	12	NA	0	30.8	31.5	19.3	2.93	109	4.64	6.06	13	18	36.1	64.2	84.7
Dibenzofuran	12	<2.4	8	28	35.1	16.2	<2.4	134	2.29	3.95	14.1	19	26.7	38.8	82
Dibenzothiophene	12	<2.4	8	24.8	36.2	13	<2.4	133	2.26	3.78	9.74	12.8	19.1	45.2	85.8
Fluoranthene	12	NA	0	458	506	286	34.6	1870	63.9	92.3	213	294	448	858	1320
Fluorene	12	<2.4	8	39.8	62.5	19.8	<2.4	231	3.48	6.42	16.5	19.4	26.5	64.3	141
Indeno(1,2,3-cd)pyrene	12	NA	0	107	98.7	71	11.5	337	16.7	21.3	50.6	66.8	134	217	271
Naphthalene	12	NA	0	59.2	75.4	35.3	4.06	289	5.37	8.56	27.6	41.5	55.9	73.3	171
Perylene	12	<1.78-<2.4	17	47.6	38.3	23.8	<1.78	99.7	1.06	2.15	15.7	40.1	89.5	91	95
Phenanthrene	12	NA	0	350	456	199	20.1	1660	40.5	63.1	146	198	278	733	1170
Pyrene	12	NA	0	419	471	258	28.6	1740	53.1	79.2	199	261	410	777	1220
Alkylated PAHs															
C1-Chrysenes	12	NA	0	117	140	70.7	9.02	513	18.8	27.7	46.3	64.7	122	206	344
C2-Chrysenes	12	NA	0	58.7	66.4	35.8	5.49	237	7.77	10.7	23.3	33.8	60.3	125	178
C3-Chrysenes	12	<2.64	8	40.3	38.6	24.5	<2.64	130	4.28	7.59	18.2	27.6	46.3	96.3	114
C4-Chrysenes	12	<2.4-<2.78	33	20.2	20.7	9.24	<2.4	62.7	1.23	1.27	1.37	15.8	26.6	51.7	58.1
C1-Dibenzothiophenes	12	<2.4	8	26.3	34.9	14	<2.4	128	2.04	3.39	10.7	12.4	25	45.1	82.5
C2-Dibenzothiophenes	12	<2.4	8	33.2	40.8	17.9	<2.4	146	2.59	4.6	13	17.8	32.7	71.7	107
C3-Dibenzothiophenes	12	<2.4	8	29.9	33.3	16.9	<2.4	110	2.45	4.22	12.1	19.1	30.6	79.1	96
C4-Dibenzothiophenes	12	<2.4-<2.64	17	23.2	23.7	13.2	<2.4	72.1	1.27	2.1	10.1	15.6	23.6	66	71.1

Table 10 (continued)
Summary Statistics Calculated from the sediment Chemistry Data Obtained for Selectedf Sediment Samples collected from the upper Hudson River in 2008.

Chemical Class/Chemical of Potential Concern	n	Detection Limit Range	% ND	Mean	SD	Geometric Mean	Min	Max	Distribution						
									5th	10th	25th	50th	75th	90th	95th
Alkylated PAHs (continued)															
C1-Fluoranthenes/pyrenes	12	NA	0	270	342	154	17.2	1260	27.8	42.1	110	151	272	459	820
C2-Fluoranthenes/pyrenes	12	NA	0	201	234	123	16.1	866	26.4	37.2	90.4	123	197	355	587
C3-Fluoranthenes/pyrenes	12	NA	0	62.5	68.5	39	6.16	248	7.79	10.1	27.9	37.6	62.4	130	186
C4-Fluoranthenes/pyrenes	12	NA	0	42	40.1	29.6	5.14	145	9.85	14.1	21.3	25.3	43	90.7	117
C1-Fluorenes	12	<2.4	8	28.9	37.7	16.3	<2.4	141	3.17	5.61	13.4	15.1	27.4	47.8	90.3
C2-Fluorenes	12	NA	0	36.5	40.4	23	3.43	147	5.24	7.37	14	22.2	37.8	75.8	110
C3-Fluorenes	12	NA	0	52.7	58.9	34.1	5.3	222	7.71	10.8	22.8	32.7	55.8	92.8	152
1-Methylnaphthalene	12	NA	0	32.1	54.2	16	2.46	201	2.56	3.42	11.7	17	22.6	39.1	112
2-Methylnaphthalene	12	NA	0	51.4	91	23.6	2.43	336	2.83	4.66	18.6	24.2	36	54.9	182
C1-Naphthalenes	12	NA	0	54.3	94.4	26.1	3.56	349	3.68	5.28	19.5	26.5	38.2	61	191
C2-Naphthalenes	12	NA	0	66.1	106	34.6	5.41	394	5.69	7.84	25.6	34.3	51.2	82.1	223
C3-Naphthalenes	12	NA	0	60.6	72.7	37.4	6.04	270	7.62	10.5	26.9	34.2	56.7	116	188
C4-Naphthalenes	12	NA	0	84	94.1	44.4	4.66	306	5.89	8.52	25.2	43.8	116	212	259
C1-Phenanthrenes/anthracenes	12	NA	0	155	199	87.3	10.1	726	15.4	23.4	69.6	77.3	134	305	499
C2-Phenanthrenes/anthracenes	12	NA	0	108	129	61.4	5.58	468	9.99	16.6	46.1	54.7	109	218	333
C3-Phenanthrenes/anthracenes	12	NA	0	89.4	89.7	52.9	4.81	299	7.47	12	35.5	56	104	216	258
C4-Phenanthrenes/anthracenes	12	NA	0	83.4	71.1	56.9	6.12	243	12.5	19.5	41	61.1	105	180	211
Total PAHs [3]	12	NA	0	2050	2390	1230	139	8790	250	365	876	1290	1930	3920	6160
$\sum ESB\text{-}TU_{FCV}$ [4]	12	NA	0	0.367	0.206	0.311	0.101	0.705	0.14	0.172	0.191	0.336	0.5	0.656	0.682

TABLE 10 (CONTINUED)
SUMMARY STATISTICS CALCULATED FROM THE SEDIMENT CHEMISTRY DATA OBTAINED FOR SELECTEDF SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Chemical Class/Chemical of Potential Concern	n	Detection Limit Range	% ND	Mean	SD	Geometric Mean	Min	Max	Distribution						
									5th	10th	25th	50th	75th	90th	95th
Polychlorinated Biphenyls (PCBs; µg/kg DW)															
Sum PCB (mono-CB)	12	NA	0	9770	18900	1330	15.6	65000	62	113	285	1690	8170	23100	42500
Sum PCB (di-CB)	12	NA	0	12700	20400	2550	29.4	69500	68.8	165	869	3150	15800	28200	47000
Sum PCB (tric-CB)	12	NA	0	5680	6500	1950	39.7	18900	65.4	129	982	3030	9950	14600	16600
Sum PCB (tetra-CB)	12	NA	0	3920	4090	1570	55.5	11100	75.7	110	806	2420	6540	10500	10900
Sum PCB (penta-CB)	12	NA	0	1370	1440	566	26.4	3980	35.1	48.5	243	792	2520	3360	3650
Sum PCB (hexa-CB)	12	NA	0	518	591	204	13	1690	14.5	18.4	73.6	236	924	1380	1540
Sum PCB (hepta-CB)	12	NA	0	181	219	64.3	3.72	640	6.07	8.17	22	56.4	305	478	556
Sum PCB (octac-CB)	12	<1.21-<69.5	17	80	122	25	<1.21	409	2.16	3.53	13.4	27.8	84.1	212	306
Sum PCB (nona-CB)	12	<1.21-<129	42	37.1	52.4	10.3	<1.21	179	0.688	0.823	1.81	13.6	56.4	76.3	123
Sum PCB (deca-CB)	12	<1.21-<129	92	13.1	19.8	3.93	<1.21	<129	0.605	0.618	0.749	2.83	17.2	34.1	48.2
Total PCBs [5]	12	NA	0	34300	50000	9150	185	2E+05	331	604	3390	12200	50600	76400	120000
Total $PCBs_{1\%OC}$	12	NA	0	22700	36000	7040	219	1E+05	360	689	3790	7410	19400	57500	88400
Organochlorine Pesticides (µg/kg DW)															
Aldrin	12	<0.0019-<0.0293	100	0.005	0.004	0.00362	<0.0019	<0.0293	0.00125	0.0016	0.00263	0.0032	0.0052	0.00973	0.0121
Chlordane, alpha-	12	<0.013-<0.155	92	0.033	0.0294	0.0234	<0.013	<0.155	0.0065	0.007	0.0144	0.0218	0.0406	0.0754	0.0867
Chlordane, gamma-	12	<0.006-<0.133	67	0.04	0.0417	0.0234	<0.006	0.149	0.00438	0.006	0.013	0.022	0.0579	0.0688	0.105
Chlordane, technical grade	8	NA	0	0.15	0.138	0.0808	0.01	0.373	0.0118	0.0135	0.0413	0.114	0.253	0.307	0.34
Dieldrin	12	<0.004-<0.018	50	0.011	0.0171	0.00726	<0.004	0.065	0.00283	0.0036	0.00488	0.007	0.009	0.0108	0.0353
o,p'-DDD	12	<0.04-<0.051	17	0.174	0.243	0.0834	0.012	0.861	0.0164	0.0206	0.0341	0.0785	0.204	0.371	0.6
p,p'-DDD	12	NA	0	0.373	0.284	0.275	0.039	0.948	0.0973	0.147	0.175	0.263	0.53	0.726	0.826
Sum DDDs (o,p' + p,p')	12	NA	0	0.547	0.513	0.368	0.051	1.81	0.123	0.182	0.22	0.346	0.734	1.09	1.43

TABLE 10 (CONTINUED)
SUMMARY STATISTICS CALCULATED FROM THE SEDIMENT CHEMISTRY DATA OBTAINED FOR SELECTEDF SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Chemical Class/Chemical of Potential Concern	n	Detection Limit Range	% ND	Mean	SD	Geometric Mean	Min	Max	Distribution						
									5th	10th	25th	50th	75th	90th	95th
Organochlorine Pesticides (µg/kg DW) (continued)															
o,p'-DDE	12	<0.0037	8	0.146	0.188	0.0491	<0.0037	0.52	0.00523	0.0087	0.0195	0.0425	0.28	0.414	0.466
p,p'-DDE	12	NA	0	0.728	0.623	0.488	0.069	2.15	0.103	0.143	0.326	0.413	1.15	1.25	1.66
Sum DDEs (o,p' + p,p')	12	NA	0	0.874	0.8	0.555	0.0709	2.67	0.117	0.166	0.336	0.445	1.43	1.66	2.12
o,p'-DDT	12	<0.0286-<0.0992	50	0.03	0.0169	0.0258	0.01	<0.0992	0.0124	0.0143	0.015	0.0314	0.0376	0.0491	0.0565
p,p'-DDT	12	<0.0324	8	0.116	0.0776	0.0905	<0.0324	0.293	0.0331	0.0473	0.056	0.106	0.162	0.168	0.225
Sum DDTs (o,p' + p,p')	12	<0.0305	8	0.144	0.0918	0.112	<0.0305	0.328	0.0382	0.0578	0.0707	0.138	0.201	0.232	0.276
Total DDTs (Sum DDDs + Sum DDEs + Sum DDTs)	12	NA	0	1.57	1.29	1.08	0.179	3.95	0.284	0.39	0.608	0.99	2.56	3.35	3.65
Endosulfan sulfate	12	<0.003-<0.02	58	0.01	0.00636	0.00749	<0.003	0.022	0.00178	0.0022	0.00511	0.0093	0.0123	0.0184	0.0204
Endosulfan-alpha	12	<0.0054-<0.04	100	0.01	0.00405	0.0088	<0.0054	<0.04	0.00507	0.007	0.00738	0.01	0.0106	0.011	0.0151
Endosulfan-beta	12	<0.028-<0.064	100	0.02	0.00532	0.0191	<0.028	<0.064	0.014	0.0141	0.0154	0.019	0.0228	0.024	0.0276
Endrin	12	<0.0013-<0.005	83	0.002	0.00184	0.00175	<0.0013	0.006	0.00068	0.0007	0.00116	0.0018	0.00213	0.00565	0.006
Endrin aldehyde	12	<0.0021-<0.0081	100	0.002	0.00085	0.00171	<0.0021	<0.0081	0.00108	0.0011	0.00126	0.0016	0.0021	0.00249	0.0032
Endrin ketone	12	<0.0012-<0.038	100	0.003	0.00518	0.00136	<0.0012	<0.038	0.00071	0.0008	0.00094	0.0011	0.0012	0.00206	0.00973
Heptachlor	11	<0.0015-<0.0122	100	0.003	0.00144	0.00267	<0.0015	<0.0122	0.0014	0.0021	0.00223	0.0028	0.00343	0.0047	0.0054
Heptachlor epoxide	12	<0.001-<0.002	100	6E-04	0.00022	0.000613	<0.001	<0.002	0.0005	0.0005	0.0005	0.0005	0.000738	0.001	0.001
Hexachlorobenzene	12	<0.028-<0.125	17	0.355	0.291	0.197	0.017	0.869	0.0157	0.0216	0.139	0.261	0.587	0.677	0.768
Hexachlorocyclohexane-alpha	12	<0.0014-<0.057	67	0.015	0.0174	0.00703	<0.0014	0.058	0.00087	0.0011	0.00225	0.008	0.0225	0.0326	0.0443
Hexachlorocyclohexane-beta	12	<0.0016-<0.026	92	0.005	0.00388	0.00349	<0.0016	<0.026	0.00127	0.0017	0.00204	0.003	0.00575	0.0104	0.0117
Hexachlorocyclohexane-gamma (Lindane)	12	<0.0015-<0.0168	100	0.004	0.00271	0.0029	<0.0015	<0.0168	0.00089	0.0011	0.00208	0.0025	0.00586	0.0079	0.00818
Methoxychlor	12	<0.008-<0.322	100	0.066	0.0505	0.0436	<0.008	<0.322	0.00978	0.0148	0.0246	0.0609	0.0945	0.122	0.14

TABLE 10 (CONTINUED)
SUMMARY STATISTICS CALCULATED FROM THE SEDIMENT CHEMISTRY DATA OBTAINED FOR SELECTEDF SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Chemical Class/Chemical of Potential Concern	n	Detection Limit Range	% ND	Mean	SD	Geometric Mean	Min	Max	Distribution						
									5th	10th	25th	50th	75th	90th	95th
Organochlorine Pesticides (µg/kg DW) (continued)															
Nonachlor, cis	12	<0.004-<0.075	100	0.012	0.00969	0.00907	<0.004	<0.075	0.00409	0.0058	0.00609	0.0085	0.0141	0.0213	0.029
Nonachlor, trans	12	<0.008-<0.053	92	0.016	0.014	0.0125	<0.008	0.056	0.00565	0.0071	0.00788	0.0125	0.0169	0.0257	0.0398
Oxychlordane	12	<0.0046-<0.0724	100	0.012	0.00996	0.00945	<0.0046	<0.0724	0.00255	0.0033	0.00864	0.0091	0.0119	0.0269	0.032
Toxaphene	12	<0.0967-<1.92	100	0.269	0.264	0.187	<0.0967	<1.92	0.0531	0.0631	0.123	0.157	0.305	0.56	0.751
Mean Quotients (no units)															
Mean PEC-Q [6]	12	NA	0	17	24.8	4.73	0.115	84.3	0.193	0.332	1.73	6.13	25.2	37.9	59.3
Mean PEC-Q_{METALS} [7]	12	NA	0	0.326	0.335	0.227	0.0653	1.27	0.0762	0.0879	0.144	0.184	0.466	0.491	0.842
Mean PEC-$Q_{METALS(1\%OC)}$	12	NA	0	0.234	0.24	0.174	0.0773	0.917	0.0841	0.0901	0.111	0.148	0.197	0.457	0.679
Nutrients/Inorganics/Conventionals															
Moisture (%)	12	NA	0	0.174	0.243	0.0834	22	43	0.0164	0.0206	0.0341	0.0785	0.204	0.371	0.6
Total organic carbon (%)	12	NA	0	0.002	0.00184	0.00175	0.76	3.3	0.00068	0.0007	0.00116	0.0018	0.00213	0.00565	0.006
Silt-fine (%)	12	NA	0	18.1	10.3	16.3	8.6	48	8.88	9.36	13.5	15.7	20.3	21.5	33.5
Clay-fine (%)	12	NA	0	3.73	2.21	3.32	1.6	10.1	1.88	2.11	2.35	3.35	4.13	4.38	6.97
Fines (silt+clay; %)	12	NA	0	21.8	12.5	19.6	10.2	58.1	10.8	11.5	16.4	19.1	24.4	25.8	40.3
Sand - fine (%)	12	NA	0	68.5	11.3	67.5	40.4	80.5	49.3	57.4	65.8	69.7	76.5	79.8	80.2
Sand - medium (%)	12	NA	0	9.49	9.13	5.96	0.8	33.3	1.3	1.74	2.78	7.2	13	15.8	23.8
Sand - coarse (%)	12	NA	0	0.142	0.162	NC	0	0.5	0	0	0	0.1	0.2	0.38	0.445

TABLE 10 (CONTINUED)
SUMMARY STATISTICS CALCULATED FROM THE SEDIMENT CHEMISTRY DATA OBTAINED FOR SELECTEDF SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Notes:

n = number of samples; DW = dry weight; ND = non-detects (i.e., reported as less than the detection limit); SD = standard deviation; Geo. Mean = geometric mean; Min = minimum; Max = maximum; NA = not applicable; NC = not calculated; f = fraction; OC = organic carbon; 1%OC = normalized to 1%OC; PEC = probable effect concentration.

1. ∑SEM-AVS = the sum of simultaneously extracted metals concentrations (i.e., SE-cadmium, SE-copper, SE-lead, SE-nickel, SE-zinc, and one-half of SE-silver) minus the acid volatile sulfides concentration.
2. ∑SEM-AVS)/f_{OC} = (∑SEM-AVS) divided by the fraction organic carbon.
3. Total PAHs were calculated as the sum of the 13 PAHs noted with a "T" in Table 9. Using these 13 PAHs results in total PAH estimates that are comparable to sediment quality guidelines.
4. ∑ESB-TU_{FCV} was calculated as the sum of the equilibrium partitioning sediment benchmark-toxic units for the 34 PAHs listed by USEPA (2003); these PAHs are noted with an * in Table 9.
5. Total PCBs were calculated as the sum of the reported concentrations of individual homolog groups (i.e., mono-, di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona-, and deca-chlorobiphenyls).
6. Mean PEC-Q was calculated based on the following metals: arsenic, cadmium, chromium, copper, nickel, lead, and zinc; total PAHs; and, total PCBs (Ingersoll et al. 2001).
7. Mean PEC-Q_{METALS} was calculated based on the following metals: arsenic, cadmium, chromium, copper, nickel, lead, zinc (Ingersoll et al. 2001).

TABLE 11

SUMMARY OF PORE-WATER CHEMISTRY DATA FOR SELECTED SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008[1].

Chemical Class/Chemical of Potential Concern	Station											
	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-124	UHR-SVS-13	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-29/36 [2]	UHR-SVS-31	UHR-SVS-16/37 [3]
Conventionals & Nutrients												
Alkalinity, total (mg/L)	200	120	132	108	110	156	110	158	98	158	102	98
Hardness (mg/L)	220	220	146	100	130	170	128	130	110	166	116	102
Oxygen, dissolved (mg/L)	5.2	5.07	5.42	5.21	4.79	3.31	5.04	3.14	5.53	2.99	5.94	3.75
pH	7.48	7.24	7.29	7.15	7.19	6.94	7.05	6.94	7.26	7.04	7.05	6.93
Specific Conductance (µS/cm)	437	220	296	215	251	343	245	334	225	333	233	222
Ammonia-nitrogen (mg/L)	2.72	2.87	3.27	5.85	2.47	10.2	2.62	11.1	2.61	7.55	6.25	9.26
Unionized ammonia (mg/L)	0.04	0.025	0.031	0.041	0.019	0.044	0.015	0.048	0.023	0.041	0.035	0.039

Notes:

1. Pore water was obtained by centrifugation of selected sediment samples.

2. UHR-SVS-29/36 consists of a 1:2 ratio (by weight) mixing of samples from stations UHR-SVS-29 and UHR-SVS-36.

3. UHR-SVS-16/37 consists of a 1:1 ratio (by weight) mixing of samples from stations UHR-SVS-16 and UHR-SVS-37.

Table 12

Results of 42-Day Toxicity Tests with Hyalella Azteca Conducted with Sediment Samples Collected from the Upper Hudson River in 2008.

Station ID	Control	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-29/36 [2]	UHR-SVS-31	UHR-SVS-16/37 [3]
CERC ID	***(WB)***	***2***	***1***	***4***	***6***	***5***	***7***	***8***	***9***	***3***	***12***	***10***	***11***
Survival (%; Day 28)													
Mean Response	98.3	98.3	100	98.3	97.5	95	92.5	100	99.2	94.2	96.7	100	89.2
Control-Adjusted Response	100	100	102	100	99.2	96.6	94.1	102	101	95.8	98.4	102	90.7
Standard Error	1.12	1.12	0	1.12	1.31	1.51	2.18	0	0.833	2.29	1.42	0	2.88
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Length (mm; Day 28)													
Mean Response	4.63	4.55	4.63	4.7	4.42	4.74	4.76	4.62	4.56	4.43	4.44	4.6	4.2
Control-Adjusted Response	100	98.3	100	102	95.5	102	103	99.8	98.5	95.7	95.9	99.4	90.7
Standard Error	0.13	0.187	0.0674	0.126	0.0448	0.162	0.139	0.0638	0.0723	0.0777	0.0668	0.0695	0.0539
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Weight (mg; Day 28)													
Mean Response	0.506	0.485	0.501	0.528	0.434	0.546	0.551	0.499	0.481	0.438	0.44	0.495	0.371
Control-Adjusted Response	100	95.8	99	104	85.8	108	109	98.6	95.1	86.6	87	97.8	73.3
Standard Error	0.0422	0.0614	0.0217	0.0458	0.0125	0.0595	0.0531	0.0201	0.0257	0.0249	0.021	0.0243	0.0144
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	**T**
Biomass (mg; Day 28)													
Mean Response	4.93	4.85	5.01	5.28	4.24	5.09	5.21	4.99	4.81	4.17	4.09	4.95	3.23
Control-Adjusted Response	100	98.4	102	107	86	103	106	101	97.6	84.6	83	100	65.5
Standard Error	0.452	0.614	0.217	0.458	0.215	0.517	0.43	0.201	0.257	0.33	0.295	0.243	0.198
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	**T**

TABLE 12 (CONTINUED)

RESULTS OF 42-DAY TOXICITY TESTS WITH HYALELLA AZTECA CONDUCTED WITH SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Station ID	Control	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-29/36 [2]	UHR-SVS-31	UHR-SVS-16/37 [3]
CERC ID	***(WB)***	***2***	***1***	***4***	***6***	***5***	***7***	***8***	***9***	***3***	***12***	***10***	***11***
Survival (%; Day 35)													
Mean Response	93.9	96.3	97.5	96.3	95	91.3	91.3	98.8	97.5	62.5	93.8	78.8	83.8
Control-Adjusted Response	100	103	104	103	101	97.2	97.2	105	104	66.6	99.9	83.9	89.2
Standard Error	3.74	1.83	1.64	1.83	1.89	3.5	2.95	1.25	1.64	7.26	4.2	7.89	5.65
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	**T**	NT	NT	NT
Survival (%; Day 42)													
Mean Response	87.5	93.8	97.5	87.5	93.8	85	86.3	90	92.5	42.5	88.8	62.5	81.3
Control-Adjusted Response	100	107	111	100	107	97.1	98.6	103	106	48.6	101	71.4	92.9
Standard Error	4.53	3.75	1.64	3.66	1.83	3.78	3.24	2.67	2.5	9.59	3.98	9.96	6.93
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	**T**	NT	**T**	NT
Length (mm; Day 42)													
Mean Response	4.69	4.63	4.8	4.94	4.65	4.74	4.87	4.83	4.64	4.62	4.64	4.79	4.48
Control-Adjusted Response	100	98.7	102	105	99.1	101	104	103	98.9	98.5	98.9	102	95.5
Standard Error	0.0364	0.0821	0.0653	0.0531	0.0613	0.0606	0.0642	0.0994	0.0864	0.072	0.0433	0.0802	0.0808
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Weight (mg; Day 42)													
Mean Response	0.521	0.504	0.56	0.618	0.507	0.539	0.584	0.573	0.508	0.499	0.506	0.556	0.456
Control-Adjusted Response	100	96.7	107	119	97.3	103	112	110	97.5	95.8	97.1	107	87.5
Standard Error	0.0127	0.0264	0.0224	0.0211	0.0211	0.0203	0.0241	0.0365	0.0289	0.0263	0.0148	0.0287	0.025
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	**T**

TABLE 12 (CONTINUED)

RESULTS OF 42-DAY TOXICITY TESTS WITH HYALELLA AZTECA CONDUCTED WITH SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Station ID	Control	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-29/36 [2]	UHR-SVS-31	UHR-SVS-16/37 [3]
CERC ID	***(WB)***	***2***	***1***	***4***	***6***	***5***	***7***	***8***	***9***	***3***	***12***	***10***	***11***
Biomass (mg; Day 42)													
Mean Response	4.59	4.7	5.45	5.41	4.73	4.56	5.03	5.11	4.67	2.08	4.51	3.45	3.71
Control-Adjusted Response	100	102	119	118	103	99.3	110	111	102	45.3	98.3	75.2	80.8
Standard Error	0.307	0.256	0.227	0.282	0.14	0.208	0.252	0.268	0.22	0.437	0.273	0.594	0.38
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	**T**	NT	NT	**T**
Total Number of Young (Day 42)													
Mean Response	51.9	26	44	43.6	27.8	27.5	39	55.4	28.6	18.4	37.4	33.1	12.8
Control-Adjusted Response	100	50.1	84.8	84	53.6	53	75.1	107	55.1	35.5	72.1	63.8	24.7
Standard Error	8.75	5.63	4.84	11.9	4.98	7.64	6.98	5.2	6.58	2.9	5.9	5.55	2.94
Toxicity Designation [1]	NT	**T**	NT	NT	**T**	**T**	NT	NT	**T**	**T**	NT	**T**	**T**
Number of Young per Female (Day 42)													
Mean Response	11.1	5.73	7.8	8.54	6.38	7.91	7.68	9.76	6.24	7.75	7.36	9.55	3.21
Control-Adjusted Response	100	51.6	70.3	76.9	57.5	71.3	69.2	87.9	56.2	69.8	66.3	86	28.9
Standard Error	1.44	1.26	0.552	1.3	0.841	1.13	0.702	0.57	0.821	1.13	0.84	1.25	0.828
Toxicity Designation [1]	NT	**T**	**T**	NT	**T**	NT	**T**	NT	**T**	**T**	**T**	NT	**T**
Number of Young per Female (Normalized to 42-d Survival)													
Mean Response	9.63	5.47	7.61	7.54	6.04	6.76	6.61	8.75	5.73	3.57	6.48	7.23	2.81
Control-Adjusted Response	100	56.8	79	78.3	62.7	70.2	68.6	90.9	59.5	37.1	67.3	75.1	29.2
Standard Error	1.3	1.16	0.556	1.26	0.888	0.819	0.703	0.484	0.717	0.288	0.735	0.962	0.911
Toxicity Designation [1]	NT	**T**	NT	NT	**T**	**T**	**T**	NT	**T**	**T**	**T**	NT	**T**

TABLE 12 (CONTINUED)

RESULTS OF 42-DAY TOXICITY TESTS WITH HYALELLA AZTECA CONDUCTED WITH SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Station ID	Control	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-29/36 [2]	UHR-SVS-31	UHR-SVS-16/37 [3]
CERC ID				***4***	***6***	***5***	***7***	***8***	***9***	***3***	***12***	***10***	***11***
Any Endpoints within an Endpoint Group Toxic?													
Survival	No	No	No	No	No	No	No	No	No	**Yes**	No	**Yes**	No
Growth	No	No	No	No	No	No	No	No	No	**Yes**	No	No	**Yes**
Reproduction	No	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Any Endpoint Toxic?	No	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

Notes:

1. A station was designated as toxic for a given endpoint if the control-adjusted response was <90% and the raw response was significantly different from control sediments using multiple t-Tests (α=0.05).
2. UHR-SVS-29/36 consists of a 1:2 ratio (by weight) mixing of samples from stations UHR-SVS-29 and UHR-SVS-36.
3. UHR-SVS-16/37 consists of a 1:1 ratio (by weight) mixing of samples from stations UHR-SVS-16 and UHR-SVS-37.

TABLE 13

RESULTS OF ~53-DAY TOXICITY TESTS WITH CHIRONOMUS DILUTUS CONDUCTED WITH SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Station ID	Control	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-29/36 [2]	UHR-SVS-31	UHR-SVS-16/37 [3]
CERC ID	***(WB)***	***2***	***1***	***4***	***6***	***5***	***7***	***8***	***9***	***3***	***12***	***10***	***11***
Survival (%; Day 13)													
Mean Response	91.7	97.9	91.7	91.7	97.9	97.9	97.9	100	100	91.7	97.9	95.9	85.4
Control Adjusted Response	100	107	100	100	107	107	107	109	109	100	107	105	93.1
Standard Error	3.41	2.08	5.89	3.41	2.08	2.08	2.08	0	0	3.41	2.08	2.4	2.1
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Weight (mg; Day 13)													
Mean Response	1.32	1.49	1.45	1.38	1.36	1.42	1.46	1.28	1.38	1.66	1.49	1.47	0.982
Control-Adjusted Response	100	113	110	105	103	108	111	97	105	126	113	111	74.4
Standard Error	0.0614	0.159	0.11	0.00854	0.0763	0.0731	0.0512	0.0381	0.0563	0.198	0.0445	0.0763	0.101
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	**T**
Biomass (mg; Day 13)													
Mean Response	14.5	17.4	15.8	15.2	15.9	16.6	17.9	16.3	16.5	18.1	17.5	17.2	10.1
Control-Adjusted Response	100	120	109	105	110	114	123	112	114	125	121	119	69.7
Standard Error	0.954	1.87	0.638	0.599	0.926	0.861	1.17	0.471	0.68	1.6	0.884	0.786	1.16
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	**T**
Emergence (%)													
Mean Response	74	73.9	59.4	63.5	79.2	56.3	72.9	75	72.9	75	71.9	64.6	54.2
Control-Adjusted Response	100	99.9	80.3	85.8	107	76.1	98.5	101	98.5	101	97.2	87.3	73.2
Standard Error	3.67	6.77	4.58	6.29	4.46	7.18	5.4	5.9	7.35	5.46	4.44	6.25	6.3
Toxicity Designation [1]	NT	NT	**T**	NT	NT	**T**	NT	NT	NT	NT	NT	NT	**T**

TABLE 13 (CONTINUED)

RESULTS OF ~53-DAY TOXICITY TESTS WITH CHIRONOMUS DILUTUS CONDUCTED WITH SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Station ID	Control	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-29/36 [2]	UHR-SVS-31	UHR-SVS-16/37 [3]
CERC ID	***(WB)***	***2***	***1***	***4***	***6***	***5***	***7***	***8***	***9***	***3***	***12***	***10***	***11***
20th Percentile Emergence Time (days)													
Mean Response	22.9	21.4	22.5	19.5	23.2	21.9	24.1	22.2	22.1	20.8	25.2	20.1	27.6
Control-Adjusted Response	100	93.4	98.3	85.2	101	95.6	105	96.9	96.5	90.8	110	87.8	121
Standard Error	1.47	1.17	1.5	0.563	0.959	0.856	1.77	1.01	0.492	0.436	1.77	0.517	1.21
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	**T**
Median Emergence Time (days)													
Mean Response	27.4	27.7	26.2	25.4	29.4	25.7	29	28.6	27.8	27.5	28.1	27.4	31
Control-Adjusted Response	100	101	95.6	92.7	107	93.8	106	104	101	100	103	100	113
Standard Error	2.05	2.22	1.53	1.15	1.04	1.26	2.1	1	1.09	1.73	1.42	1.45	0.818
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Emerged Females (%)													
Mean Response	64.5	51.6	56.5	50.5	53.3	49.4	58.6	42.5	43.6	50	54.8	52.8	55.9
Control-Adjusted Response	100	80	87.6	78.3	82.6	76.6	90.9	65.9	67.6	77.5	85	81.9	86.7
Standard Error	7.82	9.13	6.74	4.86	4.46	9.73	5.97	6.47	9.36	7.67	8	5.21	6.01
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	**T**	NT	NT	NT	NT	NT
Total Number of Egg Cases													
Mean Response	4.5	3.75	2.38	2.63	3	2.13	2.88	2.75	2.5	3.63	3.13	2.63	2.88
Control-Adjusted Response	100	83.3	52.9	58.4	66.7	47.3	64	61.1	55.6	80.7	69.6	58.4	64
Standard Error	0.707	0.75	0.625	0.375	0.5	0.581	0.398	0.526	0.779	0.8	0.666	0.498	0.441
Toxicity Designation [1]	NT	NT	**T**	**T**	NT	**T**	**T**	**T**	**T**	NT	NT	**T**	**T**

Table 13 (continued)

Results of ~53-day toxicity tests with Chironomus dilutus conducted with sediment samples collected from the upper Hudson River in 2008.

Station ID	Control	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-29/36 [2]	UHR-SVS-31	UHR-SVS-16/37 [3]
CERC ID	***(WB)***	***2***	***1***	***4***	***6***	***5***	***7***	***8***	***9***	***3***	***12***	***10***	***11***
Paired Females Laying an Egg Case (%)													
Mean Response	84	82.4	65	78.3	69.9	83.6	86.5	88.8	69.1	91.1	65.1	88.1	86.5
Control-Adjusted Response	100	98.1	77.4	93.2	83.2	99.5	103	106	82.3	108	77.5	105	103
Standard Error	5.42	5.24	11.2	5.15	7.61	8.22	7.02	6.39	14.7	6.05	10.8	5.68	7.02
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Number of Eggs per Case													
Mean Response	941	959	1029	848	922	894	1011	889	898	886	965	1044	934
Control-Adjusted Response	100	102	109	90.1	98	95	107	94.5	95.4	94.2	103	111	99.3
Standard Error	66.6	89	82.8	47	71.9	83.3	56.3	45.6	38.6	87.4	43.1	82.2	89.3
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Hatched (%)													
Mean Response	95.1	87.4	85.5	95.6	95.9	81.9	96.2	96.2	93.8	90.6	85.1	94.7	84.9
Control-Adjusted Response	100	91.9	89.9	101	101	86.1	101	101	98.6	95.3	89.5	99.6	89.3
Standard Error	1.05	3.28	12.2	1.02	1.37	13.7	0.97	1.08	1.78	2.81	5.25	1.65	7.77
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Number of Larvae per Paired Female													
Mean Response	760	686	565	624	629	711	855	657	575	727	525	871	673
Control-Adjusted Response	100	90.3	74.3	82.1	82.8	93.6	113	86.4	75.7	95.7	69.1	115	88.6
Standard Error	90.7	70.9	158	34.9	89.9	136	97.9	115	122	89.8	88.4	86.2	108
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	**T**	NT	NT

TABLE 13 (CONTINUED)

RESULTS OF ~53-DAY TOXICITY TESTS WITH CHIRONOMUS DILUTUS CONDUCTED WITH SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Station ID	Control	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-29/36 [2]	UHR-SVS-31	UHR-SVS-16/37 [3]
CERC ID	***(WB)***	***2***	***1***	***4***	***6***	***5***	***7***	***8***	***9***	***3***	***12***	***10***	***11***
Number of Larvae per Case													
Mean Response	898	872	912	813	885	796	976	859	846	816	843	986	824
Control-Adjusted Response	100	97.1	102	90.5	98.6	88.6	109	95.7	94.2	90.9	93.9	110	91.8
Standard Error	69.4	88.8	149	51.7	71.9	136	59.8	50.1	40.2	87.7	66.5	75	98.8
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Total Fecundity													
Mean Response	4163	3921	2495	2224	2707	2216	2929	2873	2907	3826	3419	3184	2830
Control-Adjusted Response	100	94.2	59.9	53.4	65	53.2	70.4	69	69.8	91.9	82.1	76.5	68
Standard Error	621	492	680	348	397	532	416	464	655	687	554	516	551
Toxicity Designation [1]	NT	NT	**T**	**T**	**T**	**T**	NT	NT	NT	NT	NT	NT	NT
Total Number of Larvae Produced													
Mean Response	4000	3488	2343	2132	2585	2059	2838	2796	2734	3476	2968	3011	2480
Control-Adjusted Response	100	87.2	58.6	53.3	64.6	51.5	71	69.9	68.4	86.9	74.2	75.3	62
Standard Error	623	335	704	339	370	540	407	464	624	613	529	491	507
Toxicity Designation [1]	NT	NT	NT	**T**	**T**	**T**	NT	NT	NT	NT	**T**	NT	NT
Intrinsic Rate of Natural Increase (days)													
Mean Response	0.185	0.175	0.17	0.173	0.156	0.177	0.156	0.17	0.165	0.173	0.177	0.179	0.166
Control-Adjusted Response	100	94.6	91.9	93.5	84.3	95.7	84.3	91.9	89.2	93.5	95.7	96.8	89.7
Standard Error	0.0071	0.0107	0.0109	0.0108	0.00787	0.0119	0.00927	0.00541	0.0037	0.013	0.00862	0.0148	0.00833
Toxicity Designation [1]	NT	NT	NT	NT	**T**	NT	**T**	NT	**T**	NT	NT	NT	NT

TABLE 13 (CONTINUED)

RESULTS OF ~53-DAY TOXICITY TESTS WITH CHIRONOMUS DILUTUS CONDUCTED WITH SEDIMENT SAMPLES COLLECTED FROM THE UPPER HUDSON RIVER IN 2008.

Station ID	Control	UHR-SVS-19	UHR-SVS-04	UHR-SVS-112	UHR-SVS-13	UHR-SVS-124	UHR-SVS-38	UHR-SVS-127	UHR-SVS-26	UHR-SVS-24	UHR-SVS-29/36 [2]	UHR-SVS-31	UHR-SVS-16/37 [3]
CERC ID	***(WB)***	***2***	***1***	***4***	***6***	***5***	***7***	***8***	***9***	***3***	***12***	***10***	***11***
Adult Time to Death (days)													
Mean Response	6.29	6.64	5.67	6.69	6.41	5.57	6.06	6.19	6.04	6.47	6.23	6.51	6.33
Control-Adjusted Response	100	106	90.1	106	102	88.6	96.3	98.4	96	103	99	103	101
Standard Error	0.159	0.287	0.372	0.288	0.222	0.683	0.24	0.306	0.301	0.322	0.266	0.57	0.386
Toxicity Designation [1]	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Any Endpoints within an Endpoint Group Toxic?													
Survival	No	No	No	No	No	No	No	No	No	No	No	No	No
Growth	No	No	No	No	No	No	No	No	No	No	No	No	**Yes**
Reproduction	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**
Any Endpoint Toxic?	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**

Notes:

1. A station was designated as toxic for a given endpoint if the control-adjusted response was <90% and the raw response was significantly different from control sediments using multiple t-Tests (α=0.05).
2. UHR-SVS-29/36 consists of a 1:2 ratio (by weight) mixing of samples from stations UHR-SVS-29 and UHR-SVS-36.
3. UHR-SVS-16/37 consists of a 1:1 ratio (by weight) mixing of samples from stations UHR-SVS-16 and UHR-SVS-37.

Table 14

Summary of benthic invertebrate community structure (BICS) metrics calculated for each replicate sample collected in the upper Hudson River in 2008 (Watershed Assessment Associates, LLC 2010).

Station	Replicate	Benthic Invertebrate Community Structure (BICS) Metric									
		# Individual	# Tolerant	# Intolerant	EPT Taxa	TR	HBI	PMA	SD	DOM	BAP
UHR-SVS-04	A	21	6	2	2	8	8	68	1.72	71	4.13
UHR-SVS-04	B	24	11	3	2	14	7.38	73	2.32	54	6.59
UHR-SVS-04	C	16	6	1	2	7	8.63	64	1.72	69	3.82
UHR-SVS-04	D	45	11	4	2	15	7.98	75	2.38	51	6.82
UHR-SVS-04	E	65	12	6	2	18	7.29	74	2.52	43	7.57
UHR-SVS-13	A	52	13	1	1	14	8.35	54	2.09	62	5.54
UHR-SVS-13	B	43	8	1	1	9	8.77	52	1.61	77	3.67
UHR-SVS-13	C	30	11	1	2	12	6.9	37	2.27	47	5.27
UHR-SVS-13	D	51	13	5	2	18	7.27	62	2.46	48	6.93
UHR-SVS-13	E	56	15	3	3	18	7.27	75	2.56	41	7.66
UHR-SVS-16	A	13	4	1	1	5	8	68	1.52	77	3.48
UHR-SVS-16	B	29	11	0	0	11	8.1	65	2.17	55	5.32
UHR-SVS-16	C	19	8	1	1	9	8.37	61	1.86	68	4.09
UHR-SVS-16	D	8	4	1	1	5	7.13	55	1.49	75	4.22
UHR-SVS-16	E	47	12	2	2	14	7.23	56	2.03	62	5.4
UHR-SVS-19	A	27	11	1	0	12	7.78	58	2.15	56	5.45
UHR-SVS-19	B	24	9	0	0	9	7.21	44	1.94	63	4.32
UHR-SVS-19	C	13	8	1	1	9	7.31	58	2.1	54	5.21
UHR-SVS-19	D	30	12	3	2	15	6.87	57	2.59	33	6.83
UHR-SVS-19	E	13	7	3	0	10	6.69	75	2.25	46	6.61

TABLE 14 (CONTINUED)
SUMMARY OF BENTHIC INVERTEBRATE COMMUNITY STRUCTURE (BICS) METRICS CALCULATED FOR EACH REPLICATE SAMPLE COLLECTED IN THE UPPER HUDSON RIVER IN 2008 (WATERSHED ASSESSMENT ASSOCIATES, LLC 2010).

Station	Replicate	Benthic Invertebrate Community Structure (BICS) Metric									
		# Individual	# Tolerant	# Intolerant	EPT Taxa	TR	HBI	PMA	SD	DOM	BAP
UHR-SVS-24	A	32	10	1	1	11	7.94	62	2.05	63	5.13
UHR-SVS-24	B	12	5	1	0	6	7.17	60	1.7	67	4.23
UHR-SVS-24	C	19	8	1	0	9	8.32	45	1.76	68	3.51
UHR-SVS-24	D	39	7	2	1	9	8.1	53	1.57	74	3.98
UHR-SVS-24	E	71	11	3	2	14	7.9	56	1.96	66	5.01
UHR-SVS-26	A	59	10	2	2	12	7.36	43	1.85	68	4.27
UHR-SVS-26	B	127	24	3	2	27	7.36	42	2.17	67	5.83
UHR-SVS-26	C	162	20	2	4	22	7.55	37	1.73	72	4.66
UHR-SVS-26	D	42	11	2	2	13	7.43	30	1.62	74	3.39
UHR-SVS-26	E	19	9	1	1	10	7.58	62	2.01	63	5.04
UHR-SVS-29	A	38	12	1	1	13	7.24	38	2.08	63	4.61
UHR-SVS-29	B	29	12	2	3	14	6.86	47	2.13	59	5.64
UHR-SVS-29	C	25	9	2	2	11	6.6	36	1.99	68	4.28
UHR-SVS-29	D	24	11	2	2	13	7	41	2.3	50	5.41
UHR-SVS-29	E	47	15	1	1	16	7.15	58	2.21	60	5.99
UHR-SVS-31	A	32	12	2	1	14	7.81	68	2.37	50	6.46
UHR-SVS-31	B	70	14	4	2	18	7.79	73	2.38	50	7.1
UHR-SVS-31	C	38	11	4	2	15	7.53	64	2.41	50	6.56
UHR-SVS-31	D	178	14	4	2	18	8.9	50	1.62	74	4.53
UHR-SVS-31	E	18	5	2	1	7	7.39	57	1.69	72	3.95

TABLE 14 (CONTINUED)
SUMMARY OF BENTHIC INVERTEBRATE COMMUNITY STRUCTURE (BICS) METRICS CALCULATED FOR EACH REPLICATE SAMPLE COLLECTED IN THE UPPER HUDSON RIVER IN 2008 (WATERSHED ASSESSMENT ASSOCIATES, LLC 2010).

Station	Replicate	Benthic Invertebrate Community Structure (BICS) Metric									
		# Individual	# Tolerant	# Intolerant	EPT Taxa	TR	HBI	PMA	SD	DOM	BAP
UHR-SVS-36	A	110	18	4	4	22	7.74	74	2.4	54	7.36
UHR-SVS-36	B	268	26	6	5	32	6.61	86	2.86	43	9.05
UHR-SVS-36	C	174	18	7	4	25	8.09	65	2.04	66	6.2
UHR-SVS-36	D	113	13	7	4	20	8.43	55	1.73	73	4.79
UHR-SVS-36	E	42	13	5	4	18	7.43	65	2.46	48	7.03
UHR-SVS-37	A	29	9	3	2	12	6.72	56	1.95	69	5.76
UHR-SVS-37	B	8	6	0	1	6	7	72	1.73	63	4.88
UHR-SVS-37	C	12	5	1	0	6	6.67	28	1.54	75	2.8
UHR-SVS-37	D	12	5	1	1	6	5.83	55	1.66	75	5
UHR-SVS-37	E	33	15	3	5	18	6.82	70	2.7	36	7.76
UHR-SVS-38	A	349	15	3	4	18	7.74	50	1.7	79	4.99
UHR-SVS-38	B	178	11	0	0	11	8.02	51	1.64	76	4.05
UHR-SVS-38	C	47	10	5	4	15	7.23	81	2.52	38	7.55
UHR-SVS-38	D	14	8	2	1	10	6.57	56	2.14	50	5.69
UHR-SVS-38	E	77	14	1	2	15	8.53	58	1.92	71	4.62
UHR-SVS-112	A	84	13	6	2	19	7.44	55	2.09	64	6.54
UHR-SVS-112	B	5	3	1	0	4	6.4	40	1.33	80	3.03
UHR-SVS-112	C	30	18	0	3	18	7.4	70	2.78	38	7.62
UHR-SVS-112	D	18	10	0	1	10	7.11	70	2.12	56	5.8
UHR-SVS-112	E	107	23	1	1	24	7.6	50	2.14	62	6.57

Table 14 (continued)

Summary of benthic invertebrate community structure (BICS) metrics calculated for each replicate sample collected in the upper Hudson River in 2008 (Watershed Assessment Associates, LLC 2010).

Station	Replicate	Benthic Invertebrate Community Structure (BICS) Metric									
		# Individual	# Tolerant	# Intolerant	EPT Taxa	TR	HBI	PMA	SD	DOM	BAP
UHR-SVS-124	A	7	2	2	1	4	8	54	1.28	86	3.29
UHR-SVS-124	B	26	9	2	1	11	7.77	67	2.1	62	5.45
UHR-SVS-124	C	22	9	2	1	11	8.05	54	2.13	55	5.56
UHR-SVS-124	D	45	15	3	2	18	7.69	78	2.42	51	7.29
UHR-SVS-124	E	15	5	1	2	6	8.47	73	1.52	73	3.77
UHR-SVS-127	A	32	15	2	1	17	6.72	66	2.68	34	7.53
UHR-SVS-127	B	11	6	1	0	7	8.18	40	1.85	64	3.26
UHR-SVS-127	C	148	13	2	1	15	7.16	54	1.57	80	5.12
UHR-SVS-127	D	72	13	3	2	16	7.29	64	2.29	57	6.36
UHR-SVS-127	E	28	12	1	2	13	7.82	78	2.44	39	6.99

Notes:
BICS = benthic invertebrate community structure; # Individual = Total abundance of all individuals in sample; # Tolerant = Abundance of pollution tolerant taxa in sample; # Intolerant = Abundance of pollution intolerant taxa in sample; EPT Taxa = Abundance of taxa in the orders of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies).; TR = Taxa richness; HBI = Hilsenhoff Biotic Index; PMA = Percent model affinity; SD = Species diversity; DOM = Percent dominance of the three most abundant taxa; BAP = Biological assessment profile (based on TR, HBI, PMA, SD, and DOM).

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TABLE 15

SUMMARY OF BENTHIC INVERTEBRATE COMMUNITY STRUCTURE DATA (MEAN AND STANDARD ERROR FOR FIVE REPLICATE SAMPLES) COLLECTED IN THE UPPER HUDSON RIVER IN 2008 (WATERSHED ASSESSMENT ASSOCIATES, LLC 2010).

Station	Benthic Invertebrate Community Structure (BICS) Metrics [1]																			
	# Individual		# Tolerant		# Intolerant		EPT Taxa		TR		HBI		PMA		SD		DOM		BAP	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
UHR-SVS-04	34.2	9.15	9.20	1.32	3.20	0.860	2.00	0.00	12.4	2.11	7.86	0.243	70.8	2.08	2.13	0.171	57.6	5.38	5.79	0.758
UHR-SVS-13	46.4	4.61	12.0	1.18	2.20	0.800	1.80	0.374	14.2	1.74	7.71	0.359	56.0	6.24	2.20	0.168	55.0	6.49	5.81	0.694
UHR-SVS-16	23.2	6.90	7.80	1.69	1.00	0.316	1.00	0.316	8.80	1.74	7.77	0.247	61.0	2.51	1.81	0.135	67.4	4.08	4.50	0.372
UHR-SVS-19	21.4	3.56	9.40	0.927	1.60	0.600	0.60	0.400	11.0	1.14	7.17	0.189	58.4	4.93	2.21	0.108	50.4	5.12	5.68	0.464
UHR-SVS-24	34.6	10.3	8.20	1.07	1.60	0.400	0.80	0.374	9.80	1.32	7.89	0.194	55.2	2.99	1.81	0.0873	67.6	1.81	4.37	0.308
UHR-SVS-26	81.8	26.9	14.8	3.02	2.00	0.316	2.20	0.490	16.8	3.28	7.46	0.047	42.8	5.32	1.88	0.098	68.8	1.93	4.64	0.405
UHR-SVS-29	32.6	4.37	11.8	0.97	1.60	0.245	1.80	0.374	13.4	0.812	6.97	0.113	44.0	3.96	2.14	0.0532	60.0	2.95	5.19	0.321
UHR-SVS-31	67.2	29.0	11.2	1.66	3.20	0.490	1.60	0.245	14.4	2.01	7.88	0.266	62.4	4.06	2.09	0.180	59.2	5.64	5.72	0.621
UHR-SVS-36	141	37.9	17.6	2.38	5.80	0.583	4.20	0.200	23.4	2.44	7.66	0.311	69.0	5.21	2.30	0.193	56.8	5.58	6.89	0.7
UHR-SVS-37	18.8	5.07	8.00	1.90	1.60	0.600	1.80	0.860	9.60	2.40	6.61	0.203	56.2	7.86	1.92	0.207	63.6	7.25	5.24	0.799
UHR-SVS-38	133	60.6	11.6	1.29	2.20	0.860	2.20	0.800	13.8	1.46	7.62	0.336	59.2	5.65	1.98	0.16	62.8	8.01	5.38	0.604
UHR-SVS-112	48.8	19.8	13.4	3.41	1.60	1.12	1.40	0.510	15.0	3.55	7.19	0.213	57.0	5.83	2.09	0.23	60.0	6.78	5.91	0.777
UHR-SVS-124	23.0	6.38	8.00	2.19	2.00	0.316	1.40	0.245	10.0	2.43	8.00	0.136	65.2	4.89	1.89	0.211	65.4	6.36	5.07	0.713
UHR-SVS-127	58.2	24.6	11.8	1.53	1.80	0.374	1.20	0.374	13.6	1.78	7.43	0.256	60.4	6.37	2.17	0.201	54.8	8.39	5.85	0.762
UHR-SVS-16/37 [2]	21.0	5.99	7.90	1.80	1.30	0.458	1.40	0.588	9.20	2.07	7.19	0.225	58.6	5.19	1.87	0.171	65.5	5.67	4.87	0.586
UHR-SVS-29/36 [3]	105	26.7	15.7	1.91	4.40	0.470	3.40	0.258	20.1	1.90	7.43	0.245	60.7	4.79	2.25	0.146	57.9	4.70	6.32	0.574

Notes:

Individual = Total abundance of all individuals in sample; # Tolerant = Abundance of pollution tolerant taxa in sample; # Intolerant = Abundance of pollution intolerant taxa in sample; EPT Taxa = Abundance of taxa in the orders of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies); TR = Taxa richness; HBI = Hilsenhoff Biotic Index; PMA = Percent model affinity; SD = Species diversity; DOM = Percent dominance of the three most abundant taxa; BAP = Biological assessment profile (based on TR, HBI, PMA, SD, and DOM); BICS = Benthic Invertebrate Community Structure; SE = standard error.

1. Table 7 contains a detailed description of the BICS metrics.
2. UHR-SVS-16/37 consists of a 1:1 ratio (by weight) mixing of samples from stations UHR-SVS-16 and UHR-SVS-37. The BICS data for this formulated sample were calculated as a weighted mean of data from the constituent stations.
3. UHR-SVS-29/36 consists of a 1:2 ratio (by weight) mixing of samples from stations UHR-SVS-29 and UHR-SVS-36. The BICS data for this sample were calculated as a weighted mean of data from the constituent stations.

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FIGURE 1: MAP OF THE UPPER HUDSON RIVER STUDY AREA.

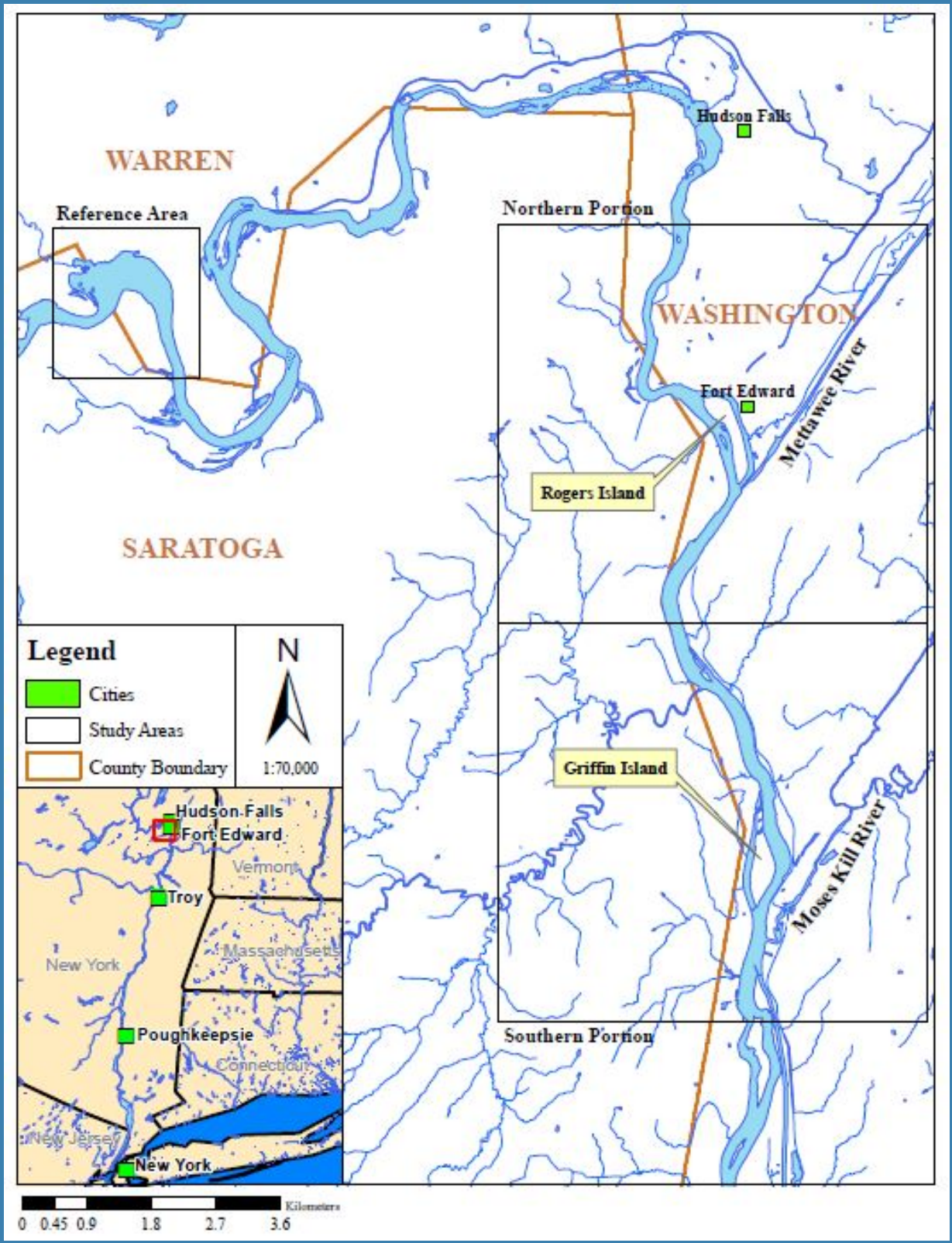


FIGURE 2: UPPER HUDSON RIVER SHOWING THE LOCATIONS WHERE SEDIMENT SAMPLES WERE COLLECTED DURING THE 2008 PILOT STUDY.

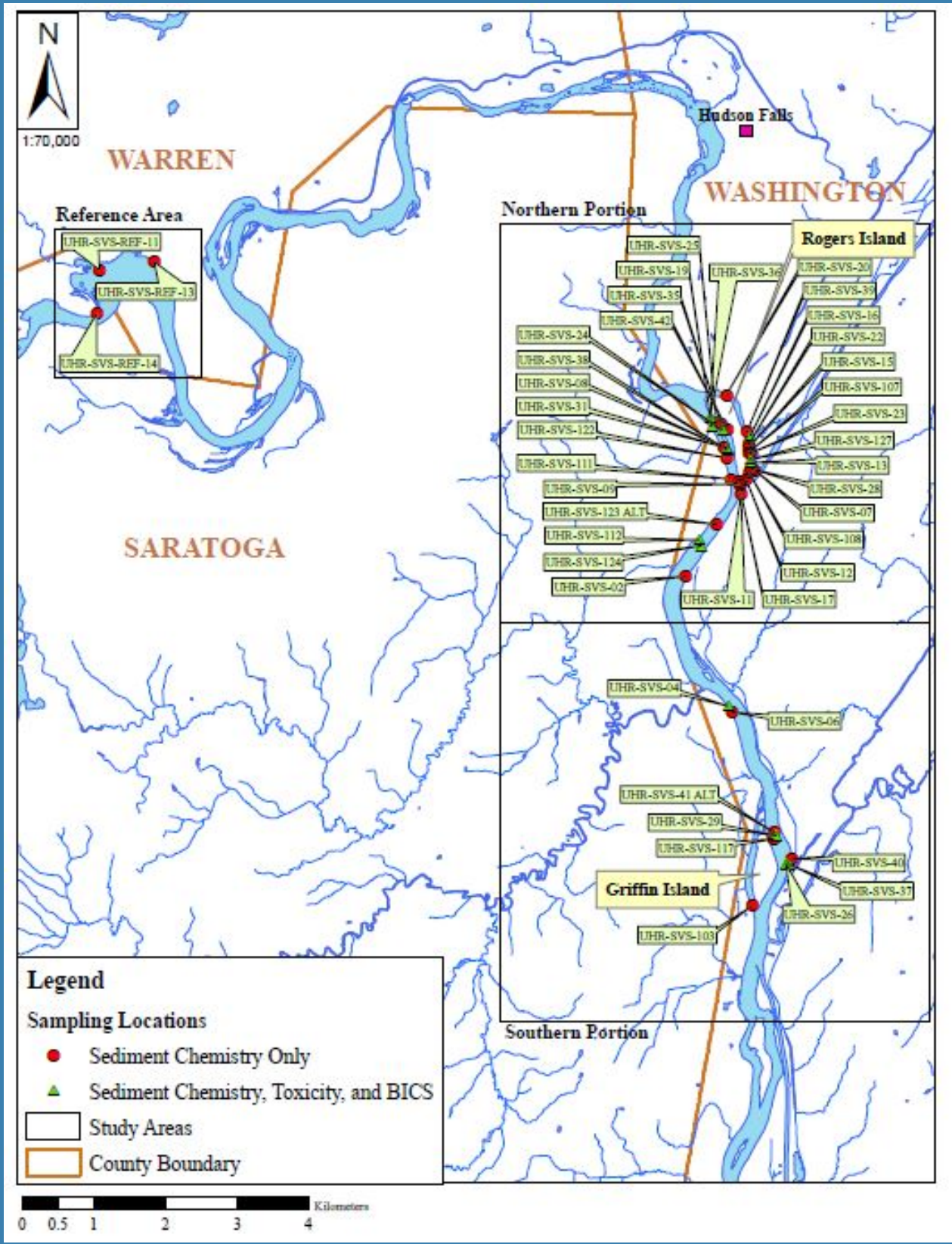
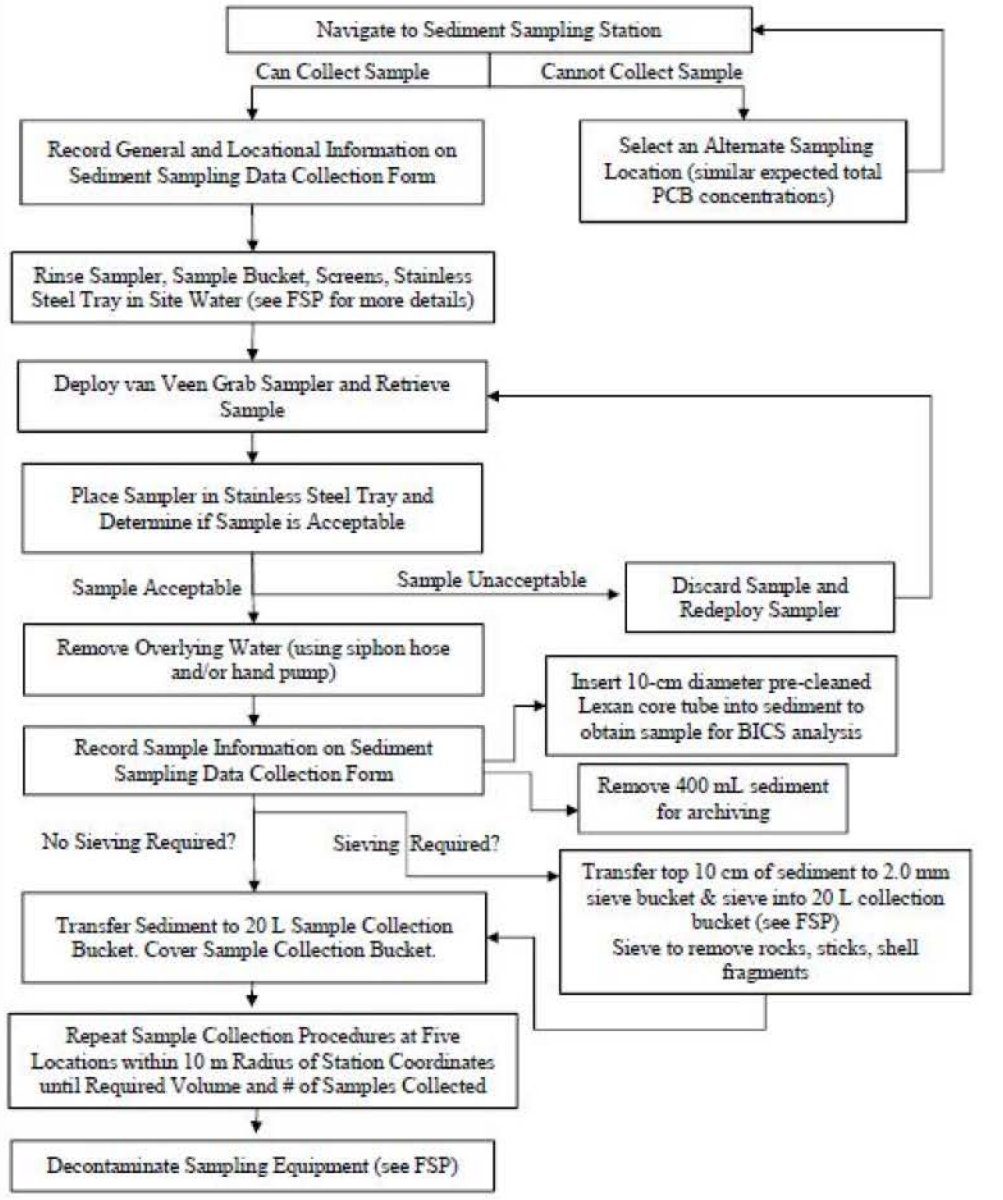
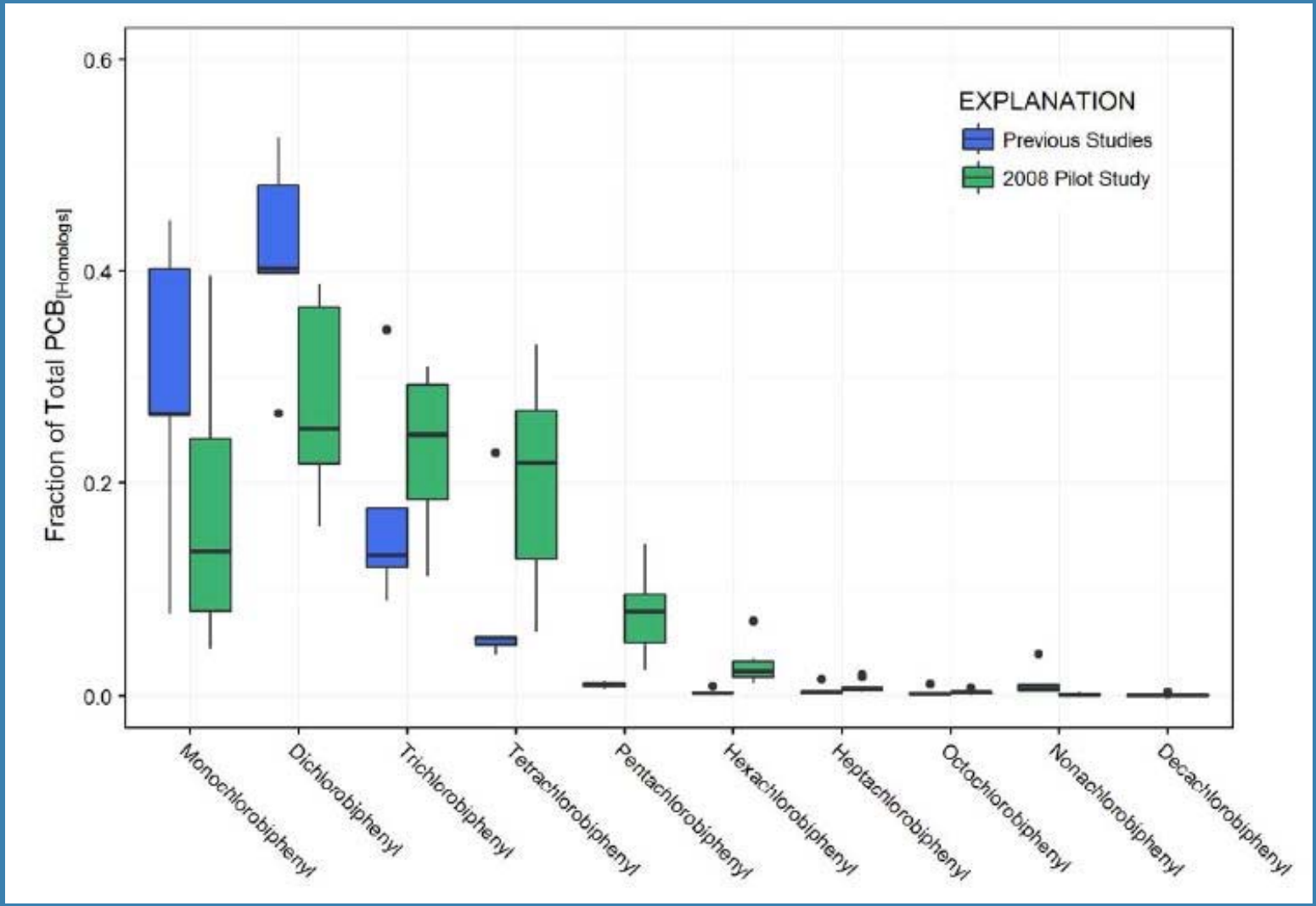


FIGURE 3: DESCRIPTION OF STEPS FOLLOWED DURING SEDIMENT SAMPLING FOR THE 2008 HUDSON RIVER PILOT STUDY.



FSP = Field Sampling Plan; PCB = polychlorinated biphenyl.

FIGURE 4: DISTRIBUTION OF POLYCHLORINATED BIPHENYL (PCB) HOMOLOGS FOR SELECTED SEDIMENT SAMPLES COLLECTED PRIOR TO 2008 (GE 2002; 2003; 2004) AND DURING THE 2008 PILOT STUDY FROM SIMILAR LOCATIONS IN THE UPPER HUDSON RIVER.



APPENDIX 1

Work Plan for the Pilot Study on the Effects of PCB-Contaminated Sediments on Benthic Invertebrates in the Upper Hudson River, New York

PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENT CHEMISTRY, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE FOR PCB-CONTAMINATED SEDIMENTS FROM THE UPPER HUDSON RIVER, NEW YORK—DATA REPORT

WORK PLAN FOR THE PILOT STUDY ON THE EFFECTS OF PCB-CONTAMINATED SEDIMENTS ON BENTHIC INVERTEBRATES IN THE UPPER HUDSON RIVER, NEW YORK

HUDSON RIVER NATURAL RESOURCE DAMAGE ASSESSMENT

PREPARED FOR:

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
DAMAGE ASSESSMENT, REMEDIATION, AND RESTORATION PROGRAM
1305 EAST-WEST HIGHWAY, ROOM 10218
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PREPARED SEPTEMBER, 2008; REVISED JANUARY, 2009

Work Plan for the Pilot Study on the Effects of PCB-Contaminated Sediments on Benthic Invertebrates in the Upper Hudson River, New York

Work Plan for the Pilot Study on the Effects of PCB-Contaminated Sediments on Benthic Invertebrates in the Upper Hudson River, New York

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1.0 INTRODUCTION

Bed sediments in the Hudson River are known to be contaminated by polychlorinated biphenyls (PCBs). The PCBs that occur in bed sediments originated primarily from discharges from capacitor manufacturing operations at Hudson Falls and Fort Edward, New York. It has been estimated that as much as 1.3 million pounds (509 kg) of PCBs were discharged to the Hudson River from these sources between 1947 and 1977 (USEPA 2008). Additional PCBs may have been released due to the disposal of manufacturing wastes in landfills and from discharges from wastewater collection systems. Other sources of PCBs to the river could include electric utilities, paper mills, other industries, transportation sources, electrical component scavengers, land- filling of dredged materials, recycling of carbonless copy paper, and uncontrolled combined sewage outfalls.

The presence of elevated levels of PCBs in aquatic sediments represents a potential environmental concern for several reasons. First, bed sediments provide essential habitats for communities of benthic and epibenthic organisms. The presence of elevated concentrations of PCBs in freshwater sediments could be harmful to sediment-dwelling organisms, which are important elements of freshwater ecosystems. In addition, PCBs can bioaccumulate in the tissues of aquatic organisms and, as a result, pose a potential hazard to those species that consume aquatic organisms, including humans and wildlife.

From 1991-2000, the USEPA conducted a remedial investigation (RI) to evaluate the nature and extent of contamination, to assess risks to human health, and to characterize risks to ecological receptors utilizing habitats in the vicinity of the Hudson River. Subsequently, a feasibility study (FS) was conducted to determine the most effective means of addressing concerns relative to the effects of PCB- contaminated sediments on human health and the environment. The results of the FS informed a remedial decision that involves removal of contaminated sediment from nearly 500 acres of the upper Hudson River during two phases of the removal action.

As dredging activities are currently being planned for the upper portions of the river, there is a need to collect data and information on the effects of PCB-contaminated sediment on benthic invertebrates before this opportunity is lost. Accordingly, this project is being conducted to characterize the concentrations of PCBs and other chemicals of potential concern (COPCs) in surficial sediments, to evaluate the toxicity of PCB-contaminated sediments to two indicator species of benthic invertebrates, and to support an assessment of benthic macroinvertebrate community structure in this portion of the river. Depending on the results of this pilot project, additional field investigations and/or sediment-spiking studies may be conducted in the future. In order to integrate all technical and quality aspects of the project, including planning, implementation, and assessment, it is essential that a sampling and analysis plan (SAP) be developed and quality assurance/quality control (QA/QC) steps be established and followed.

A sampling and analysis plan (SAP) typically consists of three primary elements, including a quality assurance project plan (QAPP), a field sampling plan (FSP), and an associated health and safety plan (HSP). The FSP describes the methods and procedures that will be applied during the collection, handling, and preparation of the environmental samples that are to be obtained during the sediment sampling program. The FSP is complemented by the QAPP for the study, which describes how the accuracy of sampling and laboratory analyses will be managed and describes procedures for acquiring, evaluating, and managing measurement data to assure the quality of the project data (HRNRT 2005). The Health and Safety Plan for the project represents the third element of the SAP.

This document describes the approach that will be used in the *Pilot Study on the Effects of PCB-Contaminated Sediments on Benthic Invertebrates in the Hudson River* (i.e., the study Work Plan). In addition, this document describes procedures that will be used to collect and process the sediment samples that are collected from the Hudson River (i.e., the FSP). Furthermore, the procedures for conducting chemical analyses, toxicity tests, and benthic macroinvertebrate community structure assessments are presented in this document (i.e., QAPP supplement). Finally, the quality assurance/quality control measures that will be implemented to assure the quality of the sediment chemistry, sediment toxicity, and benthic macroinvertebrate community structure data, including the relevant Standard Operating Procedures, are described in this document and in the associated Analytical Quality Assurance Plan (HRNRT 2005). Therefore, this document, when used in conjunction with the Health and Safety Plan (Lanahan 2008), represents the Work Plan and SAP for the study. All field personnel will be required to review all elements of the Work Plan and SAP and sign/date a certification sheet to indicate that they have read and understand the plan and agree to abide by the stated procedures and restrictions.

This document was prepared to guide the 2008 FSP for the upper Hudson River. The earlier drafts of this document were prepared prior to implementing the FSP. Upon completion of the sampling activities, this document was reviewed and updated to reflect field modifications and other changes to the sampling plan. Accordingly, a post-sampling summary has been prepared for certain sections of the document to document these modifications. These changes were made in consultation with the field auditor, and/or the Natural Resource Trustees (NRTs).

2.0 BACKGROUND ON THE EFFECTS OF PCB-CONTAMINATED SEDIMENTS ON BENTHIC INVERTEBRATES

Sediment provides habitat for many aquatic organisms and is a major repository for many of the more persistent chemicals that are introduced into surface waters. In the aquatic environment, most anthropogenic chemicals and waste materials, including toxic organic and inorganic chemicals, eventually accumulate in sediments. Although certain chemicals are highly sorbed to sediment, these compounds may still be available to the biota. Contaminated sediments may be directly toxic to aquatic life or can be a source of contaminants for bioaccumulation in the food chain (ASTM 2008a; 2008b; 2008c).

This document was prepared to guide the 2008 field sampling program for the upper Hudson River. The earlier drafts of this document were prepared prior to implementing the field sampling program. Upon completion of the sampling activities, this document was reviewed and updated to reflect field modifications and other changes to the sampling plan. Accordingly, a post-sampling summary has been prepared for certain sections of the document to document these modifications. These changes were made in consultation with the field auditor, and/or the NRTS.

Concentrations of contaminants in sediment can be several orders of magnitude higher than in the overlying water. However, bulk sediment concentrations may not always be strongly correlated to bioavailability. Because relationships between concentrations of contaminants in sediment and their bioavailability are poorly understood, determining effects of contaminants in sediment on aquatic organisms requires information from controlled toxicity and bioaccumulation tests and measures of effects on benthic communities inhabiting sediments (Ingersoll *et al.* 1997).

While individual measurement tools for assessing sediment contamination each have an inherent level of uncertainty associated with their application, the uncertainty associated with an assessment of sediment quality conditions can be reduced by integrating these tools. For example, the use of sediment chemistry, sediment toxicity, and benthic community data together in an assessment

can be used to establish a weight-of-evidence linking contaminated sediments to adverse biological effects (Chapman *et al.* 1997). Similarly, Long *et al.* (1995) and Ingersoll and MacDonald (1999) used sediment chemistry and toxicity data, in conjunction with sediment quality guidelines, to evaluate sediment quality and identify contaminants that were likely causing adverse biological effects. The integration of multiple lines of evidence using a weight-of-evidence approach has the potential to substantially reduce uncertainty associated with assessment of contaminated sediments and to improve management decisions. Results of biological assessments and contaminant measurements can be integrated with results of benthic community and other evaluations (e.g., toxicity identification evaluation; TIE) to determine if causal links exist between sediment contamination and adverse effects.

Sediment-dwelling organisms may be exposed to PCBs that are bound to particulates, as well as the dissolved PCBs in the interstitial and overlying waters. Consequently, the effects of sediment-associated PCBs on benthic organisms can be evaluated using sediment toxicity tests, in which test organisms are exposed to PCBs in both the solid and aqueous phases. More specifically, spiked-sediment toxicity tests can provide information on the relationships between the concentrations of PCBs in sediments and the responses of test organisms under controlled laboratory conditions. In addition, numerical sediment quality guidelines (SQGs) provide a basis for identifying the concentrations of sediment-associated PCBs that could adversely affect benthic invertebrates.

Information from spiked-sediment toxicity tests to evaluate the effects of PCBs on freshwater benthic invertebrates was not located in the literature. However, limited data are available on the toxicity of sediment-associated PCBs to marine and estuarine invertebrate species. More specifically, Swartz *et al.* (1988) reported a 10-d LC_{50} of 8.8 mg/kg DW of Aroclor 1254 (29 mg/kg DW @1% organic carbon; OC) for the amphipod, *Rhepoxynius abronius*. In addition, DiPinto *et al.* (1993) reported acute toxicity and reproductive impairment in copepods, *Microarthridion litorale*, exposed for 12-d to Aroclor 1254 concentrations of 83 and 4.2 mg Aroclor 1254/kg DW (i.e, 64 and 1.0 mg/kg DW @ 1% OC), respectively, suggesting a lethal-to-sublethal effect ratio of roughly 20. USEPA (1980) reported an acute-to-chronic ratio (ACR) of 11 for the freshwater amphipod, *Gammarus pseudolimnaeus*, based on the results of water-only toxicity tests. Using the 10-d LC_{50} for the marine amphipod and the ACR for the freshwater amphipod, MacDonald *et al.* (2000) estimated a toxicity threshold of 0.8 mg/kg DW for total PCBs (i.e., 2.6 mg/kg DW @ 1% OC).

Various compilations of data from field studies conducted in North America have been used to developed sediment quality guidelines for total PCBs that range from0.003 to 5.3 mg/kg DW for freshwater ecosystems (Neff *et al.* 1986; Long and Morgan 1991; Environment Canada and Ministere de l'Environnement du Quebec 1992; Persaud *et al.* 1993; Ingersoll *et al.* 1996; Smith *et al.* 1996; Cubbage *et al.* 1997). Subsequently, MacDonald *et al.* (2000) used these SQGs to derive consensus-based sediment effect concentrations (SECs) for PCBs that were thought to provide a unifying synthesis of the existing SQGs, reflect causal rather than correlative effects, and accurately predict sediment toxicity to benthic invertebrates exposed to PCB-contaminated sediments. More specifically, a threshold effect concentration (TEC; 0.04 mg/kg DW), midrange effect concentration (MEC; 0.4 mg/kg DW), and extreme effect concentration (EEC; 1.7 mg/kg DW) were derived from the underlying SQGs and evaluated to determine their predictive ability. By comparison, Fuchsman *et al.* (2006) reported equilibrium-partitioning based sediment quality benchmarks ranging from 210 to 5,300 mg/kg OC (using a final chronic value of 0.54 ì g/L), depending on the Aroclor mixture or site under consideration. The lower sediment quality benchmarks were calculated for the mixtures and sites that had lower-chlorinated PCBs (i.e., Aroclor 1242 vs. Aroclor 1260). Expressed on a dry-weight basis at 1% OC, these sediment quality benchmarks range from 2.1 to 53 mg/kg DW of total PCBs.

A large body of information is available on the magnitude and extent of contamination of upper Hudson River sediments by PCBs. However, few data are available to assess the actual

impacts of PCBs on invertebrates utilizing benthic habitats in the Hudson River. Co-located macroinvertebrate data (e.g., richness, diversity, indices) and PCB concentrations are sparse or collections do not seem representative of exposure to most of the highly-contaminated sediment types (e.g., fine to transitional sediments with concentrations greater than 30 ppm total PCBs). In addition, sediment toxicity data are from a limited number of federal or private applicant navigational dredging projects in the lower Hudson River that have lower PCB concentrations than are typically observed in the upper Hudson River. In light of the uncertainties associated with the effects on benthic invertebrates associated with exposure to PCB-contaminated sediments in the upper Hudson River, the natural resources trustees (NRTs) will conduct one or more investigations to evaluate the toxicity of PCB-contaminated sediments to benthic invertebrates. It is anticipated that the results of these investigations may provide the data and information needed to assess injuries to benthic invertebrates in the study area and elsewhere in the Hudson River. This Work Plan describes one such study.

3.0 STUDY AREA

The study area includes those portions of the Hudson River between Rogers Island and Griffin Island (Figures 1 and 2). This area is considered to be among the most contaminated reaches of the Hudson River with respect to PCBs in sediment. This area includes two river sections that are being addressed in the USEPA response actions.

The USEPA is planning to implement a Phase 1 dredging effort in the upper Hudson River, NY in 2009. Phase 1 dredging is anticipated to occur over about 92 acres, comprising two general locations within River Section 1, which extends from about river mile RM 194.8 to RM 188.5 (i.e., between the former Fort Edward Dam and the Thompson Island Dam). Most of the Phase 1 dredge areas are located along a 1.5-mile stretch of river in the Thompson Island Pool near Rogers Island (Figure 1). However, a smaller area, about half a mile in length, located several miles downstream in the channel east of Griffin Island is also included in the Phase 1 dredging area (BB&L 2006).

The Phase 2 dredging effort has not yet been scheduled and a Final Design Report has not yet been released. However, General Electric (GE) has recently finalized its Dredge Area Delineation (DAD) Report for Phase 2 (December 17, 2007), which identifies 397 acres as meeting the USEPA established criteria for removal. The Phase 2 DAD includes 217.7 acres in River Section 1, 83.5 acres in River Section 2, and 95.8 acres in River Section 3. River Section 2 extends from about RM 188.5 to RM 186.4 (i.e., between the Thompson Island Dam and Northumberland Dam). River Section 3 extends from about RM 183.4 to RM 153.9 (i.e., between Northumberland Dam and the Federal Dam at Troy). Figure 2 shows the general locations of Phase 2 dredging areas and their relationship to the Phase 1 locations.

4.0 STUDY OBJECTIVES

The existing whole-sediment chemistry data for the upper Hudson River indicate that PCB concentrations are elevated throughout the study area (GE 2002; 2003; 2004; 2005; 2007). For example, the levels of PCBs in surficial sediments within River Sections 1 and 2 of the upper Hudson average about 100 ppm total PCBs, while River Section 3 has an average of 10-30 ppm total PCBs. Maximum upper Hudson River PCB concentrations of 1,650 ppm in the top six inches of material and up to 4,942 ppm in the top 12 inches were recorded in River Section 1 transitional

sediments from 2002-2003 remedial design data. By comparison, the concentrations of PCBs in the low contamination sediments are well below 1 ppm (expressed on a dry weight basis).

This study is intended to provide the data needed to determine if benthic invertebrates are adversely affected by exposure to PCB-contaminated sediments in the upper Hudson River. More specifically, the objectives of this study are to:

- Collect large-volume surficial sediment samples at 42 locations in the upper Hudson River;
- Sub-sample each sediment sample for analysis of benthic invertebrate community structure. Process and preserve all of the samples. Make decision to proceed with the benthic community assessment when toxicity test results become available;
- Sub-sample each sediment sample to obtain 2L of unsieved material for archiving;
- Homogenize the samples in the field and sub-sample for analysis of total PCBs (as homologues) and total organic carbon (TOC). Hold samples in cold storage until analytical results are available;
- Review the total PCB (as sum of homologues) and TOC data, calculate dry weight and OC-normalized concentrations (i.e., dry weight concentration @ 1% of total PCBs), and select 12 sediment samples for full characterization, based on PCB concentrations that fall into six target ranges (i.e., <1, 1-5; 5-10; 10-20, 20-50, and 50-100 mg/kg; two samples per concentration range). Both dry-weight normalized and TOC- normalized concentrations of total PCBs will be considered during the selection of samples for full chemical and toxicological characterization;
- Ship the 12 selected sediment samples to the Columbia Environmental Research Center (CERC) for processing;
- Homogenize and sub-sample the selected sediment samples and submit the sub-samples to various laboratories for chemical characterization and toxicity testing;
- Determine the concentrations of selected COPCs in sediment samples, including metals, acid volatile sulfides (AVS) and simultaneously extracted metals (SEM), polycyclic aromatic hydrocarbons (PAHs), PCBs, organochlorine pesticides, and/or polychlorinated dibenzo-*p*- dioxins/polychlorinated dibenzofurans (PCDDs/PCDFs). In addition, measure total organic carbon (TOC) and grain size distribution in the sediment samples and hydrogen sulfide and ammonia levels in the associated pore water;
- Evaluate the chronic toxicity of sediment samples to the amphipod, *Hyalella azteca*, and to the midge, *Chironomus dilutus*;
- Evaluate the bioavailability of PCBs using matrix solid phase microextraction (SPME), measure concentrations of PCBs in pore water and/or implement an alternate strategy for evaluating the bioavailability of sediment-associated PCBs;
- Evaluate benthic macroinvertebrate community structure (BICS) for each of the sediment samples, depending on the results of the sediment toxicity tests (Note: BICS will be evaluated if significant relationships between PCB concentrations and sediment toxicity are developed from the resultant data);
- Maintain and document chain-of-custody throughout the sampling and analytical program;

- Review and evaluate the data generated by the various analytical, toxicity testing, and taxonomy laboratories, and validate the data on the concentrations of COPCs in sediment; and,
- Analyze the resultant data and prepare a technical report that summarizes the study results.

Up to four types of information will be collected to evaluate the effects of PCB- contaminated sediments from the upper Hudson River on benthic invertebrates, including sediment chemistry, sediment toxicity, benthic macroinvertebrate community structure (contingent on the results of the sediment toxicity tests), and the bioavailability of PCBs. Data quality objectives for each of these data types are presented in Section 7.1 of this document.

The Field Sampling Plan (FSP) presented in Section 5.0 of this document describes the methods and procedures that will be used to collect and process sediment samples for chemical analysis, toxicity testing, bioavailability evaluation, and BICS assessment. The Sample Analysis Plan presented in Section 6.0 of this document describes the methods and procedures that will be used to generate the sediment- chemistry, PCB bioavailability, sediment-toxicity, and BICS data that are required to evaluate the effects of PCB-contaminated sediments on benthic invertebrates. The methods and procedures that will be used to assure the quality of the data generated during the study are described in Section 7.0 of this document.

5.0 FIELD SAMPLING PLAN

This section of the Work Plan presents the field sampling plan for the *Pilot Study on the Effects of PCB-Contaminated Sediment on Benthic Invertebrates in the Hudson River*. This FSP includes the following elements:

- Overview of Sampling Plan;
- Volume Requirements for Sediment Samples;
- Sampling Timing;
- Composition, Roles and Responsibilities of Sampling Team;
- Sample Designation;
- Sampling Methods and Equipment;
- Sample Handling and Preparation;
- Decontamination Procedures;
- Procedures for Avoiding Sampling Contamination;
- Procedures for Avoiding Exposure to Contaminated Sediments;
- Chemicals of Concern; and,
- Sampling Program Logistics.

Each of these field sampling plan elements are described in the following sections of this document.

5.1 OVERVIEW OF SAMPLING PLAN

The sampling program described herein is designed to provide the data and information needed to evaluate the effects of PCB-contaminated sediments from the Hudson River on benthic macroinvertebrates. The focus of this sampling effort will primarily be on the Thompson Island Pool and, in particular, the Phase 1 areas targeted for dredging in 2009. Most of Phase 1 dredge areas have been characterized as transitional sediment (Type 4) and range over several orders of magnitude in PCB concentrations. Type 4 sediments are characterized as variable in grain size, consisting of a mix of fine sediments (Type 1), sandy sediments (Type 2), and gravel/cobble materials (Type 3). Type 1, 2 and 3 sediments will also be removed during Phase 1 dredging, but those areas represent smaller acreages than do the areas with Type 4 sediments. The pilot study will focus on sediments in unvegetated areas to minimize confounding factors in the toxicity tests and benthic community assessment. Sampling will be conducted in late September and early October to coincide with the period of maximal benthic biomass and diversity and to coordinate with the schedule for toxicity testing.

This study will involve collection of a total of 42 large-volume (i.e., 10 L) sediment samples within the study area. The concentrations of total PCBs (as homologues) and TOC will be measured in each of these samples. These analytical results will be used to select 12 large-volume sediment samples to support evaluations of sediment chemistry, the bioavailability of sediment-associated PCBs, sediment toxicity, and/or BICS. The 12 large-volume sediment samples will be selected to span the range of PCB concentrations within which adverse effects on sediment-dwelling organisms are likely to occur. Both dry-weight normalized and TOC-normalized concentrations of total PCBs will be considered during the selection of samples for full chemical and toxicological characterization.

Toxicity thresholds for PCBs can be established based on the results of sediment- spiking studies, field studies, and/or equilibrium partitioning (EqP) theory. Based on the results of spiked-sediment toxicity tests, PCBs are likely to be acutely toxic at concentrations ranging from 29 to 64 mg/kg DW @ 1% OC (Swartz *et al.* 1988; DiPinto *et al.* 1993). The results of sediment-spiking studies also show that sub-lethal effects on sediment-dwelling organisms (i.e., reproductive effects) exposed to PCB-contaminated sediments can be observed at concentrations as low as 1 mg/kg DW @ 1% OC (DiPinto *et al.* 1993). By comparison, chronic EqP-based sediment quality benchmarks range from 2.1 to 53 mg/kg DW @ 1% OC (Fuchsman *et al.* 2006). Consensus-based SQGs that correspond to chronic effects thresholds range from 0.4 to 1.7 mg/kg DW @ 1% OC (MacDonald *et al.* 2000). Overall, adverse effects thresholds for total PCBs range from 0.4 to 64 mg/kg DW @ 1% OC. On a dry-weight basis, thresholds for adverse effects range from 0.8 to 83 mg tPCB/kg.

To span the range of toxicity thresholds for PCBs, sampling locations in the Hudson River were selected to bracket these ranges of PCB concentrations. Information on PCB concentrations in upper Hudson River sediments was obtained from the NOAA Hudson River Watershed Database and Mapping tools (response.restoration.noaa.gov/cpr/watershed/watershedtools.html). More specifically, data on OC levels and PCB concentrations in surficial sediments were obtained from studies conducted by General Electric (GE 2002; 2003; 2004; 2005; 2007). Target PCB concentration ranges are expressed on an organic carbon-normalized basis, but an effort will also be made to simultaneously achieve the dry weight concentrations in parentheses:

- < 1.0 mg/kg DW @ 1% OC (< 1 mg/kg DW);
- 1.0 - < 5.0 mg/kg DW @ 1% OC (1.0 - < 5.0 mg/kg DW);
- 5.0 - < 10 mg/kg DW @ 1% OC (5.0 - < 10 mg/kg DW);
- 10 - < 20 mg/kg DW @ 1% OC (10 - < 20 mg/kg DW);

- 20 - < 50 mg/kg DW @ 1% OC (20 - < 50 mg/kg DW); and,
- 50 - < 100 mg/kg DW @ 1% OC (50 - < 100 mg/kg DW).

To ensure that the resultant data are generally comparable, gravel will be removed from the samples by sieving samples through a 2.0 mm sieve (as per MacDonald *et al.* 2007).

To support the selection of sediment sampling locations in the upper Hudson River, 42 sampling sites were identified using the available whole-sediment chemistry and TOC data for the study area (Figures 3 and 4; Table 1; alternate sampling locations are listed in Table 2 and shown in Figures 5 and 6). To select these locations, the historic data set was refined to remove data for locations with water depths greater than 11 feet, for locations not within the Phase I dredge area, and for locations that did not have TOC data. Then OC-normalized concentrations of PCBs were calculated for each surficial sediment sample represented in the data set. These data were then plotted on base maps of the study area using ArcMap Software. The spatial distributions of the sediment chemistry data were examined visually. This examination focused on identifying clusters of samples that had PCB concentrations within the same range (e.g., 1 to < 5 mg/kg DW @ 1% OC). In addition, the dry-weight normalized concentrations of PCBs and TOC concentrations were plotted using overlay mapping techniques. These results were also examined to identify clusters of samples with relatively similar levels of PCBs and TOC. A total of seven primary sampling locations were identified for each of the six ranges of PCB concentrations identified above (Table 1). In this respect, a primary sampling location is considered to be the area within a 10 m radius of the designated sampling coordinates. If it is not possible to collect a sediment sample within 10 m of the designated coordinates, either the station location will be adjusted to facilitate sample collection at a nearby location where a sample can be collected or an alternate station will be selected from the list provided in Table 2. At each of these sampling locations, a large-volume sediment sample (about 10 L) will be collected using the procedures described in ASTM (2003). These samples will be homogenized and sub- sampled in the field to support chemical analysis of PCBs [i.e., homologues, using low resolution-mass spectrometry (LR-MS) to estimate total PCB concentrations] and TOC. These results will be used to select 12 large-volume sediment samples for full chemical and toxicological characterization.

At each of the 42 selected large-volume sampling locations (Table 1), three to five grab sediment samples will be collected using a Van Veen grab sampler. One or two 10 cm diameter sediment cores will be extracted from the each of the grab samples for subsequent evaluation of BICS (pending the results of toxicity tests). In total, five replicate core samples for BICS analysis will be collected at each sampling station. One 2 L sample of unsieved sediment will be collected at each sampling station. In addition, about 3-5 L of material will be obtained from each of the grab samples and wet sieved (using river water) to 2 mm in the field. Sieved material will be retained in a 20-L high-density plastic bucket. This procedure will be repeated for multiple grab samples, resulting in collection and consolidation of about 10 L of sieved sediment. Up to 6 L of overlying water may be added to the bucket to facilitate wet sieving.

Following collection, the sediment samples collected for toxicological and chemical characterization will be transported to the field laboratory for further processing. First, the sediment samples will be allowed to stand undisturbed for at least two hours to allow the fine material to settle out of the overlying water. Then, most of the overlying water will be poured off and returned to the river. The sample will then be homogenized using a stainless steel auger attached to an electric drill. Following homogenization, a 250 mL sub-sample will be obtained for analysis of PCBs and TOC. The remaining material will be transferred into three 4-L high-density polyethylene (HDPE) bottles. These containers will then be sealed, placed in labeled bins, and stored in a refrigerated truck prior to transport to a cold-storage facility in the Albany, NY area (i.e., at the completion of the field sampling program). The sediment samples will be held at this location under completed

chain-of-custody (at 0-6°C) until the selection of the 12 samples for further characterization is made.

Following collection, the sediment samples collected for BICS evaluation (in the core tubes) will be transported to the field laboratory for processing. Five replicate core samples from each sampling station will be sieved through a #30 sieve (corresponding to a 0.59 mm opening) by the aquatic taxonomist, preserved using 70-95% ethanol, and subsequently transported to the Watershed Assessment Associates laboratory (Schenectady, NY).

The sub-samples from the 42 sediment samples will be shipped under completed chain-of-custody to Alpha Analytical Labs (Mansfield, MA) for analysis of PCBs (by LR-MS) and TOC (by combustion). These results will be reviewed and used to identify a total of 12 sediment samples for full characterization. These samples will be selected with the goal of having two samples with PCB concentrations that fall within each of the six target concentration ranges, based on dry-weight normalized and OC-normalized concentrations. If that goal can not be achieved with the samples that were collected, sediment samples may be nixed to achieve the target concentrations of PCBs. The sediment samples that are selected for full characterization will be shipped under completed chain-of-custody to the CERC facility in coolers on blue ice by overnight courier.

Upon receipt at the CERC facility, the sediment samples will be stored in a walk-in cooler at 0-6^0 C prior to further processing. On or about November 10, 2008, these samples will be retrieved from the cooler, transferred to a 20-L high-density plastic bucket, and homogenized (i.e., using a stainless steel auger attached to an electric drill). Then, sub-samples will be obtained for chemical analysis and for toxicity testing. In total, 28 replicates per treatment will be prepared for toxicity testing (i.e., 12 for *Hyalella azteca* and 16 for *Chironomus dilutus*). Three (125 mL) sub-samples will be prepared for each of the 13 treatments (i.e., 12 samples from the Hudson River and one control treatment) to support evaluation of the bioavailability of PCBs (i.e., using matrix SPME methods). The sub-samples for chemical analyses will be sent to the various laboratories by overnight courier. Chain-of-custody will be documented throughout the sediment collection, processing, and transportation process.

It is important to note that this study is preliminary and will primarily be useful for determining whether exposure to upper Hudson River sediments adversely affects benthic organisms. Further investigations may be needed to characterize the range of factors that affect sediment toxicity and the associated interpretation of benthic injury.

<u>Post-Sampling Summary:</u>

In total, 43 large-volume sediment samples were collected during the field sampling program. There was one sample that was collected that was not specified in the original Work Plan. More specifically, one additional sample was collected that was estimated to be in the <1 mg/kg tPCB range. The additional sample was collected to increase the probability of obtaining at least two samples with total PCB concentrations of < 1 mg/kg @ 1%OC. The locations of the actual sampling locations are described in Table 3 and shown in Figures 7, 8, and 9.

Fourteen samples were collected at alternate sampling stations (i.e., Table 3). Alternate stations were accessed when sediment samples could not be collected at the predetermined sampling stations (i.e., due to the presence of thick aquatic vegetation or substrate that would not allow the sampler to penetrate). Five of these samples (identified in Table 3 and 4) were collected at locations that were not identified in the original Work Plan (i.e., the field supervisor collected these samples at locations that were thought to yield samples with PCB levels within the desired concentration range. Three sampling locations outside the Hudson River Phase I dredge areas were selected to increase the likelihood that at least two samples in the <1 ppm range would be obtained. These samples were collected from a reference area that was spatially removed from the area influenced

by the GE operations and has been used previously as a reference area for this type of study. These samples were identified by including a 'REF' suffix in the Sample Identification Number (Table 3 and Figure 9).

5.2 VOLUME REQUIREMENTS FOR SEDIMENT SAMPLES

Large-volume sediment samples will be collected from 42 locations to support chemical and biological characterization of upper Hudson River sediments. The following represents the maximum sub-sample volumes needed to support the various chemical analyses and toxicity tests:

i) Sediment Chemistry

Preliminary Analysis of 42 Samples

- PCB homologues (LRMS)/TOC — 250 mL

Full Analysis of 12 Samples

- Total metals (ICP/MS; EPA 6020A)
  Mercury (CVAF; EPA 7474) — 250 mL
- SEM and AVS (Lab SOP/EPA 6020A) — 30 mL
- PCBs homologues (LRMS-SIM; EPA 8270 mod)
  PAHs (LRMS-SIM; EPA 8270 mod)
  TOC (EPA 9060)
  Percent moisture (Lab SOP) — 250 mL
- Grain Size (ASTM D422) — 120 mL
- PCB congeners (EPA 1668A)
  Organochlorine pesticides w/Toxaphene
  (Lab SOP - HRGC/HRMS)
  PCDDs/PCDFs (EPA 1613B)
  Percent moisture (Lab SOP) — 250 mL

Sub-Total for Sediment Chemistry — ***1150 mL***

ii) Pore-Water Characteristics

- Ammonia, hydrogen sulfide, pH — 500 mL

iii) Sediment Toxicity

- 42-d *Hyalella azteca* (12 replicates) — 1200 mL
- 60-d *Chironomus dilutus* (16 replicates) — 1600 mL

Sub-Total for Toxicity Testing — ***2800 mL***

iv) Whole-Sediment Bioavailability

- SPME Evaluation (3 x 125 mL) — 375 mL

v) Sediment Archiving — 2000 mL

Total Required Volume for all Analyses — 6825 mL

Based on the sub-sample volumes needed to support the various chemical analyses and toxicity tests, it is apparent that a minimum of 4.8 L of sieved sediment will need to be collected at each site. In addition, 2.0 L of material will be collected at each site for sediment archiving. Archived sediment

will be used to conduct additional toxicity tests, if one of the tests fails due to low control survival or another reason. (This material will be stored in the CERC cooler at 0-6°C until toxicity testing is complete. At that time, a decision will be made regarding long-term storage or disposal of this material). Finally, 2 L of unsieved sediment will be collected at each site for possible future analysis. Therefore, a minimum of 6.8 L of material (i.e., sediment sieved to <2 mm fraction) will need to be collected at each sampling station, with a target volume of 10 L to provide a margin of safety. Three to five grab samples will be collected at each sampling location to ensure sufficient volume (i.e., 10 L after sieving) is available to support all the identified requirements.

Post-Sampling Summary:

The volume requirements described above incorporate the modifications that were made during and after the sampling program. These adjustments were made in consultation with the Quality Assurance Coordinator.

5.3 SAMPLING TIMING

The sediment sampling program to support the pilot study will be conducted in late September and early October, 2008. More specifically, the sampling team will assemble in Ft. Edwards, NY on September 28, 2008. Sampling will be initiated on September 30, 2008. Sample processing and preservation of the large-volume samples and the sediment-core samples will be conducted at the field laboratory, either on the same day the samples are collected, or the following day. It is anticipated that ten days will be required to complete the sampling program. Sediment sub-samples for PCB/TOC analysis will be shipped to the Alpha Analytical Laboratory on or about October 5, 2008 with demobilization occurring at the same time. The large-volume samples will be driven under chain of custody by truck to a cold storage facility in the Albany, NY area during demobilization. The processed benthic macroinvertebrate sub-samples (i.e., sieved and preserved in ethanol) will be maintained under chain of custody by Watershed Assessment Associates at their laboratory in Schenectady, NY.

The results of the PCB/TOC analysis of the large-volume samples will be reviewed upon receipt and used to identify 12 sediment samples for full characterization. These 12 sediment samples will be shipped under completed chain-of-custody to the CERC facility in coolers on blue ice by overnight courier. Further processing (i.e., homogenizing and sub-sampling) of the 12 sediment samples is scheduled to occur on or about November 10, 2008. Sub-samples for chemical analysis will be shipped by overnight courier on or about November 10, 2008. The timing for processing of the benthic macroinvertebrate samples will be determined following receipt of the toxicity test results from the CERC laboratory.

Post-Sampling Summary:

Sampling was initiated on September 29, 2008. Sub-samples were shipped to Alpha Analytical for PCB/TOC screening in two batches, one on October 2, 2008 and one at the completion of sampling on October 7, 2008. The PCB/TOC concentration data for the large volume samples was reviewed on November 3, 2008 and the samples that were to undergo full characterization were selected on November 4, 2008 (Table 3 identifies the samples that were selected for full characterization). The selected samples were shipped via overnight courier to the CERC facility on November 5, 2008. Further processing of the selected samples was conducted on November 12, 2008 and sub-samples were sent via courier to Alpha Analytical and AXYS Analytical Services Ltd. on November 12, 2008.

5.4 COMPOSITION, ROLES AND RESPONSIBILITIES OF SAMPLING TEAM

Samples to support the Hudson River Pilot Study will be systematically-collected within the study area. The sampling team will consist of:

- One crew that is responsible for sediment collection, sieving, and transportation to the field laboratory (consisting of two sediment samplers and a boat operator);
- One crew that is responsible for receiving and processing the samples for BICS analysis (consisting of one person);
- One crew that is responsible for sample homogenization, sub-sampling and sample shipping (consisting of two individuals); and,
- One crew that is responsible for sample processing and shipping at the CERC facility (consisting of one individual plus CERC staff).

The sediment sample collection crew will consist of three people. All members of the sample collection crew will be required to wear personal flotation devices at all times while on the water. The crew will be responsible for:

- Assuring that all necessary sampling equipment and associated supplies are loaded onto the sampling vessel each day;
- Documenting the locations of the stations that are sampled (using differentially-corrected GPS);
- Collecting relevant field data at each of the selected sampling locations;
- Collecting five replicate sediment cores (i.e., from the sediment grab sampler) for BICS analysis at each of the selected sampling locations;
- Collecting one 2L sample of unsieved sediment at each sampling location;
- Collecting and sieving three to five grab samples to facilitate preparation of one composite large-volume sediment sample (i.e., 10 L) at each of the selected sampling locations to support analyses of sediment chemistry and sediment toxicity;
- Labeling and transporting the large-volume sediment samples to the field laboratory;
- Decontaminating the sediment samplers and other equipment between deployments at a station and following the completion of sampling activities at each station; and,
- Returning waste sediment to the river before departing from the sampling site.

For the sediment sample collection crew, it is anticipated that two people will deploy and retrieve the sediment sampler. One of these people will then remove overlying water, inspect the sediment sample for acceptability, measure the depth of penetration, core the sediment sample for BICS assessment, retrieve the sediment from the sampler for sediment chemistry and toxicity assessment, and decontaminate the sampler prior to redeployment. Another person will operate the boat, measure water depth (i.e., using an electronic or manual depth sounding device), and assist as required. A third person will operate the GPS, take any photographs and field notes needed, sieve the sediment sample for chemical analysis and toxicity testing, and prepare and label each sample for transport to the field laboratory. As indicated above, the sampling stations will be located using differentially-corrected GPS and verified using appropriate maps of the study area on which the sampling stations have been plotted.

The crew responsible for processing sediment cores for BICS assessment will consist of one individual. This person will be stationed at the field laboratory and be responsible for the following:

- Receiving and logging in all of the sediment core samples that are collected during the sampling program;
- Processing each of the sediment core samples [i.e., sieving each of the replicate samples (5) from sampling locations; these samples will be sieved using a #30 (0.59 mm) sieve];
- Preparing, preserving, and labeling each replicate sample using the sample designation protocol described in Section 5.4;
- Preparing chain-of-custody (CoC) forms; and
- Shipping/transporting the benthic macroinvertebrate samples to the Watershed Assessment Associates facility.

The crew responsible for field sample processing, chain-of-custody, and sample shipping will be stationed at the field laboratory. This crew will be responsible for:

- Maintaining an inventory of sampling equipment and sample containers;
- Dealing with any expediting or logistical issues that arise during the sampling program (e.g., acquiring supplies);
- Receiving large-volume sediment samples from the sample collection crew;
- Preparing and sub-sampling the large-volume sediment samples for shipment;
- Preparing CoC forms;
- Shipping sediment sub-samples to the Alpha Analytical Lab for analysis of PCBs/TOC and,
- Shipping the large-volume sediment samples to a cold storage facility in the Albany, NY area.

Two people will share the responsibilities of expediting, sample receiving, sample processing and sub-sampling, preparing labels for samples, packing the samples for transport, preparing shipping manifests, arranging for sample pick-up, and verifying that samples have arrived at their destinations on time and in good condition.

Sediment samples for chemical and toxicological evaluation will be held at a cold storage facility following completion of the field program. Sediment samples will be stored in the refrigerated truck at 0-6°C prior to shipment to the cold storage facility. Sediment samples will be shipped in a manner that assures that this temperature is maintained until receipt at the laboratory. Any samples that are lost or damaged during transport must be identified by sampling station and reported to the field supervisor as soon as practical. Samples may be shipped on Monday, Tuesday, Wednesday, Thursday, or Sunday only (to avoid weekend delivery to laboratories). The sub-samples for PCB and TOC analysis will be shipped as a batch to the Alpha Analytical Lab.

The laboratory sample processing and shipping crew consists of a single individual who will be stationed at the CERC facility on November 10, 2008. This person will be responsible for:

- Preparing labels for the sub-samples that will be sent to the various laboratories;
- Assisting with the homogenizing and sub-sampling of the 12 sediment samples selected for chemical analysis;
- Preparing CoC forms;
- Shipping the sub-samples of the 12 selected sediment samples to the various laboratories; and,

- Following-up with the laboratories to ensure that all of the samples have been received on time and in good condition.

This individual will also assist CERC staff, who will assume primary responsibility for sample processing (i.e., homogenization and sub-sampling).

Post-Sampling Summary

A known location was used to calibrate the GPS equipment (i.e., coordinates for a nearby location were obtained from an independent source and compared to the coordinates obtained using the GPS; expressed in NAD 83 Zone 18N coordinate system). The known location used for this calibration was the corner of the public boat dock which was located nearby the field laboratory (the coordinates for this location were obtained from Google Earth).

There were six sample locations that were not documented using differentially- corrected GPS. This deviation from the original plan occurred because of a temporary technical failure of the Trimble GeoXT GPS. All six of these sample locations were located using a hand-held Garmin GPS (i.e., UHR-SVS-13, -23, -111, -15, -107, -127).

5.5 Sample Designation

The sample numbering system that will be used to designate sediment samples that are collected to support the assessment of sediment quality conditions is presented in Table 1. For the BICS samples, the replicate samples collected at each location will be designated by adding "-A, -B, -C, -D, or -E" to the sample identification number for the sampling location. Once the sample homogenates are prepared and distributed in 4-L high-density plastic containers, the duplicate material will be designated by adding "-1, -2, or -3" to the sample identification number for the sampling location.

Post-Sampling Summary:

The sample designations were employed during the sampling program are listed in Table 3 and Figures 7, 8, and 9.

5.6 Sampling Methods

Large-volume sediment samples will be collected at 42 locations in the upper Hudson River to support detailed characterization of PCB-contaminated sediments, including chemical analysis, toxicity testing, BICS assessment, and PCB bioavailability evaluation. The procedures that will be used to collect and process these sediment samples are described in the following sections of this document.

5.6.1 Information to be Collected at All Sampling Stations

At each sampling location, the following basic information will be collected and recorded in the field note book (see Table 5):

- Station number;
- Target total PCB range at the station;
- Sampling date and time;
- Station coordinates (including datum, instrumentation used, and any problems encountered);

- Sampling equipment used;
- Sample depth;
- Estimate of sample grain size distribution;
- Sample volume collected;
- Names of sampling personnel;
- Water depth;
- Description of the sampling area;
- Whether an alternate sampling station was accessed; and,
- Other information (unusual events, overlying water in sampler, sediment color, and sediment odor).

Post-Sampling Summary:

At the end of each work day, the field collection sheets were reviewed, signed, and dated. This procedure was implemented to ensure that missing information or deviations could be identified and resolved.

5.6.2 Collection of Large-Volume Sediment Samples

This study will involve collection and characterization of surficial sediments at a total of 42 locations in the Hudson River. A step-wise approach was used to identify the sampling locations that will be targeted during the 2008 sediment sampling program. As a first step, the available information on the concentrations of COPCs in surficial sediments from the study area was acquired from the NOAA Watershed Database for the Hudson River. Next, the available data on the concentrations of PCBs in surficial sediments and associated TOC measurements were mapped using the ESRI ArcMap application. This information was used to select a total of 42 primary sediment sampling sites. For each of the six target ranges of PCB concentrations, a total of seven primary sampling locations were selected for sampling.

Table 1 provides the target coordinates (expressed in the NAD 83 Zone 18N coordinate system) for the 42 primary sampling sites and indicates which PCB concentration category that each location is expected to fall within. Upon arrival at the designated coordinates, the candidate sampling location will be inspected to determine if it is vegetated. Locations that are considered to have sufficient quantities of aquatic vegetation to impede sediment sampling will be abandoned in favor of a more suitable location. In some cases, it may be possible to identify a more suitable sampling location in the general vicinity of the target coordinates. In other cases, it may be necessary to select an alternate sampling location. The alternate candidate sampling locations for each PCB concentration category are identified in Table 2. The sampling vessel will generally be anchored at the bow to minimize vessel movement. Such anchoring will ensure that sediment samples are collected within 10 m of the target sampling coordinates (i.e., each sampling station is defined as the area lying within a 10 m radius of the designated sampling coordinates). In some cases, spuds may be used to minimize vessel movement.

At each sampling location, three to five grab sediment samples will be collected to support chemical characterization, toxicological evaluation, and BICS analysis. The grab sediment samples will be collected by deploying and retrieving a Van Veen grab sampler. The sub-sample for BICS evaluation will be obtained by inserting a core tube into the material in the sampler, removing the material around the core tube (i.e., to be sieved and retained for chemistry and toxicological evaluation), and then extracting the core tube from the material remaining in the sampler. The steps that will be followed to collect the sediment samples at each sampling location include:

- Deploy and retrieve the sediment sampler;
- Inspect the sediment sample to determine if the sample should be retained or discarded (see ASTM (2003) for guidance on evaluation of the suitability of sediment samples for retention);
- Discard unacceptable sediment samples (see ASTM (2003) for guidance on procedures for discarding samples);
- For sediment samples that are deemed to be acceptable, drain out any overlying water in the sampler using a siphon hose;
- Insert one or more labeled 10 cm diameter core tubes (20 cm length) completely into the sediment at one corner of the sampler (i.e., this is the replicate sample for BICS evaluation);
- Plug the top of each core tube with a plastic stopper;
- Measure and record the depth of penetration of the sampler into the sediment matrix;
- Remove about 500-700 mL of unsieved sediment from the sampler using a precleaned, plastic scoop;
- Place the Wildco sieve bucket (2 mm screen) into a clean (acetone washed; distilled water or river water rinsed), labeled, five-gallon bucket in preparation for sieving the resultant sediment sample. Add up to 6 L about 1 L of river water from the site to the bucket at this time;
- Remove about 3-5 L of material from the sampler using a pre-cleaned, plastic scoop. Care will be taken to ensure that the upper sediment horizon is targeted during this process (i.e., up to 15 cm depth). This material will be removed in small aliquots (about 250 mL) and transferred directly into the Wildco sieve bucket;
- Gently rotate the sieve bucket and lift it up and down to sieve the finer-grained material into the surrounding five-gallon sample collection bucket. More water may be added to the sieve bucket from time to time to facilitate sieving of the sediment sample;
- Cover the sieve bucket with a lid after the material from the grab sample has been sieved;
- Scoop any unneeded sediment out of the sampler and into a waste bucket;
- Plug the bottom of each core tube with a plastic stopper;
- Remove the sediment core(s) from the sampler and place it in a cooler on ice;
- Wash off any sediment remaining in or on the sampler prior to redeploying the sampler;
- Repeat procedure until all five replicate BICS samples, 2 L of unsieved sediment, and 10 L of sieved sediment have been collected at the sampling site; and,
- Discard the material in the waste bucket before leaving the sampling site.

After the final grab sample has been sieved, the composite sediment sample (i.e., composite from all grab samples) contained within the 5-gallon bucket will be sealed and transported to the field laboratory for further processing. A GPS reading will then be taken from roughly the center of the area from which the material was collected. Several photographs of the labeled sample will be taken at this time. The information on the sample containers will then be checked against the information that was recorded on the field data collection forms to ensure that no inconsistencies have arisen during data recording.

Post-Sampling Summary:

Figure 10 shows how the sub-samples for BICS assessment were obtained (core tubes for sampling material for BICS evaluation have been inserted into the material and capped, and a member of the sampling crew is scooping out the material surrounding the core tube and transferring it into the sample container used for unsieved sediment samples).

5.7 SAMPLE HANDLING AND PREPARATION

Within three hours of collection, the sediment samples will be delivered to the field laboratory and chain of custody (CoC) signed over from the sampling crew to the field laboratory supervisor (separate CoC forms will be maintained for the BICS samples and the chemistry/toxicity samples).

Each sample collected for chemical/toxicological characterization (i.e., in the 20-L buckets) will then be allowed to stand for at least two hours to allow fine material to settle. Samples will be processed on the same day the sample was collected or the following day. Excess overlying water will be poured off and returned to the river. If the sample material is contained in two 20-L buckets, the material will be combined into one of the buckets prior to homogenizing and sub-sampling. If the volume of the combined material is greater than 18 liters, then the sample will be transferred to a large tub prior to homogenizing and sub-sampling. The sample will be homogenized using a stainless steel auger and electric drill until the sample appears well mixed (i.e., consistent color and consistency; all samples will be mixed for at least 60 seconds). Mid-way through the homogenization process, a silicone spatula will be used to scrape material off the sides and from corners of the bucket. Sub-samples for PCB and TOC analysis will be scooped out of the bucket into a labeled 250 mL glass jar. The remainder of the samples will be transferred to three labeled 4-L high-density polyethylene (HDPE) bottles. Unused portions of sediment samples will be collected and disposed of at a location to be decided by the field supervisor.

All sub-samples will be sorted into labeled plastic bins and stored in a refrigerated truck at 0-6°C until field demobilization. Chain of custody forms and sample inventory forms will be maintained by field laboratory personnel and an independent check will be conducted on all labels and forms to assure accuracy and consistency in the sample documentation. The form that will document chain-of-custody for the sub-samples that to be shipped to Alpha Analytical for PCB and TOC characterization is presented in Table 6. The form that will document chain-of-custody for the sieved-sediment and whole-sediment samples is presented in Table 7.

The sediment samples collected to support chemical and toxicological evaluation will be transported to a cold storage facility following completion of the field program. When the result of the preliminary analysis are obtained (PCB/TOC screening). The samples that are selected for chemical analysis and toxicity testing will be shipped to the CERC facility in coolers on blue ice by overnight courier.

The samples collected for BICS analysis (i.e., in the core tubes) will also be processed at the field laboratory. Processing will involve sieving the sediment through a #30 sieve (corresponding to a 0.59 mm opening) and preserving using an ethanol solution. These samples will not be homogenized, however. Upon receipt at the laboratory, the samples will be checked to confirm that the ethanol added in the field sufficient to preserve the sample (if not, more ethanol will be added). The form that will document chain-of-custody for these samples is presented in Table 8. These samples will be further processed at the Watershed Assessment Associates laboratory once the sites for BICS evaluation have been identified (i.e., based on the results of the toxicity testing).

On November 10, 2008, the 12 selected large-volume sediment samples will be retrieved from the walk-in cooler at the CERC facility, transferred to 20 L plastic buckets, and homogenized. Sub-samples for chemical characterization and toxicity testing will then be obtained. The sub-samples for chemical analysis will be shipped by overnight courier to the Alpha Analytical and AXYS Analytical laboratories. The sub-samples for

toxicity testing will be used to set-up the toxicity tests and PCB-bioavailability evaluation at the CERC facility. The forms that will be used to document chain-of-custody for the various laboratories are presented in Tables 6 through 10.

5.8 Decontamination Procedures

Three to five surficial grab samples will be collected at each sampling station to support evaluations of sediment chemistry and sediment toxicity. To minimize the potential for cross-contamination among grab samples, the sampler will be decontaminated after each replicate sample is collected. More specifically, a silicone spatula will be used to scrape the remaining sediment from the sampler. Next, the sampler and sieve bucket will be scrubbed with a long bristle scrub brush and rinsed with site water to remove any remaining sediment.

Following collection of the final grab sample at each sampling station, the sampler will undergo a more thorough decontamination process. As was the case during within-station decontamination, a silicone spatula will first be used to scrape the remaining sediment from the sampler. The sampler will then be scrubbed with a long bristle scrub brush and sprayed with site water to remove any remaining sediment. Then, the dredge will be squirted with alconox solution, scrubbed, and rinsed with site water. Finally, the dredge will be rinsed with acetone to complete the decontamination process. The waste sediment will be returned to the water after all sampling has been completed at the sampling station (i.e., the excess sediment should be returned to the water before leaving the sampling station). All of the acetone that is used in the decontamination process will be collected in a waste bucket and disposed of in an appropriate manner.

During sample homogenization and sub-sampling, field personnel will process multiple samples each day. To minimize the potential for cross-contamination among samples, the auger and silicone spatula will be decontaminated after each sample is processed. The auger and spatula will be scrubbed with a long bristle scrub brush and rinsed with river water to remove any remaining sediment. Then, they will be squirted with alconox solution, scrubbed, and rinsed with clean water. Finally, the auger and spatula will be rinsed with acetone and deionized water to complete the decontamination process. All of the acetone that is used in the decontamination process will be collected in a waste bucket and disposed of in an appropriate manner.

5.9 Procedures for Avoiding Sample Contamination

Generation of high quality, reliable data on sediment quality conditions is a primary objective of the sampling program. As such, all reasonable efforts will be made to minimize the potential for sample contamination during the sample collection, handling, and processing process. Some of the steps that will be taken to avoid sample contamination include:

- Completing washing all of the surfaces of the sampling vessel with alconox following refueling;
- Approaching the sampling station from the downwind direction, to the extent possible;
- Stabilizing the boat with anchor(s) and shutting off the motor upon arrival at the sampling station;
- Waiting for a few minutes for the air to clear before initiating sampling activities;
- Ensuring that sediment samples do not come in contact with any item that has not undergone the approved decontamination process;
- Ensuring that any utensils that are used in the sediment sampling process do not come in contact with any item that has not undergone the approved decontamination process (the sampler and other sampling utensils should be placed in the stainless steel pan during transit between sampling stations);

- Covering the sample collection container after each replicate sample has been taken from the grab sampler;
- Fully decontaminating all sampling equipment after sampling has been completed at a sampling station; and,
- Prohibiting any activity on the sampling vessel that could result in sample contamination (e.g., refueling with sediment samples or sample equipment on board, smoking, consumption of food or drinks during the sampling process).

5.10 Procedures for Avoiding Exposure to Contaminated Sediments

It is anticipated that contaminated sediment will be routinely encountered during sampling throughout much of the study area. As such, sampling crews will take precautions to minimize exposure to potentially toxic and/or bioaccumulative substances. Some of the steps that will be taken include:

- Handling sampling equipment and sediment samples carefully;
- Avoiding direct dermal contact with sediments; and,
- Wearing protective equipment, such as gloves, safety glasses, long-sleeved shirts, long pants, rubber boots, and/or rain gear.

The need for respirators or Tyvek suits is not anticipated to assure the health and safety of the sampling team members. Nevertheless, sampling team members are required to report unsafe or hazardous conditions to the Health and Safety Officer immediately.

5.11 Chemicals of Potential Concern

The results of the previous investigations provide a basis for identifying the toxic and bioaccumulative chemicals of potential concern (COPCs) at the site. This list of COPCs has been used, in conjunction with information from other sources, to develop the list of analytes that will be quantified in sediment samples from the upper Hudson River. The list of priority analytes for whole sediments, as well as the performance criteria for measurement data, are presented in Table 11.

5.12 Sampling Equipment

A list of sampling equipment that is required to support the 2008 sediment sampling program is provided in Table 12.

6.0 SAMPLE ANALYSIS PLAN (SAP)

This section of the Work Plan for the 2008 pilot study of PCB-contaminated sediments in the upper Hudson River describes the approach that will be taken to characterize the sediment samples collected during the sampling program. It includes an overview of the sample analysis plan (SAP), presents the data quality objectives that have been established for each element of the study, and describes the procedures that will be used to generate the required data.

6.1 Overview of Sample Analysis Plan

Following collection and processing of large-volume sediment samples from the 42 sampling locations that were selected in the upper Hudson River, sub-samples will be sent to the Alpha Analytical Lab for analysis of PCB homologues and TOC. Based on these preliminary results, 12 samples will be selected for detailed characterization. More specifically, each of the 12 selected sediment samples will be evaluated to characterize:

- Sediment chemistry;
- Sediment toxicity;
- BICS (contingent on results of the toxicity tests; BICS will be evaluated for these samples if adverse effects on benthic macroinvertebrates are observed in the toxicity tests); and/or,
- Bioavailability of PCBs in upper Hudson River sediments.

All of the data generated during the study will be evaluated and, if found to be acceptable, compiled in the project database. Subsequently, these data will be interpreted to evaluate the effects of PCB-contaminated sediments on benthic invertebrates in the upper Hudson River. The results of the study will be summarized in a technical report to the Natural Resource Trustees (NRTs).

Chemical analyses of sediment samples will be performed by the Alpha Analytical Lab and AXYS Analytical Services Ltd. All twelve sediment samples will be submitted for analysis of the following analytes: PCBs (homologues and congeners), PAHs (34 parent and alkylated PAHs), total metals, simultaneously extracted metals (SEM), acid volatile sulfides (AVS), organochlorine pesticides, PCDDs/PCDFs, TOC, and grain size. In addition, pore-water ammonia, pH, and hydrogen sulfide levels will be determined, to support the interpretation of toxicity test results (i.e., in pore water obtained by centrifugation). Alpha Analytical will be responsible for measuring PCB homologues, PCB congeners (LRMS), total metals in sediment, SEM, AVS, PAHs, grain size, and TOC. AXYS Analytical will be responsible for measuring PCB coplanar congeners (HRMS), PCDDs/PCDFs, and organochlorine pesticides. Both of these laboratories are ELAP certified.

All of the toxicity testing will be conducted at the USGS Columbia Environmental Research Laboratory in Columbia, Missouri (the SOP that will be used to conduct these toxicity tests is on file with the NRTs; see Appendix 1.1). Two toxicity tests will be conducted on each sample. First, a 42-d whole-sediment toxicity test with the amphipod, *Hyalella azteca* will be conducted [Endpoints: survival, growth, and reproduction (# young/surviving female)]. Second, a 50-d whole-sediment toxicity test with the midge, *Chironomus dilutus*, will be conducted (Endpoints: larval survival, larval growth, emergence, sex ratio, fecundity, and egg viability). These toxicity tests were selected because, while PCBs have been shown to be acutely toxic to sediment-dwelling organisms, adverse effects on growth and reproduction have been demonstrated at lower levels of exposure for other receptor groups (e.g., fish, birds). At least one study has shown adverse effects of PCBs on invertebrate reproduction at levels lower than those that caused acute mortality (i.e., DiPinto *et al.* 1993).

Evaluations of BICS in the sediment cores obtained from grab samples collected from the upper Hudson River will be conducted by Watershed Assessment Associates. More specifically, five replicate sediment core samples will be collected from grab samples from each sampling location. These sediment cores will be processed and preserved in the field and shipped to the laboratory for identification, enumeration, and evaluation of midge deformities (subject to the results of the sediment toxicity tests).

The bioavailability of PCBs in sediment samples from the upper Hudson River may be evaluated, pending the results of toxicity testing. More specifically, PCB bioavailability may be evaluated by evaluating pore-

water chemistry, by applying matrix solid-phase microextraction (SPME) techniques, or by implementing an alternate strategy by (e.g., equilibrium partitioning modeling).

All of the data generated in this study will be evaluated to determine if the performance criteria for measurement data have been met (Table 11). Acceptable data will be compiled in the project database in MS Access format. It is anticipated that any additional sediment quality data that are generated by the Trustees will be compatible with those developed in this study. In this way, all of the data can be merged into a single database and used to evaluate relationships between sediment chemistry and sediment toxicity. The BICS data will also be added to this database.

Following database development, the resultant information will be analyzed and interpreted. The data analyses will be conducted in several steps. First, the sediment chemistry data will be evaluated relative to existing toxicity thresholds for individual substances and COPC mixtures. Next, toxicity test results will be evaluated relative to negative control results, positive control results. BICS data will be summarized to estimate several key metrics (e.g., total abundance, species richness, abundance of various taxa, midge deformities, etc.). Next, the three data types will be integrated to determine if exposure to PCB-contaminated sediments from the Hudson River adversely affects sediment-dwelling organisms. These results should provide preliminary information on the relationships between levels of contamination and the nature and magnitude of effects on benthic invertebrates.

6.2 Sediment Chemistry Analysis

As indicated previously, industrial activities in the upper Hudson River watershed have resulted in releases of various toxic and/or bioaccumulative substances into the river. While certain substances tend to remain in solution and are transported to downstream areas, other substances tend to become associated with fine particulate matter and become associated with bottom sediments. Data collected by USEPA and others (i.e., as compiled in the NOAA Watersheds Database) indicate that sediments within the Phase I dredging area are contaminated by PCBs. These data also show that upper Hudson River sediments can also be contaminated by metals, PAHs, and other substances.

This study is intended to evaluate the effects on benthic invertebrates associated with long-term exposure to PCB-contaminated sediments from the upper Hudson River. More specifically, this study is designed to determine if the concentrations of PCBs and/or other contaminants in Hudson River sediments are sufficient to adversely affect the survival, growth, or reproduction of sediment-dwelling organisms. Successful completion of this study necessitates the collection of matching sediment chemistry and sediment toxicity data from the study area. Increasing frequency and/or magnitude of response by amphipods or midge with increasing concentrations of PCBs and/or other COPCs (particularly at concentrations in excess of the published toxicity thresholds) will be considered to provide the necessary and sufficient evidence to demonstrate that PCB-contaminated sediments in the upper Hudson River are sufficiently contaminated to injure sediment-dwelling organisms. Additional investigations may be planned and conducted in the future to establish toxicity thresholds for PCBs in upper Hudson River sediments.

To support these study objectives, the concentrations of COPCs will be determined in the sediment samples that were selected for more comprehensive characterization. Chemical analyses of sediment samples will be conducted by the Alpha Analytical Lab and AXYS Analytical Lab. Chemical characterization of sediment samples from the study area will include PCBs (homologues and congeners), PAHs (34 parent and alkylated PAHs), PCDDs/PCDFs, total metals, SEM, AVS, organochlorine pesticides, TOC, and grain size. In addition, pore-water ammonia, pH, and hydrogen sulfide levels will be determined, to support the interpretation of toxicity test results by USGS (i.e., in pore water obtained by centrifugation). Alpha Analytical will be responsible for measuring PCBs homologues, PCB congeners, total metals, SEM, AVS,

PAHs, grain size, and TOC. AXYS Analytical will be responsible for measuring PCB congeners, PCDDs/PCDFs, and organochlorine pesticides. The SOPs that will be used to evaluate the chemical and physical characteristics of upper Hudson River sediments are on file with the NRTs (see Appendix 1.1).

6.3 Solid-Phase Microextraction

The results of chemical analyses of sediments will provide essential information for assessing exposure of benthic invertebrates to COPCs in upper Hudson River sediments. However, a number of factors can influence the bioavailability of toxic and/or bioaccumulative COPCs to sediment-dwelling organisms. For this reason, there is a need to estimate the bioavailable fraction of key COPCs (i.e., PCBs) in sediments.

Several approaches have been used to estimate the bioavailability of sediment-associated COPCs. For example, EqP theory suggests that the bioavailable fraction of a COPC can be estimated by measuring or predicting the dissolved concentration in pore water. Alternatively, sediment bioaccumulation tests can be conducted to evaluate the bioavailability of sediment-associated COPCs more directly. Such information can provide direct evidence for determining if the concentrations of COPCs in pore water or in tissues are sufficient to adversely affect benthic invertebrates.

In this study, matrix solid-phase microextraction (SPME) techniques may be used to evaluate the bioavailability of PCBs in sediments from the upper Hudson River. More specifically, this technique may be used to estimate the concentration of PCBs in pore water for the 12 selected sediment samples from the upper Hudson River. In addition, the data generated using the matrix SPME methods may be used to estimate concentrations of PCBs in the tissues of benthic invertebrates exposed to sediments from the study area. This approach is being considered for use because it is not practical to collect sufficient quantities of pore water to accurately measure the concentrations of PCBs in pore water. In addition, previous studies have shown that there is good correspondence between the concentrations of PCBs in the microfibers used in the matrix SPME procedure and in the tissues of benthic invertebrates (e.g., oligochaetes, such as *Lumbriculus variegatus*; You *et al.* 2007; Trimble *et al.* 2008). Accordingly, the matrix SPME technique represents an economical alternative to sediment bioaccumulation testing. A Work Plan for this study will be included as an addendum to this plan if this approach is selected for evaluating PCB bioavailability.

6.4 Sediment Toxicity Testing

Data from controlled laboratory studies provide essential information for evaluating adverse effects associated with exposure of benthic invertebrates to contaminated sediments. More specifically, the results of solid-phase toxicity tests will provide the information needed to determine if long-term exposure to sediments from the upper Hudson River adversely affects the survival, growth, or reproduction of benthic invertebrates.

Two whole-sediment toxicity tests will be used to evaluate the toxicity of the Hudson River sediment samples collected during the 2008 field sampling program. More specifically, 42-d whole-sediment toxicity tests with the amphipod, *Hyalella azteca*, will be conducted on these samples (Endpoints: 28-d survival, 28-d growth, and 42-d survival, growth, reproduction). In addition, 50-d whole-sediment toxicity tests with the midge, *Chironomus dilutus*, will be conducted on these samples (Endpoints 13-d survival, 13-d growth, emergence, and 50-d egg production/egg hatching success). Water-only NaCl reference toxicant tests with the test organisms (48-hour exposures with amphipods and 96-hour exposures with the midge) will be conducted in ASTM moderately hard water following procedures outlined in USEPA (2000) and ASTM (2007a; 2007b; 2007c). The SOP that will be used to conduct these toxicity tests is on file with the NRTs (see Appendix 1.1).

Sediment samples will be designated as toxic or not toxic on an endpoint-by-endpoint basis, based on statistical comparison to negative control results (ANOVA). In addition, the data on the survival and growth of amphipods and midge will be integrated to estimate biomass for each test organism. Adverse effects on sediment-dwelling organisms will also be identified on a sample-by-sample basis by considering the results for multiple toxicity test endpoints combined (i.e., survival or growth or reproduction).

6.5 BENTHIC MACROINVERTEBRATE COMMUNITY STRUCTURE ASSESSMENT

Matching data on the concentrations of COPCs in upper Hudson River sediments and on the structure of the benthic macroinvertebrate community can provide useful information for evaluating the effects of PCB-contaminated sediments on benthic macroinvertebrates. In this study, key indicators of BICS will be used to provide ancillary information on the effects of PCB-contaminated sediments on benthic macroinvertebrates in the upper Hudson River. Some of the key indicators that will be used in the assessment include species richness, presence/absence of key taxa (e.g., EPT taxa), abundance of indicator species, total macroinvertebrate abundance, and midge deformities.

Sediment cores for evaluation of BICS will be collected from sediment grab samples obtained at all 42 sampling locations in the upper Hudson River (five replicate samples at each location). These samples will be archived for possible future analysis, pending the results of the toxicological evaluation of the 12 selected Hudson River sediment samples. For each replicate sample, the abundance of each taxon will be determined by direct enumeration. Whenever possible, benthic macroinvertebrates will be identified to species. Ten percent of the samples will be evaluated by an independent taxonomist to assure the quality of the taxonomic identifications and enumerations. The resultant data will be summarized on a replicate-by-replicate basis by calculating abundance of each taxon, species richness, species diversity, abundance of EPT taxa, abundance of pollution sensitive species, and abundance of pollution tolerant species. In addition, chironomid deformities will be evaluated. Means and standard deviations for each treatment will be calculated to facilitate statistical comparison among the sampling locations. The SOP that will be used to process sediment samples and enumerate benthic macroinvertebrates is on file with the NRTs (see Appendix 1.1).

7.0 QUALITY ASSURANCE / QUALITY CONTROL PLAN

The purpose of this section is to document the steps that will be taken to assure the quality of the data that are generated during the 2008 pilot study of the upper Hudson River. These steps include:

- Documentation of data quality objectives (DQOs);
- Establishment of performance criteria for measurement data; and,
- Identification of the quality assurance/quality control measures that will be followed in the field to assure data quality.

Each of these steps in the project data quality assurance/quality control plan are discussed in the following sections of this document.

7.1 DATA QUALITY OBJECTIVES

The DQO process is a series of planning steps based on the scientific method that is designed to ensure that the type, quality, and quantity of environmental data used in decision making are appropriate for the

intended application. DQOs are qualitative and quantitative statements developed using the DQO process that:

- Clarify the study objectives and intended use of the data;
- Define the type of data needed to support the decision;
- Identify the conditions under which the data should be collected; and,
- Specify tolerable limits on the probability of making a decision error due to uncertainty in the data (USEPA 2000a; 2006).

The DQO process (USEPA 2000a; 2006) represents an essential element of the overall site investigation process and consists of the following seven steps:

- State the problem;
- Identify the goals of the study;
- Identify information inputs;
- Define the boundaries of the study;
- Develop the analytical approach;
- Specify performance or acceptance criteria; and,
- Develop the plan for obtaining data.

Consistent with the guidance provided in USEPA (2000a; 2006), the DQO process has been used to guide the collection of the data and information needed to evaluate risks to aquatic receptors in the upper Hudson River. Importantly, the DQOs established herein were used to guide the design of the 2008 pilot study of the effects of PCB-contaminated sediments on benthic invertebrates in the upper Hudson River. This field sediment sampling program is targeted on the collection of the data and information needed to evaluate relationships between sediment chemistry and sediment toxicity, to evaluate the bioavailability of sediment-associated PCBs, and to support the development of site-specific toxicity thresholds of COPCs for the benthic invertebrate community. In addition, the data and information collected during the 2008 field sampling program may be used to evaluate the reliability of generic sediment quality benchmarks and the site -specific toxicity thresholds. The individual steps of the DQO process are described in the following sub-sections.

7.1.1 Step 1—State the Problem

The purpose of this step of the DQO process is to delineate and describe the problem and the resources available for investigating it. This includes identifying the planning team members and the decision makers. . Stating the problem also involves providing a description of the problem, which is provided below, and a conceptual model of the environmental hazards to be investigated.

Problem Statement:

- The upper Hudson River has been contaminated by industrial activities, with contamination by PCBs originating primarily from the GE facilities;
- Data collected by USEPA and information from other sources indicates that water, sediments, and biota within the upper Hudson River have been contaminated by PCBs and other COPCs;
- Comparison of the measured concentrations of PCBs in water and/or sediment to ambient water quality criteria and/or generic sediment quality benchmarks suggests that exposure to surface water or sediments within the upper Hudson River is likely to adversely affect aquatic organisms;

- As the effects of PCBs and other COPCs can be influenced by the physical and chemical properties of the sediments [e.g., total organic carbon (TOC) concentration, acid volatile sulfide (AVS) concentration, grain size], the bioavailability of these substances in upper Hudson River sediments is uncertain;
- For this reason, it is necessary to evaluate the toxicity and chemistry of upper Hudson River sediments to support development of relationships between the concentrations of COPCs in sediment and the responses of sediment-dwelling organisms in controlled laboratory toxicity tests; and,
- Information on the toxicity and bioavailability of sediment-associated COPCs is also needed to support the establishment of site-specific toxicity thresholds (i.e., thresholds for sediment injury) that can be used as a basis for assessing injury to aquatic organisms and for establishing restoration goals for the site.

Figures 11 and 12 provide an overview of the conceptual site model (CSM) for the upper Hudson River. The CSM shows that aquatic organisms and aquatic-dependent wildlife utilizing habitats in the upper Hudson River can be exposed to COPCs via several exposure pathways, including direct contact with contaminated water, sediment, and/or soil, ingestion of contaminated water, sediments, and/or prey organisms, incidental ingestion of sediments and/or soil, and/or inhalation of contaminated air. For aquatic organisms (such as microbiota, aquatic plants, aquatic invertebrates, fish, and amphibians), direct contact with contaminated environmental media, ingestion of sediment, and consumption of contaminated prey represent the most important exposure routes.

The 2008 sampling program is focused on the collection of data and information needed to determine if exposure to PCB-contaminated sediments is adversely affecting sediment-dwelling organisms in the upper Hudson River. Accordingly, exposure of ecological receptors to contaminated sediments represents the primary exposure pathway that will be addressed in this study.

The last component of this step of the DQO process is to identify the available resources, constraints, and deadlines that apply to the project. The financial resources available to carry out this project include:

- Direct funding from NOAA - $250,000;
- USGS in-kind funding - $50,000; and,
- USACE in-kind funding - $20,000.

The key constraints that have been identified for this project include: 1) incomplete information on the site-specific bioavailability of sediment-associated PCBs; 2) lack of information on the toxicity of upper Hudson River sediments; and, 3) lack of site-specific information on toxicity thresholds for sediment-associated COPCs. Specific deadlines for the completion of this study have not been established, but every effort will be made to complete the final report by September 30, 2009.

7.1.2 Step 2—Identify the Goal of the Study

The purpose of this step of the DQO process is to identify the principal study question and define alternatives for addressing this question. The principal study questions for the project are:

- Are sediments in the upper Hudson River contaminated by PCBs and/or COPCs to levels that would adversely affect the survival, growth, or reproduction of benthic invertebrates?
- Are sediment in the upper Hudson River acutely or chronically toxic to selected benthic invertebrates (i.e., amphipods and/or midge)?;
- To what extent are sediment-associated PCBs in upper Hudson River sediments available to benthic invertebrates?

- Are the concentrations of COPCs in whole-sediment samples correlated with the responses of selected benthic invertebrates (i.e., amphipods and/or midge)?
- What are the concentrations of COPCs in sediments and/or pore water that are associated with adverse effects on the survival, growth, or reproduction of benthic invertebrates (i.e., toxicity thresholds)?

At this stage of the DQO process, alternative actions that could be implemented to solve the problem are typically identified. The alternative actions that could be implemented relate to the assessment of injuries to trust resources associated with exposure to PCBs and/or other COPCs. These alternative actions could include:

- Conduct further investigations to further delineate the nature, magnitude, and spatial extent of effects on benthic invertebrates associated with exposure to PCB-contaminated sediments in the Hudson River;
- Utilize the results of this study to establish toxicity thresholds for PCBs in Hudson River sediments; and/or,
- Evaluate alternative approaches to the assessment of injury to trust resources in the Hudson River.

The resultant decision statement is as follows:

- Determine whether hazards to benthic invertebrates associated with exposure to sediments are sufficiently high to warrant taking one or more of the alternative actions listed above.

7.1.3 Step 3—Identify Information Inputs

The purpose of this step of the DQO process is to identify the information required to investigate the problem. In order to resolve the decision statement, a sediment quality sampling program will be implemented in 2008 to provide high quality, matching sediment chemistry, sediment toxicity, BICS, and PCB bioavailability data for resolving the decision statement.

In this study, generic sediment quality benchmarks (i.e., which are typically referred to as Action Levels in the DQOs process) will be evaluated and used as preliminary tools for assessing sediment chemistry data. The sediment quality benchmarks that will be considered have been published in agency reports and/or the published scientific literature, including sediment effect concentrations (SECs), mean PEC-Quotients (mean PEC-Qs), and equilibrium-partitioning based sediment benchmarks. Federal ambient water quality criteria (WQC), State water quality standards, or functionally-equivalent values will be used as Action Levels for evaluating pore-water quality. The results of this study will be used to determine if sediments with COPC concentrations above such benchmarks are toxic to benthic invertebrates. The resultant data may be used to identify site-specific toxicity thresholds for PCBs and/or other COPCs in the Hudson River.

The last component of this step of the DQO process involves identifying sampling and analysis methods that can meet the data requirements. Sampling methods that will meet the data requirements identified for this project are detailed in Section 5.0 of this document. In addition, Table 13 specifies the required analytical methods, sample volume requirements, container material and size, preservation methods, and holding times for the large-volume sediment samples collected during the 2008 upper Hudson River field sampling program. Furthermore, Section 6.0 of this document specifies the required detection limit, accuracy, precision, and completeness for each analyte (Table 11). The standard operating procedures, on file with the NRTs (see Appendix 1.1), describe the analytical procedures that will be used to generate measurement data that meet these performance criteria for measurement data.

Sections 5.0 and 6.0 of this document describe a number of approaches that will be pursued to minimize bias in the resultant data. First, standard methods for preserving, transporting, and holding sediment samples will be used to assure their stability between sampling and analysis (Table 13; ASTM 2008d; ASTM 2003).

Next, the analytical laboratories will employ suitable procedures for cleaning-up the sediment samples to minimize the potential for matrix interference and associated effects on data quality. Third, care has been taken to identify the COPCs that occur or potentially occur within the upper Hudson River, the forms of the chemicals (e.g., total metals vs. simultaneously extracted metals) that may be present, and the ancillary variables (e.g., total organic carbon, acid volatile sulfides, grain size) that ought to be measured to facilitate data interpretation.

7.1.4 Step 4—Define the Boundaries of the Study

The purpose of this step of the DQO process is to define the target population to be sampled to identify the spatial and temporal boundaries of the study, to examine constraints to collecting data, and to define the scale of decision making. For the 2008 field sampling program, the target population consists of all possible sediment samples that could be collected within the portion of the upper Hudson River identified for the Phase I dredging program. The spatial boundaries of the study are limited to the portions of the upper Hudson River that will be remediated during the Phase I dredging program, and the nearby low contamination areas.

For the 2008 field sampling program, the practical constraints could compromise the collection of matching sediment-chemistry and sediment-toxicity data include:

- Individual sediment grab samples may not provide sufficient volumes of sediment to support chemical and toxicological analysis. For this reason, multiple sediment grabs will be collected from each sampling location and composited to obtain sufficient volumes of material;
- Relatively low levels of fine material at certain sites may restrict the collection of sediments using standard sampling equipment. For this reason, sampling personnel will be trained to operate a number of sampling devices that, collectively, provide a means of collecting representative sediment samples from a wide range of substrate types. At some locations, it may not be possible to collect sediment samples (i.e., due to presence of gravelly or bouldery substrates). In such cases, sampling locations may be adjusted to facilitate sample collection at a nearby location. Alternatively, an alternate sampling location may be selected; and,
- Concentrations of COPCs in sediments can be influenced by the particle size distribution of the material. For this reason, all sediment samples will be sieved in the field (to 2 mm) to assure comparability of the resultant data.

7.1.5 Step 5—Develop the Analytical Approach

The purpose of this step of the DQO process is to define the population parameter, determine what action is needed, and confirm that the Action Level exceeds minimum detection limits. Determining the population parameter (e.g., mean, median, percentile) that identifies the environmental characteristics that will be compared to the selected Action Level is a key component of the process for assessing effects on benthic invertebrates in the upper Hudson River. For each chemical analyte, the measured concentration will be compared to the corresponding Action Level for that substance. Substances that exceed the Action Level will be considered to occur at concentrations sufficient to cause or substantially contribute to sediment toxicity.

As part of the decision rule development process, it is necessary to confirm that the Action Level exceeds the measurement detection limits for each of the COPCs. Table 11 provides a listing of the preliminary Action Levels (MacDonald *et al.* 2008) for each COPC in sediment. The corresponding target analytical detection limits for each COPC are also presented in this table. To ensure that detection limits greater than the Action Levels do not bias the results of the evaluation of sediment-quality conditions, any non-detected results that are greater than the selected Action Levels will be excluded from subsequent data analyses.

7.1.6 Step 6—Specify Performance or Acceptance Criteria

The purpose of this step of the DQO process is to specify tolerable limits on decision errors for the problem. A decision error occurs when the sample data set misleads you into making the wrong decision and, therefore, taking the wrong response action (USEPA 2000a; 2006). This step involves setting the baseline condition, specifying the gray region (the range of possible true parameter values where the consequences of a false acceptance decision error are considered tolerable), and setting tolerable decision error limits (points above and below the Action Level that reflect the tolerable probability for the occurrence of decision errors).

The first step of this part of the DQO process is to set the baseline condition, which involves considering the population parameter that identifies the environment characteristics that will be compared to the selected Action Level. In this study, probable effect concentration (PEC) and equilibrium-based sediment benchmarks will form the primary tools for assessing sediment quality conditions relative to the potential for adverse effects on sediment-dwelling organisms. For both of these parameters, matching sediment chemistry and toxicity data will be used to develop concentration-response relationships that are specific to the upper Hudson River. These concentration-response models will define how the magnitude sediment toxicity changes with increasing concentrations of COPCs. Based on evaluations of data from numerous sites in the United States, the probability of observing toxicity to freshwater amphipods, *Hyalella azteca*, or midge, *Chironomus dilutus* is <10% at sites with COPC concentrations reflective of background conditions (Ingersoll *et al.* 2005).

In this study, sediment samples with COPC concentrations that correspond to a >20% magnitude of toxicity (compared to the results for the negative control treatment) will be considered to have conditions that do not adequately support benthic invertebrate communities, whereas those with COPC concentrations that correspond to a <10% magnitude of toxicity will be considered to be reflective of background conditions. Samples for which the magnitude of sediment toxicity is between 10 and 20% will be considered to fall within the grey region and samples that have these characteristics will be considered to have conditions that potentially injure sediment-dwelling organisms.

7.1.7 Step 7—Develop the Plan for Obtaining Data

The purpose of this step of the DQO process is to review existing environmental data, evaluate operational decision rules, develop data collection design alternatives, calculate the number of samples to be taken, and select the most resource-effective data collection design. The design of the project sediment quality database will be patterned after MacDonald Environmental Sciences Ltd. sediment toxicity databases, in which sediment chemistry, sediment toxicity, and tissue chemistry data are routinely compiled (e.g., MacDonald *et al.* 2002). This structure is compatible with the NOAA Watersheds Database/Query Manager format. A key component of this design is that each sample is georeferenced to facilitate spatial analyses of the underlying data and presentation of the information on appropriate base maps (i.e., using ArcView software).

The project database will be a relational database, which means that the database consists of several tables that can be linked together (i.e., relationships have been defined) to facilitate retrieval of the data in a wide variety of ways. The purpose of defining relationships is to coordinate the retrieval of information in the different tables (i.e., different types of data on a single sample). The main advantage of a relational database is that queries, forms, and reports can be created to display information from several tables at once. A relationship works by matching data in key fields (usually a field with the same name in both tables), and these matching fields provide a unique identifier for each data record. The key fields that will be used to match the data in different tables, and thus provide a unique identifier, are the SITEID, STUDYID, STATIONID, SAMPLEID, FIELDREP, LABREP, and CHEMCODE fields.

The operational decision rule (i.e., which uses an *estimate* of the true value of the population parameter; i.e., the actual data) will replace the theoretical decision rule (i.e., stated in terms of the *true* value of the population parameter) that was developed in Step 5. As the theoretical rule will be developed as part of the Work Plan task of developing site-specific toxicity thresholds, the construction of the operational decision rule will also need to be formulated as part of the project Work Plan task.

The last three components of this step of the DQO process (develop data collection design alternatives, calculate the number of samples to be taken, and select the most resource-effective data collection design) are specific to sample collection activities. First, the historic patterns of contamination, estimates of variance, and the technical characteristics of the COPCs and sediments were considered in the data collection design described in this document. Importantly, the selected design will maximize the probability that the targeted number of sediment samples within each PCB concentration range will be collected. This sampling program will consist of collection of large-volume sediment samples from 42 locations (after PCB screening analysis 12 sites will be selected for further evaluation).

The final sampling program design is documented in Section 5.0 of this document. Some of the key assumptions that underlie this sampling program design include:

- The biologically-active depth in upper Hudson River sediments is likely to be roughly the top 0 - 15 cm;
- The historical sediment chemistry data provide an adequate basis for estimating the current distribution of PCBs in surficial sediments;
- Low contamination samples can be identified based on total PCB concentrations <1.0 mg/kg DW @ 1% OC;
- PCBs represent the principal COPCs in the upper Hudson River;
- The toxicity of PCBs and other COPCs can be influenced by levels of TOC, AVS, and fine-grained material in the sediment;
- Total PCBs represent the most useful metric for interpreting sediment chemistry data; and,
- Published data on the toxicity of sediment-associated PCBs provide a basis for estimating preliminary toxicity thresholds for PCBs in the upper Hudson River.

The criteria that are used to define the quality of measurement data are accuracy, precision, completeness, comparability, representativeness, and method sensitivity. The definition and application of these parameters to this project are discussed in the section on performance criteria for measurement data (i.e., Section 7.2).

7.2 Performance Criteria for Measurement Data

Establishment of performance criteria for measurement data represents a key step in the DQOs process. Such performance criteria provide a basis for objectively evaluating the data that are generated during the study and determining if they can be used to address the study objectives. The parameters that are typically used to evaluate data quality and/or usability include accuracy, precision, sensitivity, completeness, comparability, and representativeness. Each of these parameters are briefly described below. The performance criteria that have been established for this investigation are presented in Table 11.

7.2.1 Accuracy

Accuracy is a measure of the bias of a system or measurement. It is the closeness of agreement between an observed value and an accepted value. For this project, accuracy of chemical analysis will be determined

through the analysis of matrix spikes, certified reference materials, and method blanks. Matrix spikes are environmental samples into which known quantities of surrogates are added and their concentrations are subsequently measured. Information on the recovery of surrogate spikes is used directly to assess analytical accuracy. The 1944 standard reference materials (SRMs) used in this study will be sediments obtained from National Institute of Standards Technology that contain known concentrations of key COPCs (e.g., PCBs, PCDDs/PCDFs, pesticides, and metals). Analysis of such CRMs by the analytical laboratories will also be used to evaluate analytical accuracy. Method blanks will be used to measure contamination associated with laboratory processing and analyses. Note that the SRM and other controls from the QAPP were not part of the screening phase of this study.

For toxicity tests, no true accuracy measurements are possible because of the lack of accepted values. Instead, acceptable accuracy levels are addressed during water quality measurements through: 1) the calibration of the instruments used; and, 2) establishment of acceptable ranges. Test acceptability for organisms in the negative control (without the addition of the test chemical) will be in basic accordance with performance-based criteria outlined in USEPA (1994; 2000b). Positive controls (water-only NaCl reference toxicant tests) will be used to determine if the sensitivities of test organisms fall within normal ranges.

7.2.2 Precision

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. For this project, measures of analytical precision will be determined by the analysis of laboratory duplicates and matrix spike duplicates. Laboratory duplicates will be prepared by splitting environmental samples in the laboratory and carrying the sub-samples through the entire analytical process. Matrix spike duplicates will be prepared by splitting matrix spike samples in the laboratory and carrying the sub-samples through the entire analytical process. Precision will be expressed in terms of the relative percent difference (RPD) and will be calculated as follows:

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

where: C_1 = larger measured value; and,

C_2 = smaller measured value.

7.2.3 Sensitivity

Sensitivity is the capability of methodology or instrumentation to discriminate among measurement responses for quantitative differences of a parameter of interest. Sensitivity for this project will be defined as detection limits for analyses of COPCs in sediment. The detection limit is the minimum concentration of a substance that can be measured and reported (HRNRT 2005). Target detection limits for the parameters of interest are presented in Table 11 are based on the applicable methods.

7.2.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Target completeness values are 95% for chemical analyses of water and sediment, and 90% for toxicity test ancillary measurements. Defined as follows for all measurements:

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

%C = percent completeness;

V = number of measurements judged valid; and,

n = total number of measurements necessary to achieve a specified statistical level of confidence in decision making

7.2.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability for this project will not be quantified, but will be addressed through the use of consistent laboratory methods. Comparability of other data will be discussed, when appropriate, in the final report.

7.2.6 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness will be addressed primarily in the experimental design and through the selection of appropriate characterization procedures. Representativeness also will be ensured by the proper handling and storage of samples and analysis within the accepted holding times so that the material analyzed reflects the material collected as accurately as possible (USEPA 2000b; ASTM 2008a). Representativeness of data will be discussed, when appropriate, in the final report.

7.3 Quality Assurance for Sediment Chemistry Data

The analytical methods that will be used to determine the concentrations of various COPCs in sediments are described in the SOPs that are on file with the NRTs (see Appendix 1.1). The quality control procedures that will be followed in this study are described in the Analytical Quality Assurance Plan for the Hudson River NRDA (HRNRT 2005). As indicated previously, analytical accuracy will be evaluated using standard reference materials and matrix spike samples (prepared in the analytical laboratory), analyzed at the rate of one per every 15 samples from the study area. Method blanks will also be analyzed at the rate of one per every 15 samples from the field. Analytical precision will be evaluated using duplicate samples (prepared in the analytical laboratory), analyzed at the rate of one per every 15 samples from the study area. Internal standards will be used in accordance with the requirements of the analytical SOP. The resultant quality control data will be used to evaluate the sediment chemistry data generated during the 2008 sampling program. Bottle blanks were archived for future analysis, should there be anomalies in the sediment chemistry results.

7.4 Quality Assurance for Matix SPMEs

The methods that will be used to deploy and retrieve the SPME fibers, extract the associated COPCs, and quantify COPC concentrations will be described in an addendum to this Work Plan. The quality control procedures that will be used to assure the quality of the data generated using these methods will be in general accordance with HRNRT (2005).

7.5 Quality Assurance for Sediment Toxicity

The methods that will be used to evaluate the toxicity of upper Hudson River sediments to benthic invertebrates are described in SOPs on file with the NRTs (see Appendix 1.1). The quality control procedures that will be used to assure the quality of the data generated using these methods will be accordance with ASTM (2008a) and USEPA (2000b). Briefly, test acceptability and test organism sensitivity will be evaluated using the results for the negative controls and reference toxicant test, respectively. The control sediment that will be used in this study will be selected based on a round-robin evaluation of the suitability of three candidate control materials by the CERC and USACE laboratories. In addition, two low contamination sediment treatments will be tested to evaluate benthic invertebrate responses to exposure to sediments for the site, largely absent of the COPCs of interest. All of the instruments used to collect data during the toxicity tests will be regularly maintained and calibrated.

7.6 Quality Assurance for Benthic Macroinvertebrate Community Structure

The methods that will be used to collect, process, and analyze the sediment core samples for benthic macroinvertebrate community structure assessment are described in Section 5.0 of this document. The quality control procedures that will be used to assure the quality of the data generated using these methods are described in the associated SOP. The quality of the BICS data will be evaluated using information on the accuracy and precision of the taxonomic identification and enumeration process. The accuracy of the taxonomic identifications will be assured by assembling the most recent taxonomic literature for the study area and associated ecoregion, by accessing a reference collection that has been verified by appropriate taxonomic specialists, and by creating a voucher collection for the project. In this way, the accuracy of the taxonomic identifications can be independently verified. The precision of the counts will be evaluated by having at least 10% of the samples processed and enumerated by two taxonomists.

7.7 Data Evaluation, Reduction, and Reporting

All of the data collected during the 2008 sampling program will be evaluated to determine their usability. Importantly, all of the sediment chemistry data will be subjected to formal data validated prior to use. The other data will also be evaluated to determine if they meet the performance criteria for measurement data that are described in this document. Any data that do not meet the performance criteria for measurement data will be flagged appropriately. The detailed procedures for data reduction, data review and validation, and data reporting are described in the Analytical Quality Assurance Plan for the Hudson River NRDA (HRNRT 2005).

The data generated in this study will be compiled in a GIS-compatible electronic database in MS Access format. The electronic data that are received from the various laboratories will be translated into database format. The accuracy of these data translations will be evaluated by conducting number-for-number checks of 10% of the data. This evaluation level will be increased to 100% if any errors are encountered during the initial evaluation of the data. Any data that are hand entered into the database will be evaluated by conducting number-for-number checks of 100% of the data. Upon completion, the database will be audited to determine if any data are missing, if any data are duplicated, if units are correct, and if parameters were calculated correctly.

8.0 REFERENCES

ASTM (American Society for Testing and Materials). 2003. Standard guide for collection, storage, characterization, and manipulation of sediments for toxicological testing and for selection of samplers used to collect benthic invertebrates. ASTM E1391-03. Annual Book of ASTM Standards Volume 11.06. West Conshohocken, PA.

ASTM (American Society for Testing and Materials). 2008a. Guide for collection, storage, characterization, and manipulation of sediments for toxicological testing and for selection of samplers used to collect benthic invertebrates. ASTM E1391-03 (2008). Annual Book of ASTM Standards Volume 11.06. West Conshohocken, Pennsylvania.

ASTM (American Society for Testing and Materials). 2008b. Standard test method for measuring the toxicity of sediment-associated contaminants with estuarine and marine invertebrates. E1367-03 (2008). ASTM 2004 Annual Book of Standards Volume 11.05. West Conshohocken, Pennsylvania.

ASTM (American Society for Testing and Materials). 2008c. Standard guide for determination of the bioaccumulation of sediment-associated contaminants by benthic invertebrates. E1688-00a (2007). ASTM 2004 Annual Book of Standards Volume 11.05. West Conshohocken, Pennsylvania.

ASTM (American Society for Testing and Materials). 2007d. Standard test method for particle-size analysis of soils. ASTM D422-63. Annual Book of ASTM Standards Volume 11.06. West Conshohocken, Pennsylvania.

Bay, S.M., T.H. Gries, B.S. Anderson, B.M. Phillips, L.J. Field, D.W. Moore, and D.J. Greenstein. 2005. Comparison of marine amphipod test species responsiveness to contaminated field sediments. Southern California Coastal Water Research Project. Westminster, California. Poster presented at SETAC 2005 conference. Baltimore, Maryland. November 2005.

Blasland, Bouck & Lee, Inc. (BB&L) 2006. Phase 1 Final Design Report, Hudson River PCBs Superfund Site. General Electric Company. Albany, New York.

Chapman P.M., B. Anderson, S. Carr, V. Engle, R. Green, J. Hameedi, M. Harmon, P. Haverland, J. Hyland, C. Ingersoll, E. Long, J. Rodgers, M. Salazar, P.K. Sibley, P.J. Smith, R.C. Swartz, B. Thompson, H. Windom. 1997. General guidelines for using the sediment quality. Marine Pollution Bulletin 34:368-372.

Cubbage, J., D. Batts, and S. Briedenbach. 1997. Creation and analysis of freshwater sediment quality values in Washington State. Environmental Investigations and Laboratory Services Program. Washington Department of Ecology. Olympia, Washington.

DiPinto, L.M., B.C. Coull, and G.T. Chandler. 1993. Lethal and sublethal effects of the sediment-associated PCB Aroclor 1254 on a meiobenthic copepod. Environmental Toxicology and Chemistry 12:1909-1918.

Environment Canada and Ministère de L'Environnement du Québec. 1992. Interim criteria for quality assessment of St. Lawrence River sediment. ISBN 0-662-19849-2. St. Lawrence Action Plan. St. Lawrence Centre and Ministere de l'Environnement du Quebec.

Fuchsman, P.C., T.R. Barber, and J.C. Lawton. 2006. An evaluation of cause-effect relationships between polychlorinated biphenyl concentrations and sediment toxicity to benthic invertebrates. Environmental Toxicology and Chemistry 25 (10):2601-2612.

GE (General Electric). 2002. Whole-sediment chemistry data for the upper Hudson River, New York. *In:* NOAA Hudson River Watershed Database and Mapping tools (http://response.restoration.noaa.gov/cpr/watershed/watershedtools.html). Office of Response and Restoration. NOAA's National Ocean Service.

GE (General Electric). 2003. Whole-sediment chemistry data for the upper Hudson River, New York. *In:* NOAA Hudson River Watershed Database and Mapping tools (http://response.restoration.noaa.gov/cpr/watershed/watershedtools.html). Office of Response and Restoration. NOAA's National Ocean Service.

GE (General Electric). 2004. Whole-sediment chemistry data for the upper Hudson River, New York. *In:* NOAA Hudson River Watershed Database and Mapping tools (http://response.restoration.noaa.gov/cpr/watershed/watershedtools.html). Office of Response and Restoration. NOAA's National Ocean Service.

GE (General Electric). 2005. Whole-sediment chemistry data for the upper Hudson River, New York. *In:* NOAA Hudson River Watershed Database and Mapping tools (http://response.restoration.noaa.gov/cpr/watershed/watershedtools.html). Office of Response and Restoration. NOAA's National Ocean Service.

GE (General Electric). 2007. Whole-sediment chemistry data for the upper Hudson River, New York. *In:* NOAA Hudson River Watershed Database and Mapping tools (http://response.restoration.noaa.gov/cpr/watershed/watershedtools.html). Office of Response and Restoration. NOAA's National Ocean Service.

HRNRT (Hudson River Natural Resource Trustees). 2005. Analytical quality assurance plan: Hudson River natural resource damage assessment. Prepared by National Oceanic and Atmospheric Administration. Silver Spring, Maryland.

Ingersoll, C.G. and D.D. MacDonald. 1999. An assessment of sediment injury in the West Branch of the Grand Calumet River. Report prepared for the Environmental Enforcement Section. Environment and Natural Resources Division. United States Department of Justice. Washington, District of Columbia.

Ingersoll, C.G., P.S. Haverland, E.L. Brunson, T.J. Canfield, F.J. Dwyer, C.E. Henke, N.E. Kemble, D.R. Mount, and R.G. Fox. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. Journal of Great Lakes Research 22(3):602-623.

Ingersoll, C.G., G.T. Ankley, R. Baudo, G.A. Burton, W. Lick, S. Luoma, D.D. MacDonald, T.B. Reynoldson, K.R. Solomon, R.C. Swartz, W.J. Warren-Hicks. 1997. Work group summary report on uncertainty evaluation of measurement endpoints used in sediment ecological risk assessment. *In:* Ingersoll CG, Dillon T, Biddinger GR, editors. Ecological risk assessment of contaminated sediment. Pensacola Florida. SETAC Press. p 297-352.

Ingersoll, C.G., S.M. Bay, J.L. Crane, L.J. Field, T.H. Gries, J.L. Hyland, E.R. Long, D.D. MacDonald, and T.P. O'Connor. 2005. Ability of sediment quality guidelines to estimate effects or no effects of sediment-associated contaminants in laboratory toxicity tests or in benthic community assessments. *In:* Wenning RJ, Batley G, Ingersoll CG, editors. Use of sediment quality guidelines (SQGs) and related tools for the assessment of contaminated sediments. 497-556. SETAC Press. Pensacola Florida..

Lanahan, K. 2008. Health and safety plan for pilot study on the effects of PCB-contaminated sediments on benthic invertebrates in the upper Hudson River, New York. Prepared for National Oceanic and Atmospheric Administration. Silver Spring, Maryland.

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

Long E.R., D.D. MacDonald, S.L. Smith, F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management 19:81-97.

MacDonald, D.D., L.M. DiPinto, J. Field, C.G. Ingersoll, E.R. Long, and R.C. Swartz. 2000. Development and evaluation of consensus-based sediment effect concentrations for polychlorinated biphenyls (PCBs). Environmental Toxicology and Chemistry 19:1403-1413.

MacDonald, D.D., C.G. Ingersoll, D.R.J. Moore, M. Bonnell, R.L. Breton, R.A. Lindskoog, D.B. MacDonald, Y.K. Muirhead, A.V. Pawlitz, D.E. Sims, D.E. Smorong, R.S. Teed, R.P. Thompson, and N. Wang. 2002. Calcasieu Estuary remedial investigation/feasibility study (RI/FS): Baseline ecological risk assessment (BERA). Technical report plus appendices. Contract No. 68-W5-0022. Prepared for CDM Federal Programs Corporation and United States Environmental Protection Agency. Dallas, Texas.

MacDonald, D. D., D.E. Smorong, D.G. Pehrman, C.G. Ingersoll, J. J. Jackson, Y.K. Muirhead, S. Irving, and C. McCarthy. 2007. Conceptual field sampling design - 2007 sediment sampling program of the Tri-State Mining District. Prepared for United States Environmental Protection Agency. Region 6. Dallas, Texas and Region 7. Kansas City, Kansas. Prepared by MacDonald Environmental Sciences Ltd. Nanaimo, British Columbia. Black & Veatch Special Projects Corp. Laurel Springs, New Jersey. United States Geological Survey. Columbia, Missouri and CH2M Hill. Dallas, Texas.

MacDonald, D.D., R. Gale, W. Brumbaugh, C.G. Ingersoll, D.E. Smorong, S. Hamilton, and Y. Muirhead. 2008. Guidelines on the selection of analytical detection limits for generating water chemistry, sediment chemistry, and tissue residue data for use in aquatic risk assessments. Prepared for Office of Environmental Policy and Compliance. Department of the Interior. Washington, District of Columbia and Emergency Response Team. United States Environmental Protection Agency. Edison, New Jersey. Prepared by MacDonald Environmental Sciences Ltd. Nanaimo, British Columbia.

Neff, J.M., D.J. Bean, B.W. Cornaby, R.M. Vaga, T.C. Gulbransen, and J.A. Scanlon. 1986. Sediment quality criteria methodology validation: Calculation of screening level concentrations from field data. Prepared for Environmental Protection Agency Region V. Washington, District of Columbia. 225 pp.

Persaud, D., R. Jaagumagi, and A. Hayton. 1993. Guidelines for the protection and management of aquatic sediment quality in Ontario. Water Resources Branch. Ontario Ministry of the Environment. Toronto, Ontario. 27 pp.

Smith, S.L., D.D. MacDonald, K.A. Keenleyside, C.G. Ingersoll, and J. Field. 1996. A preliminary evaluation of sediment quality assessment values for freshwater ecosystems. Journal of Great Lakes Research 22:624-638.

Swartz, R.C., P.F. Kemp, D.W. Schults, and J.O. Lamberson. 1988. Effects of mixtures of sediment contaminants on the marine infaunal amphipod, *Rhepoxynius abronius*. Environmental Toxicology and Chemistry 7:1013-1020.

Trimble, T.A., J. You and M.J. Lydy. 2008. Bioavailability of PCBs from field-collected sediments: Application of Tenax extraction and matrix-SPME techniques. Chemosphere. 71:337-344.

USEPA (United States Environmental Protection Agency). 1980. Ambient water quality criteria for polychlorinated biphenyls. Office of Water Regulations and Standards. Criteria and Standards Division. Washington, District of Columbia.

USEPA (United States Environmental Protection Agency). 1994. Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates. First edition. EPA 600/R-94/024. Duluth, Minnesota.

USEPA (United States Environmental Protection Agency). 2000a. Guidance for the data quality objectives process. USEPA QA/G-4. USEPA/600/R-96/055. Office of Environmental Information. Washington, District of Columbia.

USEPA (United States Environmental Protection Agency). 2000b. Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates. Second edition. EPA 600/R-99/064. Office of Research and Development. Washington, District of Columbia.

USEPA (United States Environmental Protection Agency). 2006. Guidance on systematic planning using the data quality objectives process. USEPA QA/G-4. USEPA/240/B-06/001. Office of Environmental Information. Washington, District of Columbia.

USEPA (United States Environmental Protection Agency). 2008. Hudson River PCBs. Region 2. New York, New York. (www.epa.gov/hudson/)

You, J., P.F. Landrum, T.A. Trimble, and M.J. Lydy. 2007. Availability of polychlorinated biphenyls in field-contaminated sediment. Environmental Toxicology and Chemistry 26 (9):1940-1948.

Tables

Table 1.

Locations and sample designations for primary sampling stations for large-volume sediment samples in the upper Hudson River.

Sample ID Number	tPCB Range (mg/kg DW @ 1% OC)	Estimated tPCB Concentration (mg/kg DW @ 1% OC)	Estimated tPCB Concentration (mg/kg DW)	Estimated TOC (%)	Sample Type	Latitude	Longitude	Estimated Water Depth (ft)
Primary Sampling Stations								
UHR-SVS-01	<1	0.0408	0.049	1.2	Grab	43.23072	-73.59099	2.5
UHR-SVS-02	<1	0.0686	1.44	21	Grab	43.24516	-73.59523	10.5
UHR-SVS-03	<1	0.154	0.538	3.5	Grab	43.25028	-73.59019	10.5
UHR-SVS-04	<1	0.37	0.74	2	Grab	43.22875	-73.58828	1
UHR-SVS-05	<1	0.551	5.51	10	Grab	43.2046	-73.58518	7
UHR-SVS-06	<1	0.591	2.01	3.4	Grab	43.22799	-73.58769	3.1
UHR-SVS-07	<1	0.667	0.8	1.2	Grab	43.25836	-73.58304	7.5
UHR-SVS-08	1-5	2.38	9.3	3.9	Grab	43.26127	-73.58826	5.8
UHR-SVS-09	1-5	3.04	7.9	2.6	Grab	43.2566	-73.5857	5
UHR-SVS-10	1-5	3.29	6.9	2.1	Grab	43.26702	-73.59237	4.7
UHR-SVS-11	1-5	4.00	28	7	Grab	43.25535	-73.58548	6.8
UHR-SVS-12	1-5	2.84	14.5	5.1	Grab	43.25723	-73.58458	6.2
UHR-SVS-13	1-5	3.89	14.8	3.8	Grab	43.25933	-73.58377	4.2
UHR-SVS-14	1-5	4.44	7.1	1.6	Grab	43.26663	-73.59237	2.5
UHR-SVS-15	5-10	5.60	47	8.4	Grab	43.26123	-73.58404	9.2
UHR-SVS-16	5-10	5.53	42	7.6	Grab	43.26266	-73.58372	2.1
UHR-SVS-17	5-10	6.21	18	2.9	Grab	43.25706	-73.5859	4
UHR-SVS-18	5-10	5.58	6.7	1.2	Grab	43.26635	-73.59362	4
UHR-SVS-19	5-10	8.43	5.9	0.7	Grab	43.26395	-73.59032	5
UHR-SVS-20	5-10	9.44	5.1	0.54	Grab	43.26792	-73.58767	7.8
UHR-SVS-21	5-10	9.71	6.6	0.68	Grab	43.25822	-73.5865	7.5
UHR-SVS-22	10-20	11.3	4.4	0.39	Grab	43.26161	-73.58403	8

TABLE 1 (CONTINUED).
LOCATIONS AND SAMPLE DESIGNATIONS FOR PRIMARY SAMPLING STATIONS FOR LARGE-VOLUME SEDIMENT SAMPLES IN THE UPPER HUDSON RIVER.

Sample ID Number	tPCB Range (mg/kg DW @ 1% OC)	Estimated tPCB Concentration (mg/kg DW @ 1% OC)	Estimated tPCB Concentration (mg/kg DW)	Estimated TOC (%)	Sample Type	Latitude	Longitude	Estimated Water Depth (ft)
Primary Sampling Stations (continued)								
UHR-SVS-23	10-20	10.3	25.8	2.5	Grab	43.26047	73.58375	8.6
UHR-SVS-24	10-20	10.8	7.8	0.72	Grab	43.26336	73.58837	10
UHR-SVS-25	10-20	12.2	8.3	0.68	Grab	43.2645	73.58951	5.6
UHR-SVS-26	10-20	17.0	27.2	1.6	Grab	43.20875	73.57883	8.4
UHR-SVS-27	10-20	18.3	12.8	0.7	Grab	43.26701	73.59325	4.2
UHR-SVS-28	10-20	11.2	12.3	1.1	Grab	43.25856	73.58378	1.5
UHR-SVS-29	20-50	33.6	84	2.5	Grab	43.21235	73.58042	10
UHR-SVS-30	20-50	27.8	125	4.5	Grab	43.26472	73.5909	7
UHR-SVS-31	20-50	44.4	12	0.27	Grab	43.26123	73.58783	7.1
UHR-SVS-32	20-50	24.7	21	0.85	Grab	43.26509	73.59001	3.3
UHR-SVS-33	20-50	26.3	17.1	0.65	Grab	43.26587	73.59178	3.6
UHR-SVS-34	20-50	30.1	6.01	0.2	Grab	43.26772	73.58725	5.5
UHR-SVS-35	20-50	42.0	20.6	0.49	Grab	43.26411	73.58863	4.1
UHR-SVS-36	50-100	100	30	0.3	Grab	43.26511	73.59058	7.9
UHR-SVS-37	50-100	79.5	517	6.5	Grab	43.20872	73.57822	10
UHR-SVS-38	50-100	67.1	125.0	2.2	Grab	43.26089	73.58766	6.6
UHR-SVS-39	50-100	65.5	72	1.1	Grab	43.26314	73.58428	10.9
UHR-SVS-40	50-100	65.8	507	7.7	Grab	43.20947	73.5779	9
UHR-SVS-41	50-100	73.9	24.4	0.33	Grab	43.21274	73.58071	10.3
UHR-SVS-42	50-100	87.5	210	2.4	Grab	43.26354	73.58761	2.5

Notes:
TOC = total organic carbon; DW = dry weight; tPCB = total polychlorinated biphenyls; ND = not determined.

TABLE 2.
LOCATIONS AND SAMPLE DESIGNATIONS FOR ALTERNATE SAMPLING STATIONS FOR LARGE-VOLUME SEDIMENT SAMPLES IN THE UPPER HUDSON RIVER.

Sample ID Number	tPCB Range (mg/kg DW @ 1% OC)	Estimated tPCB Concentration (mg/kg DW @ 1% OC)	Estimated tPCB Concentration (mg/kg DW)	Estimated TOC (%)	Sample Type	Latitude	Longitude	Estimated Water Depth (ft)
Alternate Sampling Stations								
UHR-SVS-101	<1	0.544	8.7	16	Grab	43.20745	73.58559	4.5
UHR-SVS-102	<1	0.0538	1.4	26	Grab	43.24441	73.59586	9.5
UHR-SVS-103	<1	0.554	3.6	6.5	Grab	43.20363	73.58474	6.1
UHR-SVS-106	1-5	2.68	7.8	3.1	Grab	43.25179	73.59049	4.2
UHR-SVS-107	1-5	2.3	48.3	21	Grab	43.26066	73.58396	8.8
UHR-SVS-108	1-5	2.04	10.8	5.3	Grab	43.25801	73.58394	2.9
UHR-SVS-111	5-10	5.53	42	7.6	Grab	43.25727	73.58722	7.9
UHR-SVS-112	5-10	6.83	2.05	0.3	Grab	43.24972	73.59277	4.4
UHR-SVS-113	5-10	5.06	15.7	3.1	Grab	43.2516	73.59065	10.3
UHR-SVS-116	10-20	13.7	26	1.9	Grab	43.25629	73.58621	16.6
UHR-SVS-117	10-20	12.2	1.1	0.09	Grab	43.21195	73.58091	15.9
UHR-SVS-118	10-20	14.5	42.1	2.9	Grab	43.26011	73.58705	9.3
UHR-SVS-122	20-50	22.1	95	4.3	Grab	43.25993	73.58782	5
UHR-SVS-123	20-50	29.1	96	3.3	Grab	43.25158	73.58974	15.3
UHR-SVS-124	20-50	48.9	22	0.45	Grab	43.24895	73.59248	15
UHR-SVS-125	50-100	91.4	417	9	Grab	43.21253	73.58026	12.3
UHR-SVS-126	50-100	54.8	23	0.42	Grab	43.21309	73.58101	13
UHR-SVS-127	50-100	77.6	264	3.4	Grab	43.25971	73.58376	9.8

Notes:
TOC = total organic carbon; DW = dry weight; tPCB = total polychlorinated biphenyls; ND = not determined.

TABLE 3.
LOCATIONS AND SAMPLE DESIGNATIONS FOR ACTUAL SAMPLING STATIONS FOR LARGE-VOLUME SEDIMENT SAMPLES IN THE UPPER HUDSON RIVER.

Sample ID Number[1]	tPCB Range (mg/kg DW)	Preliminary tPCB Concentration (mg/kg DW @ 1% OC)	Preliminary tPCB Concentration (mg/kg DW)	Preliminary TOC (%)	Sample Type	Easting	Northing	Estimated Water Depth (m)	Selected
UHR-SVS-REF13**	<1	0.0114	0.00108	0.1	Grab	606625.813	4793389.463	0.3	
UHR-SVS-REF14**	<1	0.06	0.01	0.12	Grab	605827.918	4792670.773	0.4	
UHR-SVS-19	<1	0.22	0.19	0.85	Grab	614413.66	4791056.87	0.4	YES
UHR-SVS-06	<1	0.31	0.37	1.2	Grab	614674.437	4787135.429	0.3	
UHR-SVS-04	<1	0.47	0.45	0.95	Grab	614594.043	4787257.701	0.1	YES
UHR-SVS-20	<1	2.2	0.75	0.34	Grab	614620.533	4791538.347	1.7	
UHR-SVS-107*	1-5	2.2	1.1	0.51	Grab	614930.7266	4790734.721	2.7	
UHR-SVS-REF11**	1-5	0.2	1.4	6.65	Grab	605860.803	4793277.717	0.8	
UHR-SVS-117*	1-5	1.9	1.5	0.78	Grab	615185.487	4785422.973	1	
UHR-SVS-123alt**	1-5	2.6	1.9	0.74	Grab	614170.122	4789450.321	0.7	
UHR-SVS-112*	1-5	2.6	2	0.76	Grab	614232.606	4789508.873	1	YES
UHR-SVS-23	1-5	3.2	2.3	0.73	Grab	614952	4790710	2.7	
UHR-SVS-103*	1-5	3	2.7	0.91	Grab	615056.45	4784312.865	0.12	
UHR-SVS-02	1-5	9.7	3.2	0.33	Grab	614060.403	4788999.588	0.27	
UHR-SVS-124*	1-5	4.7	3.9	0.82	Grab	614127.98	4789411.069	0.38	YES
UHR-SVS-13	5-10	4.2	5	1.2	Grab	614939	4790591	1.2	YES
UHR-SVS-12	5-10	3	5.6	1.9	Grab	614886.67	4790354.134	1.2	
UHR-SVS-25	5-10	4	6	1.5	Grab	614477.28	4791187.038	0.1	
UHR-SVS-16	5-10	5.6	6.5	1.15	Grab	614927.978	4790957.306	0.3	YES (mix)[2]
UHR-SVS-09	5-10	3.7	6.6	1.8	Grab	614792.188	4790282.695	1	
UHR-SVS-36	5-10	2.9	6.7	2.3	Grab	614416.692	4791236.901	0.3	YES (mix)[3]
UHR-SVS-28	5-10	2.2	7.4	3.35	Grab	614951.34	4790503.401	1	

TABLE 3 (CONTINUED).
LOCATIONS AND SAMPLE DESIGNATIONS FOR ACTUAL SAMPLING STATIONS FOR LARGE-VOLUME SEDIMENT SAMPLES IN THE UPPER HUDSON RIVER.

Sample ID Number[1]	tPCB Range (mg/kg DW)	Preliminary tPCB Concentration (mg/kg DW @ 1% OC)	Preliminary tPCB Concentration (mg/kg DW)	Preliminary TOC (%)	Sample Type	Easting	Northing	Estimated Water Depth (m)	Selected
UHR-SVS-42	5-10	6	9.4	1.55	Grab	614591.3	4791096.092	0.4	
UHR-SVS-11	5-10	3.1	9.6	3.1	Grab	614821.228	4790139.638	0.6	
UHR-SVS-17	5-10	3.3	9.7	2.95	Grab	614783.679	4790337.01	0.6	
UHR-SVS-38	5-10	5.9	9.7	1.65	Grab	614652.889	4790753.28	1.1	YES
UHR-SVS-108*	10-20	7.9	10.7	1.35	Grab	614939.363	4790447.625	1	
UHR-SVS-39	10-20	7.7	10.8	1.4	Grab	614907.817	4790994.983	2	
UHR-SVS-35	10-20	7.4	11.8	1.6	Grab	614550.294	4791128.778	0.3	
UHR-SVS-15	10-20	6.4	11.9	1.85	Grab	614923.1612	4790797.912	1.4	
UHR-SVS-22	10-20	4.8	13.6	2.85	Grab	614906.727	4790833.998	0.6	
UHR-SVS-127*	10-20	8.9	14.7	1.65	Grab	614948.7471	4790629.493	2	YES
UHR-SVS-122*	10-20	11.3	15.3	1.35	Grab	614609.648	4790644.478	0.12	
UHR-SVS-08	10-20	14.2	17	1.2	Grab	614545.123	4790811.465	0.12	
UHR-SVS-111*	10-20	8.2	18.8	2.3	Grab	614671.23	4790356.59	1.8	
UHR-SVS-26	10-20	13.4	18.8	1.4	Grab	615448.344	4784976.357	2.4	YES
UHR-SVS-24	20-50	13.8	44.9	3.25	Grab	614618.29	4791019.413	0.2	YES
UHR-SVS-31	50-100	34.1	78.5	2.3	Grab	614620.804	4790790.809	0.13	YES
UHR-SVS-29	>100	86	220	2.55	Grab	615311.02	4785374.594	2.5	YES (mix)[3]
UHR-SVS-37	>100	110	504	4.6	Grab	615498.189	4784970.558	3	YES (mix)[2]
UHR-SVS-40	>100	118	530	4.5	Grab	615519.562	4785056.895	2.5	
UHR-SVS-41alt**	>100	146	921	6.3	Grab	615523.377	4785016.498	2.7	
UHR-SVS-07	>100	243	1200	4.95	Grab	615009.253	4790480.558	3.3	

TABLE 3 (CONTINUED).

LOCATIONS AND SAMPLE DESIGNATIONS FOR ACTUAL SAMPLING STATIONS FOR LARGE-VOLUME SEDIMENT SAMPLES IN THE UPPER HUDSON RIVER.

Notes:

TOC = total organic carbon; DW = dry weight; tPCB = total polychlorinated biphenyls; ND = not determined.

[1]Single asterisks indicate samples that were collected from alternate sampling locations (see Table 2). Double asterisks indicate samples that were collected at locations that were not identified in the original Work Plan (i.e., the Field Supervisor collected these samples at locations that were thought to yield samples with PCB levels within the target concentration range). Table 4 provides more information on the sample station locations that were adjusted.

[2]Samples UHR-SVS-36 and UHR-SVS-29 were mixed at a ratio of 2:1 to provide a sediment sample that is expected to have about 77.7 mg/kg DW or 32.6 mg/kg DW @ 1% OC.

[3]Samples UHR-SVS-16 and UHR-SVS-37 were mixed at a ratio of 1:1 to provide a sediment sample that is expected to have about 255 mg/kg DW or 88.8 mg/kg DW @ 1% OC.

TABLE 4.
SEDIMENT SAMPLING STATION LOCATIONS THAT WERE ADJUSTED DURING THE FIELD SAMPLING PROGRAM.

Original Sample ID Number	Original Sample Predicted tPCB Range (mg/kg DW @ 1% OC)	Alternate/New Sample ID Number	Alternate/New Predicted tPCB Range (mg/kg DW @ 1% OC)	Distance from Original Location (m)	Method for Determining Alternate Location	Rationale for Choosing Alternate Station
Alternate Sampling Stations Identified in the Original Work Plan[1]						
UHR-SVS-10	1-5	UHR-SVS-107	1-5	1300 m	Estimated tPCB range	Vegetated
UHR-SVS-14	1-5	UHR-SVS-108	1-5	1600 m	Estimated tPCB range	Vegetated
UHR-SVS-18	5-10	UHR-SVS-112	5-10	2200 m	Estimated tPCB range	Gravel Substrate
UHR-SVS-21	5-10	UHR-SVS-111	5-10	120 m	Estimated tPCB range	Wood debris
UHR-SVS-27	10-20	UHR-SVS-117	10-20	7000 m	Estimated tPCB range	Vegetated
UHR-SVS-32	20-50	UHR-SVS-124	20-50	2100 m	Estimated tPCB range	Rocky Substrate
UHR-SVS-33	20-50	UHR-SVS-122	20-50	800 m	Estimated tPCB range	Vegetated
UHR-SVS-34	20-50	UHR-SVS-127	50-100	1000 m	Estimated tPCB range	Gravel Substrate
Sampling Stations Not Identified in the Original Work Plan[2]						
UHR-SVS-01	<1	UHR-SVS-REF11	<1	~25 km	Reference Area	Increased probability of low PCB levels
UHR-SVS-03	<1	UHR-SVS-REF13	<1	~23 km	Reference Area	Rocky
None	<1	UHR-SVS-REF14	<1	~27 km	Reference Area	No access
UHR-SVS-30	20-50	UHR-SVS-123alt	Estimated at 20-50	2000 m	Proximity to Landfill	Rocky
UHR-SVS-41	50-100	UHR-SVS-41alt	Estimated at 50-100	500 m	Proximity to UHR-SVS-37	Rocky
UHR-SVS-05	NA	UHR-SVS-103	<1	120 m	Estimated tPCB range	No access

Notes:
[1] See Table 2.
[2] The Field Supervisor collected these samples at locations that were thought to yield samples with PCB levels within the concentration range.

TABLE 5.
FIELD DATA COLLECTION FORM FOR THE SEPTEMBER 2008 UPPER HUDSON RIVER FIELD SAMPLING PROGRAM.

1. Station ID#: _____

2. Names of Personnel: _____

3. Alternate Station Accessed: [ ] Yes [ ] No
   If yes, Alternate Sample ID#: _____
   Reason for Alternate Station Accessed: _____

4. Sampling Date: _____ Time: _____

5. Target Sample Coordinates (UTM): Easting _____ Northing _____
   Actual Sample Coordinates (UTM): Easting _____ Northing _____
   Datum: _____
   Instrumentation: _____
   Problems Encountered: _____

6. Target tPCB range (e.g., 1 - 5 mg/kg$_{1\%OC}$): _____

7. Type of Sampler Used: [ ] Ekman Dredge [ ] Van Veen Sampler [ ] Other

8. Sample Depth: Target: 0 - 15 cm Actual : _____

9. Sample Volume Collected (target): _____
   Sample Volume Collected (actual): _____

10. Grainsize: (record the estimated % of each size fraction):
    [ ] Clay (slick) [ ] Silt [ ] Sand (<0.1")
    [ ] Gravel (0.1 - 2.5") [ ] Cobbles (> 2.5")

11. Sediment Color (black, brown, grey, etc.): _____

12. Sample Odor (if readily apparent; e.g., sulfur, oily, sewage, none, etc; do not intentionally smell sample to evaluate odor): _____

13. Water Depth *(at Sampling Location)*: Average _____ m Range _____ m

14. Additional Comments: _____

TABLE 6.
ALPHA ANALYTICAL LABS CHAIN-OF-CUSTODY FORM.

ALPHA ANALYTICAL

CHAIN OF CUSTODY

PAGE OF

Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193
Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Client Information
Client:
Address:
Phone:
Fax:
Email:
☐ These samples have been Previously analyzed by Alpha

Project Information
Project Name:
Project Location:
Project #:
Project Manager:
ALPHA Quote #:

Turn-Around Time
☐ Standard ☐ Rush (ONLY IF PRE-APPROVED)
Due Date: Time:

Other Project Specific Requirements/Comments/Detection Limits:

Date Rec'd in Lab:
ALPHA Job #:

Report Information Data Deliverables
☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information
☐ Same as Client info PO #:

Regulatory Requirements/Report Limits
State/Fed Program Criteria

MCP PRESUMPTIVE CERTAINTY-CT REASONABLE CONFIDENCE PROTOCOLS
☐ Yes ☐ No Are MCP Analytical Methods Required?
☐ Yes ☐ No Are CT RCP (Reasonable Confidence Protocols) Required?

ANALYSIS

SAMPLE HANDLING
Filtration
☐ Done
☐ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials												Sample Specific Comments	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						Container Type	-	-	-	-	-	-	-	-	-	-	-	
						Preservative	-	-	-	-	-	-	-	-	-	-	-	

PLEASE ANSWER QUESTIONS ABOVE!

IS YOUR PROJECT MA MCP *or* CT RCP?

FORM NO. 01-01(I)
(rev. 30-JUL-07)

Relinquished By:	Date/Time	Received By:	Date/Time

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

TABLE 7.
FIELD CHAIN-OF-CUSTODY FORM FOR THE SEPTEMBER 2008 UPPER HUDSON RIVER FIELD SAMPLING PROGRAM.

Project Name:	**2008 Upper Hudson River Sediment Sampling Program**

Sample ID#	**Sample Type**	**Sample Description/Comments**	
Transfer of Samples from Sampling Team to Sample Runner			
Relinquished By:			
Print Name	**Signature**	**Date**	**Time**
Received By:			
Print Name	**Signature**	**Date**	**Time**
Transfer of Samples from Sample Runner to Truck Inventory Team			
Relinquished By:			
Print Name	**Signature**	**Date**	**Time**
Received By:			
Print Name	**Signature**	**Date**	**Time**
Transfer of Samples from Truck Inventory Team to CERC Laboratory			
Relinquished By:			
Print Name	**Signature**	**Date**	**Time**
Received By:			
Print Name	**Signature**	**Date**	**Time**

TABLE 8.
WATERSHED ASSESSEMENT ASSOCIATES CHAIN-OF-CUSTODY FORM

Fed Ex #

Package #

CHAIN OF CUSTODY RECORD

Project Name:	Project #:	Container Type (e.g., padded sample carrier, cooler, etc.):

Sampler(s): Printed Name and Signature

Sample ID	Date Collected	Time Collected	Location	Jar size	Remarks

Special Instructions/Comments:

	Signature	Print Name	Company/Title	Date	Time
Relinquished					
Received by:					
by:					
Received by:					
by:					
Received by:					

TABLE 9.
COLUMBIA ENVIRONMENTAL RESEARCH LAB TOXICITY TEST REQUEST SHEET AND CHAIN-OF-CUSTODY FORM.

For lab use only	Project number	Date
	Client	Sample Number

Reporting and Billing Information

Results to:		**Invoice to (if different):**	
Name		Name	
Company		Company	
Address		Address	
City	Province	City	Province
Country	Zip Code	Country	Zip code
Telephone	Fax	Telephone	Fax

Sample Information

Sample Name

Sampling Method Special Instructions **See project QAPP**

Sampled by

Date **Time**

Container Type and Number

Toxicity Tests Required

Protocol		**100% screen (Pass/fail)**	**Concentration Range**	**Comments**
Acute	*Daphnia magna* 48-h static acute			
	Rainbow trout 96-h static acute			
Chronic	Salmonid 7d Embryo Viability			
	Fathead minnow 7-d survival and growth			
	Ceriodaphnia dubia 7-d survival and reproduction			
	Selenastrum growth 72-h inhibition			
Sediment	*Hyalella azteca* 10-d survival and growth			
	Hyalella azteca 28-d survival and growth			
	Chironomus dilutus 10-d survival and growth			
Other				Whole sediment (see sop and qapp)

Chain of Custody Record

Relinquished by:			**Received by:**		
Name	Date	Time	Name	Date	Time

USGS
science for a changing world

Columbia Environmental Research Lab
4200 New Haven Road, Columbia, MO 65201
http://www.cerc.usgs.gov

TABLE 10.
AXYS ANALYTICAL SERVICES LTD. CHAIN-OF-CUSTODY FORM.

AXYS | Axys Analytical Services Ltd

Post Office Box 2219, 2045 Mills Road West
Sidney, British Columbia, Canada V8L 3S8
TEL: (250) 655-5800
FAX: (250) 655-5811

CHAIN OF CUSTODY

AXYS CLIENT #:

REPORT TO:	*INVOICE TO:*	ANALYSIS REQUESTED
Company	Company	
Address	Address	
Contact	Contact	
Phone	Phone	
FAX	FAX	
E-mail	E-mail	
Project Name/Number:	Sampler's Name: Signature:	

Client Sample Identification	Matrix	Sampling Date	Sampling Time	Container Type/No.	AXYS Lab Sample ID (Lab use only)					

Relinquished by (Signature)	Date	Time	Received by (Signature) Date Time	Courier	Waybill No.
Relinquished by (Signature)	Date	Time	Received by (Signature) Date Time	Sample Receipt	
Remarks					Cooler
				Temp °C	
				Custody Seal #	
				Seal Intact Y / N	
				Sample Tags Y / N	

TABLE 11.
CHEMICALS OF POTENTIAL CONCERN AND ASSOCIATED PERFORMANCE CRITERIA FOR MEASUREMENT DATA FOR THE INVESTIGATION OF SEDIMENT QUALITY CONDITIONS IN THE UPPER HUDSON RIVER.

Media Type/Group/Substance	Target Detection Limit[1]	Analytical Method	Preliminary Action Level	Target Accuracy (% Spike Recovery)	Target Accuracy (% Surrogate Recovery)	Target Accuracy (Reference Material Recovery)[2]	Target Precision (Relative Percent Difference %)	Target Complete-ness	Lead Responsibility
Sediment									
Metals Target Compound List (mg/kg DW)									
Aluminum	10	EPA 6020	NBA	75-125	NA	Within +/- 20% of 95% confidence interval for true value	20	95%	Alpha Analytical
Antimony	0.05	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Arsenic	0.05	EPA 6020	7.15	75-125	NA		20	95%	Alpha Analytical
Barium	0.05	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Beryllium	0.02	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Cadmium	0.02	EPA 6020	0.991	75-125	NA		20	95%	Alpha Analytical
Calcium	50	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Chromium	0.20	EPA 6020	20.2	75-125	NA		20	95%	Alpha Analytical
Cobalt	0.02	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Copper	0.10	EPA 6020	25.2	75-125	NA		20	95%	Alpha Analytical
Iron	20	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Lead	0.05	EPA 6020	35.3	75-125	NA		20	95%	Alpha Analytical
Magnesium	10	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Manganese	0.2	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Mercury (total)	0.0125	EPA 7474	0.158	75-125	NA		20	95%	Alpha Analytical
Nickel	0.10	EPA 6020	18.7	75-125	NA		20	95%	Alpha Analytical
Potassium	10	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Selenium	0.10	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Silver	0.05	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Sodium	10	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Thallium	0.02	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Vanadium	0.10	EPA 6020	NBA	75-125	NA		20	95%	Alpha Analytical
Zinc	0.5	EPA 6020	124	75-125	NA		20	95%	Alpha Analytical

TABLE 11 (CONTINUED).
CHEMICALS OF POTENTIAL CONCERN AND ASSOCIATED PERFORMANCE CRITERIA FOR MEASUREMENT DATA FOR THE INVESTIGATION OF SEDIMENT QUALITY CONDITIONS IN THE UPPER HUDSON RIVER.

Media Type/Group/Substance	Target Detection Limit[1]	Analytical Method	Preliminary Action Level	Target Accuracy (% Spike Recovery)	Target Accuracy (% Surrogate Recovery)	Target Accuracy (Reference Material Recovery)[2]	Target Precision (Relative Percent Difference %)	Target Completeness	Lead Responsibility
Sediment									
Acid Volatile Sulfides/Simultaneously Extracted Metals (AVS/SEM; umol/g DW)									
Acid Volatile Sulfides	0.625	Lab SOP	NBA	NA	NA	NA	NA	95%	Alpha Analytical
Cadmium	0.0005	EPA 6020	NBA	80-120	NA	Within +/- 20% of 95% confidence interval for true value	20	95%	Alpha Analytical
Copper	0.016	EPA 6020	NBA	80-120	NA		20	95%	Alpha Analytical
Nickel	0.018	EPA 6020	NBA	80-120	NA		20	95%	Alpha Analytical
Lead	0.031	EPA 6020	NBA	80-120	NA		20	95%	Alpha Analytical
Zinc	0.034	EPA 6020	NBA	80-120	NA		20	95%	Alpha Analytical
Conventionals (%)									
Total Organic Carbon	0.01	EPA 9060A	NBA	NA	NA	Within +/- 20% of 95% confidence interval for true value	15 *	95%	Alpha Analytical
Moisture	0.01	Lab SOP	NBA	NA	NA		15	95%	All
Grain size (gravel, coarse sand, medium sand, very fine sand, silt/clay)	0.01	ASTM D422	NBA	NA	NA		15	95%	Alpha Analytical
Polychlorinated Biphenyls (PCBs; ng/g DW)									
PCB Coplanar Congeners (77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169, 189)	0.001	EPA 1668A	NBA	50-125	25-150	Within +/- 20% of 95% confidence interval for true value	30	95%	AXYS Analytical
PCB Congener Target List (8,18,28,31,44,45,47,49,52,56,66,70,74,77,81,87,95,99,101,105,110,114,118,123,126,128,138,146,149,151,153,156,157,158,167,169,170,174,177,180,183,187,189,194,195,201,206,209)	0.1	EPA 1668A	NBA	50-125	25-150		30	95%	AXYS Analytical

TABLE 11 (CONTINUED).
CHEMICALS OF POTENTIAL CONCERN AND ASSOCIATED PERFORMANCE CRITERIA FOR MEASUREMENT DATA FOR THE INVESTIGATION OF SEDIMENT QUALITY CONDITIONS IN THE UPPER HUDSON RIVER.

Media Type/Group/Substance	Target Detection Limit[1]	Analytical Method	Preliminary Action Level	Target Accu-racy (% Spike Recovery)	Target Accuracy (% Surrogate Recovery)	Target Accuracy (Reference Material Recovery)[2]	Target Precision (Relative Percent Difference %)	Target Complete-ness	Lead Responsibility
Sediment									
Polychlorinated Biphenyls (PCBs; ng/g DW; cont.)									
PCB Homologues (Total Monochlorobiphenyls, Total Dichlorobiphenyls, Total Trichlorobiphenyls, Total Tetrachlorobiphenyls, Total Pentachlorobiphenyls, Total Hexachlorobiphenyls, Total Heptachlorobiphenyls, Total Octachlorobiphenyls, Total Nonachlorobiphenyls,	10	EPA 1668A	NBA	50-125	25-150 (15-150 for monochloro biphenyls)	NA	30	95%	AXYS Analytical
Screening Data *- Total PCBs as summation of homologues (Total Monochlorobiphenyls, Total Dichlorobiphenyls, Total Trichlorobiphenyls, Total Tetrachlorobiphenyls, Total Pentachlorobiphenyls, Total Hexachlorobiphenyls, Total Heptachlorobiphenyls, Total Octachlorobiphenyls, Total Nonachlorobiphenyls, Total Decachlorobiphenyl)*	100	EPA 8270C (mod.)	NBA	50-125		NA	30	95%	Alpha Analytical

TABLE 11 (CONTINUED).

CHEMICALS OF POTENTIAL CONCERN AND ASSOCIATED PERFORMANCE CRITERIA FOR MEASUREMENT DATA FOR THE INVESTIGATION OF SEDIMENT QUALITY CONDITIONS IN THE UPPER HUDSON RIVER.

Media Type/Group/ Substance	Target Detection Limit[1]	Analytical Method	Preliminary Action Level	Target Accuracy (% Spike Recovery)	Target Accuracy (% Surrogate Recovery)	Target Accuracy (Reference Material Recovery)[2]	Target Precision (Relative Percent Difference %)	Target Completeness	Lead Responsibility
Sediment									
Pesticides (ng/g DW)									
Aldrin	0.02	Isotope Dilution - HRMS/HRGC	2	70-130	30-130	Within +/- 20% of 95% confidence interval for true value	30	95%	AXYS Analytical
alpha-BHC	0.02	Isotope Dilution - HRMS/HRGC	6	70-130	30-130		30	95%	AXYS Analytical
beta-BHC	0.02	Isotope Dilution - HRMS/HRGC	5	70-130	30-130		30	95%	AXYS Analytical
gamma-BHC (Lindane)	0.02	Isotope Dilution - HRMS/HRGC	2.33	70-130	30-130		30	95%	AXYS Analytical
alpha-Chlordane	0.02	Isotope Dilution - HRMS/HRGC	2.62	70-130	30-130		30	95%	AXYS Analytical
gamma-Chlordane	0.02	Isotope Dilution - HRMS/HRGC	2.62	70-130	30-130		30	95%	AXYS Analytical
Chlordane (technical)	0.02	Isotope Dilution - HRMS/HRGC	NBA	70-130	30-130		30	95%	AXYS Analytical
2,4-DDD	0.02	Isotope Dilution - HRMS/HRGC	NBA	70-130	30-130		30	95%	AXYS Analytical
2,4-DDE	0.02	Isotope Dilution - HRMS/HRGC	NBA	70-130	30-130		30	95%	AXYS Analytical
2,4-DDT	0.02	Isotope Dilution - HRMS/HRGC	NBA	70-130	30-130		30	95%	AXYS Analytical
4,4-DDD	0.02	Isotope Dilution - HRMS/HRGC	5.09	70-130	30-130		30	95%	AXYS Analytical
4,4-DDE	0.02	Isotope Dilution - HRMS/HRGC	2.61	70-130	30-130		30	95%	AXYS Analytical
4,4-DDT	0.02	Isotope Dilution - HRMS/HRGC	2.66	70-130	30-130		30	95%	AXYS Analytical
Dieldrin	0.02	Isotope Dilution - HRMS/HRGC	4.93	70-130	30-130		30	95%	AXYS Analytical
Endosulfan I	0.02	Isotope Dilution - HRMS/HRGC	2.97	70-130	30-130		30	95%	AXYS Analytical
Endosulfan II	0.02	Isotope Dilution - HRMS/HRGC	9.43	70-130	30-130		30	95%	AXYS Analytical
Endosulfan sulfate	0.02	Isotope Dilution - HRMS/HRGC	NBA	70-130	30-130		30	95%	AXYS Analytical
Endrin	0.02	Isotope Dilution - HRMS/HRGC	4.6	70-130	30-130		30	95%	AXYS Analytical
Endrin aldehyde	0.02	Isotope Dilution - HRMS/HRGC	480	70-130	30-130		30	95%	AXYS Analytical
Endrin ketone	0.02	Isotope Dilution - HRMS/HRGC	NBA	70-130	30-130		30	95%	AXYS Analytical
Heptachlor	0.02	Isotope Dilution - HRMS/HRGC	5.37	70-130	30-130		30	95%	AXYS Analytical

TABLE 11 (CONTINUED).
CHEMICALS OF POTENTIAL CONCERN AND ASSOCIATED PERFORMANCE CRITERIA FOR MEASUREMENT DATA FOR THE INVESTIGATION OF SEDIMENT QUALITY CONDITIONS IN THE UPPER HUDSON RIVER.

Media Type/Group/ Substance	Target Detection Limit[1]	Analytical Method	Preliminary Action Level	Target Accuracy (% Spike Recovery)	Target Accuracy (% Surrogate Recovery)	Target Accuracy (Reference Material Recovery)[2]	Target Precision (Relative Percent Difference %)	Target Complete-ness	Lead Responsibility
Sediment									
Pesticides (ng/g DW; cont.)									
Heptachlor epoxide	0.02	Isotope Dilution - HRMS/HRGC	1.73	70-130	30-130	Within +/- 20% of 95% confidence interval for true value	30	95%	AXYS Analytical
Hexachlorobenzene	0.02	Isotope Dilution - HRMS/HRGC	55.2	70-130	30-130		30	95%	AXYS Analytical
Methoxychlor	0.04	Isotope Dilution - HRMS/HRGC	14.1	70-130	30-130		30	95%	AXYS Analytical
cis-Nonachlor	0.02	Isotope Dilution - HRMS/HRGC	NBA	70-130	30-130		30	95%	AXYS Analytical
trans-nonachlor	0.02	Isotope Dilution - HRMS/HRGC	NBA	70-130	30-130		30	95%	AXYS Analytical
Oxychlordane	0.02	Isotope Dilution - HRMS/HRGC	NBA	70-130	30-130		30	95%	AXYS Analytical
Toxaphene	0.05	Isotope Dilution - HRMS/HRGC	2.79	70-130	30-130		30	95%	AXYS Analytical
Dioxins & Furans (ng/g DW)									
2,3,7,8-TCDD	0.0005	EPA 8290A/ EPA 1613B	0.00138	70-130	30-130	Within +/- 20% of 95% confidence interval for true value	30	95%	AXYS Analytical
1,2,3,7,8-PeCDD	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
1,2,3,4,7,8-HxCDD	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
1,2,3,6,7,8-HxCDD	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
1,2,3,7,8,9-HxCDD	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
1,2,3,4,6,7,8-HpCDD	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
OCDD	0.0025	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
Dioxin Homologues (Total Tetradioxins, Total Pentadioxins, Total Hexadioxins,	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical

TABLE 11 (CONTINUED).

CHEMICALS OF POTENTIAL CONCERN AND ASSOCIATED PERFORMANCE CRITERIA FOR MEASUREMENT DATA FOR THE INVESTIGATION OF SEDIMENT QUALITY CONDITIONS IN THE UPPER HUDSON RIVER.

Media Type/Group/Substance	Target Detection Limit[1]	Analytical Method	Preliminary Action Level	Target Accuracy (% Spike Recovery)	Target Accuracy (% Surrogate Recovery)	Target Accuracy (Reference Material Recovery)[2]	Target Precision (Relative Percent Difference %)	Target Completeness	Lead Responsibility
Sediment									
Dioxins & Furans (ng/g DW; cont.)									
2,3,7,8-TCDF	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130	Within +/- 20% of 95% confidence interval for true value	30	95%	AXYS Analytical
1,2,3,7,8-PeCDF	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
2,3,4,7,8-PeCDF	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
1,2,3,4,7,8-HxCDF	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
1,2,3,7,8,9-HxCDF	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
2,3,4,6,7,8-HxCDF	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
1,2,3,4,6,7,8-HpCDF	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
1,2,3,4,7,8,9-HpCDF	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical
Furan Homologues (Total Tetrafurans, Total Pentafurans, Total Hexafurans,	0.0005	EPA 8290A/ EPA 1613B	NBA	70-130	30-130		30	95%	AXYS Analytical

TABLE 11 (CONTINUED).
CHEMICALS OF POTENTIAL CONCERN AND ASSOCIATED PERFORMANCE CRITERIA FOR MEASUREMENT DATA FOR THE INVESTIGATION OF SEDIMENT QUALITY CONDITIONS IN THE UPPER HUDSON RIVER.

Media Type/Group/Substance	Target Detection Limit[1]	Analytical Method	Preliminary Action Level	Target Accuracy (% Spike Recovery)	Target Accuracy (% Surrogate Recovery)	Target Accuracy (Reference Material Recovery)[2]	Target Precision (Relative Percent Difference %)	Target Com-pleteness	Lead Responsibility
Sediment									
Parent and Alkylated Polycyclic Aromatic Hydrocarbons (PAHs; µg/kg DW); *Parent Compounds in* ***Bold*** *Type*									
Acenaphthylene	1.0	GC/MS-SIM; EPA 8270C	78.3	50-130	30-150	Within +/- 20% of 95% confidence interval for true value	30	95%	Alpha Analytical
Acenaphthene	1.0	GC/MS-SIM; EPA 8270C	98.3	50-130	30-150		30	95%	Alpha Analytical
Anthracene	1.0	GC/MS-SIM; EPA 8270C	151	50-130	30-150		30	95%	Alpha Analytical
Benz(a)anthracene	1.0	GC/MS-SIM; EPA 8270C	132	50-130	30-150		30	95%	Alpha Analytical
Benzo(a)pyrene	1.0	GC/MS-SIM; EPA 8270C	205	50-130	30-150		30	95%	Alpha Analytical
Benzo(b)fluoranthene	1.0	GC/MS-SIM; EPA 8270C	4740	50-130	30-150		30	95%	Alpha Analytical
Benzo(e)pyrene	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
Benzo(g,h,i)perylene	1.0	GC/MS-SIM; EPA 8270C	252	50-130	30-150		30	95%	Alpha Analytical
Benzo(k)fluoranthene	1.0	GC/MS-SIM; EPA 8270C	139	50-130	30-150		30	95%	Alpha Analytical
Chrysene	1.0	GC/MS-SIM; EPA 8270C	195	50-130	30-150		30	95%	Alpha Analytical
C1-Chrysenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C2-Chrysenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C3-Chrysenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C4-Chrysenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
Dibenz(a,h)anthracene	1.0	GC/MS-SIM; EPA 8270C	59.6	50-130	30-150		30	95%	Alpha Analytical
Dibenzofuran	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
Dibenzothiophene	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C1-Dibenzothiophenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C2-Dibenzothiophenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C3-Dibenzothiophenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C4-Dibenzothiophenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical

Table 11 (continued).

Chemicals of potential concern and associated performance criteria for measurement data for the investigation of sediment quality conditions in the upper Hudson River.

Media Type/Group/Substance	Target Detection Limit[1]	Analytical Method	Preliminary Action Level	Target Accuracy (% Spike Recovery)	Target Accuracy (% Surrogate Recovery)	Target Accuracy (Reference Material Recovery)[2]	Target Precision (Relative Percent Difference %)	Target Complete-ness	Lead Responsibility
Sediment									
Parent and Alkylated Polycyclic Aromatic Hydrocarbons (PAHs; µg/kg DW; cont.); *Parent Compounds in* ***Bold*** *Type*									
Fluoranthene	1.0	GC/MS-SIM; EPA 8270C	505	50-130	30-150	Within +/- 20% of 95% confi-dence interval for true value	30	95%	Alpha Analytical
C1-Fluoranthenes/Pyrenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C2-Fluoranthenes/Pyrenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C3-Fluoranthenes/Pyrenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C4-Fluoranthenes/Pyrenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
Fluorene	1.0	GC/MS-SIM; EPA 8270C	84.1	50-130	30-150		30	95%	Alpha Analytical
C1-Fluorenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C2-Fluorenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C3-Fluorenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
Indeno(1,2,3-c,d)pyrene	1.0	GC/MS-SIM; EPA 8270C	193	50-130	30-150		30	95%	Alpha Analytical
1-Methylnaphthalene	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
2-Methylnaphthalene	1.0	GC/MS-SIM; EPA 8270C	114	50-130	30-150		30	95%	Alpha Analytical
Naphthalene	1.0	GC/MS-SIM; EPA 8270C	176	50-130	30-150		30	95%	Alpha Analytical
C1-Naphthalenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C2-Naphthalenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C3-Naphthalenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C4-Naphthalenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
Perylene	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
Phenanthrene	1.0	GC/MS-SIM; EPA 8270C	234	50-130	30-150		30	95%	Alpha Analytical
C1-Phenanthrenes/Anthracenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C2-Phenanthrenes/Anthracenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C3-Phenanthrenes/Anthracenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
C4-Phenanthrenes/Anthracenes	1.0	GC/MS-SIM; EPA 8270C	NBA	50-130	30-150		30	95%	Alpha Analytical
Pyrene	1.0	GC/MS-SIM; EPA 8270C	360	50-130	30-150		30	95%	Alpha Analytical

Notes:

[1] Target reporting limits from Hudson River NRDA QAPP for all but AVS/SEM, TAL metals and PAHs.

[2] Appropriate sediment reference materials will be chosen to represent a subset of analytes for each analysis.

TABLE 12.
SAMPLING EQUIPMENT REQUIRED TO SUPPORT THE SEPTEMBER 2008 UPPER HUDSON RIVER FIELD SAMPLING PROGRAM.

Item	Volume / Number
Cleaning Supplies	
• Alconox solution	2 X 1 L
• Long bristle scrub brush	42
• Acetone - (Reagent Grade)	2 L
• Polyethylene squeeze bottles	4 x 1 L
• Waste bucket - boat	4 x 20 L
• Deionized/reverse osmosis water	4 L
• Trash bags	1 box
• Disposable rags	1 box
• Methanol	2 L
General Sampling Supplies	
• Maps of the study area	3
• Sample collection forms	3
• Van Veen grab sampler	2
• Ekman grab sampler - 9" x 9"	1
• Extra ekman cables	1
• Extra ekman springs	1
• Ekman weight kits	2
• Grab sample buckets with lids (20 L)	45
• Sub-sample containers	
- Glass bottles - 250 mL prewashed	160
- Glass bottles - 125 mL prewashed (congener SPME)	45
- Polyethylene bottles - 2 L prewashed (archiving)	45
- EP Scientific HDPE Wide-Mouth Containers > 4 LT	130
• Labels for sample containers	NA
• Stainless steel spoon - large	3
• Stainless steel spoon - small	3
• Stainless steel pan (approximately 18" x 12" x 4")	3
• Write in rain field paper/forms	some
• Clipboards for filling out field forms	2
• Digital camera with accessories	2
• Safety glasses	6
• Latex gloves - non-powdered	3 boxes of 50
• Siphon/pump for removing excess water from sampler (polyethylene)	2
• Stainless steel or teflon spatula	3

TABLE 12 (CONTINUED).
SAMPLING EQUIPMENT REQUIRED TO SUPPORT THE SEPTEMBER 2008 UPPER HUDSON RIVER FIELD SAMPLING PROGRAM.

Item	Volume / Number
General Sampling Supplies (continued)	
• 18' aluminum boat	2
• Boat anchor	4
• Winch	2
• Winch Mount (either basic or gunwale)	2
• Sieve bucket (2mm)	4
• Lexan plastic core tubes (4" diameter)	15 x 10'
• Plastic core tube plugs (4" diameter)	440
• Chest waders (or hip waders?)	2
• 10 foot lengths of 1" PVC tubing (was 4 ft)	30
• Flagging tape	3 rolls
• Buoys	30
• Spindle of heavy twine	1
• Weights	30
• Shovel	4
• Measuring tape	1
• Pocket knife	1
• Measurement device (water depth)	2
Sample Processing/Sampling Supplies	
• 24' refrigerator truck	1
• Sharpie pens (different sizes)	1 box
• Clear packing tape	15 rolls
• Electrical tape	12 rolls
• Paper towels	12 rolls
• Large Ziploc bags	2-3 boxes
• Open-sided tent	1
• Fold-up table	1
• Labeling tape	several rolls
• Lawn chairs	3
• Drill and auger	1
• Generator	1
• Extension cords	2
• Gas jerry can	1
• Ethanol (95%)	8 L

TABLE 12 (CONTINUED).
SAMPLING EQUIPMENT REQUIRED TO SUPPORT THE SEPTEMBER 2008 UPPER HUDSON RIVER FIELD SAMPLING PROGRAM.

Item	Volume / Number
Measurement Supplies	
• GPS (Trimble differentially corrected)	2
• GPS (handheld backup)	2
Shipping and Storage Supplies	
• Plastic coolers - 48-L	2
• Blue ice to maintain samples at 4oC	Volume as needed (for 2 coolers)
• Bubble wrap / packing material	As needed (for 2 coolers)
• Chain of custody forms	pre-prepared
• Sample and sub-sample inventory form	1
• Rubbermaid bins	As needed
Personal Supplies	
• First Aid Kit	1
• Personal Flotation Devices	One each
• Coolers for onsite food and beverage	2 x 48 L
• Knee pads	4
• Work gloves	NA
• Long-sleeved shirts	NA
• Rubber boots	NA
• Long pants	NA
• Rain pants/jacket	NA
• Fanny pack or back pack	NA
• Hat	NA
• Suntan lotion	NA
Miscellaneous Supplies for the Field Command Post / Sample Processing Station	
• Masterlocks for coolers, trucks	2
• File folders and plastic filing cabinet	1
• Extension cords	1
• Tool kit	1
• Walkie-talkies	3
• Scissors	1
• Pencils	10
• Packing tape dispenser	1
• Field Sampling Plan	2
• Ruler (long and short)	1
• Rope	2
• Zap straps	Many
• HSP	1

TABLE 13.

ANALYTICAL METHODS, SAMPLE VOLUME REQUIREMENTS, CONTAINER MATERIALS AND SIZE, PRESERVATION METHODS, AND HOLDING TIMES FOR THE SUB-SAMPLES OF LARGE-VOLUME SEDIMENT SAMPLES FROM THE UPPER HUDSON RIVER.

Medium	Analyte Group	Responsible Laboratory	Number of Samples	Analytical Method	Container Material	Container Volume	Minimum Sample Volume[1]	Preservation Method[2]	Recommended Holding Time[3]
Sediment	TAL Metals	Alpha Analytical	12	EPA 3050B, 6020A	Glass	250 mL	10 g	0-6°C	6 months
	Mercury	Alpha Analytical	12	EPA 7474	*Same container[4]*		2 g	0-6°C	28 days
	SEM	Alpha Analytical	12	Lab SOP and EPA 6020A	Glass septa vial	30 mL	25 g	0-6°C	14 days
	AVS	Alpha Analytical	12	Lab SOP	*Same container3*				
	tPCB homologues	Alpha Analytical	54	EPA 3570, 8270 mod	Glass	250 mL	10 g	0-6°C	14 days / 1 yr
	PAHs (Parent & Alkylated)	Alpha Analytical	12	EPA 3570, 8270 mod	*Same container[4]*		10 g	0-6°C	14 days / 1 yr
	TOC	Alpha Analytical	54	EPA 9060	*Same container[4]*		10 g	0-6°C	28 days
	% Moisture	Alpha Analytical	12	Lab SOP	*Same container[4]*		10 g	0-6°C	as practical
	Grain Size	Alpha Analytical	12	ASTM D422	Plastic bag	NA	120 mL	0-6°C	as practical
	PCB congeners[5]	AXYS Analytical	12	EPA 3540C, 1668A	Glass (amber)	250 mL	50 g	0-6°C	14 days / 1 yr
	OC Pesticides w/Toxaphene	AXYS Analytical	12	EPA 3540C, Lab SOP	*Same container[4]*		10 g	0-6°C	14 days / 1 yr
	PCDDs/PCDFs	AXYS Analytical	12	EPA 3540C, 1613B	*Same container[4]*				
	% Moisture	AXYS Analytical	12	Lab SOP	*Same container[4]*		10 g	0-6°C	as practical
Pore water (generated from sediment)	pH[6]	CERC	13	Ion Analyzer	Glass or HDPE	125 mL	125 mL	none	ASAP (4 hr)
	Ammonia[6]	CERC	13	Ion Analyzer	Glass or HDPE	125 mL	125 mL	0-6°C pH<2 w/H_2SO_4	28 days
	Sulfide (free)[6]	CERC	13	Ion specific electrode	Glass or HDPE	125 mL	125 mL	0-6°C pH>12 w/2N ZnAcetate/NaOH	7 days
SPME[7]	PCB congeners	Southern Illinois University	13	EPA 1668A	Glass	125 mL	125 mL	0-6°C	1 yr / 1 yr
	PCB homologues	Southern Illinois University	13	LRMS-SIM; EPA 8270 mod	*From same container and sample listed above.*				

[1] Approximated volumes. Additional containers will be required for QC samples.

[2] Samples may also be frozen and held at <-10°C to extend the recommended holding times for chemical analyses.

[3] Commonly referenced recommended holding times may not be relevant to this study.

[4] Sample aliquots for multiple analyses may come from the same container.

[5] Individual Aroclors and homologue totals will be derived from the reported PCB congener data and included in the final analytical report.

[6] These analyses are being performed to collect information to support the interpretation of the toxicity tests.

[7] If these analyses are conducted.

FIGURES

FIGURE 1: PHASE 1 DREDGE PRISMS (BB&L 2006).

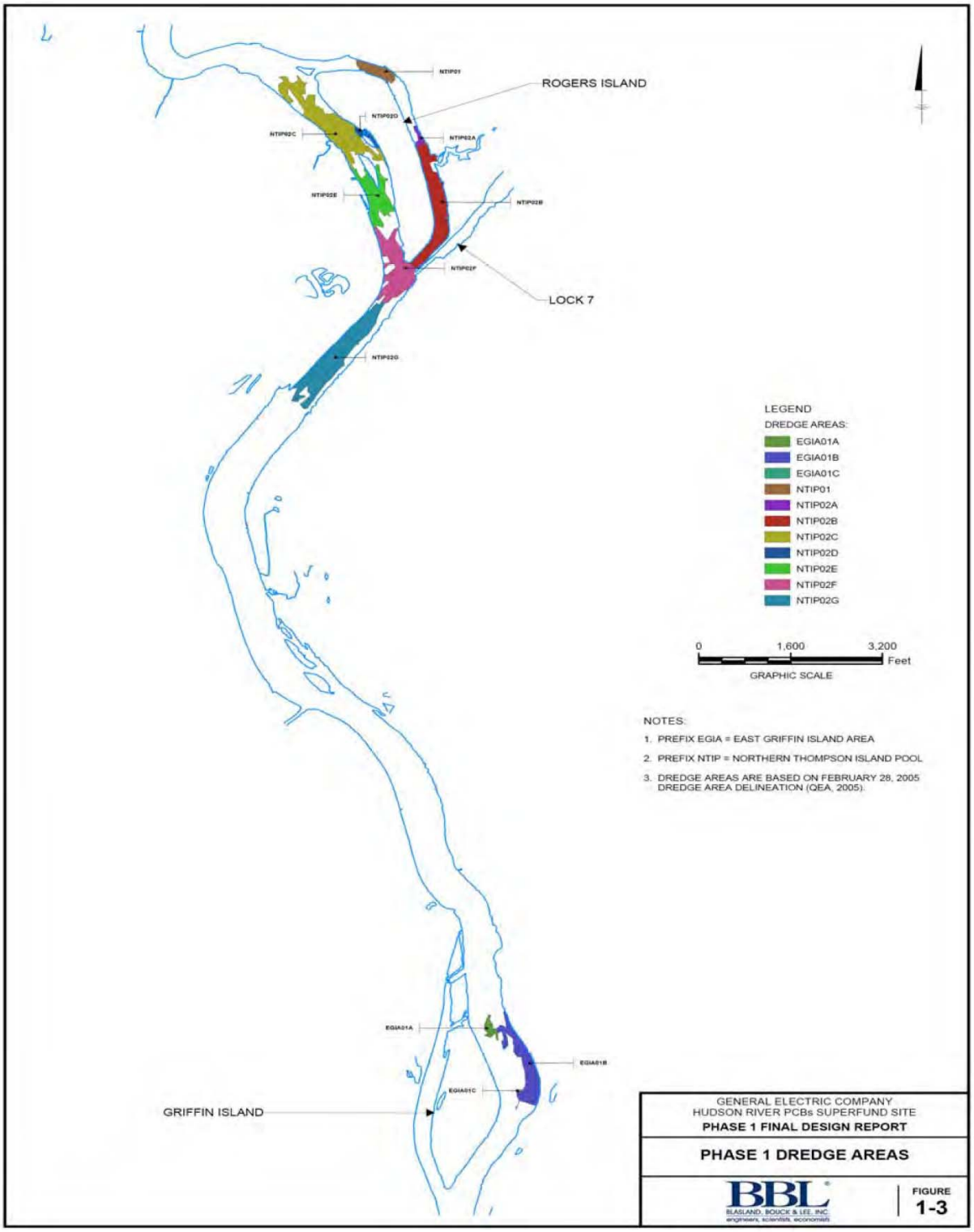


FIGURE 2: PHASE 1 AND 2 GENERAL DREDGE AREAS (DREDGE PRISMS NOT DEPICTED; BB&L 2006).

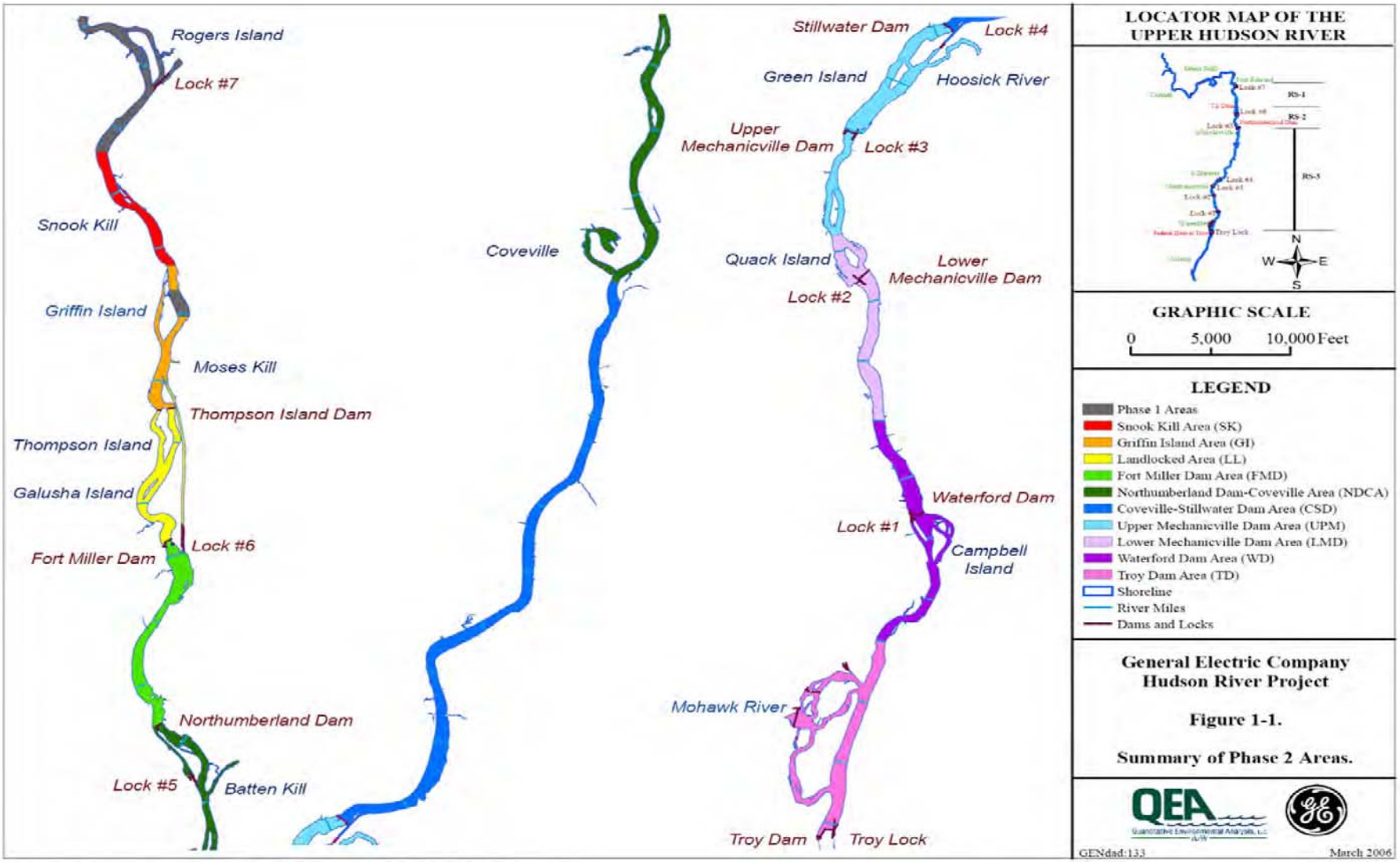


FIGURE 3: LOCATIONS OF PRIMARY SAMPLING STATIONS FOR COLLECTING LARGE-VOLUME SEDIMENT SAMPLES FROM THE NORTHERN PORTION OF THE UPPER HUDSON RIVER.

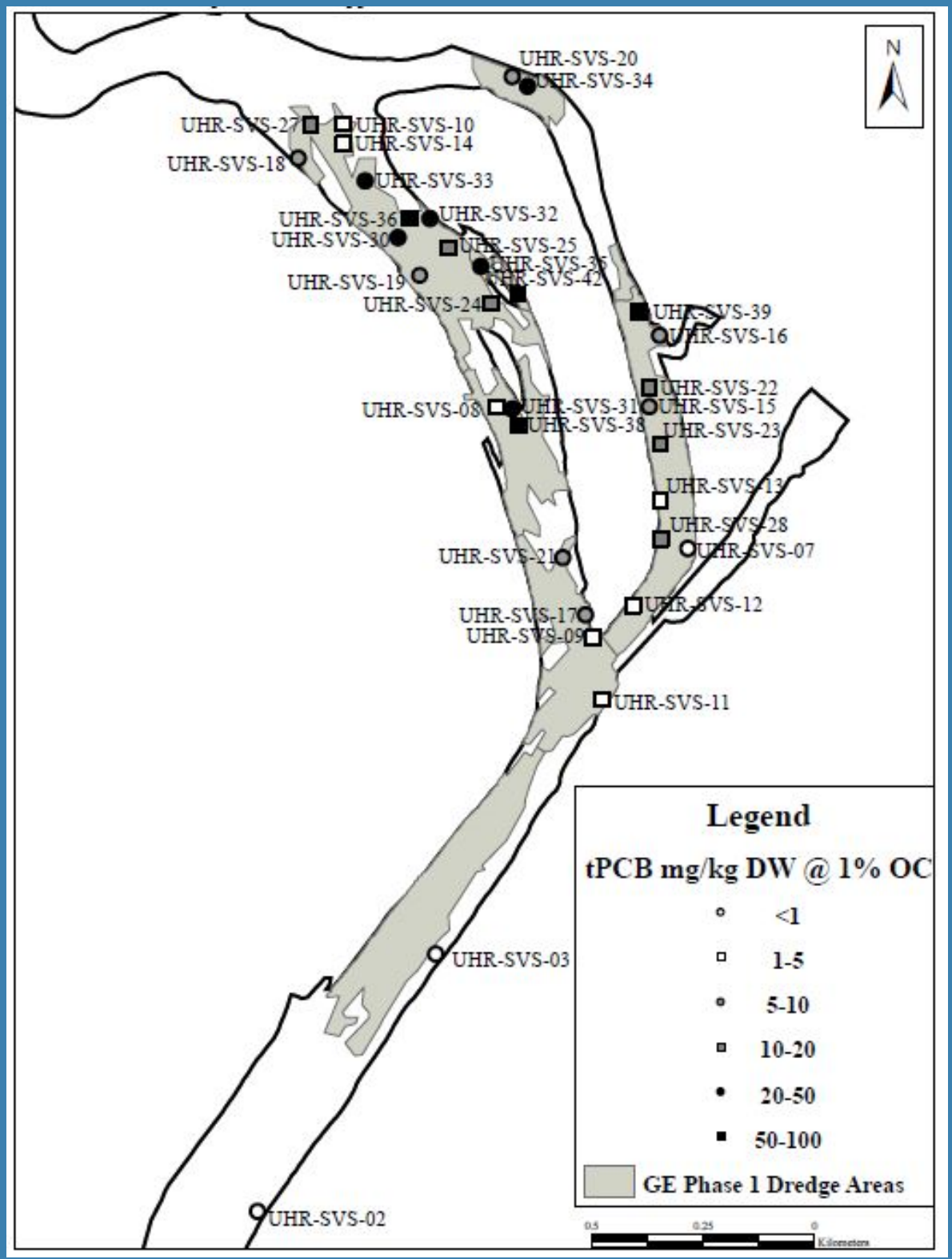


FIGURE 4: LOCATIONS OF PRIMARY SAMPLING STATIONS FOR COLLECTING LARGE-VOLUME SEDIMENT SAMPLES FROM THE SOUTHERN PORTION OF THE UPPER HUDSON RIVER.

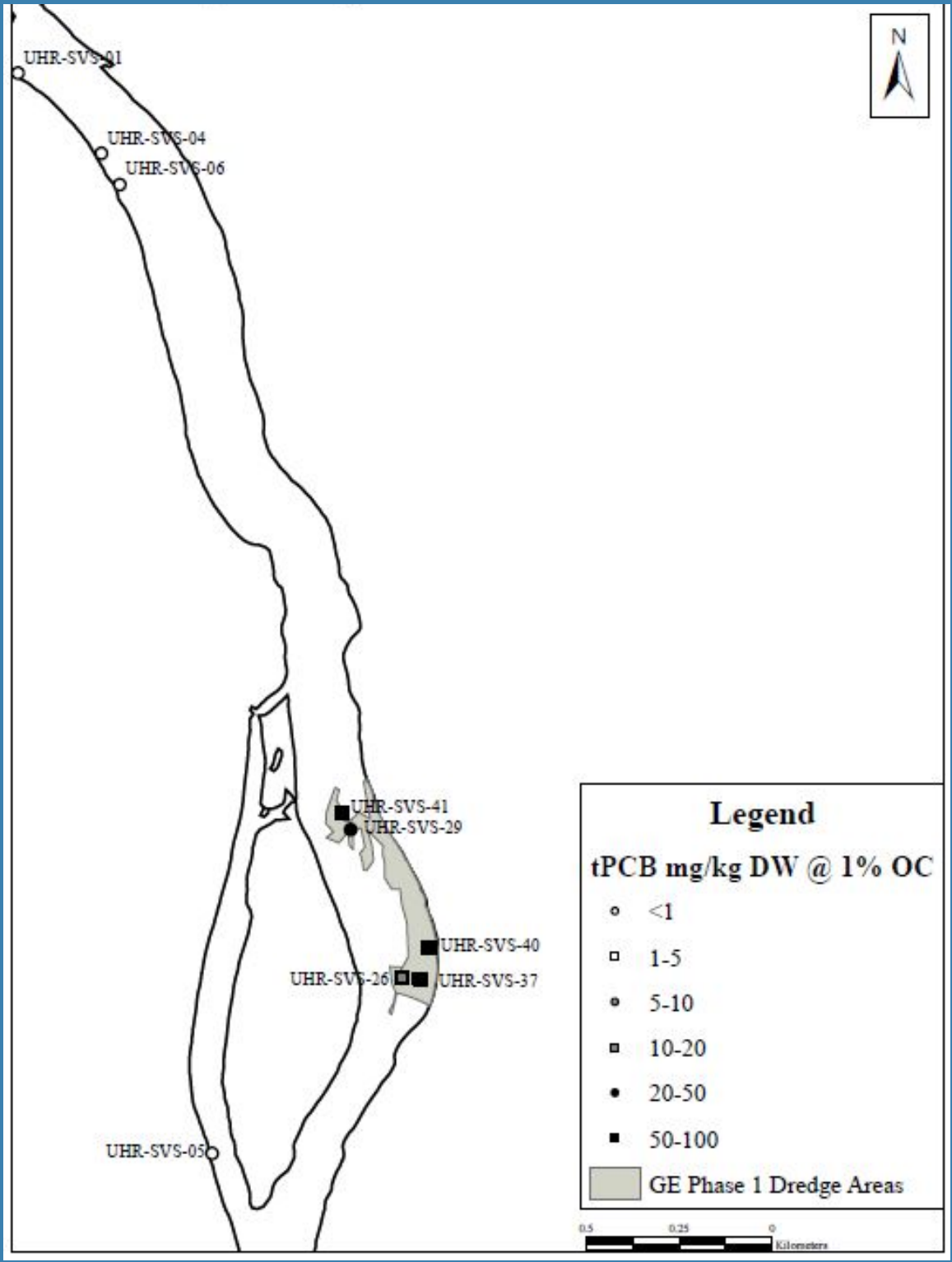


FIGURE 5: LOCATIONS OF ALTERNATE SAMPLING STATIONS FOR COLLECTING LARGE-VOLUME SEDIMENT SAMPLES FROM THE NORTHERN PORTION OF THE UPPER HUDSON RIVER.

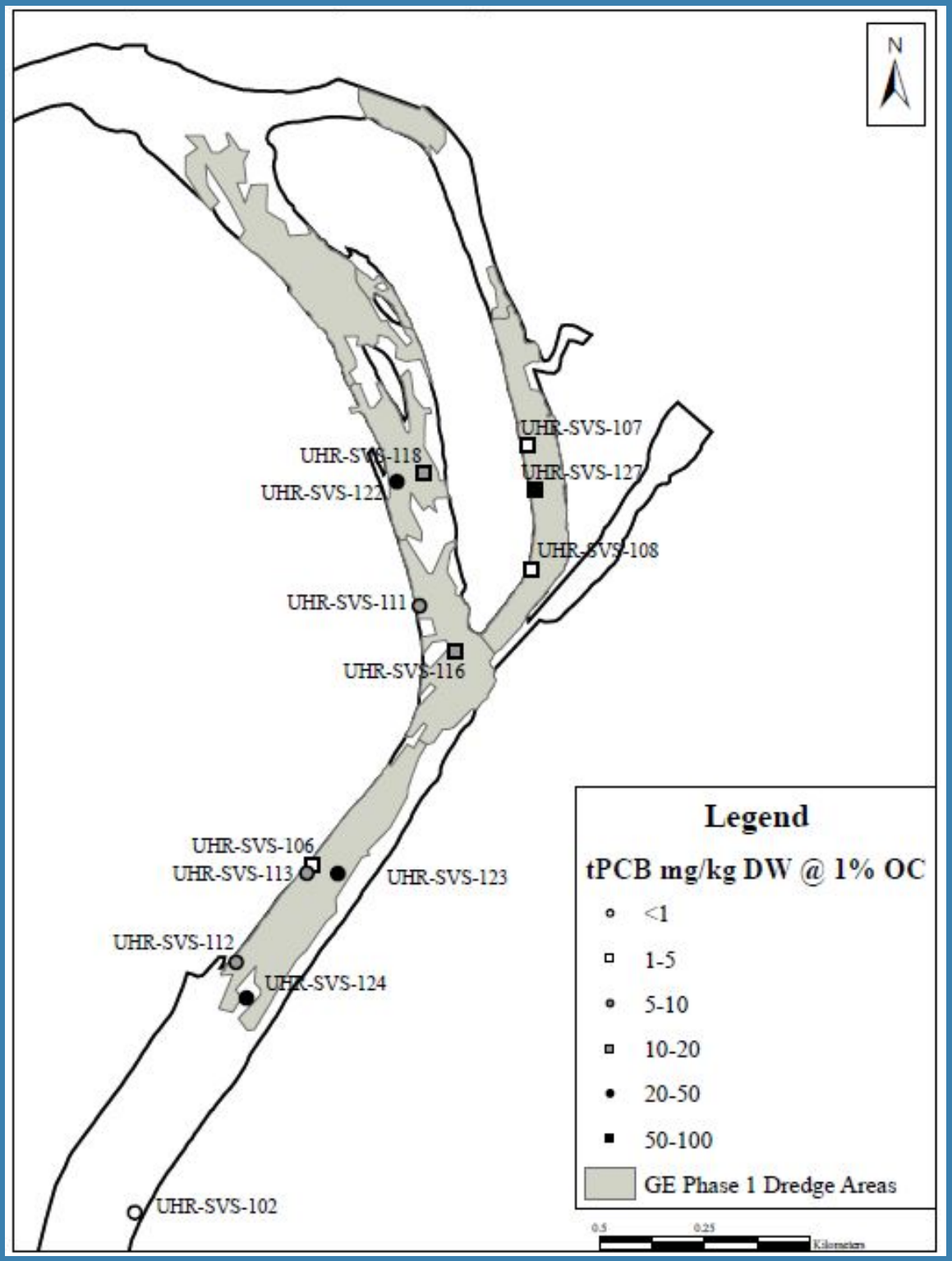


FIGURE 6: LOCATIONS OF ALTERNATE SAMPLING STATIONS FOR COLLECTING LARGE-VOLUME SEDIMENT SAMPLES FROM THE SOUTHERN PORTION OF THE UPPER HUDSON RIVER.

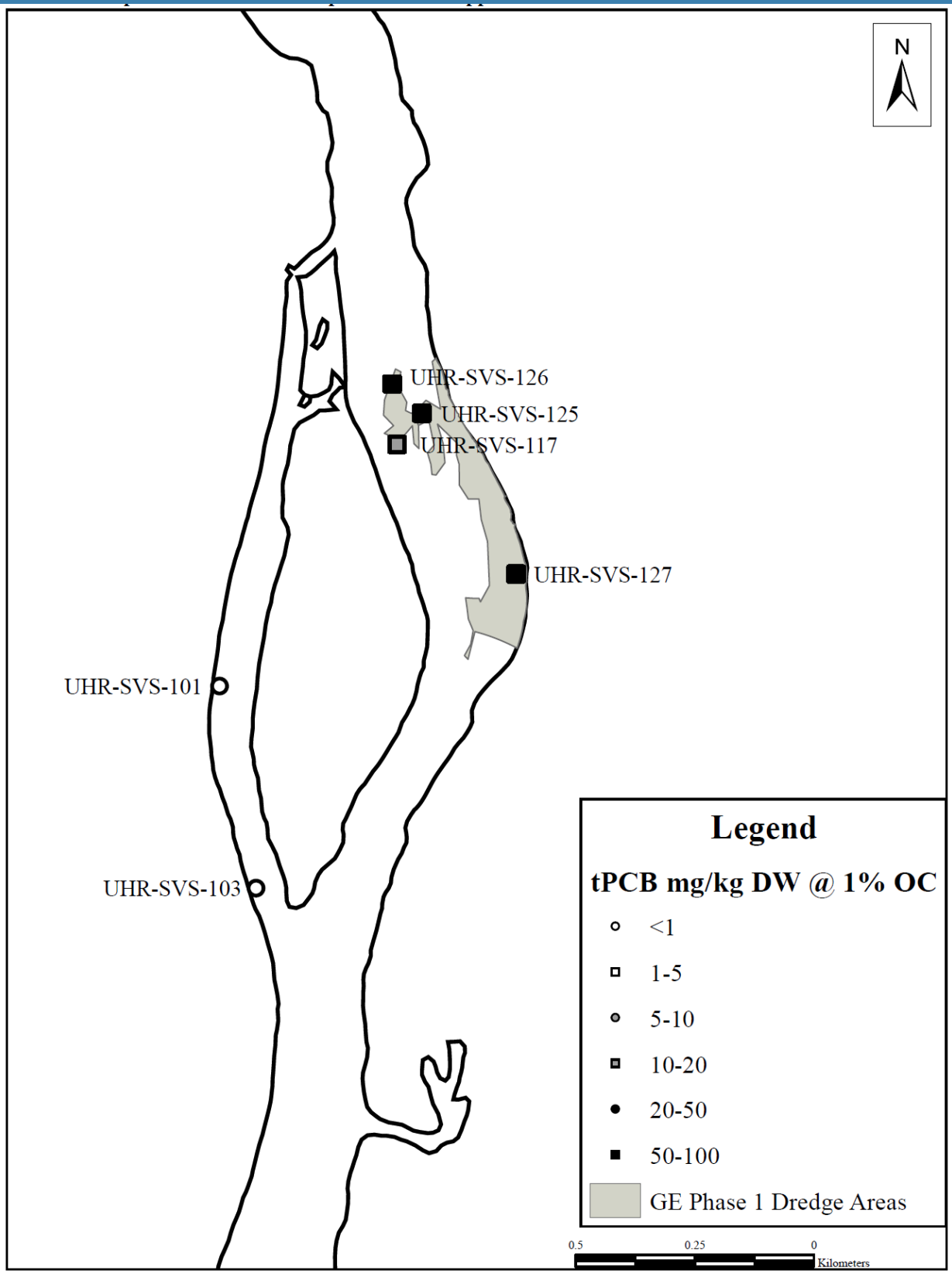


FIGURE 7: LOCATIONS OF ACTUAL SAMPLING STATIONS WITHIN THE NORTHERN PORTION OF THE UPPER HUDSON RIVER.

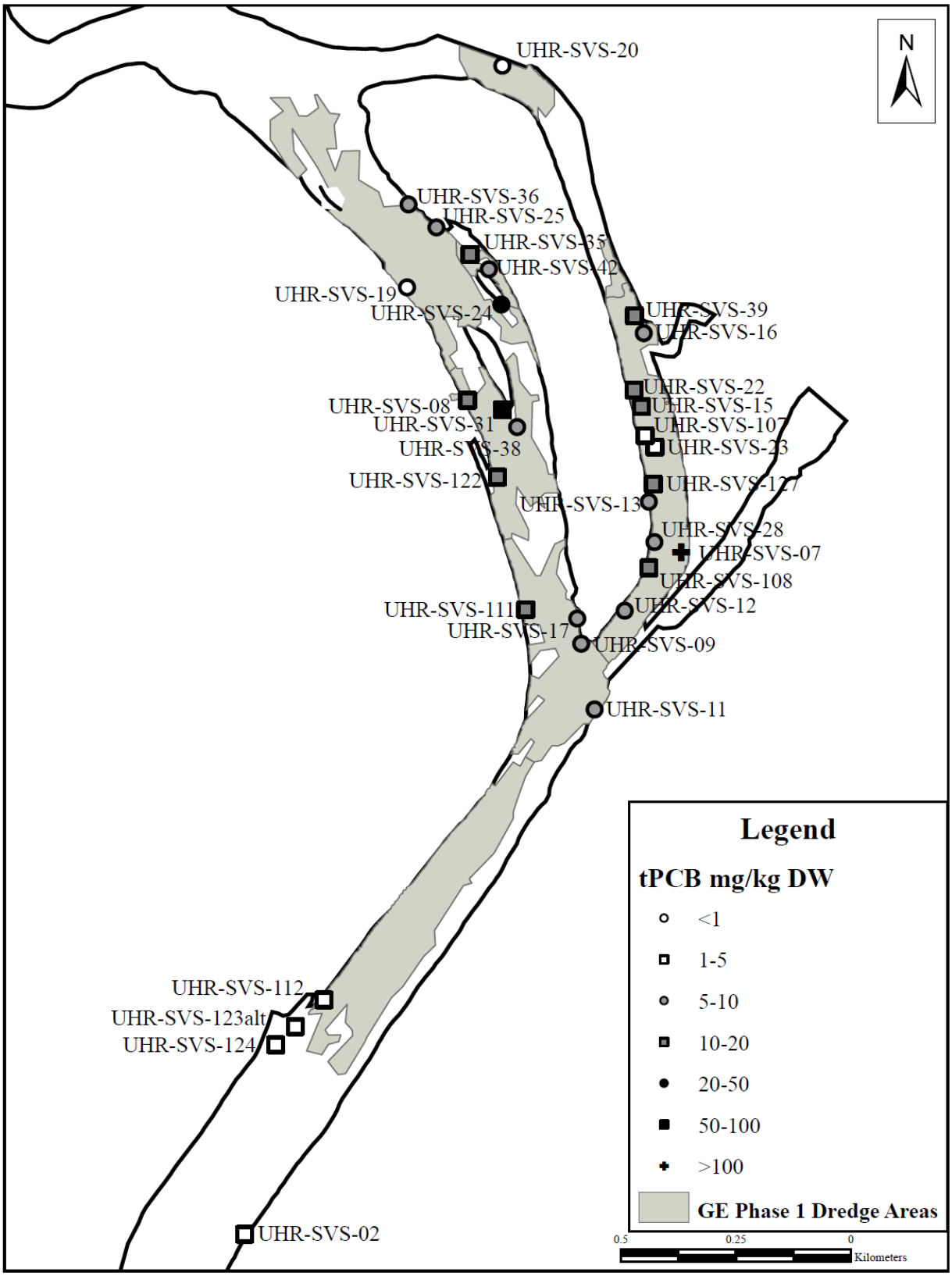


FIGURE 8: LOCATIONS OF ACTUAL SAMPLING STATIONS WITHIN THE SOUTHERN PORTION OF THE UPPER HUDSON RIVER.

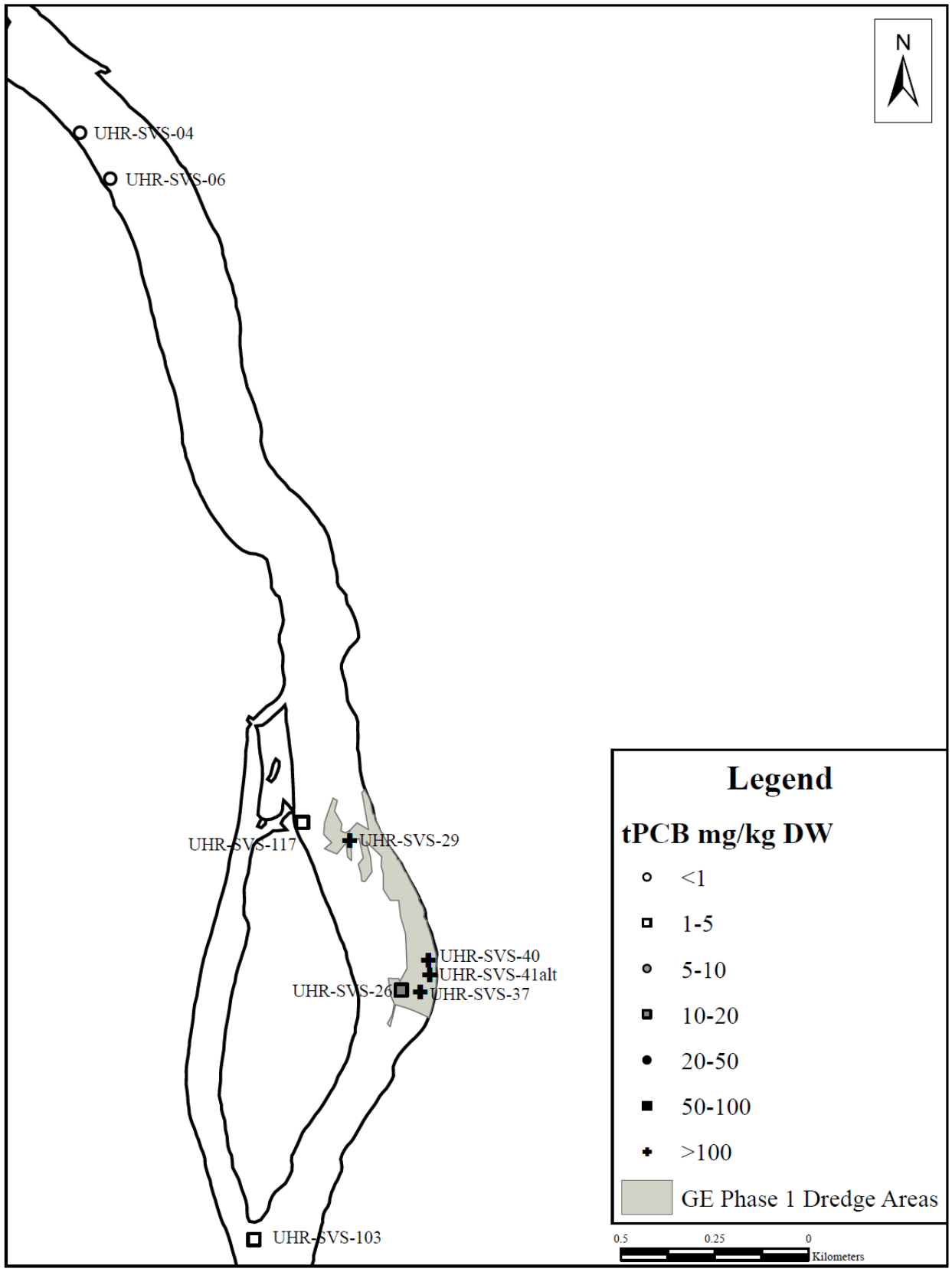


FIGURE 9: LOCATIONS OF ACTUAL SAMPLING STATIONS WITHIN THE REFERENCE AREAS OF THE UPPER HUDSON RIVER STUDY AREA.

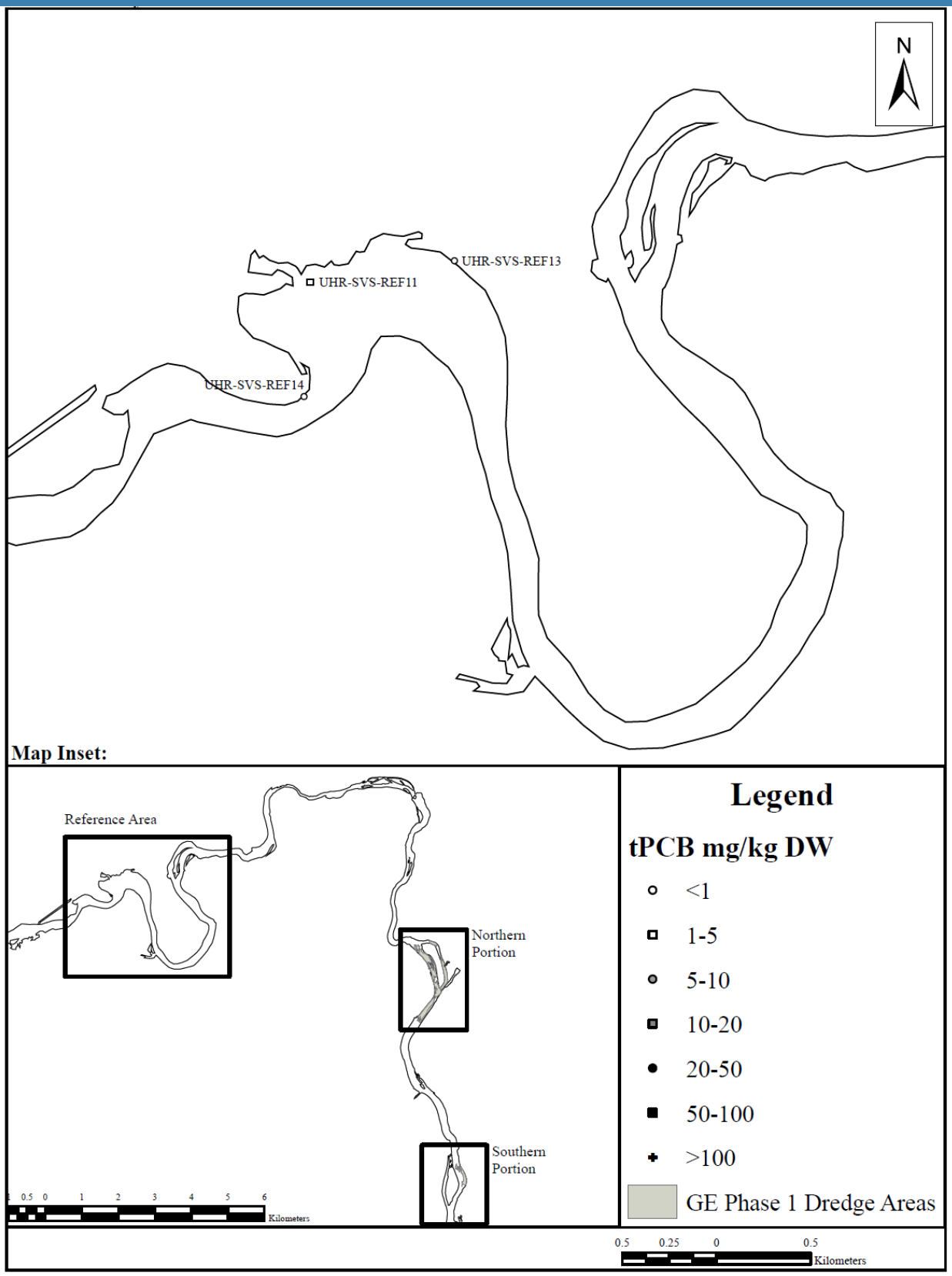


FIGURE 10: PHOTOGRAPH SHOWING INSERTED SEDIMENT CORES FOR BENTHIC INVERTEBRATE COMMUNITY STRUCTURE (BICS) AND SUB-SAMPLING OF UNSIEVED SEDIMENT.

FIGURE 11: CONCEPTUAL MODEL DIAGRAM ILLUSTRATING EXPOSURE PATHWAYS AND POTENTIAL EFFECTS FOR BIOACCUMULATIVE SUBSTANCES.

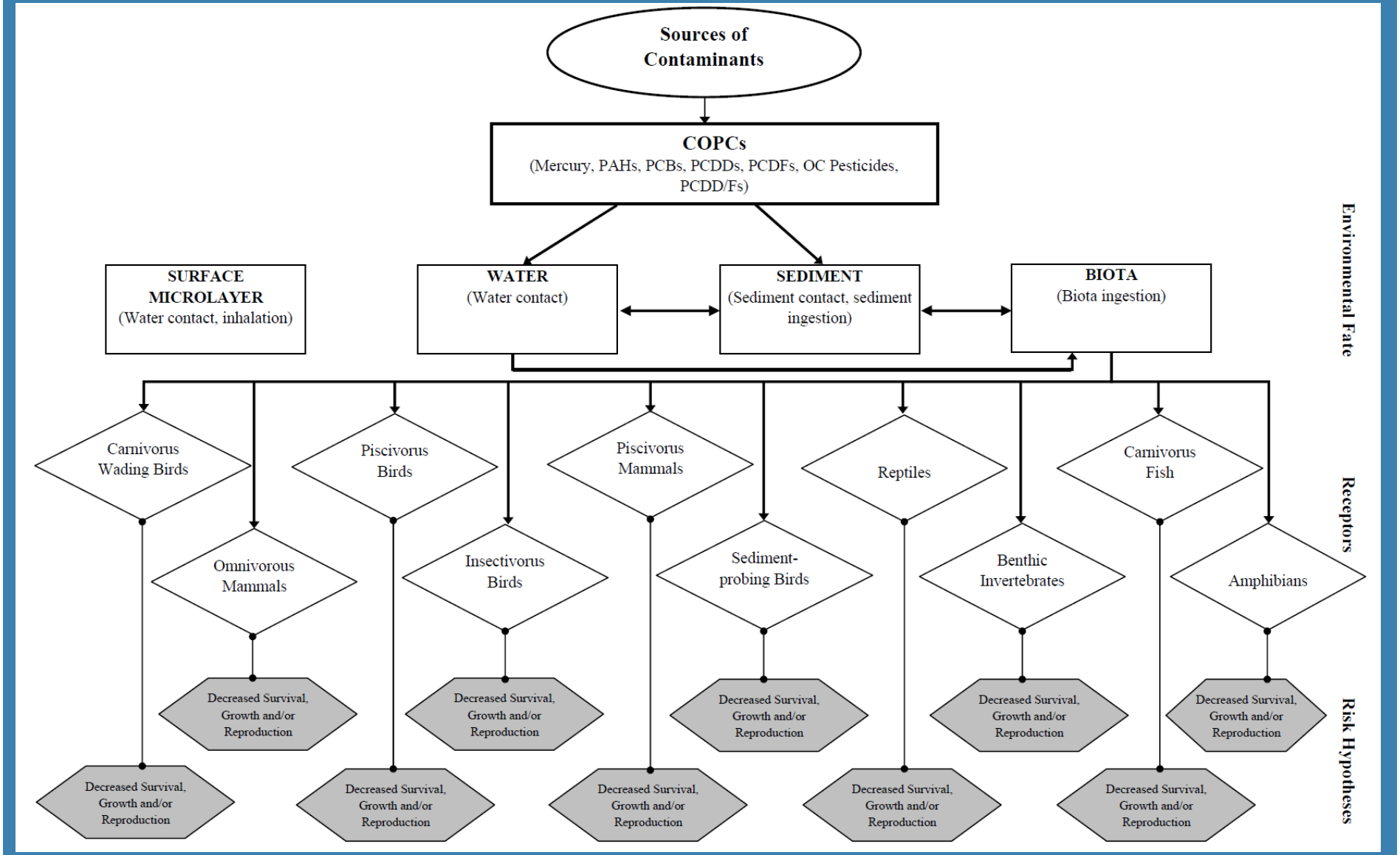
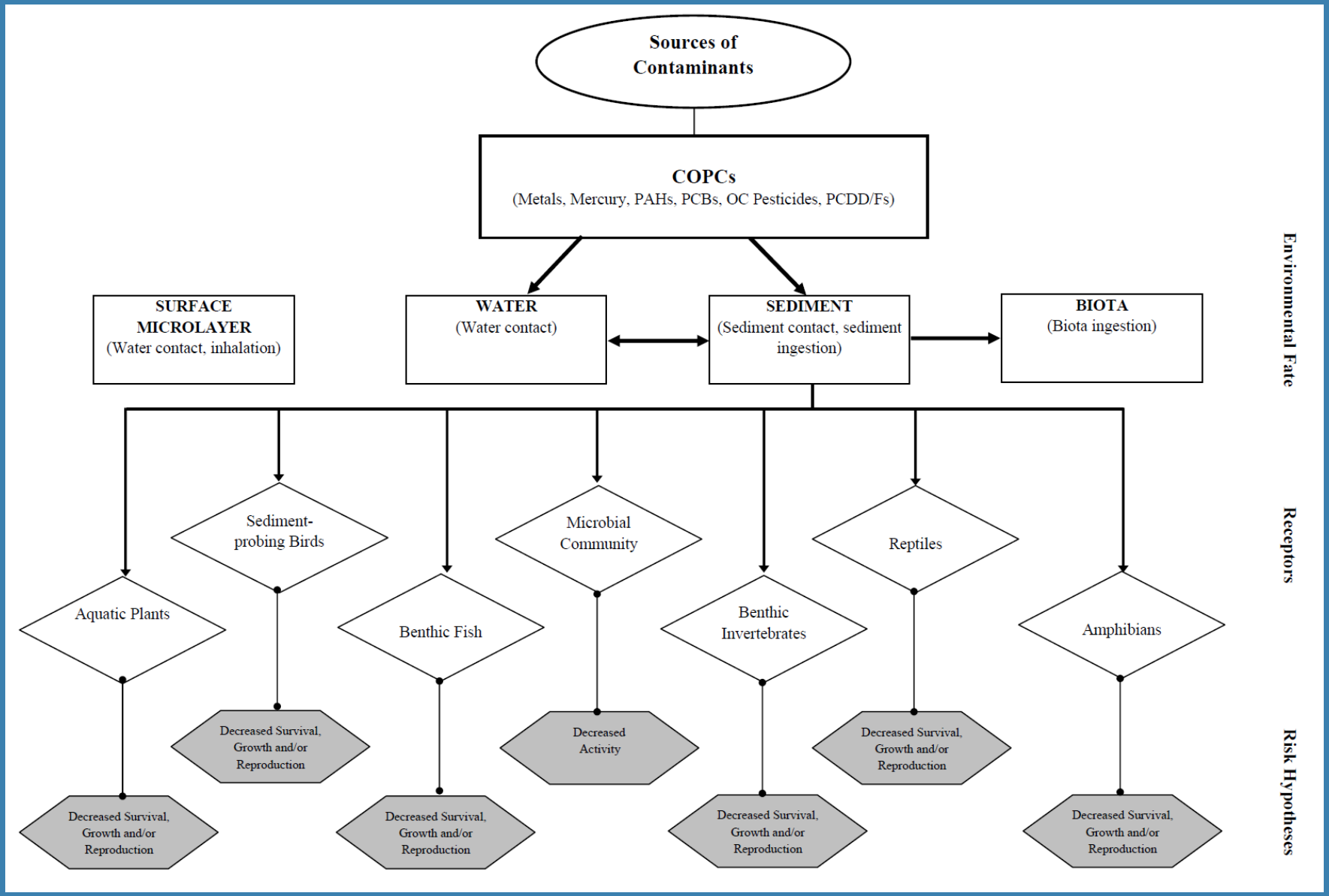


FIGURE 12: CONCEPTUAL MODEL DIAGRAM ILLUSTRATING EXPOSURE PATHWAYS AND POTENTIAL EFFECTS FOR TOXIC SUBSTANCES THAT PARTITION INTO SEDIMENTS.



APPENDIX 1.1

SUMMARY OF ANALYTICAL METHODS AND STANDARD OPERATING PROCEDURES (SOPS) FOR MEASUREMENT DATA FOR THE INVESTIGATION OF SEDIMENT QUALITY CONDITIONS IN THE UPPER HUDSON RIVER.

APPENDIX 1.1

SUMMARY OF ANALYTICAL METHODS AND STANDARD OPERATING PROCEDURES (SOPS) FOR MEASUREMENT DATA FOR THE INVESTIGATION OF SEDIMENT QUALITY CONDITIONS IN THE UPPER HUDSON RIVER.

/Analysis	Laboratory	Method/Technique	SOP Title	ID	Issued
Sediment - Preliminary Evaluation					
SemiVolatile Organic Extraction Procedure	Alpha Analytical	EPA 3570 - MSE	Microscale Solvent Extraction	OP-016, Rev # 2	2/12/08
PCB homologues (total PCBs by summation)	Alpha Analytical	EPA 8270 mod.- LRMS SIM	Determination of PCB Homologs, Individual Congeners, and Pesticides by GC/MS-SIM	O-015, Rev # 2	6/19/06
Total Organic Carbons	Alpha Analytical	EPA 9060 - Combustion	Total Organic Carbon in Soil, Sediment and Water	W-028, Rev # 2	1/22/03
Sediment - Chemistry					
SemiVolatile Organic Extraction Procedure	Alpha Analytical	EPA 3570 - MSE	Microscale Solvent Extraction	OP-016, Rev # 2	2/12/08
SemiVolatile Organic Extraction Procedure	AXYS Analytical	EPA 3540C - Soxhlet	Analytical Method for the Determination of 209 PCB Congeners by EPA Method 1668A or EPA Method CBC01	MLA-010, Rev #10	11/14/08
PCB congeners	AXYS Analytical	EPA 1668A - HRGC/HRMS	Analytical Method for the Determination of 209 PCB Congeners by EPA Method 1668A or EPA Method CBC01	MLA-010, Rev #10	11/14/08
PCDDs/PCDFs	AXYS Analytical	EPA 1613B - HRGC/HRMS	Analytical Method for the Determination of Polychlorinated Dibenzodioxins and Dibenzofurans by EPA Method 1613B, EPA Method 8290/8290A, Env. Canada EPS 1/ RM19 or EPA Method DLMO 2.0	MLA-017, Rev #15	10/31/08
OC Pesticides + toxaphene	AXYS Analytical	Lab SOP - HRGC/HRMS	Analytical Procedures for Organochlorine Pesticides by Isotope Dilution HRGC/HRMS	MLA-028, Rev# 5	4/11/08
PAHs (Parent and alkylated)	Alpha Analytical	EPA 8270 mod.- LRMS SIM	Analysis of Parent and Alkylated Polynuclear Aromatic Hydrocarbons, Selected Heterocyclic Compounds, Steranes and Triterpanes By GC/MS-SIM	O-008, Rev # 3	6/19/06
Metals Sample Preparation	Alpha Analytical	EPA 3050B	Acid Digestion of Solid Samples for Metals Analysis	MP-001, Iss # 5.1	5/2/08
Total Metals (TAL - 22)	Alpha Analytical	EPA 6020A - ICP/MS	Inductively Coupled Plasma - Mass Spectrometry	M-001, Rev # 4.1	4/29/08
Total Mercury	Alpha Analytical	EPA 7474 - CVAF	Mercury Determination in Tissue and Soil/Sediment Samples by Cold Vapor Atomic Fluorescence Technique (CVAF)	M-014, Iss # 1.1	5/5/08
AVS	Alpha Analytical	Lab SOP	Acid Volatile Sulfides and Simultaneously Extracted Metals in Sediments		
SEM (Cd, Cu, Ni, Pb, Zn)	Alpha Analytical	Lab SOP, EPA 6020A		AVSSEM, Rev # 1	3/6/00
Grain Size	Alpha Analytical	ASTM D422 - hydrometer/ sieves	Particle Size Analysis of Soils - With/Without Hydrometer and Liquid Limit, Plastic Limit, and Plasticity Index	W-029, Rev # 0.0	7/17/06
Percent moisture	Alpha Analytical	Lab SOP	Percent Solids Determination	W-001 Rev #3	5/4/07
Percent moisture	AXYS Analytical	Lab SOP	Moisture Determination	SLA-015	5/12/06

APPENDIX 1.1 (CONTINUED).
SUMMARY OF ANALYTICAL METHODS AND STANDARD OPERATING PROCEDURES (SOPS) FOR MEASUREMENT DATA FOR THE INVESTIGATION OF SEDIMENT QUALITY CONDITIONS IN THE UPPER HUDSON RIVER.

Analysis	Laboratory	Method/Technique	SOP Title	ID	Issued
Sediment - Ecotoxicity					
Toxicity Studies	CERC	ASTM (2008a), USEPA 2000	Chronic toxicity testing of Hudson River sediment samples with the amphipod *Hyalella azteca* and the midge *Chironomus dilutus*	Study Code: 08-20-21	9/24/08
Pore Water - Chemistry					
pH	CERC	Ion Analyzer	Procedure for pH Determination	Jackson SOP: F20.P12	6/30/97
Ammonia	CERC	Ion Analyzer	Orion EA 940 Users Manual (pp15-20)		
Hydrogen Sulfide	CERC	Ion specific electrode	Determining Hydrogen Sulfide Concentrations of Aqueous Samples using the Silver/Sulfide electrode	NFCRC SOP: B5.234	7/23/91
Sediment - Benthic Infauna					
Invertebrate Enumerations	Watershed Assessment Associates	Lab SOP	Procedure for Benthic Invertebrate Analysis		No Date
Sediment - Bioavailability					
SPME - PCB congeners	Dr. Michael Lydy (Southern Illinois University)	EPA 1668A	Analytical Method for the Determination of 209 PCB Congeners by EPA Method 1668A or EPA Method CBC01	TBD	TBD
SPME - PCB homologues	Dr. Michael Lydy (Southern Illinois University)	EPA 8270 mod.- LRMS SIM	Determination of PCB Homologs, Individual Congeners, and Pesticides by GC/MS-SIM	TBD	TBD

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APPENDIX 2

Upper Hudson River Pilot Study: Sediment Chemistry Analytical and Validation Reports

PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENT CHEMISTRY, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE FOR PCB-CONTAMINATED SEDIMENTS FROM THE UPPER HUDSON RIVER, NEW YORK—DATA REPORT

DATA VALIDATION REPORT

Benthic Pilot Study Sediment Data
Hudson River Natural Resource Damage Assessment

Samples Analyzed by:

Alpha Analytical
320 Forbes Boulevard
Mansfield, Massachusetts 02048

Axys Analytical Services Ltd.
2045 Mills Road West
Sidney, British Columbia, Canada V8L 3S8

February 19, 2010

PROJECT NARRATIVE

Basis for the Data Validation

This report summarizes the results of data validation performed on 12 sediment samples collected in September and October 2008 in support of the field study as outline in *Work Plan for the Pilot Study on the Effects of PCB-Contaminated Sediments on Benthic Invertebrates in the Upper Hudson River, New York, Version 4,* prepared for National Oceanic and Atmospheric Administration Damage Assessment, Remediation, and Restoration Program, September, 2008; Revised, January, 2009. Refer to the **Sample Index** on the following page for sample identifications.

The analytical data were reviewed using quality control (QC) criteria documented in the Work Plan referenced above and the Hudson River NRDA Analytical Quality Assurance Plan (Version 2.0, September 1, 2005). If criteria were not specified in the Work Plan or Analytical QAP, data were qualified based on the criteria in the analytical methods and *National Functional Guidelines for Organic and/or Inorganic Data Review.*

Samples were analyzed by Alpha Analytical, Mansfield, MA, and Axys Analytical Services Ltd., Sidney, BC. The QC requirements reviewed and validation qualifiers assigned are summarized by analytical method in the following data validation reports. Data qualifier definitions and reason codes are included as **Appendix A**. A Qualified Data Summary Table, which lists all data qualified, is included in **Appendix B**. The verified and qualified electronic data with QC sample results are provided in an accompanying Access database (Benthic_Pilot_Study_Sediment_Data.mdb). Data Validation Worksheets will be kept on file.

The goal in assigning data assessment qualifiers is to assist in proper data interpretation. If values are estimated (J or UJ), data may be used for site evaluation and risk assessment purposes but reasons for data qualification should be taken into consideration when interpreting sample concentrations. If values are assigned an R, the data are to be rejected and should not be used for any site evaluation purposes. If values have no data qualifier assigned, then the data meet the data quality objectives as stated in the documents and methods referenced above.

SAMPLE INDEX
Hudson River NRDA
Benthic Pilot Study

Field Sample ID	Laboratory	SDG	Lab Sample ID	PCB Homologues	Alkylated PAH	AVS-SEM	TAL Metals Mercury	% Solids	Grain Size	TOC	Pesticides & Toxaphene
UHR-SVS-124	Alpha	L0914111	L0914111-01		X	X	X	X	X		
UHR-SVS-127		L0914111	L0914111-02		X	X	X	X	X		
UHR-SVS-13		L0914111	L0914111-03		X	X	X	X	X		
UHR-SVS-04		L0914111	L0914111-04		X	X	X	X	X		
UHR-SVS-112		L0914111	L0914111-05		X	X	X	X	X		
UHR-SVS-19		L0914111	L0914111-06		X	X	X	X	X		
UHR-SVS-24		L0914111	L0914111-07		X	X	X	X	X		
UHR-SVS-31		L0914111	L0914111-08		X	X	X	X	X		
UHR-SVS-26		L0914111	L0914111-09		X	X	X	X	X		
UHR-SVS-38		L0914111	L0914111-10		X	X	X	X	X		
UHR-SVS-16/37		L0914111	L0914111-11	X	X	X	X	X	X	X	
UHR-SVS-29/36		L0914111	L0914111-12	X	X	X	X	X	X	X	
UHR-SVS-124	Axys	DPWG29851	L11980-2								X
UHR-SVS-127		DPWG29851	L11980-3								X
UHR-SVS-13		DPWG29851	L11980-4								X
UHR-SVS-04		DPWG29851	L11980-5								X
UHR-SVS-112		DPWG29851	L11980-6								X
UHR-SVS-19		DPWG29851	L11980-7								X
UHR-SVS-24		DPWG29851	L11980-8								X
UHR-SVS-31		DPWG29851	L11980-9								X
UHR-SVS-26		DPWG29851	L11980-10								X
UHR-SVS-38		DPWG29851	L11980-11								X
UHR-SVS-16/37		DPWG29851	L11980-12								X
UHR-SVS-29/36		DPWG29851	L11980-13								X

DATA VALIDATION REPORT
2008 Hudson River Pilot Study Sediment
PCB Homologues by LRMS-SIM; EPA 8270mod
SDG: L0914111

This report documents review of the data from the analysis of sediment samples and associated laboratory quality control (QC) samples. The samples were analyzed by Alpha Analytical, Mansfield, Massachusetts, using a low resolution mass spectrometer selective ion monitoring (LRMS-SIM) method based on EPA Method 8270. Refer to the **Sample Index** for a list of the individual samples.

SDG	No. of Samples	Validation Level
L0914111	2	Summary

I. DATA PACKAGE COMPLETENESS

The laboratory followed adequate corrective action processes and anomalies were discussed in the case narrative. The laboratory submitted all required deliverables.

II. EDD TO HARDCOPY VERIFICATION

Sample results and related quality control data were received in both an electronic and hard copy (or pdf) format. Electronic data were verified against the laboratory report; no errors were found.

III. TECHNICAL DATA VALIDATION

The QC elements that were reviewed are listed below.

1	Holding Times and Sample Receipt		Laboratory Control Samples
	Initial Calibration (ICAL)	1	Certified Reference Material (CRM)
	Continuing Calibration Verification (CVER)	1	Compound Identification and Quantitation
1	Laboratory Blanks		Internal Standards
1	Labeled Compound Recovery		Calculation Verification (full validation only)
1	Matrix Spike/ Matrix Spike Duplicate		

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Holding Times and Sample Receipt

Sediment samples were received and maintained frozen until prepared for analysis. The analytes of concern for this study are persistent compounds, which have been found to remain stable in sediment after several years of frozen storage; therefore, no maximum holding time criterion has been established.

Laboratory Blanks

In order to assess the impact of blank contamination on the reported sample results, action levels at five times the blank concentrations are established. If the concentrations in the associated field samples are less than the action levels, the results are qualified as not detected (U-7).

Positive results for pentachlorobiphenyls, hexachlorobiphenyls, and total PCBs were detected in the laboratory blank. Results in all associated samples exceeded the blank action levels. No data were qualified based on method blank contamination.

Labeled Compound Recovery

The labeled compounds in sample UHR-SVS-16/37 and UHR-SVS-29/36 were not recovered. These samples were diluted (200x, 100x), no action was required.

Matrix Spike/Matrix Spike Duplicate

The matrix spike/matrix spike duplicate (MS/MSD) analyses were performed using Sample UHR-SVS-16/37. Several compounds were not recovered. The sample amount was greater than four times the amount spiked; thus no action was taken

The laboratory did not evaluate precision based on these samples, although requested. No action was taken.

Certified Reference Material

A certified reference material (CRM) was extracted and analyzed with the analytical batch. The CRM selected for this study was SRM 1944. The criteria for CRM recovery is that the reported result be within ±20% of the 95% confidence interval of the true value for analytes with certified concentrations greater than five times the detection limit.

The results for PCB167/128, PCB194, PCB195, PCB 206 and PCB209 were greater than the upper control limits (131 – 164 %R). Since only homologs groups were reported, no qualifiers were assigned.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the CRM, and laboratory control sample/laboratory control sample duplicate (LCS/LCSD). Precision was acceptable, as demonstrated by the LCS/LCSD. MS/MSD precision was not evaluated..

No data were qualified. All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
2008 Hudson River Pilot Study Sediment
Alkylated PAHs by LRMS-SIM; EPA 8270mod
SDG: L0917094

This report documents the review of the data from the analysis of sediment samples and associated laboratory quality control (QC) samples. The samples were analyzed for PAH by Alpha Analytical, Mansfield, Massachusetts, using low resolution mass spectrometry - selective ion monitoring (LRMS-SIM), based on EPA Method 8270. Refer to the **Sample Index** for a list of the individual samples.

SDG	No. of Samples	Validation Level
L0917094	12	Summary

I. DATA PACKAGE COMPLETENESS

The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative. The laboratory submitted required deliverables, except initial calibration, continuing calibration, tune information and internal standard recoveries. The laboratory was contacted and subsequently submitted the information necessary for the validation.

II. EDD TO HARDCOPY VERIFICATION

Sample results and related quality control data were received in both an electronic and hard copy format. The electronic data deliverable (EDD) was verified against the laboratory report. Some compounds were 'J' flagged by the laboratory in the EDD that were 'U' flagged on the laboratory's hardcopy data report. As the reported results were all at the reporting limit, the EDD was changed to reflect the hardcopy report.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below:

2	Holding Times and Sample Receipt		Laboratory Control Samples
	Initial Calibration		Internal Standards
	Continuing Calibration	2	Certified Reference Material
	Method Blanks	1	Reporting Limits
	Surrogate Compounds		Compound Identification
2	Matrix Spikes/Matrix Spike Duplicates		Reported Results
1	Laboratory Duplicates		Calculation Verification (Full validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Holding Times and Sample Receipt

Sediment samples were received and maintained frozen until prepared for analysis. Although frozen, the samples were held for over a year. Because the potential for changes in some PAH concentrations over the extended holding time, all results were qualified as estimated (J/UJ-1).

Matrix Spike/Matrix Spike Duplicate Samples

The matrix spike/ matrix spike duplicate (MS/MSD) analyses were performed using Sample UHR-SVS-24. The percent recovery (%R) values for fluoranthene were less than the lower control limit. Results for fluoranthene and alkylated fluoranthene in the parent sample were estimated (J-8). The MS %R value for benzo(a)pyrene was less than the lower control limit. No qualifiers are assigned for single outliers. The relative percent deviation (RPD) for benzo(a)pyrene was outside control limits. The parent sample was qualified as estimated (J-9).

Laboratory Duplicate Samples

The laboratory duplicate analyses were performed using Sample UHR-SVS-24. Precision was acceptable.

Certified Reference Material

The Analytical Quality Assurance Plan for Hudson River requires a certified reference material (CRM) to be analyzed with each batch of samples. Results for the CRM must be within $\pm$ 20% of the 95% confidence interval for each analyte with a certified result. The sediment CRM selected for initial alkylated PAH analysis was NIST Standard Reference Material (SRM)1941b. The CRM results accompanying the initial batch of sample analyses were less than the lower control limit for 9 out of the 16 certified compounds. The laboratory was requested to re-analyze the sample batch.

The re-submitted sample analyses were analyzed with NIST SRM 1944. SRM results with the re-analyses indicated low recovery for 2 (benzo(a)pyrene and perylene) of the 18 certified PAH compounds. These analytes were qualified as estimated (J/UJ-12) in the samples. The recovery for dibenz(a,h)anthracene was greater than the upper control limits. The associated samples were qualified as estimated (J-12).

Reporting Limits

The target detection limit in the Work Plans for alkylated PAHs was 1.0 µg/kg dry weight. Detection limits ranged from 1.78 to 3.46 µg/kg

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogates, CRM, laboratory control

sample/laboratory control sample duplicate (LCS/LCSD) and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by LCS/LCSD, MS/MSD, and duplicate RPD values, with exceptions noted above.

Data were estimated based on holding times, MS/MSD and SRM %R value outliers.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
2008 Hudson River Pilot Study Sediment
Total Metals by EPA Methods 3050/6020A and 7474
AVS-SEM by Alpha Analytical SOP M-008
SDG: L0914111

This report documents the review of the data from the analysis of sediment samples and associated laboratory quality control (QC) samples. The samples were analyzed by Alpha Analytical, Mansfield, Massachusetts, for total recoverable metals following EPA Methods 3050/6020A and 7474, and for Acid Volatile Solids-Simultaneously Extracted Metals (AVS-SEM) by Alpha Analytical SOP M-008. Refer to the **Sample Index** for a list of the individual samples.

SDG	No. of Samples	Validation Level
L0914111	12	Summary

I. DATA PACKAGE COMPLETENESS

Initially the laboratory did not provide any calibration information with the data. Re-submittals were requested. Information required to perform a summary validation was provided in the re-submittals except for initial and continuing calibration information for the AVS-SEM analysis. Thus only a cursory (Level II) validation was performed for the AVS-SEM data.

The laboratory did not discuss the serial dilution outliers in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

Sample results and related quality control data were received in both an electronic and hard copy format. Electronic data were verified against the laboratory report; no errors were found.

Two magnesium results were submitted for sample L0914111-10. The sample result with the lower dilution appeared to be above the linear range of the instrument; thus the sample result from the non-diluted analysis was rejected (R-11).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

2	Holding Times and Sample Preservation	2	Laboratory Duplicates
1	Initial Calibrations		Interference Check Samples
2	Calibration Verifications		Internal Standards
	Laboratory Blanks	2	Serial Dilution
	Laboratory Control Samples (LCS)	1	Reporting Limits
2	Certified Reference Material (CRM)		Calculation Verification (Full validation only)
2	Matrix Spikes (MS)		

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Holding Times and Sample Preservation

Sediment samples were received and maintained frozen until prepared for analysis. Although frozen, the samples were held for over a year (381- 394 days). The work plan specifies holding times for refrigeration, these holding times were exceeded. For totals metals results were not qualified because samples were held frozen. Mercury and AVS/SEM results were qualified (J/UJ-1) because of extended storage time.

Initial Calibrations

No initial calibration documentation was provided for the AVS-SEM.

Calibration Verification

No documentation was provided for the AVS-SEM continuing calibration verification.

One result for total metals magnesium was qualified as estimated (JB-5B) due to low (87%) calibration verification.

Standard Reference Material

A certified reference material (CRM) was extracted and analyzed with the analytical batch. The CRM analyzed was ERA #540 Lot No. DO61-540 (metals in soil). Certified concentration values were based on a strong acid digest (the method performed) rather than a "Total Concentration", and were provided for the analytes of interest.

The recovery values for antimony and aluminum were less than the lower control limits as specified in the Work Plan. These analytes were qualified as estimated (J/UJ-12) in all samples to indicate a probable low bias.

Matrix Spike Samples

The percent recovery (%R) values for antimony (34%, 39%) were less than the lower control of 75% in the matrix spike and matrix spike duplicate (MS/MSD). All antimony results were estimated (J-8) to indicate a probable low bias.

Laboratory Duplicate Samples

One sample from each analytical batch was extracted and analyzed in duplicate. If the results were greater than five times the method detection limit (MDL), relative percent difference (RPD) values were calculated.

All RPD values were within control limits of 20%, with the following exceptions:

The RPD values of total metals for mercury (45%) and beryllium (127%) exceeded the control limit of 20% RPD. The RPD values of AVS/SEM metals for sulfide (34%) and lead (22%) exceeded the control limit of 20% RPD. Associated results, in all samples including the duplicate sample, were estimated (J-9).

Serial Dilution

The percent difference (%D) between dilutions for several analytes exceeded the control limit of 10% (only evaluated for those results greater than 50 times the method detection limit). These dilution results indicate a potential low bias, and associate results were estimated (J-16).

Reporting Limits

The target detection limit was not met for thallium. The laboratory analyzed the sample at a 10 times dilution. No explanation was provided in the case narrative.

IV. OVERALL ASSESSMENT

Data were estimated based on outliers for holding times, MS/MSD recoveries, CRM recovery values, duplicate precision, and serial dilution results. The target detection limit for thallium was not met.

Qualifications should be considered prior to data use.

DATA VALIDATION REPORT
2008 Hudson River Pilot Study Sediment
Total Organic Carbon by Method 9060
Grain Size by ASTM D422
Total Solids (% Moisture)
SDG: L0914111

This report documents the review of the data from the analysis of sediment samples and associated laboratory quality control (QC) samples. The samples were analyzed by Alpha Laboratories, Mansfield, Massachusetts, for total organic carbon (TOC) using Method 9060, and grain size using ASTM Method D422. Refer to the **Sample Index** for a list of the individual samples.

SDG	No. of Samples	Validation Level
L0914111	2 TOC 12 Grain Size 12 Total Solids	Cursory

I. DATA PACKAGE COMPLETENESS

Although requested, the laboratory did not provide calibration information for the TOC analysis, therefore instrument performance could not be evaluated. Therefore a cursory (Level II) validation was performed.

II. EDD TO HARDCOPY VERIFICATION

Sample results and related QC data were received in an electronic format and were verified against the electronic laboratory report. When reporting the grain size information on the hardcopy and in the electronic deliverable (EDD), the laboratory reported percent passing for each sieve size rather than percent retained or the representative size fractions (e.g. sand, silt, clay). This information was summarized on the laboratory calculation sheet for grain size. The laboratory did not agree to change the reported results in the EDD, thus the information was inserted by the validator.

For TOC the laboratory reported both replicate analyses for each sample. During validation an average for the replicates was calculated and this average replaced the replicate results in the database (per the method recommendation).

The total solids were reported as “% Moisture” in the EDD. The laboratory listed these results as being reported on a dry weight basis. The EDD was corrected to reflect that the % Moisture results are reported on a wet weight basis.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

2	Holding Times and Sample Preservation		Reporting Limits
1	Certified Reference Material (CRM)	2	Sample Results
2	Laboratory Duplicates		

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Holding Times and Sample Preservation

TOC samples were held frozen for more than one year (391 and 394 days). The work plan specifies holding times for refrigeration, these holding times were exceeded. TOC results were qualified (J/UJ-1) because of the extended storage time.

Standard Reference Material

The standard reference material (SRM) NIST 1944 was analyzed with the analytical batch for TOC. Recovery was acceptable.

Although specified in the Work Plan, no SRM was analyzed for grain size.

Laboratory Duplicate Samples

For TOC the relative percent difference (RPD) between the duplicates exceeded the control limit of 15% RPD at 18%. All results were estimated (J-9).

Although specified in the Work Plan, no duplicate was reported for grain size.

IV. OVERALL ASSESSMENT

TOC results were estimated because holding times were exceeded and poor precision based on duplicate results.

Qualifications should be considered prior to data use.

DATA VALIDATION REPORT
2008 Hudson River Pilot Study Sediment
Organochlorine Pesticides and Total Toxaphene
by Axys Analytical Method: MLA-028
SDG: DPWG29851

This report documents review of the data from the analysis of sediment samples and associated laboratory quality control (QC) samples. The samples were analyzed by Axys Analytical Services, Ltd., Sidney, British Columbia, Canada. Sample extracts were split into two fractions, as described by Axys Method MLA028. Each fraction was analyzed by high-resolution gas chromatography/high resolution mass spectrometry. Refer to the **Sample Index** for a list of individual samples.

SDG	No. of Samples	Validation Level
DPWG29851	12	Full

I. DATA PACKAGE COMPLETENESS

The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative. The laboratory submitted all required deliverables.

II. EDD TO HARDCOPY VERIFICATION

Sample results and related quality control data were received in both an electronic and hard copy format. Electronic data were verified against the laboratory report; no errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

2 Holding Times and Sample Receipt
GC/MS Instrument Performance Check
Initial Calibration (ICAL)
Continuing Calibration Verification (CVER)
2 Laboratory Blanks
2 Labeled Compound and Surrogate Recovery
2 Laboratory Duplicates
Spiked Matrix (OPR)
1 Certified Reference Material (CRM)
2 Compound Identification and Quantitation
1 Calculation Verification (full validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Holding Times and Sample Receipt

Samples were kept frozen by the laboratory. The holding time criterion for Samples UHR-SVS-24 and UHR-SVS-31 exceeded the 40 day hold time for analysis after extraction. The results and reporting limits in these samples were qualified as estimated (J/UJ-1).

Laboratory Blanks

In order to assess the impact of blank contamination on the reported sample results, action levels at five times the blank concentrations are established. If the concentrations in the associated field samples are less than the action levels, the results are qualified as not detected (U-7). The following contamination was found in the blanks:

E1 Fraction: Hexachlorobenzene, gamma-chlordane, cis-nonachlor

E2 Fraction: heptachlor epoxide, alpha-endosulfan, beta-endosulfan

Labeled Compound & Surrogate Recovery

The percent recovery (%R) values for labeled compounds (E1 fraction) and surrogates (E2 fraction) were within control limits of 25-150% and 30–130%, with the exceptions noted below:

E1 Fraction: The surrogate ^{13}C-heptachlor was less than the control limit in the Samples UHR-SVS-13 and UHR-SVS-31. The reporting limits for the associated compound was qualified as estimated (UJ-13) in these samples. The surrogates ^{13}C-heptachlor, ^{13}C-aldrin, ^{13}C-oxychlordane, ^{13}C-transchlordane, ^{13}C-trans nonachlor were less than the control limits for Sample UHR-SVS-16/37. The reporting limits for the associated compounds were qualified as estimated (UJ-13) in this sample. The surrogate ^{13}C-heptachlor was less than 10% in the Sample UHR-SVS-04. The reporting limit for the associated compound was rejected (R-13) in this sample.

Laboratory Duplicates

Sample UHR-SVS-38 was extracted and analyzed in duplicate. Relative percent difference (RPD) values were calculated for all detected analytes. RPD values were within control limits of 30%, (or, for results less than five times the reporting limit, the absolute differences between results were less than twice the reporting limit), with the exceptions noted below:

The RPD value for alpha-HCH, 2,4-DDE, and 4,4'-DDT were greater than the control limit and the result for these analytes were qualified as estimated (J-9).

Certified Reference Material

A reference material NIST SRM 1944 was extracted and analyzed with this analytical batch. The measurement quality objective (MQO) for certified reference material (CRM) recovery requires the reported result to be within ±20% of the 95% confidence interval of the true value for analytes with certified concentrations greater than five times the detection limit. The CRM recovery values met the acceptance criteria of ±20% of the 95% confidence interval.

Compound Identification & Quantification

The laboratory assigned K-flags to numerous pesticide analyte values when a peak was detected but did not meet quantitation criteria, therefore the reported values were not considered as positive identification for these analytes. These results were considered potential false positives

or "estimated maximum possible concentrations" and were qualified as not detected (U-21) at the reported values.

The target detections limit for pesticides in the Work Plan is 0.02 ng/g-dry weight. The reported detection limits ranged from 0.001 to 0.115 ng/g-dry weight.

Calculation Verification

A full validation (Level IV) was performed. No transcription or calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the labeled compound, CRM, and ongoing precision and recovery (OPR) %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by laboratory duplicate RPD values, with the exceptions noted above.

Data were qualified as estimated because of labeled compound %R outliers and lab duplicate RPD outliers. Data were also qualified as not detected because of blank contamination and quantitation criteria for compound identification were not met.

All data, as qualified, are acceptable for use.

APPENDIX A

DATA QUALIFIER DEFINITIONS AND REASON CODES

DATA VALIDATION QUALIFIER CODES
National Functional Guidelines

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification".
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents the approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

The following is a qualifier that may also be assigned during the data review process:

DNR	Do not report; a more appropriate result is reported from another analysis or dilution.

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DATA QUALIFIER REASON CODES

1	Holding Time/Sample Preservation
2	Chromatographic pattern in sample does not match pattern of calibration standard.
3	Compound Confirmation
4	Tentatively Identified Compound (TIC) (associated with NJ only)
5A	Calibration (initial)
5B	Calibration (continuing)
6	Field Blank Contamination
7	Lab Blank Contamination (e.g., method blank, instrument, etc.)
8	Matrix Spike(MS & MSD) Recoveries
9	Precision (all replicates)
10	Laboratory Control Sample Recoveries
11	A more appropriate result is reported (associated with “R” and “DNR” only)
12	Reference Material
13	Surrogate Spike Recoveries (a.k.a., labeled compounds & recovery standards)
14	Other (define in validation report)
15	GFAA Post Digestion Spike Recoveries
16	ICP Serial Dilution % Difference
17	ICP Interference Check Standard Recovery
18	Trip Blank Contamination
19	Internal Standard Performance (e.g., area, retention time, recovery)
20	Linear Range Exceeded
21	Potential False Positives
22	Elevated Detection Limit Due to Interference (i.e., laboratory, chemical and/or matrix)

APPENDIX B
QUALIFIED DATA SUMMARY TABLE

QUALIFIED DATA SUMMARY TABLE
Benthic Pilot Study Sediment

Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-26	L11980-10	E2PEST	AXYS Method MLA-028 Rev 05	Methoxychlor	0.234	K	NG/G	U	21
UHR-SVS-26	L11980-10	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Gamma	0.005	KDJ	NG/G	U	21
UHR-SVS-26	L11980-10	E2PEST	AXYS Method MLA-028 Rev 05	alpha-Endosulphan	0.014	KB	NG/G	U	21
UHR-SVS-26	L11980-10	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.038	KB	NG/G	U	21
UHR-SVS-26	L11980-10	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, gamma (trans)	0.028	KBDJ	NG/G	U	21
UHR-SVS-26	L11980-10	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.032	KDJ	NG/G	U	21
UHR-SVS-26	L11980-10	E2PEST	AXYS Method MLA-028 Rev 05	Dieldrin	0.009	K	NG/G	U	21
UHR-SVS-26	L11980-10	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, trans-	0.017	KDJ	NG/G	U	21
UHR-SVS-38	L11980-11 i (A)	E2PEST	AXYS Method MLA-028 Rev 05	Endrin	0.005	K	NG/G	U	21
UHR-SVS-38	L11980-11 i (A)	E2PEST	AXYS Method MLA-028 Rev 05	alpha-Endosulphan	0.015	KB	NG/G	U	21
UHR-SVS-38	L11980-11 i (A)	E2PEST	AXYS Method MLA-028 Rev 05	Heptachlor epoxide	0.001	B	NG/G	U	7
UHR-SVS-38	L11980-11 i (A)	E2PEST	AXYS Method MLA-028 Rev 05	Endrin aldehyde	0.003	K	NG/G	U	21
UHR-SVS-38	L11980-11 i (A)	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.033	KB	NG/G	U	21
UHR-SVS-38	L11980-11 i (A)	E2PEST	AXYS Method MLA-028 Rev 05	Methoxychlor	0.174	K	NG/G	U	21
UHR-SVS-38	L11980-11 Wi (A)	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, gamma (trans)	0.029	KBDJ	NG/G	U	21
UHR-SVS-38	L11980-11 Wi (A)	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.031	KDJ	NG/G	U	21
UHR-SVS-38	L11980-11 Wi (A)	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, trans-	0.014	KDJ	NG/G	U	21
UHR-SVS-38	L11980-11 Wi (A)	E1PEST	AXYS Method MLA-028 Rev 05	Aldrin	0.02	KDJ	NG/G	U	21
UHR-SVS-38	L11980-11 Wi (A)	E1PEST	AXYS Method MLA-028 Rev 05	4,4'-DDT	0.131	DJ	NG/G	J	9
UHR-SVS-38	L11980-11 Wi (A)	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Alpha	0.01	DJ	NG/G	J	9
UHR-SVS-38	L11980-11 Wi (A)	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Beta	0.007	KDJ	NG/G	U	21
UHR-SVS-38	L11980-11 Wi (A)	E1PEST	AXYS Method MLA-028 Rev 05	2,4'-DDE	0.044	DJ	NG/G	J	9
UHR-SVS-16/37	L11980-12	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, cis-	0.075	KBDJ	NG/G	U	21
UHR-SVS-16/37	L11980-12	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, trans-	0.033	KDJ	NG/G	UJ	13,21
UHR-SVS-16/37	L11980-12	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.112	KDJ	NG/G	U	21
UHR-SVS-16/37	L11980-12	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, oxy-	0.0571	UD	NG/G	UJ	13
UHR-SVS-16/37	L11980-12	E2PEST	AXYS Method MLA-028 Rev 05	alpha-Endosulphan	0.021	KB	NG/G	U	21
UHR-SVS-16/37	L11980-12	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.038	KB	NG/G	U	21
UHR-SVS-16/37	L11980-12	E1PEST	AXYS Method MLA-028 Rev 05	Aldrin	0.0146	UD	NG/G	UJ	13
UHR-SVS-16/37	L11980-12	E1PEST	AXYS Method MLA-028 Rev 05	Heptachlor	0.0094	UD	NG/G	UJ	13
UHR-SVS-16/37	L11980-12	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Gamma	0.011	KDJ	NG/G	U	21
UHR-SVS-16/37	L11980-12	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Beta	0.01	KDJ	NG/G	U	21
UHR-SVS-16/37	L11980-12	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, gamma (trans)	0.133	KBDJ	NG/G	UJ	13,21
UHR-SVS-16/37	L11980-12	E2PEST	AXYS Method MLA-028 Rev 05	Methoxychlor	0.322	K	NG/G	U	21
UHR-SVS-16/37	L11980-12	E2PEST	AXYS Method MLA-028 Rev 05	Endosulphan sulphate	0.017	K	NG/G	U	21
UHR-SVS-16/37	L11980-12	E2PEST	AXYS Method MLA-028 Rev 05	Endrin aldehyde	0.004	K	NG/G	U	21
UHR-SVS-29/36	L11980-13	E2PEST	AXYS Method MLA-028 Rev 05	Methoxychlor	0.244	K	NG/G	U	21
UHR-SVS-29/36	L11980-13	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.047	KB	NG/G	U	21

QUALIFIED DATA SUMMARY TABLE
Benthic Pilot Study Sediment

Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-29/36	L11980-13	E2PEST	AXYS Method MLA-028 Rev 05	Endrin	0.004	K	NG/G	U	21
UHR-SVS-29/36	L11980-13	E2PEST	AXYS Method MLA-028 Rev 05	Dieldrin	0.014	K	NG/G	U	21
UHR-SVS-29/36	L11980-13	E2PEST	AXYS Method MLA-028 Rev 05	alpha-Endosulphan	0.02	KB	NG/G	U	21
UHR-SVS-29/36	L11980-13	E2PEST	AXYS Method MLA-028 Rev 05	Heptachlor epoxide	0.002	B	NG/G	U	7
UHR-SVS-29/36	L11980-13	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Alpha	0.03	KDJ	NG/G	U	21
UHR-SVS-29/36	L11980-13	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Beta	0.016	KDJ	NG/G	U	21
UHR-SVS-29/36	L11980-13	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Gamma	0.016	KDJ	NG/G	U	21
UHR-SVS-29/36	L11980-13	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.071	KDJ	NG/G	U	21
UHR-SVS-29/36	L11980-13	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, cis-	0.029	KBDJ	NG/G	U	21
UHR-SVS-29/36	L11980-13	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, trans-	0.027	KDJ	NG/G	U	21
UHR-SVS-124	L11980-2	E2PEST	AXYS Method MLA-028 Rev 05	Dieldrin	0.007	K	NG/G	U	21
UHR-SVS-124	L11980-2	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Alpha	0.011	KDJ	NG/G	U	21
UHR-SVS-124	L11980-2	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Gamma	0.005	KDJ	NG/G	U	21
UHR-SVS-124	L11980-2	E1PEST	AXYS Method MLA-028 Rev 05	Aldrin	0.009	KDJ	NG/G	U	21
UHR-SVS-124	L11980-2	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, gamma (trans)	0.02	KBDJ	NG/G	U	21
UHR-SVS-124	L11980-2	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.022	KDJ	NG/G	U	21
UHR-SVS-124	L11980-2	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, trans-	0.023	KDJ	NG/G	U	21
UHR-SVS-124	L11980-2	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Beta	0.005	KDJ	NG/G	U	21
UHR-SVS-124	L11980-2	E2PEST	AXYS Method MLA-028 Rev 05	Heptachlor epoxide	0.001	KB	NG/G	U	21
UHR-SVS-124	L11980-2	E2PEST	AXYS Method MLA-028 Rev 05	alpha-Endosulphan	0.02	KB	NG/G	U	21
UHR-SVS-124	L11980-2	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.045	KB	NG/G	U	21
UHR-SVS-124	L11980-2	E1PEST	AXYS Method MLA-028 Rev 05	2,4'-DDD	0.051	KDJ	NG/G	U	21
UHR-SVS-124	L11980-2	E2PEST	AXYS Method MLA-028 Rev 05	Methoxychlor	0.064	K	NG/G	U	21
UHR-SVS-127	L11980-3	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.047	KDJ	NG/G	U	21
UHR-SVS-127	L11980-3	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, gamma (trans)	0.044	KBDJ	NG/G	U	21
UHR-SVS-127	L11980-3	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Gamma	0.006	KDJ	NG/G	U	21
UHR-SVS-127	L11980-3	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Beta	0.01	KDJ	NG/G	U	21
UHR-SVS-127	L11980-3	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, cis-	0.02	BDJ	NG/G	U	7
UHR-SVS-127	L11980-3	E2PEST	AXYS Method MLA-028 Rev 05	Methoxychlor	0.165	K	NG/G	U	21
UHR-SVS-127	L11980-3	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, trans-	0.036	KDJ	NG/G	U	21
UHR-SVS-127	L11980-3	E2PEST	AXYS Method MLA-028 Rev 05	Heptachlor epoxide	0.002	KB	NG/G	U	21
UHR-SVS-127	L11980-3	E2PEST	AXYS Method MLA-028 Rev 05	alpha-Endosulphan	0.04	KB	NG/G	U	21
UHR-SVS-127	L11980-3	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.048	KB	NG/G	U	21
UHR-SVS-127	L11980-3	E2PEST	AXYS Method MLA-028 Rev 05	Endrin	0.003	K	NG/G	U	21
UHR-SVS-13	L11980-4	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Gamma	0.005	KDJ	NG/G	U	21
UHR-SVS-13	L11980-4	E1PEST	AXYS Method MLA-028 Rev 05	Heptachlor	0.0122	UD	NG/G	UJ	13
UHR-SVS-13	L11980-4	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.04	KDJ	NG/G	U	21
UHR-SVS-13	L11980-4	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, trans-	0.015	KDJ	NG/G	U	21

QUALIFIED DATA SUMMARY TABLE
Benthic Pilot Study Sediment

Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-13	L11980-4	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, cis-	0.019	KBDJ	NG/G	U	21
UHR-SVS-13	L11980-4	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Alpha	0.003	KDJ	NG/G	U	21
UHR-SVS-13	L11980-4	E2PEST	AXYS Method MLA-028 Rev 05	Heptachlor epoxide	0.001	KB	NG/G	U	21
UHR-SVS-13	L11980-4	E2PEST	AXYS Method MLA-028 Rev 05	alpha-Endosulphan	0.022	KB	NG/G	U	21
UHR-SVS-13	L11980-4	E2PEST	AXYS Method MLA-028 Rev 05	Endrin	0.003	K	NG/G	U	21
UHR-SVS-13	L11980-4	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.064	KB	NG/G	U	21
UHR-SVS-13	L11980-4	E2PEST	AXYS Method MLA-028 Rev 05	Methoxychlor	0.054	K	NG/G	U	21
UHR-SVS-04	L11980-5	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, cis-	0.028	KBJ	NG/G	U	21
UHR-SVS-04	L11980-5	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.067	KJ	NG/G	U	21
UHR-SVS-04	L11980-5	E1PEST	AXYS Method MLA-028 Rev 05	Aldrin	0.003	KJ	NG/G	U	21
UHR-SVS-04	L11980-5	E1PEST	AXYS Method MLA-028 Rev 05	Heptachlor		U	NG/G	R	13
UHR-SVS-04	L11980-5	E2PEST	AXYS Method MLA-028 Rev 05	alpha-Endosulphan	0.017	KB	NG/G	U	21
UHR-SVS-04	L11980-5	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.043	KB	NG/G	U	21
UHR-SVS-04	L11980-5	E1PEST	AXYS Method MLA-028 Rev 05	Hexachlorobenzene	0.028	KBJ	NG/G	U	21
UHR-SVS-04	L11980-5	E2PEST	AXYS Method MLA-028 Rev 05	Methoxychlor	0.008	K	NG/G	U	21
UHR-SVS-04	L11980-5	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Gamma	0.002	KJ	NG/G	U	21
UHR-SVS-04	L11980-5	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Alpha	0.002	KJ	NG/G	U	21
UHR-SVS-112	L11980-6	E2PEST	AXYS Method MLA-028 Rev 05	Dieldrin	0.004	K	NG/G	U	21
UHR-SVS-112	L11980-6	E1PEST	AXYS Method MLA-028 Rev 05	2,4'-DDD	0.04	KDJ	NG/G	U	21
UHR-SVS-112	L11980-6	E2PEST	AXYS Method MLA-028 Rev 05	Methoxychlor	0.035	K	NG/G	U	21
UHR-SVS-112	L11980-6	E1PEST	AXYS Method MLA-028 Rev 05	Hexachlorobenzene	0.125	KBDJ	NG/G	U	21
UHR-SVS-112	L11980-6	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.028	KB	NG/G	U	21
UHR-SVS-112	L11980-6	E2PEST	AXYS Method MLA-028 Rev 05	alpha-Endosulphan	0.014	KB	NG/G	U	21
UHR-SVS-112	L11980-6	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Alpha	0.005	KDJ	NG/G	U	21
UHR-SVS-112	L11980-6	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Beta	0.005	KDJ	NG/G	U	21
UHR-SVS-112	L11980-6	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, gamma (trans)	0.006	BDJ	NG/G	U	7
UHR-SVS-112	L11980-6	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.013	KDJ	NG/G	U	21
UHR-SVS-112	L11980-6	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, trans-	0.008	KDJ	NG/G	U	21
UHR-SVS-112	L11980-6	E2PEST	AXYS Method MLA-028 Rev 05	Endosulphan sulphate	0.003	K	NG/G	U	21
UHR-SVS-19	L11980-7	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, cis-	0.004	BJ	NG/G	U	7
UHR-SVS-19	L11980-7	E2PEST	AXYS Method MLA-028 Rev 05	Methoxychlor	0.029	K	NG/G	U	21
UHR-SVS-19	L11980-7	E2PEST	AXYS Method MLA-028 Rev 05	Endosulphan sulphate	0.004	K	NG/G	U	21
UHR-SVS-19	L11980-7	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.028	KB	NG/G	U	21
UHR-SVS-19	L11980-7	E2PEST	AXYS Method MLA-028 Rev 05	Dieldrin	0.012	K	NG/G	U	21
UHR-SVS-19	L11980-7	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, gamma (trans)	0.011	KBJ	NG/G	U	21
UHR-SVS-19	L11980-7	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, trans-	0.016	KJ	NG/G	U	21
UHR-SVS-19	L11980-7	E2PEST	AXYS Method MLA-028 Rev 05	alpha-Endosulphan	0.02	KB	NG/G	U	21
UHR-SVS-19	L11980-7	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.013	KJ	NG/G	U	21

QUALIFIED DATA SUMMARY TABLE
Benthic Pilot Study Sediment

Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	Aldrin	0.0058	UD	NG/G	UJ	1
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	4,4'-DDD	0.948	D	NG/G	J	1
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	Hexachlorobenzene	0.685	BDJ	NG/G	J	1
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Gamma	0.0168	UD	NG/G	UJ	1
UHR-SVS-24	L11980-8	E2PEST	AXYS Method MLA-028 Rev 05	Dieldrin	0.018	K	NG/G	U	1,21
UHR-SVS-24	L11980-8	E2PEST	AXYS Method MLA-028 Rev 05	Endrin	0.004	K	NG/G	U	21
UHR-SVS-24	L11980-8	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.031	KB	NG/G	U	1,21
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	4,4'-DDT	0.161	DJ	NG/G	J	1
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	2,4'-DDT	0.0992	UD	NG/G	UJ	1
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	2,4'-DDE	0.256	DJ	NG/G	J	1
UHR-SVS-24	L11980-8	E2PEST	AXYS Method MLA-028 Rev 05	alpha-Endosulphan	0.022	KB	NG/G	U	1,21
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	2,4'-DDD	0.861	D	NG/G	J	1
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	Heptachlor	0.0044	UD	NG/G	UJ	1
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Alpha	0.041	KDJ	NG/G	UJ	1,21
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	4,4'-DDE	1.12	D	NG/G	J	1
UHR-SVS-24	L11980-8	E2PEST	AXYS Method MLA-028 Rev 05	Endrin ketone	0.038	K	NG/G	U	1,21
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, cis-	0.0149	UD	NG/G	UJ	1
UHR-SVS-24	L11980-8	E2PEST	AXYS Method MLA-028 Rev 05	Endosulphan sulphate	0.02	K	NG/G	U	1,21
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, oxy-	0.0183	UD	NG/G	UJ	1
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, gamma (trans)	0.149	BDJ	NG/G	J	1
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.155	KDJ	NG/G	UJ	1,21
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	Technical Chlordane	0.373		NG/G	J	1
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, trans-	0.053	KDJ	NG/G	UJ	1,21
UHR-SVS-24	L11980-8	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Beta	0.0214	UD	NG/G	UJ	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, cis-	0.044	KBDJ	NG/G	UJ	1,21
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	2,4'-DDT	0.0594	UD	NG/G	UJ	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	4,4'-DDE	1.25	D	NG/G	J	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	2,4'-DDE	0.421	DJ	NG/G	J	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	4,4'-DDD	0.726	DJ	NG/G	J	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	2,4'-DDD	0.387	DJ	NG/G	J	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Gamma	0.0139	UD	NG/G	UJ	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	Nonachlor, trans-	0.031	KDJ	NG/G	UJ	1,21
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	4,4'-DDT	0.081	DJ	NG/G	J	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Beta	0.026	KDJ	NG/G	UJ	1,21
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	Hexachlorobenzene	0.869	BD	NG/G	J	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	Heptachlor	0.0068	UD	NG/G	UJ	1,13
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	Aldrin	0.0293	UD	NG/G	UJ	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, oxy-	0.0724	UD	NG/G	UJ	1

QUALIFIED DATA SUMMARY TABLE
Benthic Pilot Study Sediment

Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, gamma (trans)	0.087	KBDJ	NG/G	UJ	1,21
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	Chlordane, alpha (cis)	0.098	DJ	NG/G	J	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	Technical Chlordane	0.245		NG/G	J	1
UHR-SVS-31	L11980-9	E1PEST	AXYS Method MLA-028 Rev 05	HCH, Alpha	0.057	KDJ	NG/G	UJ	1,21
UHR-SVS-31	L11980-9	E2PEST	AXYS Method MLA-028 Rev 05	Methoxychlor	0.167	KJ	NG/G	U	1,21
UHR-SVS-31	L11980-9	E2PEST	AXYS Method MLA-028 Rev 05	Heptachlor epoxide	0.002	KJ	NG/G	U	1,21
UHR-SVS-31	L11980-9	E2PEST	AXYS Method MLA-028 Rev 05	beta-Endosulphan	0.03	KBJ	NG/G	U	1,21
UHR-SVS-16/37	L0914111-11	WETCHM	9060	Total Organic Carbon	1.385		%	J	1,9
UHR-SVS-29/36	L0914111-12	WETCHM	9060	Total Organic Carbon	0.988		%	J	1,9
UHR-SVS-124	L0914111-01	METALS	6020A	Antimony, Total	0.122		mg/kg	J	8,12
UHR-SVS-127	L0914111-02	METALS	6020A	Antimony, Total	0.34		mg/kg	J	8,12
UHR-SVS-13	L0914111-03	METALS	6020A	Antimony, Total	0.51		mg/kg	J	8,12
UHR-SVS-04	L0914111-04	METALS	6020A	Antimony, Total	0.041	J	mg/kg	J	8,12
UHR-SVS-112	L0914111-05	METALS	6020A	Antimony, Total	0.23		mg/kg	J	8,12
UHR-SVS-19	L0914111-06	METALS	6020A	Antimony, Total	0.032	J	mg/kg	J	8,12
UHR-SVS-24	L0914111-07	METALS	6020A	Antimony, Total	0.633		mg/kg	J	8,12
UHR-SVS-31	L0914111-08	METALS	6020A	Antimony, Total	0.77		mg/kg	J	8,12
UHR-SVS-26	L0914111-09	METALS	6020A	Antimony, Total	0.229		mg/kg	J	8,12
UHR-SVS-38	L0914111-10	METALS	6020A	Antimony, Total	0.165		mg/kg	J	8,12
UHR-SVS-16/37	L0914111-11	METALS	6020A	Antimony, Total	1.58		mg/kg	J	8,12
UHR-SVS-29/36	L0914111-12	METALS	6020A	Antimony, Total	0.633		mg/kg	J	8,12
UHR-SVS-124	L0914111-01	METALS	7474	Mercury, Total	0.12		mg/kg	J	1,9
UHR-SVS-127	L0914111-02	METALS	7474	Mercury, Total	0.21		mg/kg	J	1,9
UHR-SVS-13	L0914111-03	METALS	7474	Mercury, Total	0.093		mg/kg	J	1,9
UHR-SVS-04	L0914111-04	METALS	7474	Mercury, Total	0.03		mg/kg	J	1,9
UHR-SVS-112	L0914111-05	METALS	7474	Mercury, Total	0.064		mg/kg	J	1,9
UHR-SVS-19	L0914111-06	METALS	7474	Mercury, Total	0.016	J	mg/kg	J	1,9
UHR-SVS-24	L0914111-07	METALS	7474	Mercury, Total	0.877		mg/kg	J	1,9
UHR-SVS-31	L0914111-08	METALS	7474	Mercury, Total	0.854		mg/kg	J	1,9
UHR-SVS-26	L0914111-09	METALS	7474	Mercury, Total	0.368		mg/kg	J	1,9
UHR-SVS-38	L0914111-10	METALS	7474	Mercury, Total	0.136		mg/kg	J	1,9
UHR-SVS-16/37	L0914111-11	METALS	7474	Mercury, Total	1.99		mg/kg	J	1,9
UHR-SVS-29/36	L0914111-12	METALS	7474	Mercury, Total	0.648		mg/kg	J	1,9
UHR-SVS-124	L0914111-01	METALS	6020A	Cobalt, Total	4.32		mg/kg	J	16
UHR-SVS-124	L0914111-01	METALS	6020A	Magnesium, Total	1660		mg/kg	J	16
UHR-SVS-124	L0914111-01	METALS	6020A	Barium, Total	40.8		mg/kg	J	16
UHR-SVS-124	L0914111-01	METALS	6020A	Aluminum, Total	4740		mg/kg	J	12,16
UHR-SVS-124	L0914111-01	METALS	6020A	Beryllium, Total	0.34		mg/kg	J	9,16

QUALIFIED DATA SUMMARY TABLE
Benthic Pilot Study Sediment

Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-124	L0914111-01	METALS	6020A	Chromium, Total	25.1		mg/kg	J	16
UHR-SVS-124	L0914111-01	METALS	6020A	Nickel, Total	7.6		mg/kg	J	16
UHR-SVS-124	L0914111-01	METALS	6020A	Lead, Total	21.6		mg/kg	J	16
UHR-SVS-124	L0914111-01	METALS	6020A	Copper, Total	9.44		mg/kg	J	16
UHR-SVS-124	L0914111-01	METALS	6020A	Vanadium, Total	10.2		mg/kg	J	16
UHR-SVS-127	L0914111-02	METALS	6020A	Barium, Total	77.4		mg/kg	J	16
UHR-SVS-127	L0914111-02	METALS	6020A	Beryllium, Total	0.361		mg/kg	J	9,16
UHR-SVS-127	L0914111-02	METALS	6020A	Aluminum, Total	5030		mg/kg	J	12,16
UHR-SVS-127	L0914111-02	METALS	6020A	Vanadium, Total	11.2		mg/kg	J	16
UHR-SVS-127	L0914111-02	METALS	6020A	Nickel, Total	10.1		mg/kg	J	16
UHR-SVS-127	L0914111-02	METALS	6020A	Magnesium, Total	1910		mg/kg	J	16
UHR-SVS-127	L0914111-02	METALS	6020A	Lead, Total	39.6		mg/kg	J	16
UHR-SVS-127	L0914111-02	METALS	6020A	Copper, Total	17.1		mg/kg	J	16
UHR-SVS-127	L0914111-02	METALS	6020A	Chromium, Total	28.8		mg/kg	J	16
UHR-SVS-127	L0914111-02	METALS	6020A	Cobalt, Total	4.73		mg/kg	J	16
UHR-SVS-13	L0914111-03	METALS	6020A	Cobalt, Total	3.44		mg/kg	J	16
UHR-SVS-13	L0914111-03	METALS	6020A	Magnesium, Total	1650		mg/kg	J	16
UHR-SVS-13	L0914111-03	METALS	6020A	Lead, Total	52.9		mg/kg	J	16
UHR-SVS-13	L0914111-03	METALS	6020A	Copper, Total	14.5		mg/kg	J	16
UHR-SVS-13	L0914111-03	METALS	6020A	Chromium, Total	23.8		mg/kg	J	16
UHR-SVS-13	L0914111-03	METALS	6020A	Beryllium, Total	0.341		mg/kg	J	9,16
UHR-SVS-13	L0914111-03	METALS	6020A	Barium, Total	42.5		mg/kg	J	16
UHR-SVS-13	L0914111-03	METALS	6020A	Vanadium, Total	10.6		mg/kg	J	16
UHR-SVS-13	L0914111-03	METALS	6020A	Nickel, Total	6.92		mg/kg	J	16
UHR-SVS-13	L0914111-03	METALS	6020A	Aluminum, Total	4680		mg/kg	J	12,16
UHR-SVS-04	L0914111-04	METALS	6020A	Manganese, Total	146		mg/kg	J	16
UHR-SVS-04	L0914111-04	METALS	6020A	Vanadium, Total	11.1		mg/kg	J	16
UHR-SVS-04	L0914111-04	METALS	6020A	Nickel, Total	8.75		mg/kg	J	16
UHR-SVS-04	L0914111-04	METALS	6020A	Barium, Total	43		mg/kg	J	16
UHR-SVS-04	L0914111-04	METALS	6020A	Aluminum, Total	5640		mg/kg	J	12,16
UHR-SVS-04	L0914111-04	METALS	6020A	Beryllium, Total	0.364		mg/kg	J	9,16
UHR-SVS-04	L0914111-04	METALS	6020A	Lead, Total	7.76		mg/kg	J	16
UHR-SVS-04	L0914111-04	METALS	6020A	Copper, Total	8.29		mg/kg	J	16
UHR-SVS-04	L0914111-04	METALS	6020A	Cobalt, Total	5.02		mg/kg	J	16
UHR-SVS-04	L0914111-04	METALS	6020A	Chromium, Total	10.4		mg/kg	J	16
UHR-SVS-04	L0914111-04	METALS	6020A	Magnesium, Total	1820		mg/kg	J	16
UHR-SVS-112	L0914111-05	METALS	6020A	Cobalt, Total	2.78		mg/kg	J	16
UHR-SVS-112	L0914111-05	METALS	6020A	Nickel, Total	5.6		mg/kg	J	16

QUALIFIED DATA SUMMARY TABLE
Benthic Pilot Study Sediment

Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-112	L0914111-05	METALS	6020A	Beryllium, Total	0.258		mg/kg	J	9,16
UHR-SVS-112	L0914111-05	METALS	6020A	Magnesium, Total	1230		mg/kg	J	16
UHR-SVS-112	L0914111-05	METALS	6020A	Chromium, Total	17.4		mg/kg	J	16
UHR-SVS-112	L0914111-05	METALS	6020A	Copper, Total	8.99		mg/kg	J	16
UHR-SVS-112	L0914111-05	METALS	6020A	Barium, Total	30.5		mg/kg	J	16
UHR-SVS-112	L0914111-05	METALS	6020A	Aluminum, Total	3130		mg/kg	J	12,16
UHR-SVS-112	L0914111-05	METALS	6020A	Vanadium, Total	7		mg/kg	J	16
UHR-SVS-112	L0914111-05	METALS	6020A	Lead, Total	23.5		mg/kg	J	16
UHR-SVS-19	L0914111-06	METALS	6020A	Copper, Total	5.94		mg/kg	J	16
UHR-SVS-19	L0914111-06	METALS	6020A	Lead, Total	7.06		mg/kg	J	16
UHR-SVS-19	L0914111-06	METALS	6020A	Nickel, Total	6.89		mg/kg	J	16
UHR-SVS-19	L0914111-06	METALS	6020A	Cobalt, Total	5.15		mg/kg	J	16
UHR-SVS-19	L0914111-06	METALS	6020A	Magnesium, Total	1480		mg/kg	J	16
UHR-SVS-19	L0914111-06	METALS	6020A	Aluminum, Total	4990		mg/kg	J	12,16
UHR-SVS-19	L0914111-06	METALS	6020A	Barium, Total	40.4		mg/kg	J	16
UHR-SVS-19	L0914111-06	METALS	6020A	Beryllium, Total	0.356		mg/kg	J	9,16
UHR-SVS-19	L0914111-06	METALS	6020A	Chromium, Total	7.01		mg/kg	J	16
UHR-SVS-19	L0914111-06	METALS	6020A	Vanadium, Total	10.5		mg/kg	J	16
UHR-SVS-24	L0914111-07	METALS	6020A	Aluminum, Total	4460		mg/kg	J	12,16
UHR-SVS-24	L0914111-07	METALS	6020A	Lead, Total	144		mg/kg	J	16
UHR-SVS-24	L0914111-07	METALS	6020A	Nickel, Total	9.67		mg/kg	J	16
UHR-SVS-24	L0914111-07	METALS	6020A	Copper, Total	25.6		mg/kg	J	16
UHR-SVS-24	L0914111-07	METALS	6020A	Magnesium, Total	1250		mg/kg	J	16
UHR-SVS-24	L0914111-07	METALS	6020A	Chromium, Total	115		mg/kg	J	16
UHR-SVS-24	L0914111-07	METALS	6020A	Barium, Total	37.3		mg/kg	J	16
UHR-SVS-24	L0914111-07	METALS	6020A	Cobalt, Total	4.06		mg/kg	J	16
UHR-SVS-24	L0914111-07	METALS	6020A	Calcium, Total	1590		mg/kg	J	
UHR-SVS-24	L0914111-07	METALS	6020A	Beryllium, Total	0.302		mg/kg	J	9,16
UHR-SVS-31	L0914111-08	METALS	6020A	Cobalt, Total	3.8		mg/kg	J	16
UHR-SVS-31	L0914111-08	METALS	6020A	Aluminum, Total	4830		mg/kg	J	12,16
UHR-SVS-31	L0914111-08	METALS	6020A	Barium, Total	39.3		mg/kg	J	16
UHR-SVS-31	L0914111-08	METALS	6020A	Chromium, Total	87.1		mg/kg	J	16
UHR-SVS-31	L0914111-08	METALS	6020A	Copper, Total	14.1		mg/kg	J	16
UHR-SVS-31	L0914111-08	METALS	6020A	Nickel, Total	7.69		mg/kg	J	16
UHR-SVS-31	L0914111-08	METALS	6020A	Beryllium, Total	0.322		mg/kg	J	9,16
UHR-SVS-31	L0914111-08	METALS	6020A	Magnesium, Total	1410		mg/kg	J	16
UHR-SVS-26	L0914111-09	METALS	6020A	Barium, Total	37		mg/kg	J	16
UHR-SVS-26	L0914111-09	METALS	6020A	Nickel, Total	7.61		mg/kg	J	16

QUALIFIED DATA SUMMARY TABLE
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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-26	L0914111-09	METALS	6020A	Magnesium, Total	1450		mg/kg	J	16
UHR-SVS-26	L0914111-09	METALS	6020A	Copper, Total	11		mg/kg	J	16
UHR-SVS-26	L0914111-09	METALS	6020A	Cobalt, Total	4.7		mg/kg	J	16
UHR-SVS-26	L0914111-09	METALS	6020A	Beryllium, Total	0.301		mg/kg	J	9,16
UHR-SVS-26	L0914111-09	METALS	6020A	Aluminum, Total	4310		mg/kg	J	12,16
UHR-SVS-26	L0914111-09	METALS	6020A	Chromium, Total	55.2		mg/kg	J	16
UHR-SVS-38	L0914111-10	METALS	6020A	Beryllium, Total	0.327		mg/kg	J	9,16
UHR-SVS-38	L0914111-10	METALS	6020A	Nickel, Total	6.84		mg/kg	J	16
UHR-SVS-38	L0914111-10	METALS	6020A	Copper, Total	9.26		mg/kg	J	16
UHR-SVS-38	L0914111-10	METALS	6020A	Cobalt, Total	3.89		mg/kg	J	16
UHR-SVS-38	L0914111-10	METALS	6020A	Barium, Total	37		mg/kg	J	16
UHR-SVS-38	L0914111-10	METALS	6020A	Magnesium, Total	1580		mg/kg	J	16
UHR-SVS-38	L0914111-10	METALS	6020A	Magnesium, Total			mg/kg	R	11
UHR-SVS-38	L0914111-10	METALS	6020A	Chromium, Total	28.3		mg/kg	J	16
UHR-SVS-38	L0914111-10	METALS	6020A	Aluminum, Total	4460		mg/kg	J	12,16
UHR-SVS-16/37	L0914111-11	METALS	6020A	Beryllium, Total	1.69		mg/kg	J	9,16
UHR-SVS-16/37	L0914111-11	METALS	6020A	Aluminum, Total	7010		mg/kg	J	12,16
UHR-SVS-16/37	L0914111-11	METALS	6020A	Magnesium, Total	1770		mg/kg	J	16
UHR-SVS-16/37	L0914111-11	METALS	6020A	Copper, Total	37.4		mg/kg	J	16
UHR-SVS-16/37	L0914111-11	METALS	6020A	Barium, Total	61.7		mg/kg	J	16
UHR-SVS-16/37	L0914111-11	METALS	6020A	Cobalt, Total	6.21		mg/kg	J	16
UHR-SVS-16/37	L0914111-11	METALS	6020A	Nickel, Total	12.4		mg/kg	J	16
UHR-SVS-16/37	L0914111-11	METALS	6020A	Chromium, Total	228		mg/kg	J	16
UHR-SVS-29/36	L0914111-12	METALS	6020A	Chromium, Total	116		mg/kg	J	16
UHR-SVS-29/36	L0914111-12	METALS	6020A	Beryllium, Total	0.33		mg/kg	J	9,16
UHR-SVS-29/36	L0914111-12	METALS	6020A	Barium, Total	48.7		mg/kg	J	16
UHR-SVS-29/36	L0914111-12	METALS	6020A	Copper, Total	22.2		mg/kg	J	16
UHR-SVS-29/36	L0914111-12	METALS	6020A	Nickel, Total	9.46		mg/kg	J	16
UHR-SVS-29/36	L0914111-12	METALS	6020A	Aluminum, Total	5420		mg/kg	J	12,16
UHR-SVS-29/36	L0914111-12	METALS	6020A	Cobalt, Total	4.49		mg/kg	J	16
UHR-SVS-29/36	L0914111-12	METALS	6020A	Magnesium, Total	1600		mg/kg	J	5B,16
UHR-SVS-124	L0914111-01	AVS-SEM	-	Sulfide, Acid Volatile	3.99		umoles/gm	J	1,9
UHR-SVS-127	L0914111-02	AVS-SEM	-	Sulfide, Acid Volatile	5.49		umoles/gm	J	1,9
UHR-SVS-13	L0914111-03	AVS-SEM	-	Sulfide, Acid Volatile	9.59		umoles/gm	J	1,9
UHR-SVS-04	L0914111-04	AVS-SEM	-	Sulfide, Acid Volatile	3.34		umoles/gm	J	1,9
UHR-SVS-112	L0914111-05	AVS-SEM	-	Sulfide, Acid Volatile	1.91		umoles/gm	J	1,9
UHR-SVS-19	L0914111-06	AVS-SEM	-	Sulfide, Acid Volatile	0.393		umoles/gm	J	1,9
UHR-SVS-24	L0914111-07	AVS-SEM	-	Sulfide, Acid Volatile	1.06		umoles/gm	J	1,9

QUALIFIED DATA SUMMARY TABLE
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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-31	L0914111-08	AVS-SEM	-	Sulfide, Acid Volatile	2.48		umoles/gm	J	1,9
UHR-SVS-26	L0914111-09	AVS-SEM	-	Sulfide, Acid Volatile	1.53		umoles/gm	J	1,9
UHR-SVS-38	L0914111-10	AVS-SEM	-	Sulfide, Acid Volatile	3.45		umoles/gm	J	1,9
UHR-SVS-16/37	L0914111-11	AVS-SEM	-	Sulfide, Acid Volatile	1.26		umoles/gm	J	1,9
UHR-SVS-29/36	L0914111-12	AVS-SEM	-	Sulfide, Acid Volatile	4.93		umoles/gm	J	1,9
UHR-SVS-124	L0914111-01	AVS-SEM	6020A	Cadmium, Total	0.00511		umoles/gm	J	1
UHR-SVS-124	L0914111-01	AVS-SEM	6020A	Copper, Total	0.0649		umoles/gm	J	1
UHR-SVS-124	L0914111-01	AVS-SEM	6020A	Lead, Total	0.0751		umoles/gm	J	1,9
UHR-SVS-124	L0914111-01	AVS-SEM	6020A	Nickel, Total	0.0377		umoles/gm	J	1
UHR-SVS-124	L0914111-01	AVS-SEM	6020A	SEM/AVS Ratio	0.26		umoles/gm	J	1
UHR-SVS-124	L0914111-01	AVS-SEM	6020A	Zinc, Total	0.857		umoles/gm	J	1
UHR-SVS-127	L0914111-02	AVS-SEM	6020A	Cadmium, Total	0.0131		umoles/gm	J	1
UHR-SVS-127	L0914111-02	AVS-SEM	6020A	Lead, Total	0.151		umoles/gm	J	1,9
UHR-SVS-127	L0914111-02	AVS-SEM	6020A	Zinc, Total	0.735		umoles/gm	J	1
UHR-SVS-127	L0914111-02	AVS-SEM	6020A	Nickel, Total	0.0411		umoles/gm	J	1
UHR-SVS-127	L0914111-02	AVS-SEM	6020A	Copper, Total	0.1		umoles/gm	J	1
UHR-SVS-127	L0914111-02	AVS-SEM	6020A	SEM/AVS Ratio	0.19		umoles/gm	J	1
UHR-SVS-13	L0914111-03	AVS-SEM	6020A	Copper, Total	0.068		umoles/gm	J	1
UHR-SVS-13	L0914111-03	AVS-SEM	6020A	Nickel, Total	0.0263		umoles/gm	J	1
UHR-SVS-13	L0914111-03	AVS-SEM	6020A	Zinc, Total	0.513		umoles/gm	J	1
UHR-SVS-13	L0914111-03	AVS-SEM	6020A	Cadmium, Total	0.00581		umoles/gm	J	1
UHR-SVS-13	L0914111-03	AVS-SEM	6020A	SEM/AVS Ratio	0.075		umoles/gm	J	1
UHR-SVS-13	L0914111-03	AVS-SEM	6020A	Lead, Total	0.105		umoles/gm	J	1,9
UHR-SVS-04	L0914111-04	AVS-SEM	6020A	Nickel, Total	0.0372		umoles/gm	J	1
UHR-SVS-04	L0914111-04	AVS-SEM	6020A	Cadmium, Total	0.00153		umoles/gm	J	1
UHR-SVS-04	L0914111-04	AVS-SEM	6020A	Lead, Total	0.0253		umoles/gm	J	1,9
UHR-SVS-04	L0914111-04	AVS-SEM	6020A	Zinc, Total	0.311		umoles/gm	J	1
UHR-SVS-04	L0914111-04	AVS-SEM	6020A	SEM/AVS Ratio	0.135		umoles/gm	J	1
UHR-SVS-04	L0914111-04	AVS-SEM	6020A	Copper, Total	0.0764		umoles/gm	J	1
UHR-SVS-112	L0914111-05	AVS-SEM	6020A	Lead, Total	0.0917		umoles/gm	J	1,9
UHR-SVS-112	L0914111-05	AVS-SEM	6020A	Nickel, Total	0.0289		umoles/gm	J	1
UHR-SVS-112	L0914111-05	AVS-SEM	6020A	Cadmium, Total	0.00278		umoles/gm	J	1
UHR-SVS-112	L0914111-05	AVS-SEM	6020A	Zinc, Total	0.421		umoles/gm	J	1
UHR-SVS-112	L0914111-05	AVS-SEM	6020A	SEM/AVS Ratio	0.31		umoles/gm	J	1
UHR-SVS-112	L0914111-05	AVS-SEM	6020A	Copper, Total	0.0457		umoles/gm	J	1
UHR-SVS-19	L0914111-06	AVS-SEM	6020A	SEM/AVS Ratio		U	umoles/gm	UJ	1
UHR-SVS-19	L0914111-06	AVS-SEM	6020A	Cadmium, Total	0.00077		umoles/gm	J	1
UHR-SVS-19	L0914111-06	AVS-SEM	6020A	Copper, Total	0.0492		umoles/gm	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-19	L0914111-06	AVS-SEM	6020A	Lead, Total	0.0251		umoles/gm	J	1,9
UHR-SVS-19	L0914111-06	AVS-SEM	6020A	Zinc, Total	0.15		umoles/gm	J	1
UHR-SVS-19	L0914111-06	AVS-SEM	6020A	Nickel, Total	0.0294		umoles/gm	J	1
UHR-SVS-24	L0914111-07	AVS-SEM	6020A	Cadmium, Total	0.0182		umoles/gm	J	1
UHR-SVS-24	L0914111-07	AVS-SEM	6020A	Copper, Total	0.112		umoles/gm	J	1
UHR-SVS-24	L0914111-07	AVS-SEM	6020A	Lead, Total	0.597		umoles/gm	J	1,9
UHR-SVS-24	L0914111-07	AVS-SEM	6020A	Nickel, Total	0.0384		umoles/gm	J	1
UHR-SVS-24	L0914111-07	AVS-SEM	6020A	Zinc, Total	0.714		umoles/gm	J	1
UHR-SVS-24	L0914111-07	AVS-SEM	6020A	SEM/AVS Ratio	1.4		umoles/gm	J	1
UHR-SVS-31	L0914111-08	AVS-SEM	6020A	Lead, Total	0.338		umoles/gm	J	1,9
UHR-SVS-31	L0914111-08	AVS-SEM	6020A	Zinc, Total	0.806		umoles/gm	J	1
UHR-SVS-31	L0914111-08	AVS-SEM	6020A	Nickel, Total	0.0329		umoles/gm	J	1
UHR-SVS-31	L0914111-08	AVS-SEM	6020A	SEM/AVS Ratio	0.507		umoles/gm	J	1
UHR-SVS-31	L0914111-08	AVS-SEM	6020A	Copper, Total	0.0549		umoles/gm	J	1
UHR-SVS-31	L0914111-08	AVS-SEM	6020A	Cadmium, Total	0.0254		umoles/gm	J	1
UHR-SVS-26	L0914111-09	AVS-SEM	6020A	Zinc, Total	0.867		umoles/gm	J	1
UHR-SVS-26	L0914111-09	AVS-SEM	6020A	Nickel, Total	0.0516		umoles/gm	J	1
UHR-SVS-26	L0914111-09	AVS-SEM	6020A	SEM/AVS Ratio	0.764		umoles/gm	J	1
UHR-SVS-26	L0914111-09	AVS-SEM	6020A	Lead, Total	0.156		umoles/gm	J	1,9
UHR-SVS-26	L0914111-09	AVS-SEM	6020A	Cadmium, Total	0.017		umoles/gm	J	1
UHR-SVS-26	L0914111-09	AVS-SEM	6020A	Copper, Total	0.0777		umoles/gm	J	1
UHR-SVS-38	L0914111-10	AVS-SEM	6020A	Nickel, Total	0.0364		umoles/gm	J	1
UHR-SVS-38	L0914111-10	AVS-SEM	6020A	Zinc, Total	0.689		umoles/gm	J	1
UHR-SVS-38	L0914111-10	AVS-SEM	6020A	Lead, Total	0.102		umoles/gm	J	1,9
UHR-SVS-38	L0914111-10	AVS-SEM	6020A	Copper, Total	0.0608		umoles/gm	J	1
UHR-SVS-38	L0914111-10	AVS-SEM	6020A	Cadmium, Total	0.00658		umoles/gm	J	1
UHR-SVS-38	L0914111-10	AVS-SEM	6020A	SEM/AVS Ratio	0.259		umoles/gm	J	1
UHR-SVS-16/37	L0914111-11	AVS-SEM	6020A	Copper, Total	0.0683		umoles/gm	J	1
UHR-SVS-16/37	L0914111-11	AVS-SEM	6020A	Lead, Total	0.401		umoles/gm	J	1,9
UHR-SVS-16/37	L0914111-11	AVS-SEM	6020A	SEM/AVS Ratio	1.11		umoles/gm	J	1
UHR-SVS-16/37	L0914111-11	AVS-SEM	6020A	Zinc, Total	0.909		umoles/gm	J	1
UHR-SVS-16/37	L0914111-11	AVS-SEM	6020A	Nickel, Total	0.0258	U	umoles/gm	UJ	1
UHR-SVS-16/37	L0914111-11	AVS-SEM	6020A	Cadmium, Total	0.0296		umoles/gm	J	1
UHR-SVS-29/36	L0914111-12	AVS-SEM	6020A	Cadmium, Total	0.0174		umoles/gm	J	1
UHR-SVS-29/36	L0914111-12	AVS-SEM	6020A	Copper, Total	0.155		umoles/gm	J	1
UHR-SVS-29/36	L0914111-12	AVS-SEM	6020A	Nickel, Total	0.0474		umoles/gm	J	1
UHR-SVS-29/36	L0914111-12	AVS-SEM	6020A	Lead, Total	0.422		umoles/gm	J	1,9
UHR-SVS-29/36	L0914111-12	AVS-SEM	6020A	Zinc, Total	1.31		umoles/gm	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-29/36	L0914111-12	AVS-SEM	6020A	SEM/AVS Ratio	0.396		umoles/gm	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Phenanthrene	221		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Fluoranthene	278		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Anthracene	25.1		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	46.6		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	37.3		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Pyrene	246		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	77.1		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	22.9		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	10.4		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	13.4		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	48.9		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	135		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	32.9		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	15.1		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Benz(a)anthracene	104		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Chrysene	132		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C1-Chrysenes	57.2		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C2-Chrysenes	26.1		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C3-Chrysenes	19		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	103		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Dibenzofuran	24.8		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	113		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Naphthalene	53.3		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	99.5		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Acenaphthene	17.1		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	12.1		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Benzo(a)pyrene	25.6		ug/kg	J	1,12
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Perylene	17.4		ug/kg	J	1,12
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	69.9		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C4-Chrysenes	2.52	U	ug/kg	UJ	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Benzo(ghi)perylene	66.9		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Benzo(e)Pyrene	77.3		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C1-Naphthalenes	31.8		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C2-Naphthalenes	34.3		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C2-Fluorenes	16.7		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Dibenzothiophene	13.6		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	18.5		ug/kg	J	1,12

QUALIFIED DATA SUMMARY TABLE
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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C3-Fluorenes	31.1		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C3-Naphthalenes	30.9		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C1-Fluorenes	13.6		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Fluorene	22.5		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	Acenaphthylene	16.5		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	1-Methylnaphthalene	19.2		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	2-Methylnaphthalene	29.4		ug/kg	J	1
UHR-SVS-124	L0917094-01	PAH	8270C-SIM(M)	C4-Naphthalenes	27.1		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C2-Fluorenes	42		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C3-Fluorenes	67.7		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	45.3		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	30.5		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Phenanthrene	772		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	313		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	170		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	91		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Dibenzothiophene	47.1		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	68.1		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Anthracene	139		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Fluoranthene	874		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Naphthalene	63.7		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C1-Naphthalenes	61.8		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C2-Naphthalenes	71.7		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C3-Naphthalenes	70.6		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C4-Naphthalenes	63.7		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	460		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	46.1		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C1-Fluorenes	48.8		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	2-Methylnaphthalene	55.3		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	322		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Fluorene	67.1		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	18.2		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	1-Methylnaphthalene	40		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	88.5		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	55		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Benz(a)anthracene	396		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Chrysene	429		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C1-Chrysenes	202		ug/kg	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C2-Chrysenes	92.8		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C3-Chrysenes	54.4		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	C4-Chrysenes	27.2		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	339		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Dibenzofuran	39.5		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Benzo(e)Pyrene	240		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Benzo(a)pyrene	266		ug/kg	J	1,12
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Perylene	89.6		ug/kg	J	1,12
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	217		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Acenaphthene	56		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	64.8		ug/kg	J	1,12
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Benzo(ghi)perylene	212		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Pyrene	790		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Acenaphthylene	34.7		ug/kg	J	1
UHR-SVS-127	L0917094-02	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	280		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C3-Naphthalenes	27.6		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C1-Naphthalenes	19.7		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Naphthalene	29.7		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C2-Chrysenes	40.9		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C1-Chrysenes	86.3		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Benz(a)anthracene	158		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Fluorene	18.9		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	25.4		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	39.8		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Chrysene	172		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	2-Methylnaphthalene	18.2		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	1-Methylnaphthalene	12.1		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Dibenzofuran	15.1		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Acenaphthene	12.2		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C1-Fluorenes	16.2		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C2-Fluorenes	14.3		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C3-Fluorenes	23.5		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	133		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C2-Naphthalenes	25.1		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C4-Chrysenes	16.2		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Dibenzothiophene	10.8		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Acenaphthylene	24.6		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	147		ug/kg	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C4-Naphthalenes	25.8		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C3-Chrysenes	29.6		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	9.35		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Benzo(e)Pyrene	110		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	171		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Benzo(a)pyrene	152		ug/kg	J	1,12
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Perylene	68.9		ug/kg	J	1,12
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	105		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	28.4		ug/kg	J	1,12
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Benzo(ghi)perylene	99.6		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	36.3		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	130		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Pyrene	276		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	12.4		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	36		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Fluoranthene	310		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	52.6		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	77.4		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Phenanthrene	194		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	9.14		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	10.9		ug/kg	J	1
UHR-SVS-13	L0917094-03	PAH	8270C-SIM(M)	Anthracene	46.4		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Dibenzothiophene	3.13		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	3.48		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	2.73		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	3.73		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	2.64	U	ug/kg	UJ	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Phenanthrene	57.1		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	19.7		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	13.6		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	17.7		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C3-Naphthalenes	8.92		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	9.65		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C3-Fluorenes	9.68		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C2-Fluorenes	6.72		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C1-Fluorenes	4.79		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Fluorene	5.34		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Acenaphthene	2.64	J	ug/kg	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Acenaphthylene	4.64		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Dibenzofuran	3.18		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	1-Methylnaphthalene	2.64	J	ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Anthracene	6.47		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C4-Naphthalenes	6.89		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Chrysene	42.1		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	2-Methylnaphthalene	3.16		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Benz(a)anthracene	30.3		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C2-Naphthalenes	5.92		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Naphthalene	6.44		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C1-Naphthalenes	3.77		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Benzo(e)Pyrene	25		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	32.5		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	33.8		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C4-Chrysenes	2.64	U	ug/kg	UJ	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C3-Chrysenes	2.64	U	ug/kg	UJ	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	13.7		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C1-Chrysenes	26.8		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Benzo(a)pyrene	14.3		ug/kg	J	1,12
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	9.12		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	34.8		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	36.4		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Pyrene	73.1		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Fluoranthene	87.8		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Benzo(ghi)perylene	24		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	6.21		ug/kg	J	1,12
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	24.4		ug/kg	J	1
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	Perylene	89.4		ug/kg	J	1,12
UHR-SVS-04	L0917094-04	PAH	8270C-SIM(M)	C2-Chrysenes	9.63		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Fluorene	16.6		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Naphthalene	27.6		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Acenaphthylene	13.3		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	42.7		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Anthracene	14		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Fluoranthene	133		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Pyrene	134		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	92.9		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	58.6		ug/kg	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	18.7		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	43.7		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Benz(a)anthracene	42.8		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	56.8		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C1-Naphthalenes	18.9		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C2-Naphthalenes	25.8		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C3-Naphthalenes	24.8		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C4-Naphthalenes	23.2		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	2-Methylnaphthalene	18.7		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	1-Methylnaphthalene	10.4		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Dibenzofuran	10.9		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Acenaphthene	8.65		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C1-Fluorenes	13		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	17.4		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	20.9		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Chrysene	55.8		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C1-Chrysenes	35.3		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C2-Chrysenes	20.6		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C3-Chrysenes	15.6		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C4-Chrysenes	8.83		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	33.6		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	37.2		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Benzo(e)Pyrene	28.8		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	32.9		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Perylene	1.78	U	ug/kg	UJ	1,12
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C2-Fluorenes	13.2		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	6.04		ug/kg	J	1,12
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Benzo(ghi)perylene	21.6		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C3-Fluorenes	20.7		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Dibenzothiophene	9.58		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	11.1		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	15.9		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	15.3		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	12.9		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Phenanthrene	117		ug/kg	J	1
UHR-SVS-112	L0917094-05	PAH	8270C-SIM(M)	Benzo(a)pyrene	2.99		ug/kg	J	1,12
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	16.4		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Phenanthrene	20.1		ug/kg	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Dibenzofuran	2.4	U	ug/kg	UJ	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Acenaphthylene	4.77		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Acenaphthene	2.4	U	ug/kg	UJ	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Fluorene	2.4	U	ug/kg	UJ	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C1-Fluorenes	2.4	U	ug/kg	UJ	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C2-Fluorenes	3.43		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C3-Fluorenes	5.3		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Dibenzothiophene	2.4	U	ug/kg	UJ	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	1-Methylnaphthalene	2.46		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	2.4	U	ug/kg	UJ	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	2.4	U	ug/kg	UJ	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	10.1		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	5.58		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Perylene	2.4	U	ug/kg	UJ	1,12
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	11.5		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	2.93		ug/kg	J	1,12
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Benzo(ghi)perylene	11.4		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	6.12		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C3-Chrysenes	6.7		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	4.81		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	2.4	U	ug/kg	UJ	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Pyrene	28.6		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Anthracene	3.83		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	2.4	U	ug/kg	UJ	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Fluoranthene	34.6		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	2-Methylnaphthalene	2.43		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	17.2		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	16.1		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	6.16		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	5.14		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Benz(a)anthracene	15		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Chrysene	19		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C1-Chrysenes	9.02		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C2-Naphthalenes	5.41		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C2-Chrysenes	5.49		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C4-Naphthalenes	4.66		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C3-Naphthalenes	6.04		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C1-Naphthalenes	3.56		ug/kg	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Naphthalene	4.06		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Benzo(a)pyrene	2.4	U	ug/kg	UJ	1,12
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Benzo(e)Pyrene	12.7		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	16.8		ug/kg	J	1
UHR-SVS-19	L0917094-06	PAH	8270C-SIM(M)	C4-Chrysenes	2.4	U	ug/kg	UJ	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Dibenzofuran	134		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	110		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Phenanthrene	1660		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	726		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	146		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	468		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	299		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	185		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Anthracene	303		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	70.2		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C1-Naphthalenes	349		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C3-Naphthalenes	270		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C4-Naphthalenes	221		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Chrysene	871		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	1-Methylnaphthalene	201		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Acenaphthylene	145		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Acenaphthene	126		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Fluorene	231		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Naphthalene	289		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	128		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	2-Methylnaphthalene	336		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	583		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C2-Naphthalenes	394		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Dibenzothiophene	133		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C1-Chrysenes	513		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C2-Chrysenes	237		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C3-Chrysenes	130		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	588		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C1-Fluorenes	141		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Benzo(e)Pyrene	442		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Benzo(a)pyrene	359		ug/kg	J	1,9,12
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Perylene	99.7		ug/kg	J	1,12
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	337		ug/kg	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C2-Fluorenes	147		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C4-Chrysenes	54.4		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C3-Fluorenes	222		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Benz(a)anthracene	753		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	145		ug/kg	J	1,8
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	248		ug/kg	J	1,8
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	866		ug/kg	J	1,8
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	1260		ug/kg	J	1,8
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Pyrene	1740		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Fluoranthene	1870		ug/kg	J	1,8
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Benzo(ghi)perylene	327		ug/kg	J	1
UHR-SVS-24	L0917094-07	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	109		ug/kg	J	1,12
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	108		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	52.3		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	37.9		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Benz(a)anthracene	112		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Chrysene	146		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C1-Chrysenes	72.1		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C2-Chrysenes	42.8		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C3-Chrysenes	36.3		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C4-Chrysenes	26		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	155		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	108		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Benzo(e)Pyrene	86.2		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Benzo(a)pyrene	56.4		ug/kg	J	1,12
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Perylene	22.6		ug/kg	J	1,12
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	63.6		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	17.4		ug/kg	J	1,12
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Benzo(ghi)perylene	66.3		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Naphthalene	27.6		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C1-Naphthalenes	25		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	2-Methylnaphthalene	22.4		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Fluoranthene	360		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C2-Naphthalenes	38.8		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Fluorene	21.9		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	166		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Pyrene	301		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C3-Naphthalenes	47.3		ug/kg	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	1-Methylnaphthalene	16.5		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Dibenzofuran	19.2		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Acenaphthene	12.4		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C4-Naphthalenes	131		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C1-Fluorenes	23.6		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C2-Fluorenes	36.4		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C3-Fluorenes	51.8		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	137		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Acenaphthylene	21.4		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Anthracene	36.6		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Dibenzothiophene	16.2		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	130		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	80.9		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	98.9		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	Phenanthrene	244		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	22.1		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	23.1		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	22.5		ug/kg	J	1
UHR-SVS-31	L0917094-08	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	18.5		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C1-Fluorenes	14		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	80		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Perylene	10.7		ug/kg	J	1,12
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	69.6		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Anthracene	24.3		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Fluoranthene	240		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Pyrene	221		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	121		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	101		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Benzo(e)Pyrene	69.9		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C2-Fluorenes	22.1		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C3-Fluorenes	34.2		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Dibenzothiophene	9.79		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	12.6		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	19.6		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	22.8		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	20.7		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Phenanthrene	156		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	73.8		ug/kg	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C2-Naphthalenes	29.8		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	56.8		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C1-Naphthalenes	23.2		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Benzo(a)pyrene	14		ug/kg	J	1,12
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	63.7		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C3-Naphthalenes	33.8		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C4-Naphthalenes	54.1		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	2-Methylnaphthalene	22.7		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	1-Methylnaphthalene	12.9		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Dibenzofuran	17.8		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Acenaphthylene	23.4		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Acenaphthene	7.41		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Fluorene	16.1		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Naphthalene	44.1		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C1-Chrysenes	50		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	94.3		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	60.8		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C2-Chrysenes	26.6		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C4-Chrysenes	15.4		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Chrysene	110		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Benz(a)anthracene	76.2		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	25.2		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	35.4		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Benzo(ghi)perylene	62.6		ug/kg	J	1
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	15.3		ug/kg	J	1,12
UHR-SVS-26	L0917094-09	PAH	8270C-SIM(M)	C3-Chrysenes	20.8		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C2-Chrysenes	24.2		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C1-Chrysenes	50.8		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Chrysene	118		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Benz(a)anthracene	88.9		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	22.6		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	31		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	102		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C3-Chrysenes	25.6		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Pyrene	235		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	59.3		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	116		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C4-Chrysenes	2.78	U	ug/kg	UJ	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	90.2		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	88.4		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Benzo(e)Pyrene	71.4		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Perylene	29.8		ug/kg	J	1,12
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	15.7		ug/kg	J	1,12
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Benzo(ghi)perylene	60.9		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C1-Naphthalenes	28		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Fluoranthene	256		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	48.3		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Benzo(a)pyrene	67.7		ug/kg	J	1,12
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Acenaphthene	10.6		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Naphthalene	38.8		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Anthracene	31.4		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C4-Naphthalenes	33.5		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	2-Methylnaphthalene	25.7		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	1-Methylnaphthalene	17.4		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C2-Naphthalenes	34.3		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Acenaphthylene	19.6		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C3-Naphthalenes	34.5		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Fluorene	18.8		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C1-Fluorenes	13.5		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C2-Fluorenes	22.3		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Dibenzothiophene	12.3		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	12		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	13.2		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	12.5		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	12.8		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Phenanthrene	180		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	75.2		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	46.9		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C3-Fluorenes	30.8		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	Dibenzofuran	18.8		ug/kg	J	1
UHR-SVS-38	L0917094-10	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	54		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Pyrene	661		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C2-Chrysenes	129		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C1-Chrysenes	206		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Chrysene	373		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Benz(a)anthracene	335		ug/kg	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	94.7		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	135		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	359		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	450		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Fluoranthene	712		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C3-Chrysenes	101		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C4-Chrysenes	62.7		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	296		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	290		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Benzo(e)Pyrene	230		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Benzo(a)pyrene	240		ug/kg	J	1,12
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Perylene	91.1		ug/kg	J	1,12
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	213		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Benzo(ghi)perylene	212		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Anthracene	104		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Fluorene	38.6		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	59.1		ug/kg	J	1,12
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	1-Methylnaphthalene	30.5		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C2-Fluorenes	79.5		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C1-Naphthalenes	53.6		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C2-Naphthalenes	83.2		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C3-Naphthalenes	121		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	243		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	2-Methylnaphthalene	51.6		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Naphthalene	74.4		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Dibenzofuran	32.3		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Acenaphthylene	62.2		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Acenaphthene	20.6		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	223		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C3-Fluorenes	95.6		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Dibenzothiophene	27.9		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	43.7		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	74.5		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	84.5		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	72.1		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	Phenanthrene	381		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	231		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C1-Fluorenes	38.7		ug/kg	J	1

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Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C4-Naphthalenes	306		ug/kg	J	1
UHR-SVS-16/37	L0917094-11	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	225		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Benzo(ghi)perylene	108		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Dibenz(a,h)anthracene	26.6		ug/kg	J	1,12
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Indeno(1,2,3-cd)Pyrene	107		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Perylene	50.4		ug/kg	J	1,12
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Benzo(a)pyrene	108		ug/kg	J	1,12
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Benzo(e)Pyrene	118		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Benzo(k)fluoranthene	134		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C4-Chrysenes	26.4		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Benzo(b)fluoranthene	155		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Naphthalene	51.5		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C1-Naphthalenes	33.1		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C2-Naphthalenes	44.3		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C3-Naphthalenes	52.1		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C4-Naphthalenes	111		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	2-Methylnaphthalene	30.8		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	1-Methylnaphthalene	19.9		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Dibenzofuran	19.5		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Acenaphthylene	42		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C3-Chrysenes	43.6		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C2-Fluorenes	33.9		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C3-Phenanthrenes/Anthracenes	95		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Acenaphthene	12.1		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C4-Phenanthrenes/Anthracenes	94.4		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C1-Fluorenes	18		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Fluorene	19.9		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C3-Fluorenes	40.6		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Dibenzothiophene	13.3		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C1-Dibenzothiophenes	18.8		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C2-Dibenzothiophenes	28.2		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C3-Dibenzothiophenes	30.9		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C4-Dibenzothiophenes	27.9		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Phenanthrene	201		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Anthracene	44		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C2-Phenanthrenes/Anthracenes	88.2		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C2-Chrysenes	49.4		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Fluoranthene	338		ug/kg	J	1

QUALIFIED DATA SUMMARY TABLE
Benthic Pilot Study Sediment

Field Sample ID	Lab ID	Analysis Group	Analytical Method	Analyte	Result	Lab Flag	Units	DV Qualifier	DV Reason Code
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Pyrene	326		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C1-Fluoranthenes/Pyrenes	212		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C2-Fluoranthenes/Pyrenes	154		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C3-Fluoranthenes/Pyrenes	53.7		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C4-Fluoranthenes/Pyrenes	39		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Benz(a)anthracene	157		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	Chrysene	178		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C1-Chrysenes	95		ug/kg	J	1
UHR-SVS-29/36	L0917094-12	PAH	8270C-SIM(M)	C1-Phenanthrenes/Anthracenes	101		ug/kg	J	1

APPENDIX 3

Hudson River Saratoga and Washington County, NY: Benthic Macroinvertebrate Community Analysis

PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENT CHEMISTRY, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE FOR PCB-CONTAMINATED SEDIMENTS FROM THE UPPER HUDSON RIVER, NEW YORK—DATA REPORT

Hudson River

Saratoga and Washington County, NY

Benthic Macroinvertebrate

Community Analysis

January 2010

Watershed Assessment Associates, LLC

Water body:	Hudson River
Drainage Basin:	Hudson-Hoosic
USGS Cataloging Unit:	02020003

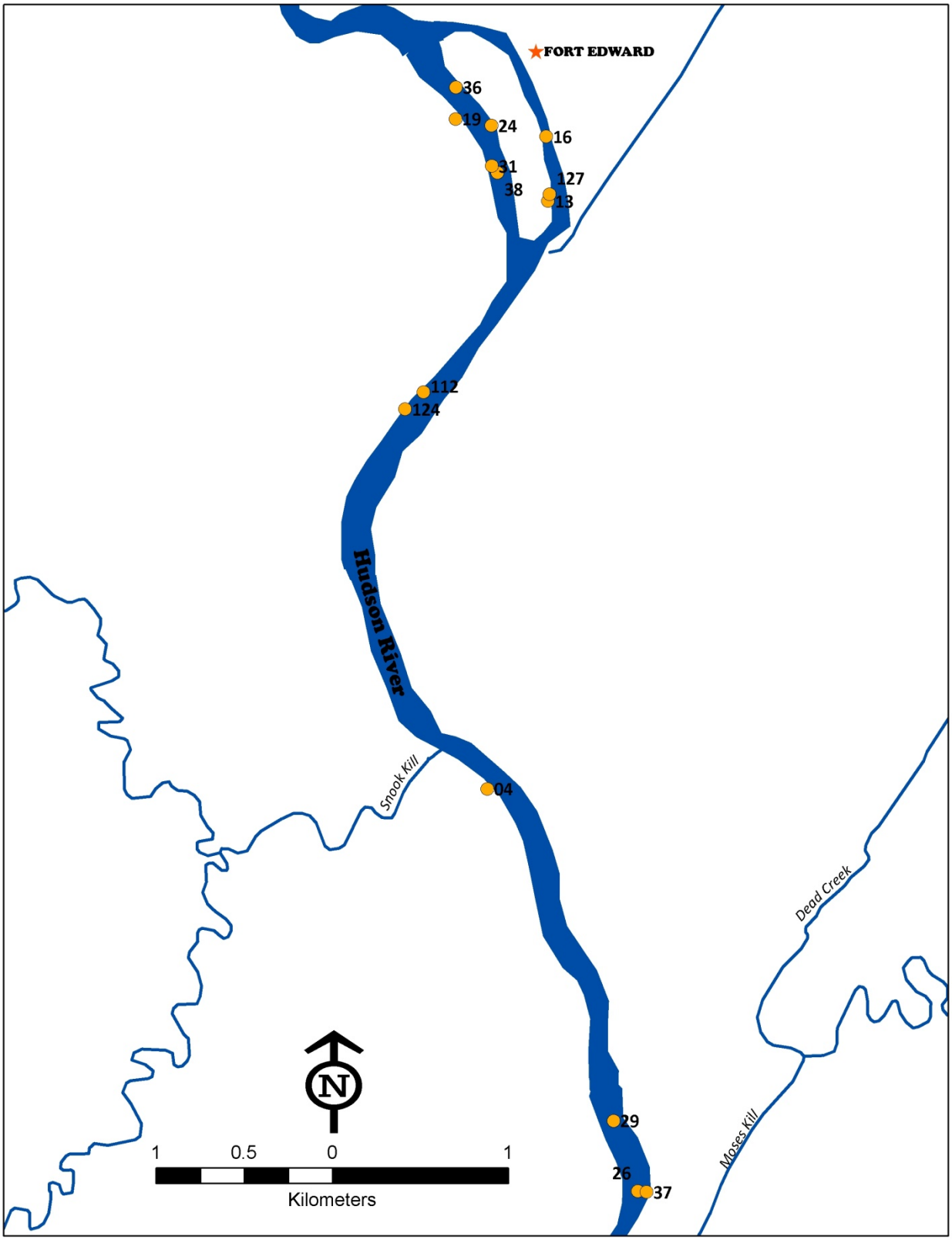
Background

The Hudson River Trustees, composed of representatives from the National Oceanic and Atmospheric Administration (NOAA), New York State Department of Environmental Conservation (NYDEC), and Department of the Interior implemented a study on the effects of PCB-contaminated sediment on benthic invertebrates in the Upper Hudson River of New York State between the former Fort Edward Dam and the Northumberland Dam. The study objectives were to investigate the concentrations of PCBs and other chemicals of potential concern in sediments, to assess the toxicity of PCB-contaminated sediments on two indicator species of benthic invertebrates (*Hyalella azteca* and *Chironomus dilutes)*, and, contingent upon sediment toxicity evaluation, assess of the benthic invertebrate community structure in the study portion of the river. Sediment toxicity results supported the assessment of the benthic invertebrate community structure; this report details the benthic community assessment. The objectives of the assessment included:

- Summarize data on a replicate-by-replicate basis by calculating abundance of each taxon, species richness, species diversity, abundance of EPT taxa, abundance of pollution sensitive species, abundance of pollution tolerant species, and NYSDEC standard biotic metrics.
- Calculate means and standard deviations for each treatment to facilitate statistical comparison among the sampling locations.
- Evaluate the macroinvertebrate community structure among selected sample stations.
- Morphological deformity analysis of *Chironomus sp.*
- Complete precision and accuracy assessment of the taxonomic identification and enumeration process on 10% of the samples and the voucher specimen collection.

Five replicate ponar samples collected from 14 sampling locations (Figure1) were shipped to Watershed Assessment Associates, LLC for benthic invertebrate community structure analysis. Background information, study area selection, study objectives, field sampling plan, sample analysis plan, and quality assurance plans are provided within the associated work plan (MESL 2008).

Figure 1. Map of benthic community sample locations.



Methods

Sorting and Organism Identification

Sample sorting and identification adhered to NYS DEC laboratory methods (Bode et al. 2002). The subsamples were rinsed with tap water in a U.S. number 40 standard sieve to remove fine particles and the remaining material was placed in a Petri dish with water. Samples were then examined under a dissecting microscope to separate organisms from the debris. Macroinvertebrates were then placed in vials containing 70% alcohol. This sorting procedure was repeated for each subsample until all organisms were removed. Oligochaetes and chironomids were slide-mounted in CMCP-10 mounting medium and viewed using a compound microscope.

Specimens were identified to genus/species except when specimen condition is poor or taxonomic keys are unavailable, and enumerated using a dissecting microscope.

Macroinvertebrate Community Composition and Metrics

The following macroinvertebrate community metrics were calculated for each subsample: Taxa Richness, Biotic Index, Percent Model Affinity (PMA), Dominance-3, abundance of EPT taxa, abundance of intolerant and tolerant taxa, and Species Diversity (Table 1). New York State's multimetric water quality score, the Biological Assessment Profile (BAP), was also calculated for each sample (Table 1). The BAP is calculated by converting the community indices mentioned above to a common ten-scale and then calculating the mean of these scores. The mean BAP score identifies the assessed impact for each station (i.e., non-impacted, and slightly, moderately, or severely impacted). Bode et al. (1990 and 2002) provide further information on macroinvertebrate community indices, interpretation of biological impairment, and the BAP.

Metric means and standard deviations were calculated for each sample location. Analysis of variance (ANOVA) was performed on the benthic invertebrate community metrics to detect benthic community differences among sample locations.

Bray-Curtis cluster analysis was performed on taxa abundance (fourth root transformed) to reveal community composition similarities between sample locations and sediment composition and total PCB homologs (µg/Kg) to examine the similarities among the sites. Dendrograms were generated using the Bray-Curtis resemblance matrix; relationships were identified using the Similarity Profile (SIMPROF) test.

Table 1. Descriptions of the metrics calculated for each replicate sample.

Metric	Description
Taxa Richness (TR)	Taxa richness is the total number of species or taxa found in the subsample. Higher species richness values are mostly associated with undisturbed sediment conditions.
Biotic Index (BI)	Biotic Index, or the Hilsenhoff Biotic Index (Hilsenhoff 1987), is calculated by multiplying the number of individuals of each species or taxa by its assigned tolerance value, summing these products, and dividing the total number of individuals. Tolerance values range from intolerant (0) to tolerant (10). High biotic index values are suggestive of organically enriched condition, while low values indicate naturally occurring, ambient communities.
Percent Model Affinity (PMA)	PMA is a measure of similarity to a model non-impacted community based on percent abundance of seven major groups. For ponar samples, the NYS model is 20% Oligochaeta, 15% Mollusca, 15% Crustacea, 20% Non-Chironomidae Insecta, 20% Chironomidae, and 10% Other. The lower the similarity value, the greater the impact.
Species Diversity (SD)	Species diversity is the value that combines species richness and community balance or evenness. High species diversity values usually indicate diverse, well balanced communities, while low values may indicate stress or impact.
Dominance-3 (DOM)	Dominance-3 is a measure of community balance, or how even the combined percent contribution of the three most numerous species are distributed. High dominance values indicate unbalanced communities strongly dominated by one or more very numerous species.
Biological Assessment Profile (BAP)	BAP is an assessment based on the above metrics. The BAP score is the mean value of SR, BI, PMA, SD, DOM after converting each metric score to a common scale of 0 - 10. The higher the BAP score the better the water quality condition. There are four impact categories in NYS: non-impacted, and slightly, moderately, or severely impacted.
Abundance of EPT taxa	Number of taxa in the sample in the (generally more tolerant) orders of Ephemeroptera, Plecoptera, and Trichoptera
Abundance of pollution tolerant taxa	Number of taxa in sample that are tolerant of pollution based on tolerance values used to calculate the biotic index (Merritt et al. 2008, Bode et al. 2002).
Abundance of pollution sensitive taxa	Number of taxa in sample that are sensitive to pollution based on tolerance values used to calculate the biotic index (Merritt et al. 2008, Bode et al. 2002).

Morphological Deformity Analysis

This analysis focuses on the evaluation of mentum mouthparts of *Chironomus sp*. larvae. Exposure to high levels of toxicants may result in mentum deformities at a greater frequency and severity than in non-exposed populations (Lenat 1993, Warwick 1988). Deformities are organized into three classes: 1) slight or hard to distinguish, 2) conspicuous (including: extra teeth, missing teeth, large gaps, and distinct asymmetry), and 3) severe (organism has two or more of the deformities listed in 2) (Bode et al. 2002). A minimum of fifteen mature *Chironomus* specimens from a subsample are required to perform the analysis.

Taxonomic precision and accuracy

The accuracy of taxonomic identifications was ensured by consulting the most recent taxonomic literature, accessing a reference collection verified by appropriate taxonomic specialists, and the creation of a voucher specimen collection. In addition, 10% of the samples were checked for identification accuracy and enumeration precision by a second outside certified benthic taxonomist and the results were quantified by calculating the percent difference enumeration (PDE) and percent taxonomic disagreement (PTD)(Stribling et al. 2003, 2008).

Results

Sorting and Organism Identification

Seventy replicate samples were fully picked free of organisms and identified to the lowest possible taxonomic level. The number of individual organisms sorted and identified from the replicate samples ranged in abundance from 5 to 349; a total of 3823 individuals were identified from the 70 replicate samples. Ninety-six unique taxa were identified (Appendix A); the majority of taxa abundance (67%) was represented by 9 taxa: *Dicrotendipes sp.* (15.8%), *Limnodrilus hoffmeisteri* (12.5%), *Tribelos sp* (11.8%), Tubificidae without cap setae (9.2%), Tubificidae with cap setae (4.7%), *Phylocentropus sp* (3.5%), *Gammarus sp.* (3.5%), *Probezzia sp.* (3.2%), and *Caecidotea sp*. (3.1%)(Appendix A). The Tubificidae without cap setae are most likely immature *Limnodrilus hoffmeisteri*.

Macroinvertebrate Community Composition and Metrics

Taxa richness, Species Diversity, EPT taxa abundance, pollution sensitive taxa abundance, pollution tolerant taxa abundance, and NYS DEC metrics (Biotic Index, Dominance-3, Percent Model Affinity, and Biotic Assessment Profile) were calculated for each replicate sample (Table 2); descriptive statistics were calculated for each site (5 replicates)(Appendix B). Replicate samples at

several sites exhibited great variability; for example, the total taxa abundance for replicate samples of Site 38 ranged from 14 to 349 and EPT taxa ranged from 0 to 4 (Table 2).

Table 2. Summary of metrics and community attributes calculated for each replicate sample. TR = taxa richness; BI= Biotic Index, SD= species diversity; PMA = percent model affinity; DOM = percent dominance of three most abundant taxa; BAP = Biological Assessment Profile; No. Indiv. = total individuals in sample; No. Tol*= number of tolerant taxa in sample; No. Intol*= number of intolerant taxa in sample; EPT taxa= number of EPT taxa in sample. Please see Table 1 for detailed descriptions of metrics and attributes.

Station	HBI	TR	SD	DOM	PMA	BAP	No. Indiv	No. Tol	No. Intol	EPT Taxa
4A	8.00	8	1.72	71	68	4.13	21	6	2	2
4B	7.38	14	2.32	54	73	6.59	24	11	3	2
4C	8.63	7	1.72	69	64	3.82	16	6	1	2
4D	7.98	15	2.38	51	75	6.82	45	11	4	2
4E	7.29	18	2.52	43	74	7.57	65	12	6	2
13A	8.35	14	2.09	62	54	5.54	52	13	1	1
13B	8.77	9	1.61	77	52	3.67	43	8	1	1
13C	6.90	12	2.27	47	37	5.27	30	11	1	2
13D	7.27	18	2.46	48	62	6.93	51	13	5	2
13E	7.27	18	2.56	41	75	7.66	56	15	3	3
16A	8.00	5	1.52	77	68	3.48	13	4	1	1
16B	8.10	11	2.17	55	65	5.32	29	11	0	0
16C	8.37	9	1.86	68	61	4.09	19	8	1	1
16D	7.13	5	1.49	75	55	4.22	8	4	1	1
16E	7.23	14	2.03	62	56	5.40	47	12	2	2
19A	7.78	12	2.15	56	58	5.45	27	11	1	0
19B	7.21	9	1.94	63	44	4.32	24	9	0	0
19C	7.31	9	2.10	54	58	5.21	13	8	1	1
19D	6.87	15	2.59	33	57	6.83	30	12	3	2
19E	6.69	10	2.25	46	75	6.61	13	7	3	0
24A	7.94	11	2.05	63	62	5.13	32	10	1	1
24B	7.17	6	1.70	67	60	4.23	12	5	1	0
24C	8.32	9	1.76	68	45	3.51	19	8	1	0
24D	8.10	9	1.57	74	53	3.98	39	7	2	1
24E	7.90	14	1.96	66	56	5.01	71	11	3	2
26A	7.36	12	1.85	68	43	4.27	59	10	2	2
26B	7.36	27	2.17	67	42	5.83	127	24	3	2
26C	7.55	22	1.73	72	37	4.66	162	20	2	4
26D	7.43	13	1.62	74	30	3.39	42	11	2	2
26E	7.58	10	2.01	63	62	5.04	19	9	1	1

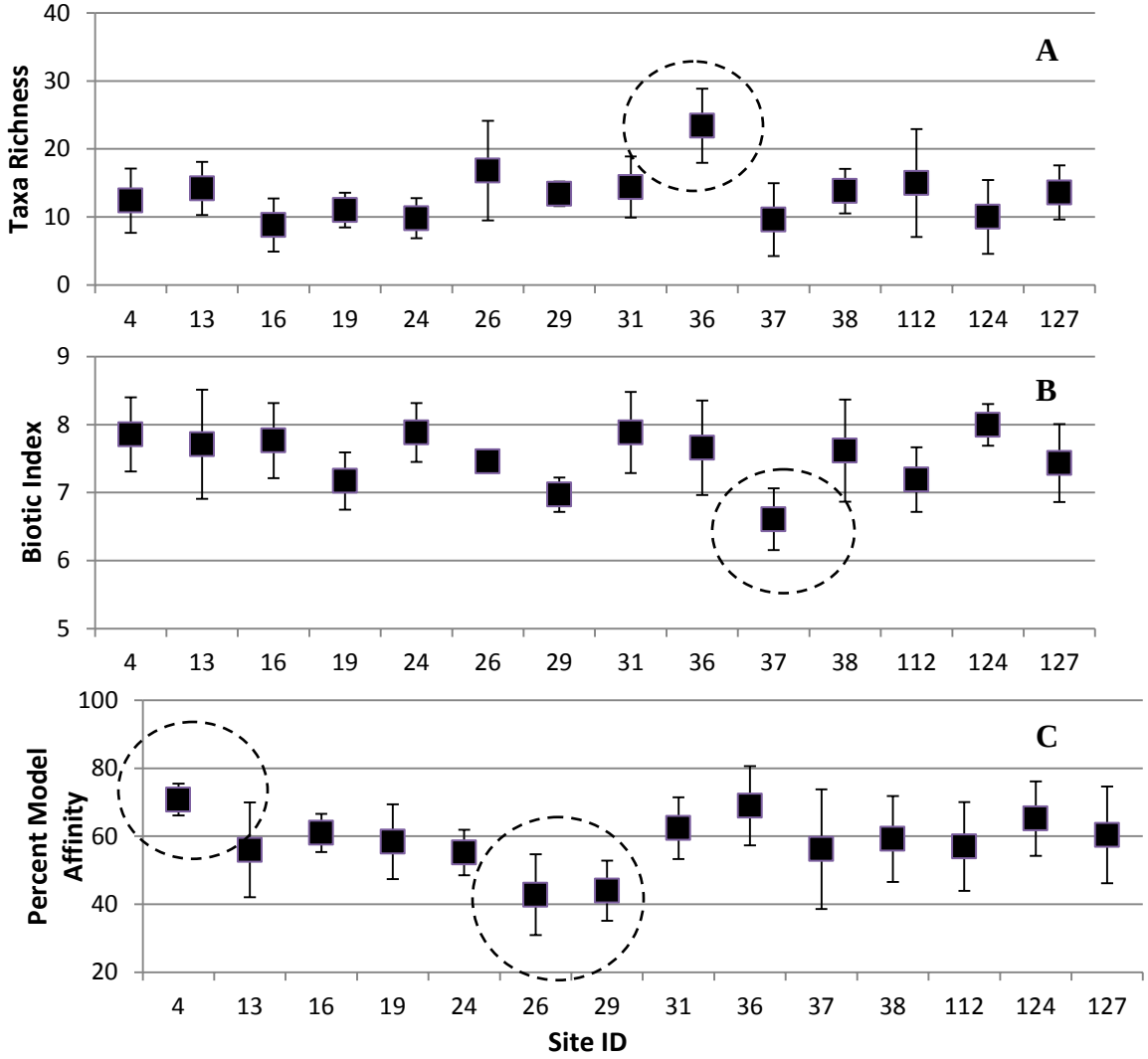
Station	HBI	TR	SD	DOM	PMA	BAP	No. Indiv	No. Tol	No. Tol	EPT Taxa
29A	7.24	13	2.08	63	38	4.61	38	12	1	1
29B	6.86	14	2.13	59	47	5.64	29	12	2	3
29C	6.60	11	1.99	68	36	4.28	25	9	2	2
29D	7.00	13	2.30	50	41	5.41	24	11	2	2
29E	7.15	16	2.21	60	58	5.99	47	15	1	1
31A	7.81	14	2.37	50	68	6.46	32	12	2	1
31B	7.79	18	2.38	50	73	7.10	70	14	4	2
31C	7.53	15	2.41	50	64	6.56	38	11	4	2
31D	8.90	18	1.62	74	50	4.53	178	14	4	2
31E	7.39	7	1.69	72	57	3.95	18	5	2	1
36A	7.74	22	2.40	54	74	7.36	110	18	4	4
36B	6.61	32	2.86	43	86	9.05	268	26	6	5
36C	8.09	25	2.04	66	65	6.20	174	18	7	4
36D	8.43	20	1.73	73	55	4.79	113	13	7	4
36E	7.43	18	2.46	48	65	7.03	42	13	5	4
37A	6.72	12	1.95	69	56	5.76	29	9	3	2
37B	7.00	6	1.73	63	72	4.88	8	6	0	1
37C	6.67	6	1.54	75	28	2.80	12	5	1	0
37D	5.83	6	1.66	75	55	5.00	12	5	1	1
37E	6.82	18	2.70	36	70	7.76	33	15	3	5
38A	7.74	18	1.70	79	50	4.99	349	15	3	4
38B	8.02	11	1.64	76	51	4.05	178	11	0	0
38C	7.23	15	2.52	38	81	7.55	47	10	5	4
38D	6.57	10	2.14	50	56	5.69	14	8	2	1
38E	8.53	15	1.92	71	58	4.62	77	14	1	2
112A	7.44	19	2.09	64	55	6.54	84	13	6	2
112B	6.40	4	1.33	80	40	3.03	5	3	1	0
112C	7.40	18	2.78	38	70	7.62	30	18	0	3
112D	7.11	10	2.12	56	70	5.80	18	10	0	1
112E	7.60	24	2.14	62	50	6.57	107	23	1	1
124A	8.00	4	1.28	86	54	3.29	7	2	2	1
124B	7.77	11	2.10	62	67	5.45	26	9	2	1
124C	8.05	11	2.13	55	54	5.56	22	9	2	1
124D	7.69	18	2.42	51	78	7.29	45	15	3	2
124E	8.47	6	1.52	73	73	3.77	15	5	1	2
127A	6.72	17	2.68	34	66	7.53	32	15	2	1
127B	8.18	7	1.85	64	40	3.26	11	6	1	0
127C	7.16	15	1.57	80	54	5.12	148	13	2	1
127D	7.29	16	2.29	57	64	6.36	72	13	3	2
127E	7.82	13	2.44	39	78	6.99	28	12	1	2

*Tolerance values are the same used to calculate the Biotic Index (Bode et al. 2002).

To detect metric differences among the sites an ANOVA for each metric was performed (see Appendix C for detailed results of each test)(Figure 2). The majority of metric differences among the sites were unremarkable (Table 2, Figure 2, Appendix C). Mean BAP metric results indicated 3 sites to be moderately impacted and 11 sites to be slightly impacted.

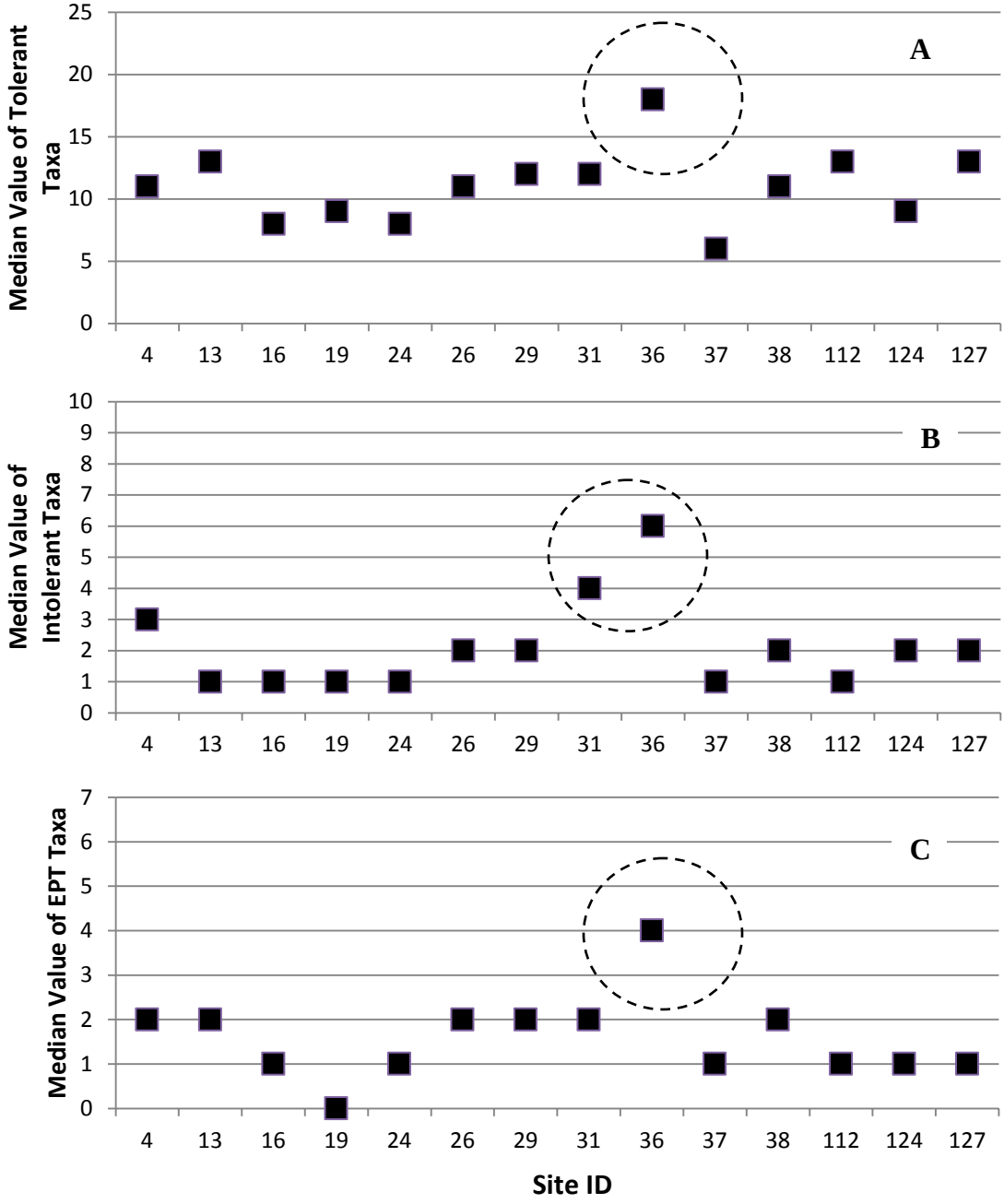
Taxa richness was significantly different at Site 36 from all other sites (ANOVA, F=3.05, p= 0.002, α=0.05)(Figure 2A). Biotic Index values at Site 37 were significantly different from the other sites (ANOVA, F=2.88, p= 0.003, α=0.05)(Figure 2B); this site had the highest mean Biotic Index value indicating slightly less organic pollution impact. PMA was significantly different at Sites 26, 29, and 4 (ANOVA, F= 2.42, p= 0.012, α=0.05) (Figure 2C). PMA results for Site 4 were closest to the NYSDEC reference community structure designated for ponar samples.

Figure 2. Means and standard deviations for each site; data was used for ANOVA calculations. Points circled with dashed lines indicate statistically different values (α=0.05).



EPT taxa, abundance of pollution-intolerant, and abundance of pollution-tolerant taxa were not normally distributed; therefore nonparametric Kruskal-Wallis statistical tests were performed to elucidate differences among the sites (see Appendix C for detailed results of each test). Site 36 had significantly higher intolerant taxa abundance in the samples (Z= 2.84, *p*= 0.049, α=0.05), intolerant taxa abundance (Z= 3.48, *p*= 0.037, α=0.05), and EPT taxa abundance (Z= 3.47, *p*= 0.03 α=0.05)(Figure 3A-C).

Figure 3. Median values for each site; data was used for Kruskal-Wallis calculations. Points circled with dashed lines indicate statistically different values (α=0.05).



Sediment composition was significantly different at Site 04 (SIMPROF, pi= 0, *p*= 0.00001, α =0.05) (Figure 4). Total PCB homolog concentrations were significantly dissimilar between Sites 04 and 19 and sites 24, 29, 31, and 37 (SIMPROF, pi= 0, *p*= 0.0001, α =0.05)(Figure 5).

Figure 4. Dendrogram of the Euclidean distance hierarchical cluster analysis for sediment values (median phi value) for all sites. Numbers represent site identification number.

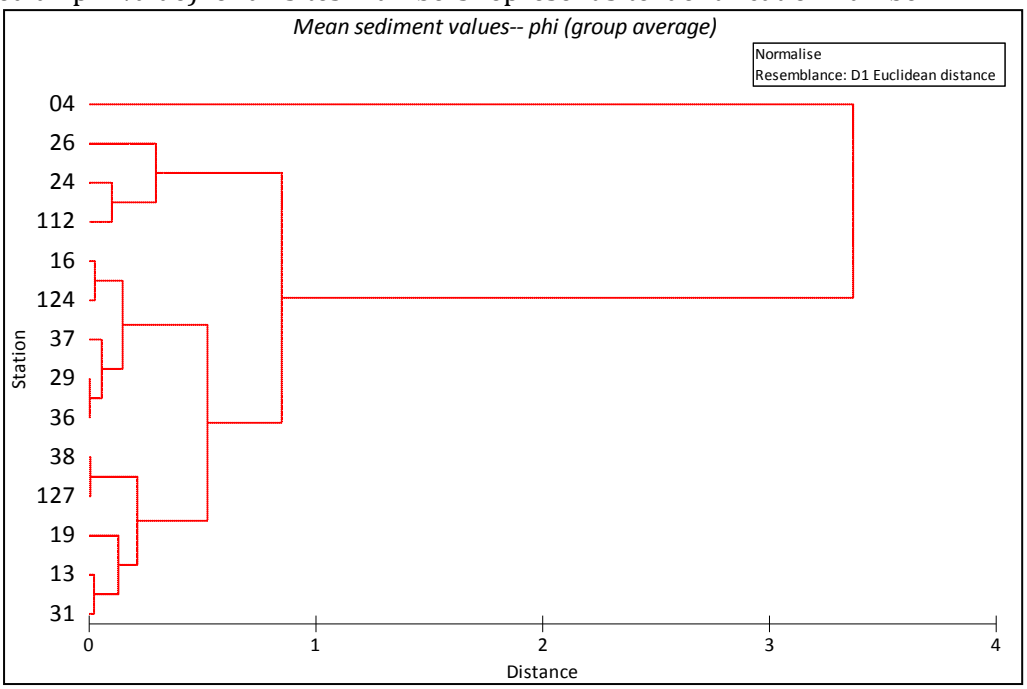
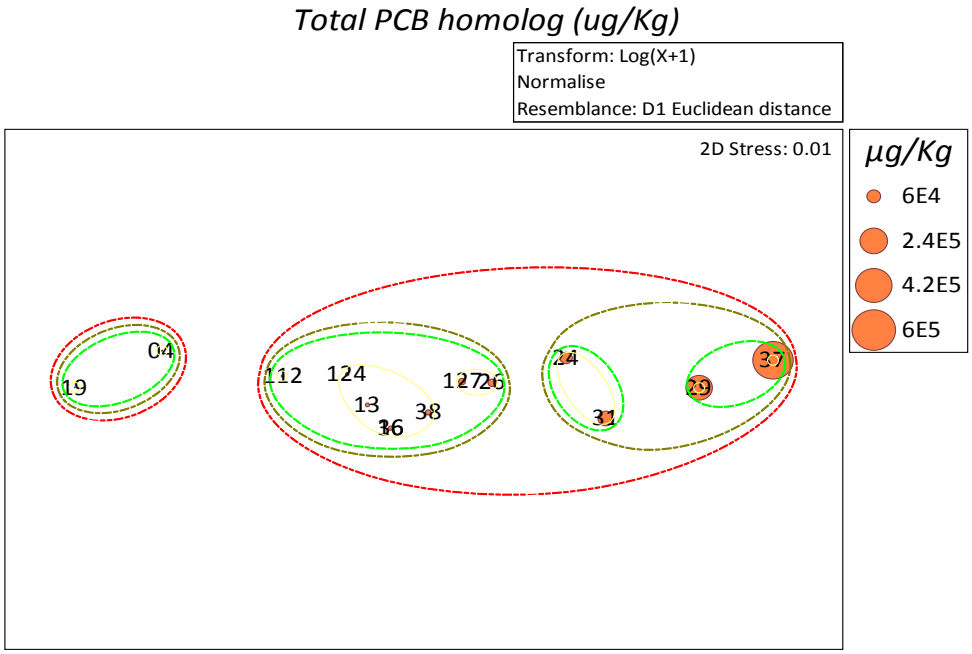
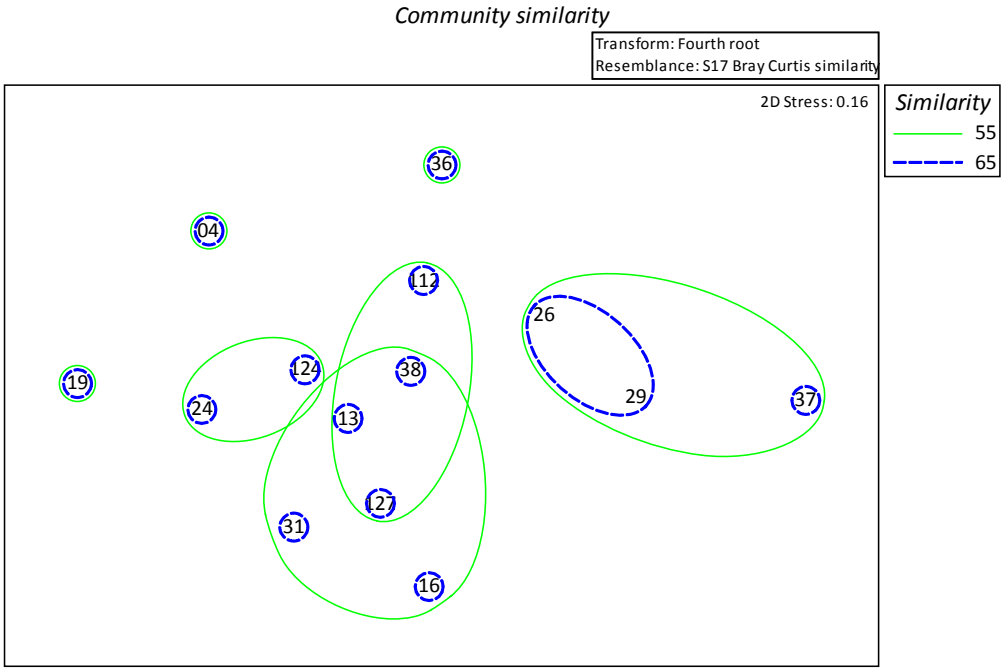


Figure 5. Euclidean distance hierarchical cluster analysis plot for total PCB homolog concentrations (µg/Kg) for all sites. Numbers represent site identification number.



Similarity among the sites was strongest for Sites 26, 29, and 37; three sites (19, 4, and 36) were distinctly dissimilar from each other and all other sites; and the remaining sites formed three overlapping clusters (Figure 6). Two distinct groups were significantly dissimilar from the other sites: Sites 29, 26, and 37 (Bray-Curtis similarity, pi= 2.75, p= 0.001, α =0.05) and Site 19 (Bray-Curtis similarity, pi= 1.46, p= 0.012, α =0.05) (Figure 6).

Figure 6. Bray-Curtis similarity index for all sites (entire collection); similarity based on community composition and abundance. Numbers represent site identification number.



Rare taxa are routinely removed from multivariate analysis because their presence may be more related to probability than to the ecological conditions and may appear as outliers (Riva-Murray et al. 2002). The abundance data (composite of the 5 replicate sites) was re-analyzed after eliminating rare taxa (contributed less than 0.3% of the entire collection (70 replicates) (Table 3) and condensing several taxa to the lowest common taxonomic level among the samples (Riva-Murray et al. 2002). The remaining taxa represent the core taxa within all 70 replicates and characterize the expected community structure within large riverine ecosystems; therefore, changes in abundance or presence/absence of these taxa may help elucidate differences among the sites. The most abundant taxa were Tubificidae without cap setae, *Dicrotendipes sp., Tribelos sp.,* Tubificidae with cap setae, *Gammarus sp,. Phylocentropus sp., Probezzia sp., Caecidotea sp*., *Polypedilum sp.,* and Pisidiidae.

Table 3. Taxa list composed of 95% of entire collection taxa abundance, total individuals, and relative abundance with the entire sample (n= 3823).

Phylum	Class	Order	Family	Genspecies	Indiv	%
Annelida	Oligochaeta	Tubificida	Tubificidae	Tubificidae w/o cap setae	826	21.6
Arthropoda	Insecta	Diptera	Chironomidae	Dicrotendipes sp.	606	15.9
Arthropoda	Insecta	Diptera	Chironomidae	Tribelos sp.	451	11.8
Annelida	Oligochaeta	Tubificida	Tubificidae	Tubificidae w/ cap setae	179	4.7
Arthropoda	Crustacea	Amphipoda	Gammaridae	Gammarus sp.	134	3.5
Arthropoda	Insecta	Trichoptera	Dipseudopsidae	Phylocentropus sp.	132	3.5
Arthropoda	Insecta	Diptera	Ceratopogonidae	Probezzia sp.	122	3.2
Arthropoda	Crustacea	Isopoda	Asellidae	Caecidotea sp.	120	3.1
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum sp.	118	3.1
Mollusca	Pelecypoda	Veneroidea	Pisidiidae	Pisidiidae	87	2.3
Arthropoda	Insecta	Diptera	Chironomidae	Procladius sp.	69	1.8
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	63	1.6
Arthropoda	Insecta	Diptera	Chironomidae	Cryptochironomus sp.	53	1.4
Arthropoda	Insecta	Trichoptera	Leptoceridae	Oecetis sp.	51	1.3
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	50	1.3
Arthropoda	Insecta	Trichoptera	Leptoceridae	Mystacides sepulchralis	48	1.3
Arthropoda	Insecta	Diptera	Chironomidae	Ablabesmyia mallochi	42	1.1
Arthropoda	Insecta	Diptera	Chironomidae	Coelotanypus sp.	42	1.1
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	Lumbriculidae	42	1.1
Arthropoda	Insecta	Diptera	Chironomidae	Microtendipes pedellus gr.	40	1.0
Arthropoda	Insecta	Ephemeroptera	Ephemeridae	Hexagenia sp.	39	1.0
Platyhelminthes	Turbellaria	Tricladida		Turbellaria	34	0.9
Mollusca	Gastropoda	Mesogastropoda	Hydrobiidae	Hydrobiidae	29	0.8
Arthropoda	Insecta	Diptera	Chironomidae	Demicryptochironomus sp.	27	0.7
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia gr. sp.	26	0.7
Arthropoda	Insecta	Diptera	Chironomidae	Pseudochironomus sp.	23	0.6
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis sp.	20	0.5
Arthropoda	Insecta	Diptera	Chironomidae	Cladotanytarsus sp.	18	0.5
Annelida	Oligochaeta	Tubificida	Naididae	Stylaria lacustris	18	0.5
Annelida	Hirudinea	Rhynchobdellida	Glossiphoniidae	Glossiphoniidae	17	0.4
Arthropoda	Insecta	Diptera	Chironomidae	Chironomidae	16	0.4
Arthropoda	Insecta	Ephemeroptera	Caenidae	Caenis sp.	15	0.4
Annelida	Oligochaeta	Tubificida	Naididae	Uncinais uncinata	15	0.4
Arthropoda	Insecta	Diptera	Chironomidae	Nilothauma sp.	14	0.4
Mollusca	Gastropoda	Basommatophora	Physidae	Physa sp.	14	0.4
Arthropoda	Insecta	Diptera	Chironomidae	Djalmabatista sp.	13	0.3
Mollusca	Gastropoda	Mesogastropoda	Valvatidae	Valvata tricarinata	13	0.3
Annelida	Oligochaeta	Tubificida	Naididae	Specaria josinae	12	0.3
Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	11	0.3
Mollusca	Pelecypoda	Unionida	Unionidae	Unionidae	11	0.3
				Totals	*3660*	*95.7*

Bray-Curtis similarity analysis of the revised abundance data clustered sites comparable to the community similarity for the entire collection (Figure 7). Sites 26, 29, and 37 were significantly dissimilar from all other sites (Bray-Curtis, pi= 2.46, p= 0.0001, α =0.05).

Total homolog PCB concentration (µg/Kg) plotted with the benthic similarity data show that Sites 29 and 37 had the highest concentrations and Site 19 had the lowest concentration (Figure 8).

Figure 7. Bray-Curtis similarity index for all sites (reduced taxa richness to 95% of entire collection); similarity based on community composition and abundance. Numbers represent site identification number.

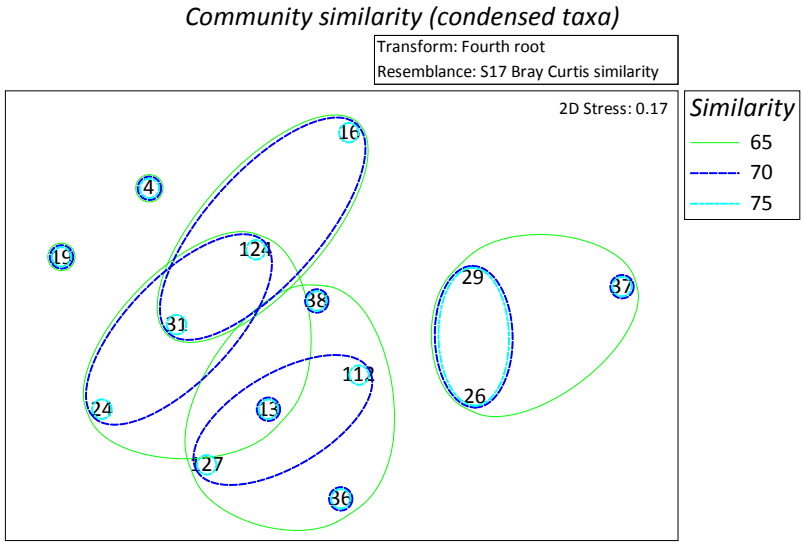
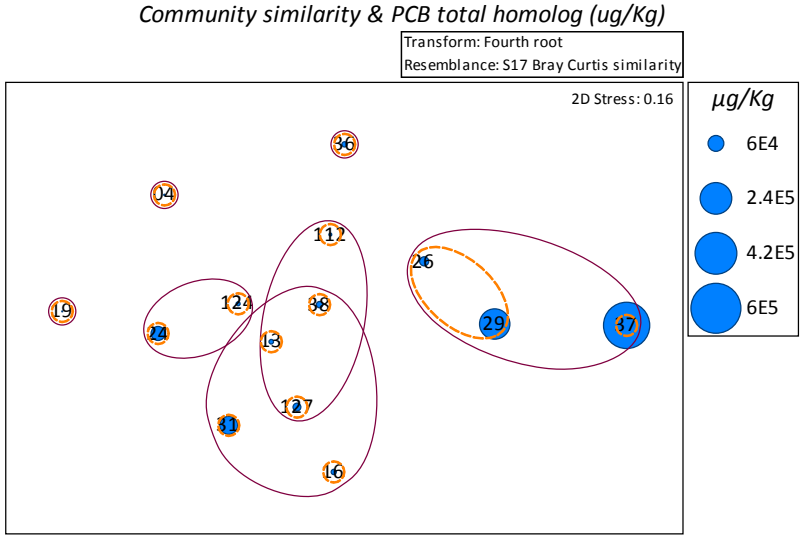


Figure 8. Bray-Curtis benthic community similarity index (entire collection) overlaid with total PCB homolog concentration (µg/Kg) values. Numbers represent site identification number.



Morphological Deformity Analysis

The abundance of *Chironomus sp*. larvae within the replicate samples was inadequate to complete morphological deformity analysis. The analysis developed for *Chironomus sp.* requires at least 15 individuals (Bode at al. 2002). Six replicate samples contained a total of 7 individual *Chironomus sp.* taxa; the ability to discern biological impairment with this amount of data would be questionable.

Taxonomic precision and accuracy

The PDE and PTD results were well within the acceptable threshold of less than 5% and less than 15%, respectively (Stribling et al. 2003 and 2008). Percent difference enumeration (PDE) ranged from 0-0.88% disagreement and percent taxonomic disagreement (PTD) ranged from 0-11.6% disagreement (Table 4). The majority of disagreements were differences of taxonomic resolution and taxa counts. Site 13 (replicate E) had the lowest similarity (88.4%); this was due to differences of abundance and taxa resolution between the subfamily Tanytarsini and the genus within the subfamily, *Cladotanytarsus sp.;* the WAA taxonomist and QC taxonomist discussed the discrepancies, re-examined the taxa in question, and agreed with the QC taxonomist's determination (adjusted percent taxonomic disagreement decreased to 0.01%). The data reported and analyzed reflect this change.

Table 4. Percent difference enumeration (PDE) and percent taxonomic disagreement (PTD) results from external quality assurance for 10% of the replicate samples.

Site ID	PDE (count difference)	PTD (taxonomic disagreement)	Percent similarity
13	0.88	11.6	88.4
19	0	6.9	93.1
24	0	0	100
26	0	7.5	92.5
31	0.84	2.2	97.8
124	0	4.5	95.5
127	0	0	100

Discussion

The biotic metrics indicate the benthic community structure among the sites were not remarkably different. The benthic community composition was typical of a large river ecosystem as evidenced by the majority of taxa that are soft sediment burrowers. Site 04 community structure included *Eurylophella sp*. and *Prosimulium sp*., uncommon species within large river ecosystems and likely due to the upstream influence of Snook Kill.

Substrate composition influences community structure; work by Simpson et al. (1986) within the Lower Hudson River, found greater taxa richness and density at sites with heterogeneous substrates (sands and silt) and few taxa within substrates dominated by fine well sorted sands. Analysis of substrate composition revealed that the benthic samples collected were composed of similar particle sizes, except Site 04. Site 04 benthic sample contained a higher percentage of fine sediments in relation to the other sites; this difference is most likely related to hydrologic influences from the upstream tributary, Snook Kill. The differences in substrate composition may be influencing the community structure of Site 04 relative to the other sites. When Site 04 was removed from the analysis, the sites then clustered into 3 groups of varying degrees of fine to very fine sand, based on the mean particle size (phi) (Wentworth 1922, Folk 1974).

Site 19, the lowest total PCB homolog concentration, had a community structure significantly dissimilar to Sites 29 and 37, the highest total PCB homolog concentrations. However, it is difficult to discern if the differences in community structure among the sites from other environmental variables. Community differences may be related to variation of depth and current velocity among the sites; also lack of comparable community structure data from non-impacted sites limits interpretation of these results. In addition, variability may be related to the distribution of contaminants in the sediment sample and the site location (distance from) in relation to the contaminant source (EPA 1994).

The most notable differences in community structure between Site 19 and Sites 29 and 37 was the absence of *Phylocentropus sp*. at Sites 29 and 37. *Phylocentropus sp*. is a sediment tube burrowing filter feeding caddisfly that requires a minimum current velocity to capture food resources suspended and carried in the water column. Their absence may be related to the lack of current in this particular area and/or water depth. No current data was obtained during field collection. Also, *Hexagenia sp.* (mayfly) was present at most sites, including Sites 29 and 37; indicating the sites are supportive of this taxon (Jaagumagi and Petro 1992). *Hexagenia sp*. prefers backwaters of

lakes and large rivers where silt accumulates; they burrow in the sediment and create a current through their burrows, for oxygen transfer, by undulating their gills (Merritt et al. 2008). Greater than 50% of the sites contained both tolerant (*Caecidotea sp., Gammarus sp,* Hydrobiidae, Lumbriculidae, and Tubificidae with and without cap setae) and intolerant taxa (*Oecetis sp, Hexagenia sp., Nilothauma sp., Polypedlium sp., and Pseudochironomus sp*.) (DeShon 1995).

EPT taxa richness is not used by NYSDEC to characterize ponar community structure since EPT taxa are low within these aquatic ecosystems. Their distribution within these systems is limited by the distribution of adequate substrate, temperature, and flow conditions, therefore these results should be interpreted cautiously.

Literature Cited

Bode, R.W. Novak, M.A. Abele, L.A. 1990. Biological impairment criteria for flowing waters in New York State. New York State Department of Environmental Conservation, Albany, NY.

Bode, R.W. Novak, M.A. Abele, L.A. Heitzman, D.L. Smith, A.J., 2002. Quality assurance work plan for biological stream monitoring in New York State. New York State Department of Environmental Conservation, Albany, NY.

DeShon, J.E. 1995. Development and application of the invertebrate community index (ICI). *In* Davis, W.S. and T.P. Simon (Eds.). 1994. Biological Assessment and Criteria. Lewis Publishers, Boca Raton, FL.

Environmental Protection Agency (EPA). 1994. ARCS Assessment Guidance Document. EPA 905-B94-002. Chicago, IL: Great Lakes National Program Office.

Hilsenhoff, W.L. 1987. An improved biotic index of organic stream pollution. Great Lakes Entomol. 20:31-39.

Jaagumagi, R. and S. Petro. 1992. An in-place pollutants study of the Otonabee River and Rice Lake. Watershed Management Section, Water Resources Branch, Ontario Ministry of the Environment, ISBN 07729-8010-1.

Lenat, D.R. 1993. Using mentum deformities of Chironomus larvae to evaluate effects of toxicity and organic loading in streams. J.N. Am. Benthol. Soc. 12(3):265-269.

MacDonald Environmental Sciences Ltd. 2008. DRAFT: Work Plan for the Pilot Study on the Effects of PCB-Contaminated Sediments on Benthic Invertebrates in the Upper Hudson River, NewYork, 196 pp.

Merritt, R.W., K.W. Cummins, and M.B. Berg. 2008. An introduction to the Aquatic Insects of North America. Kendall/Hunt Publishing, Iowa.

Simpson, K.W., J.P. Fagnani, R.W. Bode, D.M. DeNicola, and L.E. Abele. 1986. Organism-substrate relationships in the main channel of the Lower Hudson. J.N. Am. Benthol. Soc. 5(1):41-57.

Riva-Murray, K., R.W. Bode, P.J. Philips, and G.L. Wall. 2002. Impact source determination with biomonitoring data in New York State: concordance with environmental data. Northeastern Naturalist 9: 127-162.

Stribling, J.B., S.R. Moulton III, and G.T. Lester. 2003. Determining the quality of taxonomic data. J.N. Am. Benthol. Soc. 22(4):621-631.

Stribling, J.B., K.L. Pavlik, S.M. Holdsworth, and E.W. Leppo. 2008. Data quality, performance, and uncertainty in taxonomic identification for biological assessments. J.N. Am. Benthol. Soc. 27(4):906-919.

Warwick, W.F. 1988. Morphological deformities in Chironomidae (Diptera: larvae as biological indicators of toxic stress. *In* M.S. Evans (Ed.). 1988. Toxic contaminants and ecosystem health; a Great lakes focus. Wiley and Sons, NY.

Appendix A: List of unique taxa collected and identified from all 70 replicate samples.

Phylum	Class	Order	Family	Subfamily	Final Taxa Determination	Total Indiv.	% of total
Annelida	Hirudinea	Rhynchobdellida	Glossiphoniidae		Glossiphoniidae	17	0.445
Annelida	Hirudinea	Rhynchobdellida	Glossiphoniidae		Helobdella stagnalis	1	0.026
Annelida	Oligochaeta	Lumbricida			Lumbricina	3	0.078
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae		Lumbriculidae	42	1.099
Annelida	Oligochaeta	Tubificida	Enchytraeidae		Enchytraeidae	5	0.131
Annelida	Oligochaeta	Tubificida	Naididae		Arcteonais lomondi	7	0.183
Annelida	Oligochaeta	Tubificida	Naididae		Nais sp.	1	0.026
Annelida	Oligochaeta	Tubificida	Naididae		Pristina sp.	1	0.026
Annelida	Oligochaeta	Tubificida	Naididae		Specaria josinae	12	0.314
Annelida	Oligochaeta	Tubificida	Naididae		Stylaria lacustris	18	0.471
Annelida	Oligochaeta	Tubificida	Naididae		Uncinais uncinata	15	0.392
Annelida	Oligochaeta	Tubificida	Tubificidae		Aulodrilus americanus	1	0.026
Annelida	Oligochaeta	Tubificida	Tubificidae		Aulodrilus limnobius	1	0.026
Annelida	Oligochaeta	Tubificida	Tubificidae		Limnodrilus hoffmeisteri	476	**12.451**
Annelida	Oligochaeta	Tubificida	Tubificidae		Rhyacodrilus sp.	2	0.052
Annelida	Oligochaeta	Tubificida	Tubificidae		Tubificidae w/ cap setae	179	**4.682**
Annelida	Oligochaeta	Tubificida	Tubificidae		Tubificidae w/o cap setae	350	**9.155**
Annelida	Polychaeta	Sabellida	Sabellidae		Manayunkia speciosa	8	0.209
Arthropoda	Crustacea	Amphipoda	Gammaridae		Gammarus sp.	134	**3.505**
Arthropoda	Crustacea	Amphipoda	Talitridae		Hyalella sp.	7	0.183
Arthropoda	Crustacea	Isopoda	Asellidae		Caecidotea sp.	120	**3.139**
Arthropoda	Insecta	Coleoptera	Elmidae		Dubiraphia sp.	9	0.235
Arthropoda	Insecta	Coleoptera	Elmidae		Stenelmis sp.	20	0.523
Arthropoda	Insecta	Coleoptera	Haliplidae		Haliplus sp.	4	0.105
Arthropoda	Insecta	Coleoptera	Hydrophilidae		Berosus sp.	3	0.078
Arthropoda	Insecta	Diptera		Ceratopogoninae	Ceratopogoninae	1	0.026
Arthropoda	Insecta	Diptera	Ceratopogonidae		Ceratopogonidae	6	0.157
Arthropoda	Insecta	Diptera	Ceratopogonidae		Probezzia sp.	122	**3.191**
Arthropoda	Insecta	Diptera	Chironomidae		Chironomidae	16	0.419
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironominae	63	1.648
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomus sp.	9	0.235
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Cladotanytarsus sp.	18	0.471
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Cryptochironomus sp.	53	1.386
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Demicryptochironomus sp.	27	0.706

Phylum	Class	Order	Family	Subfamily	Final Taxa Determination	Total Indiv.	% of total
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Dicrotendipes sp.	606	**15.851**
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Micropsectra sp.	1	0.026
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Microtendipes pedellus gr.	40	1.046
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Nilothauma sp.	14	0.366
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Polypedilum halterale gr.	89	2.328
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Polypedilum scalaenum gr.	19	0.497
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Polypedilum sp.	10	0.262
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Pseudochironomus sp.	23	0.602
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Stictochironomus sp.	1	0.026
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	50	1.308
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsus sp.	9	0.235
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tribelos sp.	451	**11.797**
Arthropoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesa sp.	1	0.026
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	Cricotopus sp.	2	0.052
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	Orthocladiinae	4	0.105
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	Orthocladiinae sp. C	4	0.105
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	Parametriocnemus sp.	1	0.026
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	Synorthocladius sp.	1	0.026
Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Ablabesmyia annulata	5	0.131
Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Ablabesmyia mallochi	42	1.099
Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Ablabesmyia sp.	3	0.078
Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Clinotanypus sp.	1	0.026
Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Coelotanypus sp.	42	1.099
Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Djalmabatista sp.	13	0.340
Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladius sp.	69	1.805
Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Tanypodinae	11	0.288
Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Thienemannimyia gr. spp.	26	0.680
Arthropoda	Insecta	Diptera	Simuliidae		Prosimulium sp.	1	0.026
Arthropoda	Insecta	Diptera	Tabanidae		Tabanidae	4	0.105
Arthropoda	Insecta	Diptera	Tipulidae		Hexatoma sp.	1	0.026
Arthropoda	Insecta	Ephemeroptera	Caenidae		Caenis sp.	15	0.392
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae		Eurylophella sp.	1	0.026
Arthropoda	Insecta	Ephemeroptera	Ephemeridae		Hexagenia limbata	26	0.680
Arthropoda	Insecta	Ephemeroptera	Ephemeridae		Hexagenia sp.	13	0.340

Phylum	Class	Order	Family	Subfamily	Final Taxa Determination	Total Indiv.	% of total
Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae		Leptophlebiidae	1	0.026
Arthropoda	Insecta	Lepidoptera	Pyralidae		Parapoynx sp.	1	0.026
Arthropoda	Insecta	Megaloptera	Sialidae		Sialis sp.	3	0.078
Arthropoda	Insecta	Odonata	Coenagrionidae		Coenagrionidae	4	0.105
Arthropoda	Insecta	Odonata	Gomphidae		Stylurus sp.	1	0.026
Arthropoda	Insecta	Trichoptera	Dipseudopsidae		Phylocentropus sp.	132	**3.453**
Arthropoda	Insecta	Trichoptera	Hydroptilidae		Hydroptila sp.	3	0.078
Arthropoda	Insecta	Trichoptera	Hydroptilidae		Orthotrichia sp.	3	0.078
Arthropoda	Insecta	Trichoptera	Leptoceridae		Ceraclea sp.	1	0.026
Arthropoda	Insecta	Trichoptera	Leptoceridae		Leptoceridae	1	0.026
Arthropoda	Insecta	Trichoptera	Leptoceridae		Mystacides sepulchralis	48	1.256
Arthropoda	Insecta	Trichoptera	Leptoceridae		Oecetis sp.	51	1.334
Arthropoda	Insecta	Trichoptera	Leptoceridae		Triaenodes sp.	8	0.209
Arthropoda	Insecta	Trichoptera	Limnephilidae		Limnephilidae	9	0.235
Arthropoda	Insecta	Trichoptera	Molannidae		Molanna sp.	4	0.105
Arthropoda	Insecta	Trichoptera	Polycentropodidae		Polycentropus sp.	2	0.052
Mollusca	Gastropoda	Basommatophora	Ancylidae		Ancylidae	4	0.105
Mollusca	Gastropoda	Basommatophora	Physidae		Physa sp.	14	0.366
Mollusca	Gastropoda	Basommatophora	Planorbidae		Gyraulus sp.	2	0.052
Mollusca	Gastropoda	Mesogastropoda	Hydrobiidae		Hydrobiidae	29	0.759
Mollusca	Gastropoda	Mesogastropoda	Valvatidae		Valvata tricarinata	13	0.340
Mollusca	Gastropoda	Mesogastropoda	Viviparidae		Campeloma decisum	3	0.078
Mollusca	Pelecypoda	Unionida	Unionidae		Unionidae	11	0.288
Mollusca	Pelecypoda	Veneroidea	Pisidiidae		Pisidiidae	18	0.471
Mollusca	Pelecypoda	Veneroidea	Pisidiidae		Pisidium sp.	69	1.805
Mollusca	Pelecypoda	Veneroidea	Sphaeriidae		Musculium sp.	2	0.052
Nemertea	Enopla	Hoplonemertea	Tetrastemmatidae		Prostoma sp.	2	0.052
Platyhelminthes	Turbellaria	Tricladida			Turbellaria	34	0.889
					Total individuals	*3823*	100

Appendix B: Descriptive statistics for each site (5 replicates per site).

Biotic Index									
Station	**N**	**Mean**	**SE Mean**	**StDev**	**Min**	**Q1**	**Median**	**Q3**	**Max**
4	5	7.856	0.243	0.544	7.29	7.335	7.98	8.315	8.63
13	5	7.712	0.359	0.803	6.9	7.085	7.27	8.56	8.77
16	5	7.766	0.247	0.553	7.13	7.18	8	8.235	8.37
19	5	7.172	0.189	0.422	6.69	6.78	7.21	7.545	7.78
24	5	7.886	0.194	0.433	7.17	7.535	7.94	8.21	8.32
26	5	7.456	0.0465	0.1041	7.36	7.36	7.43	7.565	7.58
29	5	6.97	0.113	0.253	6.6	6.73	7	7.195	7.24
31	5	7.884	0.266	0.595	7.39	7.46	7.79	8.355	8.9
36	5	7.66	0.311	0.696	6.61	7.02	7.74	8.26	8.43
37	5	6.608	0.203	0.453	5.83	6.25	6.72	6.91	7
38	5	7.618	0.336	0.751	6.57	6.9	7.74	8.275	8.53
112	5	7.19	0.213	0.476	6.4	6.755	7.4	7.52	7.6
124	5	7.996	0.136	0.305	7.69	7.73	8	8.26	8.47
127	5	7.434	0.256	0.573	6.72	6.94	7.29	8	8.18

Taxa Richness									
Station	**N**	**Mean**	**SE Mean**	**StDev**	**Min**	**Q1**	**Median**	**Q3**	**Max**
4	5	12.4	2.11	4.72	7	7.5	14	16.5	18
13	5	14.2	1.74	3.9	9	10.5	14	18	18
16	5	8.8	1.74	3.9	5	5	9	12.5	14
19	5	11	1.14	2.55	9	9	10	13.5	15
24	5	9.8	1.32	2.95	6	7.5	9	12.5	14
26	5	16.8	3.28	7.33	10	11	13	24.5	27
29	5	13.4	0.812	1.817	11	12	13	15	16
31	5	14.4	2.01	4.51	7	10.5	15	18	18
36	5	23.4	2.44	5.46	18	19	22	28.5	32
37	5	9.6	2.4	5.37	6	6	6	15	18
38	5	13.8	1.46	3.27	10	10.5	15	16.5	18
112	5	15	3.55	7.94	4	7	18	21.5	24
124	5	10	2.43	5.43	4	5	11	14.5	18
127	5	13.6	1.78	3.97	7	10	15	16.5	17

Species Diversity									
Station	**N**	**Mean**	**SE Mean**	**StDev**	**Min**	**Q1**	**Median**	**Q3**	**Max**
4	5	2.132	0.171	0.383	1.72	1.72	2.32	2.45	2.52
13	5	2.198	0.168	0.375	1.61	1.85	2.27	2.51	2.56
16	5	1.814	0.135	0.303	1.49	1.505	1.86	2.1	2.17
19	5	2.206	0.108	0.242	1.94	2.02	2.15	2.42	2.59
24	5	1.808	0.0873	0.1951	1.57	1.635	1.76	2.005	2.05
26	5	1.876	0.098	0.219	1.62	1.675	1.85	2.09	2.17
29	5	2.142	0.0532	0.119	1.99	2.035	2.13	2.255	2.3
31	5	2.094	0.18	0.402	1.62	1.655	2.37	2.395	2.41
36	5	2.298	0.193	0.431	1.73	1.885	2.4	2.66	2.86
37	5	1.916	0.207	0.463	1.54	1.6	1.73	2.325	2.7
38	5	1.984	0.16	0.359	1.64	1.67	1.92	2.33	2.52
112	5	2.092	0.23	0.514	1.33	1.71	2.12	2.46	2.78
124	5	1.89	0.211	0.472	1.28	1.4	2.1	2.275	2.42
127	5	2.166	0.201	0.45	1.57	1.71	2.29	2.56	2.68

Dominance-3									
Station	**N**	**Mean**	**SE Mean**	**StDev**	**Min**	**Q1**	**Median**	**Q3**	**Max**
4	5	57.71	5.39	12.04	43.08	47.09	54.17	70.09	71.43
13	5	54.82	6.43	14.38	41.07	43.87	48.08	69.14	76.74
16	5	67.44	4.07	9.1	55.17	58.44	68.42	75.96	76.92
19	5	50.28	4.97	11.11	33.33	39.74	53.85	59.03	62.5
24	5	67.63	1.94	4.34	62.5	64.35	66.67	71.39	74.36
26	5	68.78	1.91	4.28	63.16	65.04	67.8	73.02	73.81
29	5	59.87	2.97	6.63	50	54.31	59.57	65.58	68
31	5	59.28	5.69	12.72	50	50	50	73.19	74.16
36	5	56.49	5.6	12.52	42.54	45.08	53.98	69.16	72.81
37	5	63.57	7.18	16.06	36.36	49.43	68.97	75	75
38	5	63.1	8.06	18.01	38.3	44.15	71.43	77.89	79.37
112	5	59.89	6.81	15.23	37.93	46.74	61.68	72.14	80
124	5	65.25	6.37	14.25	51.11	52.83	61.54	79.52	85.71
127	5	54.79	8.25	18.45	34.38	36.83	56.94	71.68	79.73

Percent Model Affinity									
Station	**N**	**Mean**	**SE Mean**	**StDev**	**Min**	**Q1**	**Median**	**Q3**	**Max**
4	5	70.8	2.08	4.66	64	66	73	74.5	75
13	5	56	6.24	13.95	37	44.5	54	68.5	75
16	5	61	2.51	5.61	55	55.5	61	66.5	68
19	5	58.4	4.93	11.01	44	50.5	58	66.5	75
24	5	55.2	2.99	6.69	45	49	56	61	62
26	5	42.8	5.32	11.9	30	33.5	42	52.5	62
29	5	44	3.96	8.86	36	37	41	52.5	58
31	5	62.4	4.06	9.07	50	53.5	64	70.5	73
36	5	69	5.21	11.64	55	60	65	80	86
37	5	56.2	7.86	17.58	28	41.5	56	71	72
38	5	59.2	5.65	12.64	50	50.5	56	69.5	81
112	5	57	5.83	13.04	40	45	55	70	70
124	5	65.2	4.89	10.94	54	54	67	75.5	78
127	5	60.4	6.37	14.24	40	47	64	72	78

Biotic Assessment Profile									
Station	**N**	**Mean**	**SE Mean**	**StDev**	**Min**	**Q1**	**Median**	**Q3**	**Max**
4	5	5.786	0.759	1.696	3.815	3.975	6.587	7.196	7.569
13	5	5.813	0.694	1.551	3.669	4.467	5.542	7.294	7.657
16	5	4.502	0.372	0.831	3.481	3.787	4.219	5.359	5.4
19	5	5.685	0.465	1.039	4.321	4.766	5.449	6.722	6.83
24	5	4.372	0.308	0.688	3.512	3.746	4.232	5.069	5.127
26	5	4.636	0.404	0.904	3.39	3.83	4.655	5.432	5.826
29	5	5.184	0.322	0.719	4.276	4.441	5.407	5.815	5.991
31	5	5.721	0.62	1.387	3.949	4.242	6.461	6.83	7.101
36	5	6.887	0.7	1.566	4.792	5.495	7.027	8.209	9.055
37	5	5.24	0.799	1.786	2.797	3.839	5.002	6.759	7.756
38	5	5.378	0.605	1.352	4.05	4.333	4.987	6.618	7.55
112	5	5.914	0.777	1.737	3.033	4.414	6.545	7.098	7.623
124	5	5.074	0.712	1.593	3.293	3.533	5.452	6.425	7.286
127	5	5.853	0.763	1.705	3.261	4.19	6.357	7.263	7.534

Number of Individuals in Sample									
Station	**N**	**Mean**	**SE Mean**	**StDev**	**Min**	**Q1**	**Median**	**Q3**	**Max**
4	5	34.2	9.15	20.46	16	18.5	24	55	65
13	5	46.4	4.61	10.31	30	36.5	51	54	56
16	5	23.2	6.9	15.43	8	10.5	19	38	47
19	5	21.4	3.56	7.96	13	13	24	28.5	30
24	5	34.6	10.3	22.9	12	15.5	32	55	71
26	5	81.8	26.9	60.3	19	30.5	59	144.5	162
29	5	32.6	4.37	9.76	24	24.5	29	42.5	47
31	5	67.2	29	64.8	18	25	38	124	178
36	5	141.4	37.9	84.8	42	76	113	221	268
37	5	18.8	5.07	11.34	8	10	12	31	33
38	5	133	60.6	135.4	14	30.5	77	263.5	349
112	5	48.8	19.8	44.3	5	11.5	30	95.5	107
124	5	23	6.38	14.27	7	11	22	35.5	45
127	5	58.2	24.6	55	11	19.5	32	110	148

Number of Tolerant Taxa									
Station	**N**	**Mean**	**SE Mean**	**StDev**	**Min**	**Q1**	**Median**	**Q3**	**Max**
4	5	9.2	1.32	2.95	6	6	11	11.5	12
13	5	12	1.18	2.65	8	9.5	13	14	15
16	5	7.8	1.69	3.77	4	4	8	11.5	12
19	5	9.4	0.927	2.074	7	7.5	9	11.5	12
24	5	8.2	1.07	2.39	5	6	8	10.5	11
26	5	14.8	3.02	6.76	9	9.5	11	22	24
29	5	11.8	0.97	2.168	9	10	12	13.5	15
31	5	11.2	1.66	3.7	5	8	12	14	14
36	5	17.6	2.38	5.32	13	13	18	22	26
37	5	8	1.9	4.24	5	5	6	12	15
38	5	11.6	1.29	2.88	8	9	11	14.5	15
112	5	13.4	3.41	7.64	3	6.5	13	20.5	23
124	5	8	2.19	4.9	2	3.5	9	12	15
127	5	11.8	1.53	3.42	6	9	13	14	15

Number of Intolerant Taxa									
Station	**N**	**Mean**	**SE Mean**	**StDev**	**Min**	**Q1**	**Median**	**Q3**	**Max**
4	5	3.2	0.86	1.924	1	1.5	3	5	6
13	5	2.2	0.8	1.789	1	1	1	4	5
16	5	1	0.316	0.707	0	0.5	1	1.5	2
19	5	1.6	0.6	1.342	0	0.5	1	3	3
24	5	1.6	0.4	0.894	1	1	1	2.5	3
26	5	2	0.316	0.707	1	1.5	2	2.5	3
29	5	1.6	0.245	0.548	1	1	2	2	2
31	5	3.2	0.49	1.095	2	2	4	4	4
36	5	5.8	0.583	1.304	4	4.5	6	7	7
37	5	1.6	0.6	1.342	0	0.5	1	3	3
38	5	2.2	0.86	1.924	0	0.5	2	4	5
112	5	1.6	1.12	2.51	0	0	1	3.5	6
124	5	2	0.316	0.707	1	1.5	2	2.5	3
127	5	1.8	0.374	0.837	1	1	2	2.5	3

Ephemeroptera- Plecoptera-Trichoptera Richness									
Station	**N**	**Mean**	**SE Mean**	**StDev**	**Min**	**Q1**	**Median**	**Q3**	**Max**
4	5	2	0	0	2	2	2	2	2
13	5	1.8	0.374	0.837	1	1	2	2.5	3
16	5	1	0.316	0.707	0	0.5	1	1.5	2
19	5	0.6	0.4	0.894	0	0	0	1.5	2
24	5	0.8	0.374	0.837	0	0	1	1.5	2
26	5	2.2	0.49	1.095	1	1.5	2	3	4
29	5	1.8	0.374	0.837	1	1	2	2.5	3
31	5	1.6	0.245	0.548	1	1	2	2	2
36	5	4.2	0.2	0.447	4	4	4	4.5	5
37	5	1.8	0.86	1.924	0	0.5	1	3.5	5
38	5	2.2	0.8	1.789	0	0.5	2	4	4
112	5	1.4	0.51	1.14	0	0.5	1	2.5	3
124	5	1.4	0.245	0.548	1	1	1	2	2
127	5	1.2	0.374	0.837	0	0.5	1	2	2

Appendix C: ANOVA results

One-way ANOVA: HBI versus station

```
Source   DF      SS     MS     F      P
station  13  10.539  0.811  2.88  0.003
Error    56  15.765  0.282
Total    69  26.305

S = 0.5306   R-Sq = 40.07%   R-Sq(adj) = 26.15%


                          Individual 95% CIs For Mean Based on
                          Pooled StDev
Level  N    Mean   StDev  --------+---------+---------+---------+-
  4    5  7.8560  0.5436                      (-------*-------)
 13    5  7.7120  0.8026                    (-------*------)
 16    5  7.7660  0.5529                     (------*-------)
 19    5  7.1720  0.4224            (-------*------)
 24    5  7.8860  0.4330                        (------*-------)
 26    5  7.4560  0.1041                (-------*-------)
 29    5  6.9700  0.2526        (-------*-------)
 31    5  7.8840  0.5950                      (-------*-------)
 36    5  7.6600  0.6963                   (-------*-------)
 37    5  6.6080  0.4528  (-------*-------)
 38    5  7.6180  0.7512                  (-------*-------)
112    5  7.1900  0.4757            (-------*-------)
124    5  7.9960  0.3051                         (-------*-------)
127    5  7.4340  0.5725                (-------*-------)
                          --------+---------+---------+---------+-
                                6.60      7.20      7.80      8.40

Pooled StDev = 0.5306
```

One-way ANOVA: TaxaRich versus station

```
Source   DF      SS    MS     F      P
station  13   913.5  70.3  3.05  0.002
Error    56  1291.2  23.1
Total    69  2204.7

S = 4.802   R-Sq = 41.43%   R-Sq(adj) = 27.84%


                         Individual 95% CIs For Mean Based on
                         Pooled StDev
Level  N    Mean  StDev  ---+---------+---------+---------+------
  4    5  12.400  4.722        (-------*------)
 13    5  14.200  3.899           (-------*------)
 16    5   8.800  3.899  (-------*------)
 19    5  11.000  2.550     (------*-------)
 24    5   9.800  2.950   (------*-------)
 26    5  16.800  7.328               (------*------)
 29    5  13.400  1.817          (------*-------)
 31    5  14.400  4.506            (------*------)
 36    5  23.400  5.459                          (------*------)
 37    5   9.600  5.367   (------*------)
 38    5  13.800  3.271          (------*------)
112    5  15.000  7.937            (------*------)
124    5  10.000  5.431   (-------*------)
127    5  13.600  3.975          (-------*------)
                         ---+---------+---------+---------+------
```

```
                          6.0      12.0      18.0      24.0

Pooled StDev = 4.802
```

One-way ANOVA: shan_e versus station

```
Source   DF     SS     MS     F      P
station  13  1.660  0.128  0.93  0.527
Error    56  7.669  0.137
Total    69  9.329

S = 0.3701   R-Sq = 17.79%   R-Sq(adj) = 0.00%


                          Individual 95% CIs For Mean Based on
                          Pooled StDev
Level  N    Mean   StDev   -+---------+---------+---------+--------
  4    5  2.1320  0.3830             (----------*----------)
 13    5  2.1980  0.3749               (----------*----------)
 16    5  1.8140  0.3029   (----------*-----------)
 19    5  2.2060  0.2421               (-----------*----------)
 24    5  1.8080  0.1951   (----------*----------)
 26    5  1.8760  0.2190     (-----------*----------)
 29    5  2.1420  0.1190             (----------*----------)
 31    5  2.0940  0.4018            (----------*----------)
 36    5  2.2980  0.4306                  (----------*----------)
 37    5  1.9160  0.4630       (----------*----------)
 38    5  1.9840  0.3587         (----------*----------)
112    5  2.0920  0.5141            (----------*----------)
124    5  1.8900  0.4721      (----------*----------)
127    5  2.1660  0.4499               (----------*----------)
                           -+---------+---------+---------+--------
                          1.50      1.80      2.10      2.40

Pooled StDev = 0.3701
```

One-way ANOVA: Dom3 versus station

```
Source   DF     SS   MS     F      P
station  13   2008  154  0.93  0.526
Error    56   9263  165
Total    69  11271

S = 12.86   R-Sq = 17.81%   R-Sq(adj) = 0.00%


                         Individual 95% CIs For Mean Based on
                         Pooled StDev
Level  N   Mean  StDev  --------+---------+---------+---------+-
  4    5  57.71  12.04       (---------*---------)
 13    5  54.82  14.38     (---------*--------)
 16    5  67.44   9.10               (--------*---------)
 19    5  50.28  11.11  (---------*---------)
 24    5  67.63   4.34               (--------*---------)
 26    5  68.78   4.28                (--------*---------)
 29    5  59.87   6.63         (---------*--------)
 31    5  59.28  12.72         (--------*---------)
 36    5  56.49  12.52       (---------*---------)
 37    5  63.57  16.06            (---------*---------)
 38    5  63.10  18.01            (---------*--------)
```

```
112    5  59.89  15.23          (---------*---------)
124    5  65.25  14.25               (--------*---------)
127    5  54.79  18.45      (---------*--------)
                         --------+---------+---------+---------+-
                                48        60        72        84

Pooled StDev = 12.86
```

One-way ANOVA: ponar_pma versus station

```
Source   DF     SS   MS     F      P
station  13   4066  313  2.42  0.012
Error    56   7252  130
Total    69  11319

S = 11.38   R-Sq = 35.93%   R-Sq(adj) = 21.05%


                         Individual 95% CIs For Mean Based on
                         Pooled StDev
Level  N   Mean  StDev  --------+---------+---------+---------+-
  4    5  70.80   4.66                    (------*------)
 13    5  56.00  13.95          (-----*------)
 16    5  61.00   5.61             (------*-----)
 19    5  58.40  11.01           (------*------)
 24    5  55.20   6.69         (------*------)
 26    5  42.80  11.90  (------*-----)
 29    5  44.00   8.86   (-----*------)
 31    5  62.40   9.07             (------*-----)
 36    5  69.00  11.64                 (------*------)
 37    5  56.20  17.58          (-----*------)
 38    5  59.20  12.64            (-----*------)
112    5  57.00  13.04          (------*------)
124    5  65.20  10.94               (-----*------)
127    5  60.40  14.24            (------*------)
                         --------+---------+---------+---------+-
                                45        60        75        90

Pooled StDev = 11.38
```

One-way ANOVA: P_BAP versus station

```
Source   DF      SS    MS     F      P
station  13   28.98  2.23  1.17  0.326
Error    56  106.85  1.91
Total    69  135.83

S = 1.381   R-Sq = 21.33%   R-Sq(adj) = 3.07%


                         Individual 95% CIs For Mean Based on
                         Pooled StDev
Level  N   Mean  StDev  ---------+---------+---------+---------+
  4    5  5.786  1.696          (--------*-------)
 13    5  5.813  1.551           (-------*-------)
 16    5  4.502  0.831   (-------*-------)
 19    5  5.685  1.039          (-------*-------)
 24    5  4.372  0.688  (-------*-------)
 26    5  4.636  0.904    (-------*-------)
 29    5  5.184  0.719       (--------*-------)
```

```
 31    5  5.721  1.387           (-------*-------)
 36    5  6.887  1.566                   (-------*-------)
 37    5  5.240  1.786        (-------*-------)
 38    5  5.378  1.352         (-------*-------)
112    5  5.914  1.737            (-------*--------)
124    5  5.074  1.593       (-------*-------)
127    5  5.853  1.705            (-------*-------)
                         ---------+---------+---------+---------+
                                4.5       6.0       7.5       9.0

Pooled StDev = 1.381
```

One-way ANOVA: Tolerant Taxa versus station

```
Source   DF      SS    MS     F      P
station  13   541.4  41.6  2.31  0.016
Error    56  1010.4  18.0
Total    69  1551.8

S = 4.248   R-Sq = 34.89%   R-Sq(adj) = 19.77%


                         Individual 95% CIs For Mean Based on
                         Pooled StDev
Level  N    Mean  StDev  --+---------+---------+---------+-------
  4    5   9.200  2.950     (------*-------)
 13    5  12.000  2.646          (-------*-------)
 16    5   7.800  3.768  (-------*------)
 19    5   9.400  2.074     (-------*------)
 24    5   8.200  2.387   (------*-------)
 26    5  14.800  6.760                (-------*------)
 29    5  11.800  2.168          (-------*------)
 31    5  11.200  3.701         (------*-------)
 36    5  17.600  5.320                      (------*-------)
 37    5   8.000  4.243  (-------*-------)
 38    5  11.600  2.881          (------*-------)
112    5  13.400  7.635             (-------*------)
124    5   8.000  4.899  (-------*-------)
127    5  11.800  3.421          (-------*------)
                         --+---------+---------+---------+-------
                         5.0      10.0      15.0      20.0

Pooled StDev = 4.248
```

One-way ANOVA: Intolerant Taxa versus station

```
Source   DF      SS    MS     F      P
station  13   92.07  7.08  3.71  0.000
Error    56  106.80  1.91
Total    69  198.87

S = 1.381   R-Sq = 46.30%   R-Sq(adj) = 33.83%


                         Individual 95% CIs For Mean Based on
                         Pooled StDev
Level  N   Mean  StDev   -+---------+---------+---------+--------
  4    5  3.200  1.924              (-----*-----)
 13    5  2.200  1.789         (-----*-----)
 16    5  1.000  0.707   (-----*-----)
```

```
 19    5  1.600  1.342      (-----*-----)
 24    5  1.600  0.894      (-----*-----)
 26    5  2.000  0.707        (-----*-----)
 29    5  1.600  0.548      (-----*-----)
 31    5  3.200  1.095              (-----*-----)
 36    5  5.800  1.304                          (-----*-----)
 37    5  1.600  1.342      (-----*-----)
 38    5  2.200  1.924         (-----*-----)
112    5  1.600  2.510      (-----*-----)
124    5  2.000  0.707        (-----*-----)
127    5  1.800  0.837       (-----*-----)
                         -+---------+---------+---------+--------
                        0.0       2.0       4.0       6.0

Pooled StDev = 1.381
```

One-way ANOVA: EPTRich versus station

```
Source   DF      SS    MS     F      P
station  13   49.09  3.78  3.70  0.000
Error    56   57.20  1.02
Total    69  106.29

S = 1.011   R-Sq = 46.18%   R-Sq(adj) = 33.69%


                         Individual 95% CIs For Mean Based on
                         Pooled StDev
Level  N   Mean  StDev  --+---------+---------+---------+-------
  4    5  2.000  0.000           (-----*-----)
 13    5  1.800  0.837          (-----*-----)
 16    5  1.000  0.707     (-----*-----)
 19    5  0.600  0.894  (-----*-----)
 24    5  0.800  0.837   (-----*-----)
 26    5  2.200  1.095             (-----*-----)
 29    5  1.800  0.837          (-----*-----)
 31    5  1.600  0.548         (-----*-----)
 36    5  4.200  0.447                          (-----*-----)
 37    5  1.800  1.924          (-----*-----)
 38    5  2.200  1.789             (-----*-----)
112    5  1.400  1.140       (-----*-----)
124    5  1.400  0.548       (-----*-----)
127    5  1.200  0.837      (-----*-----)
                         --+---------+---------+---------+-------
                         0.0       1.5       3.0       4.5

Pooled StDev = 1.011
```

Kruskal-Wallis Test: Tolerant Taxa versus station

```
Kruskal-Wallis Test on Tolerant Taxa

station   N  Median  Ave Rank      Z
  4       5  11.000      27.6  -0.90
 13       5  13.000      43.2   0.88
 16       5   8.000      20.9  -1.66
 19       5   9.000      27.1  -0.96
 24       5   8.000      20.7  -1.69
 26       5  11.000      44.7   1.05
 29       5  12.000      41.5   0.68
 31       5  12.000      39.7   0.48
```

```
 36       5  18.000      60.4   2.84
 37       5   6.000      21.9  -1.55
 38       5  11.000      39.7   0.48
112       5  13.000      42.9   0.84
124       5   9.000      23.1  -1.41
127       5  13.000      43.6   0.92
Overall  70              35.5

H = 22.45  DF = 13  P = 0.049
H = 22.61  DF = 13  P = 0.047  (adjusted for ties)
```

Kruskal-Wallis Test: Intolerant Taxa versus station

```
Kruskal-Wallis Test on Intolerant Taxa

station   N  Median  Ave Rank      Z
  4       5   3.000      47.0   1.31
 13       5   1.000      34.0  -0.17
 16       5   1.000      19.1  -1.87
 19       5   1.000      28.7  -0.78
 24       5   1.000      28.8  -0.76
 26       5   2.000      36.8   0.15
 29       5   2.000      30.0  -0.63
 31       5   4.000      51.2   1.79
 36       5   6.000      66.0   3.48
 37       5   1.000      28.7  -0.78
 38       5   2.000      35.1  -0.05
112       5   1.000      22.0  -1.54
124       5   2.000      36.8   0.15
127       5   2.000      32.8  -0.31
Overall  70              35.5

H = 23.43  DF = 13  P = 0.037
H = 24.79  DF = 13  P = 0.025  (adjusted for ties)
```

Kruskal-Wallis Test: EPTRich versus station

```
Kruskal-Wallis Test on EPTRich

station   N       Median  Ave Rank      Z
  4       5  2.000000000      46.0   1.20
 13       5  2.000000000      39.2   0.42
 16       5  1.000000000      23.5  -1.37
 19       5  0.000000000      16.9  -2.12
 24       5  1.000000000      20.2  -1.74
 26       5  2.000000000      45.0   1.08
 29       5  2.000000000      39.2   0.42
 31       5  2.000000000      36.4   0.10
 36       5  4.000000000      65.9   3.47
 37       5  1.000000000      33.0  -0.29
 38       5  2.000000000      40.7   0.59
112       5  1.000000000      31.1  -0.50
124       5  1.000000000      31.6  -0.44
127       5  1.000000000      28.3  -0.82
Overall  70                   35.5

H = 24.10  DF = 13  P = 0.030
H = 26.34  DF = 13  P = 0.015  (adjusted for ties)
```

Appendix D: Taxa composition and abundance at each site (summed 5 replicates per site).

Taxa	19	4	112	124	13	16	36	38	127	26	24	31	29	37
Ablabesmyia annulata										1			2	2
Ablabesmyia mallochi			9		2	1	20			4		1	4	1
Ablabesmyia sp.							3							
Ancylidae							3							
Arcteonais lomondi							7							
Aulodrilus americanus											1			
Aulodrilus limnobius	1													
Berosus sp.												3		
Caecidotea sp.		1	4	5	3	7	24	35	5	6	1	20	3	6
Caenis sp.		1	2		1		7	2				2		
Campeloma decisum	2				1									
Ceraclea sp.														1
Ceratopogonidae		1	1							1	3			
Ceratopogoninae	1													
Chironomidae		1	4		2		4	2						3
Chironominae	5		3	4		1	13	1	8	13	9	5	1	
Chironomus sp.		3	1	1				3		1				
Cladotanytarsus sp.					6		10				1	1		
Clinotanypus sp.												1		
Coelotanypus sp.			1	2						25			7	7
Coenagrionidae							4							
Cricotopus sp.			1		1									
Cryptochironomus sp.	5	12	6				7	4	5	5	2		5	2
Demicryptochironomus sp.	9	3	2	1	4		2		3		2	1		
Diamesa sp.									1					
Dicrotendipes sp.	1	4	92	6	9	8	25	142	3	215	3	19	57	22
Djalmabatista sp.	1		2		5				2		2	1		
Dubiraphia sp.					1	5		1		1		1		
Enchytraeidae					1		4							
Eurylophella sp.		1												
Ferrissia sp.										1				
Gammarus sp.	2	2	16			7	57	20	9	4		8	9	
Glossiphoniidae		8				4		1		1		3		
Gyraulus sp.							1			1				
Haliplus sp.		1					3							
Helobdella stagnalis				1										
Hexagenia limbata				6						4			9	7
Hexagenia sp.	1	1	1	1	1			2		4			2	
Hexatoma sp.	1													
Hyalella sp.			3	2	1					1				
Hydrobiidae	2	5		1			9	7		3	1		1	
Hydroptila sp.			3											
Leptoceridae											1			

Taxa	19	4	112	124	13	16	36	38	127	26	24	31	29	37
Leptophlebiidae														1
Limnephilidae		2	1				6							
Limnodrilus hoffmeisteri	9	21		22	23	4	173	53	38	8	10	107	4	4
Lumbricina												3		
Lumbriculidae	2	12		3	1		6	2			1	15		
Manayunkia speciosa			3	1	1					1		1		1
Micropsectra sp.												1		
Microtendipes pedellus gr.	1		1	1	2		15			5			12	3
Molanna sp.									2	1			1	
Musculium sp.														2
Mystacides sepulchralis					1		41	3	1	1	1			
Nais sp.									1					
Nilothauma sp.			3	1	1			1		1	1		5	1
Oecetis sp.					3	3	27	8		5		1	3	1
Orthocladiinae			1						3					
Orthocladiinae sp. C					1				2			1		
Orthotrichia sp.			2							1				
Parametriocnemus sp.	1													
Parapoynx sp.							1							
Phylocentropus sp.	2	19	8	5	10	6	26	15	25		3	13		
Physa sp.		1					5		1	7				
Pisidiidae	2							1	1			1	1	12
Pisidium sp.	3	15	1	7	11	2	2	1	3	2	3	19		
Polycentropus sp.	1													1
Polypedilum halterale gr.	3	1	2	2	14	1	4	7	5	2	21	22	4	1
Polypedilum scalaenum gr.	8		4	1	3				2		1			
Polypedilum sp.	4		1	1		1			3					
Pristina sp.							1							
Probezzia sp.	2	3	15	6	19	1	27	2	18	1	14	7	4	3
Procladius sp.			14	2	9	3	6	7	5	7	8	7	1	
Prosimulium sp.		1												
Prostoma sp.			1				1							
Pseudochironomus sp.	1	1	1	5	1		3	3		1	7			
Rhyacodrilus sp.									2					
Sialis sp.		1					1							1
Specaria josinae			2		2		4	1	1			2		
Stenelmis sp.			2				13		3					2
Stictochironomus sp.	1													
Stylaria lacustris							18							
Stylurus sp.	1													
Synorthocladius sp.			1											

Taxa	19	4	112	124	13	16	36	38	127	26	24	31	29	37
Tabanidae	1		1				2							
Tanypodinae			1				1		4	5				
Tanytarsini	3		2	1	19		3	1	7	2	10		1	1
Tanytarsus sp.	2						3				1	1	2	
Thienemannimyia gr. spp.			1		2		9	1	1	2			5	5
Triaenodes sp.							5	1					1	1
Tribelos sp.	3	1	1	1	11	35	8	229	108	38		1	15	
Tubificidae w/ cap Setae		2	4	5	52	18	4	57	11		2	23	1	
Tubificidae w/o cap Setae	12	41	17	21	8	9	68	45	6	13	64	45		1
Turbellaria		6	1				14	7	1	5				
Uncinais uncinata	14								1					
Unionidae			2							4			3	2
Valvata tricarinata							7			6				
Total individuals/site	**107**	**171**	**244**	**115**	**232**	**116**	**707**	**665**	**291**	**409**	**173**	**336**	**163**	**94**

APPENDIX 4

Upper Hudson River Pilot Study: Raw Toxicity Test Results

PILOT STUDY FOR THE CHARACTERIZATION OF SEDIMENT CHEMISTRY, SEDIMENT TOXICITY, AND BENTHIC INVERTEBRATE COMMUNITY STRUCTURE FOR PCB-CONTAMINATED SEDIMENTS FROM THE UPPER HUDSON RIVER, NEW YORK—DATA REPORT

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
Control	WB	Control	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	28	Days
Control	WB	Control	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	17	Days
Control	WB	Control	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	26.2	Days
Control	WB	Control	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	23.2	Days
Control	WB	Control	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	17.4	Days
Control	WB	Control	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20.6	Days
Control	WB	Control	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	26	Days
Control	WB	Control	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	24.8	Days
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	25.8	Days
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	18.2	Days
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	28	Days
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	24.2	Days
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21	Days
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	27	Days
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	18	Days
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	18	Days
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	19	Days
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21.4	Days
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21.2	Days
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21	Days
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	19.6	Days
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	17	Days
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	18	Days
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	19	Days
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20.2	Days
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	19	Days
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	19.2	Days
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21.8	Days
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	26	Days
UHR-SVS-124	5	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	22	Days
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	23	Days
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	24	Days
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	19.6	Days
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	26	Days
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20	Days
UHR-SVS-127	8	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	18.8	Days

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	24	Days
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20	Days
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	25	Days
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	24	Days
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	23.6	Days
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	23.6	Days
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	25	Days
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	28.4	Days
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20.4	Days
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	23.4	Days
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20.2	Days
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21.2	Days
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	23	Days
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	27	Days
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	31	Days
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	22	Days
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	28.2	Days
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	29.2	Days
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	30.6	Days
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	30	Days
UHR-SVS-19	2	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	19.4	Days
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	25.8	Days
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	25	Days
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	19.4	Days
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21.6	Days
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	18	Days
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	17.6	Days
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	24.6	Days
UHR-SVS-24	3	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20	Days
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21	Days
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21.2	Days
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	19.6	Days
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20	Days
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	19.6	Days
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	22	Days
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	23	Days

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	23	Days
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20	Days
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	22.8	Days
UHR-SVS-26	9	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21	Days
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	24	Days
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20.6	Days
UHR-SVS-26	9	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	22	Days
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	23	Days
UHR-SVS-29/36	12	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21	Days
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20	Days
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20	Days
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	31.2	Days
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	27.4	Days
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	32	Days
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	22	Days
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	27.6	Days
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	18	Days
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20.4	Days
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21.6	Days
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	19	Days
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21.8	Days
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	18.4	Days
UHR-SVS-31	10	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20	Days
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21.2	Days
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	18	Days
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	26	Days
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	22	Days
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	23	Days
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	21	Days
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	33.2	Days
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	29	Days
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	20th Percentile Emergence Time	Day 20 - 30	20.6	Days
Control	WB	Control	1	*Chironomus dilutus*	Adult Time to Death	NA	5.7	Days
Control	WB	Control	2	*Chironomus dilutus*	Adult Time to Death	NA	6.38	Days
Control	WB	Control	4	*Chironomus dilutus*	Adult Time to Death	NA	5.88	Days
Control	WB	Control	5	*Chironomus dilutus*	Adult Time to Death	NA	6.25	Days

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
Control	WB	Control	6	*Chironomus dilutus*	Adult Time to Death	NA	6.43	Days
Control	WB	Control	7	*Chironomus dilutus*	Adult Time to Death	NA	6.88	Days
Control	WB	Control	8	*Chironomus dilutus*	Adult Time to Death	NA	6.89	Days
Control	WB	Control	12	*Chironomus dilutus*	Adult Time to Death	NA	5.89	Days
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	6.89	Days
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	4.43	Days
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	5.5	Days
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	4.83	Days
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	6.38	Days
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	4.75	Days
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	5.29	Days
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	7.25	Days
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	6.33	Days
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	5.75	Days
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	7.25	Days
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	5.57	Days
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	7.33	Days
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	7.86	Days
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	6.33	Days
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	7.09	Days
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	6.75	Days
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	7	Days
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	8.57	Days
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	4	Days
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	4.14	Days
UHR-SVS-124	5	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	3	Days
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	4.4	Days
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	6.67	Days
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	6.43	Days
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	5.33	Days
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	6.55	Days
UHR-SVS-127	8	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	5.38	Days
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	7	Days
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	4.88	Days
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	7.18	Days
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	6.73	Days

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	5.89	Days
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	6.67	Days
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	6.89	Days
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	7.55	Days
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	5.86	Days
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	6	Days
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	5.8	Days
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	6.63	Days
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	7.36	Days
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	4.5	Days
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	6	Days
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	7.6	Days
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	7.2	Days
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	6.2	Days
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	6.63	Days
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	5.17	Days
UHR-SVS-19	2	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	7.67	Days
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	6.9	Days
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	7.22	Days
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	6.43	Days
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	6.6	Days
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	6.2	Days
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	5	Days
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	7.11	Days
UHR-SVS-24	3	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	8.2	Days
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	5.1	Days
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	6.67	Days
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	6.22	Days
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	6.38	Days
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	6.13	Days
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	7.11	Days
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	5.92	Days
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	6.8	Days
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	6.14	Days
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	5.29	Days
UHR-SVS-26	9	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	5.1	Days

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	5.9	Days
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	7.63	Days
UHR-SVS-26	9	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	5.33	Days
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	6.09	Days
UHR-SVS-29/36	12	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	7	Days
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	7.11	Days
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	6.44	Days
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	5.86	Days
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	6.14	Days
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	5.86	Days
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	6.63	Days
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	4.78	Days
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	7.91	Days
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	6.5	Days
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	7.9	Days
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	8.5	Days
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	5.14	Days
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	4.88	Days
UHR-SVS-31	10	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	4.17	Days
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	7.11	Days
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Adult Time to Death	NA	5.75	Days
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Adult Time to Death	NA	5.36	Days
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Adult Time to Death	NA	7.13	Days
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Adult Time to Death	NA	6.5	Days
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Adult Time to Death	NA	6.27	Days
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Adult Time to Death	NA	6.43	Days
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Adult Time to Death	NA	6	Days
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Adult Time to Death	NA	5	Days
Control	WB	Control	3	*Chironomus dilutus*	Biomass	Day 13	15.8	mg
Control	WB	Control	9	*Chironomus dilutus*	Biomass	Day 13	13.4	mg
Control	WB	Control	10	*Chironomus dilutus*	Biomass	Day 13	12.4	mg
Control	WB	Control	11	*Chironomus dilutus*	Biomass	Day 13	16.4	mg
UHR-SVS-04	1	Test	3	*Chironomus dilutus*	Biomass	Day 13	14.1	mg
UHR-SVS-04	1	Test	9	*Chironomus dilutus*	Biomass	Day 13	16.6	mg
UHR-SVS-04	1	Test	10	*Chironomus dilutus*	Biomass	Day 13	16.9	mg
UHR-SVS-04	1	Test	11	*Chironomus dilutus*	Biomass	Day 13	15.4	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-112	4	Test	3	*Chironomus dilutus*	Biomass	Day 13	15.4	mg
UHR-SVS-112	4	Test	9	*Chironomus dilutus*	Biomass	Day 13	15.3	mg
UHR-SVS-112	4	Test	10	*Chironomus dilutus*	Biomass	Day 13	13.6	mg
UHR-SVS-112	4	Test	11	*Chironomus dilutus*	Biomass	Day 13	16.5	mg
UHR-SVS-124	5	Test	3	*Chironomus dilutus*	Biomass	Day 13	14.7	mg
UHR-SVS-124	5	Test	9	*Chironomus dilutus*	Biomass	Day 13	16	mg
UHR-SVS-124	5	Test	10	*Chironomus dilutus*	Biomass	Day 13	18.8	mg
UHR-SVS-124	5	Test	11	*Chironomus dilutus*	Biomass	Day 13	16.9	mg
UHR-SVS-127	8	Test	3	*Chironomus dilutus*	Biomass	Day 13	16	mg
UHR-SVS-127	8	Test	9	*Chironomus dilutus*	Biomass	Day 13	15.8	mg
UHR-SVS-127	8	Test	10	*Chironomus dilutus*	Biomass	Day 13	15.7	mg
UHR-SVS-127	8	Test	11	*Chironomus dilutus*	Biomass	Day 13	17.7	mg
UHR-SVS-13	6	Test	3	*Chironomus dilutus*	Biomass	Day 13	13.7	mg
UHR-SVS-13	6	Test	9	*Chironomus dilutus*	Biomass	Day 13	15.1	mg
UHR-SVS-13	6	Test	10	*Chironomus dilutus*	Biomass	Day 13	16.8	mg
UHR-SVS-13	6	Test	11	*Chironomus dilutus*	Biomass	Day 13	17.9	mg
UHR-SVS-16/37	11	Test	3	*Chironomus dilutus*	Biomass	Day 13	11.2	mg
UHR-SVS-16/37	11	Test	9	*Chironomus dilutus*	Biomass	Day 13	10.1	mg
UHR-SVS-16/37	11	Test	10	*Chironomus dilutus*	Biomass	Day 13	12.2	mg
UHR-SVS-16/37	11	Test	11	*Chironomus dilutus*	Biomass	Day 13	6.87	mg
UHR-SVS-19	2	Test	3	*Chironomus dilutus*	Biomass	Day 13	17.6	mg
UHR-SVS-19	2	Test	9	*Chironomus dilutus*	Biomass	Day 13	15.9	mg
UHR-SVS-19	2	Test	10	*Chironomus dilutus*	Biomass	Day 13	22.5	mg
UHR-SVS-19	2	Test	11	*Chironomus dilutus*	Biomass	Day 13	13.7	mg
UHR-SVS-24	3	Test	3	*Chironomus dilutus*	Biomass	Day 13	14.3	mg
UHR-SVS-24	3	Test	9	*Chironomus dilutus*	Biomass	Day 13	18.2	mg
UHR-SVS-24	3	Test	10	*Chironomus dilutus*	Biomass	Day 13	22.1	mg
UHR-SVS-24	3	Test	11	*Chironomus dilutus*	Biomass	Day 13	17.6	mg
UHR-SVS-26	9	Test	3	*Chironomus dilutus*	Biomass	Day 13	14.9	mg
UHR-SVS-26	9	Test	9	*Chironomus dilutus*	Biomass	Day 13	18	mg
UHR-SVS-26	9	Test	10	*Chironomus dilutus*	Biomass	Day 13	17.2	mg
UHR-SVS-26	9	Test	11	*Chironomus dilutus*	Biomass	Day 13	16	mg
UHR-SVS-29/36	12	Test	3	*Chironomus dilutus*	Biomass	Day 13	14.9	mg
UHR-SVS-29/36	12	Test	9	*Chironomus dilutus*	Biomass	Day 13	18.1	mg
UHR-SVS-29/36	12	Test	10	*Chironomus dilutus*	Biomass	Day 13	18.4	mg
UHR-SVS-29/36	12	Test	11	*Chironomus dilutus*	Biomass	Day 13	18.7	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-31	10	Test	3	*Chironomus dilutus*	Biomass	Day 13	18	mg
UHR-SVS-31	10	Test	9	*Chironomus dilutus*	Biomass	Day 13	14.9	mg
UHR-SVS-31	10	Test	10	*Chironomus dilutus*	Biomass	Day 13	18.4	mg
UHR-SVS-31	10	Test	11	*Chironomus dilutus*	Biomass	Day 13	17.4	mg
UHR-SVS-38	7	Test	3	*Chironomus dilutus*	Biomass	Day 13	15.6	mg
UHR-SVS-38	7	Test	9	*Chironomus dilutus*	Biomass	Day 13	18.3	mg
UHR-SVS-38	7	Test	10	*Chironomus dilutus*	Biomass	Day 13	16.7	mg
UHR-SVS-38	7	Test	11	*Chironomus dilutus*	Biomass	Day 13	21	mg
Control	WB	Control	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	45	%
Control	WB	Control	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	38	%
Control	WB	Control	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	67	%
Control	WB	Control	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	88	%
Control	WB	Control	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	43	%
Control	WB	Control	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	56	%
Control	WB	Control	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	89	%
Control	WB	Control	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	90	%
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	44	%
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	57	%
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	67	%
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	71	%
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	88	%
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	25	%
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	75	%
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	57	%
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	57	%
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	44	%
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	44	%
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	27	%
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	33	%
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	17	%
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	14	%
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	60	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	88	%
UHR-SVS-124	5	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	83	%
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	14	%
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	45	%
UHR-SVS-127	8	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	25	%
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	75	%
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	45	%
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	36	%
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	56	%
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	56	%
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	45	%
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	75	%
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	43	%
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	67	%
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	40	%
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	44	%
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	45	%
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	67	%
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	67	%
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	25	%
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	80	%
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	63	%
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-19	2	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	0	%
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	70	%
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	70	%
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	57	%
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	80	%
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	30	%
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	56	%
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-24	3	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	17	%
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	36	%
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	25	%
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	56	%
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	63	%
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	78	%
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	56	%
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	69	%
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	36	%
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	57	%
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	75	%
UHR-SVS-26	9	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	40	%
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	64	%
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	13	%
UHR-SVS-26	9	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	0	%
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	64	%
UHR-SVS-29/36	12	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	18	%
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	44	%
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	40	%
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	86	%
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	57	%
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	71	%
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	44	%
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	78	%
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	55	%
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	67	%
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	30	%
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	60	%
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	71	%
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-31	10	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	33	%
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	56	%
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Emerged Females	Day 20 - 30	25	%
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Emerged Females	Day 20 - 30	64	%
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Emerged Females	Day 20 - 30	50	%
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Emerged Females	Day 20 - 30	70	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Emerged Females	Day 20 - 30	64	%
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Emerged Females	Day 20 - 30	57	%
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Emerged Females	Day 20 - 30	83	%
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Emerged Females	Day 20 - 30	56	%
Control	WB	Control	1	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
Control	WB	Control	2	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
Control	WB	Control	4	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
Control	WB	Control	5	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
Control	WB	Control	6	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
Control	WB	Control	7	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
Control	WB	Control	8	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
Control	WB	Control	12	*Chironomus dilutus*	Emergence	Day 20 - 30	83.3	%
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	33.3	%
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	33.3	%
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	100	%
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	41.7	%
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-124	5	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	33.3	%
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-127	8	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	83.3	%
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	100	%
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	83.3	%
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	33.3	%
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	41.7	%
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-19	2	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	33.3	%
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	83.3	%
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	83.3	%
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	83.3	%
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	83.3	%
UHR-SVS-24	3	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	100	%
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-26	9	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	83.3	%
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-26	9	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	33.3	%
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-29/36	12	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	83.3	%
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	83.3	%
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	41.7	%
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-31	10	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Emergence	Day 20 - 30	66.7	%
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Emergence	Day 20 - 30	83.3	%
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Emergence	Day 20 - 30	91.7	%
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Emergence	Day 20 - 30	58.3	%
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Emergence	Day 20 - 30	50	%
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Emergence	Day 20 - 30	75	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
Control	WB	Control	1	*Chironomus dilutus*	Hatched	~ Day 53	89.6	%
Control	WB	Control	2	*Chironomus dilutus*	Hatched	~ Day 53	98	%
Control	WB	Control	4	*Chironomus dilutus*	Hatched	~ Day 53	97.2	%
Control	WB	Control	5	*Chironomus dilutus*	Hatched	~ Day 53	96.2	%
Control	WB	Control	6	*Chironomus dilutus*	Hatched	~ Day 53	92.3	%
Control	WB	Control	7	*Chironomus dilutus*	Hatched	~ Day 53	93.6	%
Control	WB	Control	8	*Chironomus dilutus*	Hatched	~ Day 53	97.4	%
Control	WB	Control	12	*Chironomus dilutus*	Hatched	~ Day 53	96.6	%
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Hatched	~ Day 53	97.9	%
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	96.9	%
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	98.1	%
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Hatched	~ Day 53	97	%
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	98.7	%
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Hatched	~ Day 53	98	%
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Hatched	~ Day 53	97.7	%
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	0	%
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Hatched	~ Day 53	98.4	%
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	96.2	%
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	90.8	%
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Hatched	~ Day 53	95.2	%
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	93	%
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Hatched	~ Day 53	97	%
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Hatched	~ Day 53	94.3	%
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	99.7	%
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Hatched	~ Day 53	94.1	%
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	97.2	%
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	94.4	%
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Hatched	~ Day 53	0	%
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	92.5	%
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Hatched	~ Day 53	96.7	%
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	98.1	%
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Hatched	~ Day 53	90.6	%
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	94.1	%
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	97.5	%
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	98.5	%
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Hatched	~ Day 53	97.2	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Hatched	~ Day 53	97.8	%
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	97.9	%
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Hatched	~ Day 53	96.3	%
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	98.3	%
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	86.6	%
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Hatched	~ Day 53	96.8	%
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	95.7	%
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Hatched	~ Day 53	96.8	%
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Hatched	~ Day 53	98.2	%
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	98.3	%
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Hatched	~ Day 53	31.4	%
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	94.2	%
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	95.3	%
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Hatched	~ Day 53	93.9	%
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	89.7	%
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Hatched	~ Day 53	92.5	%
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Hatched	~ Day 53	84.4	%
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	97.5	%
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	95.3	%
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	94.3	%
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Hatched	~ Day 53	81.6	%
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	81.4	%
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Hatched	~ Day 53	96.6	%
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Hatched	~ Day 53	88.9	%
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	73.8	%
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	90	%
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	93.9	%
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Hatched	~ Day 53	77.8	%
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	97.7	%
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Hatched	~ Day 53	95.2	%
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Hatched	~ Day 53	96.2	%
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	83.2	%
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Hatched	~ Day 53	86.1	%
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	98.2	%
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	93.3	%
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	94.6	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Hatched	~ Day 53	92.8	%
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	97.6	%
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	70.4	%
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	64.6	%
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Hatched	~ Day 53	77.5	%
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	96	%
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Hatched	~ Day 53	96.8	%
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Hatched	~ Day 53	95.2	%
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	95.3	%
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Hatched	~ Day 53	95.4	%
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	85.2	%
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	96.9	%
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Hatched	~ Day 53	97.4	%
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	98	%
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Hatched	~ Day 53	94.2	%
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	95.7	%
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Hatched	~ Day 53	90.1	%
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Hatched	~ Day 53	96.5	%
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Hatched	~ Day 53	96.8	%
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Hatched	~ Day 53	96.9	%
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Hatched	~ Day 53	95.1	%
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Hatched	~ Day 53	99.2	%
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Hatched	~ Day 53	97.9	%
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Hatched	~ Day 53	97.4	%
Control	WB	Control	1	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.146	Days
Control	WB	Control	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.21	Days
Control	WB	Control	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.185	Days
Control	WB	Control	5	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.202	Days
Control	WB	Control	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.199	Days
Control	WB	Control	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.182	Days
Control	WB	Control	8	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.18	Days
Control	WB	Control	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.172	Days
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.115	Days
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.18	Days
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.153	Days
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.184	Days

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.142	Days
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.188	Days
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.21	Days
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.188	Days
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.2	Days
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.186	Days
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.23	Days
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.159	Days
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.155	Days
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.157	Days
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.158	Days
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.135	Days
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.156	Days
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.212	Days
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.18	Days
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.119	Days
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.181	Days
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.181	Days
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.207	Days
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.162	Days
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.163	Days
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.185	Days
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.16	Days
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.161	Days
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.196	Days
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.164	Days
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.123	Days
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.159	Days
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.154	Days
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.157	Days
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.2	Days
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.136	Days
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.161	Days
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.158	Days
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.136	Days
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.161	Days

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.18	Days
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.192	Days
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.125	Days
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.181	Days
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.179	Days
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.17	Days
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.138	Days
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.146	Days
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.218	Days
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.164	Days
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.198	Days
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.185	Days
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.175	Days
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.149	Days
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.122	Days
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.178	Days
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.195	Days
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.219	Days
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.2	Days
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.149	Days
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.161	Days
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.17	Days
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.173	Days
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.159	Days
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.152	Days
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.175	Days
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.227	Days
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.165	Days
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.166	Days
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.174	Days
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.159	Days
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.172	Days
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.178	Days
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.126	Days
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.208	Days
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.155	Days

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.137	Days
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.203	Days
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.201	Days
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.225	Days
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.147	Days
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.151	Days
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.219	Days
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.14	Days
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.155	Days
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.137	Days
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.156	Days
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Intrinsic Rate of Natural Increase	NA	0.145	Days
Control	WB	Control	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	32	Days
Control	WB	Control	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	19.5	Days
Control	WB	Control	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	28	Days
Control	WB	Control	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	28	Days
Control	WB	Control	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	19	Days
Control	WB	Control	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	26	Days
Control	WB	Control	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	35	Days
Control	WB	Control	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	32	Days
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30	Days
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	21	Days
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	28	Days
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	29	Days
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	28	Days
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30.5	Days
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	24	Days
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	19	Days
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	22	Days
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	31	Days
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	24	Days
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	25	Days
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	27	Days
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	21	Days
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	25	Days
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	28	Days

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	26.5	Days
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	19.5	Days
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	23	Days
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	29	Days
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30.5	Days
UHR-SVS-124	5	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	25	Days
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	28	Days
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	24	Days
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	28	Days
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	32.5	Days
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	26	Days
UHR-SVS-127	8	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	27.5	Days
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	31	Days
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	25	Days
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	27	Days
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	32	Days
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	35	Days
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	27	Days
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	28	Days
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	32	Days
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	27	Days
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30	Days
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	26.5	Days
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30	Days
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30	Days
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	32	Days
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	32	Days
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	26.5	Days
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	34	Days
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30	Days
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	33	Days
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30.5	Days
UHR-SVS-19	2	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	22	Days
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	34.5	Days
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	37.5	Days
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	21	Days

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30.5	Days
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	21	Days
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	26	Days
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	29	Days
UHR-SVS-24	3	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	23	Days
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30	Days
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	23.5	Days
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	31	Days
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	23.5	Days
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	25	Days
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	27	Days
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	37	Days
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	31	Days
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	26	Days
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30.5	Days
UHR-SVS-26	9	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	27	Days
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	32	Days
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	26.5	Days
UHR-SVS-26	9	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	23	Days
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	26	Days
UHR-SVS-29/36	12	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	24	Days
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	25	Days
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	25.5	Days
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	33	Days
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30	Days
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	34	Days
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	24	Days
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	29	Days
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	28	Days
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	28	Days
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	27	Days
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	34	Days
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	28	Days
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	20	Days
UHR-SVS-31	10	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	30	Days
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	24	Days

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	19	Days
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	29	Days
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	23	Days
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	36	Days
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	31	Days
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	34	Days
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	34	Days
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Median Emergence Time	Day 20 - 30	26	Days
Control	WB	Control	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
Control	WB	Control	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
Control	WB	Control	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	6	Individuals
Control	WB	Control	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
Control	WB	Control	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
Control	WB	Control	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
Control	WB	Control	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	7	Individuals
Control	WB	Control	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	7	Individuals
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-124	5	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	0	Individuals
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-127	8	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	0	Individuals
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	6	Individuals
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-19	2	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	0	Individuals
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	7	Individuals
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-24	3	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	0	Individuals
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	7	Individuals
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-26	9	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	0	Individuals
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-26	9	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	0	Individuals
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-29/36	12	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	0	Individuals
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	6	Individuals
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-31	10	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	0	Individuals
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	5	Individuals
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	1	Individuals
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	3	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	4	Individuals
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Number of Egg Cases	~ Day 53	2	Individuals
Control	WB	Control	1	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	785	Individuals
Control	WB	Control	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1330	Individuals
Control	WB	Control	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	895	Individuals
Control	WB	Control	5	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	998	Individuals
Control	WB	Control	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	806	Individuals
Control	WB	Control	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	999	Individuals
Control	WB	Control	8	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	982	Individuals
Control	WB	Control	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	731	Individuals
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	862	Individuals
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1290	Individuals
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	830	Individuals
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	968	Individuals
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1040	Individuals
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1030	Individuals
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1450	Individuals
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	769	Individuals
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	872	Individuals
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	898	Individuals
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	785	Individuals
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	881	Individuals
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	682	Individuals
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	847	Individuals
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	709	Individuals
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1110	Individuals
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1010	Individuals
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	950	Individuals
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1110	Individuals
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	428	Individuals
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	861	Individuals
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	902	Individuals
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	995	Individuals
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	780	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	824	Individuals
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1050	Individuals
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	910	Individuals
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	741	Individuals
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1040	Individuals
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	879	Individuals
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	941	Individuals
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	876	Individuals
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	918	Individuals
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	766	Individuals
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1130	Individuals
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	532	Individuals
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1110	Individuals
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1100	Individuals
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	901	Individuals
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	929	Individuals
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1050	Individuals
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1230	Individuals
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	455	Individuals
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	697	Individuals
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1120	Individuals
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1090	Individuals
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	654	Individuals
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	796	Individuals
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1150	Individuals
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	917	Individuals
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1370	Individuals
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	881	Individuals
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	948	Individuals
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	835	Individuals
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	476	Individuals
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1080	Individuals
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	921	Individuals
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1146	Individuals
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1020	Individuals
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	725	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	892	Individuals
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	974	Individuals
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	729	Individuals
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	880	Individuals
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	996	Individuals
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	917	Individuals
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1100	Individuals
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	868	Individuals
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	817	Individuals
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1120	Individuals
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	910	Individuals
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	943	Individuals
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	998	Individuals
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	789	Individuals
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1220	Individuals
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1020	Individuals
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	705	Individuals
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1260	Individuals
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1180	Individuals
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1130	Individuals
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	826	Individuals
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1040	Individuals
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1260	Individuals
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1040	Individuals
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	946	Individuals
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	1210	Individuals
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	910	Individuals
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Number of Eggs per Case	~ Day 53	851	Individuals
Control	WB	Control	1	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	702	Individuals
Control	WB	Control	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1300	Individuals
Control	WB	Control	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	873	Individuals
Control	WB	Control	5	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	955	Individuals
Control	WB	Control	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	744	Individuals
Control	WB	Control	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	942	Individuals
Control	WB	Control	8	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	960	Individuals
Control	WB	Control	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	707	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	844	Individuals
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1250	Individuals
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	811	Individuals
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	940	Individuals
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1020	Individuals
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1010	Individuals
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1420	Individuals
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	0	Individuals
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	859	Individuals
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	864	Individuals
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	721	Individuals
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	839	Individuals
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	633	Individuals
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	820	Individuals
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	668	Individuals
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1100	Individuals
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	950	Individuals
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	923	Individuals
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1040	Individuals
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	0	Individuals
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	810	Individuals
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	873	Individuals
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	976	Individuals
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	707	Individuals
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	775	Individuals
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1030	Individuals
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	897	Individuals
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	722	Individuals
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1020	Individuals
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	861	Individuals
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	905	Individuals
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	861	Individuals
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	804	Individuals
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	739	Individuals
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1090	Individuals
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	513	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1090	Individuals
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1080	Individuals
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	476	Individuals
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	884	Individuals
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1000	Individuals
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1160	Individuals
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	408	Individuals
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	647	Individuals
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	959	Individuals
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1060	Individuals
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	626	Individuals
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	748	Individuals
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	983	Individuals
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	741	Individuals
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1320	Individuals
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	950	Individuals
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	734	Individuals
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	766	Individuals
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	447	Individuals
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	892	Individuals
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	899	Individuals
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1126	Individuals
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	979	Individuals
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	600	Individuals
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	771	Individuals
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	956	Individuals
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	697	Individuals
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	836	Individuals
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	924	Individuals
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	894	Individuals
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	862	Individuals
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	557	Individuals
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	667	Individuals
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1080	Individuals
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	884	Individuals
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	896	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	953	Individuals
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	748	Individuals
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1060	Individuals
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	992	Individuals
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	685	Individuals
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1230	Individuals
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1110	Individuals
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1080	Individuals
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	744	Individuals
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1010	Individuals
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1220	Individuals
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1010	Individuals
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	903	Individuals
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	1200	Individuals
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	891	Individuals
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Number of Larvae per Case	~ Day 53	828	Individuals
Control	WB	Control	1	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	528	Individuals
Control	WB	Control	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1307	Individuals
Control	WB	Control	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	869	Individuals
Control	WB	Control	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	686	Individuals
Control	WB	Control	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	743	Individuals
Control	WB	Control	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	561	Individuals
Control	WB	Control	8	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	837	Individuals
Control	WB	Control	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	550	Individuals
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	281	Individuals
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	415	Individuals
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	407	Individuals
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	939	Individuals
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	341	Individuals
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	718	Individuals
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1420	Individuals
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	0	Individuals
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	571	Individuals
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	720	Individuals
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	712	Individuals
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	559	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	634	Individuals
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	616	Individuals
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	445	Individuals
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	735	Individuals
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	713	Individuals
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	923	Individuals
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1044	Individuals
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	0	Individuals
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	797	Individuals
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	524	Individuals
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	976	Individuals
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	707	Individuals
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	775	Individuals
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	821	Individuals
UHR-SVS-127	8	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	0	Individuals
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	717	Individuals
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	360	Individuals
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1017	Individuals
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	861	Individuals
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	604	Individuals
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	517	Individuals
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	795	Individuals
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	556	Individuals
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1086	Individuals
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	206	Individuals
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	729	Individuals
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	538	Individuals
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	283	Individuals
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	437	Individuals
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1000	Individuals
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	771	Individuals
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	408	Individuals
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	484	Individuals
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	941	Individuals
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1064	Individuals
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	446	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	536	Individuals
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	942	Individuals
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	653	Individuals
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	882	Individuals
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	784	Individuals
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	559	Individuals
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	751	Individuals
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	447	Individuals
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	844	Individuals
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	899	Individuals
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1089	Individuals
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	589	Individuals
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	469	Individuals
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	767	Individuals
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	319	Individuals
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	544	Individuals
UHR-SVS-26	9	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	0	Individuals
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	833	Individuals
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	924	Individuals
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	639	Individuals
UHR-SVS-29/36	12	Test	1	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	0	Individuals
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	773	Individuals
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	421	Individuals
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	528	Individuals
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	539	Individuals
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	529	Individuals
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	599	Individuals
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	815	Individuals
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	753	Individuals
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	783	Individuals
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	990	Individuals
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	458	Individuals
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	924	Individuals
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1113	Individuals
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1079	Individuals
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	372	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	670	Individuals
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1223	Individuals
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	754	Individuals
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	900	Individuals
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	1200	Individuals
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	891	Individuals
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Number of Larvae per Paired Female	~ Day 53	828	Individuals
Control	WB	Control	1	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	75	%
Control	WB	Control	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
Control	WB	Control	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
Control	WB	Control	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	71	%
Control	WB	Control	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
Control	WB	Control	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	60	%
Control	WB	Control	8	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	88	%
Control	WB	Control	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	78	%
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	33	%
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	33	%
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	50	%
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	33	%
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	71	%
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	67	%
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	83	%
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	67	%
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	75	%
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	67	%
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	67	%
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	75	%
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	50	%
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	60	%
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	80	%
UHR-SVS-127	8	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	80	%
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	50	%
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	67	%
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	60	%
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	75	%
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	40	%
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	67	%
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	50	%
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	50	%
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	67	%
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	75	%
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	71	%
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	71	%
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	88	%
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	67	%
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	80	%
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	60	%
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	78	%
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	33	%
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	80	%
UHR-SVS-26	9	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	0	%
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	71	%
UHR-SVS-29/36	12	Test	1	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	0	%
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	75	%
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	83	%
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	50	%
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	60	%
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	67	%
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	86	%
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	75	%
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	67	%
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	75	%
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	50	%
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	67	%
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	75	%
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Paired Females Laying an Egg Case	~ Day 53	100	%
Control	WB	Control	3	*Chironomus dilutus*	Survival	Day 13	100	%
Control	WB	Control	9	*Chironomus dilutus*	Survival	Day 13	91.7	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
Control	WB	Control	10	*Chironomus dilutus*	Survival	Day 13	83.3	%
Control	WB	Control	11	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-04	1	Test	3	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-04	1	Test	9	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-04	1	Test	10	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-04	1	Test	11	*Chironomus dilutus*	Survival	Day 13	75	%
UHR-SVS-112	4	Test	3	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-112	4	Test	9	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-112	4	Test	10	*Chironomus dilutus*	Survival	Day 13	83.3	%
UHR-SVS-112	4	Test	11	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-124	5	Test	3	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-124	5	Test	9	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-124	5	Test	10	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-124	5	Test	11	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-127	8	Test	3	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-127	8	Test	9	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-127	8	Test	10	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-127	8	Test	11	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-13	6	Test	3	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-13	6	Test	9	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-13	6	Test	10	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-13	6	Test	11	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-16/37	11	Test	3	*Chironomus dilutus*	Survival	Day 13	83.3	%
UHR-SVS-16/37	11	Test	9	*Chironomus dilutus*	Survival	Day 13	83.3	%
UHR-SVS-16/37	11	Test	10	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-16/37	11	Test	11	*Chironomus dilutus*	Survival	Day 13	83.3	%
UHR-SVS-19	2	Test	3	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-19	2	Test	9	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-19	2	Test	10	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-19	2	Test	11	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-24	3	Test	3	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-24	3	Test	9	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-24	3	Test	10	*Chironomus dilutus*	Survival	Day 13	83.3	%
UHR-SVS-24	3	Test	11	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-26	9	Test	3	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-26	9	Test	9	*Chironomus dilutus*	Survival	Day 13	100	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-26	9	Test	10	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-26	9	Test	11	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-29/36	12	Test	3	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-29/36	12	Test	9	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-29/36	12	Test	10	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-29/36	12	Test	11	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-31	10	Test	3	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-31	10	Test	9	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-31	10	Test	10	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-31	10	Test	11	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-38	7	Test	3	*Chironomus dilutus*	Survival	Day 13	91.7	%
UHR-SVS-38	7	Test	9	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-38	7	Test	10	*Chironomus dilutus*	Survival	Day 13	100	%
UHR-SVS-38	7	Test	11	*Chironomus dilutus*	Survival	Day 13	100	%
Control	WB	Control	1	*Chironomus dilutus*	Total Fecundity	~ Day 53	2355	Individuals
Control	WB	Control	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	3990	Individuals
Control	WB	Control	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	5370	Individuals
Control	WB	Control	5	*Chironomus dilutus*	Total Fecundity	~ Day 53	4990	Individuals
Control	WB	Control	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	1612	Individuals
Control	WB	Control	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	2997	Individuals
Control	WB	Control	8	*Chironomus dilutus*	Total Fecundity	~ Day 53	6874	Individuals
Control	WB	Control	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	5117	Individuals
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Total Fecundity	~ Day 53	862	Individuals
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	1290	Individuals
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	1660	Individuals
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Total Fecundity	~ Day 53	4840	Individuals
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	1040	Individuals
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	5150	Individuals
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Total Fecundity	~ Day 53	4350	Individuals
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	769	Individuals
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Total Fecundity	~ Day 53	1744	Individuals
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	4490	Individuals
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	1570	Individuals
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Total Fecundity	~ Day 53	1762	Individuals
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	2046	Individuals
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	2541	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Total Fecundity	~ Day 53	1418	Individuals
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	2220	Individuals
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Total Fecundity	~ Day 53	3030	Individuals
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	950	Individuals
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	1110	Individuals
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Total Fecundity	~ Day 53	428	Individuals
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	4305	Individuals
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Total Fecundity	~ Day 53	2706	Individuals
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	2985	Individuals
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Total Fecundity	~ Day 53	780	Individuals
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	2472	Individuals
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	4200	Individuals
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	3640	Individuals
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	2223	Individuals
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Total Fecundity	~ Day 53	4160	Individuals
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	2637	Individuals
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Total Fecundity	~ Day 53	1882	Individuals
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	2628	Individuals
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	3672	Individuals
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Total Fecundity	~ Day 53	4596	Individuals
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	3390	Individuals
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	1064	Individuals
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Total Fecundity	~ Day 53	2220	Individuals
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	2200	Individuals
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Total Fecundity	~ Day 53	2703	Individuals
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	1858	Individuals
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	4200	Individuals
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Total Fecundity	~ Day 53	2460	Individuals
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	455	Individuals
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	2091	Individuals
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Total Fecundity	~ Day 53	5600	Individuals
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	3270	Individuals
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	3270	Individuals
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	3980	Individuals
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Total Fecundity	~ Day 53	4600	Individuals
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	6419	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	2740	Individuals
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Total Fecundity	~ Day 53	2643	Individuals
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	3792	Individuals
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	3340	Individuals
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	476	Individuals
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Total Fecundity	~ Day 53	5400	Individuals
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	3684	Individuals
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	5750	Individuals
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Total Fecundity	~ Day 53	3060	Individuals
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	5075	Individuals
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Total Fecundity	~ Day 53	3568	Individuals
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	974	Individuals
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	2916	Individuals
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	4400	Individuals
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	996	Individuals
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	4585	Individuals
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	4400	Individuals
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	2604	Individuals
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Total Fecundity	~ Day 53	4085	Individuals
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	2240	Individuals
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	2730	Individuals
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Total Fecundity	~ Day 53	1886	Individuals
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	5988	Individuals
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Total Fecundity	~ Day 53	2367	Individuals
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	3660	Individuals
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	3060	Individuals
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Total Fecundity	~ Day 53	1410	Individuals
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	3780	Individuals
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	2360	Individuals
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	5650	Individuals
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Total Fecundity	~ Day 53	826	Individuals
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Total Fecundity	~ Day 53	4160	Individuals
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Total Fecundity	~ Day 53	3780	Individuals
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Total Fecundity	~ Day 53	3120	Individuals
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Total Fecundity	~ Day 53	3784	Individuals
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Total Fecundity	~ Day 53	2420	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Total Fecundity	~ Day 53	3640	Individuals
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Total Fecundity	~ Day 53	1702	Individuals
Control	WB	Control	1	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2106	Individuals
Control	WB	Control	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3900	Individuals
Control	WB	Control	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	5238	Individuals
Control	WB	Control	5	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4775	Individuals
Control	WB	Control	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1488	Individuals
Control	WB	Control	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2826	Individuals
Control	WB	Control	8	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	6720	Individuals
Control	WB	Control	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4949	Individuals
UHR-SVS-04	1	Test	1	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	844	Individuals
UHR-SVS-04	1	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1250	Individuals
UHR-SVS-04	1	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1622	Individuals
UHR-SVS-04	1	Test	5	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4700	Individuals
UHR-SVS-04	1	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1020	Individuals
UHR-SVS-04	1	Test	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	5050	Individuals
UHR-SVS-04	1	Test	8	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4260	Individuals
UHR-SVS-04	1	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	0	Individuals
UHR-SVS-112	4	Test	1	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1718	Individuals
UHR-SVS-112	4	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4320	Individuals
UHR-SVS-112	4	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1442	Individuals
UHR-SVS-112	4	Test	5	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1678	Individuals
UHR-SVS-112	4	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1899	Individuals
UHR-SVS-112	4	Test	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2460	Individuals
UHR-SVS-112	4	Test	8	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1336	Individuals
UHR-SVS-112	4	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2200	Individuals
UHR-SVS-124	5	Test	1	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2850	Individuals
UHR-SVS-124	5	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	923	Individuals
UHR-SVS-124	5	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1040	Individuals
UHR-SVS-124	5	Test	5	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	0	Individuals
UHR-SVS-124	5	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4050	Individuals
UHR-SVS-124	5	Test	8	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2619	Individuals
UHR-SVS-124	5	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2928	Individuals
UHR-SVS-127	8	Test	1	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	707	Individuals
UHR-SVS-127	8	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2325	Individuals
UHR-SVS-127	8	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4120	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-127	8	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3588	Individuals
UHR-SVS-127	8	Test	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2166	Individuals
UHR-SVS-127	8	Test	8	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4080	Individuals
UHR-SVS-127	8	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2583	Individuals
UHR-SVS-13	6	Test	1	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1810	Individuals
UHR-SVS-13	6	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2583	Individuals
UHR-SVS-13	6	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3216	Individuals
UHR-SVS-13	6	Test	5	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4434	Individuals
UHR-SVS-13	6	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3270	Individuals
UHR-SVS-13	6	Test	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1026	Individuals
UHR-SVS-13	6	Test	8	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2180	Individuals
UHR-SVS-13	6	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2160	Individuals
UHR-SVS-16/37	11	Test	1	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1428	Individuals
UHR-SVS-16/37	11	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1768	Individuals
UHR-SVS-16/37	11	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4000	Individuals
UHR-SVS-16/37	11	Test	5	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2320	Individuals
UHR-SVS-16/37	11	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	408	Individuals
UHR-SVS-16/37	11	Test	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1941	Individuals
UHR-SVS-16/37	11	Test	8	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4795	Individuals
UHR-SVS-16/37	11	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3180	Individuals
UHR-SVS-19	2	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3130	Individuals
UHR-SVS-19	2	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3740	Individuals
UHR-SVS-19	2	Test	5	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3932	Individuals
UHR-SVS-19	2	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	5187	Individuals
UHR-SVS-19	2	Test	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2640	Individuals
UHR-SVS-19	2	Test	8	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2850	Individuals
UHR-SVS-19	2	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2936	Individuals
UHR-SVS-24	3	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3064	Individuals
UHR-SVS-24	3	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	447	Individuals
UHR-SVS-24	3	Test	5	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4460	Individuals
UHR-SVS-24	3	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3596	Individuals
UHR-SVS-24	3	Test	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	5630	Individuals
UHR-SVS-24	3	Test	8	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2937	Individuals
UHR-SVS-24	3	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4200	Individuals
UHR-SVS-26	9	Test	1	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3084	Individuals
UHR-SVS-26	9	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	956	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-26	9	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2788	Individuals
UHR-SVS-26	9	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4180	Individuals
UHR-SVS-26	9	Test	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	924	Individuals
UHR-SVS-26	9	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4470	Individuals
UHR-SVS-29/36	12	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3448	Individuals
UHR-SVS-29/36	12	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1671	Individuals
UHR-SVS-29/36	12	Test	5	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3335	Individuals
UHR-SVS-29/36	12	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2160	Individuals
UHR-SVS-29/36	12	Test	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2652	Individuals
UHR-SVS-29/36	12	Test	8	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1792	Individuals
UHR-SVS-29/36	12	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	5718	Individuals
UHR-SVS-31	10	Test	1	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2244	Individuals
UHR-SVS-31	10	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3180	Individuals
UHR-SVS-31	10	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2976	Individuals
UHR-SVS-31	10	Test	5	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1370	Individuals
UHR-SVS-31	10	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3690	Individuals
UHR-SVS-31	10	Test	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2220	Individuals
UHR-SVS-31	10	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	5400	Individuals
UHR-SVS-38	7	Test	1	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	744	Individuals
UHR-SVS-38	7	Test	2	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	4040	Individuals
UHR-SVS-38	7	Test	4	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3660	Individuals
UHR-SVS-38	7	Test	5	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3030	Individuals
UHR-SVS-38	7	Test	6	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3612	Individuals
UHR-SVS-38	7	Test	7	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	2400	Individuals
UHR-SVS-38	7	Test	8	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	3564	Individuals
UHR-SVS-38	7	Test	12	*Chironomus dilutus*	Total Number of Larvae Produced	~ Day 53	1656	Individuals
Control	WB	Control	3	*Chironomus dilutus*	Weight	Day 13	1.32	mg
Control	WB	Control	9	*Chironomus dilutus*	Weight	Day 13	1.22	mg
Control	WB	Control	10	*Chironomus dilutus*	Weight	Day 13	1.24	mg
Control	WB	Control	11	*Chironomus dilutus*	Weight	Day 13	1.49	mg
UHR-SVS-04	1	Test	3	*Chironomus dilutus*	Weight	Day 13	1.18	mg
UHR-SVS-04	1	Test	9	*Chironomus dilutus*	Weight	Day 13	1.5	mg
UHR-SVS-04	1	Test	10	*Chironomus dilutus*	Weight	Day 13	1.41	mg
UHR-SVS-04	1	Test	11	*Chironomus dilutus*	Weight	Day 13	1.71	mg
UHR-SVS-112	4	Test	3	*Chironomus dilutus*	Weight	Day 13	1.4	mg
UHR-SVS-112	4	Test	9	*Chironomus dilutus*	Weight	Day 13	1.39	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-112	4	Test	10	*Chironomus dilutus*	Weight	Day 13	1.36	mg
UHR-SVS-112	4	Test	11	*Chironomus dilutus*	Weight	Day 13	1.38	mg
UHR-SVS-124	5	Test	3	*Chironomus dilutus*	Weight	Day 13	1.22	mg
UHR-SVS-124	5	Test	9	*Chironomus dilutus*	Weight	Day 13	1.46	mg
UHR-SVS-124	5	Test	10	*Chironomus dilutus*	Weight	Day 13	1.57	mg
UHR-SVS-124	5	Test	11	*Chironomus dilutus*	Weight	Day 13	1.41	mg
UHR-SVS-127	8	Test	3	*Chironomus dilutus*	Weight	Day 13	1.33	mg
UHR-SVS-127	8	Test	9	*Chironomus dilutus*	Weight	Day 13	1.22	mg
UHR-SVS-127	8	Test	10	*Chironomus dilutus*	Weight	Day 13	1.21	mg
UHR-SVS-127	8	Test	11	*Chironomus dilutus*	Weight	Day 13	1.36	mg
UHR-SVS-13	6	Test	3	*Chironomus dilutus*	Weight	Day 13	1.14	mg
UHR-SVS-13	6	Test	9	*Chironomus dilutus*	Weight	Day 13	1.38	mg
UHR-SVS-13	6	Test	10	*Chironomus dilutus*	Weight	Day 13	1.4	mg
UHR-SVS-13	6	Test	11	*Chironomus dilutus*	Weight	Day 13	1.5	mg
UHR-SVS-16/37	11	Test	3	*Chironomus dilutus*	Weight	Day 13	1.12	mg
UHR-SVS-16/37	11	Test	9	*Chironomus dilutus*	Weight	Day 13	1.01	mg
UHR-SVS-16/37	11	Test	10	*Chironomus dilutus*	Weight	Day 13	1.11	mg
UHR-SVS-16/37	11	Test	11	*Chironomus dilutus*	Weight	Day 13	0.687	mg
UHR-SVS-19	2	Test	3	*Chironomus dilutus*	Weight	Day 13	1.6	mg
UHR-SVS-19	2	Test	9	*Chironomus dilutus*	Weight	Day 13	1.33	mg
UHR-SVS-19	2	Test	10	*Chironomus dilutus*	Weight	Day 13	1.87	mg
UHR-SVS-19	2	Test	11	*Chironomus dilutus*	Weight	Day 13	1.14	mg
UHR-SVS-24	3	Test	3	*Chironomus dilutus*	Weight	Day 13	1.3	mg
UHR-SVS-24	3	Test	9	*Chironomus dilutus*	Weight	Day 13	1.65	mg
UHR-SVS-24	3	Test	10	*Chironomus dilutus*	Weight	Day 13	2.21	mg
UHR-SVS-24	3	Test	11	*Chironomus dilutus*	Weight	Day 13	1.47	mg
UHR-SVS-26	9	Test	3	*Chironomus dilutus*	Weight	Day 13	1.24	mg
UHR-SVS-26	9	Test	9	*Chironomus dilutus*	Weight	Day 13	1.5	mg
UHR-SVS-26	9	Test	10	*Chironomus dilutus*	Weight	Day 13	1.43	mg
UHR-SVS-26	9	Test	11	*Chironomus dilutus*	Weight	Day 13	1.34	mg
UHR-SVS-29/36	12	Test	3	*Chironomus dilutus*	Weight	Day 13	1.36	mg
UHR-SVS-29/36	12	Test	9	*Chironomus dilutus*	Weight	Day 13	1.51	mg
UHR-SVS-29/36	12	Test	10	*Chironomus dilutus*	Weight	Day 13	1.53	mg
UHR-SVS-29/36	12	Test	11	*Chironomus dilutus*	Weight	Day 13	1.56	mg
UHR-SVS-31	10	Test	3	*Chironomus dilutus*	Weight	Day 13	1.5	mg
UHR-SVS-31	10	Test	9	*Chironomus dilutus*	Weight	Day 13	1.36	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-31	10	Test	10	*Chironomus dilutus*	Weight	Day 13	1.67	mg
UHR-SVS-31	10	Test	11	*Chironomus dilutus*	Weight	Day 13	1.34	mg
UHR-SVS-38	7	Test	3	*Chironomus dilutus*	Weight	Day 13	1.42	mg
UHR-SVS-38	7	Test	9	*Chironomus dilutus*	Weight	Day 13	1.41	mg
UHR-SVS-38	7	Test	10	*Chironomus dilutus*	Weight	Day 13	1.39	mg
UHR-SVS-38	7	Test	11	*Chironomus dilutus*	Weight	Day 13	1.61	mg
Control	WB	Control	2	*Hyalella azteca*	Biomass	Day 28	4.05	mg
Control	WB	Control	4	*Hyalella azteca*	Biomass	Day 28	4.44	mg
Control	WB	Control	7	*Hyalella azteca*	Biomass	Day 28	6.11	mg
Control	WB	Control	10	*Hyalella azteca*	Biomass	Day 28	5.13	mg
UHR-SVS-04	1	Test	2	*Hyalella azteca*	Biomass	Day 28	4.74	mg
UHR-SVS-04	1	Test	4	*Hyalella azteca*	Biomass	Day 28	4.65	mg
UHR-SVS-04	1	Test	7	*Hyalella azteca*	Biomass	Day 28	5.61	mg
UHR-SVS-04	1	Test	10	*Hyalella azteca*	Biomass	Day 28	5.04	mg
UHR-SVS-112	4	Test	2	*Hyalella azteca*	Biomass	Day 28	4.68	mg
UHR-SVS-112	4	Test	4	*Hyalella azteca*	Biomass	Day 28	4.45	mg
UHR-SVS-112	4	Test	7	*Hyalella azteca*	Biomass	Day 28	5.5	mg
UHR-SVS-112	4	Test	10	*Hyalella azteca*	Biomass	Day 28	6.47	mg
UHR-SVS-124	5	Test	2	*Hyalella azteca*	Biomass	Day 28	5.96	mg
UHR-SVS-124	5	Test	4	*Hyalella azteca*	Biomass	Day 28	5.13	mg
UHR-SVS-124	5	Test	10	*Hyalella azteca*	Biomass	Day 28	4.17	mg
UHR-SVS-127	8	Test	2	*Hyalella azteca*	Biomass	Day 28	5.35	mg
UHR-SVS-127	8	Test	4	*Hyalella azteca*	Biomass	Day 28	4.44	mg
UHR-SVS-127	8	Test	7	*Hyalella azteca*	Biomass	Day 28	4.96	mg
UHR-SVS-127	8	Test	10	*Hyalella azteca*	Biomass	Day 28	5.22	mg
UHR-SVS-13	6	Test	2	*Hyalella azteca*	Biomass	Day 28	4.22	mg
UHR-SVS-13	6	Test	4	*Hyalella azteca*	Biomass	Day 28	3.64	mg
UHR-SVS-13	6	Test	7	*Hyalella azteca*	Biomass	Day 28	4.6	mg
UHR-SVS-13	6	Test	10	*Hyalella azteca*	Biomass	Day 28	4.49	mg
UHR-SVS-16/37	11	Test	2	*Hyalella azteca*	Biomass	Day 28	2.86	mg
UHR-SVS-16/37	11	Test	4	*Hyalella azteca*	Biomass	Day 28	3.79	mg
UHR-SVS-16/37	11	Test	7	*Hyalella azteca*	Biomass	Day 28	3.14	mg
UHR-SVS-16/37	11	Test	10	*Hyalella azteca*	Biomass	Day 28	3.13	mg
UHR-SVS-19	2	Test	2	*Hyalella azteca*	Biomass	Day 28	3.56	mg
UHR-SVS-19	2	Test	4	*Hyalella azteca*	Biomass	Day 28	6.4	mg
UHR-SVS-19	2	Test	7	*Hyalella azteca*	Biomass	Day 28	4.26	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-19	2	Test	10	*Hyalella azteca*	Biomass	Day 28	5.17	mg
UHR-SVS-24	3	Test	2	*Hyalella azteca*	Biomass	Day 28	3.88	mg
UHR-SVS-24	3	Test	4	*Hyalella azteca*	Biomass	Day 28	3.56	mg
UHR-SVS-24	3	Test	7	*Hyalella azteca*	Biomass	Day 28	5.09	mg
UHR-SVS-24	3	Test	10	*Hyalella azteca*	Biomass	Day 28	4.13	mg
UHR-SVS-26	9	Test	2	*Hyalella azteca*	Biomass	Day 28	5.45	mg
UHR-SVS-26	9	Test	4	*Hyalella azteca*	Biomass	Day 28	4.41	mg
UHR-SVS-26	9	Test	7	*Hyalella azteca*	Biomass	Day 28	4.99	mg
UHR-SVS-26	9	Test	10	*Hyalella azteca*	Biomass	Day 28	4.37	mg
UHR-SVS-29/36	12	Test	2	*Hyalella azteca*	Biomass	Day 28	4.9	mg
UHR-SVS-29/36	12	Test	4	*Hyalella azteca*	Biomass	Day 28	4.14	mg
UHR-SVS-29/36	12	Test	7	*Hyalella azteca*	Biomass	Day 28	3.65	mg
UHR-SVS-29/36	12	Test	10	*Hyalella azteca*	Biomass	Day 28	3.65	mg
UHR-SVS-31	10	Test	2	*Hyalella azteca*	Biomass	Day 28	4.92	mg
UHR-SVS-31	10	Test	4	*Hyalella azteca*	Biomass	Day 28	4.71	mg
UHR-SVS-31	10	Test	7	*Hyalella azteca*	Biomass	Day 28	4.53	mg
UHR-SVS-31	10	Test	10	*Hyalella azteca*	Biomass	Day 28	5.64	mg
UHR-SVS-38	7	Test	2	*Hyalella azteca*	Biomass	Day 28	4.3	mg
UHR-SVS-38	7	Test	4	*Hyalella azteca*	Biomass	Day 28	5	mg
UHR-SVS-38	7	Test	7	*Hyalella azteca*	Biomass	Day 28	6.37	mg
UHR-SVS-38	7	Test	10	*Hyalella azteca*	Biomass	Day 28	5.17	mg
Control	WB	Control	1	*Hyalella azteca*	Biomass	Day 42	4.75	mg
Control	WB	Control	3	*Hyalella azteca*	Biomass	Day 42	2.87	mg
Control	WB	Control	5	*Hyalella azteca*	Biomass	Day 42	4.58	mg
Control	WB	Control	6	*Hyalella azteca*	Biomass	Day 42	5.44	mg
Control	WB	Control	8	*Hyalella azteca*	Biomass	Day 42	5.11	mg
Control	WB	Control	9	*Hyalella azteca*	Biomass	Day 42	5	mg
Control	WB	Control	11	*Hyalella azteca*	Biomass	Day 42	3.72	mg
Control	WB	Control	12	*Hyalella azteca*	Biomass	Day 42	5.21	mg
UHR-SVS-04	1	Test	1	*Hyalella azteca*	Biomass	Day 42	4.22	mg
UHR-SVS-04	1	Test	3	*Hyalella azteca*	Biomass	Day 42	5.19	mg
UHR-SVS-04	1	Test	5	*Hyalella azteca*	Biomass	Day 42	5.83	mg
UHR-SVS-04	1	Test	6	*Hyalella azteca*	Biomass	Day 42	5.43	mg
UHR-SVS-04	1	Test	8	*Hyalella azteca*	Biomass	Day 42	6.11	mg
UHR-SVS-04	1	Test	9	*Hyalella azteca*	Biomass	Day 42	4.96	mg
UHR-SVS-04	1	Test	11	*Hyalella azteca*	Biomass	Day 42	6	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-04	1	Test	12	*Hyalella azteca*	Biomass	Day 42	5.87	mg
UHR-SVS-112	4	Test	1	*Hyalella azteca*	Biomass	Day 42	5.93	mg
UHR-SVS-112	4	Test	3	*Hyalella azteca*	Biomass	Day 42	5.03	mg
UHR-SVS-112	4	Test	5	*Hyalella azteca*	Biomass	Day 42	6.12	mg
UHR-SVS-112	4	Test	6	*Hyalella azteca*	Biomass	Day 42	6.39	mg
UHR-SVS-112	4	Test	8	*Hyalella azteca*	Biomass	Day 42	5.75	mg
UHR-SVS-112	4	Test	9	*Hyalella azteca*	Biomass	Day 42	4.46	mg
UHR-SVS-112	4	Test	11	*Hyalella azteca*	Biomass	Day 42	4.16	mg
UHR-SVS-112	4	Test	12	*Hyalella azteca*	Biomass	Day 42	5.41	mg
UHR-SVS-124	5	Test	1	*Hyalella azteca*	Biomass	Day 42	4.5	mg
UHR-SVS-124	5	Test	3	*Hyalella azteca*	Biomass	Day 42	3.69	mg
UHR-SVS-124	5	Test	5	*Hyalella azteca*	Biomass	Day 42	4.69	mg
UHR-SVS-124	5	Test	6	*Hyalella azteca*	Biomass	Day 42	5.47	mg
UHR-SVS-124	5	Test	8	*Hyalella azteca*	Biomass	Day 42	4.51	mg
UHR-SVS-124	5	Test	9	*Hyalella azteca*	Biomass	Day 42	4.08	mg
UHR-SVS-124	5	Test	11	*Hyalella azteca*	Biomass	Day 42	4.27	mg
UHR-SVS-124	5	Test	12	*Hyalella azteca*	Biomass	Day 42	5.27	mg
UHR-SVS-127	8	Test	1	*Hyalella azteca*	Biomass	Day 42	4.75	mg
UHR-SVS-127	8	Test	3	*Hyalella azteca*	Biomass	Day 42	4.94	mg
UHR-SVS-127	8	Test	5	*Hyalella azteca*	Biomass	Day 42	5.43	mg
UHR-SVS-127	8	Test	6	*Hyalella azteca*	Biomass	Day 42	5.17	mg
UHR-SVS-127	8	Test	8	*Hyalella azteca*	Biomass	Day 42	4.27	mg
UHR-SVS-127	8	Test	9	*Hyalella azteca*	Biomass	Day 42	4.41	mg
UHR-SVS-127	8	Test	11	*Hyalella azteca*	Biomass	Day 42	6.71	mg
UHR-SVS-127	8	Test	12	*Hyalella azteca*	Biomass	Day 42	5.22	mg
UHR-SVS-13	6	Test	1	*Hyalella azteca*	Biomass	Day 42	5.05	mg
UHR-SVS-13	6	Test	3	*Hyalella azteca*	Biomass	Day 42	4.31	mg
UHR-SVS-13	6	Test	5	*Hyalella azteca*	Biomass	Day 42	4.38	mg
UHR-SVS-13	6	Test	6	*Hyalella azteca*	Biomass	Day 42	5.5	mg
UHR-SVS-13	6	Test	8	*Hyalella azteca*	Biomass	Day 42	4.79	mg
UHR-SVS-13	6	Test	9	*Hyalella azteca*	Biomass	Day 42	4.72	mg
UHR-SVS-13	6	Test	11	*Hyalella azteca*	Biomass	Day 42	4.67	mg
UHR-SVS-13	6	Test	12	*Hyalella azteca*	Biomass	Day 42	4.43	mg
UHR-SVS-16/37	11	Test	1	*Hyalella azteca*	Biomass	Day 42	4.22	mg
UHR-SVS-16/37	11	Test	3	*Hyalella azteca*	Biomass	Day 42	4.22	mg
UHR-SVS-16/37	11	Test	5	*Hyalella azteca*	Biomass	Day 42	2.01	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-16/37	11	Test	6	*Hyalella azteca*	Biomass	Day 42	2.68	mg
UHR-SVS-16/37	11	Test	8	*Hyalella azteca*	Biomass	Day 42	4.42	mg
UHR-SVS-16/37	11	Test	9	*Hyalella azteca*	Biomass	Day 42	4.28	mg
UHR-SVS-16/37	11	Test	11	*Hyalella azteca*	Biomass	Day 42	2.77	mg
UHR-SVS-16/37	11	Test	12	*Hyalella azteca*	Biomass	Day 42	5.09	mg
UHR-SVS-19	2	Test	1	*Hyalella azteca*	Biomass	Day 42	3.86	mg
UHR-SVS-19	2	Test	3	*Hyalella azteca*	Biomass	Day 42	4.45	mg
UHR-SVS-19	2	Test	5	*Hyalella azteca*	Biomass	Day 42	5.42	mg
UHR-SVS-19	2	Test	6	*Hyalella azteca*	Biomass	Day 42	5.45	mg
UHR-SVS-19	2	Test	8	*Hyalella azteca*	Biomass	Day 42	5.46	mg
UHR-SVS-19	2	Test	9	*Hyalella azteca*	Biomass	Day 42	4.88	mg
UHR-SVS-19	2	Test	11	*Hyalella azteca*	Biomass	Day 42	4.45	mg
UHR-SVS-19	2	Test	12	*Hyalella azteca*	Biomass	Day 42	3.63	mg
UHR-SVS-24	3	Test	1	*Hyalella azteca*	Biomass	Day 42	0.95	mg
UHR-SVS-24	3	Test	3	*Hyalella azteca*	Biomass	Day 42	2.06	mg
UHR-SVS-24	3	Test	5	*Hyalella azteca*	Biomass	Day 42	2.26	mg
UHR-SVS-24	3	Test	6	*Hyalella azteca*	Biomass	Day 42	1.25	mg
UHR-SVS-24	3	Test	8	*Hyalella azteca*	Biomass	Day 42	3.25	mg
UHR-SVS-24	3	Test	9	*Hyalella azteca*	Biomass	Day 42	4.3	mg
UHR-SVS-24	3	Test	11	*Hyalella azteca*	Biomass	Day 42	0.53	mg
UHR-SVS-24	3	Test	12	*Hyalella azteca*	Biomass	Day 42	2.05	mg
UHR-SVS-26	9	Test	1	*Hyalella azteca*	Biomass	Day 42	4.45	mg
UHR-SVS-26	9	Test	3	*Hyalella azteca*	Biomass	Day 42	4.24	mg
UHR-SVS-26	9	Test	5	*Hyalella azteca*	Biomass	Day 42	5.71	mg
UHR-SVS-26	9	Test	6	*Hyalella azteca*	Biomass	Day 42	4.85	mg
UHR-SVS-26	9	Test	8	*Hyalella azteca*	Biomass	Day 42	4.97	mg
UHR-SVS-26	9	Test	9	*Hyalella azteca*	Biomass	Day 42	5.16	mg
UHR-SVS-26	9	Test	11	*Hyalella azteca*	Biomass	Day 42	4.15	mg
UHR-SVS-26	9	Test	12	*Hyalella azteca*	Biomass	Day 42	3.79	mg
UHR-SVS-29/36	12	Test	1	*Hyalella azteca*	Biomass	Day 42	5.62	mg
UHR-SVS-29/36	12	Test	3	*Hyalella azteca*	Biomass	Day 42	4.95	mg
UHR-SVS-29/36	12	Test	5	*Hyalella azteca*	Biomass	Day 42	4.34	mg
UHR-SVS-29/36	12	Test	6	*Hyalella azteca*	Biomass	Day 42	5.01	mg
UHR-SVS-29/36	12	Test	8	*Hyalella azteca*	Biomass	Day 42	4.99	mg
UHR-SVS-29/36	12	Test	9	*Hyalella azteca*	Biomass	Day 42	4.19	mg
UHR-SVS-29/36	12	Test	11	*Hyalella azteca*	Biomass	Day 42	3.4	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-29/36	12	Test	12	*Hyalella azteca*	Biomass	Day 42	3.56	mg
UHR-SVS-31	10	Test	1	*Hyalella azteca*	Biomass	Day 42	3.64	mg
UHR-SVS-31	10	Test	3	*Hyalella azteca*	Biomass	Day 42	5.07	mg
UHR-SVS-31	10	Test	5	*Hyalella azteca*	Biomass	Day 42	1.29	mg
UHR-SVS-31	10	Test	6	*Hyalella azteca*	Biomass	Day 42	1.07	mg
UHR-SVS-31	10	Test	8	*Hyalella azteca*	Biomass	Day 42	2.89	mg
UHR-SVS-31	10	Test	9	*Hyalella azteca*	Biomass	Day 42	5.64	mg
UHR-SVS-31	10	Test	11	*Hyalella azteca*	Biomass	Day 42	3.29	mg
UHR-SVS-31	10	Test	12	*Hyalella azteca*	Biomass	Day 42	4.72	mg
UHR-SVS-38	7	Test	1	*Hyalella azteca*	Biomass	Day 42	4.79	mg
UHR-SVS-38	7	Test	3	*Hyalella azteca*	Biomass	Day 42	4.76	mg
UHR-SVS-38	7	Test	5	*Hyalella azteca*	Biomass	Day 42	4.47	mg
UHR-SVS-38	7	Test	6	*Hyalella azteca*	Biomass	Day 42	4.29	mg
UHR-SVS-38	7	Test	8	*Hyalella azteca*	Biomass	Day 42	4.99	mg
UHR-SVS-38	7	Test	9	*Hyalella azteca*	Biomass	Day 42	4.84	mg
UHR-SVS-38	7	Test	11	*Hyalella azteca*	Biomass	Day 42	5.53	mg
UHR-SVS-38	7	Test	12	*Hyalella azteca*	Biomass	Day 42	6.54	mg
Control	WB	Control	2	*Hyalella azteca*	Length	Day 28	4.3	mm
Control	WB	Control	4	*Hyalella azteca*	Length	Day 28	4.6	mm
Control	WB	Control	7	*Hyalella azteca*	Length	Day 28	4.93	mm
Control	WB	Control	10	*Hyalella azteca*	Length	Day 28	4.67	mm
UHR-SVS-04	1	Test	2	*Hyalella azteca*	Length	Day 28	4.53	mm
UHR-SVS-04	1	Test	4	*Hyalella azteca*	Length	Day 28	4.52	mm
UHR-SVS-04	1	Test	7	*Hyalella azteca*	Length	Day 28	4.81	mm
UHR-SVS-04	1	Test	10	*Hyalella azteca*	Length	Day 28	4.64	mm
UHR-SVS-112	4	Test	2	*Hyalella azteca*	Length	Day 28	4.54	mm
UHR-SVS-112	4	Test	4	*Hyalella azteca*	Length	Day 28	4.46	mm
UHR-SVS-112	4	Test	7	*Hyalella azteca*	Length	Day 28	4.78	mm
UHR-SVS-112	4	Test	10	*Hyalella azteca*	Length	Day 28	5.02	mm
UHR-SVS-124	5	Test	2	*Hyalella azteca*	Length	Day 28	5.05	mm
UHR-SVS-124	5	Test	4	*Hyalella azteca*	Length	Day 28	4.68	mm
UHR-SVS-124	5	Test	10	*Hyalella azteca*	Length	Day 28	4.5	mm
UHR-SVS-127	8	Test	2	*Hyalella azteca*	Length	Day 28	4.72	mm
UHR-SVS-127	8	Test	4	*Hyalella azteca*	Length	Day 28	4.44	mm
UHR-SVS-127	8	Test	7	*Hyalella azteca*	Length	Day 28	4.62	mm
UHR-SVS-127	8	Test	10	*Hyalella azteca*	Length	Day 28	4.7	mm

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-13	6	Test	2	*Hyalella azteca*	Length	Day 28	4.32	mm
UHR-SVS-13	6	Test	4	*Hyalella azteca*	Length	Day 28	4.36	mm
UHR-SVS-13	6	Test	7	*Hyalella azteca*	Length	Day 28	4.51	mm
UHR-SVS-13	6	Test	10	*Hyalella azteca*	Length	Day 28	4.47	mm
UHR-SVS-16/37	11	Test	2	*Hyalella azteca*	Length	Day 28	4.33	mm
UHR-SVS-16/37	11	Test	4	*Hyalella azteca*	Length	Day 28	4.24	mm
UHR-SVS-16/37	11	Test	7	*Hyalella azteca*	Length	Day 28	4.1	mm
UHR-SVS-16/37	11	Test	10	*Hyalella azteca*	Length	Day 28	4.12	mm
UHR-SVS-19	2	Test	2	*Hyalella azteca*	Length	Day 28	4.14	mm
UHR-SVS-19	2	Test	4	*Hyalella azteca*	Length	Day 28	4.39	mm
UHR-SVS-19	2	Test	7	*Hyalella azteca*	Length	Day 28	5.01	mm
UHR-SVS-19	2	Test	10	*Hyalella azteca*	Length	Day 28	4.66	mm
UHR-SVS-24	3	Test	2	*Hyalella azteca*	Length	Day 28	4.4	mm
UHR-SVS-24	3	Test	4	*Hyalella azteca*	Length	Day 28	4.3	mm
UHR-SVS-24	3	Test	7	*Hyalella azteca*	Length	Day 28	4.65	mm
UHR-SVS-24	3	Test	10	*Hyalella azteca*	Length	Day 28	4.35	mm
UHR-SVS-26	9	Test	2	*Hyalella azteca*	Length	Day 28	4.73	mm
UHR-SVS-26	9	Test	4	*Hyalella azteca*	Length	Day 28	4.45	mm
UHR-SVS-26	9	Test	7	*Hyalella azteca*	Length	Day 28	4.63	mm
UHR-SVS-26	9	Test	10	*Hyalella azteca*	Length	Day 28	4.43	mm
UHR-SVS-29/36	12	Test	2	*Hyalella azteca*	Length	Day 28	4.6	mm
UHR-SVS-29/36	12	Test	4	*Hyalella azteca*	Length	Day 28	4.5	mm
UHR-SVS-29/36	12	Test	7	*Hyalella azteca*	Length	Day 28	4.34	mm
UHR-SVS-29/36	12	Test	10	*Hyalella azteca*	Length	Day 28	4.32	mm
UHR-SVS-31	10	Test	2	*Hyalella azteca*	Length	Day 28	4.59	mm
UHR-SVS-31	10	Test	4	*Hyalella azteca*	Length	Day 28	4.53	mm
UHR-SVS-31	10	Test	7	*Hyalella azteca*	Length	Day 28	4.47	mm
UHR-SVS-31	10	Test	10	*Hyalella azteca*	Length	Day 28	4.79	mm
UHR-SVS-38	7	Test	2	*Hyalella azteca*	Length	Day 28	4.56	mm
UHR-SVS-38	7	Test	4	*Hyalella azteca*	Length	Day 28	4.63	mm
UHR-SVS-38	7	Test	7	*Hyalella azteca*	Length	Day 28	5.17	mm
UHR-SVS-38	7	Test	10	*Hyalella azteca*	Length	Day 28	4.68	mm
Control	WB	Control	1	*Hyalella azteca*	Length	Day 42	4.69	mm
Control	WB	Control	3	*Hyalella azteca*	Length	Day 42	4.57	mm
Control	WB	Control	5	*Hyalella azteca*	Length	Day 42	4.64	mm
Control	WB	Control	6	*Hyalella azteca*	Length	Day 42	4.82	mm

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
Control	WB	Control	8	*Hyalella azteca*	Length	Day 42	4.76	mm
Control	WB	Control	9	*Hyalella azteca*	Length	Day 42	4.79	mm
Control	WB	Control	11	*Hyalella azteca*	Length	Day 42	4.53	mm
Control	WB	Control	12	*Hyalella azteca*	Length	Day 42	4.69	mm
UHR-SVS-04	1	Test	1	*Hyalella azteca*	Length	Day 42	4.39	mm
UHR-SVS-04	1	Test	3	*Hyalella azteca*	Length	Day 42	4.69	mm
UHR-SVS-04	1	Test	5	*Hyalella azteca*	Length	Day 42	4.87	mm
UHR-SVS-04	1	Test	6	*Hyalella azteca*	Length	Day 42	4.93	mm
UHR-SVS-04	1	Test	8	*Hyalella azteca*	Length	Day 42	4.95	mm
UHR-SVS-04	1	Test	9	*Hyalella azteca*	Length	Day 42	4.79	mm
UHR-SVS-04	1	Test	11	*Hyalella azteca*	Length	Day 42	4.91	mm
UHR-SVS-04	1	Test	12	*Hyalella azteca*	Length	Day 42	4.85	mm
UHR-SVS-112	4	Test	1	*Hyalella azteca*	Length	Day 42	4.88	mm
UHR-SVS-112	4	Test	3	*Hyalella azteca*	Length	Day 42	4.96	mm
UHR-SVS-112	4	Test	5	*Hyalella azteca*	Length	Day 42	5.08	mm
UHR-SVS-112	4	Test	6	*Hyalella azteca*	Length	Day 42	5.17	mm
UHR-SVS-112	4	Test	8	*Hyalella azteca*	Length	Day 42	4.85	mm
UHR-SVS-112	4	Test	9	*Hyalella azteca*	Length	Day 42	5.01	mm
UHR-SVS-112	4	Test	11	*Hyalella azteca*	Length	Day 42	4.68	mm
UHR-SVS-112	4	Test	12	*Hyalella azteca*	Length	Day 42	4.91	mm
UHR-SVS-124	5	Test	1	*Hyalella azteca*	Length	Day 42	4.82	mm
UHR-SVS-124	5	Test	3	*Hyalella azteca*	Length	Day 42	4.7	mm
UHR-SVS-124	5	Test	5	*Hyalella azteca*	Length	Day 42	4.88	mm
UHR-SVS-124	5	Test	6	*Hyalella azteca*	Length	Day 42	4.77	mm
UHR-SVS-124	5	Test	8	*Hyalella azteca*	Length	Day 42	4.81	mm
UHR-SVS-124	5	Test	9	*Hyalella azteca*	Length	Day 42	4.35	mm
UHR-SVS-124	5	Test	11	*Hyalella azteca*	Length	Day 42	4.72	mm
UHR-SVS-124	5	Test	12	*Hyalella azteca*	Length	Day 42	4.88	mm
UHR-SVS-127	8	Test	1	*Hyalella azteca*	Length	Day 42	4.56	mm
UHR-SVS-127	8	Test	3	*Hyalella azteca*	Length	Day 42	4.6	mm
UHR-SVS-127	8	Test	5	*Hyalella azteca*	Length	Day 42	4.93	mm
UHR-SVS-127	8	Test	6	*Hyalella azteca*	Length	Day 42	5.03	mm
UHR-SVS-127	8	Test	8	*Hyalella azteca*	Length	Day 42	4.55	mm
UHR-SVS-127	8	Test	9	*Hyalella azteca*	Length	Day 42	4.6	mm
UHR-SVS-127	8	Test	11	*Hyalella azteca*	Length	Day 42	5.27	mm
UHR-SVS-127	8	Test	12	*Hyalella azteca*	Length	Day 42	5.06	mm

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-13	6	Test	1	*Hyalella azteca*	Length	Day 42	4.79	mm
UHR-SVS-13	6	Test	3	*Hyalella azteca*	Length	Day 42	4.57	mm
UHR-SVS-13	6	Test	5	*Hyalella azteca*	Length	Day 42	4.44	mm
UHR-SVS-13	6	Test	6	*Hyalella azteca*	Length	Day 42	4.96	mm
UHR-SVS-13	6	Test	8	*Hyalella azteca*	Length	Day 42	4.57	mm
UHR-SVS-13	6	Test	9	*Hyalella azteca*	Length	Day 42	4.71	mm
UHR-SVS-13	6	Test	11	*Hyalella azteca*	Length	Day 42	4.69	mm
UHR-SVS-13	6	Test	12	*Hyalella azteca*	Length	Day 42	4.47	mm
UHR-SVS-16/37	11	Test	1	*Hyalella azteca*	Length	Day 42	4.39	mm
UHR-SVS-16/37	11	Test	3	*Hyalella azteca*	Length	Day 42	4.55	mm
UHR-SVS-16/37	11	Test	5	*Hyalella azteca*	Length	Day 42	4.06	mm
UHR-SVS-16/37	11	Test	6	*Hyalella azteca*	Length	Day 42	4.71	mm
UHR-SVS-16/37	11	Test	8	*Hyalella azteca*	Length	Day 42	4.45	mm
UHR-SVS-16/37	11	Test	9	*Hyalella azteca*	Length	Day 42	4.72	mm
UHR-SVS-16/37	11	Test	11	*Hyalella azteca*	Length	Day 42	4.3	mm
UHR-SVS-16/37	11	Test	12	*Hyalella azteca*	Length	Day 42	4.66	mm
UHR-SVS-19	2	Test	1	*Hyalella azteca*	Length	Day 42	4.78	mm
UHR-SVS-19	2	Test	3	*Hyalella azteca*	Length	Day 42	4.45	mm
UHR-SVS-19	2	Test	5	*Hyalella azteca*	Length	Day 42	4.93	mm
UHR-SVS-19	2	Test	6	*Hyalella azteca*	Length	Day 42	4.74	mm
UHR-SVS-19	2	Test	8	*Hyalella azteca*	Length	Day 42	4.76	mm
UHR-SVS-19	2	Test	9	*Hyalella azteca*	Length	Day 42	4.6	mm
UHR-SVS-19	2	Test	11	*Hyalella azteca*	Length	Day 42	4.61	mm
UHR-SVS-19	2	Test	12	*Hyalella azteca*	Length	Day 42	4.18	mm
UHR-SVS-24	3	Test	1	*Hyalella azteca*	Length	Day 42	4.57	mm
UHR-SVS-24	3	Test	3	*Hyalella azteca*	Length	Day 42	4.66	mm
UHR-SVS-24	3	Test	5	*Hyalella azteca*	Length	Day 42	4.49	mm
UHR-SVS-24	3	Test	6	*Hyalella azteca*	Length	Day 42	4.38	mm
UHR-SVS-24	3	Test	8	*Hyalella azteca*	Length	Day 42	5.01	mm
UHR-SVS-24	3	Test	9	*Hyalella azteca*	Length	Day 42	4.42	mm
UHR-SVS-24	3	Test	11	*Hyalella azteca*	Length	Day 42	4.75	mm
UHR-SVS-24	3	Test	12	*Hyalella azteca*	Length	Day 42	4.67	mm
UHR-SVS-26	9	Test	1	*Hyalella azteca*	Length	Day 42	4.61	mm
UHR-SVS-26	9	Test	3	*Hyalella azteca*	Length	Day 42	4.4	mm
UHR-SVS-26	9	Test	5	*Hyalella azteca*	Length	Day 42	5.01	mm
UHR-SVS-26	9	Test	6	*Hyalella azteca*	Length	Day 42	4.59	mm

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-26	9	Test	8	*Hyalella azteca*	Length	Day 42	4.78	mm
UHR-SVS-26	9	Test	9	*Hyalella azteca*	Length	Day 42	4.84	mm
UHR-SVS-26	9	Test	11	*Hyalella azteca*	Length	Day 42	4.67	mm
UHR-SVS-26	9	Test	12	*Hyalella azteca*	Length	Day 42	4.24	mm
UHR-SVS-29/36	12	Test	1	*Hyalella azteca*	Length	Day 42	4.81	mm
UHR-SVS-29/36	12	Test	3	*Hyalella azteca*	Length	Day 42	4.78	mm
UHR-SVS-29/36	12	Test	5	*Hyalella azteca*	Length	Day 42	4.72	mm
UHR-SVS-29/36	12	Test	6	*Hyalella azteca*	Length	Day 42	4.62	mm
UHR-SVS-29/36	12	Test	8	*Hyalella azteca*	Length	Day 42	4.63	mm
UHR-SVS-29/36	12	Test	9	*Hyalella azteca*	Length	Day 42	4.52	mm
UHR-SVS-29/36	12	Test	11	*Hyalella azteca*	Length	Day 42	4.56	mm
UHR-SVS-29/36	12	Test	12	*Hyalella azteca*	Length	Day 42	4.47	mm
UHR-SVS-31	10	Test	1	*Hyalella azteca*	Length	Day 42	4.68	mm
UHR-SVS-31	10	Test	3	*Hyalella azteca*	Length	Day 42	4.82	mm
UHR-SVS-31	10	Test	5	*Hyalella azteca*	Length	Day 42	5.05	mm
UHR-SVS-31	10	Test	6	*Hyalella azteca*	Length	Day 42	4.76	mm
UHR-SVS-31	10	Test	8	*Hyalella azteca*	Length	Day 42	4.56	mm
UHR-SVS-31	10	Test	9	*Hyalella azteca*	Length	Day 42	5.19	mm
UHR-SVS-31	10	Test	11	*Hyalella azteca*	Length	Day 42	4.55	mm
UHR-SVS-31	10	Test	12	*Hyalella azteca*	Length	Day 42	4.7	mm
UHR-SVS-38	7	Test	1	*Hyalella azteca*	Length	Day 42	5.12	mm
UHR-SVS-38	7	Test	3	*Hyalella azteca*	Length	Day 42	4.72	mm
UHR-SVS-38	7	Test	5	*Hyalella azteca*	Length	Day 42	4.61	mm
UHR-SVS-38	7	Test	6	*Hyalella azteca*	Length	Day 42	4.75	mm
UHR-SVS-38	7	Test	8	*Hyalella azteca*	Length	Day 42	4.98	mm
UHR-SVS-38	7	Test	9	*Hyalella azteca*	Length	Day 42	4.75	mm
UHR-SVS-38	7	Test	11	*Hyalella azteca*	Length	Day 42	4.94	mm
UHR-SVS-38	7	Test	12	*Hyalella azteca*	Length	Day 42	5.05	mm
Control	WB	Control	1	*Hyalella azteca*	Number of Young	Day 42	16	Individuals
Control	WB	Control	3	*Hyalella azteca*	Number of Young	Day 42	27	Individuals
Control	WB	Control	5	*Hyalella azteca*	Number of Young	Day 42	70	Individuals
Control	WB	Control	6	*Hyalella azteca*	Number of Young	Day 42	58	Individuals
Control	WB	Control	8	*Hyalella azteca*	Number of Young	Day 42	80	Individuals
Control	WB	Control	9	*Hyalella azteca*	Number of Young	Day 42	41	Individuals
Control	WB	Control	11	*Hyalella azteca*	Number of Young	Day 42	83	Individuals
Control	WB	Control	12	*Hyalella azteca*	Number of Young	Day 42	40	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-04	1	Test	1	*Hyalella azteca*	Number of Young	Day 42	35	Individuals
UHR-SVS-04	1	Test	3	*Hyalella azteca*	Number of Young	Day 42	38	Individuals
UHR-SVS-04	1	Test	5	*Hyalella azteca*	Number of Young	Day 42	46	Individuals
UHR-SVS-04	1	Test	6	*Hyalella azteca*	Number of Young	Day 42	28	Individuals
UHR-SVS-04	1	Test	8	*Hyalella azteca*	Number of Young	Day 42	48	Individuals
UHR-SVS-04	1	Test	9	*Hyalella azteca*	Number of Young	Day 42	43	Individuals
UHR-SVS-04	1	Test	11	*Hyalella azteca*	Number of Young	Day 42	74	Individuals
UHR-SVS-04	1	Test	12	*Hyalella azteca*	Number of Young	Day 42	40	Individuals
UHR-SVS-112	4	Test	1	*Hyalella azteca*	Number of Young	Day 42	52	Individuals
UHR-SVS-112	4	Test	3	*Hyalella azteca*	Number of Young	Day 42	8	Individuals
UHR-SVS-112	4	Test	5	*Hyalella azteca*	Number of Young	Day 42	53	Individuals
UHR-SVS-112	4	Test	6	*Hyalella azteca*	Number of Young	Day 42	82	Individuals
UHR-SVS-112	4	Test	8	*Hyalella azteca*	Number of Young	Day 42	98	Individuals
UHR-SVS-112	4	Test	9	*Hyalella azteca*	Number of Young	Day 42	29	Individuals
UHR-SVS-112	4	Test	11	*Hyalella azteca*	Number of Young	Day 42	14	Individuals
UHR-SVS-112	4	Test	12	*Hyalella azteca*	Number of Young	Day 42	13	Individuals
UHR-SVS-124	5	Test	1	*Hyalella azteca*	Number of Young	Day 42	29	Individuals
UHR-SVS-124	5	Test	3	*Hyalella azteca*	Number of Young	Day 42	8	Individuals
UHR-SVS-124	5	Test	5	*Hyalella azteca*	Number of Young	Day 42	44	Individuals
UHR-SVS-124	5	Test	6	*Hyalella azteca*	Number of Young	Day 42	13	Individuals
UHR-SVS-124	5	Test	8	*Hyalella azteca*	Number of Young	Day 42	9	Individuals
UHR-SVS-124	5	Test	9	*Hyalella azteca*	Number of Young	Day 42	31	Individuals
UHR-SVS-124	5	Test	11	*Hyalella azteca*	Number of Young	Day 42	71	Individuals
UHR-SVS-124	5	Test	12	*Hyalella azteca*	Number of Young	Day 42	15	Individuals
UHR-SVS-127	8	Test	1	*Hyalella azteca*	Number of Young	Day 42	80	Individuals
UHR-SVS-127	8	Test	3	*Hyalella azteca*	Number of Young	Day 42	64	Individuals
UHR-SVS-127	8	Test	5	*Hyalella azteca*	Number of Young	Day 42	61	Individuals
UHR-SVS-127	8	Test	6	*Hyalella azteca*	Number of Young	Day 42	45	Individuals
UHR-SVS-127	8	Test	8	*Hyalella azteca*	Number of Young	Day 42	58	Individuals
UHR-SVS-127	8	Test	9	*Hyalella azteca*	Number of Young	Day 42	58	Individuals
UHR-SVS-127	8	Test	11	*Hyalella azteca*	Number of Young	Day 42	31	Individuals
UHR-SVS-127	8	Test	12	*Hyalella azteca*	Number of Young	Day 42	46	Individuals
UHR-SVS-13	6	Test	1	*Hyalella azteca*	Number of Young	Day 42	30	Individuals
UHR-SVS-13	6	Test	3	*Hyalella azteca*	Number of Young	Day 42	22	Individuals
UHR-SVS-13	6	Test	5	*Hyalella azteca*	Number of Young	Day 42	10	Individuals
UHR-SVS-13	6	Test	6	*Hyalella azteca*	Number of Young	Day 42	39	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-13	6	Test	8	*Hyalella azteca*	Number of Young	Day 42	36	Individuals
UHR-SVS-13	6	Test	9	*Hyalella azteca*	Number of Young	Day 42	17	Individuals
UHR-SVS-13	6	Test	11	*Hyalella azteca*	Number of Young	Day 42	16	Individuals
UHR-SVS-13	6	Test	12	*Hyalella azteca*	Number of Young	Day 42	52	Individuals
UHR-SVS-16/37	11	Test	1	*Hyalella azteca*	Number of Young	Day 42	21	Individuals
UHR-SVS-16/37	11	Test	3	*Hyalella azteca*	Number of Young	Day 42	8	Individuals
UHR-SVS-16/37	11	Test	5	*Hyalella azteca*	Number of Young	Day 42	6	Individuals
UHR-SVS-16/37	11	Test	6	*Hyalella azteca*	Number of Young	Day 42	5	Individuals
UHR-SVS-16/37	11	Test	8	*Hyalella azteca*	Number of Young	Day 42	23	Individuals
UHR-SVS-16/37	11	Test	9	*Hyalella azteca*	Number of Young	Day 42	14	Individuals
UHR-SVS-16/37	11	Test	11	*Hyalella azteca*	Number of Young	Day 42	3	Individuals
UHR-SVS-16/37	11	Test	12	*Hyalella azteca*	Number of Young	Day 42	22	Individuals
UHR-SVS-19	2	Test	1	*Hyalella azteca*	Number of Young	Day 42	16	Individuals
UHR-SVS-19	2	Test	3	*Hyalella azteca*	Number of Young	Day 42	6	Individuals
UHR-SVS-19	2	Test	5	*Hyalella azteca*	Number of Young	Day 42	35	Individuals
UHR-SVS-19	2	Test	6	*Hyalella azteca*	Number of Young	Day 42	3	Individuals
UHR-SVS-19	2	Test	8	*Hyalella azteca*	Number of Young	Day 42	42	Individuals
UHR-SVS-19	2	Test	9	*Hyalella azteca*	Number of Young	Day 42	32	Individuals
UHR-SVS-19	2	Test	11	*Hyalella azteca*	Number of Young	Day 42	45	Individuals
UHR-SVS-19	2	Test	12	*Hyalella azteca*	Number of Young	Day 42	29	Individuals
UHR-SVS-24	3	Test	1	*Hyalella azteca*	Number of Young	Day 42	5	Individuals
UHR-SVS-24	3	Test	3	*Hyalella azteca*	Number of Young	Day 42	20	Individuals
UHR-SVS-24	3	Test	5	*Hyalella azteca*	Number of Young	Day 42	12	Individuals
UHR-SVS-24	3	Test	6	*Hyalella azteca*	Number of Young	Day 42	21	Individuals
UHR-SVS-24	3	Test	8	*Hyalella azteca*	Number of Young	Day 42	17	Individuals
UHR-SVS-24	3	Test	9	*Hyalella azteca*	Number of Young	Day 42	23	Individuals
UHR-SVS-24	3	Test	11	*Hyalella azteca*	Number of Young	Day 42	16	Individuals
UHR-SVS-24	3	Test	12	*Hyalella azteca*	Number of Young	Day 42	33	Individuals
UHR-SVS-26	9	Test	1	*Hyalella azteca*	Number of Young	Day 42	16	Individuals
UHR-SVS-26	9	Test	3	*Hyalella azteca*	Number of Young	Day 42	40	Individuals
UHR-SVS-26	9	Test	5	*Hyalella azteca*	Number of Young	Day 42	6	Individuals
UHR-SVS-26	9	Test	6	*Hyalella azteca*	Number of Young	Day 42	26	Individuals
UHR-SVS-26	9	Test	8	*Hyalella azteca*	Number of Young	Day 42	26	Individuals
UHR-SVS-26	9	Test	9	*Hyalella azteca*	Number of Young	Day 42	68	Individuals
UHR-SVS-26	9	Test	11	*Hyalella azteca*	Number of Young	Day 42	22	Individuals
UHR-SVS-26	9	Test	12	*Hyalella azteca*	Number of Young	Day 42	25	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-29/36	12	Test	1	*Hyalella azteca*	Number of Young	Day 42	44	Individuals
UHR-SVS-29/36	12	Test	3	*Hyalella azteca*	Number of Young	Day 42	73	Individuals
UHR-SVS-29/36	12	Test	5	*Hyalella azteca*	Number of Young	Day 42	17	Individuals
UHR-SVS-29/36	12	Test	6	*Hyalella azteca*	Number of Young	Day 42	37	Individuals
UHR-SVS-29/36	12	Test	8	*Hyalella azteca*	Number of Young	Day 42	38	Individuals
UHR-SVS-29/36	12	Test	9	*Hyalella azteca*	Number of Young	Day 42	26	Individuals
UHR-SVS-29/36	12	Test	11	*Hyalella azteca*	Number of Young	Day 42	28	Individuals
UHR-SVS-29/36	12	Test	12	*Hyalella azteca*	Number of Young	Day 42	36	Individuals
UHR-SVS-31	10	Test	1	*Hyalella azteca*	Number of Young	Day 42	48	Individuals
UHR-SVS-31	10	Test	3	*Hyalella azteca*	Number of Young	Day 42	43	Individuals
UHR-SVS-31	10	Test	5	*Hyalella azteca*	Number of Young	Day 42	19	Individuals
UHR-SVS-31	10	Test	6	*Hyalella azteca*	Number of Young	Day 42	18	Individuals
UHR-SVS-31	10	Test	8	*Hyalella azteca*	Number of Young	Day 42	15	Individuals
UHR-SVS-31	10	Test	9	*Hyalella azteca*	Number of Young	Day 42	56	Individuals
UHR-SVS-31	10	Test	11	*Hyalella azteca*	Number of Young	Day 42	41	Individuals
UHR-SVS-31	10	Test	12	*Hyalella azteca*	Number of Young	Day 42	25	Individuals
UHR-SVS-38	7	Test	1	*Hyalella azteca*	Number of Young	Day 42	36	Individuals
UHR-SVS-38	7	Test	3	*Hyalella azteca*	Number of Young	Day 42	53	Individuals
UHR-SVS-38	7	Test	5	*Hyalella azteca*	Number of Young	Day 42	9	Individuals
UHR-SVS-38	7	Test	6	*Hyalella azteca*	Number of Young	Day 42	60	Individuals
UHR-SVS-38	7	Test	8	*Hyalella azteca*	Number of Young	Day 42	24	Individuals
UHR-SVS-38	7	Test	9	*Hyalella azteca*	Number of Young	Day 42	40	Individuals
UHR-SVS-38	7	Test	11	*Hyalella azteca*	Number of Young	Day 42	24	Individuals
UHR-SVS-38	7	Test	12	*Hyalella azteca*	Number of Young	Day 42	66	Individuals
Control	WB	Control	1	*Hyalella azteca*	Number of Young per Female	Day 42	5.3	Individuals
Control	WB	Control	3	*Hyalella azteca*	Number of Young per Female	Day 42	13.5	Individuals
Control	WB	Control	5	*Hyalella azteca*	Number of Young per Female	Day 42	17.5	Individuals
Control	WB	Control	6	*Hyalella azteca*	Number of Young per Female	Day 42	7.3	Individuals
Control	WB	Control	8	*Hyalella azteca*	Number of Young per Female	Day 42	13.3	Individuals
Control	WB	Control	9	*Hyalella azteca*	Number of Young per Female	Day 42	8.2	Individuals
Control	WB	Control	11	*Hyalella azteca*	Number of Young per Female	Day 42	13.8	Individuals
Control	WB	Control	12	*Hyalella azteca*	Number of Young per Female	Day 42	10	Individuals
UHR-SVS-04	1	Test	1	*Hyalella azteca*	Number of Young per Female	Day 42	7	Individuals
UHR-SVS-04	1	Test	3	*Hyalella azteca*	Number of Young per Female	Day 42	5.4	Individuals
UHR-SVS-04	1	Test	5	*Hyalella azteca*	Number of Young per Female	Day 42	7.7	Individuals
UHR-SVS-04	1	Test	6	*Hyalella azteca*	Number of Young per Female	Day 42	9.3	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-04	1	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	9.6	Individuals
UHR-SVS-04	1	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	6.1	Individuals
UHR-SVS-04	1	Test	11	*Hyalella azteca*	Number of Young per Female	Day 42	9.3	Individuals
UHR-SVS-04	1	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	8	Individuals
UHR-SVS-112	4	Test	1	*Hyalella azteca*	Number of Young per Female	Day 42	5.8	Individuals
UHR-SVS-112	4	Test	3	*Hyalella azteca*	Number of Young per Female	Day 42	2.7	Individuals
UHR-SVS-112	4	Test	5	*Hyalella azteca*	Number of Young per Female	Day 42	10.6	Individuals
UHR-SVS-112	4	Test	6	*Hyalella azteca*	Number of Young per Female	Day 42	13.7	Individuals
UHR-SVS-112	4	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	12.3	Individuals
UHR-SVS-112	4	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	9.7	Individuals
UHR-SVS-112	4	Test	11	*Hyalella azteca*	Number of Young per Female	Day 42	7	Individuals
UHR-SVS-112	4	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	6.5	Individuals
UHR-SVS-124	5	Test	1	*Hyalella azteca*	Number of Young per Female	Day 42	9.7	Individuals
UHR-SVS-124	5	Test	5	*Hyalella azteca*	Number of Young per Female	Day 42	11	Individuals
UHR-SVS-124	5	Test	6	*Hyalella azteca*	Number of Young per Female	Day 42	6.5	Individuals
UHR-SVS-124	5	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	4.5	Individuals
UHR-SVS-124	5	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	4.4	Individuals
UHR-SVS-124	5	Test	11	*Hyalella azteca*	Number of Young per Female	Day 42	11.8	Individuals
UHR-SVS-124	5	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	7.5	Individuals
UHR-SVS-127	8	Test	1	*Hyalella azteca*	Number of Young per Female	Day 42	10	Individuals
UHR-SVS-127	8	Test	3	*Hyalella azteca*	Number of Young per Female	Day 42	7.1	Individuals
UHR-SVS-127	8	Test	5	*Hyalella azteca*	Number of Young per Female	Day 42	12.2	Individuals
UHR-SVS-127	8	Test	6	*Hyalella azteca*	Number of Young per Female	Day 42	11.3	Individuals
UHR-SVS-127	8	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	9.7	Individuals
UHR-SVS-127	8	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	8.3	Individuals
UHR-SVS-127	8	Test	11	*Hyalella azteca*	Number of Young per Female	Day 42	10.3	Individuals
UHR-SVS-127	8	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	9.2	Individuals
UHR-SVS-13	6	Test	1	*Hyalella azteca*	Number of Young per Female	Day 42	5	Individuals
UHR-SVS-13	6	Test	3	*Hyalella azteca*	Number of Young per Female	Day 42	5.5	Individuals
UHR-SVS-13	6	Test	5	*Hyalella azteca*	Number of Young per Female	Day 42	5	Individuals
UHR-SVS-13	6	Test	6	*Hyalella azteca*	Number of Young per Female	Day 42	7.8	Individuals
UHR-SVS-13	6	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	9	Individuals
UHR-SVS-13	6	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	4.3	Individuals
UHR-SVS-13	6	Test	11	*Hyalella azteca*	Number of Young per Female	Day 42	4	Individuals
UHR-SVS-13	6	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	10.4	Individuals
UHR-SVS-16/37	11	Test	1	*Hyalella azteca*	Number of Young per Female	Day 42	2.3	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-16/37	11	Test	5	*Hyalella azteca*	Number of Young per Female	Day 42	1.5	Individuals
UHR-SVS-16/37	11	Test	6	*Hyalella azteca*	Number of Young per Female	Day 42	2.5	Individuals
UHR-SVS-16/37	11	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	4.6	Individuals
UHR-SVS-16/37	11	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	3.5	Individuals
UHR-SVS-16/37	11	Test	11	*Hyalella azteca*	Number of Young per Female	Day 42	0.8	Individuals
UHR-SVS-16/37	11	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	7.3	Individuals
UHR-SVS-19	2	Test	3	*Hyalella azteca*	Number of Young per Female	Day 42	1.2	Individuals
UHR-SVS-19	2	Test	5	*Hyalella azteca*	Number of Young per Female	Day 42	8.8	Individuals
UHR-SVS-19	2	Test	6	*Hyalella azteca*	Number of Young per Female	Day 42	1.5	Individuals
UHR-SVS-19	2	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	8.4	Individuals
UHR-SVS-19	2	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	6.4	Individuals
UHR-SVS-19	2	Test	11	*Hyalella azteca*	Number of Young per Female	Day 42	9	Individuals
UHR-SVS-19	2	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	4.8	Individuals
UHR-SVS-24	3	Test	3	*Hyalella azteca*	Number of Young per Female	Day 42	6.7	Individuals
UHR-SVS-24	3	Test	5	*Hyalella azteca*	Number of Young per Female	Day 42	6	Individuals
UHR-SVS-24	3	Test	6	*Hyalella azteca*	Number of Young per Female	Day 42	10.5	Individuals
UHR-SVS-24	3	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	8.5	Individuals
UHR-SVS-24	3	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	3.8	Individuals
UHR-SVS-24	3	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	11	Individuals
UHR-SVS-26	9	Test	1	*Hyalella azteca*	Number of Young per Female	Day 42	8	Individuals
UHR-SVS-26	9	Test	3	*Hyalella azteca*	Number of Young per Female	Day 42	5.7	Individuals
UHR-SVS-26	9	Test	5	*Hyalella azteca*	Number of Young per Female	Day 42	3	Individuals
UHR-SVS-26	9	Test	6	*Hyalella azteca*	Number of Young per Female	Day 42	4.3	Individuals
UHR-SVS-26	9	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	8.7	Individuals
UHR-SVS-26	9	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	9.7	Individuals
UHR-SVS-26	9	Test	11	*Hyalella azteca*	Number of Young per Female	Day 42	5.5	Individuals
UHR-SVS-26	9	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	5	Individuals
UHR-SVS-29/36	12	Test	1	*Hyalella azteca*	Number of Young per Female	Day 42	5.5	Individuals
UHR-SVS-29/36	12	Test	3	*Hyalella azteca*	Number of Young per Female	Day 42	12.2	Individuals
UHR-SVS-29/36	12	Test	5	*Hyalella azteca*	Number of Young per Female	Day 42	5.7	Individuals
UHR-SVS-29/36	12	Test	6	*Hyalella azteca*	Number of Young per Female	Day 42	6.2	Individuals
UHR-SVS-29/36	12	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	7.6	Individuals
UHR-SVS-29/36	12	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	5.2	Individuals
UHR-SVS-29/36	12	Test	11	*Hyalella azteca*	Number of Young per Female	Day 42	9.3	Individuals
UHR-SVS-29/36	12	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	7.2	Individuals
UHR-SVS-31	10	Test	1	*Hyalella azteca*	Number of Young per Female	Day 42	12	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-31	10	Test	3	*Hyalella azteca*	Number of Young per Female	Day 42	7.2	Individuals
UHR-SVS-31	10	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	7.5	Individuals
UHR-SVS-31	10	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	14	Individuals
UHR-SVS-31	10	Test	11	*Hyalella azteca*	Number of Young per Female	Day 42	10.3	Individuals
UHR-SVS-31	10	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	6.3	Individuals
UHR-SVS-38	7	Test	1	*Hyalella azteca*	Number of Young per Female	Day 42	9	Individuals
UHR-SVS-38	7	Test	3	*Hyalella azteca*	Number of Young per Female	Day 42	7.6	Individuals
UHR-SVS-38	7	Test	5	*Hyalella azteca*	Number of Young per Female	Day 42	4.5	Individuals
UHR-SVS-38	7	Test	6	*Hyalella azteca*	Number of Young per Female	Day 42	8.6	Individuals
UHR-SVS-38	7	Test	8	*Hyalella azteca*	Number of Young per Female	Day 42	8	Individuals
UHR-SVS-38	7	Test	9	*Hyalella azteca*	Number of Young per Female	Day 42	6.7	Individuals
UHR-SVS-38	7	Test	11	*Hyalella azteca*	Number of Young per Female	Day 42	6	Individuals
UHR-SVS-38	7	Test	12	*Hyalella azteca*	Number of Young per Female	Day 42	11	Individuals
Control	WB	Control	1	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.8	Individuals
Control	WB	Control	3	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	8.1	Individuals
Control	WB	Control	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	15.8	Individuals
Control	WB	Control	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.5	Individuals
Control	WB	Control	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	13.3	Individuals
Control	WB	Control	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.4	Individuals
Control	WB	Control	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	11.1	Individuals
Control	WB	Control	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	10	Individuals
UHR-SVS-04	1	Test	1	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7	Individuals
UHR-SVS-04	1	Test	3	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5.4	Individuals
UHR-SVS-04	1	Test	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.7	Individuals
UHR-SVS-04	1	Test	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	8.4	Individuals
UHR-SVS-04	1	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	9.6	Individuals
UHR-SVS-04	1	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5.5	Individuals
UHR-SVS-04	1	Test	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	9.3	Individuals
UHR-SVS-04	1	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	8	Individuals
UHR-SVS-112	4	Test	1	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5.8	Individuals
UHR-SVS-112	4	Test	3	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	2.1	Individuals
UHR-SVS-112	4	Test	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	9.5	Individuals
UHR-SVS-112	4	Test	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	12.3	Individuals
UHR-SVS-112	4	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	12.3	Individuals
UHR-SVS-112	4	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.8	Individuals
UHR-SVS-112	4	Test	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5.6	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-112	4	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5.9	Individuals
UHR-SVS-124	5	Test	1	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.7	Individuals
UHR-SVS-124	5	Test	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	8.8	Individuals
UHR-SVS-124	5	Test	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.5	Individuals
UHR-SVS-124	5	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	3.6	Individuals
UHR-SVS-124	5	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.4	Individuals
UHR-SVS-124	5	Test	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	9.5	Individuals
UHR-SVS-124	5	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.8	Individuals
UHR-SVS-127	8	Test	1	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	10	Individuals
UHR-SVS-127	8	Test	3	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.1	Individuals
UHR-SVS-127	8	Test	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	11	Individuals
UHR-SVS-127	8	Test	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	9	Individuals
UHR-SVS-127	8	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	8.7	Individuals
UHR-SVS-127	8	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.5	Individuals
UHR-SVS-127	8	Test	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	9.3	Individuals
UHR-SVS-127	8	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.4	Individuals
UHR-SVS-13	6	Test	1	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.5	Individuals
UHR-SVS-13	6	Test	3	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5	Individuals
UHR-SVS-13	6	Test	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5	Individuals
UHR-SVS-13	6	Test	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7	Individuals
UHR-SVS-13	6	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	9	Individuals
UHR-SVS-13	6	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	3.8	Individuals
UHR-SVS-13	6	Test	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	3.6	Individuals
UHR-SVS-13	6	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	10.4	Individuals
UHR-SVS-16/37	11	Test	1	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	2.3	Individuals
UHR-SVS-16/37	11	Test	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	0.9	Individuals
UHR-SVS-16/37	11	Test	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	1.3	Individuals
UHR-SVS-16/37	11	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.6	Individuals
UHR-SVS-16/37	11	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	2.8	Individuals
UHR-SVS-16/37	11	Test	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	0.5	Individuals
UHR-SVS-16/37	11	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.3	Individuals
UHR-SVS-19	2	Test	3	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	1.2	Individuals
UHR-SVS-19	2	Test	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.9	Individuals
UHR-SVS-19	2	Test	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	1.5	Individuals
UHR-SVS-19	2	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	8.4	Individuals
UHR-SVS-19	2	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.4	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-19	2	Test	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	8.1	Individuals
UHR-SVS-19	2	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.8	Individuals
UHR-SVS-24	3	Test	3	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	2.7	Individuals
UHR-SVS-24	3	Test	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	3	Individuals
UHR-SVS-24	3	Test	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	3.2	Individuals
UHR-SVS-24	3	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.3	Individuals
UHR-SVS-24	3	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	3.8	Individuals
UHR-SVS-24	3	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.4	Individuals
UHR-SVS-26	9	Test	1	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.2	Individuals
UHR-SVS-26	9	Test	3	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5.7	Individuals
UHR-SVS-26	9	Test	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	2.7	Individuals
UHR-SVS-26	9	Test	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.3	Individuals
UHR-SVS-26	9	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.8	Individuals
UHR-SVS-26	9	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	8.7	Individuals
UHR-SVS-26	9	Test	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.4	Individuals
UHR-SVS-26	9	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5	Individuals
UHR-SVS-29/36	12	Test	1	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5.5	Individuals
UHR-SVS-29/36	12	Test	3	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	11	Individuals
UHR-SVS-29/36	12	Test	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.5	Individuals
UHR-SVS-29/36	12	Test	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.2	Individuals
UHR-SVS-29/36	12	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.6	Individuals
UHR-SVS-29/36	12	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.7	Individuals
UHR-SVS-29/36	12	Test	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.5	Individuals
UHR-SVS-29/36	12	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5.8	Individuals
UHR-SVS-31	10	Test	1	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	8.4	Individuals
UHR-SVS-31	10	Test	3	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.5	Individuals
UHR-SVS-31	10	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.5	Individuals
UHR-SVS-31	10	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	11.2	Individuals
UHR-SVS-31	10	Test	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	7.2	Individuals
UHR-SVS-31	10	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5.6	Individuals
UHR-SVS-38	7	Test	1	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.3	Individuals
UHR-SVS-38	7	Test	3	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.8	Individuals
UHR-SVS-38	7	Test	5	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	4.1	Individuals
UHR-SVS-38	7	Test	6	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.9	Individuals
UHR-SVS-38	7	Test	8	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6.4	Individuals
UHR-SVS-38	7	Test	9	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	6	Individuals

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-38	7	Test	11	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	5.4	Individuals
UHR-SVS-38	7	Test	12	*Hyalella azteca*	Number of Young per Female (Normalized to 42-d Survival)	Day 42	11	Individuals
Control	WB	Control	1	*Hyalella azteca*	Survival	Day 28	100	%
Control	WB	Control	2	*Hyalella azteca*	Survival	Day 28	100	%
Control	WB	Control	3	*Hyalella azteca*	Survival	Day 28	90	%
Control	WB	Control	4	*Hyalella azteca*	Survival	Day 28	90	%
Control	WB	Control	5	*Hyalella azteca*	Survival	Day 28	100	%
Control	WB	Control	6	*Hyalella azteca*	Survival	Day 28	100	%
Control	WB	Control	7	*Hyalella azteca*	Survival	Day 28	100	%
Control	WB	Control	8	*Hyalella azteca*	Survival	Day 28	100	%
Control	WB	Control	9	*Hyalella azteca*	Survival	Day 28	100	%
Control	WB	Control	10	*Hyalella azteca*	Survival	Day 28	100	%
Control	WB	Control	11	*Hyalella azteca*	Survival	Day 28	100	%
Control	WB	Control	12	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	1	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	2	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	3	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	4	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	5	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	6	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	7	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	8	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	9	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	10	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	11	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-04	1	Test	12	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-112	4	Test	1	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-112	4	Test	2	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-112	4	Test	3	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-112	4	Test	4	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-112	4	Test	5	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-112	4	Test	6	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-112	4	Test	7	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-112	4	Test	8	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-112	4	Test	9	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-112	4	Test	10	*Hyalella azteca*	Survival	Day 28	100	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-112	4	Test	11	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-112	4	Test	12	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-124	5	Test	1	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-124	5	Test	2	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-124	5	Test	3	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-124	5	Test	4	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-124	5	Test	5	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-124	5	Test	6	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-124	5	Test	7	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-124	5	Test	8	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-124	5	Test	9	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-124	5	Test	10	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-124	5	Test	11	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-124	5	Test	12	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-127	8	Test	1	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-127	8	Test	2	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-127	8	Test	3	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-127	8	Test	4	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-127	8	Test	5	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-127	8	Test	6	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-127	8	Test	7	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-127	8	Test	8	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-127	8	Test	9	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-127	8	Test	10	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-127	8	Test	11	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-127	8	Test	12	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-13	6	Test	1	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-13	6	Test	2	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-13	6	Test	3	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-13	6	Test	4	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-13	6	Test	5	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-13	6	Test	6	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-13	6	Test	7	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-13	6	Test	8	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-13	6	Test	9	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-13	6	Test	10	*Hyalella azteca*	Survival	Day 28	100	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-13	6	Test	11	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-13	6	Test	12	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-16/37	11	Test	1	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-16/37	11	Test	2	*Hyalella azteca*	Survival	Day 28	70	%
UHR-SVS-16/37	11	Test	3	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-16/37	11	Test	4	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-16/37	11	Test	5	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-16/37	11	Test	6	*Hyalella azteca*	Survival	Day 28	80	%
UHR-SVS-16/37	11	Test	7	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-16/37	11	Test	8	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-16/37	11	Test	9	*Hyalella azteca*	Survival	Day 28	80	%
UHR-SVS-16/37	11	Test	10	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-16/37	11	Test	11	*Hyalella azteca*	Survival	Day 28	80	%
UHR-SVS-16/37	11	Test	12	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-19	2	Test	1	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-19	2	Test	2	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-19	2	Test	3	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-19	2	Test	4	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-19	2	Test	5	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-19	2	Test	6	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-19	2	Test	7	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-19	2	Test	8	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-19	2	Test	9	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-19	2	Test	10	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-19	2	Test	11	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-19	2	Test	12	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-24	3	Test	1	*Hyalella azteca*	Survival	Day 28	80	%
UHR-SVS-24	3	Test	2	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-24	3	Test	3	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-24	3	Test	4	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-24	3	Test	5	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-24	3	Test	6	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-24	3	Test	7	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-24	3	Test	8	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-24	3	Test	9	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-24	3	Test	10	*Hyalella azteca*	Survival	Day 28	100	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-24	3	Test	11	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-24	3	Test	12	*Hyalella azteca*	Survival	Day 28	80	%
UHR-SVS-26	9	Test	1	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-26	9	Test	2	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-26	9	Test	3	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-26	9	Test	4	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-26	9	Test	5	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-26	9	Test	6	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-26	9	Test	7	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-26	9	Test	8	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-26	9	Test	9	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-26	9	Test	10	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-26	9	Test	11	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-26	9	Test	12	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-29/36	12	Test	1	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-29/36	12	Test	2	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-29/36	12	Test	3	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-29/36	12	Test	4	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-29/36	12	Test	5	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-29/36	12	Test	6	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-29/36	12	Test	7	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-29/36	12	Test	8	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-29/36	12	Test	9	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-29/36	12	Test	10	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-29/36	12	Test	11	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-29/36	12	Test	12	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-31	10	Test	1	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-31	10	Test	2	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-31	10	Test	3	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-31	10	Test	4	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-31	10	Test	5	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-31	10	Test	6	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-31	10	Test	7	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-31	10	Test	8	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-31	10	Test	9	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-31	10	Test	10	*Hyalella azteca*	Survival	Day 28	100	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-31	10	Test	11	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-31	10	Test	12	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-38	7	Test	1	*Hyalella azteca*	Survival	Day 28	80	%
UHR-SVS-38	7	Test	2	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-38	7	Test	3	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-38	7	Test	4	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-38	7	Test	5	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-38	7	Test	6	*Hyalella azteca*	Survival	Day 28	80	%
UHR-SVS-38	7	Test	7	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-38	7	Test	8	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-38	7	Test	9	*Hyalella azteca*	Survival	Day 28	90	%
UHR-SVS-38	7	Test	10	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-38	7	Test	11	*Hyalella azteca*	Survival	Day 28	100	%
UHR-SVS-38	7	Test	12	*Hyalella azteca*	Survival	Day 28	100	%
Control	WB	Control	1	*Hyalella azteca*	Survival	Day 35	90.9	%
Control	WB	Control	3	*Hyalella azteca*	Survival	Day 35	70	%
Control	WB	Control	5	*Hyalella azteca*	Survival	Day 35	100	%
Control	WB	Control	6	*Hyalella azteca*	Survival	Day 35	100	%
Control	WB	Control	8	*Hyalella azteca*	Survival	Day 35	100	%
Control	WB	Control	9	*Hyalella azteca*	Survival	Day 35	100	%
Control	WB	Control	11	*Hyalella azteca*	Survival	Day 35	90	%
Control	WB	Control	12	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-04	1	Test	1	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-04	1	Test	3	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-04	1	Test	5	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-04	1	Test	6	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-04	1	Test	8	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-04	1	Test	9	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-04	1	Test	11	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-04	1	Test	12	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-112	4	Test	1	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-112	4	Test	3	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-112	4	Test	5	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-112	4	Test	6	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-112	4	Test	8	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-112	4	Test	9	*Hyalella azteca*	Survival	Day 35	90	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-112	4	Test	11	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-112	4	Test	12	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-124	5	Test	1	*Hyalella azteca*	Survival	Day 35	80	%
UHR-SVS-124	5	Test	3	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-124	5	Test	5	*Hyalella azteca*	Survival	Day 35	80	%
UHR-SVS-124	5	Test	6	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-124	5	Test	8	*Hyalella azteca*	Survival	Day 35	80	%
UHR-SVS-124	5	Test	9	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-124	5	Test	11	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-124	5	Test	12	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-127	8	Test	1	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-127	8	Test	3	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-127	8	Test	5	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-127	8	Test	6	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-127	8	Test	8	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-127	8	Test	9	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-127	8	Test	11	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-127	8	Test	12	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-13	6	Test	1	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-13	6	Test	3	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-13	6	Test	5	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-13	6	Test	6	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-13	6	Test	8	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-13	6	Test	9	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-13	6	Test	11	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-13	6	Test	12	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-16/37	11	Test	1	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-16/37	11	Test	3	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-16/37	11	Test	5	*Hyalella azteca*	Survival	Day 35	80	%
UHR-SVS-16/37	11	Test	6	*Hyalella azteca*	Survival	Day 35	60	%
UHR-SVS-16/37	11	Test	8	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-16/37	11	Test	9	*Hyalella azteca*	Survival	Day 35	70	%
UHR-SVS-16/37	11	Test	11	*Hyalella azteca*	Survival	Day 35	70	%
UHR-SVS-16/37	11	Test	12	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-19	2	Test	1	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-19	2	Test	3	*Hyalella azteca*	Survival	Day 35	100	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-19	2	Test	5	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-19	2	Test	6	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-19	2	Test	8	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-19	2	Test	9	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-19	2	Test	11	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-19	2	Test	12	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-24	3	Test	1	*Hyalella azteca*	Survival	Day 35	40	%
UHR-SVS-24	3	Test	3	*Hyalella azteca*	Survival	Day 35	70	%
UHR-SVS-24	3	Test	5	*Hyalella azteca*	Survival	Day 35	80	%
UHR-SVS-24	3	Test	6	*Hyalella azteca*	Survival	Day 35	60	%
UHR-SVS-24	3	Test	8	*Hyalella azteca*	Survival	Day 35	60	%
UHR-SVS-24	3	Test	9	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-24	3	Test	11	*Hyalella azteca*	Survival	Day 35	40	%
UHR-SVS-24	3	Test	12	*Hyalella azteca*	Survival	Day 35	50	%
UHR-SVS-26	9	Test	1	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-26	9	Test	3	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-26	9	Test	5	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-26	9	Test	6	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-26	9	Test	8	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-26	9	Test	9	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-26	9	Test	11	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-26	9	Test	12	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-29/36	12	Test	1	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-29/36	12	Test	3	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-29/36	12	Test	5	*Hyalella azteca*	Survival	Day 35	80	%
UHR-SVS-29/36	12	Test	6	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-29/36	12	Test	8	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-29/36	12	Test	9	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-29/36	12	Test	11	*Hyalella azteca*	Survival	Day 35	70	%
UHR-SVS-29/36	12	Test	12	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-31	10	Test	1	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-31	10	Test	3	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-31	10	Test	5	*Hyalella azteca*	Survival	Day 35	50	%
UHR-SVS-31	10	Test	6	*Hyalella azteca*	Survival	Day 35	40	%
UHR-SVS-31	10	Test	8	*Hyalella azteca*	Survival	Day 35	80	%
UHR-SVS-31	10	Test	9	*Hyalella azteca*	Survival	Day 35	80	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-31	10	Test	11	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-31	10	Test	12	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-38	7	Test	1	*Hyalella azteca*	Survival	Day 35	80	%
UHR-SVS-38	7	Test	3	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-38	7	Test	5	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-38	7	Test	6	*Hyalella azteca*	Survival	Day 35	80	%
UHR-SVS-38	7	Test	8	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-38	7	Test	9	*Hyalella azteca*	Survival	Day 35	90	%
UHR-SVS-38	7	Test	11	*Hyalella azteca*	Survival	Day 35	100	%
UHR-SVS-38	7	Test	12	*Hyalella azteca*	Survival	Day 35	100	%
Control	WB	Control	1	*Hyalella azteca*	Survival	Day 42	90	%
Control	WB	Control	3	*Hyalella azteca*	Survival	Day 42	60	%
Control	WB	Control	5	*Hyalella azteca*	Survival	Day 42	90	%
Control	WB	Control	6	*Hyalella azteca*	Survival	Day 42	90	%
Control	WB	Control	8	*Hyalella azteca*	Survival	Day 42	100	%
Control	WB	Control	9	*Hyalella azteca*	Survival	Day 42	90	%
Control	WB	Control	11	*Hyalella azteca*	Survival	Day 42	80	%
Control	WB	Control	12	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-04	1	Test	1	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-04	1	Test	3	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-04	1	Test	5	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-04	1	Test	6	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-04	1	Test	8	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-04	1	Test	9	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-04	1	Test	11	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-04	1	Test	12	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-112	4	Test	1	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-112	4	Test	3	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-112	4	Test	5	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-112	4	Test	6	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-112	4	Test	8	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-112	4	Test	9	*Hyalella azteca*	Survival	Day 42	70	%
UHR-SVS-112	4	Test	11	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-112	4	Test	12	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-124	5	Test	1	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-124	5	Test	3	*Hyalella azteca*	Survival	Day 42	70	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-124	5	Test	5	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-124	5	Test	6	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-124	5	Test	8	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-124	5	Test	9	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-124	5	Test	11	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-124	5	Test	12	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-127	8	Test	1	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-127	8	Test	3	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-127	8	Test	5	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-127	8	Test	6	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-127	8	Test	8	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-127	8	Test	9	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-127	8	Test	11	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-127	8	Test	12	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-13	6	Test	1	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-13	6	Test	3	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-13	6	Test	5	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-13	6	Test	6	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-13	6	Test	8	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-13	6	Test	9	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-13	6	Test	11	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-13	6	Test	12	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-16/37	11	Test	1	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-16/37	11	Test	3	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-16/37	11	Test	5	*Hyalella azteca*	Survival	Day 42	60	%
UHR-SVS-16/37	11	Test	6	*Hyalella azteca*	Survival	Day 42	50	%
UHR-SVS-16/37	11	Test	8	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-16/37	11	Test	9	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-16/37	11	Test	11	*Hyalella azteca*	Survival	Day 42	70	%
UHR-SVS-16/37	11	Test	12	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-19	2	Test	1	*Hyalella azteca*	Survival	Day 42	70	%
UHR-SVS-19	2	Test	3	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-19	2	Test	5	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-19	2	Test	6	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-19	2	Test	8	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-19	2	Test	9	*Hyalella azteca*	Survival	Day 42	100	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-19	2	Test	11	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-19	2	Test	12	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-24	3	Test	1	*Hyalella azteca*	Survival	Day 42	20	%
UHR-SVS-24	3	Test	3	*Hyalella azteca*	Survival	Day 42	40	%
UHR-SVS-24	3	Test	5	*Hyalella azteca*	Survival	Day 42	50	%
UHR-SVS-24	3	Test	6	*Hyalella azteca*	Survival	Day 42	30	%
UHR-SVS-24	3	Test	8	*Hyalella azteca*	Survival	Day 42	50	%
UHR-SVS-24	3	Test	9	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-24	3	Test	11	*Hyalella azteca*	Survival	Day 42	10	%
UHR-SVS-24	3	Test	12	*Hyalella azteca*	Survival	Day 42	40	%
UHR-SVS-26	9	Test	1	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-26	9	Test	3	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-26	9	Test	5	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-26	9	Test	6	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-26	9	Test	8	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-26	9	Test	9	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-26	9	Test	11	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-26	9	Test	12	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-29/36	12	Test	1	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-29/36	12	Test	3	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-29/36	12	Test	5	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-29/36	12	Test	6	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-29/36	12	Test	8	*Hyalella azteca*	Survival	Day 42	100	%
UHR-SVS-29/36	12	Test	9	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-29/36	12	Test	11	*Hyalella azteca*	Survival	Day 42	70	%
UHR-SVS-29/36	12	Test	12	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-31	10	Test	1	*Hyalella azteca*	Survival	Day 42	70	%
UHR-SVS-31	10	Test	3	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-31	10	Test	5	*Hyalella azteca*	Survival	Day 42	20	%
UHR-SVS-31	10	Test	6	*Hyalella azteca*	Survival	Day 42	20	%
UHR-SVS-31	10	Test	8	*Hyalella azteca*	Survival	Day 42	60	%
UHR-SVS-31	10	Test	9	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-31	10	Test	11	*Hyalella azteca*	Survival	Day 42	70	%
UHR-SVS-31	10	Test	12	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-38	7	Test	1	*Hyalella azteca*	Survival	Day 42	70	%
UHR-SVS-38	7	Test	3	*Hyalella azteca*	Survival	Day 42	90	%

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-38	7	Test	5	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-38	7	Test	6	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-38	7	Test	8	*Hyalella azteca*	Survival	Day 42	80	%
UHR-SVS-38	7	Test	9	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-38	7	Test	11	*Hyalella azteca*	Survival	Day 42	90	%
UHR-SVS-38	7	Test	12	*Hyalella azteca*	Survival	Day 42	100	%
Control	WB	Control	2	*Hyalella azteca*	Weight	Day 28	0.405	mg
Control	WB	Control	4	*Hyalella azteca*	Weight	Day 28	0.494	mg
Control	WB	Control	7	*Hyalella azteca*	Weight	Day 28	0.611	mg
Control	WB	Control	10	*Hyalella azteca*	Weight	Day 28	0.513	mg
UHR-SVS-04	1	Test	2	*Hyalella azteca*	Weight	Day 28	0.474	mg
UHR-SVS-04	1	Test	4	*Hyalella azteca*	Weight	Day 28	0.465	mg
UHR-SVS-04	1	Test	7	*Hyalella azteca*	Weight	Day 28	0.561	mg
UHR-SVS-04	1	Test	10	*Hyalella azteca*	Weight	Day 28	0.504	mg
UHR-SVS-112	4	Test	2	*Hyalella azteca*	Weight	Day 28	0.468	mg
UHR-SVS-112	4	Test	4	*Hyalella azteca*	Weight	Day 28	0.445	mg
UHR-SVS-112	4	Test	7	*Hyalella azteca*	Weight	Day 28	0.55	mg
UHR-SVS-112	4	Test	10	*Hyalella azteca*	Weight	Day 28	0.647	mg
UHR-SVS-124	5	Test	2	*Hyalella azteca*	Weight	Day 28	0.662	mg
UHR-SVS-124	5	Test	4	*Hyalella azteca*	Weight	Day 28	0.513	mg
UHR-SVS-124	5	Test	10	*Hyalella azteca*	Weight	Day 28	0.464	mg
UHR-SVS-127	8	Test	2	*Hyalella azteca*	Weight	Day 28	0.535	mg
UHR-SVS-127	8	Test	4	*Hyalella azteca*	Weight	Day 28	0.444	mg
UHR-SVS-127	8	Test	7	*Hyalella azteca*	Weight	Day 28	0.496	mg
UHR-SVS-127	8	Test	10	*Hyalella azteca*	Weight	Day 28	0.522	mg
UHR-SVS-13	6	Test	2	*Hyalella azteca*	Weight	Day 28	0.422	mg
UHR-SVS-13	6	Test	4	*Hyalella azteca*	Weight	Day 28	0.405	mg
UHR-SVS-13	6	Test	7	*Hyalella azteca*	Weight	Day 28	0.46	mg
UHR-SVS-13	6	Test	10	*Hyalella azteca*	Weight	Day 28	0.449	mg
UHR-SVS-16/37	11	Test	2	*Hyalella azteca*	Weight	Day 28	0.408	mg
UHR-SVS-16/37	11	Test	4	*Hyalella azteca*	Weight	Day 28	0.379	mg
UHR-SVS-16/37	11	Test	7	*Hyalella azteca*	Weight	Day 28	0.349	mg
UHR-SVS-16/37	11	Test	10	*Hyalella azteca*	Weight	Day 28	0.347	mg
UHR-SVS-19	2	Test	2	*Hyalella azteca*	Weight	Day 28	0.356	mg
UHR-SVS-19	2	Test	4	*Hyalella azteca*	Weight	Day 28	0.64	mg
UHR-SVS-19	2	Test	7	*Hyalella azteca*	Weight	Day 28	0.426	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-19	2	Test	10	*Hyalella azteca*	Weight	Day 28	0.517	mg
UHR-SVS-24	3	Test	2	*Hyalella azteca*	Weight	Day 28	0.432	mg
UHR-SVS-24	3	Test	4	*Hyalella azteca*	Weight	Day 28	0.396	mg
UHR-SVS-24	3	Test	7	*Hyalella azteca*	Weight	Day 28	0.509	mg
UHR-SVS-24	3	Test	10	*Hyalella azteca*	Weight	Day 28	0.413	mg
UHR-SVS-26	9	Test	2	*Hyalella azteca*	Weight	Day 28	0.545	mg
UHR-SVS-26	9	Test	4	*Hyalella azteca*	Weight	Day 28	0.441	mg
UHR-SVS-26	9	Test	7	*Hyalella azteca*	Weight	Day 28	0.499	mg
UHR-SVS-26	9	Test	10	*Hyalella azteca*	Weight	Day 28	0.437	mg
UHR-SVS-29/36	12	Test	2	*Hyalella azteca*	Weight	Day 28	0.49	mg
UHR-SVS-29/36	12	Test	4	*Hyalella azteca*	Weight	Day 28	0.46	mg
UHR-SVS-29/36	12	Test	7	*Hyalella azteca*	Weight	Day 28	0.406	mg
UHR-SVS-29/36	12	Test	10	*Hyalella azteca*	Weight	Day 28	0.405	mg
UHR-SVS-31	10	Test	2	*Hyalella azteca*	Weight	Day 28	0.492	mg
UHR-SVS-31	10	Test	4	*Hyalella azteca*	Weight	Day 28	0.471	mg
UHR-SVS-31	10	Test	7	*Hyalella azteca*	Weight	Day 28	0.453	mg
UHR-SVS-31	10	Test	10	*Hyalella azteca*	Weight	Day 28	0.564	mg
UHR-SVS-38	7	Test	2	*Hyalella azteca*	Weight	Day 28	0.477	mg
UHR-SVS-38	7	Test	4	*Hyalella azteca*	Weight	Day 28	0.5	mg
UHR-SVS-38	7	Test	7	*Hyalella azteca*	Weight	Day 28	0.708	mg
UHR-SVS-38	7	Test	10	*Hyalella azteca*	Weight	Day 28	0.517	mg
Control	WB	Control	1	*Hyalella azteca*	Weight	Day 42	0.527	mg
Control	WB	Control	3	*Hyalella azteca*	Weight	Day 42	0.479	mg
Control	WB	Control	5	*Hyalella azteca*	Weight	Day 42	0.508	mg
Control	WB	Control	6	*Hyalella azteca*	Weight	Day 42	0.568	mg
Control	WB	Control	8	*Hyalella azteca*	Weight	Day 42	0.544	mg
Control	WB	Control	9	*Hyalella azteca*	Weight	Day 42	0.555	mg
Control	WB	Control	11	*Hyalella azteca*	Weight	Day 42	0.465	mg
Control	WB	Control	12	*Hyalella azteca*	Weight	Day 42	0.521	mg
UHR-SVS-04	1	Test	1	*Hyalella azteca*	Weight	Day 42	0.422	mg
UHR-SVS-04	1	Test	3	*Hyalella azteca*	Weight	Day 42	0.519	mg
UHR-SVS-04	1	Test	5	*Hyalella azteca*	Weight	Day 42	0.583	mg
UHR-SVS-04	1	Test	6	*Hyalella azteca*	Weight	Day 42	0.603	mg
UHR-SVS-04	1	Test	8	*Hyalella azteca*	Weight	Day 42	0.611	mg
UHR-SVS-04	1	Test	9	*Hyalella azteca*	Weight	Day 42	0.551	mg
UHR-SVS-04	1	Test	11	*Hyalella azteca*	Weight	Day 42	0.6	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-04	1	Test	12	*Hyalella azteca*	Weight	Day 42	0.587	mg
UHR-SVS-112	4	Test	1	*Hyalella azteca*	Weight	Day 42	0.593	mg
UHR-SVS-112	4	Test	3	*Hyalella azteca*	Weight	Day 42	0.628	mg
UHR-SVS-112	4	Test	5	*Hyalella azteca*	Weight	Day 42	0.68	mg
UHR-SVS-112	4	Test	6	*Hyalella azteca*	Weight	Day 42	0.71	mg
UHR-SVS-112	4	Test	8	*Hyalella azteca*	Weight	Day 42	0.575	mg
UHR-SVS-112	4	Test	9	*Hyalella azteca*	Weight	Day 42	0.637	mg
UHR-SVS-112	4	Test	11	*Hyalella azteca*	Weight	Day 42	0.521	mg
UHR-SVS-112	4	Test	12	*Hyalella azteca*	Weight	Day 42	0.601	mg
UHR-SVS-124	5	Test	1	*Hyalella azteca*	Weight	Day 42	0.563	mg
UHR-SVS-124	5	Test	3	*Hyalella azteca*	Weight	Day 42	0.527	mg
UHR-SVS-124	5	Test	5	*Hyalella azteca*	Weight	Day 42	0.587	mg
UHR-SVS-124	5	Test	6	*Hyalella azteca*	Weight	Day 42	0.547	mg
UHR-SVS-124	5	Test	8	*Hyalella azteca*	Weight	Day 42	0.563	mg
UHR-SVS-124	5	Test	9	*Hyalella azteca*	Weight	Day 42	0.408	mg
UHR-SVS-124	5	Test	11	*Hyalella azteca*	Weight	Day 42	0.534	mg
UHR-SVS-124	5	Test	12	*Hyalella azteca*	Weight	Day 42	0.585	mg
UHR-SVS-127	8	Test	1	*Hyalella azteca*	Weight	Day 42	0.475	mg
UHR-SVS-127	8	Test	3	*Hyalella azteca*	Weight	Day 42	0.494	mg
UHR-SVS-127	8	Test	5	*Hyalella azteca*	Weight	Day 42	0.604	mg
UHR-SVS-127	8	Test	6	*Hyalella azteca*	Weight	Day 42	0.646	mg
UHR-SVS-127	8	Test	8	*Hyalella azteca*	Weight	Day 42	0.474	mg
UHR-SVS-127	8	Test	9	*Hyalella azteca*	Weight	Day 42	0.49	mg
UHR-SVS-127	8	Test	11	*Hyalella azteca*	Weight	Day 42	0.745	mg
UHR-SVS-127	8	Test	12	*Hyalella azteca*	Weight	Day 42	0.653	mg
UHR-SVS-13	6	Test	1	*Hyalella azteca*	Weight	Day 42	0.561	mg
UHR-SVS-13	6	Test	3	*Hyalella azteca*	Weight	Day 42	0.479	mg
UHR-SVS-13	6	Test	5	*Hyalella azteca*	Weight	Day 42	0.438	mg
UHR-SVS-13	6	Test	6	*Hyalella azteca*	Weight	Day 42	0.612	mg
UHR-SVS-13	6	Test	8	*Hyalella azteca*	Weight	Day 42	0.479	mg
UHR-SVS-13	6	Test	9	*Hyalella azteca*	Weight	Day 42	0.525	mg
UHR-SVS-13	6	Test	11	*Hyalella azteca*	Weight	Day 42	0.519	mg
UHR-SVS-13	6	Test	12	*Hyalella azteca*	Weight	Day 42	0.443	mg
UHR-SVS-16/37	11	Test	1	*Hyalella azteca*	Weight	Day 42	0.422	mg
UHR-SVS-16/37	11	Test	3	*Hyalella azteca*	Weight	Day 42	0.468	mg
UHR-SVS-16/37	11	Test	5	*Hyalella azteca*	Weight	Day 42	0.336	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-16/37	11	Test	6	*Hyalella azteca*	Weight	Day 42	0.536	mg
UHR-SVS-16/37	11	Test	8	*Hyalella azteca*	Weight	Day 42	0.442	mg
UHR-SVS-16/37	11	Test	9	*Hyalella azteca*	Weight	Day 42	0.535	mg
UHR-SVS-16/37	11	Test	11	*Hyalella azteca*	Weight	Day 42	0.396	mg
UHR-SVS-16/37	11	Test	12	*Hyalella azteca*	Weight	Day 42	0.509	mg
UHR-SVS-19	2	Test	1	*Hyalella azteca*	Weight	Day 42	0.551	mg
UHR-SVS-19	2	Test	3	*Hyalella azteca*	Weight	Day 42	0.445	mg
UHR-SVS-19	2	Test	5	*Hyalella azteca*	Weight	Day 42	0.603	mg
UHR-SVS-19	2	Test	6	*Hyalella azteca*	Weight	Day 42	0.545	mg
UHR-SVS-19	2	Test	8	*Hyalella azteca*	Weight	Day 42	0.546	mg
UHR-SVS-19	2	Test	9	*Hyalella azteca*	Weight	Day 42	0.488	mg
UHR-SVS-19	2	Test	11	*Hyalella azteca*	Weight	Day 42	0.494	mg
UHR-SVS-19	2	Test	12	*Hyalella azteca*	Weight	Day 42	0.363	mg
UHR-SVS-24	3	Test	1	*Hyalella azteca*	Weight	Day 42	0.475	mg
UHR-SVS-24	3	Test	3	*Hyalella azteca*	Weight	Day 42	0.516	mg
UHR-SVS-24	3	Test	5	*Hyalella azteca*	Weight	Day 42	0.453	mg
UHR-SVS-24	3	Test	6	*Hyalella azteca*	Weight	Day 42	0.417	mg
UHR-SVS-24	3	Test	8	*Hyalella azteca*	Weight	Day 42	0.65	mg
UHR-SVS-24	3	Test	9	*Hyalella azteca*	Weight	Day 42	0.43	mg
UHR-SVS-24	3	Test	11	*Hyalella azteca*	Weight	Day 42	0.535	mg
UHR-SVS-24	3	Test	12	*Hyalella azteca*	Weight	Day 42	0.513	mg
UHR-SVS-26	9	Test	1	*Hyalella azteca*	Weight	Day 42	0.494	mg
UHR-SVS-26	9	Test	3	*Hyalella azteca*	Weight	Day 42	0.424	mg
UHR-SVS-26	9	Test	5	*Hyalella azteca*	Weight	Day 42	0.634	mg
UHR-SVS-26	9	Test	6	*Hyalella azteca*	Weight	Day 42	0.485	mg
UHR-SVS-26	9	Test	8	*Hyalella azteca*	Weight	Day 42	0.553	mg
UHR-SVS-26	9	Test	9	*Hyalella azteca*	Weight	Day 42	0.573	mg
UHR-SVS-26	9	Test	11	*Hyalella azteca*	Weight	Day 42	0.518	mg
UHR-SVS-26	9	Test	12	*Hyalella azteca*	Weight	Day 42	0.379	mg
UHR-SVS-29/36	12	Test	1	*Hyalella azteca*	Weight	Day 42	0.562	mg
UHR-SVS-29/36	12	Test	3	*Hyalella azteca*	Weight	Day 42	0.55	mg
UHR-SVS-29/36	12	Test	5	*Hyalella azteca*	Weight	Day 42	0.543	mg
UHR-SVS-29/36	12	Test	6	*Hyalella azteca*	Weight	Day 42	0.501	mg
UHR-SVS-29/36	12	Test	8	*Hyalella azteca*	Weight	Day 42	0.499	mg
UHR-SVS-29/36	12	Test	9	*Hyalella azteca*	Weight	Day 42	0.465	mg
UHR-SVS-29/36	12	Test	11	*Hyalella azteca*	Weight	Day 42	0.485	mg

Table A4-1. Raw replicate toxicity results from the Columbia Environmental Research Center (CERC).

Station ID	CERC ID	Station Type	Rep.	Species	Endpoint	Test Day	Value	Units
UHR-SVS-29/36	12	Test	12	*Hyalella azteca*	Weight	Day 42	0.446	mg
UHR-SVS-31	10	Test	1	*Hyalella azteca*	Weight	Day 42	0.52	mg
UHR-SVS-31	10	Test	3	*Hyalella azteca*	Weight	Day 42	0.563	mg
UHR-SVS-31	10	Test	5	*Hyalella azteca*	Weight	Day 42	0.647	mg
UHR-SVS-31	10	Test	6	*Hyalella azteca*	Weight	Day 42	0.537	mg
UHR-SVS-31	10	Test	8	*Hyalella azteca*	Weight	Day 42	0.482	mg
UHR-SVS-31	10	Test	9	*Hyalella azteca*	Weight	Day 42	0.705	mg
UHR-SVS-31	10	Test	11	*Hyalella azteca*	Weight	Day 42	0.47	mg
UHR-SVS-31	10	Test	12	*Hyalella azteca*	Weight	Day 42	0.524	mg
UHR-SVS-38	7	Test	1	*Hyalella azteca*	Weight	Day 42	0.684	mg
UHR-SVS-38	7	Test	3	*Hyalella azteca*	Weight	Day 42	0.528	mg
UHR-SVS-38	7	Test	5	*Hyalella azteca*	Weight	Day 42	0.497	mg
UHR-SVS-38	7	Test	6	*Hyalella azteca*	Weight	Day 42	0.536	mg
UHR-SVS-38	7	Test	8	*Hyalella azteca*	Weight	Day 42	0.624	mg
UHR-SVS-38	7	Test	9	*Hyalella azteca*	Weight	Day 42	0.538	mg
UHR-SVS-38	7	Test	11	*Hyalella azteca*	Weight	Day 42	0.614	mg
UHR-SVS-38	7	Test	12	*Hyalella azteca*	Weight	Day 42	0.654	mg

Rep = Replicate

Table A4-2. Overlying water quality data for the 42-day toxicity test with *Hyalella azteca.*

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
1	0	23	6.8	190	7.92	72	0.392	0.0156	102
1	3	23	7.0	190	7.88				
1	6	23	6.8	204	8.05				
1	8	23	7.0	205	8.06				
1	10	23	7.6	212	8				
1	14	23	7.2	225					
1	18	23	7.0	220					
1	20	23	6.8	227					
1	22	23	6.6	225					
1	24	23	6.6	225					
1	27	23	7.5	236	8.15	86	0.0971	0.00637	106
1	31	23	7.8	220					
1	35	23	8.7	221	8.15	92	0.254	0.0167	102
1	38	23	7.3	222					
1	41	23	7.8	225	8.13	82	0.434	0.0273	104
2	0	23	7.0	202	8	70	0.277	0.0131	104
2	3	23	7.1	196	7.95				
2	6	23	6.9	206	8.09				
2	8	23	7.2	207	8				
2	10	23	7.9	216	7.97				
2	14	23	7.5	217					
2	18	23	7.4	217					
2	20	23	7.1	220					
2	22	23	6.8	221					
2	24	23	6.9	220					
2	27	23	7.5	231	8.09	84	0.113	0.00651	104
2	31	23	7.7	220					
2	35	23	8.7	220	8.14	82	0.161	0.0103	104
2	38	23	7.3	224					
2	41	23	8.0	224	8.18	84	0.372	0.0260	106
3*	0	23	8.2	213	8.03	76	0.131	0.131	102
3*	4	23	6.7	224					
3*	6	23	7.3	215					
3*	8	23	7.3	227					
3*	10	23	6.5	227					
3*	13	23	7.2	221					
3*	15	23	7.2	223					
3*	17	23	7.3	226					
3*	22	23	6.7	222					
3*	24	23	5.9	222					
3*	27	23	7.2	225	7.9	90	0.0535	0.00203	106
3*	34	23	7.7	208	8.21	82	0.0929	0.00693	104
3*	41	23	8.3	206	7.94	82	0.307	0.0127	108
4	0	23	7.0	204	8	70	0.374	0.0177	100
4	3	23	6.2	195	7.8				
4	6	23	7.0	205	8.1				

Table A4-2. Overlying water quality data for the 42-day toxicity test with *Hyalella azteca.*

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
4	8	23	7.2	203	8.03				
4	10	23	7.9	213	7.99				
4	14	23	7.7	216					
4	18	23	7.2	215					
4	20	23	7.1	217					
4	22	23	7.0	222					
4	24	23	6.6	218					
4	27	23	7.7	223	8.04	80	0.158	0.00817	104
4	31	23	7.7	220					
4	35	23	8.7	220	8.09	86	0.114	0.00657	104
4	38	23	7.3	221					
4	41	23	7.9	223	8.16	86	0.422	0.0283	102
5	0	23	7.1	196	7.97	70	0.346	0.0153	102
5	3	23	7.1	190	7.94				
5	6	23	6.8	201	8.02				
5	8	23	7.1	201	8.01				
5	10	23	7.4	218	7.9				
5	14	23	7.5	213					
5	18	23	7.3	215					
5	20	23	6.9	220					
5	22	23	6.6	221					
5	24	23	6.7	224					
5	27	23	7.7	233	8.1	84	0.153	0.00901	100
5	31	23	7.8	218					
5	35	23	8.8	220	8.1	84	0.141	0.00830	114
5	38	23	7.4	216					
5	41	23	8.0	223	7.95	90	0.405	0.0172	102
6*	0	23	7.9	219	8.01	78	0.148	0.00716	106
6*	4	23	7.0	219					
6*	6	23	7.3	211					
6*	8	23	7.6	223					
6*	10	23	6.8	227					
6*	13	23	6.9	223					
6*	15	23	7.0	222					
6*	17	23	7.0	224					
6*	22	23	6.8	225					
6*	24	23	5.4	232					
6*	27	23	7.2	220	7.87	80	0.0458	0.00163	102
6*	34	23	7.7	212	8.2	90	0.185	0.0135	100
6*	41	23	7.9	207	8	80	0.215	0.0102	100
7*	0	23	8.0	220	8.03	76	0.242	0.0122	
7*	4	23	6.8	224					
7*	6	23	7.1	216					
7*	8	23	6.6	218					
7*	10	23	6.2	229					
7*	13	23	6.5	223					

Table A4-2. Overlying water quality data for the 42-day toxicity test with *Hyalella azteca.*

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
7*	15	23	6.7	223					
7*	17	23	7.0	228					
7*	22	23	6.6	220					
7*	24	23	5.2	224					
7*	27	23	7.6	227	7.96	80	0.0381	0.00165	106
7*	34	23	7.9	216	8.19	84	0.282	0.0202	108
7*	41	23	8.0	209	8.01	80	0.442	0.0214	100
8	0	23	6.9	197	8	70	0.248	0.0117	102
8	3	23	6.8	191	7.94				
8	6	23	6.8	201	8.07				
8	8	23	7.0	203	8.16				
8	10	23	6.9	216	7.9				
8	14	23	7.4	218					
8	18	23	7.2	218					
8	20	23	6.7	222					
8	22	23	6.5	225					
8	24	23	6.3	220					
8	27	23	7.5	226	8.02	84	0.164	0.00811	104
8	31	23	7.8	219					
8	35	23	8.7	220	8.06	82	0.093	0.00502	110
8	38	23	7.3	220					
8	41	23	8.1	225	8.09	82	0.335	0.0193	104
9*	0	23	8.0	215	8.05	78	0.325	0.0172	106
9*	4	23	7.0	222					
9*	6	23	6.9	217					
9*	8	23	6.9	216					
9*	10	23	6.2	226					
9*	13	23	6.9	223					
9*	15	23	6.9	224					
9*	17	23	7.0	221					
9*	22	23	6.4	230					
9*	24	23	6.6	228					
9*	27	23	6.7	223	7.92	84	0.0368	0.00146	102
9*	34	23	7.9	208	8.19	82	0.157	0.0112	100
9*	41	23	8.3	207	7.9	80	0.464	0.0176	96
10*	0	23	8.2	214	8.03	78	0.149	0.00754	104
10*	4	23	6.8	221					
10*	6	23	7.1	220					
10*	8	23	7.0	216					
10*	10	23	6.2	227					
10*	13	23	6.8	229					
10*	15	23	7.0	224					
10*	17	23	7.0	225					
10*	22	23	6.5	225					
10*	24	23	5.4	230					
10*	27	23	6.9	225	7.89	82	0.0405	0.00150	104

Table A4-2. Overlying water quality data for the 42-day toxicity test with *Hyalella azteca.*

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
10*	34	23	7.7	206	8.24	82	0.143	0.01137	100
10*	41	23	8.2	207	7.99	84	0.351	0.0163	104
11*	0	23	7.9	213	8.03	78	0.212	0.0107	104
11*	4	23	6.7	220					
11*	6	23	6.9	216					
11*	8	23	6.3	223					
11*	10	23	5.8	223					
11*	13	23	6.8	223					
11*	15	23	6.6	222					
11*	17	23	6.7	226					
11*	22	23	6.5	224					
11*	24	23	5.3	232					
11*	27	23	6.7	233	8.06	90	0.0509	0.00275	108
11*	34	23	7.5	209	8.17	80	0.16	0.0110	102
11*	41	23	8.1	208	8.04	78	0.185	0.00956	102
12	0	23	7.0	198	8.07	72	0.337	0.0186	100
12	3	23	7.2	190	7.97				
12	6	23	7.0	205	8.06				
12	8	23	7.2	207	8.03				
12	10	23	7.7	214	8				
12	14	23	6.6	233					
12	18	23	6.4	233					
12	20	23	6.9	233					
12	22	23	6.6	226					
12	24	23	5.8	231					
12	27	23	7.5	226	8.24	90	0.167	0.0133	108
12	31	23	7.7	221					
12	35	23	8.8	223	8.14	80	0.147	0.00944	110
12	38	23	7.3	221					
12	41	23	8.0	224	8.08	90	0.38	0.0214	100
WB	0	23	7.1	190	7.95	76	0.277	0.0118	120
WB	3	23	8.0	190	7.9				
WB	6	23	7.0	204	8.01				
WB	8	23	6.9	203	7.99				
WB	10	23	7.3	213	7.95				
WB	14	23	7.7	218					
WB	18	23	7.4	216					
WB	20	23	7.2	221					
WB	22	23	7.0	221					
WB	24	23	6.3	220					
WB	27	23	7.9	227	8.11	88	0.178	0.0107	104
WB	31	23	7.8	219					
WB	35	23	8.7	224	8.14	88	0.256	0.0164	108
WB	38	23	7.2	221					
WB	41	23	7.8	225	8.04	90	0.471	0.0243	106
WB*	0	23	8.2	213	8.08	78	0.144	0.00812	104

Table A4-2. Overlying water quality data for the 42-day toxicity test with *Hyalella azteca.*

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
WB*	4	23	6.9	219					
WB*	6	23	7.4	215					
WB*	8	23	7.4	220					
WB*	10	23	6.6	225					
WB*	13	23	7.0	226					
WB*	15	23	7.1	224					
WB*	17	23	7.3	221					
WB*	22	23	7.0	220					
WB*	24	23	6.1	224					
WB*	27	23	7.4	228	7.96	100	0.0105	0.000455	108
WB*	34	23	7.8	231	8.17	92	0.36	0.0247	110
WB*	41	23	8.2	211	8.05	84	0.19	0.0100	102

*Test was restarted for this treatment due to a diluter malfunction.

Table A4-3. Overlying water quality data for the ~53-day toxicity test with *Chironomus dilutus.*

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
1	0	23	6.8	190	7.92	78.5	0.392	0.0156	102
1	3	23	7.1	197	8.04				
1	6	23	6.5	202	8				
1	8	23	6.1	209	7.78				
1	10	23	8.5	212	8.23				
1	13	23	5.7	224	7.78	84	0.043	0.00125	110
1	18	23	6.5	210	7.95				
1	20	23	5.3	224	7.85				
1	22	23	5.2	243	8.09				
1	24	23	3.7	240	7.73				
1	27	23	5.3	231	8.16				
1	29	23	6.4	229	8.05				
1	31	23	5.2	217	8				
1	36	23	6.4	226	8.19				
1	38	23	6.5	216	7.95				
1	41	23	7.1	224	8.12				
1	50	23	6.1	207	7.59	73	0.066	0.00125	104
2	0	23	7.0	202	8	70	0.277	0.0131	104
2	3	23	7.1	197	8.05				
2	6	23	6.6	207	8.02				
2	8	23	5.7	213	7.81				
2	10	23	8.5	214	8.19				
2	13	23	5.9	218	7.7	78	0.016	0.000389	110
2	18	23	6.0	223	7.92				
2	20	23	5.6	220	7.46				
2	22	23	5.4	228	8.02				
2	24	23	4.3	227	7.7				
2	27	23	6.1	226	7.95				
2	29	23	6.9	220	8.03				
2	31	23	5.8	222	7.98				
2	36	23	6.2	246	8.3				
2	38	23	6.5	204	7.99				
2	41	23	5.9	221	8.01				
2	50	23	5.6	216	7.61	74	0.157	0.00312	104
3	0	23	7.1	194	8.07	70	0.324	0.0179	98
3	3	23	7.0	194	8.04				
3	6	23	6.4	204	7.95				
3	8	23	5.8	208	7.82				
3	10	23	8.2	213	8.06				
3	13	23	5.6	212	7.68	76	0.022	0.000511	102
3	18	23	6.3	218	7.93				
3	20	23	5.4	217	7.68				
3	22	23	5.2	229	7.95				
3	24	23	3.3	220	7.58				
3	27	23	5.6	222	7.88				

Table A4-3. Overlying water quality data for the ~53-day toxicity test with *Chironomus dilutus.*

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
3	29	23	6.6	222	8.03				
3	31	23	6.4	218	7.98				
3	36	23	5.4	228	8.04				
3	38	23	6.9	207	7.99				
3	41	23	6.8	216	8.06				
3	50	23	6.2	213	7.67	74	0.0753	0.00171	102
4	0	23	7.0	204	8	70	0.374	0.0177	100
4	3	23	7.3	202	8.07				
4	6	23	6.5	216	8				
4	8	23	5.9	223	7.86				
4	10	23	8.5	215	8.18				
4	13	23	5.8	218	7.76	78	0.023	0.000640	106
4	18	23	6.3	223	7.89				
4	20	23	6.1	218	7.78				
4	22	23	5.6	230	8.02				
4	24	23	3.8	222	7.62				
4	27	23	5.7	225	7.91				
4	29	23	6.1	222	7.92				
4	31	23	5.8	220	7.91				
4	36	23	6.2	231	8.14				
4	38	23	5.9	216	7.91				
4	41	23	6.9	218	8.11				
4	50	23	5.4	213	7.54	72	0.071	0.00120	104
5	0	23	7.1	196	7.97	70	0.346	0.0153	102
5	3	23	7.0	197	8.05				
5	6	23	6.2	208	7.86				
5	8	23	5.4	215	7.8				
5	10	23	8.3	214	8.14				
5	13	23	5.7	213	7.69	76	0.059	0.00140	103
5	18	23	6.3	214	7.88				
5	20	23	6.0	224	7.77				
5	22	23	5.8	241	8.11				
5	24	23	3.6	223	7.62				
5	27	23	6.2	230	8.02				
5	29	23	6.7	2333	8.08				
5	31	23	5.9	227	7.98				
5	36	23	5.9	236	8.16				
5	38	23	6.6	218	8.15				
5	41	23	6.9	224	8.11				
5	50	23	6.6	202	7.67	74	0.292	0.00664	100
6	0	23	6.7	196	7.81	70	0.263	0.00818	104
6	3	23	6.7	196	7.94				
6	6	23	6.5	204	7.94				
6	8	23	5.4	213	7.8				
6	10	23	8.3	212	8.12				

Table A4-3. Overlying water quality data for the ~53-day toxicity test with *Chironomus dilutus.*

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
6	13	23	5.6	215	7.69	76	0.065	0.00154	100
6	18	23	6.3	225	7.96				
6	20	23	5.6	216	7.68				
6	22	23	4.8	223	7.97				
6	24	23	4.2	223	7.68				
6	27	23	6.0	222	7.96				
6	29	23	6.7	222	7.98				
6	31	23	6.4	218	7.99				
6	36	23	6.1	223	8.21				
6	38	23	6.0	214	7.88				
6	41	23	7.2	213	8.12				
6	50	23	4.7	227	7.55	80	0.0722	0.00125	80
7	0	23	6.7	197	7.97	70	0.427	0.0189	104
7	3	23	6.9	196	8				
7	6	23	6.4	206	7.92				
7	8	23	5.5	215	7.81				
7	10	23	8.1	209	8.11				
7	13	23	6.1	217	7.73	78	0.069	0.00179	106
7	18	23	5.8	213	7.91				
7	20	23	5.6	2221	7.74				
7	22	23	5.7	228	8.03				
7	24	23	2.7	223	7.53				
7	27	23	5.9	220	7.92				
7	29	23	5.5	224	7.81				
7	31	23	5.3	219	7.95				
7	36	23	5.5	226	8.19				
7	38	23	6.4	214	7.91				
7	41	23	6.6	220	8.09				
7	50	23	5.9	208	7.52	72	0.0495	0.000802	100
8	0	23	6.9	197	8	70	0.248	0.0117	102
8	3	23	7.1	195	8.03				
8	6	23	5.1	211	7.71				
8	8	23	5.7	210	7.84				
8	10	23	8.1	216	8.14				
8	13	23	6.1	214	7.77	78	0.023	0.000654	104
8	18	23	4.6	217	7.81				
8	20	23	4.5	224	7.65				
8	22	23	5.5	222	7.98				
8	24	23	4.0	221	7.63				
8	27	23	4.4	226	7.82				
8	29	23	6.2	220	7.92				
8	31	23	5.3	219	7.94				
8	36	23	6.3	230	8.18				
8	38	23	6.5	216	7.95				
8	41	23	6.6	217	8.12				

Table A4-3. Overlying water quality data for the ~53-day toxicity test with *Chironomus dilutus.*

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
8	50	23	3.1	229	7.51	72	0.352	0.00557	106
9	0	23	6.9	197	8	70	0.621	0.0294	128
9	3	23	6.8	196	7.98				
9	6	23	6.0	205	7.78				
9	8	23	5.5	211	7.81				
9	10	23	8.1	220	8.13				
9	13	23	6.0	212	7.74	76	0.017	0.000452	104
9	18	23	6.4	222	7.99				
9	20	23	5.0	222	7.7				
9	22	23	5.7	229	8.14				
9	24	23	5.0	229	7.76				
9	27	23	6.1	222	8.04				
9	29	23	6.0	223	7.93				
9	31	23	5.6	222	7.95				
9	36	23	6.2	228	8.18				
9	38	23	5.8	222	7.88				
9	41	23	6.6	220	8.14				
9	50	23	5.8	207	7.65	76	0.0759	0.00165	100
10	0	23	6.8	210	8.04	70	0.483	0.0250	108
10	3	23	6.8	201	7.96				
10	6	23	6.7	205	7.91				
10	8	23	5.6	210	7.86				
10	10	23	8.1	210	8.15				
10	13	23	5.9	213	7.49	78	0.049	0.000741	102
10	18	23	6.6	228	8.07				
10	20	23	5.0	222	7.69				
10	22	23	5.8	227	8.14				
10	24	23	3.1	222	7.56				
10	27	23	6.4	224	8.06				
10	29	23	6.1	222	7.92				
10	31	23	6.0	222	8.02				
10	36	23	6.2	228	8.24				
10	38	23	6.0	215	7.84				
10	41	23	6.7	218	8.1				
10	50	23	6.2	217	7.61	80	0.112	0.00222	80
11	0	23	6.7	202	8	70	0.491	0.0233	96
11	3	23	6.8	198	7.99				
11	6	23	6.2	207	7.83				
11	8	23	5.0	212	7.8				
11	10	23	8.2	212	8.11				
11	13	23	5.6	212	7.67	76	0.028	0.000636	102
11	18	23	6.2	214	7.93				
11	20	23	5.3	220	7.72				
11	22	23	4.5	235	8.04				
11	24	23	3.4	231	7.64				

Table A4-3. Overlying water quality data for the ~53-day toxicity test with *Chironomus dilutus.*

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
11	27	23	5.3	228	7.99				
11	29	23	5.9	227	7.96				
11	31	23	5.9	228	8.12				
11	36	23	6.0	235	8.18				
11	38	23	5.8	224	7.88				
11	41	23	6.7	218	8.11				
11	50	23	5.6	213	7.59	77	0.0789	0.00150	102
12	0	23	7.0	198	8.07	72	0.337	0.0186	100
12	3	23	6.8	199	8.01				
12	6	23	6.5	211	7.86				
12	8	23	5.7	218	7.86				
12	10	23	8.0	213	8.19				
12	13	23	4.2	213	7.53	76	0.04	0.000663	100
12	18	23	6.7	219	7.99				
12	20	23	4.5	228	7.69				
12	22	23	5.8	231	8.21				
12	24	23	3.8	233	7.69				
12	27	23	6.2	226	7.99				
12	29	23	6.2	223	7.85				
12	31	23	5.5	227	8.02				
12	36	23	6.2	245	8.14				
12	38	23	6.0	219	7.82				
12	41	23	6.9	221	8.1				
12	50	23	6.5	208	7.67	74	0.0789	0.00179	100
WB	0	23	7.1	190	7.95	76	0.277	0.0118	120
WB	3	23	6.9	199	8.07				
WB	6	23	6.5	203	7.9				
WB	8	23	6.1	206	7.91				
WB	10	23	8.3	212	8.17				
WB	13	23	6.4	212	7.78	76	0.028	0.000814	100
WB	18	23	6.5	215	8				
WB	20	23	6.1	218	7.75				
WB	22	23	5.9	220	8.02				
WB	24	23	4.4	220	7.69				
WB	27	23	6.5	220	8.03				
WB	29	23	6.5	219	7.95				
WB	31	23	5.4	221	7.91				
WB	36	23	6.6	241	8.36				
WB	38	23	6.5	217	7.98				
WB	41	23	7.4	217	8.13				
WB	50	23	6.0	213	7.67	74	0.162	0.00368	102

Table A4-4. Overlying water quality data for male-only beakers from the ~53-day toxicity test with *Chironomus dilutus.* [1]

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
1	0	23	7.9	206	7.81	70	0.303	0.00942	108
1	3	23	7.2	202	8.09				
1	5	23	5.6	207	7.76				
1	7	23	7.4	218	7.98				
1	11	23	4.5	221	7.68				
1	15	23	6.4	221	8.07				
1	17	23	4.9	224	7.78				
1	19	23	5.0	232	8.23				
1	21	23	4.6	231	7.88				
1	24	23	5.3	231	7.8				
1	26	23	6.5	227	8.03				
1	28	23	6.0	224	7.82				
1	33	23	6.6	231	8.37				
1	35	23	3.7	233	7.85				
1	38	23	4.7	234	8.01				
1	40	23	6.8	225	8.11				
2	0	23	8.0	210	8	70	0.153	0.00725	106
2	3	23	7.2	207	8.15				
2	5	23	5.3	217	7.77				
2	7	23	7.1	215	7.97				
2	11	23	7.3	216	8.05				
2	15	23	5.8	217	7.95				
2	17	23	6.0	222	7.91				
2	19	23	5.2	234	8.08				
2	21	23	2.7	232	7.62				
2	24	23	5.5	227	7.86				
2	26	23	7.0	226	8.01				
2	28	23	5.4	223	8.07				
2	33	23	6.5	231	8.21				
2	35	23	4.3	227	7.76				
2	38	23	4.8	225	7.99				
2	40	23	5.8	230	7.94				
3	0	23	7.9	202	8.08	72	0.201	0.0113	104
3	3	23	7.1	203	8.1				
3	5	23	4.6	212	7.69				
3	7	23	6.9	218	7.94				
3	11	23	7.1	212	7.95				
3	15	23	6.2	225	8.04				
3	17	23	5.6	218	7.84				
3	19	23	5.4	230	8				
3	21	23	2.5	224	7.58				
3	24	23	5.2	222	7.79				
3	26	23	7.2	219	8.02				
3	28	23	6.1	218	8.05				

Table A4-4. Overlying water quality data for male-only beakers from the ~53-day toxicity test with *Chironomus dilutus.* [1]

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
3	33	23	6.5	240	8.24				
3	35	23	4.4	220	7.71				
3	38	23	5.5	222	7.98				
3	40	23	6.0	218	7.92				
4	0	23	7.9	210	8.04	70	0.185	0.00956	104
4	3	23	7.2	203	8.15				
4	5	23	4.7	213	7.73				
4	7	23	6.8	223	7.92				
4	11	23	5.5	215	7.74				
4	15	23	6.5	217	8.08				
4	17	23	5.8	217	7.82				
4	19	23	5.2	223	8.11				
4	21	23	3.2	220	7.6				
4	24	23	5.0	230	7.84				
4	26	23	6.7	217	7.9				
4	28	23	6.3	216	8.04				
4	33	23	6.5	227	8.24				
4	35	23	4.5	221	7.79				
4	38	23	5.4	221	7.94				
4	40	23	6.4	218	7.99				
5	0	23	7.8	203	7.98	70	0.211	0.00956	102
5	3	23	7.0	202	8.06				
5	5	23	4.6	209	7.73				
5	7	23	6.6	211	7.88				
5	11	23	5.3	209	7.72				
5	15	23	6.5	212	8.03				
5	17	23	6.0	219	7.85				
5	19	23	5.3	229	8.06				
5	21	23	4.1	222	7.78				
5	24	23	6.0	224	7.96				
5	26	23	6.5	222	7.95				
5	28	23	5.4	223	8.04				
5	33	23	6.2	231	8.28				
5	35	23	4.0	221	7.73				
5	38	23	5.3	227	7.84				
5	40	23	5.7	225	7.92				
6	0	23	7.8	197	8.03	70	0.106	0.00536	100
6	3	23	7.2	202	8.2				
6	5	23	4.9	208	7.7				
6	7	23	7.6	210	7.98				
6	11	23	5.5	213	7.7				
6	15	23	7.0	208	8.15				
6	17	23	6.0	217	7.81				
6	19	23	5.9	231	8.27				

Table A4-4. Overlying water quality data for male-only beakers from the ~53-day toxicity test with *Chironomus dilutus.* [1]

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
6	21	23	4.0	223	7.71				
6	24	23	5.7	218	7.93				
6	26	23	6.9	218	7.97				
6	28	23	6.1	225	7.94				
6	33	23	6.7	231	8.34				
6	35	23	5.3	218	7.8				
6	38	23	5.8	220	8.02				
6	40	23	6.4	218	7.96				
7	0	23	7.8	202	7.94	70	0.182	0.00755	106
7	3	23	7.3	204	8.09				
7	5	23	5.2	208	7.7				
7	7	23	7.1	211	7.92				
7	11	23	5.7	209	7.7				
7	15	23	6.9	210	8.12				
7	17	23	5.1	218	7.77				
7	19	23	5.7	224	8.13				
7	21	23	4.5	225	7.8				
7	24	23	5.5	224	7.99				
7	26	23	6.5	225	8				
7	28	23	6.0	220	7.99				
7	33	23	6.9	226	8.31				
7	35	23	4.3	219	7.77				
7	38	23	5.9	224	8.04				
7	40	23	6.3	221	7.98				
8	0	23	7.8	202	7.94	70	0.11	0.00456	100
8	3	23	7.4	202	8.19				
8	5	23	4.5	216	7.64				
8	7	23	6.6	215	7.88				
8	11	23	6.7	214	7.87				
8	15	23	6.5	213	8.1				
8	17	23	5.8	223	7.85				
8	19	23	5.6	223	8.07				
8	21	23	3.8	227	7.7				
8	24	23	5.9	222	7.96				
8	26	23	6.6	220	7.92				
8	28	23	4.9	223	7.9				
8	33	23	6.7	228	8.28				
8	35	23	3.3	223	7.74				
8	38	23	5.4	223	7.97				
8	40	23	6.0	220	7.93				
9	0	23	7.8	204	8.05	70	0.187	0.00988	110
9	3	23	7.2	205	8.14				
9	5	23	3.9	227	7.63				
9	7	23	6.0	209	7.81				

Table A4-4. Overlying water quality data for male-only beakers from the ~53-day toxicity test with *Chironomus dilutus.* [1]

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
9	11	23	6.5	211	7.82				
9	15	23	5.8	220	7.99				
9	17	23	5.4	221	7.84				
9	19	23	5.8	235	8.1				
9	21	23	3.8	226	7.77				
9	24	23	6.0	224	8.06				
9	26	23	6.9	221	7.95				
9	28	23	6.1	222	8.06				
9	33	23	6.4	226	8.22				
9	35	23	3.8	220	7.79				
9	38	23	4.3	229	7.9				
9	40	23	6.1	220	7.97				
10	0	23	7.8	203	7.93	70	0.181	0.00735	100
10	3	23	6.9	202	8.01				
10	5	23	4.8	207	7.71				
10	7	23	6.8	210	7.89				
10	11	23	4.0	217	8.82				
10	15	23	6.6	222	8.14				
10	17	23	4.7	216	7.71				
10	19	23	5.8	228	8.13				
10	21	23	3.2	224	7.66				
10	24	23	5.9	219	8.02				
10	26	23	6.6	220	7.94				
10	28	23	4.9	215	7.86				
10	33	23	6.6	226	8.26				
10	35	23	3.9	225	7.81				
10	38	23	5.7	224	8.05				
10	40	23	6.7	221	8.03				
11	0	23	7.6	203	7.97	70	0.195	0.00865	106
11	3	23	7.0	201	8.02				
11	5	23	5.1	209	7.68				
11	7	23	6.9	209	7.91				
11	11	23	4.7	210	7.58				
11	15	23	6.7	215	8.1				
11	17	23	4.6	217	7.74				
11	19	23	4.6	232	8.01				
11	21	23	3.2	226	7.71				
11	24	23	5.3	225	8.04				
11	26	23	6.3	217	7.95				
11	28	23	5.5	222	8.03				
11	33	23	6.4	233	8.26				
11	35	23	3.7	227	7.82				
11	38	23	4.7	223	7.96				
11	40	23	5.5	220	7.87				

Table A4-4. Overlying water quality data for male-only beakers from the ~53-day toxicity test with *Chironomus dilutus.* [1]

CERC ID	Day	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH	Alkalinity (mg/L $CaCO_3$)	Total Ammonia (mg/L)	Unionized ammonia (mg/L)	Hardness (mg/L $CaCO_3$)
12	0	23	7.7	213	8.03	70	0.129	0.00652	108
12	3	23	7.2	202	8.05				
12	5	23	5.2	208	7.78				
12	7	23	6.8	212	7.91				
12	11	23	5.2	218	7.75				
12	15	23	6.6	213	8.12				
12	17	23	5.2	219	7.8				
12	19	23	4.7	232	8				
12	21	23	4.1	219	7.66				
12	24	23	5.7	218	8.01				
12	26	23	6.6	219	7.92				
12	28	23	5.7	217	7.95				
12	33	23	6.6	225	8.26				
12	35	23	3.6	231	7.81				
12	38	23	5.7	225	8.02				
12	40	23	6.2	219	7.97				
WB	0	23	7.6	198	7.55	70	0.272	0.00471	100
WB	3	23	7.1	201	8.07				
WB	5	23	5.7	209	7.76				
WB	7	23	7.4	211	7.97				
WB	11	23	5.7	216	7.74				
WB	15	23	6.9	230	8.1				
WB	17	23	6.0	219	7.87				
WB	19	23	5.8	227	8.13				
WB	21	23	4.4	227	7.76				
WB	24	23	5.7	219	7.94				
WB	26	23	6.4	221	7.92				
WB	28	23	5.1	225	7.99				
WB	33	23	7.2	229	8.34				
WB	35	23	4.8	230	7.87				
WB	38	23	6.6	223	8.07				
WB	40	23	6.3	219	7.99				

[1] Male midge emerge sooner than females, so extra male-only beakers were set up to ensure males were available to pair with females when they emerged.

Table A4-5. Results of the t-tests for determining the toxicity of sediment samples used in tests with *Hyalella azteca* and *Chironomus dilutus*. [1]

Species / Endpoint	CERC ID / Result											
	1		2		3		4		5		6	
	t	p-value	t	p-value	t	p-value	t	p-value	t	p-value	t	p-value
Hyalella azteca												
Survival (%; Day 28)	-1.48	0.917	0	0.5	1.63	0.0609	0	0.5	1.77	0.0456	0.484	0.317
Length (mm; Day 28)	0	0.5	0.33	0.377	1.32	0.122	-0.414	0.653	-0.571	0.701	1.53	0.103
Weight (mg; Day 28)	0.1	0.462	0.282	0.394	1.39	0.112	-0.349	0.631	-0.556	0.696	1.63	0.0942
Biomass (mg; Day 28)	-0.155	0.558	0.112	0.458	1.37	0.112	-0.533	0.693	-0.225	0.584	1.39	0.116
Survival (%; Day 35)	-0.892	0.803	-0.574	0.711	3.84	0.0015	-0.574	0.711	0.51	0.309	-0.272	0.604
Survival (%; Day 42)	-2.08	0.966	-1.06	0.847	4.24	0.000859	0	0.5	0.424	0.339	-1.28	0.884
Length (mm; Day 42)	-1.49	0.917	0.612	0.277	0.837	0.211	-3.98	0.999	-0.778	0.774	0.509	0.31
Weight (mg; Day 42)	-1.5	0.919	0.563	0.293	0.762	0.232	-3.95	0.999	-0.769	0.771	0.564	0.292
Biomass (mg; Day 42)	-2.27	0.979	-0.288	0.611	4.69	0.000233	-1.97	0.965	0.0674	0.474	-0.433	0.663
Total Number of Young (Day 42)	0.787	0.224	2.49	0.0143	3.63	0.00299	0.559	0.293	2.1	0.0274	2.4	0.0177
Number of Young per Female (Day 42)	2.14	0.0303	2.81	0.00742	1.83	0.0459	1.33	0.103	1.74	0.0528	2.84	0.00791
Number of Young per Female (Normalized to 42-d Survival)	1.43	0.093	2.38	0.0165	4.56	0.00103	1.15	0.134	1.87	0.0436	2.28	0.0205
Chironomus dilutus												
Survival (%; Day 13)	0	0.5	-1.57	0.911	0	0.5	0	0.5	-1.57	0.911	-1.57	0.911
Weight (mg; Day 13)	-1.05	0.828	-0.981	0.808	-1.64	0.908	-1.05	0.816	-1.02	0.826	-0.383	0.642
Biomass (mg; Day 13)	-1.09	0.838	-1.39	0.885	-1.91	0.942	-0.622	0.719	-1.63	0.923	-1.03	0.83
Emergence (%)	2.48	0.0135	0.00325	0.499	-0.16	0.562	1.43	0.0899	2.2	0.0258	-0.9	0.808
20th Percentile Emergence Time (days)	0.179	0.57	0.786	0.777	1.37	0.897	2.15	0.97	0.589	0.716	-0.185	0.428
Median Emergence Time (days)	0.488	0.683	-0.0826	0.468	-0.0233	0.491	0.877	0.8	0.727	0.759	-0.869	0.202
Emerged Females (%)	0.775	0.226	1.07	0.151	1.32	0.103	1.52	0.0775	1.21	0.123	1.25	0.119
Total Number of Egg Cases	2.25	0.0206	0.728	0.239	0.819	0.213	2.34	0.0199	2.6	0.0108	1.73	0.0538
Paired Females Laying an Egg Case (%)	1.53	0.0785	0.208	0.419	-0.88	0.802	0.769	0.227	0.0435	0.483	1.51	0.0776
Number of Eggs per Case	-0.838	0.792	-0.168	0.565	0.497	0.314	1.14	0.138	0.441	0.334	0.195	0.424
Hatched (%)	0.781	0.23	2.24	0.0296	1.51	0.0854	-0.315	0.621	0.967	0.185	-0.442	0.667
Number of Larvae per Paired Female	1.07	0.153	0.644	0.265	0.261	0.399	1.4	0.0973	0.301	0.385	1.03	0.161
Number of Larvae per Case	-0.0852	0.533	0.232	0.41	0.738	0.238	0.981	0.172	0.669	0.26	0.126	0.451
Total Fecundity	1.81	0.0459	0.306	0.382	0.364	0.361	2.73	0.00986	2.38	0.0166	1.98	0.0358
Total Number of Larvae Produced	1.76	0.05	0.725	0.242	0.6	0.28	2.64	0.0117	2.36	0.0174	1.95	0.0378
Intrinsic Rate of Natural Increase (days)	1.11	0.143	0.751	0.235	0.766	0.231	0.925	0.187	0.571	0.29	2.69	0.00891
Adult Time to Death (days)	1.54	0.0783	-1.08	0.848	-0.498	0.685	-1.22	0.876	1.03	0.167	-0.453	0.671

[1] A sediment sample was designated as toxic for a given endpoint if both the control-adjusted response was less than 90%, and the mean response was significantly lower than the control ($\alpha = 0.05$). See Section 2.5.2.7 of the main report for further details.

Table A4-5. Results of the t-tests for determining the toxicity of sediment samples used in tests with *Hyalella azteca* and *Chironomus dilutus*. [1]

Species / Endpoint	CERC ID / Result											
	7		8		9		10		11		12	
	t	p-value	t	p-value	t	p-value	t	p-value	t	p-value	t	p-value
Hyalella azteca												
Survival (%; Day 28)	2.38	0.0148	-1.48	0.917	-0.596	0.721	-1.48	0.917	2.97	0.00499	0.92	0.184
Length (mm; Day 28)	-0.711	0.748	0.0346	0.487	0.438	0.34	0.204	0.423	3.05	0.019	1.27	0.133
Weight (mg; Day 28)	-0.659	0.732	0.139	0.448	0.51	0.316	0.22	0.417	3.02	0.0217	1.39	0.116
Biomass (mg; Day 28)	-0.445	0.664	-0.121	0.545	0.245	0.408	-0.0341	0.513	3.45	0.0124	1.57	0.0876
Survival (%; Day 35)	0.549	0.296	-1.24	0.876	-0.892	0.803	1.73	0.0571	1.49	0.0805	0.02	0.492
Survival (%; Day 42)	0.224	0.413	-0.475	0.678	-0.966	0.823	2.29	0.023	0.755	0.232	-0.207	0.581
Length (mm; Day 42)	-2.42	0.983	-1.31	0.889	0.467	0.326	-1.16	0.864	2.33	0.0215	0.84	0.208
Weight (mg; Day 42)	-2.33	0.98	-1.34	0.892	0.424	0.34	-1.12	0.855	2.33	0.0204	0.745	0.235
Biomass (mg; Day 42)	-1.11	0.857	-1.29	0.891	-0.212	0.582	1.7	0.0596	1.79	0.0482	0.189	0.427
Total Number of Young (Day 42)	1.15	0.135	-0.344	0.631	2.12	0.0267	1.81	0.048	4.24	0.00122	1.37	0.097
Number of Young per Female (Day 42)	2.14	0.0287	0.87	0.203	2.94	0.0067	0.819	0.214	4.75	0.000302	2.25	0.0228
Number of Young per Female (Normalized to 42-d Survival)	2.04	0.0332	0.632	0.272	2.63	0.0118	1.48	0.0824	4.3	0.000505	2.11	0.0291
Chironomus dilutus												
Survival (%; Day 13)	-1.57	0.911	-2.44	0.954	-2.44	0.954	-1	0.82	1.57	0.089	-1.57	0.911
Weight (mg; Day 13)	-1.75	0.934	0.519	0.313	-0.72	0.751	-1.53	0.911	2.83	0.0185	-2.27	0.966
Biomass (mg; Day 13)	-2.25	0.966	-1.69	0.92	-1.73	0.93	-2.16	0.962	2.94	0.0135	-2.33	0.97
Emergence (%)	0.159	0.438	-0.151	0.559	0.126	0.451	1.29	0.111	2.71	0.00993	0.364	0.361
20th Percentile Emergence Time (days)	-0.522	0.305	0.407	0.655	0.549	0.702	1.83	0.949	-2.48	0.0134	-0.98	0.172
Median Emergence Time (days)	-0.532	0.302	-0.52	0.307	-0.134	0.448	0.0249	0.51	-1.61	0.0703	-0.25	0.403
Emerged Females (%)	0.597	0.28	2.17	0.0243	1.71	0.0549	1.25	0.117	0.875	0.199	0.871	0.199
Total Number of Egg Cases	2	0.0352	1.99	0.0344	1.9	0.0392	2.17	0.025	1.95	0.0377	1.42	0.0895
Paired Females Laying an Egg Case (%)	-0.282	0.609	-0.567	0.71	0.949	0.186	-0.528	0.697	-0.282	0.609	1.56	0.0747
Number of Eggs per Case	-0.798	0.781	0.639	0.267	0.555	0.295	-0.97	0.824	0.0606	0.476	-0.307	0.618
Hatched (%)	-0.786	0.778	-0.74	0.764	0.651	0.266	0.218	0.416	1.31	0.115	1.87	0.0536
Number of Larvae per Paired Female	-0.709	0.755	0.703	0.247	1.22	0.124	-0.89	0.805	0.614	0.275	1.85	0.0426
Number of Larvae per Case	-0.85	0.795	0.456	0.328	0.643	0.267	-0.866	0.799	0.61	0.276	0.574	0.288
Total Fecundity	1.65	0.062	1.67	0.0604	1.39	0.0951	1.21	0.123	1.61	0.0654	0.895	0.194
Total Number of Larvae Produced	1.56	0.072	1.55	0.073	1.44	0.0885	1.25	0.117	1.89	0.04	1.26	0.114
Intrinsic Rate of Natural Increase (days)	2.42	0.0154	1.61	0.0665	2.43	0.0174	0.318	0.379	1.73	0.0526	0.645	0.265
Adult Time to Death (days)	0.807	0.218	0.298	0.386	0.741	0.237	-0.382	0.644	-0.108	0.542	0.194	0.425

[1] A sediment sample was designated as toxic for a given endpoint if both the control-adjusted response was less than 90%, and the mean response was significantly lower than the control ($\alpha = 0.05$). See Section 2.5.2.7 of the main report for further details.

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